

ES_isopach

Type File Geodatabase Feature Class



Tags spatial database, GIS, potash, permissive tract, mineral resources, isopach map, Elk Point Basin, Canada, United States

Summary

ES_isopach -- Spatial database for isopach map of the Esterhazy Member of the Prairie Evaporite, Elk Point Group, in the Elk Point Basin, Canada and U.S. (in Esri file geodatabase feature class format).

The spatial database was created for use in a geographic information system (GIS) as part of a global potash resource assessment by the U.S. Geological Survey.

Description

The Elk Point Basin is an evaporite basin of Middle Devonian age that contains a significant portion of the world's potash resources. Potash-bearing salt is concentrated in the upper 100 meters of the Prairie Evaporite in the Patience Lake, Belle Plaine, White Bear, and Esterhazy Members. Known potash mineralization is concentrated in the southeastern portion of the Elk Point Basin mainly in Saskatchewan and extending short distances into adjacent parts of Alberta, Manitoba, North Dakota, and Montana.

Permissive tracts were delineated by the extent of each member of the Prairie Evaporite where the member is at least 1 meter in thickness and less than 3 kilometers from the surface.

Potash resources were assessed for each tract using a method based on an enhanced geometric analysis of the likely spatial distribution of potash mineralization. We used Monte Carlo simulations to estimate missing or incomplete variables such as density, average grade, and geologic loss due to salt dissolution to calculate the distribution and abundance of estimated undiscovered potash (as K₂O). Potash grades were calculated using both historic (1950s and 1960s) and recent (2007–2011) drill hole analyses. The mean estimated undiscovered K₂O resource (which includes sylvite and carnallite) in these tracts is 864 billion metric tons.

Preferred reference:

Cocker, M.D., Orris, G.J., Dunlap, P., Yang, C., and Bliss, J.D., 2023, Geology and undiscovered resource assessment of the potash-bearing, Middle Devonian (Givetian), Prairie Evaporite, Elk Point Basin, Canada and United States: U.S. Geological Survey Scientific Investigations Report 2010–5090–CC, 145 p. and data files, <https://doi.org/10.3133/sir20105090cc>.

Credits

Mark Cocker interpreted the data and is responsible for the scientific content.

Pamela Dunlap processed the digital data, built the spatial database, and generated volume data.

Deborah A. Briggs rectified scanned images of paper maps to produce georectified TIFF images (GeoTIFFs) for use in a GIS. She also digitized initial areas for extent of carnallite.

Leila Gass digitized areas of known salt solutioning from the GeoTIFF images and assisted in digitizing revisions to isopachs.

Use limitations

None. The U.S. Geological Survey (USGS) provides these geographic data "as is." The USGS makes no guarantee or warranty concerning the accuracy of information contained in the geographic data. The USGS further makes no warranties, either expressed or implied as to any other matter whatsoever, including, without limitation, the condition of the product, or its fitness for any particular purpose. The burden for determining fitness for use lies entirely with the user. Although these data have been processed successfully on computers of the USGS, no warranty, expressed or implied, is made by the USGS regarding the use of these data on any other system, nor does the fact of distribution constitute or imply such warranty.

Extent

West -108.456912 East -100.793605
North 52.516937 South 47.259077

Scale Range

Maximum (zoomed in) 1:5,000
Minimum (zoomed out) 1:150,000,000

Topics and Keywords ►

Content type ⇌ Downloadable Data

Citation ►

Title ⇌ ES_isopach

Alternate titles Generalized isopach map of the Esterhazy Member of the Prairie Evaporite

Presentation formats ⇌ digital map

FGDC geospatial presentation format map

Series

Name Scientific Investigations Report

Issue 2010-5090-CC

Collection title Geology and undiscovered resource assessment of the potash-bearing, Middle Devonian (Givetian), Prairie Evaporite, Elk Point Basin, Canada and United States

Other citation details

Cocker, M.D., Orris, G.J., Dunlap, P., Yang, C., and Bliss, J.D., 2023, Geology and undiscovered resource assessment of the potash-bearing, Middle Devonian (Givetian), Prairie Evaporite, Elk Point Basin, Canada and United States: U.S. Geological Survey Scientific Investigations Report 2010–5090–CC, 145 p. and data files, <https://doi.org/10.3133/sir20105090cc>.

Resource Details ►

Dataset languages ⇌ English (UNITED STATES)

Spatial representation type ⇔ vector

Processing environment ⇔ Microsoft Windows 7 Version 6.1 (Build 7601) Service Pack 1; Esri ArcGIS 10.2.1.3497

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ArcGIS item properties

Name ⇔ ES_isopach

Location ⇔ file://\IGSWZEWMWSPDUN2\E\$\ElkPoint_revised2014April\ElkPoint\ElkPoint_potash.gdb

Access protocol ⇔ Local Area Network

Extents ►

Extent

Geographic extent

Bounding rectangle

Extent type

Extent used for searching

West longitude ⇔ -108.456912

East longitude ⇔ -100.793605

North latitude ⇔ 52.516937

South latitude ⇔ 47.259077

Extent contains the resource ⇔ Yes

Extent in the item's coordinate system

westBL ⇔ -848112.514200

eastBL ⇔ -360922.824300

southBL ⇔ 862860.159100

northBL ⇔ 1391077.673200

exTypeCode ⇔ Yes

Resource Maintenance ►

Resource maintenance

Update frequency not planned

Resource Constraints ►

Constraints

Limitations of use

None. The U.S. Geological Survey (USGS) provides these geographic data "as is." The USGS makes no guarantee or warranty concerning the accuracy of information contained in the geographic data. The USGS further makes no warranties, either expressed or implied as to any other matter whatsoever, including, without limitation, the condition of the product, or its fitness for any particular purpose. The burden for determining fitness for use lies entirely with the user. Although these data have been processed successfully

on computers of the USGS, no warranty, expressed or implied, is made by the USGS regarding the use of these data on any other system, nor does the fact of distribution constitute or imply such warranty.

Spatial Reference ►

ArcGIS coordinate system

Type ⇔ Projected

Geographic coordinate reference ⇔ GCS_North_American_1983

Projection ⇔ Canada_Albers_Equal_Area_Conic

Coordinate reference details ⇔

ProjectedCoordinateSystem

WKID 102001

XOrigin -13825800

YOrigin -7913700

XYScale 10000

ZOrigin -100000

ZScale 10000

MOrigin -100000

MScale 10000

XYTolerance 0.001

ZTolerance 0.001

MTolerance 0.001

HighPrecision true

LatestWKID 102001

WKT

PROJCS["Canada_Albers_Equal_Area_Conic",GEOGCS["GCS_North_American_1983",DATUM["D_North_Amer

Reference system identifier

Value ⇔ 102001

Codespace ⇔ ESRI

Version ⇔ 10.2.1

Spatial Data Properties ►

Vector ►

Level of topology for this dataset ⇔ geometry only

Geometric objects

Feature class name ES_isopach

Object type ⇔ composite

Object count ⇔ 481

ArcGIS Feature Class Properties ►

Feature class name ES_isopach

Feature type ⇔ Simple

Geometry type ⇔ Polygon

Has topology ⇔ FALSE

Feature count ⇔ 481

Spatial index ⇔ TRUE

Linear referencing ⇔ FALSE

Lineage ►

Lineage statement

Total thickness of each member of the Prairie Evaporite was determined from well and drill-hole data in the feature class ElkPt_thickness, augmented by data derived from Fuzesy (1982) and Great Northern Railway Company (1965). These data were used to construct isopach maps of each member (see the feature classes BP_isopach, ES_isopach, PL_isopach, and WB_isopach) where overburden was less than 3 km in depth.

Process step ►

When the process occurred 2011-11-14 00:00:00

Description

Several steps were taken to process the data to create the isopach maps. Initially, data from drill holes and wells in Canada were used to create a continuous raster surface (using the natural neighbors interpolation algorithm in ArcGIS 9.3) from which contours (line features) were computer generated at 2-m intervals of thickness (starting at 1 m). Additional data from hand-drawn isopach maps of potash-bearing units in the United States were then digitized and incorporated into the existing datasets of thickness contours for Canada. Isopachs were truncated at the southern margin (in the U.S.) where overburden exceeded 3 km in depth. These line features were converted to polygon features which were then attributed for minimum, maximum, and average thickness for each member of the Prairie Evaporite. Areas of known salt solutioning and areas representing thickness less than 1 m were removed; the resultant isopach map datasets were proofed against the drill-hole and well dataset, and areas of salt solutioning were manually revised to exclude data points where thickness was greater than or equal to 1 m.

Source data ►

Description

ElkPt_thickness -- feature class for thickness, which is included in the ElkPoint.gdb.

Source medium name online link

Source data ►

Description

Fuzesy, Anne, 1982, Isopach maps of the White Bear and Esterhazy Members, fig. 6b in Potash in Saskatchewan: Saskatchewan Geological Survey Report 181, 44 p.

Source medium name hardcopy—printing on paper

Source data ►

Description

Great Northern Railway Company, 1965, Depths to potash bearing formation, Williston Basin— U.S. portion, Plate 6, in Potash occurrences in the Williston Basin: Great Northern Railway Company Mineral Research and Development Department Report 15, scale 1:760,320, 11 p.

Source medium name hardcopy—printing on paper

Resolution of the source data

Scale denominator 760320

Distribution ►

Distributor ►

Contact information - distributor

Organization's name U.S. Geological Survey

Contact information ►

Phone

Voice 1-888-275-8747

Voice 1-888-ASK-USGS

Address

Type postal

Delivery point Denver Federal Center, P.O. Box 25286

City Denver

Administrative area Colorado

Postal code 80225

Country US

e-mail address infoservices@usgs.gov

Transfer options

Transfer size ⇔ 0.524

Online source

Online location (URL) ⇔ <https://doi.org/10.3133/sir20105090cc>

Connection protocol ⇔

Description ⇔

Function performed download

Distribution format

Name ⇔ File Geodatabase Feature Class

Version ArcGIS 10

Specification GIS_ElkPt_potash.zip

File decompression technique To open a zipped file, double-click on the zipped file listed in My Computer or Windows Explorer, drag and drop the zipped file onto WINZIP, or use the standard Open dialogue box.

Format information content ElkPt_potash.gdb and metadata

Fields ►

Details for object ES_isopach ►

Type ⇔ Feature Class

Row count ⇔ 481

Definition

Generalized isopach map of the Esterhazy Member of the Prairie Evaporite

Field OBJECTID ►

Alias ⇔ OBJECTID

Data type ⇔ OID

Width ⇔ 4

Precision ⇔ 0

Scale ⇔ 0

Field description ⇔
Internal feature number.

Description source ⇔
ESRI

Description of values ⇔
Sequential unique whole numbers that are automatically generated.

Field Shape ►

Alias ⇔ Shape
Data type ⇔ Geometry
Width ⇔ 0
Precision ⇔ 0
Scale ⇔ 0

Field description
Feature geometry.

Description source
ESRI

Description of values
Coordinates defining the features.

Field Thick_min ►

Alias ⇔ Thick_min
Data type ⇔ SmallInteger
Width ⇔ 2
Precision ⇔ 0
Scale ⇔ 0

Field description
THICKNESS MINIMUM -- Minimum thickness of unit

Range of values
Minimum value 1
Maximum value 25
Units of measure meters

Field Thick_max ►

Alias ⇔ Thick_max
Data type ⇔ SmallInteger
Width ⇔ 2
Precision ⇔ 0
Scale ⇔ 0

Field description

THICKNESS MAXIMUM -- Maximum thickness of unit

Range of values

Minimum value 3

Maximum value 27

Units of measure meters

Field Thk_range ►

Alias ⇔ Thk_range

Data type ⇔ String

Width ⇔ 20

Precision ⇔ 0

Scale ⇔ 0

Field description

THICKNESS RANGE -- Range in thickness

List of values

Value 1 to 3 m

Value 3 to 5 m

Value 5 to 7 m

Value 7 to 9 m

Value 9 to 11 m

Value 11 to 13 m

Value 13 to 15 m

Value 15 to 17 m

Value 17 to 19 m

Value 19 to 21 m

Value 21 to 23 m

Value 23 to 25 m

Value 25 to 27 m

Field Thick_aver ►

Alias ⇔ Thick_aver

Data type ⇔ SmallInteger

Width ⇔ 2

Precision ⇔ 0

Scale ⇔ 0

Field description

THICKNESS AVERAGE -- Average (mean) thickness of the unit.

Range of values

Minimum value 2

Maximum value 26

Units of measure meters

Field Coded_ID ►

Alias ⇔ Coded_ID

Data type ⇔ String

Width ⇔ 15

Precision ⇔ 0

Scale ⇔ 0

Field description

CODED IDENTIFIER -- Coded, unique identifier assigned to permissive tract

List of values

Value 003sbK0001d

Description permissive tract for the Esterhazy Member of the Prairie Evaporite in the Elk Point Basin, North America

Field Shape_Length ►

Alias ⇔ Shape_Length

Data type ⇔ Double

Width ⇔ 8

Precision ⇔ 0

Scale ⇔ 0

Field description ⇔

Length of feature in internal units.

Description source ⇔

ESRI

Description of values ⇔

Positive real numbers that are automatically generated.

Field Shape_Area ►

Alias ⇔ Shape_Area

Data type ⇔ Double

Width ⇔ 8

Precision ⇔ 0

Scale ⇔ 0

Field description ⇔

Area of feature in internal units squared.

Description source ⇔
ESRI

Description of values ⇔
Positive real numbers that are automatically generated.

Metadata Details ►

Metadata language ⇔ English (UNITED STATES)
Metadata character set ⇔ utf8 - 8 bit UCS Transfer Format

Scope of the data described by the metadata ⇔ dataset
Scope name ⇔ dataset

Last update ⇔ 2023-09-12

ArcGIS metadata properties

Metadata format ArcGIS 1.0
Standard or profile used to edit metadata FGDC
Metadata style FGDC CSDGM Metadata

Created in ArcGIS for the item 2011-11-14 08:55:39
Last modified in ArcGIS for the item 2023-09-12 14:32:16

Automatic updates

Have been performed Yes
Last update 2014-04-07 15:13:18

Metadata Contacts ►

Metadata contact - author

Individual's name Pamela Dunlap
Organization's name U.S. Geological Survey
Contact's position Geologist

Contact information ►

Phone

Voice 1-520-670-5573

Address

Type postal
Delivery point 520 N Park Ave., Ste. 355
City Tucson
Administrative area Arizona
Postal code 85719
Country US
e-mail address pdunlap@usgs.gov

Metadata Maintenance ►

Maintenance

Update frequency not planned

Thumbnail and Enclosures ▶

- Thumbnail
 - Thumbnail type
 - Image file