Crushed Stone Resource Potential in Aitkin County, Minnesota

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Section 1 Overview

Originator	Minnesota Department of Natural Resources, Division of Lands and Minerals, Mineral Potential Evaluation Section, Aggregate Resource Mapping Program
Title	Crushed Stone Resource Potential in Aitkin County, Minnesota
Abstract	This dataset consists of information about the geology, geological characteristics, and aggregate potential of crushed-stone potential units. Four attribute fields relate to crushed stone characteristics, including overburden thickness, quality, probability, and bedrock geological unit. These characteristics were used to calculate the aggregate potential of the map unit for crushed stone.
Purpose	To summarize the geological characteristics, bedrock geology, and crushed-stone potential of the different bedrock units. To help categorize the geological characteristics and incorporate them into a model to help determine the crushed-stone potential of the deposit.
Time Period of Content Date	2015
Currentness Reference	Data were digitized between 2013-2015.
Progress	Complete
Maintenance and Update Frequency	None Planned

Spatial Extent of Data Aitkin County, Minnesota

Bounding Coordinates
-93.81
-93.05
47.16
46.15

Place Keywords

Theme Keywords bedrock, geological characteristics, aggregate potential, crushed stone, construction aggregates

Theme Keyword Thesaurus

Access Constraints None

Use Constraints

Use Disclaimer:
Every reasonable effort has been made to ensure the accuracy of the factual data on which this map interpretation is based. However, the Department of Natural Resources does not warrant the accuracy, completeness, or any implied uses of these data. Users may wish to verify critical information; sources include both the references here and information on file in the offices of the Minnesota Department of Natural Resources. Every effort has been made to ensure the interpretation shown conforms to sound geologic and cartographic principles. No claim is made that the interpretation shown is rigorously correct, however, and it should not be used to guide engineering-scale decisions without site-specific verification. This information should not be used to establish legal title, boundaries, or locations of improvements.

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Browse Graphic None available

Associated Data Sets

Aitkin County construction aggregate resource spatial datasets (shapefiles & file geodatabase) are included in the file Aitkindata.zip, accessible from the MN DNR Aggregate Mapping web page: http://www.dnr.state.mn.us/lands_minerals/aggregate_maps/completed/index.html

The spatial datasets include: sand and gravel resource potential, crushed-stone resource potential, test-holes drilled, geologic field observations, aggregate pits, Minnesota Geological Survey (MGS) County Well Index (CWI) data points, Mn/DOT Aggregate Source Information System (ASIS) points, and Mn/DOT ASIS pit quality table.

Section 2 Data Quality

Attribute Accuracy

Logical Consistency

Completeness

Since aggregate resources are mined from the earth, geologic methods are required to determine the location, distribution, and quality of a potential aggregate source. At this reconnaissance level (1:100,000) assessment, three geologic criteria were used to determine crushed-stone potential: bedrock type from existing bedrock mapping, depth of burial, and probability of occurrence based on the availability of data. Different bedrock types have different physical properties (e.g. hardness, durability, and chemical composition). To be suitable for use as a construction aggregate, a rock must be hard, durable, not fracture in a predominant direction or react chemically.

The quantity, quality, and distribution of the data available to us determined the confidence level or probability of the crushed-stone potential designation. General trends in the suitability, or quality, of bedrock as a source for crushed-stone resources were interpreted from existing geologic information and MnDOT specifications.

An existing depth to bedrock model (Jirsa and others, 2010) predicted where crystalline bedrock was within 50 feet of the land surface. Much of the subsurface information used for the model came from the County Well Index (CWI), an online database developed and maintained by the Minnesota Department of Health (MDH) and MGS. CWI contains basic geologic and stratigraphic information for over 300,000 domestic and municipal water wells drilled throughout Minnesota. The CWI identifies wells as being either located or unlocated. Located CWI wells are field-verified under the supervision of the MGS. Unlocated CWI wells have not been field-verified, but their records may contain information that can be used to associate a well with a given address or parcel of land. For this project, unlocated wells were integrated into the existing depth-to-bedrock model (Jirsa and others, 2010) if the location of a well record could be reasonably verified using parcel data from county tax records, address information, plat maps, air photographs, and road maps. When correlation was established, the well was placed near a residential dwelling within the parcel. This method of locating wells is not as accurate as field checking using 7.5 Minute USGS Quadrangle maps and/or Global Positioning System (GPS). However, the level of accuracy is within an acceptable range for this reconnaissance-level assessment.

Of the bedrock units mapped within the county, only 5 bedrock types were shallowly buried or exposed; McGrath Gneiss, Little Falls Formation, Glen Township Metabasalt, Dam Lake Quartzite, and Paleoproterzoic Iron-formation. They can be classified using MnDOTâ€™s system wherein Class A crushed-stone ranks as the highest quality aggregate (MnDOT 3139.2 A2a) and is defined as crushed-stone derived from listed rock types like basalt, diabase, gabbro, quartzite and granite. Class A aggregates are highly valued because they meet rigorous specifications for high performance pavement mix designs required for Superpave and other applications. All other rock types, (e.g. schist, carbonate, and rhyolite) are classified as Class B aggregates. However, for a bedrock source at any given location to be qualified as a certified aggregate source for concrete, the material must undergo testing and meet MnDOT specifications (MnDOT Standard Specifications for Construction, 2005). This type of testing was not performed as part of this project. Therefore, the final determination of crushed-stone quality was assessed on a relative scale from â€œlowâ€ to â€œighâ€ within the crushed-stone potential classification system.

Horizontal Positional Accuracy see completeness of data

Vertical Positional Accuracy None

Lineage see completeness of data

Section 3 Spatial Data Organization (not used in this metadata)

Section 4 Coordinate System

Horizontal Coordinate Scheme Universal Transverse Mercator

UTM Zone Number 15

Horizontal Datum NAD83

Horizontal Units meters

Section 5 Attributes

Overview The polygons were delineated to represent geological features, geological characteristics, and aggregate potential for crushed-stone. See completeness of data for more information on methods.

Detailed Citation

Table Detail:

aitk_csp - Aitkin County Crushed Stone Resource Potential

Field Name	Valid Values	Definition	Definition Source
Potential	*enumerated*	See below	
	Significant Potential for Crushed-Stone Resources	Includes high and moderate potential map units. The following bedrock lithologic types are interpreted to have significant potential for crushed-stone resources: granite, granitic gneiss, quartzite, and mafic to ultramafic intrusive rock. These bedrock types generally have physical characteristics suitable for producing Class A aggregates. In Aitkin County there are granitic rocks (Pgl-Mille Lacs Granite, Pgd- Isle and Warman Granite), granitic gneiss rocks (Agn- McGrath Gneiss), quartzite (Pmq- Dam Lake Quartzite), and mafic intrusive rocks (Pmi). High or moderate crushed-stone potential map units also need to be either exposed at the surface or be covered by less than 30 feet of overburden. Only the McGrath Gniess and Dam Lake Quartzite are exposed at the surface or interpreted to be covered by less than 30 feet of overburden in Aitkin County.	
	Nonsignificant Potential for Crushed-Stone Resources	Includes low and limited potential map units. Nonsignificant is a term used in this assessment to define mapped areas that contain any of the following conditions: poor quality bedrock units, moderate quality bedrock units with thick overburden (>30 feet), or areas where higher potential may exist but cannot be verified due to a lack of substantiating data which facilitate a lower probability rating. Poor quality bedrock units exposed at the surface, or are buried by less than 15 feet of overburden, include metasedimentary and metavolcanic rocks in the Little Falls Formation.	
Class	*enumerated*	See below	
	High Potential for Crushed Stone Resources	Includes McGrath Gneiss exposed at the land surface or buried by less than 15 feet of overburden. The interpreted quality of this bedrock type is moderate. The probability of crushed-stone existing within a map unit ranges from moderate to high.	
	Moderate Potential for Crushed Stone Resources	Can include either of the following criteria:	
	Low Potential for Crushed Stone Resources	Can include either of the following criteria:	
	Limited Potential for Crushed Stone Resources	Includes all other rock types seen in bedrock geology legend with varying thickness of overburden (15 to >50 feet). The interpreted quality ranges from poor to moderate. The probability of crushed-stone existing within a mapping unit ranges from low to moderately low.	
Overburden	-	Range of the overburden thickness, also can be described as the depth to crystalline bedrock (in feet)	
Quality	-	The relative degree of quality that a bedrock unit can be used for crushed stone. N/A is not available.	
DESCRIPTIO	-	Field and attributes taken from the Minnesota Geological Survey Bedrock Geology Maps: 'Statewide Bedrock Geology' GIS data (1:500,000, S-21, 2011). Provided as a reference.	
Rock_type	-	Field and attributes taken from the Minnesota Geological Survey Bedrock Geology Maps: 'Statewide Bedrock Geology' GIS data (1:500,000, S-21, 2011). Provided as a reference.	

Section 6 Distribution

Publisher Minnesota DNR - Lands and Minerals

Publication Date	06/23/2015
Contact Person Information	Kevin Hanson, GIS Data Contact Minnesota DNR - Lands and Minerals 500 Lafayette Rd Saint Paul, MN 55155 Phone: 651-259-5429 Email: kevin.hanson@state.mn.us
Distributor's Data Set Identifier	
Distribution Liability	Please read accompanying document: Minnesota DNR Data and Software License Agreement.pdf
Ordering Instructions	Visit the web site noted in the online linkage section, or send an email to the Distribution Contact listed in this metadata record
Online Linkage	I AGREE to the notice in "Distribution Liability" above. Clicking to agree will either begin the download process or link to download information. See "Ordering Instructions" above for details.

Section 7 Metadata Reference

Metadata Date	07/23/2014
Contact Person Information	Kevin Hanson, GIS Data Contact Minnesota DNR - Lands and Minerals 500 Lafayette Rd Saint Paul, MN 55155 Phone: 651-259-5429 Email: kevin.hanson@state.mn.us
Metadata Standard Name	Minnesota Geographic Metadata Guidelines
Metadata Standard Version	1.2
Metadata Standard Online Linkage	http://www.mngeo.state.mn.us/committee/standards/mgmg/metadata.htm

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