

**Stearns County, Minnesota - Aggregate Resources**  
**Crushed-Stone Potential**  
**stea\_csp**

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**Metadata Summary**

<b><i>Originator</i></b>	Minnesota Department of Natural Resources, Division of Lands and Minerals, Mineral Potential Evaluation Section
<b><i>Abstract</i></b>	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.
<b><i>Browse Graphic</i></b>	none available
<b><i>Time Period of Content Date</i></b>	2011
<b><i>Currentness Reference</i></b>	Data were gathered from 2005 to 2011. Data were compiled and interpreted from the Spring of 2010 to the Spring of 2012.
<b><i>Access Constraints</i></b>	
<b><i>Use Constraints</i></b>	Acknowledgement of the Minnesota Department of Natural Resources and the Minnesota Geological Survey is appreciated for products derived from these data.
<b><i>Distributor Organization</i></b>	Minnesota Department of Natural Resources, Division of Lands and Minerals
<b><i>Ordering Instructions</i></b>	<p>Stearns County's aggregate resource spatial datasets (shapefiles &amp; file geodatabase) are included in the file Stearnsdata.zip, accessible from the MN DNR Aggregate Mapping web page: <a href="http://www.dnr.state.mn.us/lands_minerals/aggregate_maps/completed/index.html">http://www.dnr.state.mn.us/lands_minerals/aggregate_maps/completed/index.html</a></p> <p>The spatial datasets include: sand and gravel resource potential, crushed-stone 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.</p>
<b><i>Online Linkage</i></b>	<a href="#">Click here</a> to download data. (See Ordering Instructions above for details.) By clicking here, you agree to the notice in "Distribution Liability" in Section 6 of this metadata.

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## Full Metadata

### Stearns County Aggregate Resources: stea\_csp (crushed-stone potential)

Section 1	Identification Information		
<b>Originator</b>	Minnesota Department of Natural Resources, Division of Lands and Minerals, Mineral Potential Evaluation Section		
<b>Title</b>	Stearns County Aggregate Resources: stea_csp (crushed-stone potential)		
<b>Abstract</b>	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.		
<b>Purpose</b>	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.		
<b>Time Period of Content Date</b>	2012		
<b>Currentness Reference</b>	Data were gathered from 2005 to 2011. Data were compiled and interpreted from the Spring of 2010 to the Spring of 2012.		
<b>Progress</b>	Complete		
<b>Maintenance and Update Frequency</b>	None planned		
<b>Spatial Extent of Data</b>	Stearns County, Minnesota		
<b>Bounding Coordinates</b>	-93.13 -94.05 45.79 45.72		
<b>Place Keywords</b>	Stearns County, Minnesota		
<b>Theme Keywords</b>	bedrock, geological characteristics, aggregate potential, crushed stone, construction aggregates		
<b>Theme Keyword Thesaurus</b>			
<b>Access Constraints</b>			
<b>Use Constraints</b>	Acknowledgement of the Minnesota Department of Natural Resources and the Minnesota Geological Survey is appreciated for products derived from these data.		
<b>Contact Person Information</b>	Aggregate Resource Mapping Program, Industrial Minerals Geologist or GIS Specialist Minnesota Department of Natural Resources, Division of Lands and Minerals 500 Lafayette Road - St. Paul, MN 55155-4045 Phone: 651-259-5959 FAX: 651-296-5939 E-mail: <a href="mailto:aggregatemap@state.mn.us">aggregatemap@state.mn.us</a>		
<b>Browse Graphic</b>	none available		

## ***Browse Graphic File Description***

### ***Associated Data Sets***

Stearns County's aggregate resource spatial datasets (shapefiles & file geodatabase) are included in the file Stearnsdata.zip, accessible from the MN DNR Aggregate Mapping web page:

[http://www.dnr.state.mn.us/lands\\_minerals/aggregate\\_maps/completed/index.html](http://www.dnr.state.mn.us/lands_minerals/aggregate_maps/completed/index.html)

The spatial datasets include: sand and gravel resource potential, crushed-stone 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 Information**

#### ***Attribute Accuracy***

#### ***Logical Consistency***

#### ***Completeness***

The crushed-stone potential units were delineated using an overburden model developed and interpreted from the county well index, soil surveys, MGS outcrops, exploratory drilling, and field observations. Additionally, the crushed-stone potential was further interpreted using the following Minnesota Geological Survey Bedrock Geology Maps: 'Statewide Bedrock Geology' (1:500,000, S-21, 2011).

#### ***Horizontal Positional Accuracy***

1:100,000

#### ***Vertical Positional Accuracy***

Not applicable.

#### ***Lineage***

The first step in determining the distribution of aggregate resources is to understand the recent geological history of the area. The geological history basically tells us the story, or sequence of events, of when the aggregate and other sediments were deposited. By understanding this story we can determine where the aggregate was deposited, as well as some of the general characteristics about the material. Data about the overburden, bedrock, and depth to bedrock includes well locations with well log information indicating a depth to bedrock; bedrock outcrops from the soil information; bedrock outcrops from MGS; depth to bedrock information from exploratory drilling; bedrock outcrops observed in the field. To interpret the overburden depth, a GIS based computer model was created using the Spatial Analyst extension in ArcGIS 9.3.

#### ***Source Scale Denominator***

500000

## **Section 3**

### **Spatial Data Organization Information**

#### ***Native Data Set Environment***

ArcGIS 9.3

#### ***Geographic Reference for Tabular Data***

#### ***Spatial Object Type***

Vector

#### ***Vendor Specific Object Types***

Polygon

#### ***Tiling Scheme***

None

Section 4		Spatial Reference Information		
<i>Horizontal Coordinate Scheme</i>		UTM		
<i>Ellipsoid</i>		GRS80		
<i>Horizontal Datum</i>		NAD83		
<i>Horizontal Units</i>		Meters		
<i>Distance Resolution</i>				
<i>Altitude Datum</i>		Not applicable		
<i>Depth Datum</i>		Not applicable		
<i>UTM Zone Number</i>		15E		
Section 5		Entity and Attribute Information		
<i>Entity and Attribute Overview</i>		The polygons were delineated to represent geological features, geological characteristics, and aggregate potential for crushed-stone		
<i>Entity and Attribute Detailed Citation</i>		See beyond Section 7 for detailed field and attribute information		
Section 6		Distribution Information		
<i>Publisher</i>		Minnesota Department of Natural Resources, Division of Lands and Minerals, Mineral Potential Evaluation Section		
<i>Publication Date</i>		2012		
<i>Contact Person Information</i>		Aggregate Resource Mapping Program Industrial Minerals Geologist or GIS Specialist Minnesota Department of Natural Resources, Division of Lands and Minerals 500 Lafayette Road St. Paul, MN 55155-4045 Phone: 651-259-5959 FAX: 651-296-5939 E-mail: <a href="mailto:aggregatemap@state.mn.us">aggregatemap@state.mn.us</a>		
<i>Distributor's Data Set Identifier</i>		Stearns County Aggregate Resources, Sand and Gravel Potential		
<i>Distribution Liability</i>		The State of Minnesota makes no representations or warranties express or implied, with respect to the use of the information contained herein regardless of its format or the means of its transmission. There is no guarantee or representation to the user as to the accuracy, currency, suitability, completeness, usefulness, or reliability of this information for any purpose. The user accepts the information "as is." The State of Minnesota assumes no responsibility for loss or damage incurred as a result of any user's reliance on this information. All maps, reports, data, and other information contained herein are protected by copyright. Permission is granted to copy and use the materials herein for any lawful noncommercial purpose. Any user of this information agrees not to transmit or provide access to all or any part of this information to another party unless the user shall include with the information a copy of this disclaimer.		

***Transfer Format  
Name***

***Transfer Format  
Version Number***

***Transfer Size*** mb for data, mb for associated maps

***Ordering  
Instructions***

Stearns County's aggregate resource spatial datasets (shapefiles & file geodatabase) are included in the file Stearnsdata.zip, accessible from the MN DNR Aggregate Mapping web page:  
[http://www.dnr.state.mn.us/lands\\_minerals/aggregate\\_maps/completed/index.html](http://www.dnr.state.mn.us/lands_minerals/aggregate_maps/completed/index.html)  
The spatial datasets include: sand and gravel resource potential, crushed stone 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.

***Online Linkage*** [Click here](#) to download data. (See Ordering Instructions above for details.) By clicking here, you agree to the notice in "Distribution Liability" above.

## **Section 7**

### **Metadata Reference Information**

***Metadata Date***

2012

***Contact Person  
Information***

Aggregate Resource Mapping Program, Industrial Minerals Geologist or GIS Specialist  
Minnesota Department of Natural Resources, Division of Lands and Minerals  
500 Lafayette Road  
St. Paul, MN 55155-4045  
Phone: 651-259-5959  
FAX: 651-296-5939  
E-mail: [aggregatemap@state.mn.us](mailto:aggregatemap@state.mn.us)

***Metadata Standard  
Name***

Minnesota Geographic Metadata Guidelines

***Metadata Standard  
Version***

2.1

***Metadata Standard  
Online Linkage***

<http://www.lmic.state.mn.us/gc/stds/metadata.htm>

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Table Name	Field Name	Definition	Valid Values	Descriptions
stea_csp.dbf	OBJECTID	Number, 4	e.g., 1-247	Unique number for each crushed stone potential polygon
	Potential	Text, 75	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: granite rock, granitic gneiss, and mafic to ultramafic intrusive rock. These bedrock types generally have physical characteristics suitable for producing Class A aggregates, inferred to be thick (greater than 200 feet), and covered by less than 30 feet of overburden. Most of the quarries located within the county are active or inactive dimension-stone quarries. Dimension-stone quarries are located within rock types that are also suitable for crushed stone aggregate and, for the purpose of this project, are considered as identified crushed-stone resources.
			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: lower quality bedrock units, high 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. Lower quality bedrock units include gneiss as well as metasedimentary and metavolcanic rocks. These rock types do not have physical characteristics suitable for producing Class A aggregates. No quarries exist within these rock types.
	Class	Text, 75	See Below	
	LANDFORM	Text, 50	See Below	
			High Potential for Crushed Stone Resources	Includes granites, granitic gneiss, and mafic to ultramafic intrusive rock exposed at the land surface or buried by less than 15 feet of overburden. Depending on the rock type, the interpreted quality is either moderate or very high. The probability of crushed stone existing within a map unit ranges from moderate to very high.
			Moderate Potential for Crushed Stone Resources	Includes granites, granitic gneiss, and mafic to ultramafic intrusive rock buried beneath 16 to 30 feet of overburden. Depending on the rock type, the interpreted quality of these units is either very good or moderate. The probability of crushed stone resource existing within a map unit ranges from moderate to moderately high.

			Low Potential for Crushed Stone Resources	Includes granites, granitic gneiss, and mafic to ultramafic intrusive rock buried by 31 to 50 feet of overburden or gneiss buried by 0 to 15 feet of overburden. Low potential also includes areas with little supporting data to substantiate a higher potential classification. The interpreted rock quality for granites, granitic gneiss and mafic to ultramafic rock units ranges from moderate to very high. The interpreted rock quality for gneiss is low. The probability that these rock types occur within the map unit ranges from low to high depending on rock type and overburden thickness.
			Limited Potential for Crushed Stone Resources	Includes all rock types listed below with varying thickness of overburden (15 to >50 feet). The interpreted quality ranges from very low to very high. The probability of crushed stone existing within a mapping unit ranges from low to moderately low. Most of these rock types have been dissolved into the attribute 'Bedrock Undifferentiated'. Granites with >50 feet of overburden Granitic Gneiss with >50 feet of overburden Gneiss with >15 feet overburden Mafic to Ultramafic Intrusive Rocks with >50 feet of overburden Metasedimentary and Metavolcanic Rocks with varying thickness of overburden (~30 to >50 feet)
	Overburden	Text, 15	(0-15, 16-30, 31-50, 50+)	Range of the overburden thickness, also can be described as the depth to crystalline bedrock (in feet)
	Quality	Text, 20	Very Good, Moderate, Moderately Poor, NA	The relative degree of quality that a bedrock unit can be used for crushed stone. NA is not available.
	Probablty	Text, 20	Very High, High, Moderately High, Moderate, Moderately Low, Low, Very Low, NA	The relative degree of certainty that crushed stone exists within a unit. Based on air photo interpretations, field observations, CWI, drilling, presence of quarries, etc. Each unit is relative to the other units and range from very high to very low. NA is not available.
	Bdrk_Class	Text, 50	See Below	
			Granites	Coarse-grained crystalline rock. This bedrock type combines three MGS OFR 10-02 rock descriptions: "undifferentiated granites" (also known as St. Cloud, Richmond, and Rockville granites), "massive granites," and a "granodioritic intrusion" (also known as Reformatory granodiorite) which correspond to bedrock map units <i>Pgu</i> , <i>Pgr</i> , and <i>Pgd</i> , respectively. Quality is interpreted within this assessment as very good. Local occurrences of preferred orientation of larger minerals, foliation (caused by metamorphism), mineral elongation, or various degrees of bedrock weathering may lower the quality in some areas.

				<p>Granites, which are located in the south-central and southeastern Stearns County, are exposed as small to large clusters of outcrops that can range from &lt;1 to 1,500 acres and are a known source for dimension stone and Class A aggregate for bituminous and concrete. Depending on thickness of overburden, crushed stone potential can range from high to limited. Specific gravity typically ranges from 2.5 to 2.7.</p>
			Granitic Gneiss	<p>Coarse-grained crystalline and metamorphic rock. This bedrock unit combines “gneissic, granodiorites to tonalites”, “granitic orthogneiss and migmatites”, and “granitic to granodioritic orthogneiss” and corresponds with bedrock map units <i>Amt</i>, <i>Amg</i> and <i>Agn</i>, respectively, from MGS OFR 10-02. Crushed stone within 30 feet of the surface only occurs within the “gneissic, granodiorites to tonalites” rock types, MGS map unit <i>Amt</i>. The quality is interpreted within this assessment as moderate due to varying degrees of metamorphism producing weak to strong foliation, mineral elongation, and preferred orientation of larger minerals. Also, the “gneissic, granodiorites to tonalites” rock unit may have been variably weathered. These factors may also lower the quality of this unit in some areas. Exposures of granitic gneiss, located in the northwestern portion of the county occur as small, isolated outcrops that are less than 5 acres. These outcrops represent the only near surface bedrock exposures in a large geographic area dominated by thick overburden (&gt;100 feet). One quarry existed in this rock unit, which was used to make blocks for local basements and foundations. Based on its physical characteristics, this rock type may classify as Class A aggregate for bituminous and concrete. Depending on thickness of overburden, crushed-stone potential can range from high to limited. Specific gravity typically ranges from 2.5 to 2.7.</p>
			Mafic to Ultramafic Intrusive Rocks	<p>Includes a variety of rock types, typically serpentinized peridotite, pyroxenite, hornblende, gabbro (also known as St. Wendel gabbro), and diorite (also known as Watab diorite), and gabbroic to dioritic intrusions and correspond to MGS OFR 10-02 bedrock map units <i>Pmi</i>, <i>Pgp</i>, <i>Pga</i>, and <i>Pm</i>, respectively. Quality of this rock is variable depending on dominant lithology; however, quality is broadly interpreted as moderate. Quality may improve with larger areal extent of an intrusion, greater distance from contacts with other rock units, and less fracturing within the rock. This unit is exposed in clusters of small outcrops that range in size from &lt;1 to 15 acres. Exposures are located in far eastern Stearns County and</p>



				no quarries have been observed within this bedrock type. Based on its physical characteristics, this bedrock type may classify as Class A aggregate for bituminous and concrete. Depending on overburden thickness, crushed-stone potential can range from high to limited. Specific gravity typically ranges from 2.6 to 3.0.
			Gneiss	Coarse-grained metamorphic rock. Gneiss consists solely of the rock-type "granitoid gneiss," which is also known as the Sartell gneiss. This unit corresponds to bedrock map unit <i>Pgn</i> from MGS OFR 10-02. Quality is interpreted as moderately poor because of the widely varying composition ranging from granite to schist( the most commonly encountered lithology consisting of biotite-cordierite-garnet mineral assemblages) and a varying degree of layering and foliation (Dacre and others 1984). Exposed as small, individual outcrops (< 0.1 acres) to clusters of small outcrops (1 to 12 acres), this unit is located in far eastern to northeastern Stearns County. No known quarries have existed in this bedrock unit. Even though this unit is categorized as gneiss, and by definition could grade as a Class A aggregate, the variable lithology of this unit generally precludes its use as a durable source of bedrock and for use in bituminous and concrete products. Because of the poor quality of this bedrock unit, crushed-stone potential is only delineated where overburden thickness is 15 feet or less and these near surface exposures are designated as having low potential. The specific gravity typically ranges from 2.6 to 3.0.
			Bedrock Undifferentiated	Attribute used to describe limited potential crushed-stone bedrock units (see limited potential for crushed-stone resources)
	DESCRIPTIO	Text, 90		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	Text, 254		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.

