Minnesota Ground Water Association Spring Conference

Assessing vertical recharge through Minnesota's glacial sediments – A mapping perspective

Bob Tipping Minnesota Geological Survey April 25, 2019

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Criteria and Guidelines for Assessing Geologic Sensitivity of Ground Water Resources in Minnesota



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assisted with word processing and mailing.

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critique.



Jan Falteisek Project Coordinator Division of Waters Department of Natural Resources TABLE III-2. Information required to complete geologic sensitivity assessments at each of the three levels.

Information needed to evaluate	Assessment Level					
geological sensitivity		2	3			

Soil texture/parent materials	х		
Depth to water	Х	х	
Vadose zone material		х	
Deeper aquifers/confining units			Х







c) Level 3 - Deeper Aquifers

Sensitivity ratings, based on estimated vertical travel time:

- Very high hours to months
- High weeks to years
- Moderate years to decades
- Low several decades to a century

L score calculation

For a single well, divide each confining layer thickness by 10, round down, sum the totals

- L-5 or greater = very low
- < L-5, low

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			LIMESTONE OR DOLOMITE	LIMESTONE/DOLOMITE, INTERBEDDED SHALE	SANDSTONE	SHALE					
		DEPTH TO BEDROCK LESS THAN 5 FEET	VH	VH SHALE MAY RETARD VERTICAL FLOW H		L					
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Meyer etal, 1998 estimated range of hydraulic conductivity, cm/sec.







and bedrock surface





Geologic Atlas of Clay County, Minnesota, Part B, County Atlas Series C-29



Geologic Atlas of Clay County, Minnesota, Part B, County Atlas Series C-29

Hydrologic Soil Group (0–3 feet)		Surficial Ge (3–2			
Group*	Transmission rate (in/hr)	Classification		Transmission rate (in/hr)	Surficial geology map unit (Part A, Plate 3)
A, A/D	1	gravel, sandy gravel, silty gravel		1	ha, grb, grc, gro, ro, roc, wlg
	T	sand, silty sand		0.71	Not mapped in county
B, B/D	0.50	silt, loamy sand		0.50	wls
	0.50	sandy loam		0.28	ruw
C, C/D	0.075	silt Ioam, Ioam		0.075	rgs, rl, rlw, ru, gsw
	0.075	sandy clay loam		0.035	Not mapped in county
D	0.015	clay, clay loam, silty clay loam, sandy clay, silty cla	ay	0.015	gst, sld**, slw**
		glacial lake sediments of Lake Agassiz		0.000011	sld, slw

Table 1. Transmission rates used to assess the pollution sensitivity rating of near-surface materials

Geologic Atlas of Clay County, Minnesota, Part B, County Atlas Series C-29

















- K value assigned from surfical map
- K value assigned
- x unassigned

Table of Contents

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 - K_class_composite
 - loam to clay loam
 - loam to sandy loam
 - loam, silt rich; silt and clay
 - loam to sandy loam
 - sand and gravel
 - fine sand
 - sandy silt
 - loam to clay loam deep conditions
 - loam to sandy loam deep conditions
 - loam , silt rich; silt and clay deep conditions
 - loam to sandy loam deep conditions

Conclusions

Methods to map vertical infiltration are consistent with 1991 guidelines Subsurface mapping methods have changed Additional methods to consider adding: Vertical hydraulic gradient Mapping chemical types/facies in 3 dimensions UNIVERSITY OF MINNESOTA

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