

Tables

Table 1

**Drilling Program Summary
Groundwater Assessment Report
UMore Mining Area
Dakota County, Minnesota**

Location ID	Borehole Sealing ID Number / Unique Well ID Number	Borehole Details				
		Total Depth (feet bgs)	Location		Ground Elevation (feet MSL)	Drilling Method Used
			Northing (feet)	Easting (feet)		
<u>Pilot Borings</u>						
A6-Pilot Boring	H-277823	162	195437.3	565908.1	934.0	Rotasonic
B2-Pilot Boring	H-277824	140	193288.8	556259.3	951.3	Rotasonic
C2-Pilot Boring	H-277822	165	190174.1	556863.2	950.4	Rotasonic
E1-Pilot Boring	H-277821	162	184792.6	553205.9	946.9	Rotasonic
<u>Monitoring Well Locations</u>						
MW-B1-001	769796	75	194474.3	553294.5	947.6	Rotasonic
MW-C2-002	769493	75	189952.6	555403.4	949.6	Rotasonic
MW-C2-202	769489	150	189954.5	555375.5	949.9	Mud Rotary
PW-C2-202	769482	147	189952.5	555431.1	949.6	Mud Rotary
MW-A3-003	769494	85	196104.5	559964.8	941.0	Rotasonic
MW-C7-004	769484	90	191395.2	568057.4	928.6	Rotasonic
MW-E2-305	769429	75	184388.3	557403.7	939.0	Rotasonic
MW-A6-006	769491	115	195438.4	565915.8	933.6	Mud Rotary
MW-D3-007	769490	70	186970.6	559064.6	943.6	Rotasonic
MW-D5-308	769486	75	187762.8	565044.7	935.0	Rotasonic
MW-E2-009	769488	71	186933.8	555370.9	947.8	Rotasonic
MW-E2-209	769483	126	186932.9	555352.6	947.2	Rotasonic
MW-E4-010	769487	72	184326.2	560351.5	938.6	Rotasonic
MW-C4-311	769485	93	190788.9	561893.3	934.3	Rotasonic

Notes:

bgs - Below ground surface

MSL - Mean sea level

Northing and easting measured relative to Dakota County Coordinates in U.S. Feet (horizontal datum NAD 83(1996))

Elevations measured relative relative to NAVD88

Table 2

**Well Construction Details
Groundwater Assessment Report
UMore Mining Area
Dakota County, Minnesota**

Well ID Number	Unique Well ID Number	Borehole Details					Well Details						
		Total Depth (feet bgs)	Location		Ground Elevation (feet MSL)	Drilling Method Used	Riser			Screen Depth		Screen Elevation	
			Northing (feet)	Easting (feet)			Top Elevation (feet MSL)	Diameter (inches)	Stickup (feet)	Top (feet bgs)	Bottom (feet bgs)	Top (feet MSL)	Bottom (feet MSL)
MW-B1-001	769796	75	194474.3	553294.5	947.6	Rotasonic	949.29	2	1.7	61	71	884.3	874.3
MW-C2-002	769493	75	189952.6	555403.4	949.6	Rotasonic	951.17	2	1.6	65	75	886.2	876.2
MW-C2-202	769489	150	189954.5	555375.5	949.9	Mud Rotary	951.88	2	2.0	137	147	811.9	801.9
PW-C2-202	769482	147	189952.5	555431.1	949.6	Mud Rotary	952.47	6	2.9	125	145	824.6	804.6
MW-A3-003	769494	85	196104.5	559964.8	941.0	Rotasonic	942.95	2	2.0	72	82	868.0	858.0
MW-C7-004	769484	90	191395.2	568057.4	928.6	Rotasonic	930.32	2	1.7	80	90	850.3	840.3
MW-E2-305	769429	75	184388.3	557403.7	939.0	Rotasonic	940.73	2	1.7	64	74	875.7	865.7
MW-A6-006	769491	115	195438.4	565915.8	933.6	Mud Rotary	935.41	2	1.8	102	112	830.4	820.4
MW-D3-007	769490	70	186970.6	559064.6	943.6	Rotasonic	945.49	2	1.9	60	70	885.5	875.5
MW-D5-308	769486	75	187762.8	565044.7	935.0	Rotasonic	936.86	2	1.9	65	75	871.9	861.9
MW-E2-009	769488	71	186933.8	555370.9	947.8	Rotasonic	949.37	2	1.6	57.7	67.7	888.4	878.4
MW-E2-209	769483	126	186932.9	555352.6	947.2	Rotasonic	948.85	2	1.6	116	126	832.9	822.9
MW-E4-010	769487	72	184326.2	560351.5	938.6	Rotasonic	940.15	2	1.5	62	72	878.2	868.2
MW-C4-311	769485	93	190788.9	561893.3	934.3	Rotasonic	935.96	2	1.7	82	92	853.0	843.0

Notes:

bgs - Below ground surface

MSL - Mean sea level

Northing and easting measured relative to Dakota County Coordinates in U.S. Feet (horizontal datum NAD 83(1996))

Elevations measured relative relative to NAVD88

Table 3

**Well Development Summary
Groundwater Assessment Report
UMore Mining Area
Dakota County, Minnesota**

Well ID	Sustained Pumping Rate (gallons per minute)	Drawdown (feet)	Total Purge Volume (gallons)	Development Method Used
MW-B1-001	1.7	0.66	384	Pumped continuously, reached steady drawdown
MW-C2-002	1.7	0.58	378	Pumped continuously, reached steady drawdown
MW-C2-202	1.3	12.41	363	Pumped continuously, reached steady drawdown
PW-C2-202	150 (estimated)	NM	~16000	Airlifted
MW-A3-003	1.3	1.22	318	Pumped continuously, reached steady drawdown
MW-C7-004	1.7	2.39	482	Pumped continuously, reached steady drawdown
MW-E2-305	1.7	14.57	305	Pumped continuously, reached steady drawdown
MW-A6-006	1.0	0.1	296	Pumped continuously, reached steady drawdown
MW-D3-007	2.5	3.3	408	Pumped continuously, reached steady drawdown
MW-D5-308	0.5	9.82	114	Pumped continuously, reached steady drawdown
MW-E2-009	NA	NA	142	Pumped dry repeatedly
MW-E2-209	1.7	3.67	340	Pumped continuously, reached steady drawdown
MW-E4-010	1.7	0.57	365	Pumped continuously, reached steady drawdown
MW-C4-311	1.0	21.11	356	Pumped continuously, reached steady drawdown

Notes:

NM - Not Measured

NA - Not Applicable

Table 4
Pre-Existing Well Construction Details
Groundwater Assessment Report
UMore Mining Area
Dakota County, Minnesota

Well ID Number	Approximate Total Depth (feet bgs)	Location		Ground Elevation (feet MSL)	Measurement Point Elevation (feet MSL)	Top of Riser Elevation (feet MSL)	Riser Diameter (inches)	Riser Stickup (feet)	Open Hole/Screen Interval		Open Hole/Screen Elevation	
		Northing (feet)	Easting (feet)						Top (feet)	Bottom (feet)	Top (feet MSL)	Bottom (feet MSL)
On-site												
PDC-E1-185278	310	186979.8	552779.6	950.6	952.09	952.09	10	1.5	145	310	805.6	640.6
JDN-E2-207608	415	185680.0	556150.0	946.5	948.61	948.41	10	1.9	355	415	591.5	531.5
PDC-C7-425291	231.8	192314.3	568066.8	925.6	927.59	927.59	6	2.0	97	230	828.6	695.6
PDC-C7-425292	148	191437.9	568055.6	929.4	930.36	930.36	3	1.0	105	230	824.4	699.4
Q-C5-T00006	143.2	192144.9	564445.8	931.2	932.20	932.2	4	1.0	127.3	142	803.7	789.0
PDC-C7-T00019	160.4	191755.2	568088.8	930.6	932.12	932.12	4	1.5	135	161	796.9	770.9
Off-site												
PDC-170885	305	179978.3	563163.1	973.7	974.9	975.41	8	1.7	134	305	839.7	668.7
Q-539515	71.7	184117.2	570631.0	923.9	926.1	926.14	6	2.2	58	65	865.9	858.9
PDC-540396	117.6	184131.2	570632.1	924.1	925.8	925.79	4	1.7	95	110	829.1	814.1
STP-559530	18.82	176284.5	572515.8	874.9	874.8	874.61	2	-0.3	9	19	865.9	855.9
Q-559531	14.9	176066.6	572474.4	872.2	874.3	874.08	2	1.9	6.5	16.5	865.7	855.7
Q-559532	18.02	176131.1	572473.6	870.3	872.0	871.49	2	1.2	6	16.5	864.3	853.8
Q-698456	19	179037.6	556519.0	886.5	889.4	889.37	2	2.9	8.5	18.5	878.0	868.0
Q-698459	50.5	183080.9	552101.4	923.4	926.6	926.61	2	3.2	44.5	49.5	878.9	873.9
Q-698460	80.5	186039.1	545313.9	943.8	947.7	947.66	2	3.9	72	77.5	871.8	866.3
Q-698461	56	189182.6	541792.2	918.6	922.1	922.09	2	3.5	50	55	868.58	863.58
Q-698462	64.4	184369.8	547065.0	954.9	957.9	957.86	2	3.0	59.4	64.4	895.46	890.46
JDN-457167 (R1)	400	197830.0	561475.0	940.6	942.6	942.09	16	1.5	345	400	595.61	540.61
PDC-T00020	138	194932.9	573073.3	924.2	925.5	925.53	4	1.3	92	135	833.4	790.4
PDC-T00022	123	198193.2	572982.7	864.2	865.7	865.73	4	1.5	105	135	758.5	728.5
PDC-T00023	167	200033.5	579717.1	848.0	849.7	849.69	4	1.7	133	164	714.5	683.5
PDC-W05882 (W1)*	58	NM	NM	860.4	863.2	863.24	2	2.8	48	58	812.4	802.4
STP-433260 (W8)*	68	NM	NM	873.8	876.3	876.25	4	2.5	53	68	820.8	805.8
Q-W05807 (W113)*	107	NM	NM	NM	879.8	879.82	NM	-2	95	105	-781	-771

Notes:

bgs - Below ground surface

MSL - Mean sea level

NM - Not measured

Northing and easting measured relative to Dakota County Coordinates in U.S. Feet (horizontal datum NAD 83(1996))

Elevations measured relative to NAVD88

* Reference elevations provided by Flint Hills Refinery

Table 5

**Groundwater Elevations
Groundwater Assessment Report
UMore Mining Area
Dakota County, Minnesota**

Well ID Number	Measurement Point Elevation (feet MSL)	Depth to Water 1/16/2009	Groundwater Elevation 1/16/2009	Depth to Water 1/30/2009	Groundwater Elevation 1/30/2009	Depth to Water 2/19/2009	Groundwater Elevation 2/19/2009	Depth to Water 3/3/2009	Groundwater Elevation 3/3/2009	Depth to Water 4/3/2009	Groundwater Elevation 4/3/2009	Depth to Water 4/22/2009	Groundwater Elevation 4/22/2009
On-site Monitoring Wells													
MW-B1-001	949.29	65.32	883.97	65.32	883.97	65.33	883.96	65.18	884.11	65.19	884.10	65.21	884.08
MW-C2-002	951.17	NM	NM	65.5	885.67	65.53	885.64	65.55	885.62	65.48	885.69	65.53	885.64
MW-C2-202	951.88	NM	NM	66.26	885.62	66.35	885.53	66.31	885.57	66.24	885.64	66.28	885.6
PW-C2-202	952.47	NM	NM	NM	NM	NM	NM	66.84	885.63	66.83	885.64	NM	NM
MW-A3-003	942.95	71.62	871.33	71.84	871.11	72.11	870.84	71.75	871.20	72.06	870.89	72.14	870.81
MW-C7-004	930.32	71.26	859.06	71.31	859.01	71.41	858.91	71.39	858.93	71.42	858.9	71.46	858.86
MW-E2-305	940.73	NM	NM	NM	NM	53.9	886.83	53.72	887.01	53.67	887.06	53.93	886.80
MW-A6-006	935.41	NM	NM	83.2	852.21	83.47	851.94	83.20	852.21	83.42	851.99	83.39	852.02
MW-D3-007	945.49	60.86	884.63	60.9	884.59	60.99	884.5	61.00	884.49	60.88	884.61	60.95	884.54
MW-D5-308	936.86	64.89	871.97	65.01	871.85	65.2	871.66	65.09	871.77	64.99	871.87	65.00	871.86
MW-E2-009	949.37	62.76	886.61	62.83	886.54	62.94	886.43	62.91	886.46	62.86	886.51	62.91	886.46
MW-E2-209	948.85	NM	NM	62.31	886.54	62.41	886.44	62.39	886.46	62.33	886.52	62.35	886.50
MW-E4-010	940.15	57.4	882.75	57.45	882.7	57.49	882.66	57.55	882.60	57.34	882.81	57.44	882.71
MW-C4-311	935.96	NM	NM	NM	NM	61.35	874.61	61.24	874.72	61.29	874.67	61.38	874.58
On-site Pre-Existing Wells													
PDC-E1-185278	952.09	NM	NM	NM	NM	NM	NM	NM	NM	62.46	889.63	NM	NM
JDN-E2-207608	948.61	NM	NM	NM	NM	NM	NM	62.00	886.61	61.96	886.65	NM	NM
PDC-C7-425291	927.59	NM	NM	NM	NM	NM	NM	70.39	857.20	70.44	857.15	NM	NM
PDC-C7-425292	930.36	NM	NM	NM	NM	NM	NM	71.77	858.59	71.87	858.49	71.91	858.45
PDC-C5-T00006	932.20	NM	NM	NM	NM	NM	NM	NM	NM	70.81	861.39	NM	NM
PDC-C7-T00019	932.12	NM	NM	NM	NM	NM	NM	74.05	858.07	74.05	858.07	NM	NM
Off-site Pre-Existing Wells													
PDC-170885	974.91	NM	NM	NM	NM	NM	NM	100.72	874.19	100.46	874.45	NM	NM
Q-539515	926.14	NM	NM	NM	NM	NM	NM	63.90	862.24	63.83	862.31	63.89	862.25
PDC-540396	925.79	NM	NM	NM	NM	NM	NM	63.80	861.99	63.75	862.04	64.54	861.25
STP-559530	874.84	NM	NM	NM	NM	NM	NM	NM	NM	15.05	859.79	NM	NM
Q-559532	871.96	NM	NM	NM	NM	NM	NM	NM	NM	12.91	859.05	NM	NM
Q-698456	889.37	NM	NM	NM	NM	NM	NM	7.84	881.53	7.39	881.98	NM	NM
Q-698459	926.61	NM	NM	NM	NM	NM	NM	31.99	894.62	31.86	894.75	NM	NM
Q-698460	947.66	NM	NM	NM	NM	NM	NM	46.52	901.14	46.22	901.44	NM	NM
Q-698461	922.09	NM	NM	NM	NM	NM	NM	18.05	904.04	17.66	904.43	NM	NM
Q-698462	957.86	NM	NM	NM	NM	NM	NM	50.16	907.70	50.27	907.59	NM	NM
JDN-457167 (R1)	942.6	NM	NM	NM	NM	NM	NM	79.71	862.89	79.65	862.95	NM	NM
PDC-T00020	925.53	NM	NM	NM	NM	NM	NM	86.25	839.28	86.25	839.28	NM	NM
PDC-T00022	865.73	NM	NM	NM	NM	NM	NM	37.91	827.82	37.69	828.04	NM	NM
PDC-T00023	849.69	NM	NM	NM	NM	NM	NM	NM	NM	47.35	802.34	NM	NM
PDC-W05882 (W1)*	863.24	NM	NM	NM	NM	NM	NM	47.31	815.93	47.11	816.13	NM	NM
STP-433260 (W8)*	876.25	NM	NM	NM	NM	NM	NM	62.71	813.54	63.03	813.22	NM	NM
Q-W05807 (W113)*	879.82	NM	NM	NM	NM	NM	NM	78.57	801.25	78.65	801.17	NM	NM

Notes:

Depth to water measurements in feet below top of well riser

Groundwater elevations in feet relative to mean sea level (NAVD88)

NM - Not measured

R - Data rejected

ID prefixes for pre-existing wells relate to unit each well is completed within; Q-Quaternary, STP-St. Peter Sandstone, PDC-Prairie du Chien, JDN-Jordan Sandstone

* Reference elevations provided by Flint Hills Refinery

Table 6

**Vertical Gradients Between Hydrogeologic Units
Groundwater Assessment Report
UMore Mining Area
Dakota County, Minnesota**

Hydrogeologic Units	Location	Shallow Well	Deep Well	Avg Vertical Gradient (unitless)	
Within outwash	Center of UMA	MW-C2-002	MW-C2-202	-0.00067	Neutral
Outwash and diamicton	Southern portion of UMA	MW-E2-009	MW-E2-209	0.000090	Neutral
Outwash and Prairie Du Chien formation	Eastern portion of UMore Park	MW-C7-004	425292	-0.0045	Downward
Outwash and Prairie Du Chien formation	1 mile southeast of UMore Park	539515	540396	-0.0064	Downward
Outwash and Jordan sandstone	Southern portion of UMA	MW-E2-009	207608	0.00045	Neutral
St Peter sandstone and Jordan sandstone	Southern portion of UMA	MW-E2-305	207608	-0.0013	Downward

Notes:

1. The vertical gradient shown is the average of gradients measured on 3/3/2009 and 4/3/2009, except for the gradient between the Outwash and the St Peter sandstone, which was only measured on 4/3/2009.
2. The direction of the vertical gradient was the same at each well nest for both measurement events, except at MW-E2-009/209 where the gradient was zero during the 3/3/2009 measurement.
3. Gradients less than 0.001 are considered neutral due to the accuracy of measurements.

Table 7

**Hydraulic Conductivity Summary
Groundwater Assessment Report
UMore Mining Area
Dakota County, Minnesota**

Unit	Test Type	Horizontal Hydraulic Conductivity ¹		Vertical Hydraulic Conductivity ²	
		(feet/day)	# of samples	(feet/day)	# of samples
Outwash	Pumping Test	290	n = 1	101	n = 1
	Specific Capacity	21	n = 9	-	-
	Particle Size Analysis	78	n = 9	-	-
	Permeameter	1.6	n = 3	-	-
Fluvial/lacustrine	Permeameter	-	-	1.3E-02	n = 1
Diamicton	Permeameter	-	-	7.7E-05	n = 4
St. Peter	Specific Capacity	1	n = 3	-	-
	Permeameter	0.2	n = 1	-	-

Notes:

¹ Horizontal hydraulic conductivity values are a geometric mean of the hydraulic conductivity measured for each unit (when multiple samples were tested). See Appendix D for all measured values of hydraulic conductivity.

² Vertical hydraulic conductivity values are a geometric mean of the hydraulic conductivity measured for each unit (when multiple samples were tested). See Appendix D for all measured values of hydraulic conductivity.

Table 8

**Analytical Results for Groundwater
Groundwater Assessment Report
UMore Mining Area
(concentrations as noted)**

Location	MW-A3-003	MW-A3-003	MW-A6-006	MW-A6-006	MW-B1-001	MW-B1-001	MW-C2-002	MW-C2-002	MW-C2-202	MW-C2-202	MW-C4-311	MW-C4-311	MW-C7-004	MW-C7-004
Date	2/12/2009	4/14/2009	2/10/2009	4/15/2009	2/13/2009	4/10/2009	2/9/2009	4/10/2009	2/12/2009	4/10/2009	2/12/2009	4/15/2009	2/13/2009	2/13/2009
Dup														DUP
<u>General Parameters, mg/L</u>														
Alkalinity, bicarbonate as CaCO3	250	280	240	260	260	210	270	290	270	260	260	260	290	260
Chloride	13	13	14	15	12	18	24	45	19	21	2.8	2.3	12	12
Aluminum	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	380	<20	<20
Calcium	85000	83000	85000	83000	60000	66000	73000	94000	86000	86000	58000	37000	99000	100000
Iron	58	<50	<50	69	<50	<50	<50	<50	160	130	<50	500	150	110
Magnesium	28000	28000	29000	29000	22000	23000	26000	35000	29000	28000	25000	19000	28000	28000
Manganese	28	23	54	<20	120	77	390	250	34	25	240	170	51	51
Potassium	1600	1400	1900	1600	1700	1300	3000	2000	3000	2500	1300	1100	1400	1400
Sodium	4200	4800	5900	6700	3800	17000	54000	24000	40000	24000	11000	51000	6400	6400

Table 8

**Analytical Results for Groundwater
Groundwater Assessment Report
UMore Mining Area
(concentrations as noted)**

Location	MW-C7-004	MW-C7-004	MW-D3-007	MW-D3-007	MW-D5-308	MW-D5-308	MW-E2-009	MW-E2-009	MW-E2-209	MW-E2-209	MW-E2-209	MW-E2-305	MW-E2-305	MW-E4-010	MW-E4-010
Date	4/15/2009	4/15/2009	2/12/2009	4/14/2009	2/13/2009	4/14/2009	2/10/2009	4/13/2009	2/10/2009	4/13/2009	2/10/2009	4/13/2009	2/12/2009	4/13/2009	4/13/2009
Dup		DUP													
<u>General Parameters, mg/L</u>															
Alkalinity, bicarbonate as CaCO3	320	310	240	260	280	270	250	380 h	250	280 h	260	260 h	200	250 h	
Chloride	14	14	20	20	9.8	11	6.0	8.8	2.6	1.6	20	22	33	35	
Aluminum	<20	<20	<20	<20	<20	<20	<20	170	<20	<20	<20	<20	<20	<20	<20
Calcium	99000	99000	88000	83000	79000	78000	39000	62000	70000	58000	85000	70000	96000	92000	
Iron	150	180	<50	66	<50	59	<50	640	410	910	560	290	<50	120	
Magnesium	28000	28000	29000	29000	24000	24000	13000	19000	23000	20000	24000	20000	33000	32000	
Manganese	<20	<20	80	84	150	99	240	940	200	160	350	190	220	83	
Potassium	1200	1200	2400	1900	1900	1200	3500	3400	1900	1400	3000	2500	2300	1600	
Sodium	13000	13000	13000	15000	25000	21000	97000	140000	9500	32000	36000	43000	7100	7300	

Table 8

**Analytical Results for Groundwater
Groundwater Assessment Report
UMore Mining Area
(concentrations as noted)**

Detections are presented in **bold**.

DUP	Duplicate sample.
--	Not analyzed/not measured.
*	Estimated value, QA/QC criteria not met.
b	Potential false positive based on blank data validation procedure.
h	EPA recommended sample preservation, extraction or analysis holding time was exceeded.

Table 9

**Hydrostratigraphic Units Used in the Groundwater Model
Groundwater Assessment Report
UMore Mining Area
Dakota County, Minnesota**

Geologic Unit	Encountered During Field Investigation	Present at Site	Represented in Model	Description	Hydrostratigraphic Unit	Model Layer	Hydraulic Conductivity Zone Numbers ^[1]
Quaternary	X	X	X	The Quaternary deposits locally consist of Cromwell Formation outwash and till associated the Superior lobe. Also present is Pierce Formation till associated with glaciation of Winnipeg provenance. An older undifferentiated outwash was also identified.	Outwash and alluvium units generally aquifers, Till units are generally aquitards	Generally 1-3	1-99
Decorah Shale				Calcareous shale with some thin beds of limestone.	Aquitard	Not in model	Not in model
Platteville Formation				Fossiliferous limestone and dolomite.	Generally Aquitard, local areas productive enough for small water supplies	Not in model	Not in model
Glenwood Formation				Blocky shale with thin stringers of fine- to coarse-grained quartz sandstone.		Not in model	Not in model
St. Peter Sandstone	X	X	X	Very fine- to medium-grained quartzose sandstone that generally is massive- to very thick-bedded. The lower part of the St. Peter Sandstone consists of fine-very coarse-grained, well-cemented sandstone interlayered with multicolored beds of mudstone, siltstone and shale.	Aquifer. Locally shaley portions of basal unit can act as an aquitard	4 (where present)	100-199
Prairie du Chien Group							
Shakopee Formation	X	X	X	Dolostone with interbedded, thin layers, of fine- to medium-grained quartz sandstone and shale.	Aquifer	5 (where present)	200-299
Oneota Dolomite				Massive- to thick-bedded dolostone. The lower part of the Oneota Dolomite is often oolitic or sandy	Leaky aquitard: generally lower conductivity but fractured		
Jordan Sandstone	WL Only	X	X	Medium- to coarse-grained, cross bedded, friable quartz sandstone and massive, very fine-grained, often bioturbated, feldspathic sandstone, with some siltstone and shale.	Aquifer	6 (where present)	300-399
St. Lawrence Formation		X	X	Fossiliferous, silty to very-fine crystalline dolostone, interlayered with thin intervals of siltstone and in some rare areas, very fine-grained glauconitic sandstone and shale	Leaky Aquitard. At shallow depth the St. Lawrence Formation is often more fractured and able to produce moderate yields for water supply	7 (where present)	400-499
Franconia Formation		X	X	Glauconitic and feldspathic sandstone.	Aquifer	8	500-599
Ironton and Galesville Sandstones		X	X	Medium to very coarse-grained, quartzose sandstone and very-fine grained feldspathic sandstone, with scattered thin beds of shale.	Aquifer	9	600-699
Eau Claire Formation		X	X	Siltstone with very fine feldspathic sandstone, and greenish-gray shale	Aquitard	10	700-799
Mt. Simon Sandstone		X	X	Fine- to coarse-grained, quartzose sandstone, with some feldspathic sandstone, and small amounts of shale and siltstone.	Aquifer	11	800-899
Precambrian Crystalline Rocks		X			Aquitard	Not in model	Not in model

^[1] All possible zone numbers were not used in model.
WL Only - Water levels measured from this unit (no drilling)

Table 10

**Baseflow Calibration Targets
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Baseflow Reach Number	Reach Description	Estimated Baseflow	Model Simulated Net Baseflow
		cfs	cfs
1012 ^[2]	Minnesota and Mississippi Rivers: USGS Fort Snelling and Model edge to USGS St. Paul	14.4	16.9
1013 ^[2]	Mississippi River: USGS St. Paul to model edge	439.7	445.1
1025 ^[2]	Minnesota River: Edge of model to USGS Fort Snelling	0.5	2.7
1081 ^[2]	Vermillion River: VR809 to SC804	8.9	0.0
1082 ^[2]	Vermillion River: South Creek and SC804 to CHP1	8.7	8.1
1083 ^[1]	Vermillion River: Middle Creek, CHP1, and CHP2 to BSC2	7.99 - 15.22	10.6
1084 ^[1]	Vermillion River: BSC2 to USGS Empire	17.5 - 22.7	20.6
1085 ^[2]	Vermillion River: USGS Empire to VR803	4.7	5.3
1087 ^[1]	Vermillion River: North Creek Beginning to CHP2	1.3 - 4.3	2.5
^[1] Baseflow estimates from EOR (2007) ^[2] Estimates based off those established for the Metro Model 2 (Metropolitan Council, 2008)			

Table 11

**Transmissivity Calibration Targets
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Calibration Target ID	Test Name	Associated Well Unique Number	Aquifer	Target T (ft ² /day)	Model T (ft ² /day)	Δ T (Residual) (ft ² /day)	% Difference
T0002 ^[1]	Eagan 1	205596	Jordan	12,800	12,785	15	0
T0004 ^[1]	Apple Valley 6	127263	Jordan	10,500	9,121	1,379	13
T0012 ^[1]	Empire 1	207521	Jordan	4,048	4,144	-96	-2
T0042 ^[1]	Rosemount 14	722623	Jordan	5,655	4,843	812	14
T0060 ^[2]	Apple Valley 14 & 15	509056	Mt. Simon	1,840	1,067	773	42
T0069 ^[2]	Farmington 7	655902	Jordan	26,146	16,547	9,599	37
T0086 ^[2]	Rosemount 7,8,9	509060	Jordan	3,320	2,013	1,307	39
T0092 ^[2]	South St Paul 1 & 7	200674	Jordan	7,080	5,750	1,330	19
T0093 ^[2]	South St Paul 4	208347	Prairie Du Chien - Jordan	5,760	6,859	-1,099	-19
T0095 ^[2]	St Paul Park 1	208414	Jordan	2,592	2,435	157	6
T0099 ^[3]	Rosemount Rural 2 S	474335	Jordan	3,240	3,308	-68	-2
T0100 ^[4]	PW-C2-202	769482	Quaternary Outwash	23,000	23,121	-121	-1
^[1] Minnesota Department of Health database ^[2] List of transmissivity values compiled by Metropolitan Council for Twin Cities Metro Groundwater ^[3] Delta, 1991 ^[4] Test conducted as part of this study							