

Tables

TABLE 1
PROPOSED WELL NETWORK
UMA Groundwater Assessment Work Plan
Dakota County, Minnesota

Well ID Number	Pilot Boring	Planned Screen Placement		Planned Location (approximate)		Approximate Ground Elevation (ft MSL)	Estimated Water Table Elevation (ft MSL)	Estimated Bedrock Elevation (ft MSL)	Estimated Depth to Bedrock (ft)	Planned Well Depth (ft)	Planned Screen Interval		Well Diameter (inches)	Monitored Unit	Planned Uses	
		Water Table	Below Water Table	UTM E (m)	UTM N (m)						Top (ft bgs)	Bottom (ft bgs)				
MW-B1-001		X		490908	4953113	950	885	825	125	80	70	-	80	2	Outwash	HH, WQ
MW-D1-002		X		491015	4951603	945	890	775	170	70	60	-	70	2	Outwash	HH, WQ
MW-A3-003	X	X		493193	4953524	940	880	800	140	75	65	-	75	2	Outwash	HH, WQ
MW-C2-004	X	X		492231	4951784	950	885	775	175	80	70	-	80	2	Outwash	HH, WQ
MW-E1-005	X	X		491081	4950114	950	890	850	100	75	65	-	75	2	Outwash	AT, HH, WQ
PW-E1-205			X	491081	4950114	950	890	850	100	100	80	-	100	4	Outwash	AT, HH, WQ
MW-A6-006	X	X		495024	4953338	930	860	750	180	85	75	-	85	2	Outwash	HH, WQ
MW-D3-007		X		492770	4951478	940	885	790	150	70	60	-	70	2	Outwash	HH, WQ
MW-B2-008	X	X		492072	4952683	950	885	805	145	80	70	-	80	2	Outwash	AT, HH, WQ
PW-B2-208			X	492072	4952683	950	885	805	145	145	125	-	145	4	Outwash	AT, HH, WQ
MW-E2-009		X		491798	4950771	950	885	810	140	80	70	-	80	2	Outwash	HH, WQ
PW-E2-209			X	491798	4950771	950	885	810	140	140	120	-	140	4	Outwash	AT, HH, WQ
MW-E4-010		X		493211	4950075	945	880	860	85	80	70	-	80	2	Outwash	AT, HH, WQ
MW-D5-011		X		494735	4951004	935	870	885	50	80	70	-	80	2	St. Peter	HH, WQ
MW-B4-012		X		493675	4952441	940	865	775	165	90	80	-	90	2	Outwash	HH, WQ
MW-C7-013		X		495968	4952027	925	855	855	70	85	75	-	85	2	St. Peter	HH, WQ

Notes:

Well ID Number - Prefix corresponds to type of well (MW = monitoring well; PW = pumping well); Center segment corresponds to Umore Park Grid System (shown on Figure 10); Suffix corresponds to serial number location (XX1 = location #1, XX2 = location #2, etc.) and relative screen placement (0XX = water table well, 1XX = submerged screen in middle portion of outwash, 2XX = submerged screen at base of outwash)

Pilot Boring - 'X' indicates a pilot boring will be advanced prior to well installation. For locations without pilot borings, stratigraphic information from the Geologic Assessment (ProSource, 2008) will be used

UTM - Universal transmercator system in meter; E = easting; N = northing

m - Meters

ft MSL - Feet relative to mean sea level

ft bgs - Feet below ground surface

HH - Hydraulic head monitoring

WQ - Water quality monitoring

AT - Aquifer testing

TABLE 2
Selected Existing Well Construction Summary
UMA Groundwater Assessment Work Plan
Dakota County, Minnesota

Well ID	Location		Approximate Ground Elevation (ft MSL)	Estimated Groundwater Elevation (ft MSL)	Approximate Well Depth (feet)	Screened Interval		Monitored Unit	Proposed Use
	UTM E (m)	UTM N (m)				Top (ft bgs)	Bottom (ft bgs)		
Wells Located on UMore Property									
PDC-E1-185278	490996	4950779	951	NA	310	145	310	PDC	GW Elevation Monitoring
PDC-D3-207605	492808	4951477	943	NA	206	NR	NR	PDC	GW Elevation Monitoring
PDC-C2-208402	492215	4951596	950	875	166	161	166	PDC	GW Elevation Monitoring
Q-B4-208403	493701	4953115	940	NA	188	172	188	Quaternary	GW Elevation Monitoring
Q-B3-208404	492923	4953129	940	NA	115	100	115	Quaternary	GW Elevation Monitoring
PDC-C7-227460	495755	4952362	922	NA	88	NR	NR	PDC	GW Elevation Monitoring
PDC-B7-425291	495665	4952591	930	NA	230	97	130	PDC	GW Elevation Monitoring
PDC-C7-425292	495654	4952117	926	NA	230	105	230	PDC	GW Elevation Monitoring
Wells Located off of UMore Property									
PDC-457126	493664	4954047	940	NA	245	NR	NR	PDC	GW Elevation Monitoring
Q-539518	497006	4950061	920	NA	68	NR	NR	Quaternary	GW Elevation Monitoring
PDC-540395	497022	4949955	920	NA	99	NR	NR	PDC	GW Elevation Monitoring
Q-T00020	497152	4951519	922	NA	63	NR	NR	Quaternary	GW Elevation Monitoring
Q-T00022	497161	4954121	882	NA	NR	NR	NR	Quaternary?	GW Elevation Monitoring
Q-698456	492136	4948292	800	NA	19	8.5	18.5	Quaternary	GW Elevation Monitoring
Q-698459	490784	4949593	950	NA	50.5	44.5	49.5	Quaternary	GW Elevation Monitoring
Q-698460	488720	4950502	850	NA	80.5	72	77.5	Quaternary	GW Elevation Monitoring
Q-698461	487651	4951463	950	NA	56	50	55	Quaternary	GW Elevation Monitoring
Q-698462	489252	4949992	950	NA	65.5	59.4	64.4	Quaternary	GW Elevation Monitoring

Notes:

Well ID Number - Prefix corresponds to monitored unit (Q = Quaternary; PDC = Prairie du Chien); Center segment corresponds to Umore Park Grid System (shown on Figure 10); Suffix corresponds to Minnesota unique well identification number

UTM - Universal Transverse Mercator system in meters; E = easting; N = northing

m - Meters

ft MSL - Feet relative to mean sea level

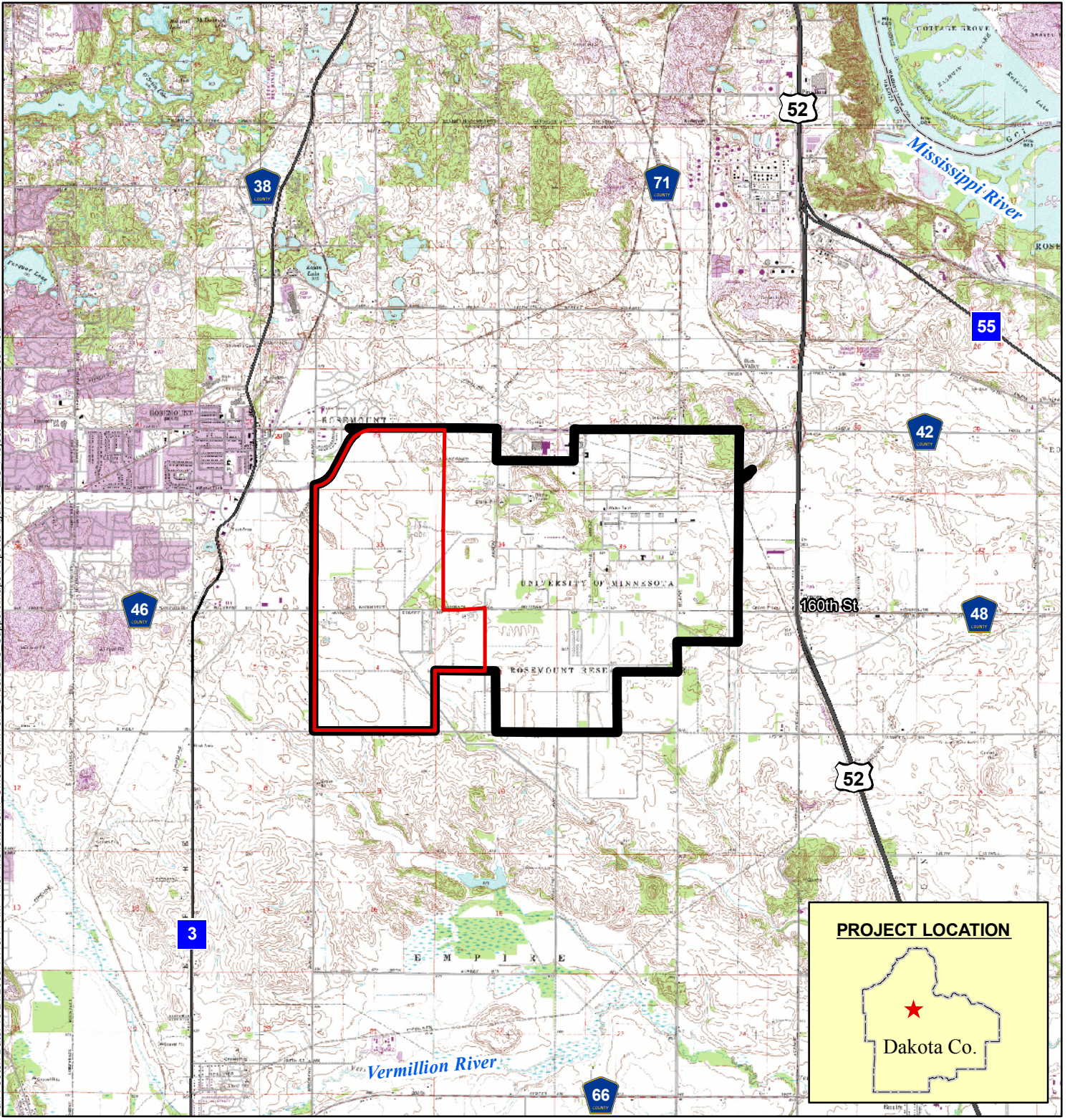
ft bgs - Feet below ground surface

PDC - Prairie du Chien

NR - Indicates no record or data incomplete based on review of available records

Figures

Barr Footer: Date: 10/21/2008 11:43:14 AM File: I:\Client\UofM_UmorePark\Work_Orders\EIS_Support\Maps\Reports\Figure1 EIS Project Area.mxd User: csl



- UMore Mining Area (UMA)
- UMore Park Boundary



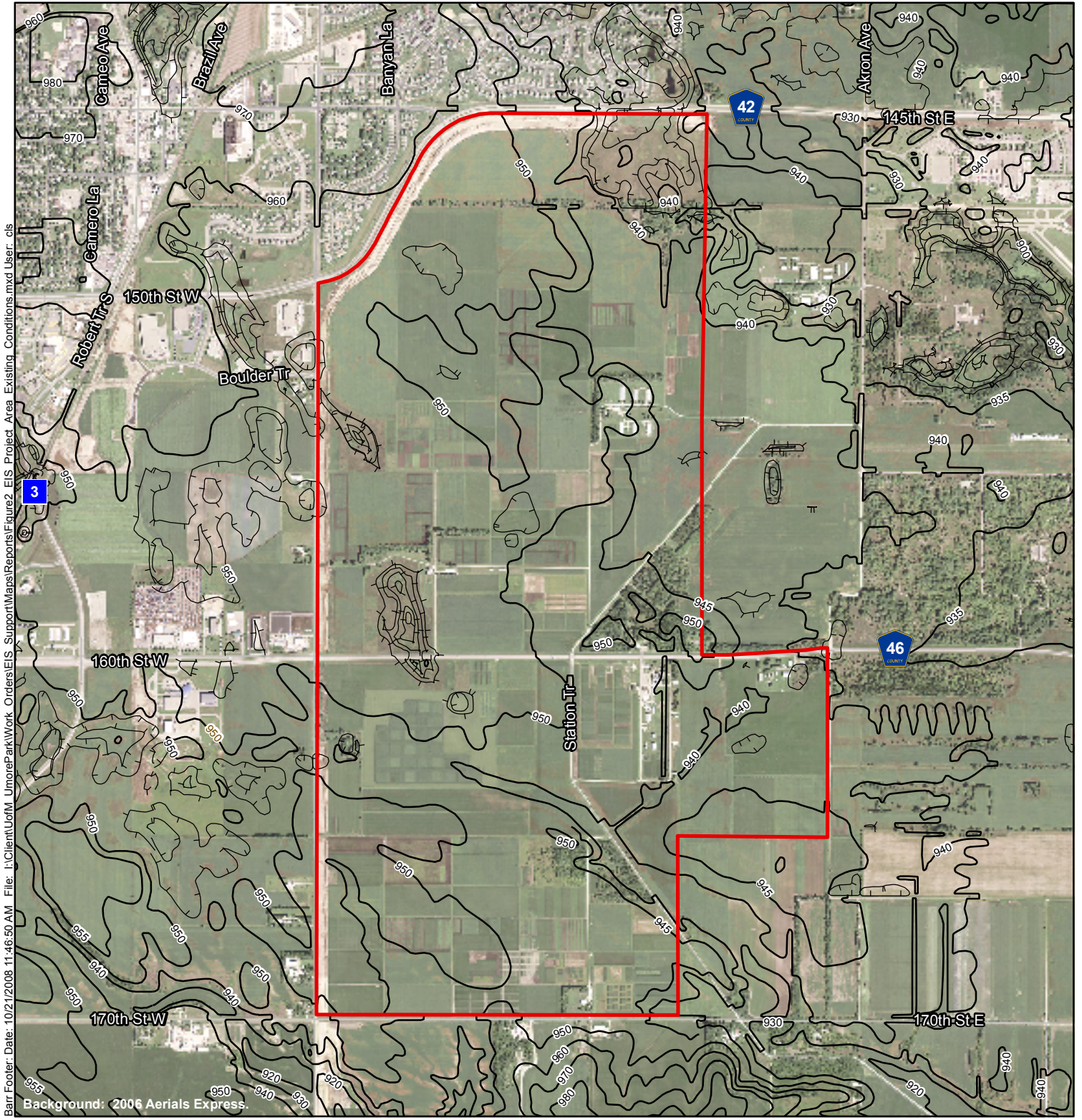
Figure 1

UMORE PARK AND UMA LOCATION

Umore Mining Area Groundwater Assessment Dakota County, MN

Source: MnDOT, MN DNR, Dakota County, Barr, SEH, HKGI. USGS topographic map background downloaded from the U.S. Department of Agriculture, Natural Resources Conservation Service.





Barr Footer: Date: 10/21/2008 11:46:50 AM File: I:\Client\UofM_UmorePark\Work_Orders\EIS_Support\Maps\Reports\Figure2 EIS Project Area Existing Conditions.mxd User: als

- UMore Mining Area (UMA)
- Ground Surface Contour
- Depressional Ground Surface Contour

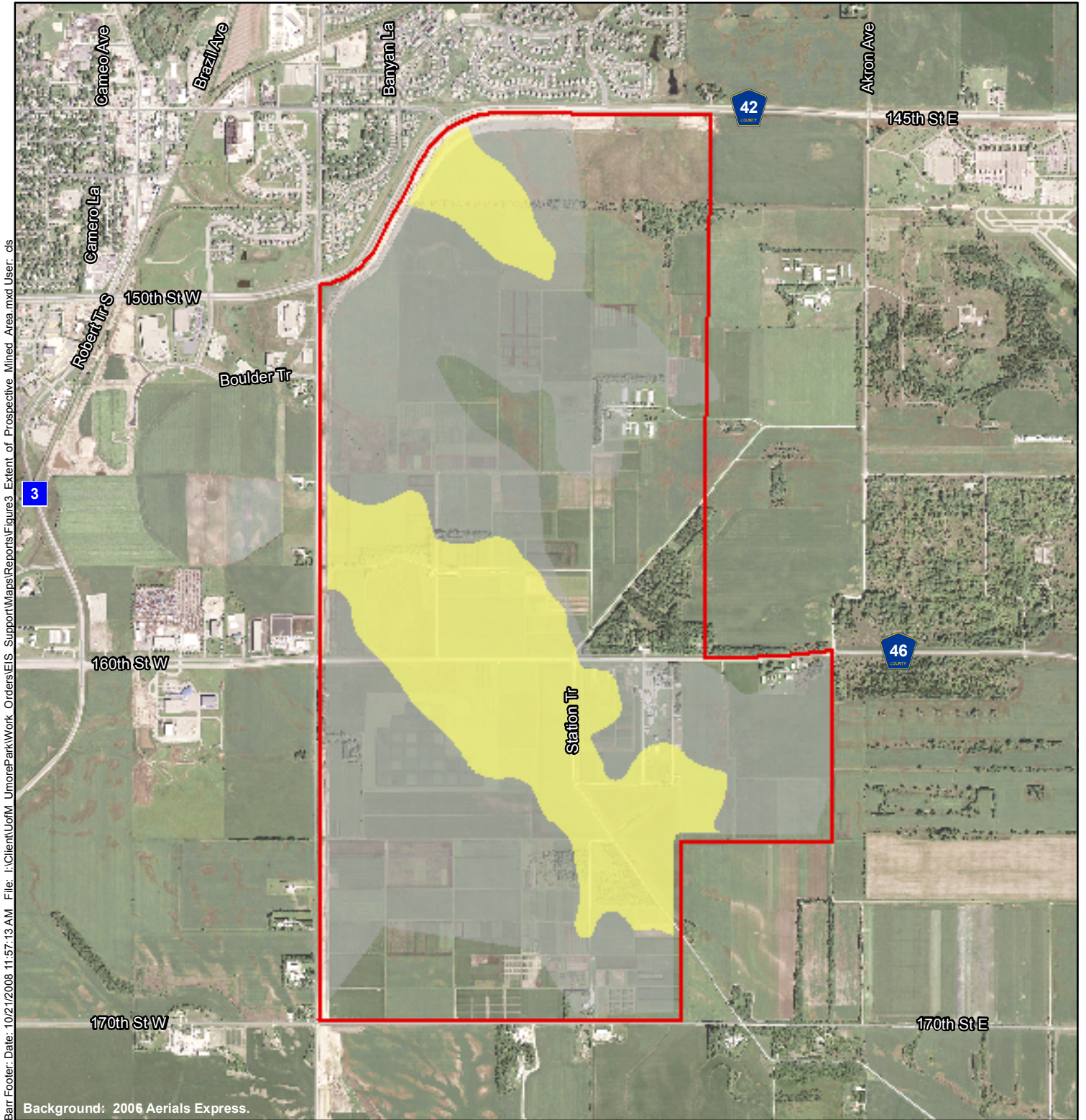


Figure 2

UMA EXISTING CONDITIONS

UMore Mining Area
Groundwater Assessment
Dakota County, MN





Barr Footer: Date: 10/21/2008 11:57:13 AM File: I:\Client\UofM_UmorePark\Work_Orders\EIS_Support\Maps\Reports\Figure3_Extent_of_Prospective_Mined_Area.mxd User: ds

- UMore Mining Area (UMA)
- Economic Gravel Deposit Below the Water Table (Approximate)
- Gravel Deposit Areas (ProSource, 2008)

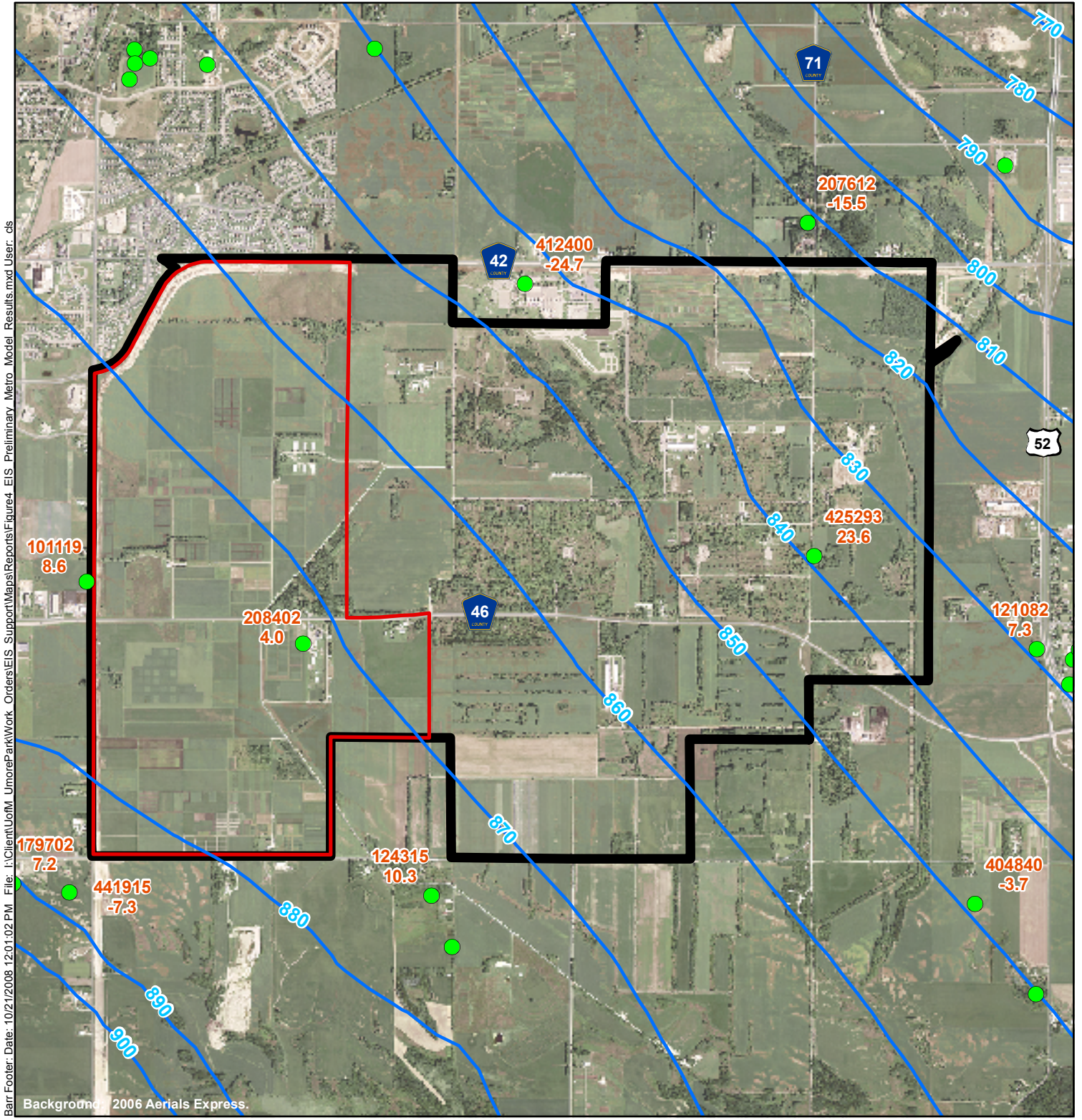


Figure 3

EXTENT OF PROSPECTIVE MINED AREAS

UMore Mining Area
Groundwater Assessment
Dakota County, MN





Barr Footer: Date: 10/21/2008 12:01:02 PM File: I:\Client\UofM_UmorePark\Work_Orders\EIS_Support\Maps\Reports\Figure4_EIS_Preliminary_Metro_Model_Results.mxd User: cbs

- Calibration Target (with Well ID No. & Residual Errors in Feet)
- Groundwater Contours (ft MSL)
- UMore Mining Area (UMA)
- UMore Park Boundary

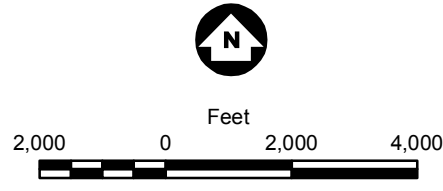


Figure 4

METRO MODEL
PRELIMINARY OUTPUT

UMore Mining Area
Groundwater Assessment
Dakota County, MN

Source: Metropolitan Council, MnDOT, MN DNR, Dakota County, USGS, Barr, SEH, HKGi.
GW contours are from the new Metro Groundwater Model.

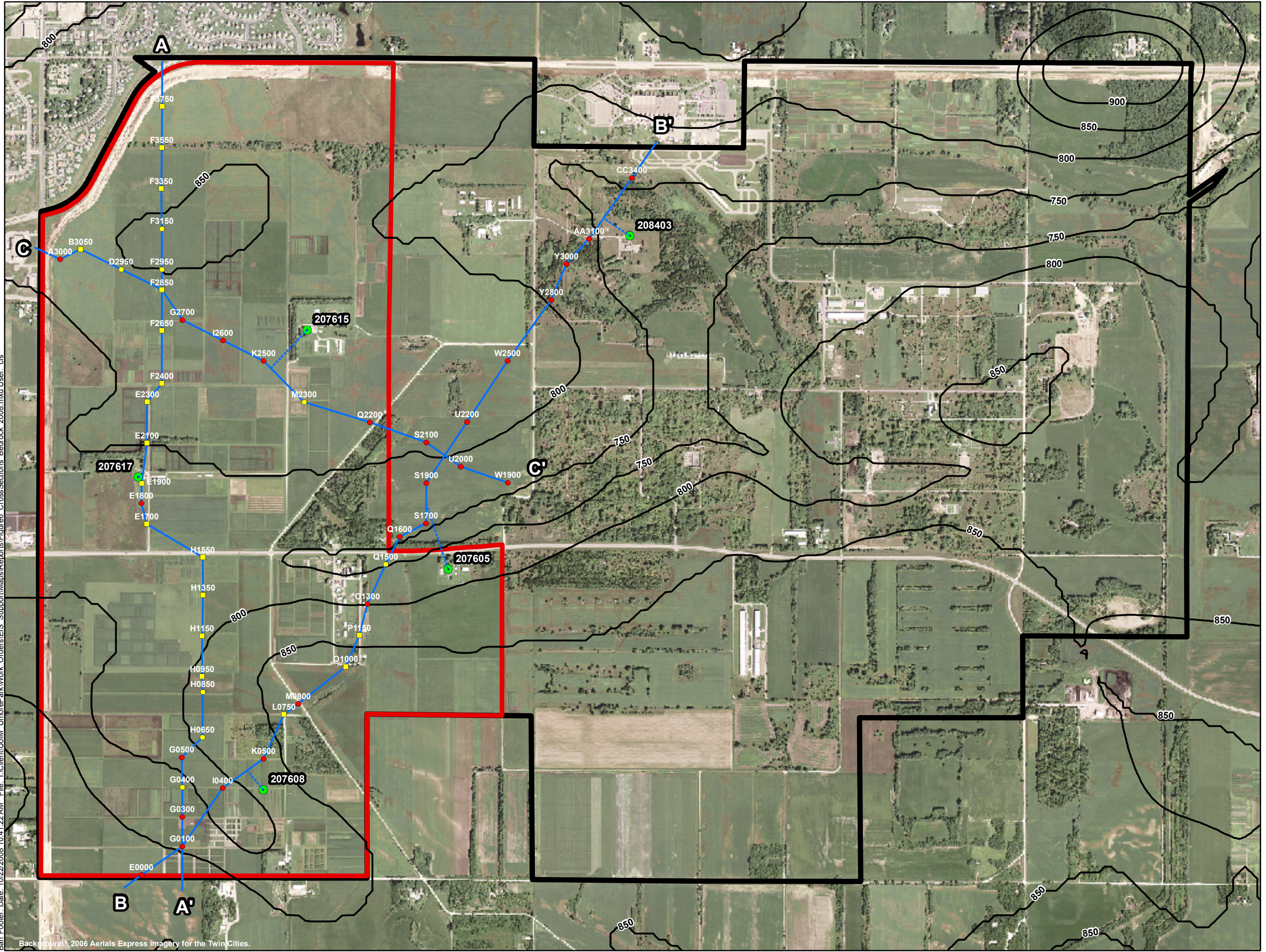


<u>Formation Name and Graphic</u>	<u>Description</u>	<u>Site Nomenclature</u>	<u>Hydrogeologic Role</u>
Unconsolidated Glacial Deposits	Unconsolidated sand and gravel containing fine grained diamicton (till-like) and lacustrine deposits.	Outwash (sand & gravel deposit)	Surficial Aquifer
		Till	Leaky Confining Unit
		Lacustrine - Lake bed silts & clays	Leaky Confining Unit
St. Peter	Fine to medium grained sandstone	St. Peter Sandstone	Aquifer (where saturated)
Shakopee and Oneota	Thin to medium-bedded crystalline dolomite	Prairie du Chien	Aquifer
Jordan	Fine to coarse sandstone	Jordan Sandstone	Aquifer
St. Lawrence	Dolomitic shale and siltstone	St. Lawrence	Regional Confining Unit

Figure 5

GENERALIZED STRATIGRAPHIC COLUMN
 UMore Mining Area Groundwater Assessment
 Dakota County, Minnesota

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- Approximate Well Locations
- Cross Section
- Bedrock Contours*
- ▭ UMore Park Boundary
- ▭ UMore Mining Area (UMA)
- Boring Locations**
- Phase I, Auger (ProSource, 2008)
- Phase II, Auger (ProSource, 2008)
- Phase II, Coring (ProSource, 2008)

Source: ProSource, SEH, Barr.

*Bedrock contours were generated from 30-meter DEM obtained from the Metropolitan Council. The Metropolitan Council DEM was interpolated from 50-foot bedrock contours obtained from the Minnesota Geological Survey. Contour Interval = 50 feet.

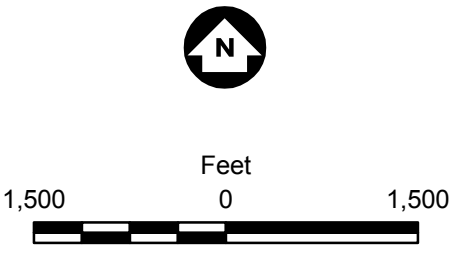
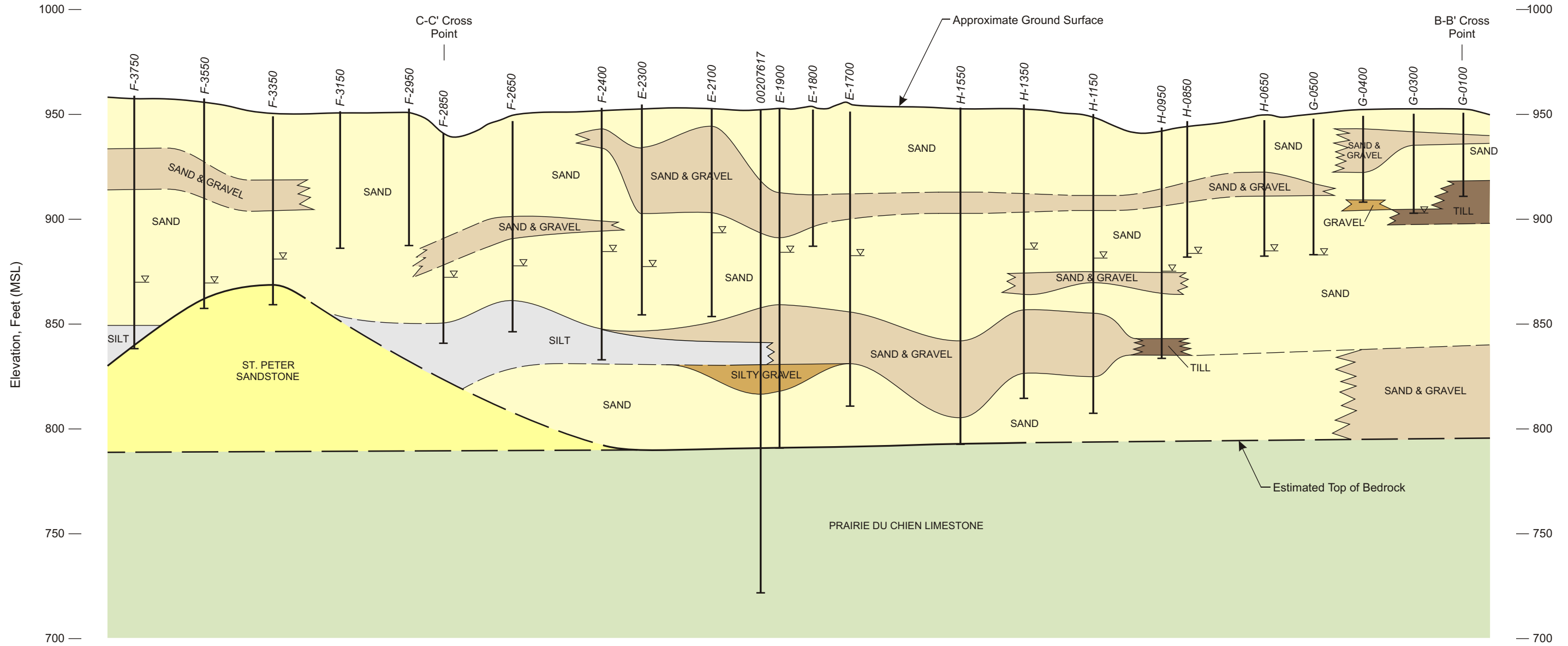


Figure 6
BEDROCK CONTOURS AND CROSS SECTION LOCATIONS
 UMore Mining Area
 Groundwater Assessment
 Dakota County, MN



A
NORTH

A'
SOUTH



0 1000
Approximate Horizontal Scale in Feet
20X Vertical Exaggeration

- Sand, < 25% Gravel
- Sand & Gravel, 25-40% Gravel
- Gravel, > 40% Gravel
- Glacial Diamicton
- Till/Diamicton
- Lacustrine
- Silt/Clay
- St. Peter Sandstone
- Prairie du Chien Dolomite

▽ Approximate Groundwater Elevation
(From ProSource gINT Lithology Table or CWI)

┆ Boring (Top of boring elevation and boring depth is from
ProSource gINT boring records or CWI)

NOTES:

1. Ground Surface derived from USGS National Elevation Dataset (NED) 10-meter Digital Elevation Model (DEM)
2. Geologic descriptions from ProSource (2008) and Minnesota County Well Index.
3. Isolated geologic units less than 10 feet thick are not shown.

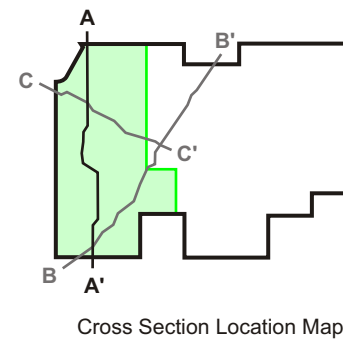
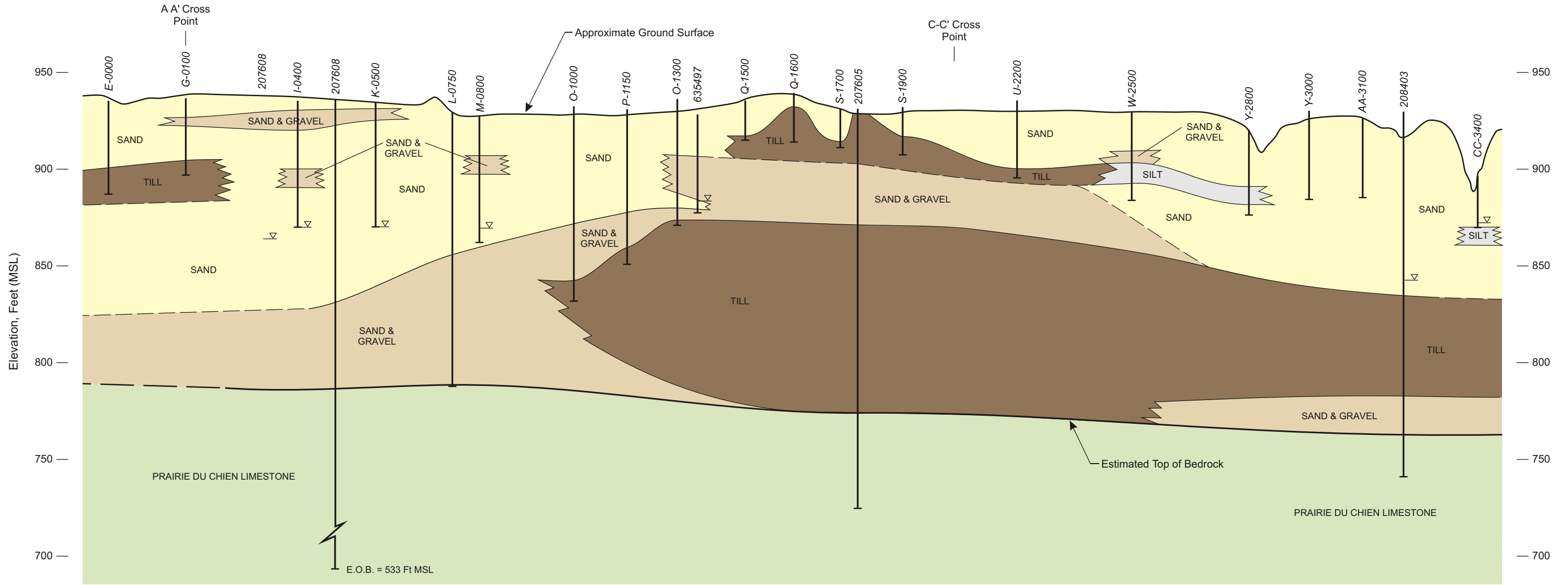


Figure 7
CROSS SECTION A-A'
UMore Mining Area Groundwater Assessment
Dakota County, Minnesota

B
SOUTHWEST

B'
NORTHEAST



0 1000
Approximate Horizontal Scale in Feet
20X Vertical Exaggeration

- Sand, < 25% Gravel
- Sand & Gravel, 25-40% Gravel
- Gravel, > 40% Gravel
- Glacial Diamicton
- Till/Diamicton
- Lacustrine
- Silt/Clay
- St. Peter Sandstone
- Prairie du Chien Dolomite

▽ Approximate Groundwater Elevation
(From ProSource gINT Lithology Table or CWI)

┆ Boring (Top of boring elevation and boring depth is from
ProSource gINT boring records or CWI)

NOTES:

1. Ground Surface derived from USGS National Elevation Dataset (NED) 10-meter Digital Elevation Model (DEM)
2. Geologic descriptions from ProSource (2008) and Minnesota County Well Index.
3. Isolated geologic units less than 10 feet thick are not shown.

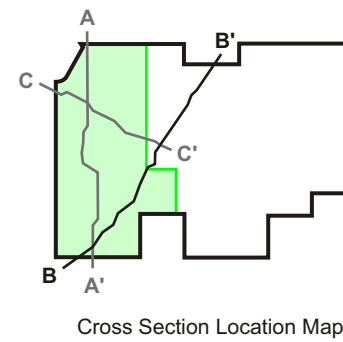
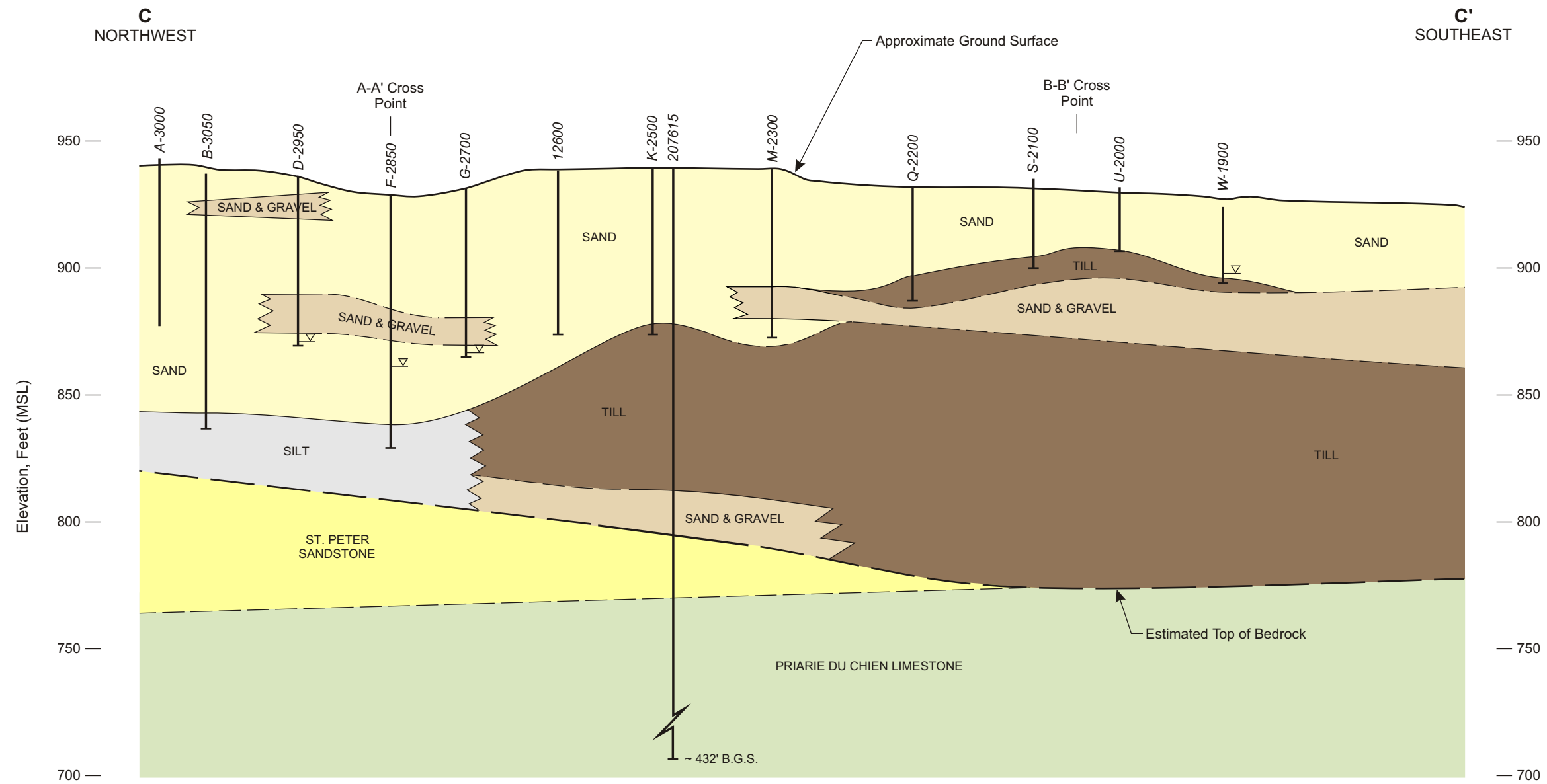


Figure 8
CROSS SECTION B-B'
UMore Mining Area Groundwater Assessment
Dakota County, Minnesota



0 1000
 Approximate Horizontal Scale in Feet
 20X Vertical Exaggeration

- Sand, < 25% Gravel
- Sand & Gravel, 25-40% Gravel
- Gravel, > 40% Gravel
- Glacial Diamicton
- Till/Diamicton
- Lacustrine
- Silt/Clay
- St. Peter Sandstone
- Prairie du Chien Dolomite

- Approximate Groundwater Elevation
(From ProSource gINT Lithology Table or CWI)
- Boring (Top of boring elevation and boring depth is from ProSource gINT boring records or CWI)

NOTES:
 1. Ground Surface derived from USGS National Elevation Dataset (NED) 10-meter Digital Elevation Model (DEM)
 2. Geologic descriptions from ProSource (2008) and Minnesota County Well Index.
 3. Isolated geologic units less than 10 feet thick are not shown.

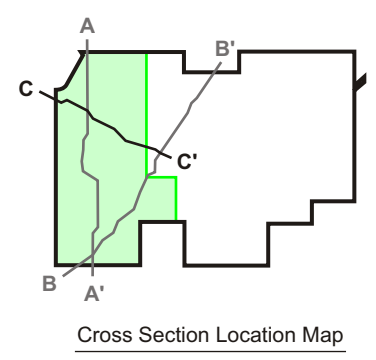
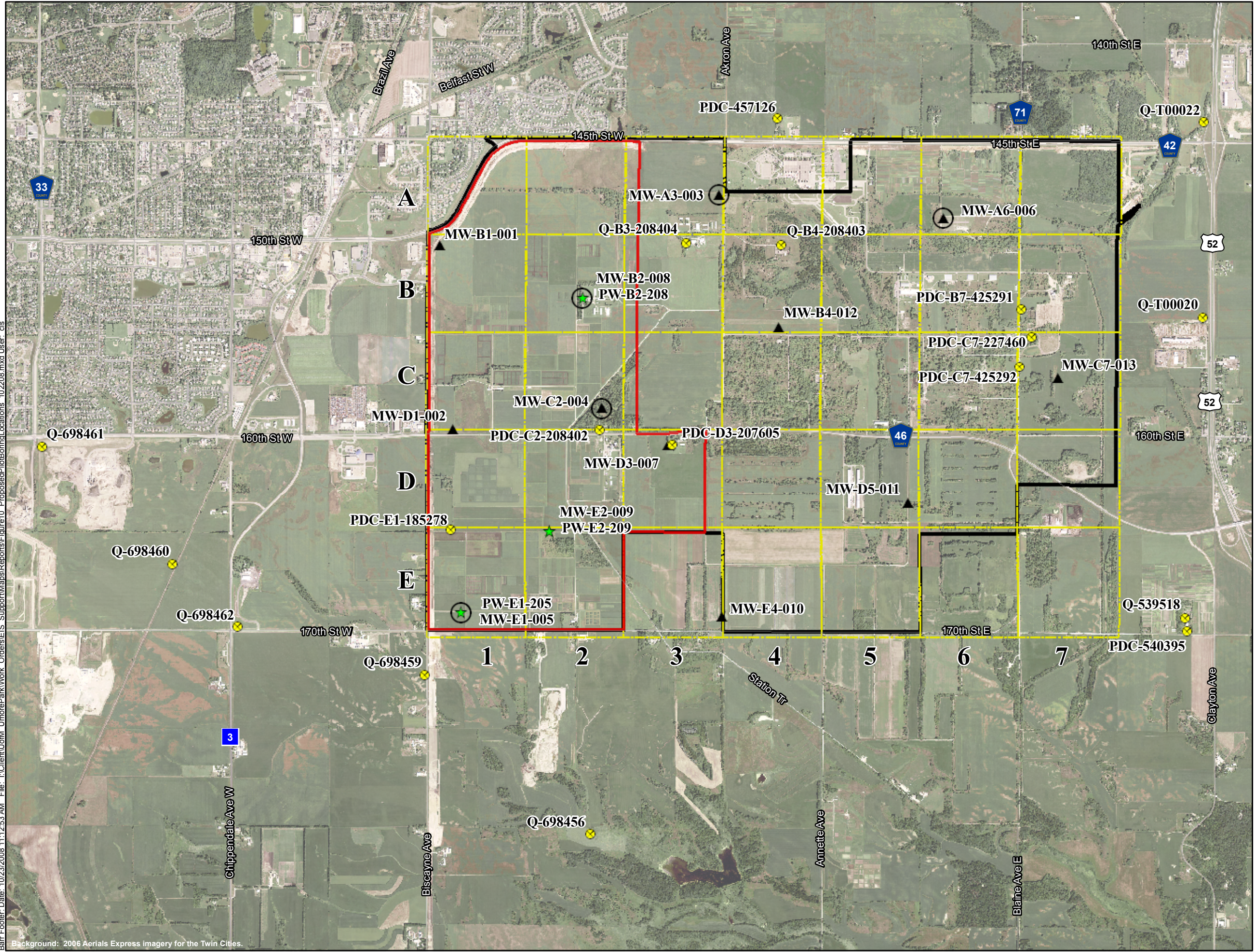


Figure 9
 CROSS SECTION C-C'
 UMore Mining Area Groundwater Assessment
 Dakota County, Minnesota

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- Pilot Boring Location
- Monitoring Well Location
- Pumping/Monitoring Well Nest Location
- Existing Well
- UMore Mining Area (UMA)
- UMore Park Boundary
- Site Location Grid

Source: Metropolitan Council, MnDOT, Dakota County, Barr, SEH, HKGI, Minnesota Geological Survey.

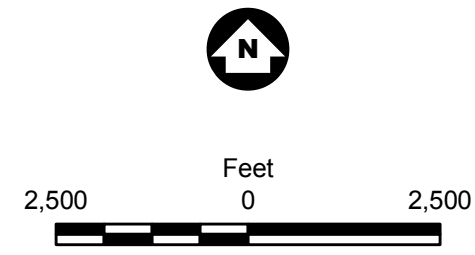


Figure 10
 PILOT BORING/
 WELL LOCATIONS

UMore Mining Area
 Groundwater Assessment
 Dakota County, MN

