

ANNUAL MONITORING REPORT – 2005/2006

**PAYNESVILLE MUNICIPAL WATER SUPPLY /
FORMER MIDTOWN SERVICE STATION
500 LAKE AVENUE SOUTH
PAYNESVILLE, MINNESOTA
MPCA SITE ID # LEAK00000131 AND LEAK00002181**

**Terracon Project No. 41987018
June 30, 2006**

Prepared for:

**MINNESOTA POLLUTION CONTROL AGENCY
Remediation Division
Petroleum and Closed Landfill Remediation Section
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Section 1. GROUND WATER MONITORING

Discuss the groundwater monitoring results, including water level measurements and analytical results, performed since the Investigation Report or the last progress report submitted. Include all cumulative data in the tables. Indicate whether samples were purged or unpurged (see Guidance Document 4-05). If purged, indicate purging method.

Background

The Paynesville Municipal Water Supply / Former Midtown Service Station site is located within the City of Paynesville (Figure 1). Based on available information and previous assessment work conducted by Terracon, the site has soil, soil gas and groundwater impacts. Soil gas impacts appear to be concentrated along Lake Avenue between the former Midtown Service Station and State Highway 23. Benzene and 1,2-dichloroethane have been detected in City Wells CW-3 and CW-4 on several occasions in the past. The most recent corrective action for this issue involved assisting the City of Paynesville with the installation of new municipal water supply wells (CW-7 and CW-8) and utilizing City Well CW-4 as a plume containment wells. The available information indicates that the source of the impacts is a petroleum release that occurred at the former Midtown Service Station located at 500 Lake Avenue South (southwest corner of Lake Avenue South and Mill Street).

Previous soil gas assessment activities were conducted at the site and included six soil probes (VP-1 through VP-6, Figure 2A) completed in the right-of-way of Lake Avenue as part of a Vapor Intrusion Assessment (VIA) Pilot Study performed for the MPCA. The results of the initial vapor monitoring work are discussed in Terracon's *VIA Pilot – Midtown Station* report dated January 21, 2005. Subsequent VIA activities included advancing four hand-driven soil gas probes (VP-7 through VP-10, Figure 2A) to assess the vapor migration potential to receptors (i.e., building) located near the previously identified source area. The results of the additional work were discussed in Terracon's *Annual Monitoring Report* dated June 29, 2005.

This Annual Monitoring Report (AMR) includes groundwater monitoring results for monitoring events conducted since Terracon's *Annual Monitoring Report* dated June 29, 2005. In addition, this AMR includes the results additional soil gas sampling activities performed in October 2005 as part of Vapor Intrusion Assessment (VIA) Pilot Study activities being performed for the MPCA. A copy of the *VIA Pilot – Midtown Station* report dated December 14, 2005 is included in Appendix D.

Various petroleum-related VOCs have been detected in the soil gas samples collected from the two soil-gas probes. One or more petroleum related VOCs were detected at concentrations that exceeded one of the soil gas action levels [i.e., Minnesota Department of Health (MDH) Health Risk Value (HRV), Environmental Protection

Agency (EPA) Reference concentrations (Rfcs), MDH Interim Screening Concentrations (ISCs), or MPCA residential Intrusion Screening Values (ISVs)].

In addition to the activities described in this document, Terracon completed a review of the Minnesota Pollution Control Agency (MPCA) file for the former Midtown Service Station (LEAK00002181) in order to develop a limited focused feasibility study (FFS). The results of the FFS were submitted to the MPCA in Terracon's *Focused Feasibility Study* dated March 15, 2006. The FFS included a summary of the historic activities on site and assessment of the effectiveness of corrective actions that have previously targeted the source area at the site. The FFS also included recommendations for further definition of the source area to be remediated; proposes a plan for developing cleanup objectives for the site; and provided a summary of potential corrective actions. Corrective action alternatives evaluated in the FFS included: free product recovery, excavation, bioslurping (multi-phase extraction), soil excavation and in situ soil flushing. The FFS did not include a recommendation for implementing a specific corrective action to address the current extent and magnitude of the petroleum impacts in and near the source area.

Hydrogeologic Conditions

Depth to groundwater measurements were conducted at the following wells on a semi-annual basis during this reporting period (Figure 2).

Well ID	Map ID	Well ID	Map ID
DW-1	1	<i>Midtown wells</i>	
DW-2	2	MW-10	24
DW-3	3	MW-10D	5
DW-4	4	MW-14	25
DW-5	45	MW-14D	6
DW-6	46	MW-15	27
DW-7S	48	MW-17	28
DW-7D	49	<i>City of Paynesville monitoring wells</i>	
		-	44
		-	43

Well construction information is summarized in Table 1. The groundwater level data is presented in Table 2. The fluid level data from wells screened in the drinking water aquifer between 75 and 95 feet below ground surface were used to prepare the groundwater contour maps depicted in Figures 3A and 3B. The estimated groundwater contours for groundwater levels measured on November 2, 2005 and

May 4, 2006 show the regional groundwater flow is generally to the east-southeast. Available information indicates the local horizontal groundwater flow direction in the water table aquifer near the source area is to the north, towards the North Fork of the Crow River. However, local fluctuations and variations due to seasonal infiltration/exfiltration, geologic formations, groundwater pump-out and/or other site features can affect the groundwater flow. Fluid level data from select monitoring wells screened within the drinking water aquifer and/or located near recovery well DW-5 are depicted on hydrographs in Figures 4A and 4B. The hydrographs illustrate seasonal fluctuations in groundwater elevations, and in the case of wells CMW-42 (42) and DW-5 (45) (Figure 4A) the results of groundwater pumping activities.

Groundwater Sampling

The following table summarizes the groundwater monitoring/sampling activities.

Location	Analysis	Quarterly	Semi-Annual	Annual
WTP Influent	VOCs		*	
WTP Effluent	VOCs		*	
CW-3	VOCs		*	
CW-4	VOCs	*		
CW-5	VOCs		*	
CW-6	VOCs		*	
CW-7	VOCs		*	
CW-8	VOCs			*
DW-3	BTEX, MTBE, GRO	*		
DW-5	BTEX, MTBE, GRO	*		
DW-6	BTEX, MTBE, GRO	*		
DW-7S	BTEX, MTBE, GRO			*
DW-7D	BTEX, MTBE, GRO			*
MW-17	BTEX, MTBE, GRO	*		

Groundwater samples were collected from the city wells via sampling taps after purging. Groundwater samples were collected from the monitoring wells after purging three to five well volumes using disposable bailers, dedicated plastic purge pumps with polyethylene tubing or a Grundfos Redi-Flow 2 sampling pump with dedicated polyethylene tubing as described in the attached sampling forms. The laboratory results are summarized in Table 3 and Table 4. Natural attenuation monitoring parameters are summarized in Table 5. Copies of laboratory reports are included in Appendix A and the sampling information forms are included in Appendix C.

Semi-annual and annual groundwater monitoring events occurred during November 2005 and May 2006, respectively. The most recent monitoring event was conducted in May 2006 and included collecting groundwater samples from monitoring wells DW-3,

DW-5, DW-6, DW-7S, DW-7D, MW-17, CW-3, CW-5, CW-6, CW-7, CW-8, WTP influent and WTP effluent. The laboratory analytical results for the groundwater samples from these monitoring locations were below laboratory reporting limits for VOCs, except for concentrations detected in samples collected from wells DW-5 and DW-6. The VOCs detected in the sample collected from well DW-5 include benzene (180 ug/L), toluene (1.5 ug/L), ethyl benzene (32 ug/L), total xylenes (32 ug/L), MTBE (1.3 ug/L) and GRO (440 ug/L). The VOCs detected in the sample from well DW-6 include benzene (27 ug/L), ethyl benzene (1.7 ug/L) and GRO (71 ug/L). The detected VOCs are consistent with laboratory analytical results conducted on groundwater samples collected during previous monitoring events. Monitoring well DW-3 was abandoned on May 5, 2006 following the annual sampling event because Pomeroy Avenue was being realigned in the well would be within the road surface.

Plume Containment Activities (CW-4)

The groundwater pumping rate for well CW-4 decreased from approximately 103 gallons per minute (gpm) during Summer 2005 until it was shutdown on August 31, 2005 to replace the RPZ backflow preventer on the well that had failed. The pump was restarted on September 14, 2004 and the maximum pumping rate was approximately 90 gpm. The pump in well CW-4 failed during March 2006. A new pump was installed in the well CW-4 on May 5, 2006, but it had the wrong voltage motor. The pump was reinstalled in City Well CW-4 on June 1, 2006 and started the next day. The pumping rate was set to approximately 90 gpm. Monitoring well DW-3 was abandoned on May 5, 2006 because Pomeroy Avenue was being realigned in the well would be within the road surface.

The laboratory analytical results for samples collected from well CW-4 have been decreasing steadily from March 2003 (13 ug/L benzene) to the present (below laboratory reporting limits for benzene). This decrease may be indicative of a reduction in the dissolved phase petroleum, a decreased pumping rate or other unidentified well or pump issue. The current pumping rate at city well CW-4 of approximately 90 gpm appears to be controlling dissolved phase petroleum plume migration in the direction of city wells CW-3, CW-5, CW-6 and CW-7. The pumping rate of city well CW-4 should be limited so that it does not promote excessive migration of the contaminant plume to the north or downward into the drinking water aquifer. The pump installed in the well during May/June 2006 may operate at lower pumping rates than the previous pump.

Well 4
P.M.A.

Section 2. VAPOR IMPACT MONITORING

If vapor impacts were detected during previous assessments, discuss the results of follow-up vapor monitoring. Include in your discussion the sampling instrument and sampling method.

Soil gas sampling was conducted during October 2005 at two locations, soil gas probes VP-1A and VP-11, near the "source area" and "fringe" of the soil gas associated with the site VIA Pilot Study activities being performed for the MPCA. A copy of the *VIA Pilot - Midtown Station* report dated December 14, 2005 is included in Appendix D. Refer to Figure 2A for soil gas probe locations. Additional VIA activities planned for the site were postponed until MPCA staff could review the FFS dated March 15, 2006 such that assessment activities could be integrated and locations selected.

Various petroleum-related VOCs were detected in the soil gas samples collected from the two soil-gas probes (VP-1A through VP-11). One or more petroleum related VOCs were detected in samples from soil gas probes VP-1A and VP-11 at concentrations that exceeded their respective soil gas action levels (i.e., MDH HRVs, EPA Rfcs, MDH ISCs, or MPCA residential ISVs). The soil-gas sample collected from soil gas probe VP-1A exhibited higher concentrations of VOCs due to its location near the source area. The concentrations of VOCs detected in the sample collected from soil gas probe VP-11 were several orders of magnitude lower than those detected in vapor probe VP-1A.

NOTE: If vapor concentrations exceed 10 percent of the lower explosive limit, exit the building and contact the local fire department immediately. Then contact the Minnesota Duty Officer (24 hours) at 651/649-5451 (metro and outside Minnesota) or 1-800/422-0798 (Greater Minnesota). TTY users call 651/297-5353 (V/TTY) or 1-800/627-3529 (V/TTY).
Vapor mitigation is required.

Section 3. RECOMMENDATIONS

Discuss your recommendations. Your recommendation should be based on Guidance Document 1-01 *Petroleum Remediation Program General Policy*.

The dissolved phase petroleum plume emanating from the former Midtown Service Station continues to impact the water quality in the water table aquifer and underlying drinking water aquifer at the site an to the north and northeast. The primary source of the dissolved phase petroleum plume appears to be light non-aqueous phase liquid (LNAPL) which has consistently been observed in several monitoring wells on the former Midtown Service Station property. Groundwater quality data indicates the dissolved phase petroleum plume is responsive to groundwater pumping activities. In

Soil Gas

comparing data from similar time periods, the City Well CW-4 pumping rates and laboratory analytical data for groundwater samples collected from wells at the site appear to correlate well. During increased groundwater pumping rates at well CW-4, dissolved phase petroleum hydrocarbon concentrations for samples collected from well CW-4 at times increase while those in nearby monitoring wells MW-17 and DW-3 have remained below laboratory reporting limits or at levels below their respective MDH Health Risk Limits (HRLs), Health Based Values (HBVs) and EPA Maximum Contaminant Levels (MCLs). However, benzene concentrations in samples from monitoring wells DW-5 and DW-6 consistently exceed the MDH HRL indicating that the dissolved phase petroleum plume continues to impact the drinking water aquifer and poses a continuing risk of once again impacting one of the city well if pumping activities at City Well CW-4 cease. Continued analysis of samples from the water treatment plant, city wells, and select monitoring wells should be performed in order to monitor the quality of the water supply and plume stability or migration. In addition, the recommendations in the FFS dated March 15, 2006 for additional assessment and remediation of the source area on and near the former Midtown Service Station should be implemented.

If additional corrective action is recommended, please provide your justification.

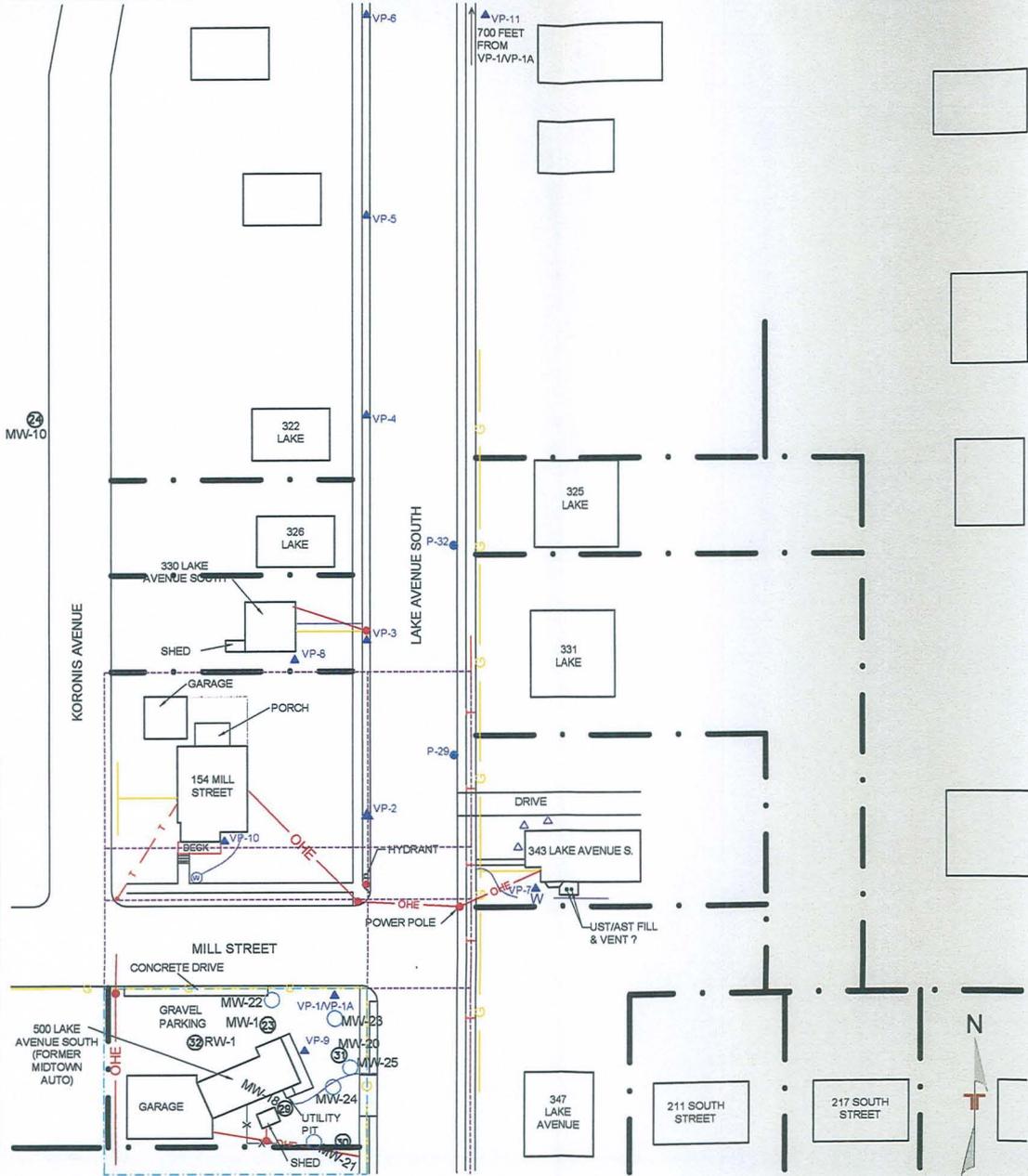
As discussed above, Terracon's *FFS dated March 15, 2006* identifies a list of potentially effective corrective actions for the former Midtown Service Station site that would address source area petroleum contamination; decrease dissolved phase petroleum concentrations in the drinking water aquifer; and potential mitigate vapor migration into nearby buildings. Additional assessment of the extent and magnitude of petroleum contamination in and near the source area is needed before a useful evaluation of the feasibility and potential effectiveness of implementing the identified corrective actions (CAs).

Terracon recommends that assessment activities in and near the source area include the following:

- **Laser induced fluorescence (LIF) and conductive probes should be advanced on-site and along the Mill Street, Lake Avenue and Kronis Avenue road right-of-ways to attempt to delineate the horizontal and vertical extent of free product impacts. Terracon estimates that a total of 24 LIF probes locations will be utilized for the off-site assessment. An additional 18 LIF probes will be utilized for the on-site assessment. An estimated 50 percent of these locations would include an additional conductivity probe evaluation. Also, approximately 20 percent of the probe locations will require confirmatory sampling.**

LEGEND

- ▲ SOIL VAPOR PROBE
- △ SOIL VAPOR PROBE REFUSAL
- ⊙ SOIL PROBE BORING
- Ⓢ WELL LOCATION
- POWER POLE
- x - x - x - x - FENCE LINE
- - - - - PROPERTY BOUNDARY
- T - TELEPHONE
- G - NATURAL GAS
- W - WATER
- - - - - OFFSITE ASSESSMENT
- OHE - OVERHEAD ELECTRIC
- SS - SANITARY SEWER
- ST - STORM SEWER
- [] ON SITE ASSESSMENT



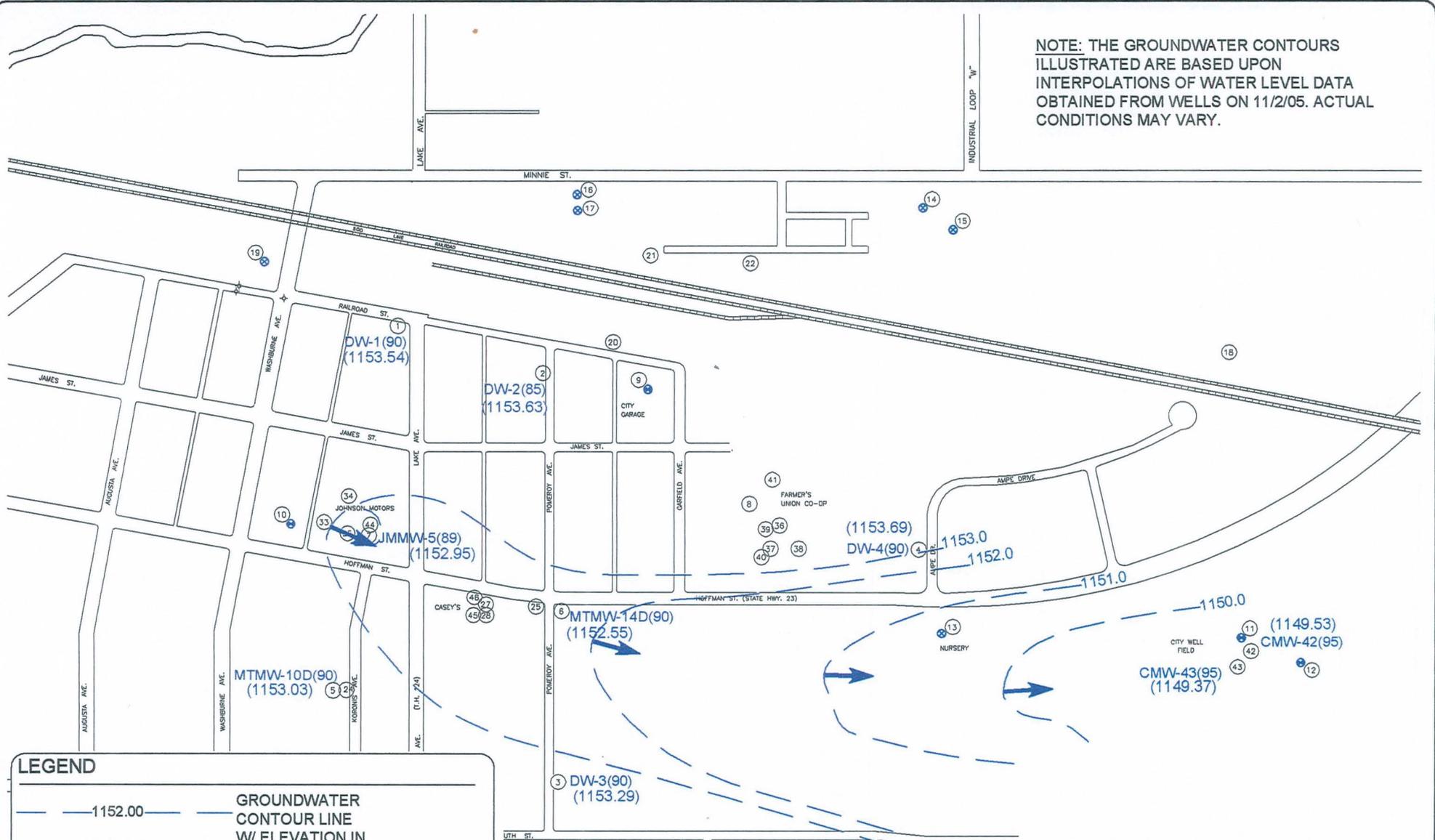
SITE MAP
PAYNESVILLE MUNICIPAL SUPPLY
 FORMER MIDDTOWN SERVICE STATION
 TERRACON PROJECT NO. 41987018

Project Mgr:	PJW	Project No.	41987018
Designed By:	PJW	Scale:	AS SHOWN
Checked By:	PJW	Date:	6/24/05
Approved By:	PJW	3535 Hoffman Road East White Bear Lake, MN 55110	Drawn By: CDR (41)
File Name:	41987018bu2.dwg	FIG 11	Figure No. 2A

Terracon

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

NOTE: THE GROUNDWATER CONTOURS ILLUSTRATED ARE BASED UPON INTERPOLATIONS OF WATER LEVEL DATA OBTAINED FROM WELLS ON 11/2/05. ACTUAL CONDITIONS MAY VARY.



LEGEND

— 1152.00 — GROUNDWATER CONTOUR LINE W/ ELEVATION IN FEET AMSL

WELL NAME (WELL DEPTH) IN FEET

FUMW-7(89) (1151.39)

WELL LOCATION

8

GROUNDWATER LEVEL IN FEET AMSL

⊗ PRIVATE POTABLE WELLS

⊕ MUNICIPAL POTABLE WELLS

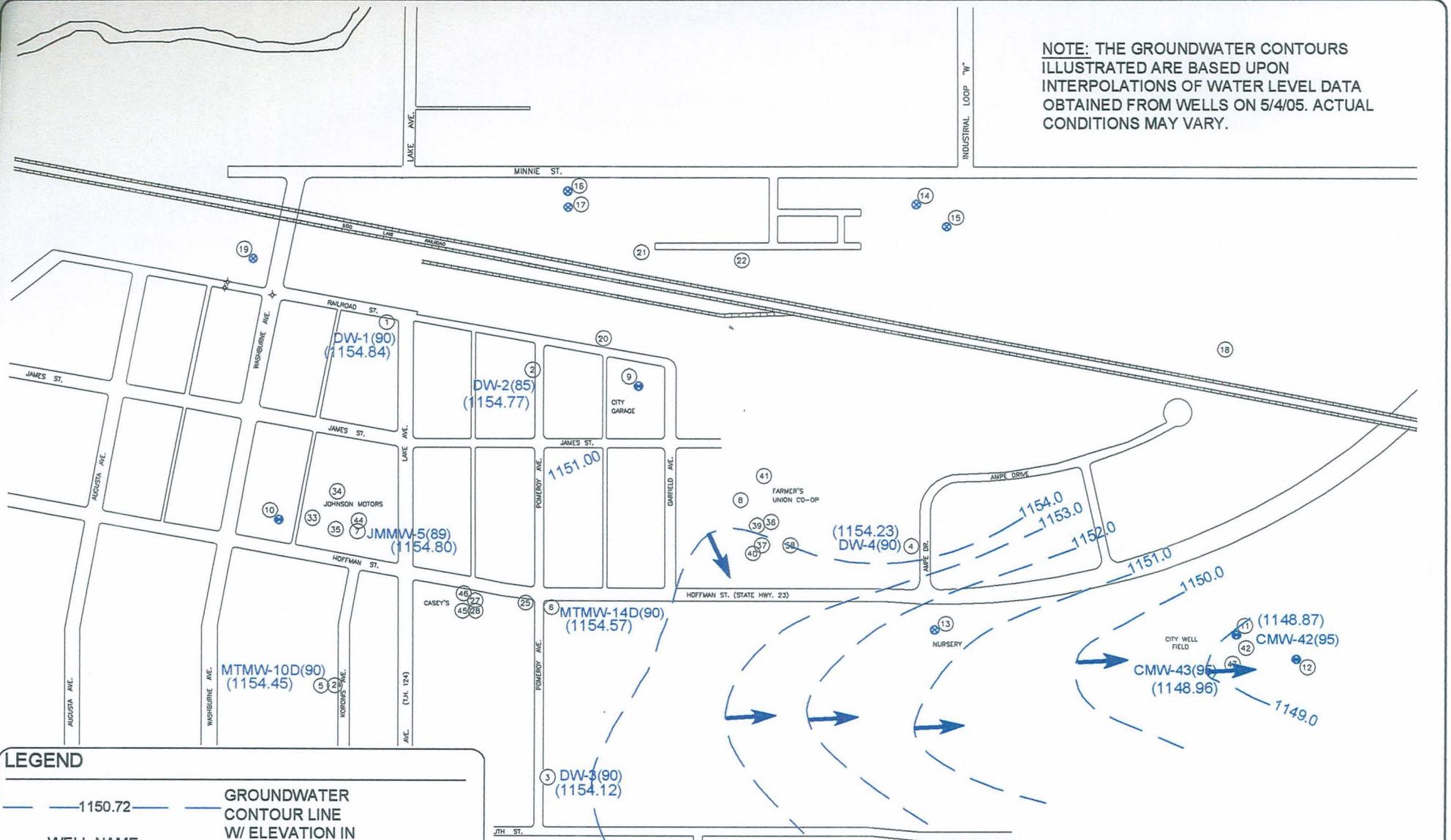
Contour Maps

GROUNDWATER CONTOUR MAP (11/2/05)
 PAYNESVILLE MUNICIPAL WATER SUPPLY
 MINNESOTA STATE HIGHWAY 23
 PAYNESVILLE, MN
 MPCA

Project Mngr:	PJW	<p>3535 Hoffman Road East White Bear Lake, MN 55110</p>	Project No.	41987018
Designed By:	JU		Scale:	AS SHOWN
Checked By:	JU		Date:	6/24/05
Approved By:	PJW		Drawn By:	CDR (41)
File Name:	41987018gw.dwg	Layout1	Figure No.	3A

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT TO BE USED FOR DESIGN PURPOSES

NOTE: THE GROUNDWATER CONTOURS ILLUSTRATED ARE BASED UPON INTERPOLATIONS OF WATER LEVEL DATA OBTAINED FROM WELLS ON 5/4/05. ACTUAL CONDITIONS MAY VARY.



LEGEND

— 1150.72 — GROUNDWATER CONTOUR LINE W/ ELEVATION IN FEET AMSL

WELL NAME (WELL DEPTH) IN FEET

GROUNDWATER LEVEL IN FEET AMSL

⊗ PRIVATE POTABLE WELLS

○ MUNICIPAL POTABLE WELLS

○ WELL LOCATION

Contour

GROUNDWATER CONTOUR MAP (5/4/06) PAYNESVILLE MUNICIPAL WATER SUPPLY MINNESOTA STATE HIGHWAY 23 PAYNESVILLE, MN MPCA		
Project Mngr:	PJW	Project No. 41987018
Designed By:	JU	Scale: AS SHOWN
Checked By:	JU	Date: 6/24/05
Approved By:	PJW	Drawn By: CDR (41)
File Name:	41987018gw.dwg	Figure No. 3B