



PLAN COMPLETION REPORT FOR THE VB 6 AREA

**BRAIDWOOD GENERATION STATION
BRACEVILLE, ILLINOIS**

**Prepared For:
Exelon Generation Company, LLC**

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1.0 INTRODUCTION

1.1 BACKGROUND AND PURPOSE

This document has been prepared for the Illinois Environmental Protection Agency (IEPA) to address on-going groundwater remediation at the Exelon Generation Company LLC (Exelon) Braidwood Generating Station property¹ located in Braceville, Illinois. More specifically, this Plan Completion Report addresses the Vacuum Breaker #6 area (Site) and discusses the groundwater investigation, monitoring, and remedial actions that were implemented in accordance with the Agreed Preliminary Injunction Order (PIO) dated May 24, 2006. Information collected to date as a result of Action Plan implementation is sufficient to determine that remediation at the VB 6 area is complete and can be concluded.

Among other things, the May 24, 2006 PIO required Exelon to submit a Groundwater Action Plan to address tritium in groundwater at or near Braidwood Generating Station's Vacuum Breaker #6 (VB 6). In November 2006, the Minimization Impairment Plan for Vacuum Breaker 6 was prepared and submitted to the IEPA (hereinafter referred to as the "Action Plan"). Upon approval by the IEPA, the Action Plan was implemented.

As a result of the implementation of the approved Action Plan, the levels of tritium detected in groundwater have been reduced to below the Lower Level of Detection (LLD) of 200 picocuries per liter (pCi/L) in the VB 6 area. Additionally, a significant amount of environmental data has been collected as part of the Action Plan implementation. Analyses of these data have revealed the geologic and hydrogeologic characteristics of the subject area, providing an understanding of the groundwater movement and tritium migration. This Plan Completion Report for the VB 6 area is based on Site characterization data collected through May 2009 which indicate a substantial reduction in tritium levels through passive remediation.

Information collected to date as a result of Action Plan implementation is sufficient to determine that remediation at the VB 6 area is complete and can be concluded.

Section 5.0 of this Plan Completion Report provides a list of references specific to the VB 6 area as well as pertinent documents related to the other areas on the Braidwood Station property where remediation of tritium in groundwater is being performed.

¹ The Braidwood Station property includes lands listed under the Station's Nuclear Regulatory Commission (NRC) licensed property along the blowdown line and property recently purchased by Exelon along Smiley Road and Center Street.

1.2 DESCRIPTION OF THE REMEDIATION AREA

Land surrounding the VB 6 area falls mainly into the agricultural, residential, and recreational use categories (Figure 1.1). The center of the Village of Braidwood is approximately 10,000 feet from the vacuum breaker VB 6. To the northwest of the Site, there are two main highways (Illinois State Highway 53 and Illinois Route 129) running parallel to each other with a railroad (Southern Pacific Railroad) between them. The Will County Forest Preserve is located to the north of the Site. Five monitoring wells have been installed in the vicinity of the Site (Figure 1.2).

1.3 SUMMARY OF REMEDIAL ACTIONS TO DATE AND CURRENT GROUNDWATER CONDITIONS

The current groundwater remediation program for the VB 6 area utilizes passive techniques, which includes monitored natural attenuation (MNA).

The concentration of tritium in groundwater at monitoring wells in the VB 6 area has been reduced by as much as 100% since September 2006 (e.g., MW-148D and MW-150D). As of May 2009, tritium concentrations in groundwater samples collected from all the monitoring wells at the VB 6 location were below the LLD of 200 pCi/L. All monitoring wells at the VB 6 location have been below the LLD for six consecutive sampling events since December 2007.

2.0 CURRENT GROUNDWATER CONDITIONS AT VB 6

This section presents a description of the pre-remediation and current groundwater conditions at the VB 6 area.

2.1 BACKGROUND

Vacuum breaker VB 6 is located on the blowdown line about 425 yards east of Essex Road and 450 yards north of Smiley Road on the Exelon transmission tower right-of-way (Figure 1.2). This land is leased to a local resident for agriculture. The Will County Forrest Preserve District (WCFPD) owns the property directly north of the right-of-way.

A search of work history for leaks from the VB 6 and its associated air release valve determined the following:

- Engineers discovered minor leakage of the main seat on November 10, 2000. The valve had been previously verified leak free on March 3, 2000.
- Another main seat leak with the same description was discovered on October 30, 2003. This leak was repaired on October 17, 2005.

2.2 PRE-REMEDICATION GROUNDWATER CONDITIONS

A total of 20 monitoring wells have been installed into the deep and shallow zones of the overburden sand aquifer in the VB 6 area. The majority of these monitoring wells have been abandoned. Currently, there are five monitoring wells in the VB 6 area used for routine groundwater monitoring. Figure 2.1 presents the monitoring well network in the vicinity of VB 6. This figure includes temporary 1-inch diameter monitoring wells and permanent 2-inch diameter monitoring wells.

Figures 2.2 and 2.3 present the groundwater elevations and flow directions in the shallow and deep zones of the overburden sand aquifer for March 2006, respectively. Groundwater in the vicinity of VB 6 flows generally northeast in the deep zone.

Figures 2.4 and 2.5 present the estimated horizontal distribution of tritium in the vicinity of VB 6 in the shallow and deep zones of the overburden aquifer, respectively, in the winter of 2005. These figures indicate that the highest tritium concentrations were downgradient of VB 6.

2.3 REMEDIAL ACTION PLAN IMPLEMENTED AT VB 6

The remedial action plan selected for the VB 6 area and approved by the IEPA is MNA.

The monitoring phase of the plan was designed to insure that the residual levels of tritium in groundwater did not further impair groundwater for current groundwater users (those outside the limits of the Station's property). This monitoring program was specifically designed to assess and evaluate residual levels of tritium in groundwater.

Since the winter of 2005, Exelon has been monitoring tritium levels in groundwater near the VB 6 area. As a result, more than 3.5 years of data, including groundwater levels and tritium concentrations, has been collected. More specifically, in September 2006, Exelon implemented routine quarterly groundwater monitoring as part of the Action Plan described above. Since implementation of the Action Plan, an additional 11 quarters of sampling data has been collected, analyzed, and submitted to the IEPA for evaluation. This groundwater monitoring is in addition to the Nuclear Regulatory Commission (NRC) required groundwater sampling performed under the Station's Radiological Environmental Monitoring Program (REMP).

Groundwater flow and tritium transport modeling performed at the VB 6 area was presented in the report prepared by CRA entitled "Groundwater Flow and Tritium Transport Modeling, Braidwood Generating Station" (CRA, August 2006). The modeling indicated that the tritium in the VB 6 area would not impact groundwater users off the Station property. The modeling results presented in this report also suggest that 200 pCi/L would be reached within a few years at locations off the licensed property.

2.4 CURRENT GROUNDWATER CONDITIONS

The current trends of decreasing tritium concentrations within groundwater at the VB 6 area (January 2006 through May 2009) have been depicted on Figure 2.6 and in Table 2.1.

Table 2.1 provides a summary of the statistical analyses of the monitoring wells sampled generally between the time period from January 2006 to May 2009. These analyses indicate a predominately downward trend of tritium concentrations in the groundwater monitoring wells in the vicinity of VB 6. Three monitoring wells in the VB 6 area were sampled and continue to indicate levels of tritium below the LLD of 200 pCi/L from January 2006 and May 2009 and therefore were excluded from the statistical analysis.

Two monitoring wells that have had tritium detected at concentrations greater than 200 pCi/L between January 2006 and May 2009 were utilized for statistical analysis. The overall percent reduction of tritium concentrations between January 2006 and May 2009 is also presented in Table 2.1. Tritium concentrations have been reduced by as much as 100% from 520 pCi/L in September 2006 to less than the LLD of 200 pCi/L in May 2009, as shown at locations MW-148D and MW-150D. Groundwater samples collected from monitoring wells in the VB 6 area are at levels significantly below the drinking water standard of 20,000 pCi/L and, in fact, all sample data are currently less than the LLD of 200 pCi/L. Figure 2.6 presents the predominately downward trend in tritium concentrations over time at select monitoring wells in the VB 6 area.

Figure 2.7 provides the September 2008 groundwater level contours. Groundwater flow in the vicinity of VB 6 is generally towards the northeast.

Figure 2.8 provides the September 2008 estimated tritium results.

Previous BIOSCREEN modeling in 2006 of the area indicated that tritium concentrations would not exceed 200 pCi/L beyond approximately 490 feet from the source concentration. Previous modeling results estimated that steady state would be achieved in 15 years. In less than 2 years after the initial modeling results, all sampled monitoring well locations in the VB 6 area had tritium concentrations less than the LLD of 200 pCi/L.

2.5 EVALUATION OF REMEDIAL ACTIVITIES TO DATE

A review of the groundwater data, evaluations, and graphical presentations provided in Table 2.1 and on Figures 2.4 through 2.8 provides sufficient information to document the following:

- There is no groundwater in this area that is above the drinking water standard of 20,000 pCi/L;
- As of May 2009 tritium concentrations in all sampled monitoring wells in this area are less than the LLD of 200 pCi/L;
- The average reduction in tritium concentrations per monitoring well is 100%;
- With the exception of one out of two monitoring wells in this area utilized for statistical analysis, the trend in tritium concentrations in routine sampling events has been downward. For one monitoring well a statistical trend could not be identified since the majority of results for that location were below LLD; and

- The maximum extent of tritium migration in the VB 6 area has been limited to less than 52 feet² from time of discovery in later 2005 and early 2006.

Based on the results of the monitoring program, no detectable levels of tritium in groundwater above the LLD of 200 pCi/L, it is apparent that the MNA remedy proved successful in reducing tritium levels both on and off the Station property.

² The maximum extent was determined based upon the estimated plume length in 2006.

3.0 CONCLUSIONS

The previous sections of this Plan Completion Report have identified the nature and extent of tritium in groundwater near VB 6 and the progress of the remediation completed over the last 3.5 years. This information demonstrates the success of the cleanup of tritium in groundwater at VB 6 area.

Specifically, the following remedial objectives have been met for the VB 6 area:

- Concentrations of tritium in groundwater from the vacuum breaker releases are below the drinking water standard of 20,000 pCi/L; and
- Any residual concentrations of tritium will not impact off-Site, private groundwater users; all monitoring wells are currently less than the LLD of 200 pCi/L.

These remedial objectives are documented through the following facts:

- All VB 6 area monitoring wells are below 20,000 pCi/L and have been since December 2005; and
- All tritium concentrations as of May 2009 are below 200 pCi/L and have had a reduction of 100% since September 2006.

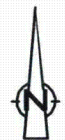
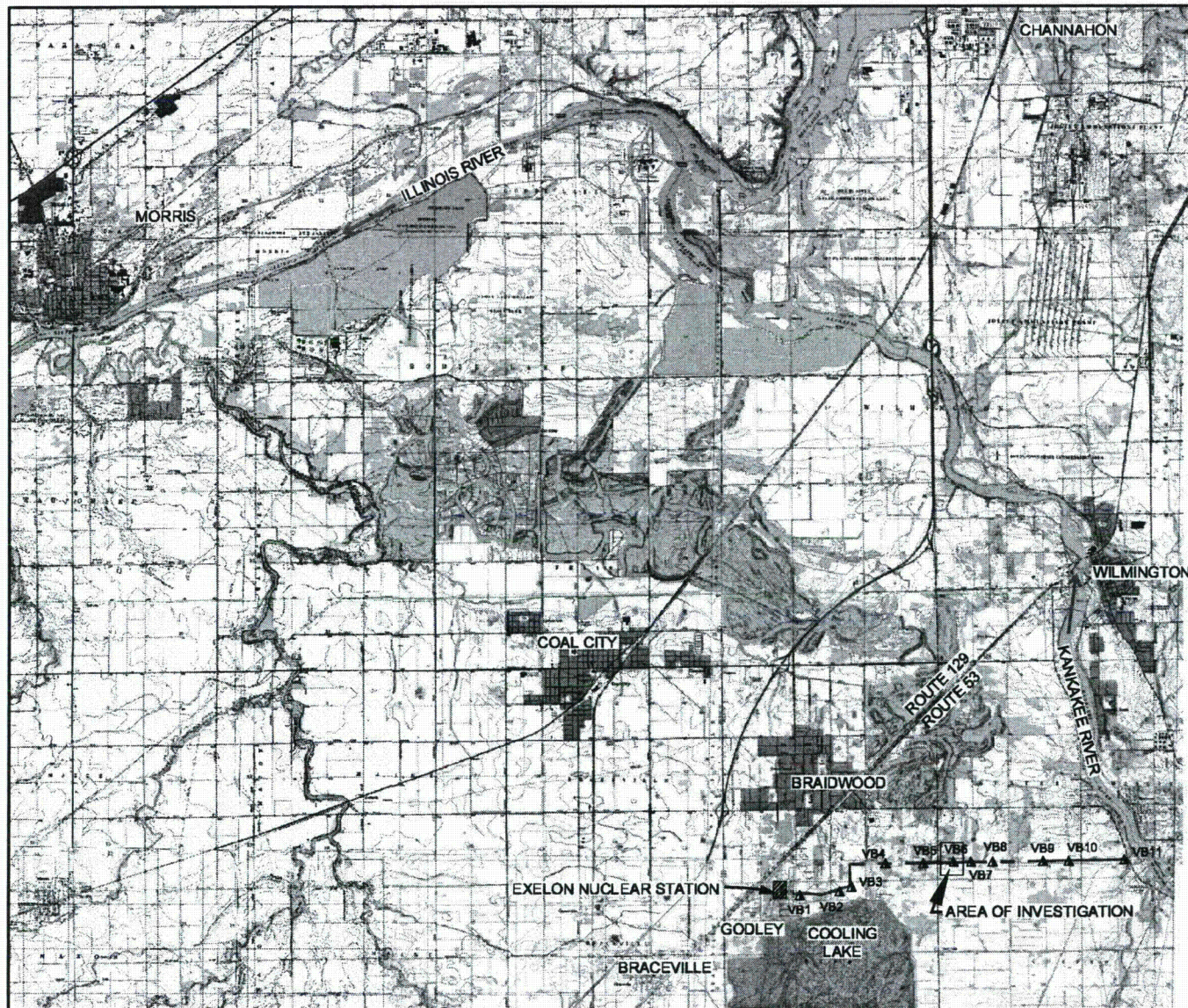
4.0 PLANNED COMPLETION ACTIVITIES

Groundwater sampling and analyses for tritium at the VB 6 area will be eliminated, and all monitoring wells will be plugged and abandoned. The monitoring wells to be abandoned are listed in Table 4.1.

5.0 REFERENCES

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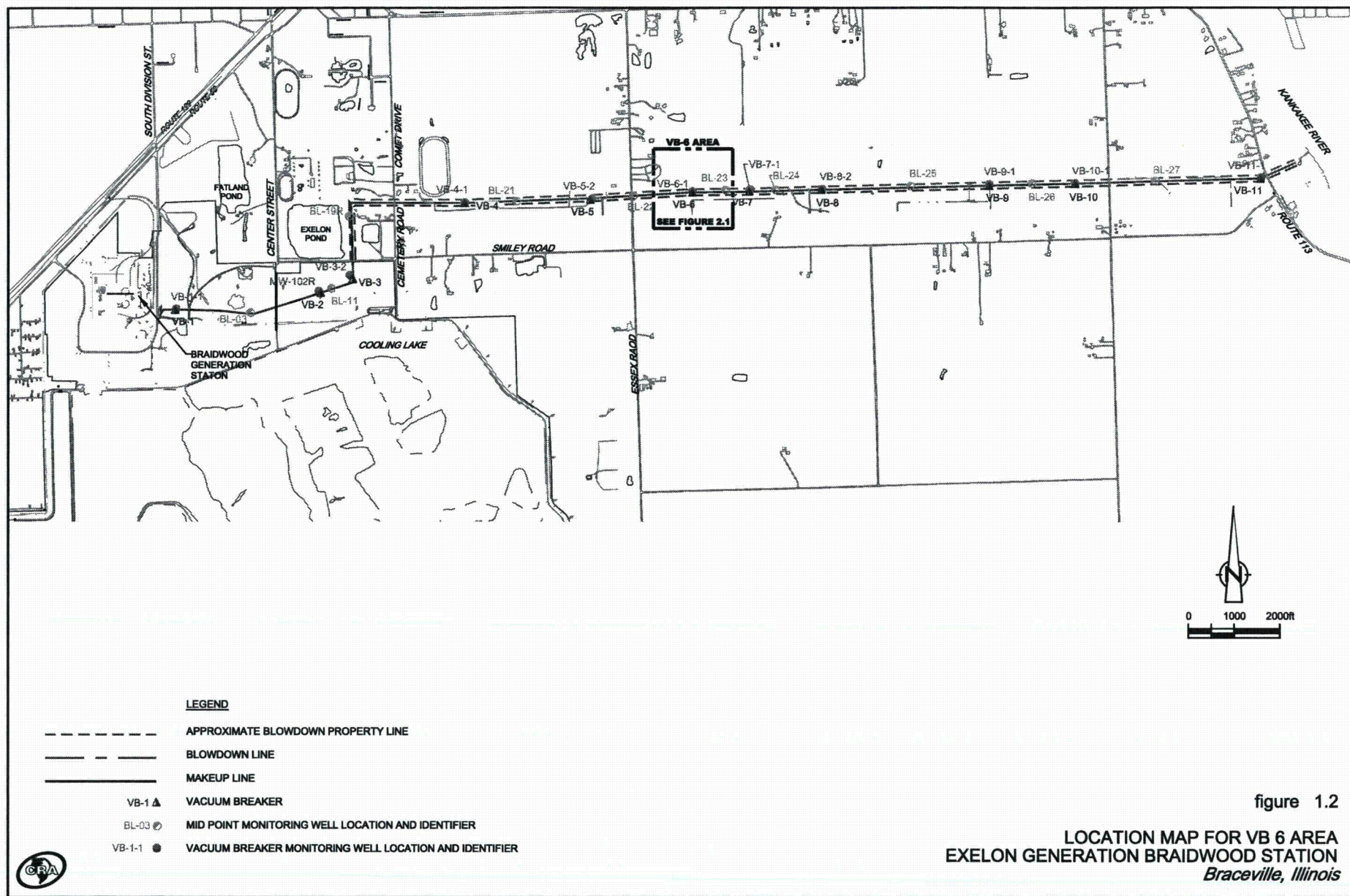
LEGEND

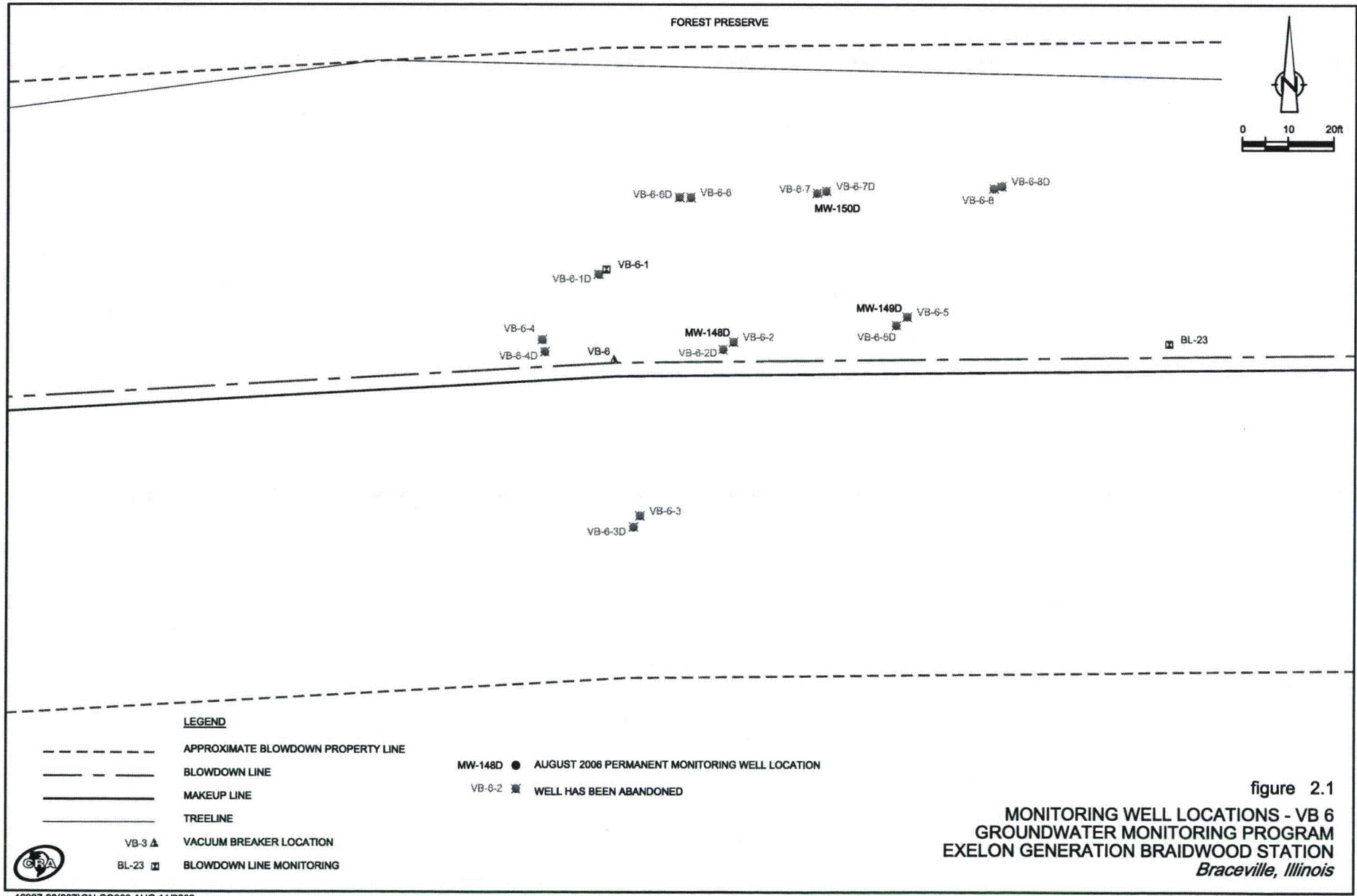
- VB-1 ▲ VACUUM BREAKER LOCATION AND IDENTIFIER
- — — BLOW DOWN LINE

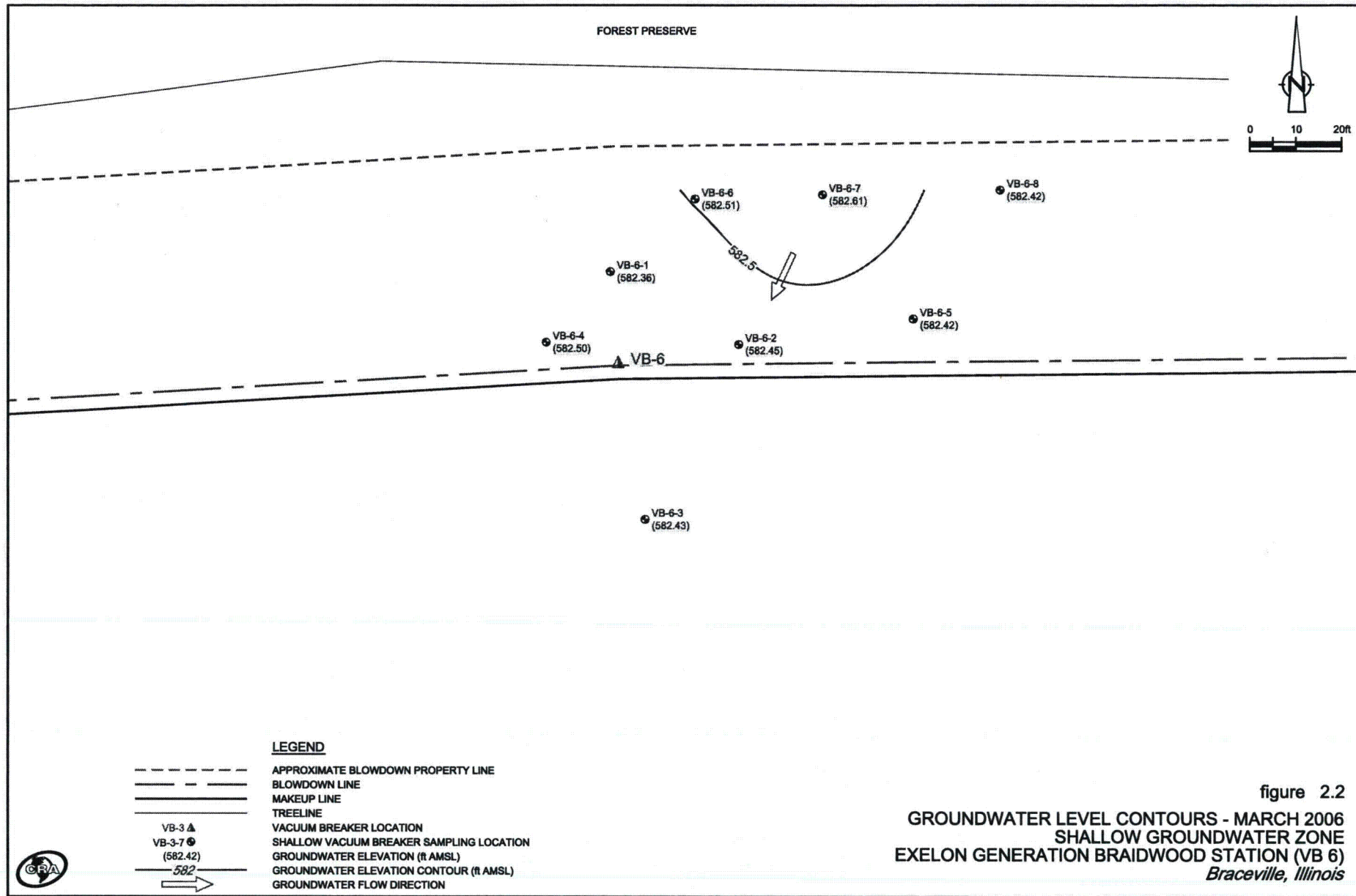
figure 1.1

SITE LOCATION MAP
EXELON GENERATION BRAIDWOOD STATION
Braceville, Illinois









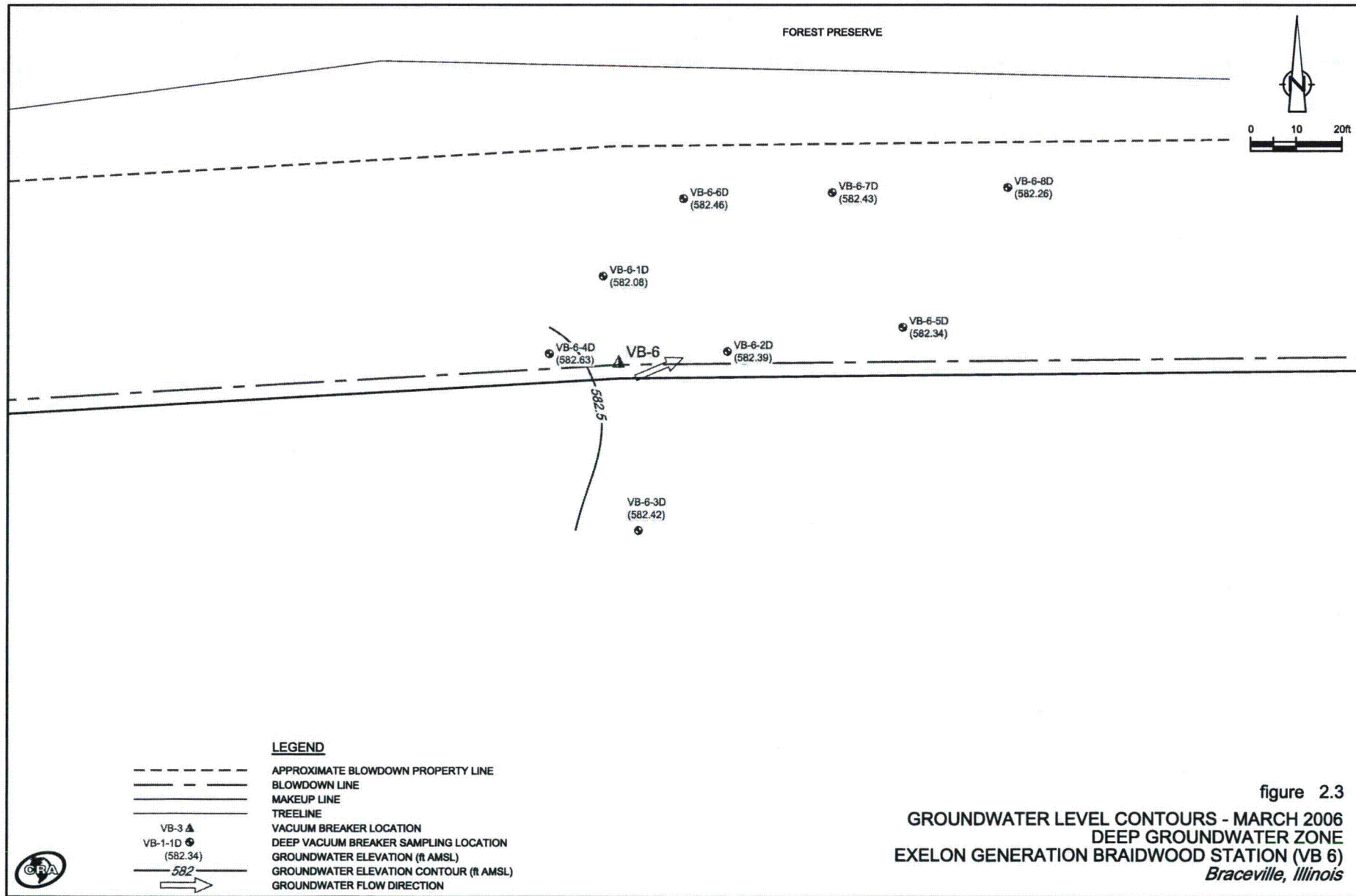
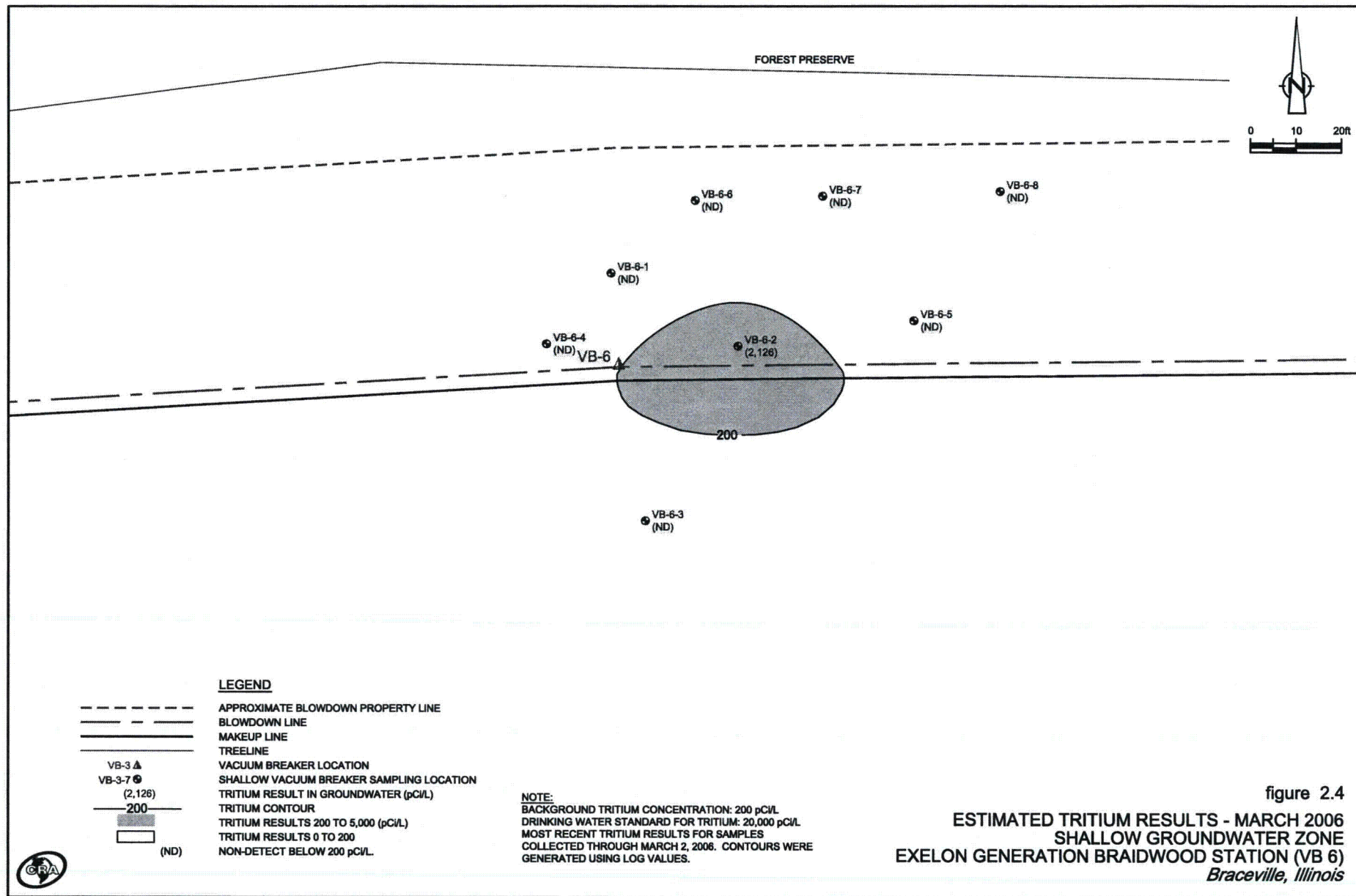
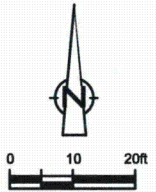


figure 2.3
 GROUNDWATER LEVEL CONTOURS - MARCH 2006
 DEEP GROUNDWATER ZONE
 EXELON GENERATION BRAIDWOOD STATION (VB 6)
 Braceville, Illinois



FOREST PRESERVE



VB-6-6D (ND) VB-6-7D (ND) VB-6-8D (ND)
VB-6-1D (ND)
VB-6-4D (ND) VB-6-2D (ND) VB-6-5D (ND)
VB-6

VB-6-3D (ND)

LEGEND

- APPROXIMATE BLOWDOWN PROPERTY LINE
- ==== BLOWDOWN LINE
- ==== MAKEUP LINE
- ==== TREELINE
- VB-3 ▲ VACUUM BREAKER LOCATION
- VB-1-1D ● (79) DEEP VACUUM BREAKER SAMPLING LOCATION
- (ND) TRITIUM RESULT IN GROUNDWATER (pCi/L)
- NON-DETECT BELOW 200 pCi/L

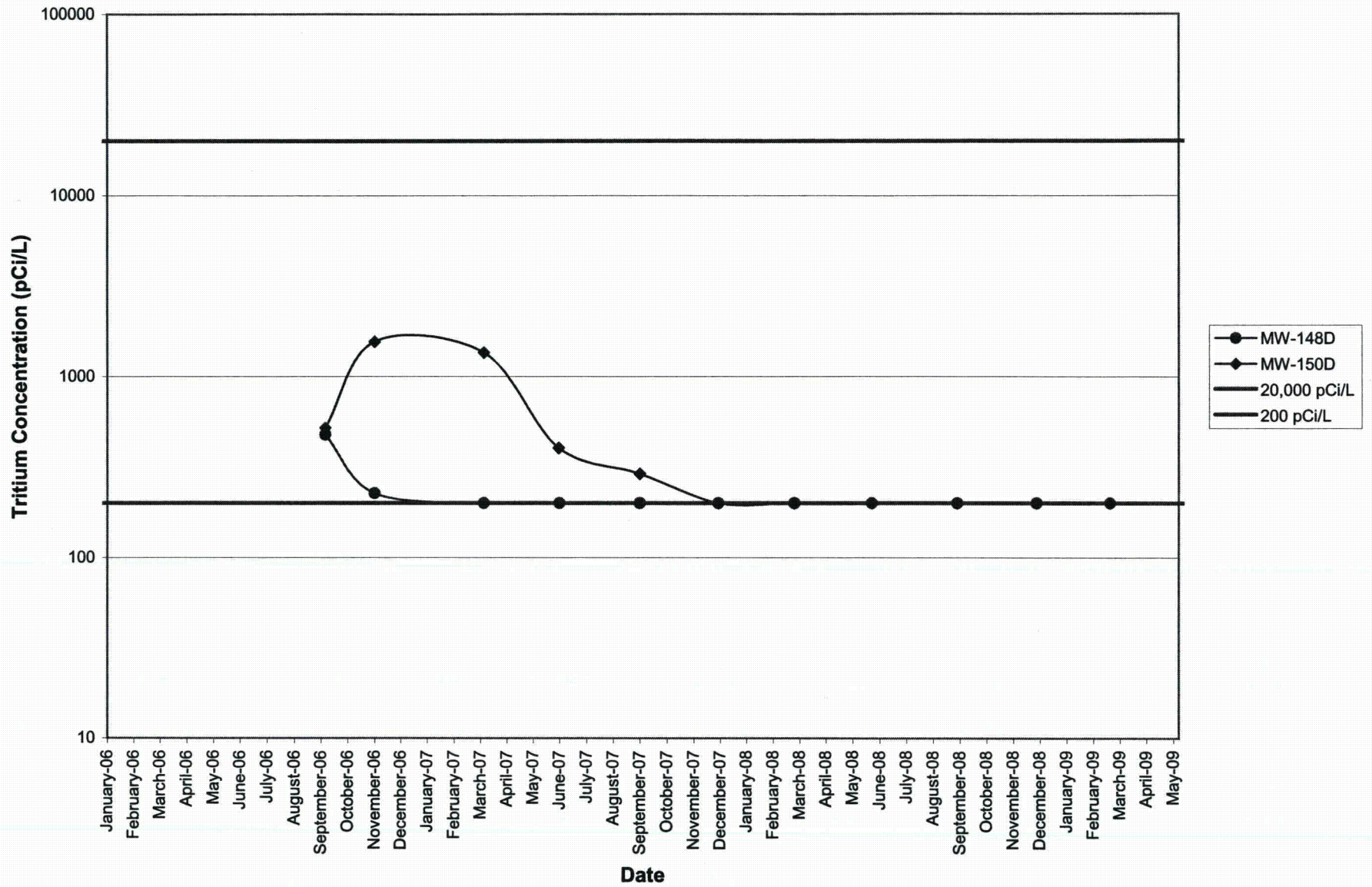
NOTE:
BACKGROUND TRITIUM CONCENTRATION: 200 pCi/L
DRINKING WATER STANDARD FOR TRITIUM: 20,000 pCi/L
MOST RECENT TRITIUM RESULTS FOR SAMPLES
COLLECTED THROUGH MARCH 6, 2006.

figure 2.5
ESTIMATED TRITIUM RESULTS - MARCH 2006
DEEP GROUNDWATER ZONE
EXELON GENERATION BRAIDWOOD STATION (VB 6)
Braceville, Illinois



FIGURE 2.6

TRITIUM CONCENTRATION TRENDS AROUND VB 6 AREA
EXELON GENERATION BRAIDWOOD STATION
BRACEVILLE, ILLINOIS



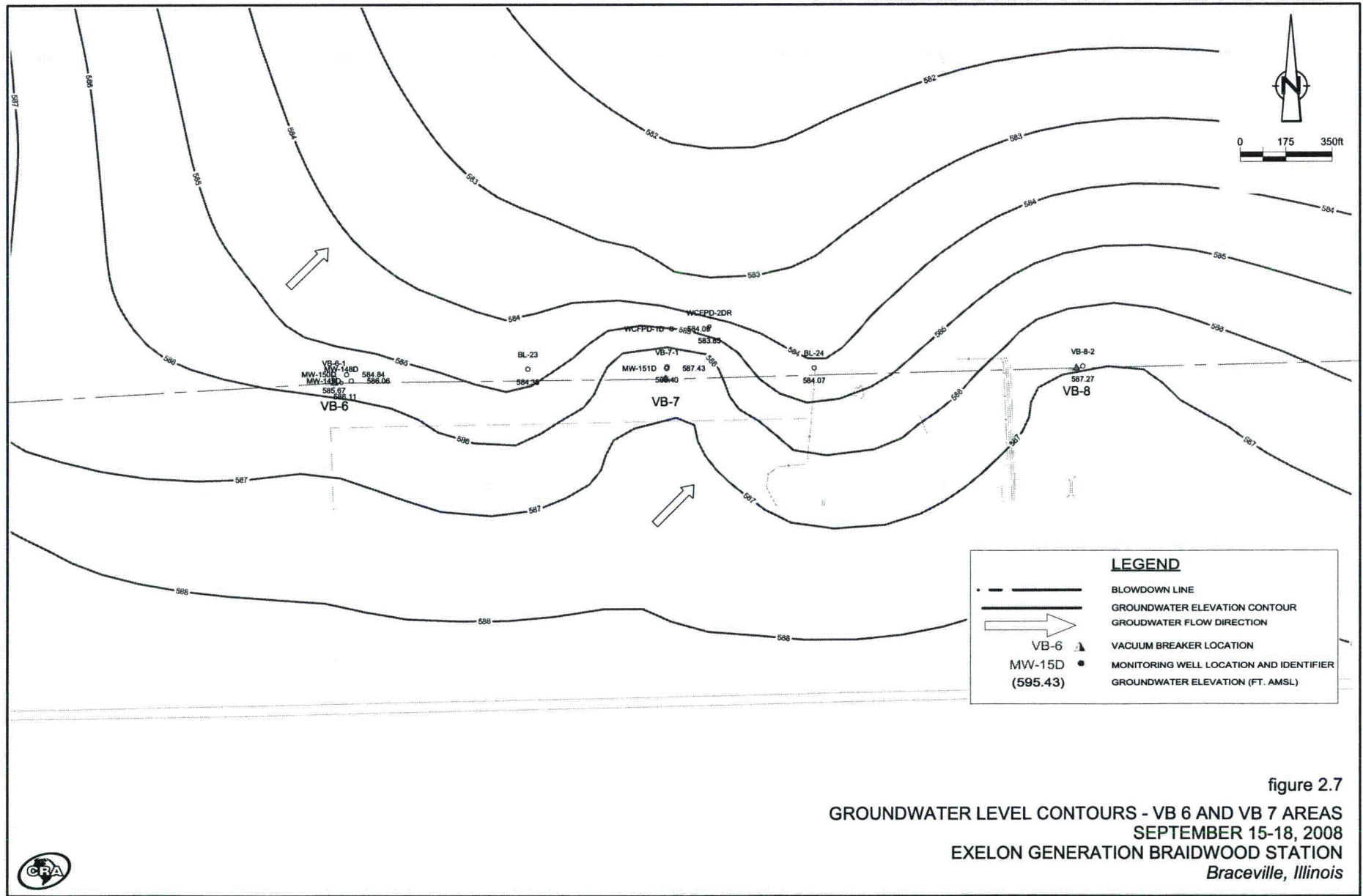
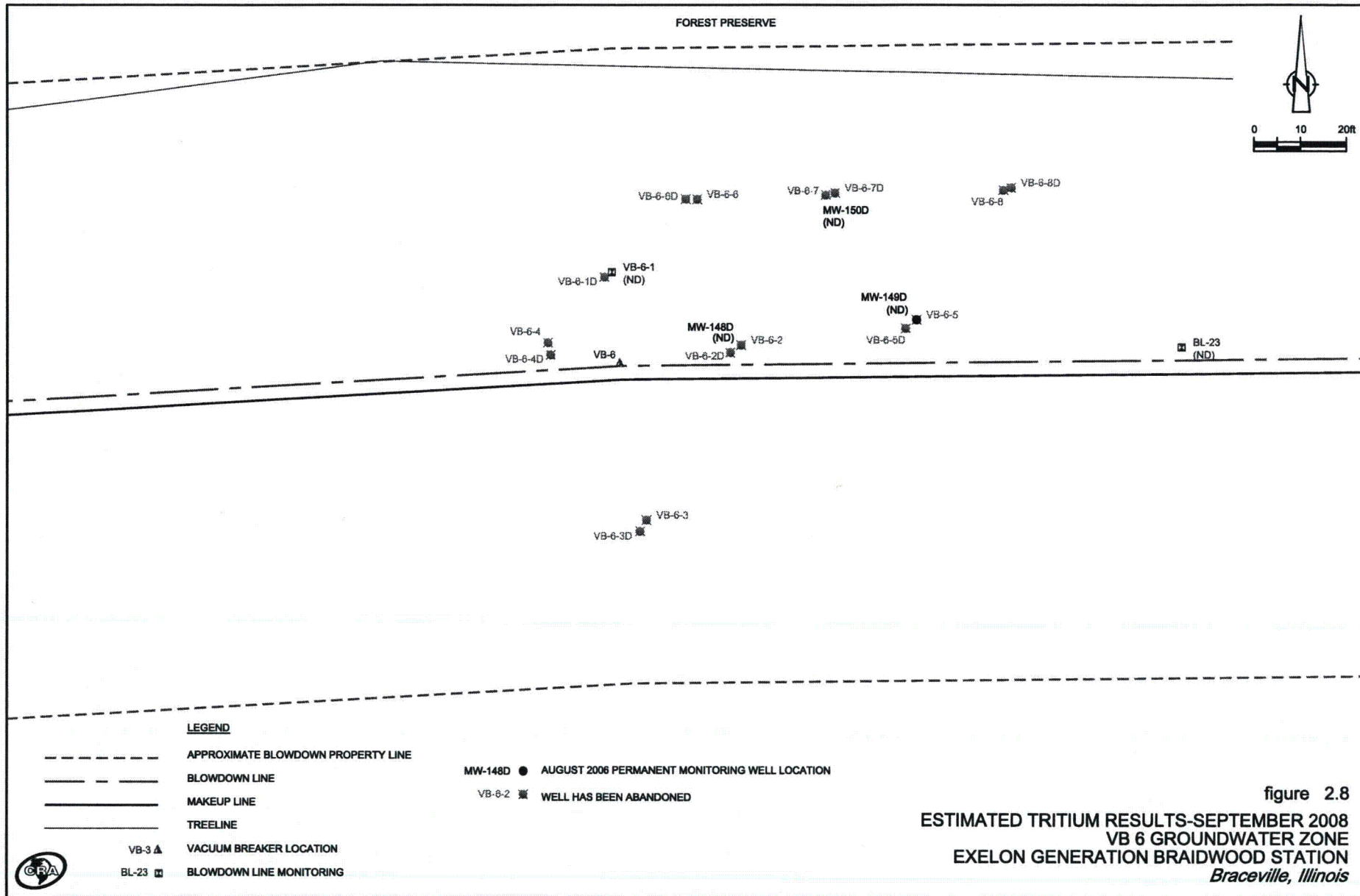


figure 2.7
 GROUNDWATER LEVEL CONTOURS - VB 6 AND VB 7 AREAS
 SEPTEMBER 15-18, 2008
 EXELON GENERATION BRAIDWOOD STATION
 Braceville, Illinois





**SUMMARY OF TRITIUM STATISTICAL ANALYSES NEAR VB 6
EXELON GENERATION BRAIDWOOD STATION
BRACEVILLE, ILLINOIS**

<i>Sample Location</i>	<i>Sample Date</i>	<i>Result¹ (pCi/L)</i>	<i>Trend</i>	<i>Percent Reduction²</i>	<i>Minimum</i>	<i>Maximum</i>
MW-148D	9/11/2006	477				
MW-148D	11/7/2006	227				
MW-148D	3/15/2007	ND				
MW-148D	6/12/2007	ND				
MW-148D	9/13/2007	ND				
MW-148D	12/13/2007	ND				
MW-148D	3/11/2008	ND				
MW-148D	6/9/2008	ND				
MW-148D	9/16/2008	ND				
MW-148D	12/17/2008	ND				
MW-148D	3/12/2009	ND				

No trend identified 100% ND 477

MW-150D	9/11/2006	520
MW-150D	11/7/2006	1555
MW-150D	3/15/2007	1352
MW-150D	6/11/2007	403
MW-150D	9/13/2007	290
MW-150D	12/13/2007	ND
MW-150D	3/11/2008	ND
MW-150D	6/9/2008	ND
MW-150D	9/16/2008	ND
MW-150D	12/17/2008	ND
MW-150D	3/12/2009	ND

Downward trend 100% ND 1555

	Average	MIN	MAX	Average Reduction³
Downward trend	100%	ND	1555.0	100%

Non-Impacted Wells⁴

BL-23	6/2/2006	ND
BL-23	7/10/2006	ND
BL-23	8/15/2006	ND
BL-23	9/12/2006	ND
BL-23	10/10/2006	ND
BL-23	11/7/2006	ND
BL-23	12/11/2006	ND
BL-23	1/9/2007	ND
BL-23	2/14/2007	ND
BL-23	3/15/2007	ND

**SUMMARY OF TRITIUM STATISTICAL ANALYSES NEAR VB 6
EXELON GENERATION BRAIDWOOD STATION
BRACEVILLE, ILLINOIS**

<i>Sample Location</i>	<i>Sample Date</i>	<i>Result¹ (pCi/L)</i>	<i>Trend</i>	<i>Percent Reduction²</i>	<i>Minimum</i>	<i>Maximum</i>
BL-23	4/13/2007	ND				
BL-23	5/15/2007	ND				
BL-23	6/12/2007	ND				
BL-23	7/10/2007	ND				
BL-23	8/14/2007	ND				
BL-23	9/12/2007	ND				
BL-23	10/17/2007	ND				
BL-23	11/14/2007	ND				
BL-23	12/13/2007	ND				
BL-23	1/15/2008	ND				
BL-23	3/13/2008	ND				
BL-23	4/17/2008	ND				
BL-23	5/14/2008	ND				
BL-23	6/10/2008	ND				
BL-23	7/15/2008	ND				
BL-23	8/12/2008	ND				
BL-23	9/16/2008	ND				
BL-23	10/14/2008	ND				
BL-23	11/11/2008	ND				
BL-23	12/16/2008	ND				
BL-23	1/14/2009	ND				
BL-23	2/10/2009	ND				
BL-23	3/12/2009	ND				
BL-23	4/16/2009	ND				
BL-23	5/12/2009	ND				
MW-149D	9/11/2006	ND				
MW-149D	11/7/2006	ND				
MW-149D	3/15/2007	271				
MW-149D	6/11/2007	ND				
MW-149D	9/13/2007	ND				
MW-149D	12/13/2007	ND				
MW-149D	3/11/2008	ND				
MW-149D	6/9/2008	ND				
MW-149D	9/16/2008	ND				
MW-149D	12/17/2008	ND				
MW-149D	3/12/2009	ND				
VB-6-1	12/20/2005	ND				
VB-6-1	1/3/2006	ND				
VB-6-1	7/11/2006	ND				
VB-6-1	8/15/2006	ND				
VB-6-1	9/11/2006	ND				
VB-6-1	10/9/2006	ND				

**SUMMARY OF TRITIUM STATISTICAL ANALYSES NEAR VB 6
EXELON GENERATION BRAIDWOOD STATION
BRACEVILLE, ILLINOIS**

<i>Sample Location</i>	<i>Sample Date</i>	<i>Result¹ (pCi/L)</i>	<i>Trend</i>	<i>Percent Reduction²</i>	<i>Minimum</i>	<i>Maximum</i>
VB-6-1	11/7/2006	ND				
VB-6-1	12/11/2006	ND				
VB-6-1	1/9/2007	ND				
VB-6-1	2/14/2007	ND				
VB-6-1	3/15/2007	ND				
VB-6-1	4/11/2007	ND				
VB-6-1	5/15/2007	ND				
VB-6-1	6/11/2007	ND				
VB-6-1	7/9/2007	ND				
VB-6-1	8/14/2007	ND				
VB-6-1	9/12/2007	ND				
VB-6-1	10/17/2007	ND				
VB-6-1	11/13/2007	ND				
VB-6-1	12/13/2007	ND				
VB-6-1	1/15/2008	ND				
VB-6-1	2/13/2008	ND				
VB-6-1	3/11/2008	ND				
VB-6-1	8/12/2008	ND				
VB-6-1	9/16/2008	ND				
VB-6-1	10/14/2008	ND				
VB-6-1	11/11/2008	ND				
VB-6-1	12/16/2008	ND				
VB-6-1	1/13/2009	ND				
VB-6-1	2/10/2009	ND				
VB-6-1	3/12/2009	ND				
VB-6-1	4/15/2009	ND				
VB-6-1	5/12/2009	ND				

Note: January 2006 data was used as initial concentrations for statistical analysis where available.

¹Non-detect (ND) below 200 picocuries per liter (pCi/L).

²Monitoring Well locations with the most current data at ND were assumed to have 100% reduction.

³Average Reduction excludes well locations with a percent increase in concentration.

Non impacted well were generally below or near the LLD and were excluded from statistical analysis.

**SUMMARY OF WELLS TO BE ABANDONED
EXELON GENERATION BRAIDWOOD STATION
BRACEVILLE, ILLINOIS**

Vacuum Breaker Area

Sample Location

Vacuum Breaker 6

BL-23
MW-148D
MW-149D
MW-150D
VB-6-1