UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, ILLINOIS 60532-4352

October 24, 2007

MEMORANDUM TO: Battelle Memorial Institute File
West Jefferson, Ohio
License No.: SNM-00008
Docket No.: 070-00008

THRU: Patrick L. Louden, Chief
Decommissioning Branch (DB)
Division of Nuclear Materials Safety (DNMS)

FROM: George M. McCann, Senior Health Physicist
Decommissioning Branch
Division of Nuclear Materials Safety

Johari Moore, NSPDP

MEETING DATE: September 25, 2007

SUBJECT: NRC AND OHIO EPA MEETING TO DISCUSS THE BATTELLE MEMORIAL INSTITUTE'S LICENSE TERMINATION

MEETING ATTENDEES
NRC
Patrick Louden, Branch Chief, RIII, Decommissioning Branch
George Mike McCann, Senior Health Physicist-RIII
Jon Peckenpaugh, HQ, Hydrogeologist
Roland Lickus, RIII, State Liaison Officer
Johari Moore, HQ, Health Physicist

Ohio EPA
Michael Baker, Chief DDAGW
Tom Allen, Assistant Chief DDAGW
Linnea Saukko, Ground Water Manager
Scot Foltz, Drinking Water Manager
Isaac Robinson, Central District Office Chief
Craig Butler, Central District Office Chief
Bob Kupmyer, Director's Office
Jed Thorp, Public Involvement Coordinator
Melissa Fazekas, Deputy Director for Communications

CONTACT: G. McCann, DNMS
630-829-9856

Battelle
Joe Jacobsen, Radiation Safety Officer
Gretchen Farnung, CHP, Environmental Protection Manager
Steve Maheras, PhD, CHP, Health Physicist
Tom Naymik, PhD, Geosyntec Consultant

Discussion

On September 25, 2007, Patrick Louden facilitated a working level meeting with the Ohio Environmental Protection Agency (OEPA) management and staff, at the OEPA' s Columbus, Ohio Central Office. Battelle Memorial Institute technical staff also participated in the meeting as a technical resource for the NRC. A copy of the meeting agenda is attached.

This Region III and OEPA working meeting was conducted to discuss and answer OEPA questions regarding the NRC actions relating to the termination of Battelle's license, which had been brought to the attention of the NRC in an OEPA letter dated August 29, 2007. The OEPA August 29 letter, in general discussed Battelle's documents relating to the Battelle West Jefferson North Nuclear Sciences Site's underlying hydrogeology, associated radioanalytical groundwater sampling results, activities relating to former filter beds, and the radiological dose model used by Battelle to demonstrate the Site's suitability for unrestricted use.

This issue was broght to the OEPA's attention as the result of the NRC's review of Battelle's August 3, 2006 license termination request. During this review, NRC staff determined that strontium-90 in excess of the USEPA's Maximum Contamination Limits had been identified in a perched water bearing layer at the Battelle's former North Nuclear Sciences Site. In accordance with the MOU "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites" between the NRC and USEPA, the NRC consulted with the USEPA by letter dated March 23, 2007 (ML0700801260). The USEPA responded by letter dated June 21, 2007, (ML0718602130), and indicated that "EPA is concerned that in making its groundwater use determination for the Battelle site, NRC had not considered EPA's guidance document "EPA Guidelines for Ground-Water Classifications" nor had the NRC consulted with Ohio EPA,"

Ms. Farnung, Battelle's Environmental Protection Manager provided a handout and discussed, in general, the licensee's radioanalytical counting, documenting, and sampling practices performed during decommissioning activities at the West Jefferson Site.

Dr. Maheras discussed Battelle's dose assessment for the West Jefferson Site. Dr. Maheras indicated that the results of the dose assessment indicates that the site meets the NRC unrestricted use criteria. It was explained during the discussion that, Battelle used the RESRAD model and the "resident farmer" scenario to estimate the highest potential dose to a hypothetical member of the public residing at the Battelle site. Dr. Maheras also discussed the conservatisms used in the model.

The NRC staff explained that the dose model is only part of the NRC review process. That is the staff also evaluates the site characterization information as part of the Decommissioning Plan review, as well as the final status survey reports provided after completion of site remediation and with the licensee's termination request. It was indicated during the discussion that NRC licensee's are routinely inspected and must comply with NRC requirements, which limit effluent

releases to the environment and specifies when the NRC must be notified following any incident or accident.

The OEPA staff indicated that they are unsure whether the "resident farmer" scenario actually represents the highest dose risk. They are also unsure whether the NRC's assumptions regarding potential dose pathways are valid, particularly NRC's decision to eliminate as a groundwater pathway, drinking water from the shallow groundwater units, which they believe are also frequently low-yielding groundwater units. OEPA staff also believed that off-site dose modeling for recreational use, for example areas near the Big Darby Creek would be useful information to have available at a public meeting.

The NRC's hydrogeologist discussed the NRC's technical evaluation regarding the Battelle site hydrogeology. He also discussed his evaluation using USEPA guidelines for the shallow groundwater layer referenced in the USEPA's June 21 letter. The OEPA management indicated that the information provided by the NRC's hydrogeologist appeared to be reasonable. However, OEPA provided information to the NRC, that they believe indicates the movement of groundwater between the water-bearing units beneath the Battelle site. The OEPA hand-out is attached as Attachment 2. The NRC agreed to review this information to determine if it should be included in the site dose assessment model.

The OEPA staff noted that some reports contained labeling errors, such as the location of certain well installations and the identification of storm water discharge pipes as sewer lines. They also indicated that they were concerned about the possibility of past cesium-137 soil flushing from a filter bed, and the storage of spent fuel in the filter beds, which may have occurred during 1960.

At the request of the NRC, Mr. Jacobsen, Battelle's Radiation Safety Officer provided a detailed discussion regarding the filter beds and their final disposition (Reference 3). He also provided a document (reference 4), indicating that neither soil flushing nor storage of spent fuel in the filter beds had occurred. The report indicated that a filter bed had been remediated, but only mixing of soil had occurred, and this action had been done during the 1980s. He also indicated that the wording in the report which the OEPA had reviewed was misleading. The reference to storage of fuel, was meant to infer the collection of residual contamination resulting in liquid discharges through the filter bed.

The NRC technical staff informed the OEPA attendees that characterization, final status surveys, and Oak Ridge Institute of Science and Education (ORISE) and NRC inspection, and confirmatory surveys, which address the decommissioning of these areas, are listed in the NRC's Safety Evaluation Report.

The OEPA participants also questioned information which appeared to indicate that sewer discharge lines empty into the Bog Area near the Dam, and that four other lines discharge into the Battelle Lake.

Battelle's Radiation Safety Officer also addressed this issue. The Radiation Safety Officer reported during the meeting that the sewer line, which appeared to go into the Bog Area, in actuality went through the Bog Area under the Dam Road to the filter Beds. He also indicated that this sewer line was removed, and surveyed by the NRC, ORISE, and the licensee to verify that all underlying soils were below unrestricted release limits. He also indicated that the four

lines mentioned by OEPA were storm water discharge lines and not sewer lines. The RSO indicated that the Lake had been lowered, so radiological sediment sampling around these outfall areas could be performed.

SUMMARY AND CONCLUSIONS This meeting proved useful in allowing the participants to more clearly understand the issues and questions and determine how they can be addressed. It was concluded that additional documentation from the NRC, explaining the links between the radiological data and the conclusions will allow for most of the necessary clarifications. A follow-up meeting is planned for a future date to be determined. The NRC and the OEPA have agreed upon the following action items as a path forward:

Action Item 1: The NRC in conjunction with the licensee, will identify anomalous radiological groundwater sampling data results, which appear to exceed the USEPA MCLs, or infer vertical and lateral movement between water-bearing units. The report will discuss the anomalous results, and provide bases and justification why the results shouldn't invalidate or necessitate modification of the NRC's final determination regarding site release. This information will be documented and provided to OEPA.

Action Item 2: The NRC will provide additional information regarding potential dose impacts for off-site locations around the West Jefferson Site. In conjunction with the licensee, the NRC will perform a "recreational dose model" assessment, and make this information available to the OEPA. If evaluation of the radioanalytical groundwater data can't be resolved, the NRC will consider modeling on-site doses using RESRAD and include the other potentially impacted water-bearing units.

Action Item 3: The OEPA will provide the NRC with justification for its determination that the low-yield and shallow groundwater units impacted by operations at Battelle are current or potential drinking water sources. The NRC will evaluate this information and determine if this assumption should be changed in the dose assessment model.

Action Item 4: The NRC will discuss in general the site condition prior to site remediation, and the condition of the site as it exist currently. Based on the outcome of the above action items, the NRC will consider if additional groundwater sampling is warranted.

Enclosures:
1. Meeting Agenda
2. OEPA Ground-water and radioanalytical data summaries
3. References

U.S. Nuclear Regulatory Commission Working Level Meeting with the State of Ohio Environmental Protection Agency
September 25, 2007
9:00 a.m.

Agenda

Facilitator: Patrick Louden, USNRC Region III

1. **Discussion on USEPA letter to consult with State EPA on groundwater use determinations (dated June 21, 2007)**

2. **Discussion of State EPA letter containing comments and recommendations to USNRC (dated August 29, 2007)**

3. **Review of issues and items resolved and those that remain open**

4. **Discuss next steps**

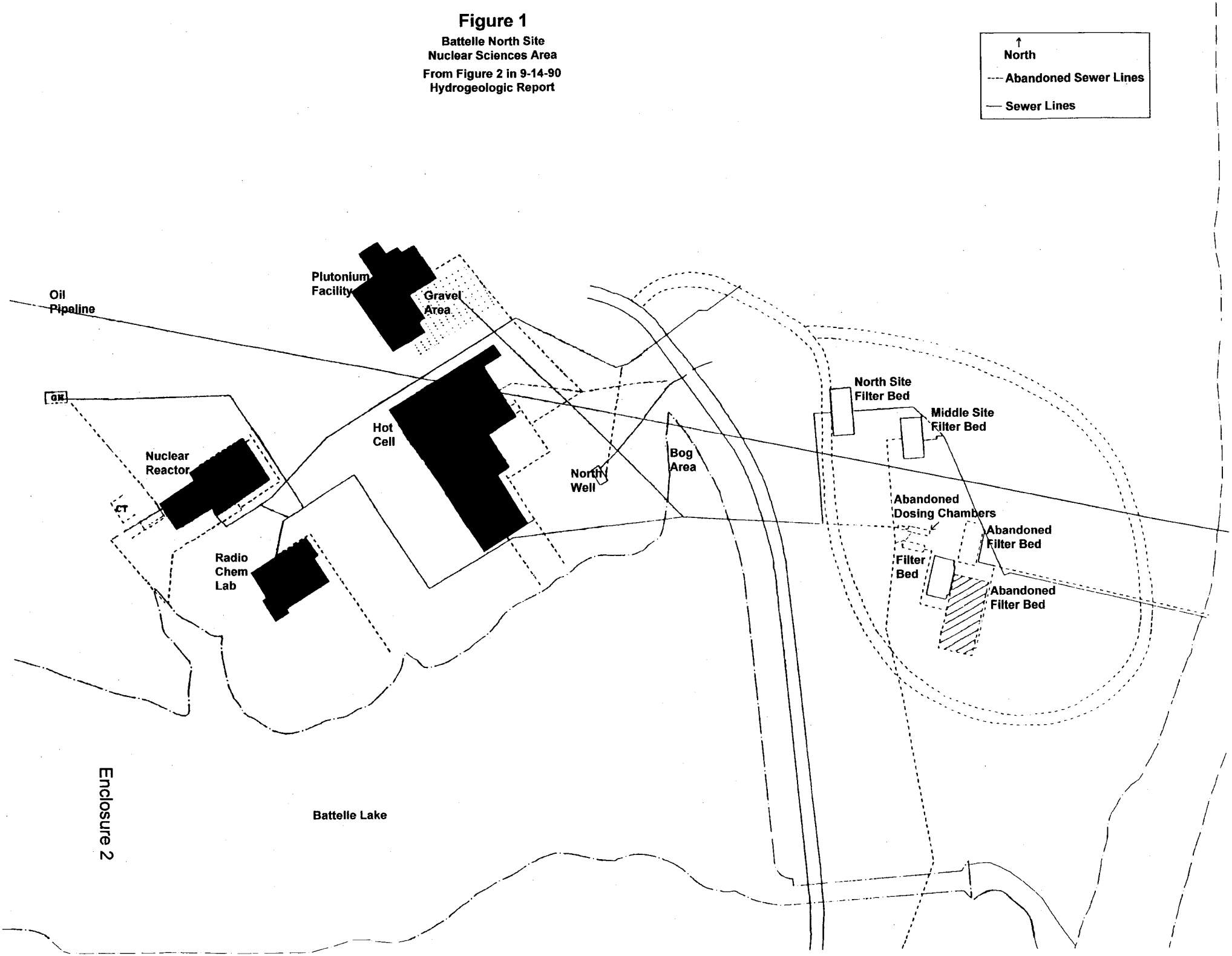
Reserved Time for meeting: 5 hours

USNRC Point of Contact:	**Patrick Louden (630) 829-9627**
Ohio EPA Point of Contact:	**Thomas Allen (614) 644-2752**

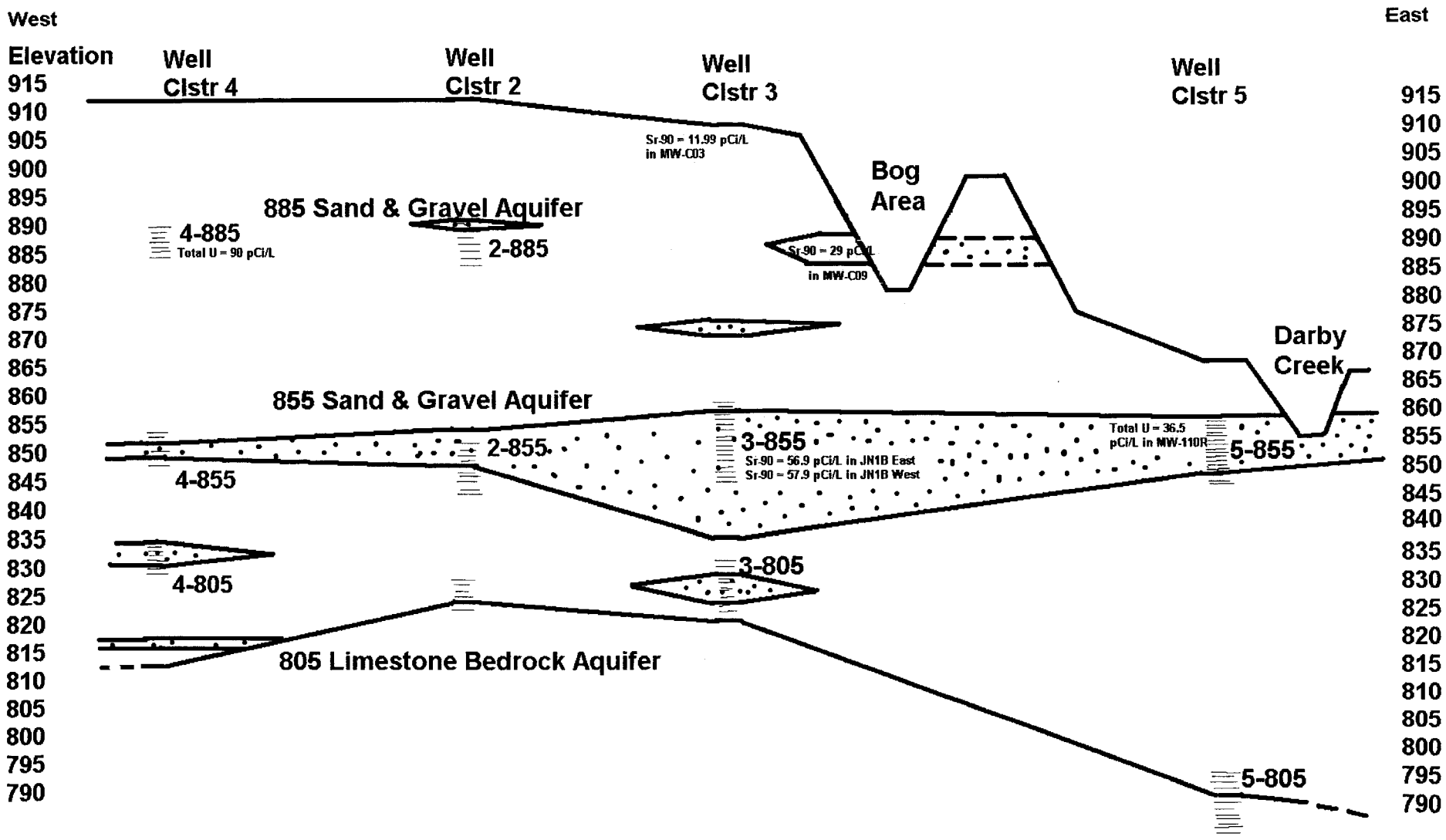
Enclosure 1

Figure 1

Battelle North Site
Nuclear Sciences Area
From Figure 2 in 9-14-90
Hydrogeologic Report



Enclosure 2

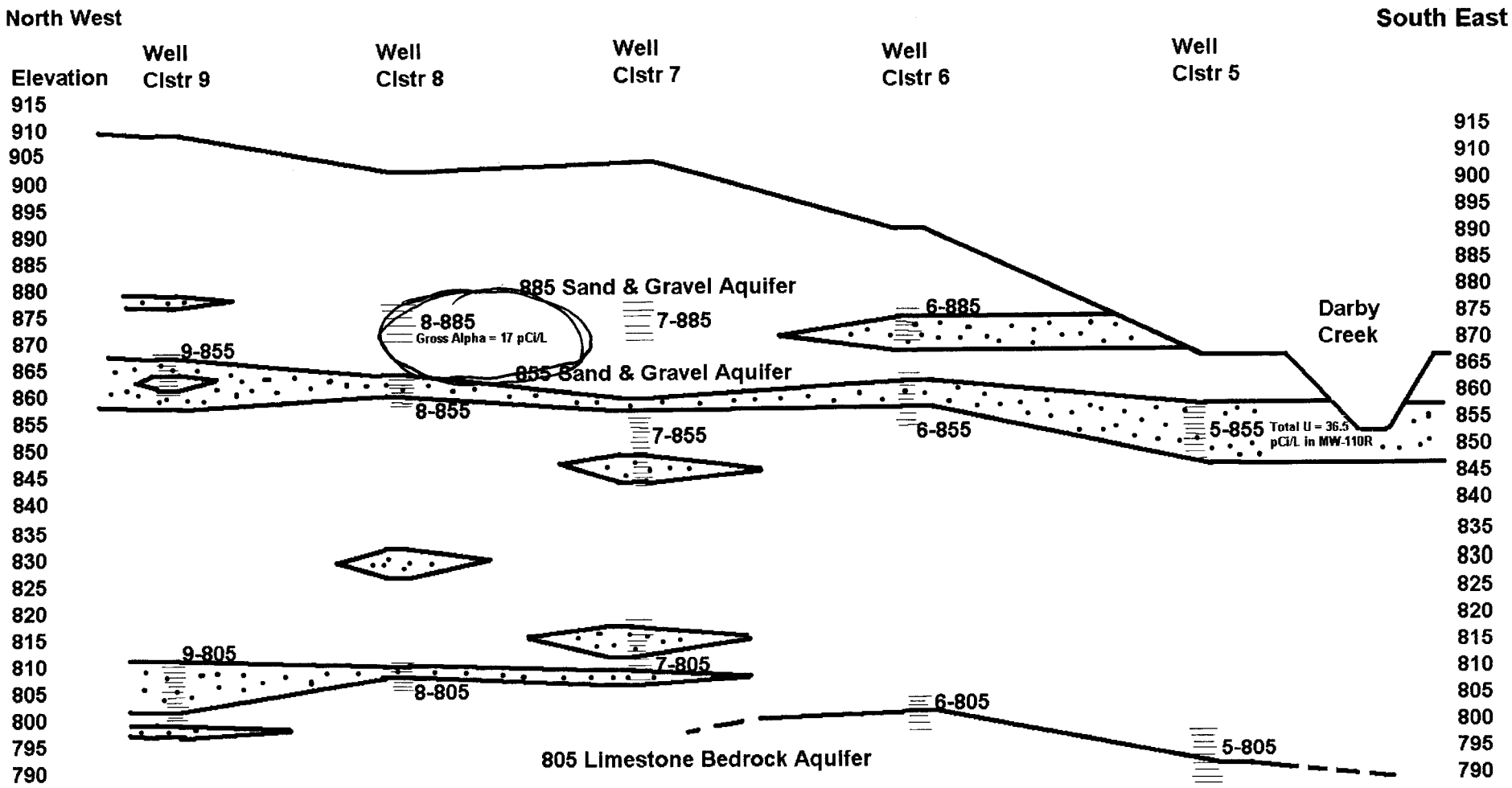


Battelle West Jefferson

Figure 2

West to East Cross Section

Areas where MCLs are exceeded are shown

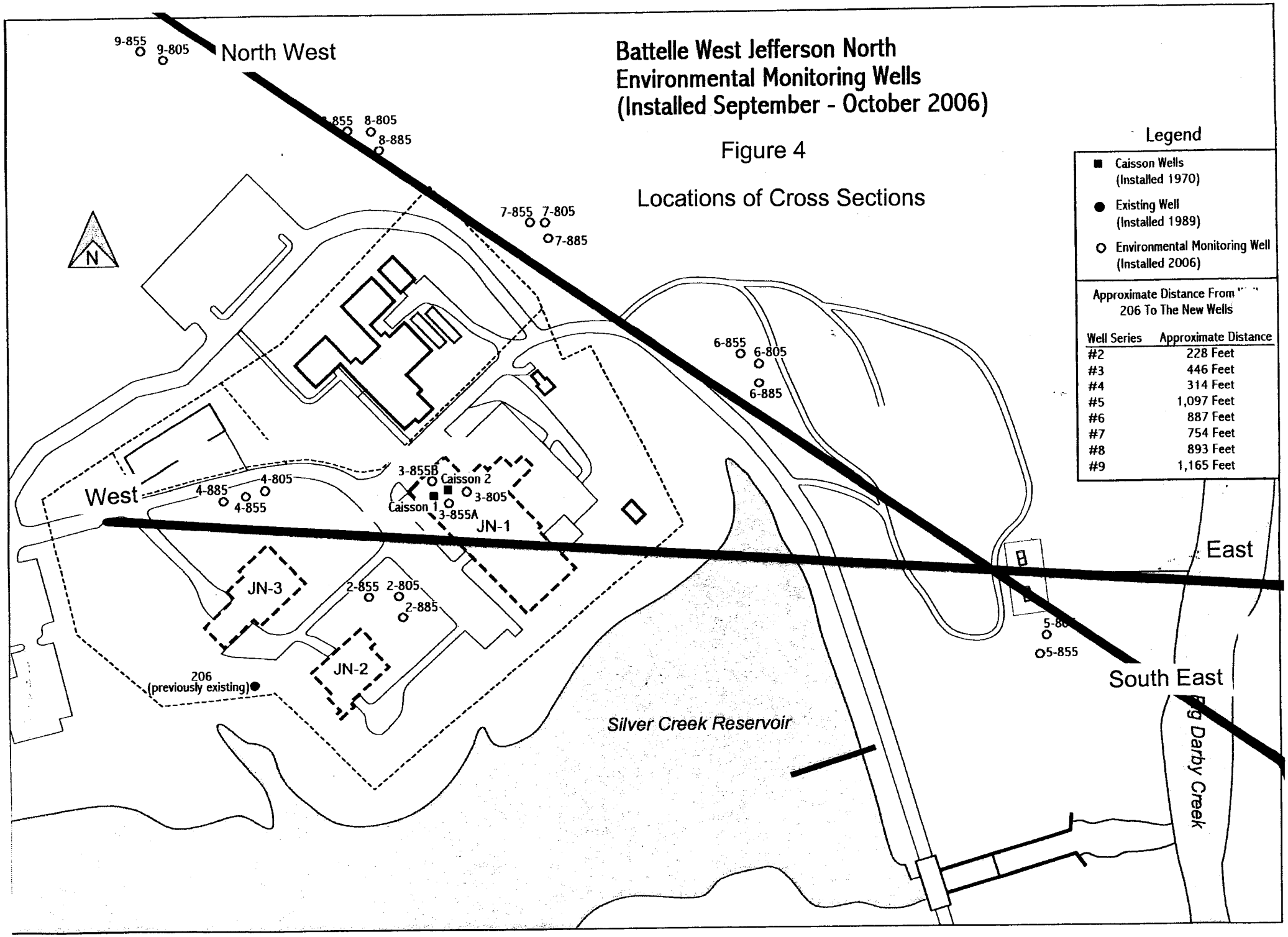


Battelle West Jefferson

Figure 3

North West to South East Cross Section

Areas Where MCLs are exceeded are shown


Battelle West Jefferson North
Environmental Monitoring Wells
(Installed September - October 2006)
Figure 4
Locations of Cross Sections
Legend
Caisson Wells (Installed 1970)
Existing Well (Installed 1989)
Environmental Monitoring Well (Installed 2006)
Approximate Distance From 206 To The New Wells
Well Series | Approximate Distance
#2 | 228 Feet
#3 | 446 Feet
#4 | 314 Feet
#5 | 1,097 Feet
#6 | 887 Feet
#7 | 754 Feet
#8 | 893 Feet
#9 | 1,165 Feet
North West
West
East
South East
N
9-855
9-805
8-805
8-885
7-855
7-805
7-885
6-855
6-805
6-885
5-855
4-885
4-805
4-855
3-855B
Caisson 2
3-805
Caisson 1
3-855A
JN-1
JN-2
JN-3
2-855
2-805
2-885
206
(previously existing)
Silver Creek Reservoir
Big Darby Creek

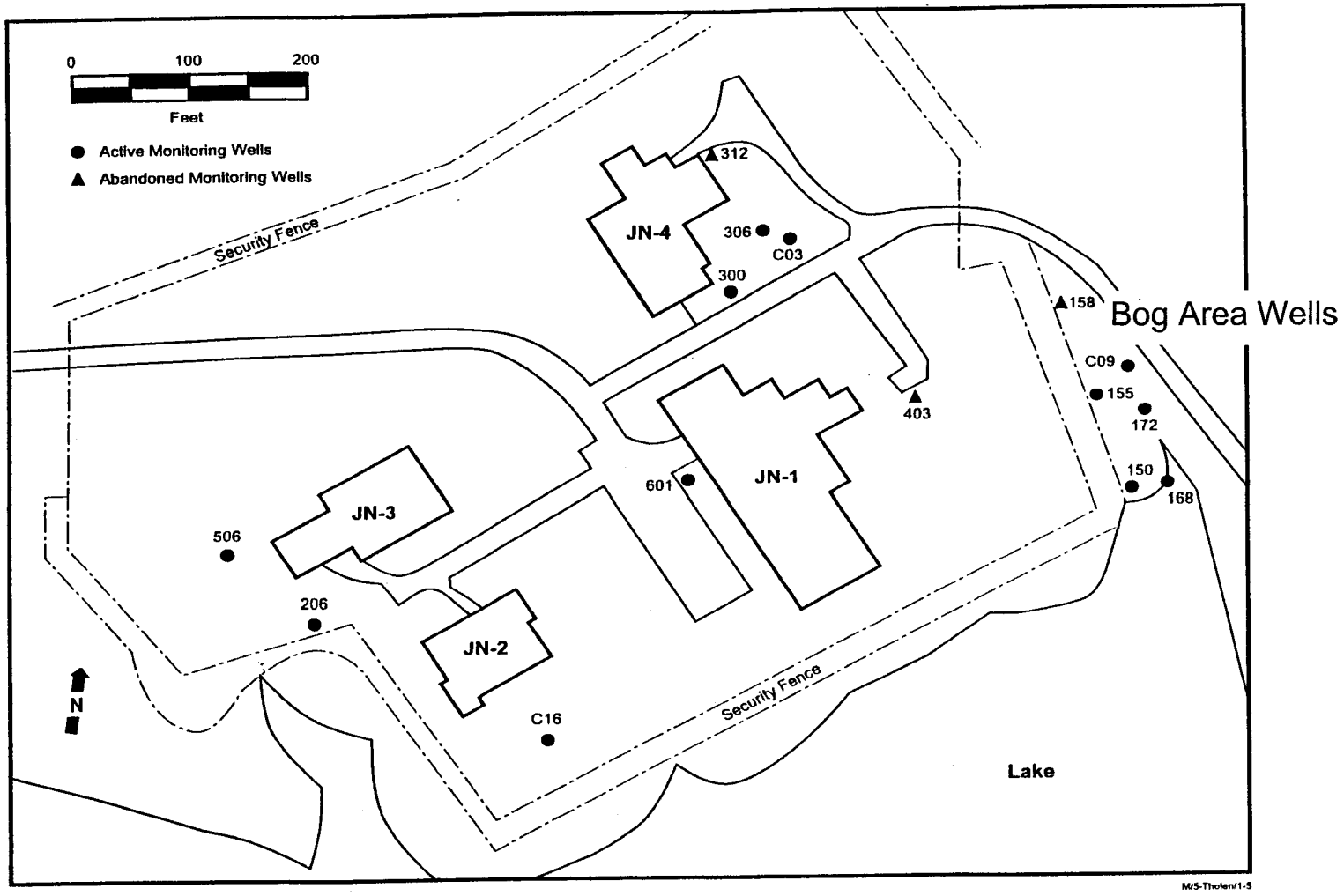


Figure 5 **North Site Groundwater Monitoring Wells**

BOREHOLE NUMBER: 150 LOCATION: Sample Area 1 24 APRIL 1989

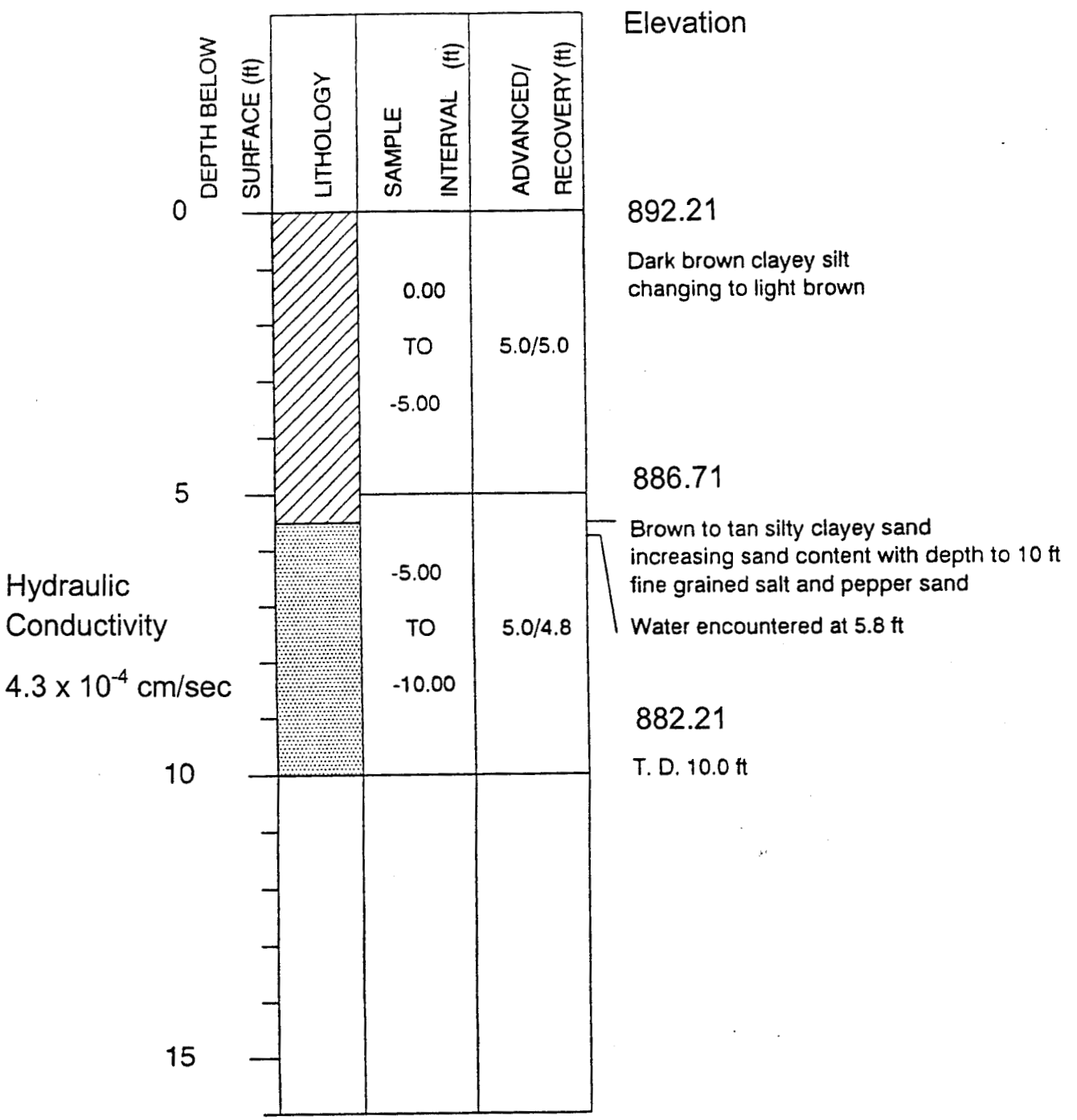


Figure 6

BOREHOLE NUMBER: 155 LOCATION: Sample Area 1 27 APRIL 1989

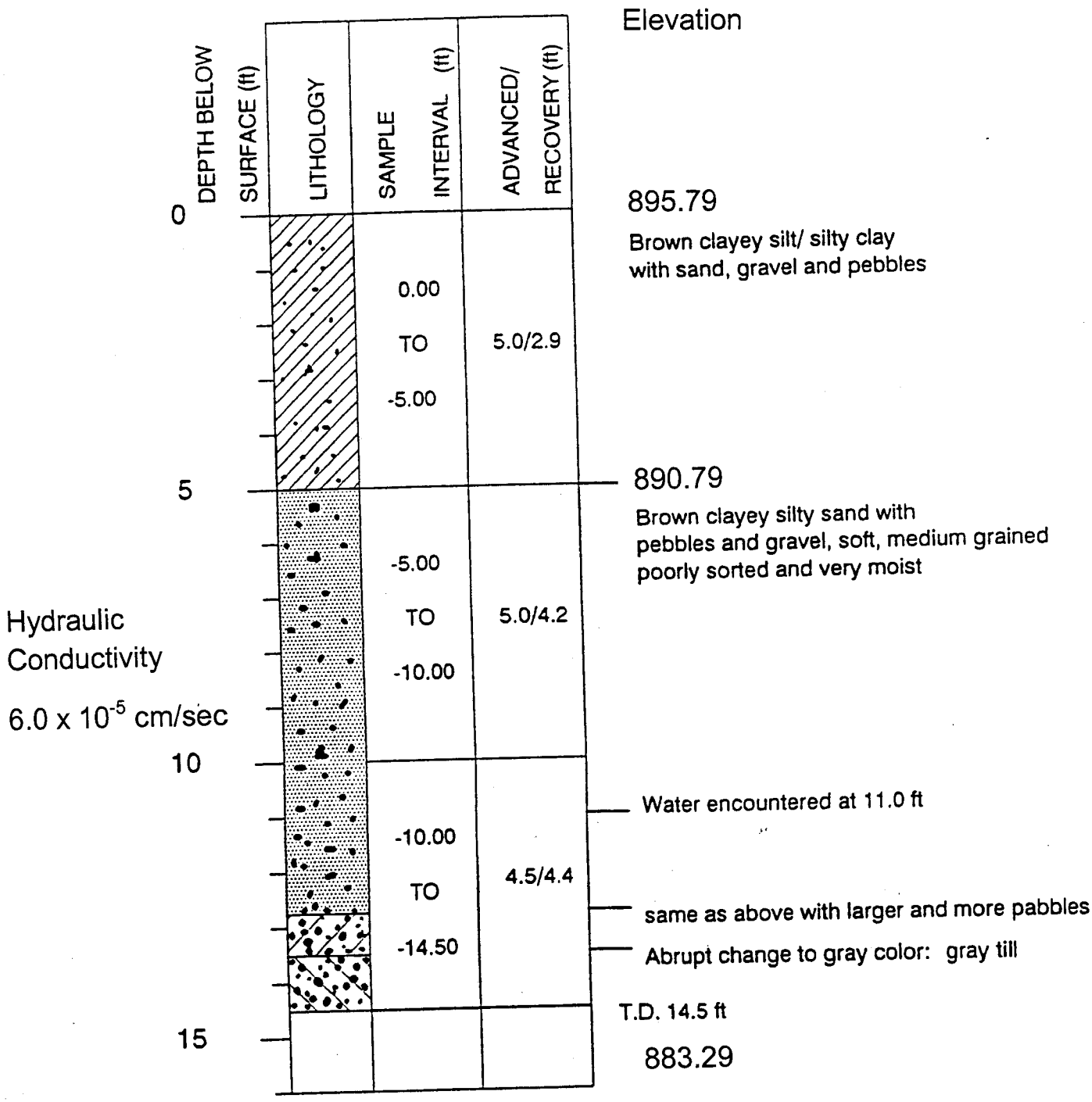


Figure 7

BOREHOLE NUMBER: 168 LOCATION: Sample Area 1 25 APRIL 1989

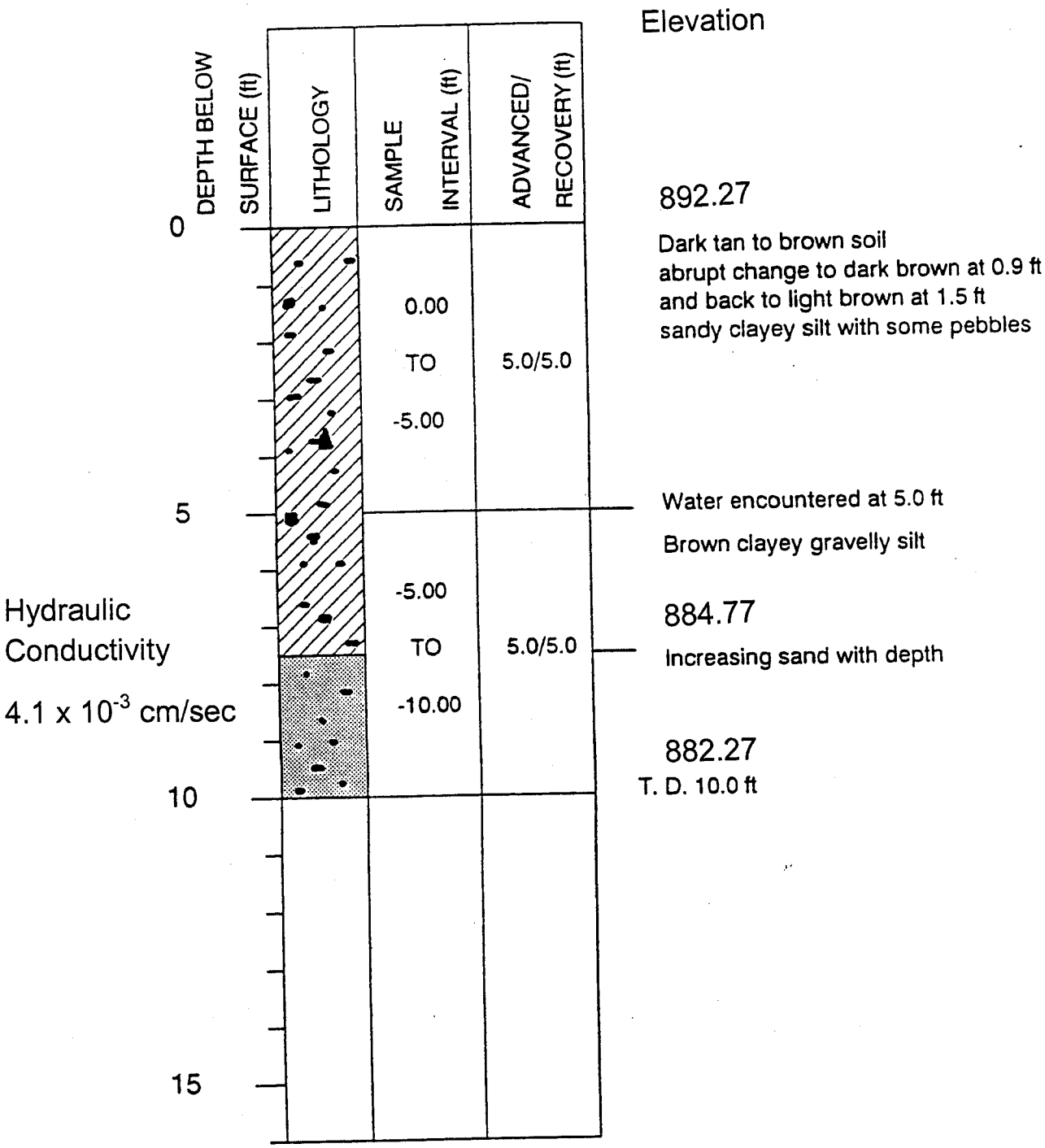


Figure 8

BOREHOLE NUMBER: 172 LOCATION: Sample Area 1 27 APRIL 1989

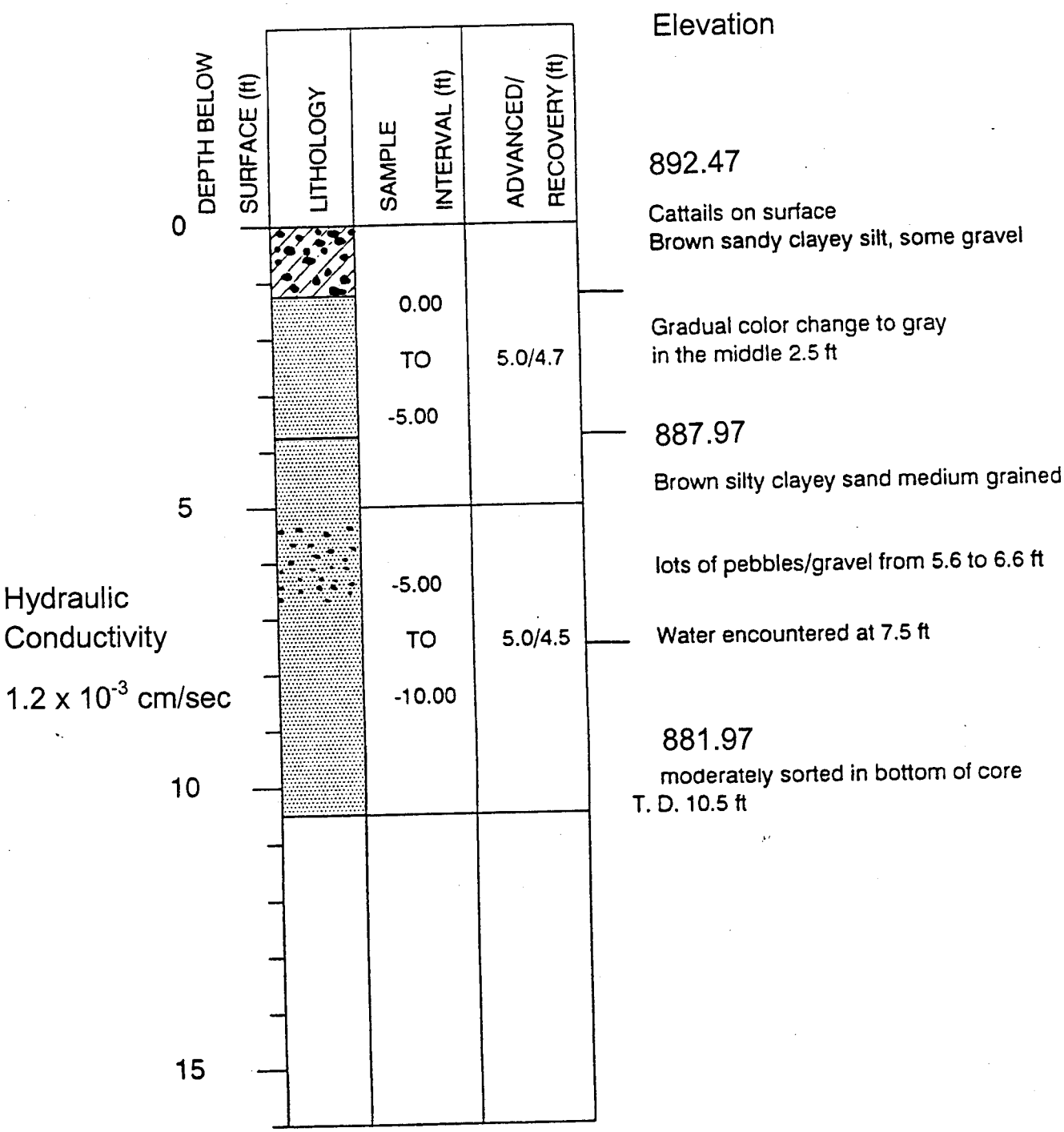


Figure 9

3.0 Nature of the Cs 137 Contaminant Release

Approximately fifty years ago low levels of spent fuel were transferred into the filter beds of the West Jefferson site. When the filter beds were replaced in the early 1960s, the water tiles and much of the contaminated sand were removed, leaving only soluble isotopes. The major contaminant in question was Cesium. Site personnel essentially tried to blend the contaminant into a solution and flush it out. This did not completely remediate the beds, and the contaminant presently remains in low-level concentrations. The natural clay area was then graded and capped with a one-foot clay layer to prevent storm water from entering through the suspect area.

3.1 WIDE Description

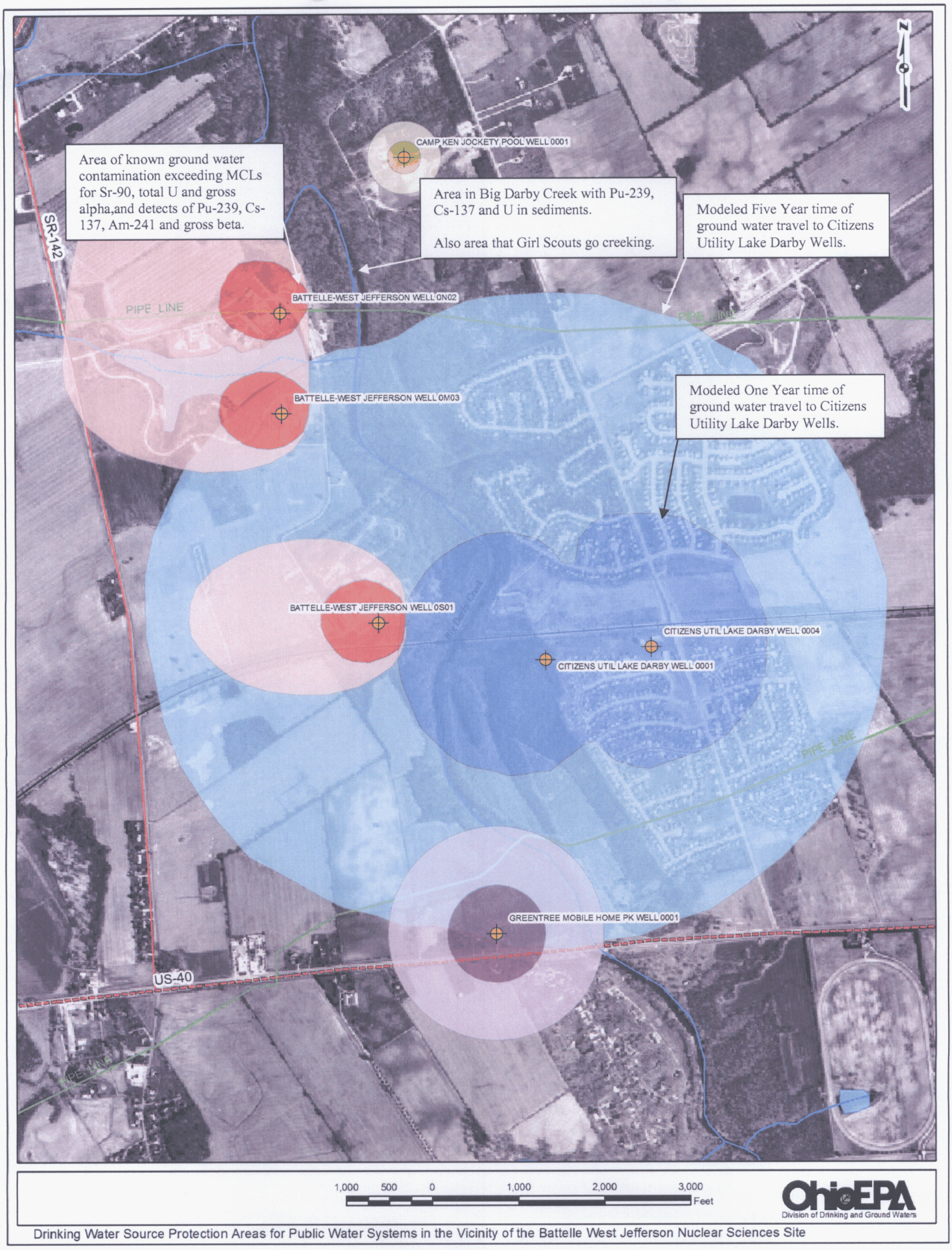
The WIDE system is proposed for deployment at the BCDLP West Jefferson site. The WIDE system is a hybrid subsurface flushing/vapor-gas extraction system that uses Prefabricated Vertical Wells (PVWs) for the *in situ* remediation of contaminated groundwater and fine-grained soils with hydraulic conductivities ranging from 10^{-3} to 10^{-8} cm/s. The primary components of this system are a vacuum extraction system and a cyclone air/water separator. The vacuum extraction system simultaneously removes groundwater and soil gas, promoting volatilization of contaminants. The PVWs are the WIDE's subsurface elements that are going to be used as the avenue for the pressurized injection of potable water and a lixciviant into soil concurrent with the vacuum extraction for removal of the cesium. The PVWs are designed for depth-specific extraction of contaminated plumes with or without concurrent liquid injection. The WIDE technology has been designed to target the aerial and depth source points of a plume, thereby controlling and minimizing the volumes of liquids being extracted.

3.1.1 Liquids and Vapor Extraction using WIDE Technology

WIDE was developed for the *in situ* remediation of low-permeability soils and high clay-fraction subsurface soils. The WIDE system has been field demonstrated for removal of groundwater having soluble contaminant waste streams, dense non-aqueous phase liquids (DNAPLs), and light non-aqueous phase liquids (LNAPLs), and heavy metals. The liquid and vapor extraction process is based on a compressed air motive powering an eductor to develop the liquid suction lift. The air vacuum is transmitted to the PVWs through surface piping networks in which the extracted waste streams (groundwater, and liquid and air phase contaminants) are collected. The system will be configured using surface piping used for distributing the air vacuum, receiving the extracted groundwater, and introducing the injection liquids. The system will be set up to enable operation in modes of either: a) extraction only, b) injection only, or c) concurrent extraction/injection.

3.1.2 Site Preparation

The WIDE deployment will encompass a 60'x 120'area near the Big Darby Creek; however, the runout area will extend the site measurements to 70' x 130'. The site



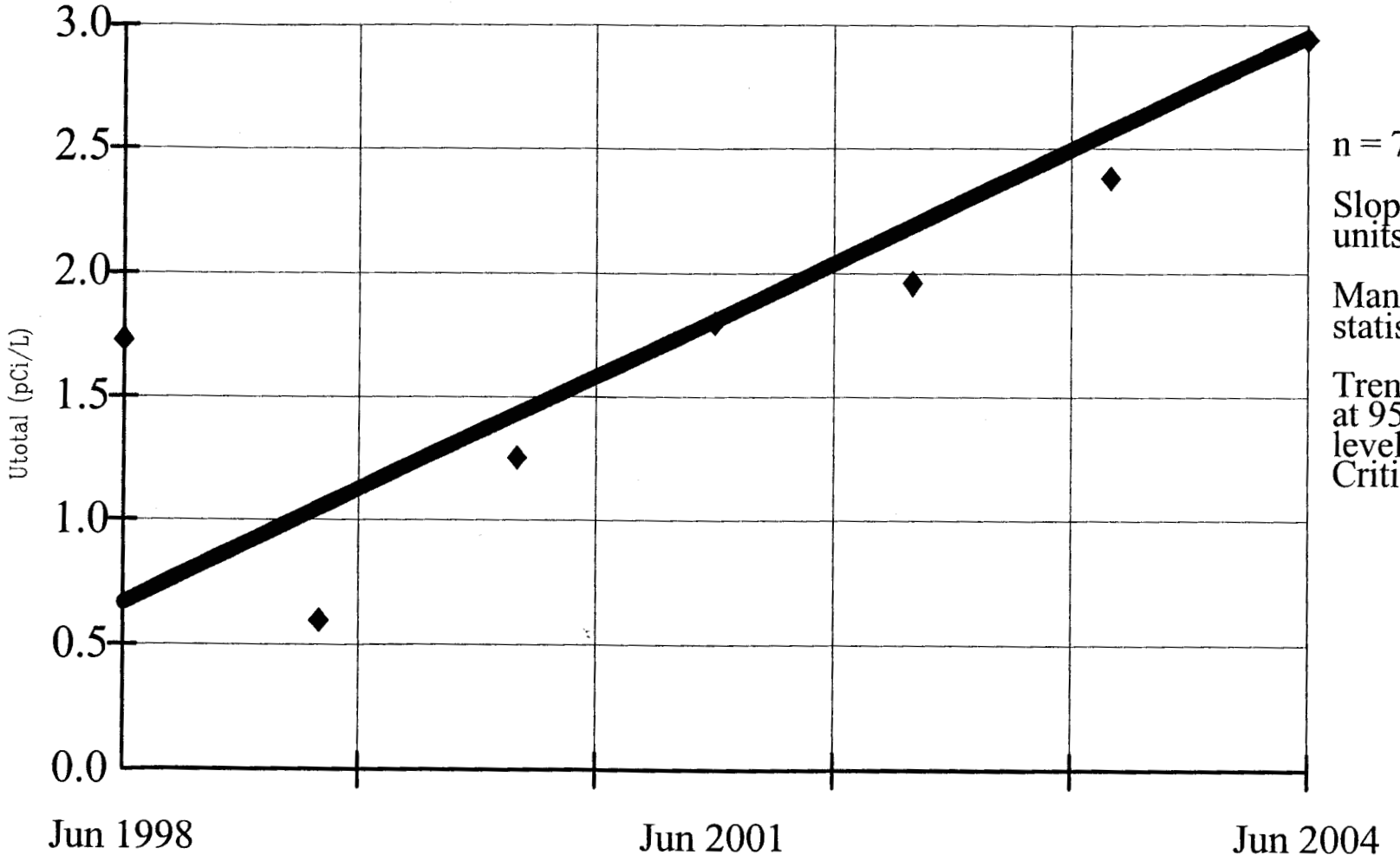
Drinking Water Source Protection Areas for Public Water Systems in the Vicinity of the Battelle West Jefferson Nuclear Sciences Site

Figure 11

Public Water Supply Wells near Battelle and their Modeled One and Five Year Ground Water Travel Areas

(private wells not shown).

SEN'S SLOPE ESTIMATOR
Well150



n = 7.

Slope = 0.38 units per year.

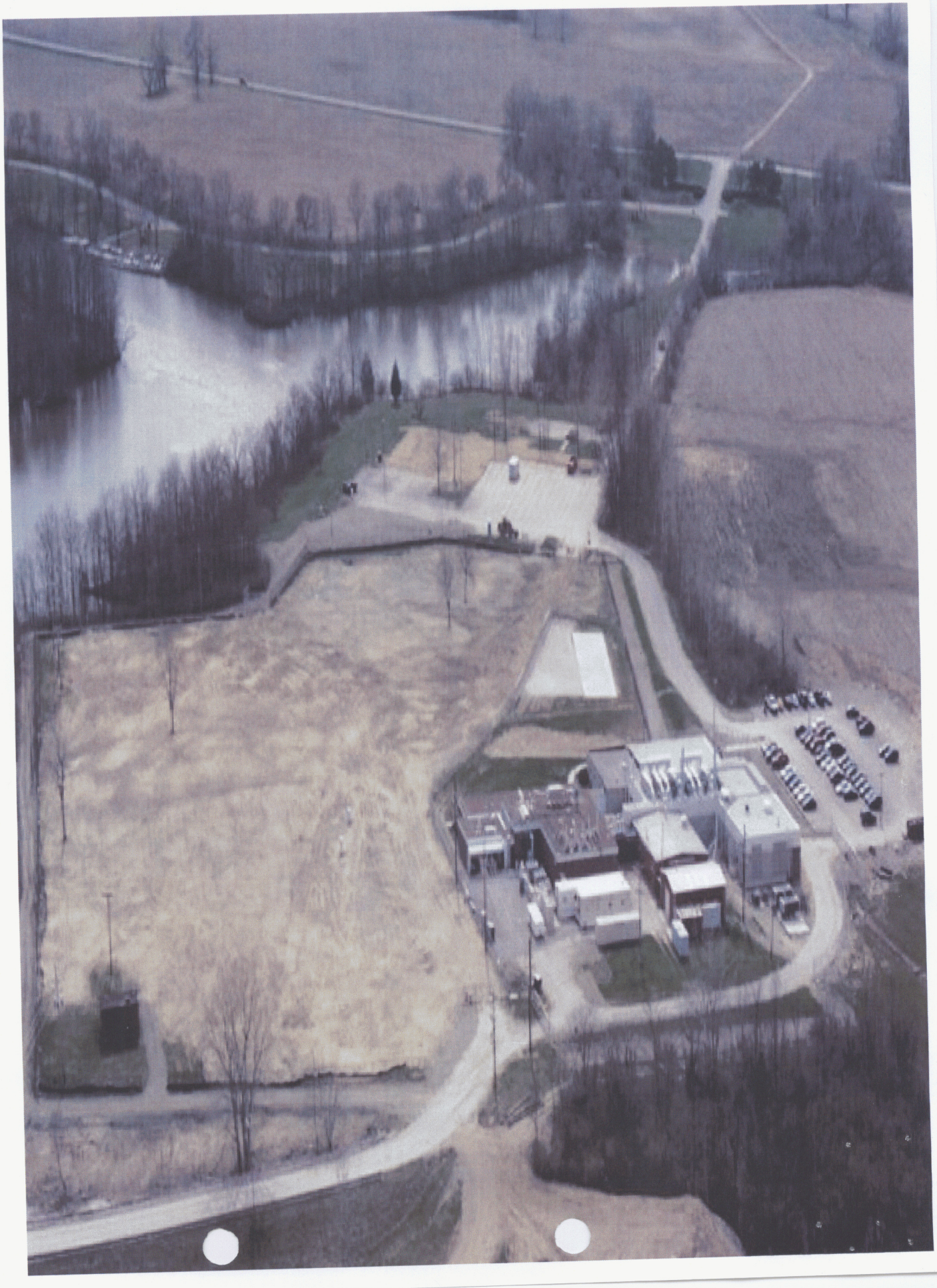
Mann Kendall statistic = 17.

Trend significant at 95% confidence level (two tailed). Critical value = 15.

User Comment: Increasing concentration trend for total Unanium in well 150

Figure 12

Constituent: Utotal (pCi/L) Facility: Landfill X Data File: Sub
Date: 7/26/07, 11:44 AM Client: Regulatory Use View: Btl1



DOE Columbus Closure Project (before and after)

References:

1. "Technical Evaluation Report on Battelle's Groundwater Monitoring Plan and the Radiological Impact of Site Activities on the Groundwater at the West Jefferson North Site West Jefferson, Ohio." (ML063600048)

2. July 31, 2007, Performance Assessment Branch, Environmental Protection and Performance Assessment Directorate, memorandum by Jon Peckenpaugh "SUBJECT: SUSTAINABLE YIELD OF THE WATER-BEARING UNIT ASSOCIATED WITH WELL 168 AT THE BATTELLE'S WEST JEFFERSON FACILITY." ML0726200950

3. September 11, 2007, e-mail from Battelle to the NRC Region III, Subject: "Breakdown of Battelle West Jefferson North Site Filter Bed Area Dispositions of Filter Bed Systems (ML0725701050)

4. September 14, 2007, Battelle memo to the NRC via e-mail Subject: "Review of Former West Jefferson North Site Filter Beds and Sanitary Sewer Treatment Systems"