Five-Year Review Report

Third Five-Year Review Report

for

Maxey Flats Disposal Site

Fleming County, Kentucky

September 2012

PREPARED BY:

United States Environmental Protection Agency
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Approved by:

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Superfund Division Director
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Date: 9/26/12

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List of Acronyms

ARARs	Applicable or Relevant and Appropriate Requirements
BORP	Balance of Remedial Phase
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Commonwealth	Commonwealth of Kentucky
CFS	Cubic Feet per second
DAW	Dry Active Waste
EDB	East detention basin
EMDC	East main drainage channel
EPA	U.S. Environmental Protection Agency
FCP	Final Closure Period
HASP	Health and Safety Plan
IMP	Interim Maintenance Period
IRP	Initial Remedial Phase
LLRW	Low Level Radioactive Waste
LMB	Lower Marker Bed
LNM	Lower Nancy Member
LR/D	Leachate Removal and Disposal
LSF	Leachate Storage Facility
MFDS	Maxey Flats Disposal Site
NCP	National Contingency Plan
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NECO	Nuclear Engineering Company
NRC	U.S. Nuclear Regulatory Commission
O&M	Operations and Maintenance
OSWER	Office of Solid Waste and Emergency Response
PCP	Process Control Program
PSVP	Performance Standards and Verification Plan
PRP	Potentially Responsible Party
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control

List of Acronyms (Cont'd)

RA	Remedial Action
RCA	Radiologically Controlled Area
RCN	Runoff Curve Number
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RW	Remaining Work
SARA	Superfund Amendments and Reauthorization Act
SOW	Statement of Work
SPP	Settling Private Parties

Executive Summary

The Maxey Flats Disposal Site (MFDS), located in Fleming County, Kentucky, is an inactive low-level radioactive waste site owned by the Commonwealth of Kentucky approximately ten (10) miles northwest of Morehead, Kentucky. The remedy selected at the MFDS is natural stabilization, which will allow the materials in the trenches to subside naturally to a stable condition prior to installation of a final engineered cap. Installation of an interim cap was completed in 2003. Natural stabilization was predicted to take 35 to 100 years. Construction completion at the site will not be achieved until the final cap is in place.

This is the third five-year review of the ongoing remedy. The selected remedy at the MFDS is expected to be protective of human health and the environment at the conclusion of the remedial action (RA), and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name (*from WasteLan*): Maxey Flats Disposal Site		
EPA ID (*from WasteLan*): KYD980729107		
Region: 4	**State:** Kentucky	**City/County:** Fleming

SITE STATUS	
NPL status: Final Deleted Other (specify): _____	
Remediation status (choose all that apply): Under construction Operating Complete	
Multiple OUs?* YES NO	**Construction completion date:** October 3, 2003 - Initial Phase Final Phase - Pending
Has site been put into reuse? YES NO	

REVIEW STATUS	
Lead agency: EPA State Tribe Other Federal Agency _____	
Author name: Pam Scully	
Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA, Region 4
Review period:** 10/2011 to 9/2012	
Date(s) of site inspection: 10 April 2012	
Type of review: Post-SARA Pre-SARA NPL-Removal only Non-NPL Remedial Action Site NPL State/Tribe-lead Regional Discretion	
Review number: 1 (first) 2 (second) **3 (third)** Other (specify) _____	
Triggering action: Actual RA Onsite Construction at OU #NA Actual RA Start at OU #_____ Construction Completion Previous Five-Year Review Report Other (specify)	
Triggering action date (*from WasteLAN*): September 2002	
Due date (*five years after triggering action date*): September 2012	

* ["OU" refers to operable unit.]

** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd

Issues:

Although no deficiencies that affect the protectiveness of the remedy were noted during the third five-year review, the Commonwealth of Kentucky should have collected additional groundwater and surface water monitoring data pursuant to their IMP Work Plan for the Five-Year Review.

Recommendations and Follow-up Actions:

No recommendations or required actions are needed to correct deficiencies affecting protectiveness based on this five-year review.

However, the Commonwealth of Kentucky should collect data pursuant to their IMP Work Plan that remains outstanding at the time of this Five Year Review. EPA will review the analytical data upon receipt and prepare recommendations based on that data, if necessary.

Protectiveness Statement(s):

The selected remedy at the MFDS is expected to be protective of human health and the environment at the conclusion of the RA, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

Other Comments:

The second Five Year Review in 2007 identified the need for an Explanation of Significant Differences (ESD) to document a number of decisions made during the Initial Remedial Phase (IRP) and Interim Maintenance Period (IMP) that were different from the specific requirements listed in the ROD. The three topics to be addressed in the ESD were: (1) installation of an infiltration monitoring system to continuously verify remedy performance and detect the accumulation of leachate in disposal trenches; (2) using a tiered approach to sampling and analysis for compounds other than tritium; and (3) determining no horizontal flow barrier other than the North Channel, as constructed, is necessary.

EPA still plans to address in an ESD the discontinuance of the continuous sump level monitors and the conclusion that no horizontal flow barrier is needed at this time

In support of the ESD and pursuant to Section 10.2 of the ROD, a statistical analysis of the leachate level monitoring data was performed and is further explained in Section VI of this report. The conclusions of this Horizontal Flow Barrier evaluation were consistent with those in the second Five Year Review that a Horizontal Flow barrier is not needed based on the leachate monitoring data. This information will be included in an ESD subsequent to the completion of this Five Year Review.

As to the tiered approach to sampling and analysis of contaminants other than tritium, more information is necessary in order to adequately justify the decision in an ESD. The ROD identified indicator contaminants of concern, applicable to both the groundwater and surface water pathways, as listed on Table III-2. Based on the historical site data and data collected by the Commonwealth during the IRP, the configuration of the site, the mobility of tritium, and the use of realistic exposure pathways, it was determined that compliance testing and monitoring related to source control should focus on water borne pathways for tritium. As stated in the ROD, "Risks associated with the MFDS are primarily due to potential exposure to radionuclides rather than the very low concentrations of chemical constituents detected at the site" (page 110). The Commonwealth's IMP Work Plan, Appendix C, the Performance Standards Verification Plan, states that analysis for other contaminants will not occur unless any annual average concentration of tritium exceeds 50% of the screening assessment (20 pCi/ml or 100 pCi/ml as applicable) during the previous five years. Based on the third Five Year review, tritium concentrations at one sampling location exceeded the 50% of the screening assessment and therefore triggers the collection of additional analytical data, including radionuclides other than tritium and some metals and volatile organic compounds. Inclusion of the tiered sampling approach using tritium as a trigger in the ESD will be evaluated again following review of the sampling data.

Pursuant to these statements in the previous Five-Year Review, the Commonwealth and EPA have had numerous discussions and meetings relative to subsidence completion and initiation of the FCP. The Commonwealth has appropriated additional funding to implement the FCP and, subsequent to the completion of this Five-Year Review, plans to provide documentation to EPA demonstrating that the trench stabilization criteria have been achieved. EPA's written approval of the Commonwealth's trench stabilization report will initiate the FCP.

I. Introduction

The Maxey Flats Disposal Site (MFDS or Site), is an inactive low-level radioactive waste site owned by the Commonwealth of Kentucky in Fleming County, Kentucky, approximately 10 miles northwest of Morehead, Kentucky.

The purpose of the five-year review is to determine whether the remedy at the MFDS is protective of human health and the environment. The methods, findings, and conclusions of the review are documented in the Five-Year Review report. In addition, the Five-Year Review report identifies issues found during the review, if any, and includes recommendations to address them.

The United States Environmental Protection Agency (EPA or Agency) is preparing this Five-Year Review report pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the president selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review, it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP. 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

EPA Region 4 conducted the five-year review of the remedy implemented at the MFDS in

Fleming County, Kentucky. The review was conducted between November 2011 and August 2012. This report documents the results of that review. *de maximis, inc*., a contractor for the Settling Private Parties (SPPs) conducted analyses and provided information in support of the five-year review. EPA reviewed the analyses and developed the conclusions.

This is the third five-year review for the MFDS. The first five-year review was completed in 2002, five years after mobilization for the remedial action, which is the triggering action for this statutory review. The second five-year review was completed in 2007. The five-year review is required because hazardous substances pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestrictive exposure. The next five-year review will be required in September 2017.

II. Site Chronology

The following is a list of the chronology of events that occurred at the MFDS.

Month/Year	Activity
May 1963 – Dec 1977	NECO managed and operated the disposal of approximately 4,750,000 cu. ft. of Low Level Radioactive Waste (LLRW).
1973 – Apr 1986	Evaporator operations processed more than 6,000,000 gallons of liquid.
1981	PVC cover was placed over the disposal trenches
1986	EPA lists Maxey Flats Disposal Site on National Priorities List
1987	PRPs sign Administrative Order by Consent (EPA Docket No. 87-08-C) for the Remedial Investigation and Feasibility Study (RI/FS). PRPs formed the Maxey Flats Steering Committee
Dec 1988 – Nov 1991	EPA performed Emergency Action
Jul 1989	EPA approves the SPPs' RI Report
May 1991	EPA submits the FS and the Administrative Record to the public.
Sep 1991	EPA issues the Record of Decision for the MFDS, Fleming County, Kentucky.
1992	EPA issues Special Notice to the Potentially Responsible Parties.
1992-1995	Settling Defendants Consent Decree and Statement of Work, *de minimis* Consent Decree, Settlement Agreement between the Federal Agencies and the Settling Private Parties (SPPs), Steering Committee Participation and Cost Sharing Agreement, and the Operating Agreement of the Maxey Flats Site IRP, L.L.C. negotiated among Settling Private Parties, Commonwealth of Kentucky, Settling Federal Agencies and EPA.
Jul 1995	Consent Decree, U.S. District Court for the Eastern District of Kentucky No. 95-58, for the Maxey Flats Disposal Site is lodged. Settling Private Parties (SPPs) initiate installation of Construction cover.
Oct 1995	SPPs complete installation of Construction cover.

Month/Year	Activity
Apr 1996	Consent Decree is entered by the Court. Initial Remedial Phase (IRP) Remedial Design activities begun by SPPs; IRP Monitoring and Maintenance activities begun by the Commonwealth
Jun 1997	SPPs mobilize to site, initiate Leachate Removal / Disposal (LR/D) Design Construction.
Jan 1998	EPA approves SPP's Final LR/D Design Report
Aug 1998	EPA holds Public Open House at MFDS
Sep 1998	SPPs complete LR/D Construction and initiate LR/D operations
Feb 1999	EPA holds Public Meeting, Fleming County Courthouse to discuss LR/D Operations and winter shutdown.
Jun 1999	SPPs initiate Remaining Work with Southeast Cap construction.
Oct 1999	EPA holds Public Open House at MFDS to review ongoing IRP LR/D activities.
Aug 2000	EPA finds Leachate Removal Performance Standards met, Leachate removal operations cease and shutdown/ decommissioning is initiated.
Sep 2000	EPA holds Public Open House at MFDS to discuss LR/D decommissioning and RW construction.
Oct 2000	SPPs initiate balance of RW construction.
Jun 2002	EPA conducts Five-Year Review. SPPs continue RW Construction.
Jan 2003	Commonwealth begins Interim Maintenance Period (IMP) Monitoring
May 2003	SPPs complete the IRP work.
Jun 2003	SPPs submit IRP Remedial Action (RA) Construction Report to EPA. EPA approves Commonwealth IMP Work Plan.
Oct 2003	EPA issues the IRP Certification of Completion.
Apr 2006	Commonwealth holds Public Open House at MFDS.
September 2007	EPA completes second Five-Year review.
Apr 2008	Commonwealth holds Public Open House at MFDS
May 2, 2010	Greater than 25-year project storm occurs at site
Oct 2010	Commonwealth holds Public Open House at MFDS
Oct 2011	EPA Initiates third Five Year Review

III. Background

Physical Characteristics

The MFDS includes an inactive low-level radioactive waste landfill and a 464-acre buffer zone. The whole site encompasses 770 acres. The Site is owned by the Commonwealth of Kentucky. The landfill is capped to reduce groundwater infiltration.

The MFDS is located in the Appalachian Plateau, in the Knobs physiographic region of northeast Kentucky, an area characterized by relatively flat-topped ridges (flats) and hills (knobs). The MFDS is located on a spur of Maxey Flats, one of the larger flat-topped ridges in the region. The MFDS is bounded by steep slopes to the west, east, and south and is approximately 350 feet above the adjacent valley bottoms.

Numerous studies have reported on the geology of the MFDS. The following text is a summary of the geology, hydrology, and hydrogeology from the RI report and the ROD.

The Maxey Flats Disposal Site lies in a tectonically stable region of North America with few exposed faults and relatively infrequent earthquakes. The rock units exposed in the area surrounding the MFDS consist of shale, siltstone, and sandstone ranging in age from the Silurian to Mississippian (320 to 430 million years old). In the MFDS area, the rock units dip 25 feet per mile (0.3 degrees); regionally they dip to the east at 30 to 50 feet per mile.

The Nancy Member of the Borden Formation is exposed on the hilltop at Maxey Flats and is 27 to 60 feet thick. The unit is mostly shale with two laterally extensive siltstone beds, the Lower Marker Bed (LMB) and Upper Marker Bed (UMB). These beds were up to 2.8 feet thick at locations encountered during drilling operations at Maxey Flats

Underlying the Nancy Member, the Farmers member of the Borden Formation is characterized as an interbedded siltstone and shale, approximately 29 to 42 feet thick. Underlying the Farmers Member is the 4 to 7 feet thick shale of the Henley Bed, 17 to 18 feet thick Sunbury Shale, and 21 feet thick Bedford Shale. The Ohio Shale lies beneath the Bedford Shale and above the upper part of the Crab Orchard formation.

Fractures are present in all rock units at the MFDS with fracture sets oriented in descending

order, northeast-southwest, northwest-southeast, and north-south. The fracture sets are generally within 20 degrees of vertical. The weathered shale of the Nancy Member is the most highly fractured.

The distinguishing feature of the Nancy Member, and perhaps that of the MFDS geology, is the LMB of the Nancy Member. The LMB is a thin siltstone layer that is generally flat-lying (some local undulations of the bed are present), fractured and weathered, and lies approximately 15 to 25 feet below ground surface. The LMB has been identified as the principal leachate flow pathway at the MFDS and underlies or intersects the majority of disposal trenches. Consequently, the LMB is a highly contaminated geologic unit at the MFDS. Another distinguishing characteristic of the LMB is that underlying units are hydraulically connected to the LMB.

Groundwater resources in a three county area, including the Maxey Flats area, are very limited, with adequate residential supplies (up to 500 gallons per day (gpd)) generally available only in broad valley bottoms like the Licking River valley. The small valleys adjacent to MFDS would not produce enough water for a dependable domestic water supply. On hills the Borden Formation yields little water (less than 100 gpm), and almost no water from wells drilled in shale. Groundwater is sometimes present in the fractures of rock units. Wells drilled in the Ohio Shale can provide up to 500 gpd but locally can be of poor quality.

The residents of Maxey Flats have been on a public water supply since about 1985. Before then, water was typically obtained from shallow wells dug in the soil or weathered shale of the Nancy Member, which supplied approximately 25 to 50 gpd. Most investigators have considered the water to be from a perched water table. The source of this water was apparently from secondary porosity in the soil or weathered rock, and also from roof downspouts routed into the wells. These shallow wells were unreliable sources of water and may have acted more as storage cisterns than as wells.

Vertical migration of groundwater between geological strata is limited by low permeability shale layers, which act as aquitards. Because the MFDS is bounded on the three sides by steep slopes, the contaminated leachate migrating horizontally through the fractured siltstone layers generally moves into the bottom of the soil layer on these hillslopes. However, as evidenced by the occurrence of seeps on the east hillside, not all leachate migrates to the

bottom of the soil layer. A cross-section of the geologic units at the MFDS is included as Figure III-1.

Hydrogeologic evaluations of the MFDS indicate that ground water movement through the rock strata into the disposal trenches may be negligible. Regardless, the potential pathway for ground water flow into the trenches through the narrow neck at the north side of Maxey Flats where the trench area is connected to the main portion of the Maxey Plateau was partially eliminated during IRP Construction by construction of the North Channel.

Drip Springs Creek, located on the west side of the MFDS, and No Name Creek, located on the east side of the MFDS, both flow into Rock Lick Creek to the southwest of the MFDS. Rock Lick Creek flows into Fox Creek approximately 2 miles southwest of Maxey Flats. Fox Creek flows into the Licking River, approximately 6.5 miles west of MFDS, which empties into the Ohio River near Cincinnati, Ohio, approximately 100 miles from Maxey Flats.

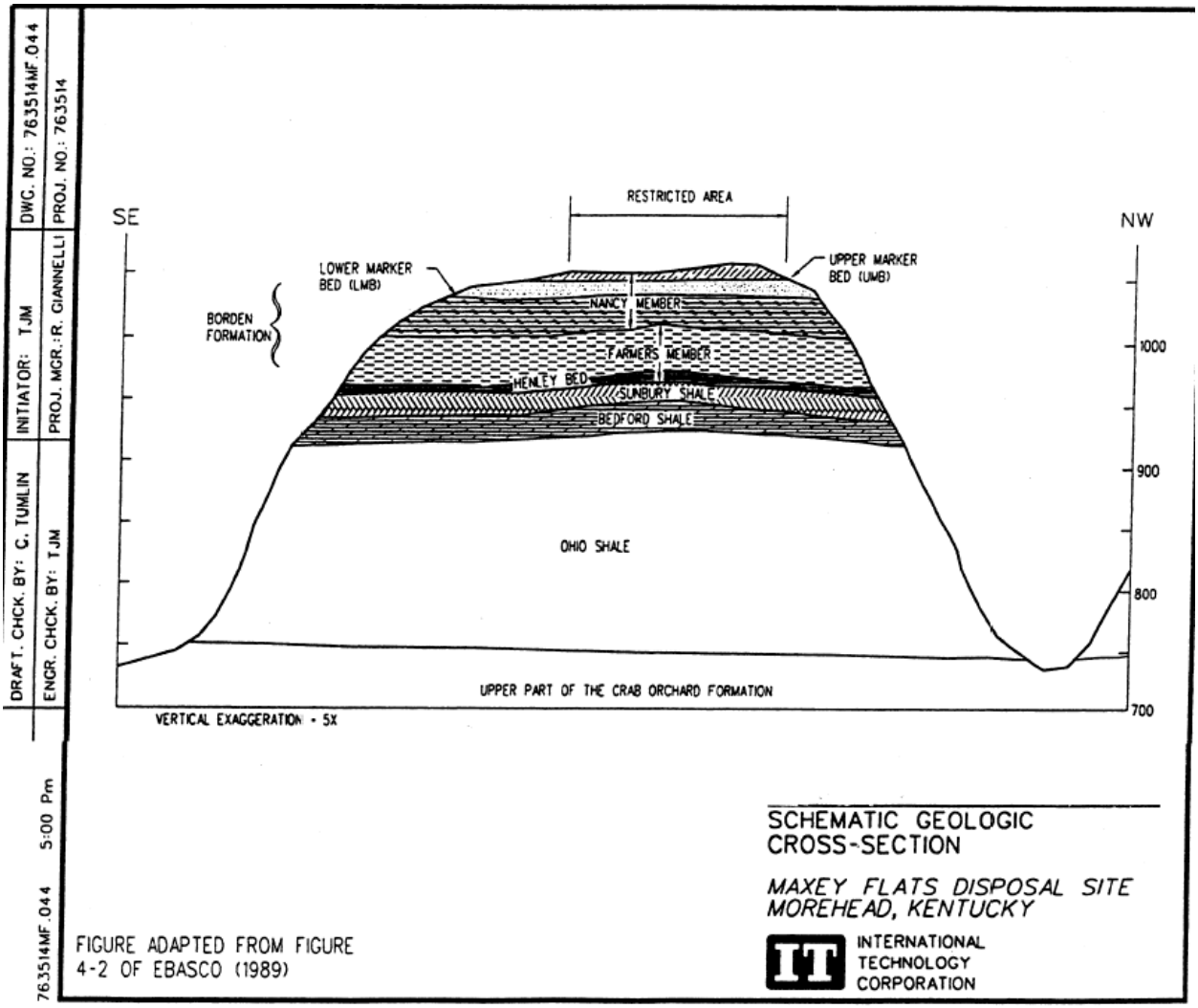

Table III-1: Geologic Cross Section of Maxey Flats;
IT Corporation's Remedial Design Report
(Figure comes from Ebasco's FS report)

Land & Resource Use

The land surrounding the MFDS is primarily mixed woodlands and open farmland. A number of residences, farms and some small commercial establishment are located on roadways near the site. The region around the site is best characterized as a rural, undeveloped area distinguished by low-density housing and rugged topography. The Maxey Flats region has a public water supply system that is operated by the Fleming County Water Association. The limited employment base of the area, along with the limited roadway and utilities access, makes large-scale economic expansion in this region unlikely. Future land use can be expected to follow the same historical patterns for the area: small family farms,

crop raising, logging activities and moderate growth in population.

Pursuant to the Consent Decree, during the IRP the Settling Defendants purchased additional land consisting of 197 acres surrounding the site. The additional land was added to the Buffer Zone to form the currently held 464 acres by the Commonwealth. Access to the Buffer Zone is restricted and monitored and maintained by the Commonwealth.

The perennial streams at the base of the plateau, outside of the MFDS Buffer Zone, are used as freshwater supplies for livestock raised in the valleys. Fox Creek is also used for light recreational fishing. The Licking River is used both for recreational purposes and as a source of public drinking water through municipal water systems upstream and downstream of Maxey Flats. The nearest municipal water intake downstream of the MFDS on the Licking River is located approximately 54 miles from the site.

History of Contamination

In January 1963, the Commonwealth of Kentucky issued a license to Nuclear Engineering Company, Inc. (NECO) for the disposal of solid by-product, source and special nuclear material on a 252-acre tract now known as MFDS. From May 1963 through December 1977, NECO managed and operated the disposal of an estimated 4,750,000 cubic feet of low-level radioactive waste (LLRW) at the Site. Environmental monitoring in 1972 by the Commonwealth revealed possible migration of radionuclides from the Restricted Area. A special study was performed by the Commonwealth in 1974 that confirmed that tritium and other radioactive contaminants were migrating out of the trenches and that some radioactive material had migrated into unrestricted areas. In 1977, it was determined that leachate was migrating through the subsurface geology and NECO was ordered to cease the receipt and burial of radioactive waste. NECO's license was transferred back to the Commonwealth Department of Natural Resources and Environmental Protection in 1979, when the Commonwealth hired independent contractors to assist in stabilization and maintenance activities for the 27-acre trench disposal area.

From 1973 through April 1986, an evaporator was operated at the Site as a means of managing the large volume of water infiltrating the disposal trenches as well as waste water generated by on-site activities. The evaporator processed over 6,000,000 gallons of liquids during its operation and the evaporator concentrates were disposed of on-site.

Initial Response

From 1983 to 1986, MFDS was in the process of being listed on EPA's National Priorities List (NPL) at the request of the Commonwealth. In 1986, the listing was finalized and EPA issued general notice letters to 832 Potentially Responsible Parties (PRPs) informing them of their potential liability with respect to site contamination. In March 1987, 82 PRPs signed an Administrative Order by Consent to perform the Remedial Investigation and Feasibility Study (RI/FS).

In December 1989, EPA initiated an Emergency Response Action at Maxey Flats due to an imminent threat to public health, welfare, and the environment posed by the potential release of liquids stored in on-site storage tanks. EPA installed heaters in the tank farm building to prevent freezing and possible rupturing and installed additional storage capacity on-site. EPA also solidified 286,000 gallons of radioactive liquids stored in the tanks and on the floor of the tank building. These 216 solidified blocks were buried in newly constructed trenches within the Restricted Area.

Basis for Action

The MFDS has approximately 4.75 million cubic feet of low level radioactive waste buried onsite. Radionuclides and non-radionuclides have been found in ground water, soil and surface water at the Site. Tritium is the most abundant and most mobile of the indicator contaminants and has therefore been identified as the primary contaminant of concern. Indicator contaminants identified in the ROD (page 58) are listed in Table III-2.

TABLE III -2
INDICATOR CONTAMINANTS

Radionuclides	Non-Radionuclides
Hydrogen-3 (Tritium)	Arsenic
Carbon-14	Benzene
Cobalt-60	Bis (2-Ethylhexyl) Phthalate
Strontium-90	Chlorobenzene
Technetium-99	Chloroform
Iodine-129	1, 2-Dichloroethane
Cesium-137	Lead
Radium-226	Nickel
Thorium-232	Toluene
Plutonium-238	Trichloroethylene
Plutonium-239	Vinyl Chloride
Americium-241	

An assessment of site risks was performed using existing site data and information gathered during the remedial investigation. The risk assessment evaluated the contaminant sources and exposure pathways posing the greatest potential threat to human health and the environment. The ground water pathway was determined to be the pathway with the highest potential risk. It was also demonstrated that if left uncontrolled, individuals might unintentionally become exposed to radionuclide and non-radionuclide contaminants at unacceptable levels.

IV. Remedial Actions

Remedy Selection

The remedy selected at the MFDS is natural stabilization, which will allow the materials in the trenches to subside naturally to a stable condition prior to installation of a final engineered cap. The major components of the selected remedy include:

- Excavation of additional on-site disposal trenches for disposal of site debris and solidified leachate;
- Demolition and on-site disposal of site structures;
- Extraction, solidification, and on-site disposal of approximately three million gallons of trench leachate;
- Installation of an initial cap consisting of clay and a synthetic liner;
- Re-contouring of capped disposal area to enhance management of surface water runon and runoff;
- Installation of a ground water flow barrier, if necessary;
- Installation of an infiltration monitoring system to continuously verify remedy performance and detect the accumulation of leachate in disposal trenches;
- Monitoring of ground water, surface water, air, selected environmental indicators, and rates of subsidence;
- Procurement of a buffer zone adjacent to the existing site property boundary, estimated to range from 200 to 400 acres, for the purposes of preventing deforestation of the hillslopes or other activities which would accelerate hillslope erosion and affect the integrity of the selected remedy, and providing frequent and unrestricted access to areas adjacent to the site to allow monitoring;
- Installation of a multi-layer engineered soil cap with synthetic liner after natural subsidence process is complete;
- Five-year reviews to evaluate the protectiveness of the remedy and to ensure the selected remedy is achieving the necessary remedial action objectives; and
- Institutional controls to restrict the use of the MFDS and to ensure monitoring and maintenance in perpetuity.

The remedy was divided into four phases: the Initial Closure Period, the Interim

Maintenance Period, the Final Closure Period, and the Custodial Maintenance Period. This remedy selection in the ROD led to the division of the remedy, as defined in the Consent Decree/Statement of Work, into the Initial Remedial Phase (IRP), which incorporates the activities described as the Initial Closure Period, and the Balance of the Remedial Phase (BoRP), which incorporates the activities described as the Interim Maintenance Period and the Final Closure Period. The final phase of the project, termed the Custodial Maintenance Period in the ROD, is called the Institutional Control Period (ICP) that includes continued monitoring for 100 years followed by the Post-ICP, which will allow for monitoring in perpetuity.

The Remedial Action Objectives in the ROD are:

- Minimize the infiltration of rainwater and ground water into the trench areas and migration from the trenches;
- Stabilize the site such that an engineered cap that will require minimal care and maintenance over the long term can be placed over the trench disposal area;
- Minimize the mobility of trench contaminants by extracting trench leachate, to the extent practicable;
- Promote site drainage and minimize potential for erosion to protect against natural degradation;
- Implement institutional controls to permanently prevent unrestricted use of the site;
- Implement a site performance and environmental monitoring program.

The objectives were expanded upon in Section II of the Statement of Work (SOW) to the Consent Decree. The first ROD remedial action objective was expanded to include the following components:

- Prevent or mitigate the continued release of hazardous substances, pollutants and contaminants from the Site to underlying bedrock formations and ground water aquifers;

- Prevent or mitigate the continued release of hazardous substances, pollutants and contaminants from the Site to surface water bodies and sediments;

- Reduce the risks to human health associated with direct contact with hazardous substances, pollutants or contaminants within the Site;

- Eliminate or reduce the risks to human health from inhalation of hazardous substances, pollutants or contaminants from the Site;

- Eliminate or minimize the threat posed to human health and the environment from current and potential migration of hazardous substances from the Site in the surface water, ground water, and subsurface and surface soil and rock;

- Minimize the infiltration of rainwater and ground water into the trench areas and migration from the trenches;

The SOW clarified the second ROD RA objective by adding use of natural stabilization of the trench area in preparation for the final cap, as the SOW objective reads:

- Allow natural stabilization of the Site to provide a foundation for a final cap over the trench disposal area that will require minimal care and maintenance over the long term;

The other four ROD RA objectives remained essentially the same in the CD/SOW. The SOW did add that the extracted leachate would be solidified in earth mounded concrete (EMC) bunkers.

Remedy Implementation

Initial Remedial Phase Remedial Action

The objectives of the IRP RA were met through two construction phases: Leachate/Removal Disposal (LR/D) and Remaining Work (RW). These activities were completed by the SPPs in 2003. The Commonwealth performed the environmental monitoring and maintenance throughout the IRP. The LR/D RA phase included the following activities:

- Removing leachate from the trenches by pumping from specified sumps;

- Conveying removed leachate to field collection tanks (FCTs);

- Transferring the leachate from the FCTs to leachate storage tanks where the leachate was confirmed to be Class A (NRC 10 CDR 61 Class A, B, C) waste and sample process control tests were performed to confirm the proper leachate-to-cement ratio;

- Metering leachate from the storage tanks and cement from a storage silo into a transit mix truck for mixing; and

- Transferring leachate-cement mixture (grout) to the EMC bunkers where the mixture solidified.

A few RW RA activities (building demolition, southeast cap construction, and east detention basin) were performed during LR/D to expedite IRP completion. The RW RA phase included the following activities:

- Demolition of buildings and on-site disposal of debris;

- Construction of a geomembrane cap which directs storm water away from disposal trenches to the East Detention Basin (EDB) and minimizes storm water infiltration into the trenches;

- Enlarging the EDB to accommodate a range of storm events including the 100-year, 24-hour storm event. The EDB contains storm water from the cap area (geomembrane lined area) and directs the water in a controlled manner to the East Main Drainage Channel. Storm water is released from the EDB at rates below the pre-development condition at the site;

- Construction of a geomembrane and soil cover cap in the southeastern corner of the site immediately outside of the restricted area to prevent infiltration of rainwater into the subsurface near several disposal trenches;

- Modifying/constructing the perimeter drainage channels to direct storm water to the EDB; and

- Construction of erosion monuments along the East Main Drainage Channel (EMDC).

Commonwealth IRP Activities

During the IRP, the Commonwealth performed the following activities:

- Acquisition of the additional Buffer Zone property;
- Buffer zone building demolition;
- Acquiring Deed Restrictions for the entire Maxey Flats Site;
- Environmental monitoring; and
- Continued Site maintenance.

Balance of the Remedial Phase (BoRP) Remedial Action

The BoRP is divided into the Interim Maintenance Period (IMP), currently on-going since 2003, and the Final Closure Period (FCP). The Commonwealth is responsible for implementation of the BoRP. The primary objective of the IMP is to allow the trenches to stabilize by natural subsidence. During this period, the following activities are also required:

- IRP Cap maintenance and replacement as necessary;
- Trench leachate management and monitoring;
- Subsidence monitoring, periodic surveys, and repairs as necessary;
- Erosion evaluation in channels along the hillslopes;
- General Site maintenance;
- Stream monitoring;
- Alluvial well monitoring;
- Data collection, analysis and reporting to EPA;
- Maintenance of site drainage and erosion control features; and
- Waste burial.

The activities required during the IMP are ongoing. The costs associated with these activities are provided in Table IV-1, IMP Costs. As noted in the previous five-year review, these costs are expected to increase with geomembrane liner deterioration over time and will be significantly increased in years where the replacement of the exposed geomembrane is required. Moving to the FCP and installation of a final cap will supersede the requirement to

replace the exposed geomembrane of the Interim Cap and therefore impact the expected operational cost related thereto. In addition, once it has been demonstrated that the FCP performance standards have been achieved, a decrease in the required monitoring (locations and frequency) may help decrease overall costs. In comparison to cost incurred the first five years of the IMP (years 2003-2007), the past five-year period (2007-2011) totals show a reduction in overall costs by greater than 12 percent, including the special maintenance projects that were not accounted for in the previous Five-Year Review.

TABLE IV – 1
Annual IMP Costs

	2007	2008	2009	2010	2011	Totals
Payroll/Personnel Expenses	363,100	370,920	312,900	319,176	320,104	1,686,200
Operating Expenses	72,200	79,300	51,200	53,871	51,000	307,571
USGS	57,796	49,680	51,500	15,254	8,100	182,330
Maintenance Projects	-	-	16,508	22,342	52,422	91,272
	493,096	**499,900**	**432,108**	**410,643**	**431,626**	**2,267,373**

Operations and Maintenance /Institutional Control Period

Following completion of the BoRP when the Remedial Action has been fully performed and the Performance Standards have been achieved, the Commonwealth will then be responsible for the Custodial Maintenance Period, or Institutional Control Period (ICP). The ICP shall be conducted for 100 years following EPA issuance of the Certification of Completion of the Remedial Action. The Post-Institutional Control Period will follow the ICP with the necessary operations and maintenance activities to be performed in perpetuity.

V. Progress Since the Last Five-Year Review

Protectiveness Statement from 2007 Five-Year Review

The selected remedy at the MFDS is expected to be protective of human health and the environment at the conclusion of the RA, and in the interim; exposure pathways that could result in unacceptable risks are being controlled (page 40).

Deficiencies

No deficiencies were noted during the second five-year review.

Recommendations and Required Actions

No recommendations or required actions were needed based on the second five-year review.

Other comments

During the second five-year review, the need to process an Explanation of Significant Differences (ESD) was identified to address decisions made during the IRP and the IMP that are different from the specific requirements of the ROD. The ESD would address three specific points from the ROD: (1) installation of an infiltration monitoring system to continuously verify remedy performance and detect the accumulation of leachate in disposal trenches; (2) using a tiered approach to sampling and analysis for compounds other than tritium; and (3) determining no horizontal flow barrier other than the North Channel, as constructed, is necessary.

(1) The ROD required the installation of an infiltration monitoring system to continuously verify remedy performance and detect the accumulation of leachate in disposal trenches. Continuous water level monitors were installed in eighty-three sumps during the IRP. Due to extensive malfunctions and accuracy concerns, the electronic water level monitors were discontinued from use and only manual measurements are being used. The Commonwealth documented this change in a Technical Change submitted to and approved by EPA.

(2) The ROD identified indicator contaminants of concern as listed on Table III-2. Based on the Commonwealth's collection of historical data and data obtained during the IRP, the configuration of the site, the mobility of tritium and the use of realistic exposure pathways, it was determined that compliance testing and monitoring related to source control should focus on water borne pathways (surface water and groundwater) for tritium. It was agreed that analysis for other contaminants will not occur unless any annual average concentration of tritium exceeds 50% of the screening assessment (20pCi/ml or 100 pCi/ml, as applicable) during the previous five years.

(3) The ROD also required the installation of a ground water flow barrier, if necessary. Hydrogeologic evaluations of Maxey Flats indicate that ground water movement through the rock strata into the disposal trenches may be negligible. Regardless, the potential pathway for ground water flow into the trenches through the narrow neck at the north side of Maxey Flats where the trench area is connected to the main portion of the Maxey Plateau was partially eliminated during IRP Construction through construction of the North Channel. A review of the monitoring data revealed little change in leachate levels in the sumps and a site wide change from the exterior to the interior is not present, confirming that no Horizontal Flow Barrier other than the North Channel will be required.

The second five-year review report also noted that subsidence in the trenches has been significantly lower than originally anticipated. The end of the Interim Maintenance Period (IMP) and the beginning of the Final Closure Period (FCP) is defined as the time when subsidence of the trenches has nearly ceased and final cap installation can begin. EPA was to confer with the Commonwealth of Kentucky to determine when the Final Closure Period should begin.

Subsequent to the 2007 Five Year Review:

In support of the ESD and pursuant to Section 10.2 of the ROD, a statistical analysis of the leachate level monitoring data was performed and is further explained in Section VI of this report. The conclusions of this Horizontal Flow Barrier evaluation were consistent with those in the second Five Year Review that a Horizontal Flow barrier is not needed based on

the leachate monitoring data. This information will be included in an ESD subsequent to the completion of this Five Year Review. EPA still plans to address the discontinuance of the continuous level monitors in the ESD as well.

As stated in the ROD, "Risks associated with the MFDS are primarily due to potential exposure to radionuclides rather than the very low concentrations of chemical constituents detected at the site" (page 110). The Commonwealth's IMP Work Plan, Appendix C, the Performance Standard and Verification Plan, states that analysis for other contaminants will not occur unless any annual average concentration of tritium exceeds 50% of the screening assessment (20 pCi/ml or 100 pCi/ml as applicable) during the previous five years. Based on the third Five Year review, the annual average tritium concentrations from one sampling location (out of eight locations) exceeded the 50% of the screening assessment and therefore triggers the collection of additional analytical data, including radionuclides other than tritium and some volatile organic compounds. Inclusion of this tiered sampling approach in the ESD will be evaluated again following review of the sampling data.

Pursuant to the statements in the previous Five-Year Review, the Commonwealth and EPA have had numerous discussions and meetings relative to subsidence completion and initiation of the FCP. The Commonwealth has appropriated additional funding to implement the FCP (in addition to the trust accounts established pursuant to the Consent Decree) and, subsequent to the completion of this Five-Year Review, plans to provide documentation to EPA demonstrating that the trench stabilization criteria have been achieved. EPA's written approval of the Commonwealth's submission of meeting the trench stabilization criteria will initiate the FCP.

VI. Third Five-Year Review Process

Administrative Components

The Commonwealth of Kentucky, the Settling Federal Agencies and the Settling Private Parties were notified of the initiation of the third Five-Year Review in fall 2011. The MFDS Five-Year Review team was led by Pam Scully of EPA, Remedial Project Manager (RPM) for the MFDS and included members of the EPA Regional Technical Services staff with expertise in hydrology and radiation risk assessment. The Commonwealth of Kentucky and the Settling Private Parties Project Coordinator participated in the review.

From October 2011 through August 2012, the review team established the review schedule whose components included:

- Community involvement;
- Document review;
- Data review;
- Site inspection;
- Local interviews; and
- Five-year Review report development and review.

The Five-Year Review Report completion was scheduled for September 2012.

Community Involvement

Activities to involve the community in the five-year review were initiated with notification of the upcoming five-year review in the local papers in March and April, 2012. A notice was sent to six local area newspapers (see Attachments 1 and 2) that a five-year review was to be performed. The Maxey Flats Concerned Citizens Group disbanded during the IRP after having the longest standing Technical Assistance Grant (TAG) and reported to be happy with the progress of the remedial action. During this past five-year review period, EPA RPM Pam Scully learned that the former secretary, Nancy Powell, had passed away. The former President of the Maxey Flats Concerned Citizens Group, Ed Story, reportedly still works for the local college in Maysville, Kentucky, but was unavailable for comment. EPA contacted the local emergency management personnel for an interview, which is included in

Attachment 8D. The Commonwealth plans to continue their Public Open House biannually and has tentatively planned the next one for the fall of 2012.

After the Five-Year Review is signed by the Superfund Division Director, a notice will be sent to the same area newspapers that announced that the Five-Year Review report for the MFDS is complete and that the results of the review and the report are available to the public at the Fleming County Public Library and EPA Region 4 office.

Document Review

This five-year review consisted of a review of relevant documents, including the O&M records and monitoring data at the MFDS. Specifically, the following documents were reviewed during this five-year review:

Maxey Flats Record of Decision

Maxey Flats Consent Decree and Statement of Work, Civil Action 95-58

Commonwealth of Kentucky Interim Maintenance Work Plan and appendices
- Appendix A, Health and Safety Plan
- Appendix B, Operations and Maintenance Requirements Summary
- Appendix C, Performance Standards Verification Plan

Commonwealth of Kentucky Annual Report 2007

Commonwealth of Kentucky Semi-Annual Report 2008

Commonwealth of Kentucky Annual Report 2008

Commonwealth of Kentucky Semi-Annual Report 2009

Commonwealth of Kentucky Annual Report 2009

Commonwealth of Kentucky Semi-Annual Report 2010

Commonwealth of Kentucky Annual Report 2010

Commonwealth of Kentucky Semi-Annual Report 2011

Commonwealth of Kentucky Annual Report 2011

IRP Remedial Action Construction Report

First Five-Year Review Report for MFDS, September 2002

Second Five-Year Review Report for MFDS, September 2007

Remedial Investigation Report

Feasibility Study Report

Maxey Flats Nuclear Disposal Site Summary Reports Years 2007 through 2011,

(Commonwealth Cabinet for Health and Family Services)
Institutional Control Documents
Horizontal Flow Barrier Evaluation, June 2012

Data Review

The data review included the data collected and reported by the Commonwealth of Kentucky Division of Waste Management pursuant to the IMP Work Plan. The findings from these data all collected pursuant to the IMP Work Plan, have been divided into two sections: (A) Physical Conditions and (B) Contaminant Monitoring. The Physical Conditions include (1) Erosion Monitoring of the Drainage Channels; (2) Interim Cap Maintenance (including subsidence monitoring); (3) Leachate Level Monitoring; and (4) EDB Discharge Flow Monitoring. The Contaminant Monitoring includes (1) Surface Water Sampling; (2) Alluvial Well Sampling; and (3) Drainage Channel Sampling. In addition to the documents reviewed as listed above, additional tables and figures have been prepared as part of this review and are included in attachments to this report as referenced herein.

A. Physical Conditions

1. Erosion Monitoring

The erosion monitoring program monitors the East Main Drainage Channel (EMDC), the South Drainage Channel and the West Drainage Channel.

The EMDC extends from the outlet of the East Detention Basin (EDB) to its confluence with No-Name Creek. As part of the IRP design, all storm water from the cap area was routed to the EDB. As a result, no storm water runoff from the cap flows down the South or West drainage channels. During the IRP, twenty-two fixed monuments (eleven cross sections) were installed in the EMDC and surveyed to establish baseline conditions.

Pursuant to the IMP Work Plan, the Commonwealth continued erosion monitoring in the EMDC semi-annually by collecting cross-sectional measurements for screening purposes using standard USGS methodology for years 2007 through 2011 during the spring and the fall. Beginning in the fall of 2010, the Commonwealth site personnel began to perform the erosion monitoring instead of the USGS staff that were used in previous IMP semi-annual

events. Also in 2010, a 25-year storm event occurred the first weekend in May. The rainfall event altered USGS screening cross section 3.5, which was later repaired, and affected the measurements in that cross section. In addition, USGS cross section 6.75 was reset due to fallen timbers and storm events. The Commonwealth removed the sediment and old channel liner and reused what was removed to improve the access road to sampling station 144. The repairs to the EMDC took approximately one month and site personnel required assistance from an excavation contractor and heavy equipment. The fallen timbers presented an overhead hazard, restricted personnel access, restricted flow and re-directed flow from the center of the drain to the slopes which in turn, increased erosion.

In the spring of 2011, both visual inspection and erosion measurements in the EMDC revealed evidence of substantial hillside erosion. The Commonwealth observed evidence of mass earth movement and a slump on the south bank that exceeded 100 feet horizontally and 50 ft vertically. Multiple trees were also observed fallen from the steep east drain slopes into the drain floor. Repairs made to the channel in 2010 also included using a Master Logger to remove the fallen timbers from the drain floor and adjacent slopes. April 2011 was widely documented by local news sources to be the wettest April on record for Kentucky, and the year 2011 was the second wettest year on record. As a result, five USGS cross sections were impacted, and the necessary maintenance of the channel caused the baseline for those five cross sections to be re-established. The Commonwealth performed the necessary repairs in the EMDC and baseline for the impacted cross sections was re-established. Using an excavator, the Commonwealth removed more than 15 tons of slump material from the drain that restricted flow and personnel access.

Cross-sectional areas of the EMDC using the USGS screening methodology data are provided in Attachment 3.A and 3.B. The graph in Attachment 3.A shows minimal erosion and deposition for each cross section over time except for those stations affected by the 2010 and 2011 rainfall and subsequent erosion. The longitudinal cross sections were also reviewed and are provided in Attachment 3.B. This centerline profile of the EMDC varies little over the review period with the exception of the 2011 data.

As part of the five-year review, a statistical analysis of changes in the cross sectional areas was performed using the Student's t Statistical evaluation. The student's t evaluation for the EMDC using the USGS screening methodology data is provided as Attachment 3.C. This statistical evaluation did not include the cross sections that had baselines reset based upon

the channel repairs (sections 3.5, 6.0, 6.5, 6.75) The other locations did not show any cross sectional change to be greater than 25% from baseline. The 25% change from baseline is an event marker to be used as an action level where one might expect to see major erosive conditions that would require further engineering evaluation. The major erosion observed in the channel has been repaired and new cross sectional baselines established.

To assure effective erosion monitoring during the fall of 2010 and both monitoring events of 2011, the Commonwealth performed its erosion monitoring by collecting the cross sectional measurements using the USGS screening methodology and contracting a licensed surveyor to collect cross sections using the 22 survey monuments installed during the IRP. The survey data are provided in Attachment 3.D and maps of the cross sections are submitted by the Commonwealth in their annual reports. The three survey events in the EMDC are not enough to complete a statistical analysis this review period. When the surveyor performed their first survey, they had to reset monument 1A because it had been destroyed during the IRP construction. The baseline for cross section 1 has been reset to 2010 as shown in Attachment 3.D. Based upon the repairs made to the channel, the 2011 fall event replaces the 2003 baseline survey performed by the Settling Private Parties at IRP completion for cross sections 6 through 9 as noted in Attachment 3.D. Moving forward, the Commonwealth plans to collect only the semi-annual survey using the 22 survey monuments and 11 cross-sections pursuant to its IMP Work Plan PSVP.

The South Drainage Channel, which no longer receives run-off from the Interim Cap, was inspected semi-annually. Monitoring involved specified cross sectional areas using the USGS manual leveling methodology for screenings. Measurements and observations were to be collected a minimum of every five years. The requirements for the South Drainage Channel also apply to the West Drainage Channel, which also does not receive any runoff from the IRP cap. No major water erosion or mud/rock slides were evident in the South and West Drainage Channels during the years 2007-2009. The Commonwealth reported only minor evidence of erosion in the South and West Channels in 2010. The seasonal visual erosion monitoring of the south drain revealed a mud/rock slide occurred in 2011. The slide appeared to be the result of steep side slope slides and no evidence was observed that would indicate the IRP southeast cap runoff contributed to the slide. The Commonwealth collected cross sectional measurements using the USGS screening methodology in both the South and West channels during 2012. For the West Drainage Channel, the two previous screening events occurred in 2007 and 2001 and the data comparison of the cross sectional area is

provided in Table VI-1 below. For the South Drainage Channel, a comparison between the 2012 and 2007 cross-sectional area is provided in Table VI-2.

Based on the minimal erosion in both channels, the Commonwealth plans to submit a technical change removing the requirement for the USGS screening methodology but continue the semi-annual visual inspection and, if extreme conditions are observed, install survey monuments pursuant to the PSVP

TABLE VI -1
West Drainage Channel Area Comparison

Cross Section	2001 Area	2007 Area	2012 Area
1	245.75	245.74	259.23
2	111.3	111.31	114.65
3	244.88	244.88	253.73
4	545.17	545.18	558.69
5	207.81	205.05	215.1
6	398.39	399.44	406.93
7	91.94	91.94	92.7
8	129.41	126.69	131

TABLE VI -2
South Drainage Channel Area Comparison

Cross Section	2007 Area	2012 Area
1	256.68	256.23
2	165.57	166.87
3	157.17	165.16

2. Interim Cap-Subsidence Area Monitoring

During the IMP, the Commonwealth annually surveyed the subsidence monuments and monitoring locations installed during the IRP. The Commonwealth also performed monthly subsidence inspections on the IRP cap. Since the last five-year review, only three areas (see Attachments 4.A and 4.B) met the IMP Work Plan requirements for repair. During the previous five-year review period (2002-2007), only one area had been repaired (minor repair) and that area had previously been repaired during IRP construction.

Attachment 4.B shows the subsidence monitoring points and their change from 2004 to 2011 over the outline of the disposal trenches. A positive change indicates an increase in elevation since baseline; a negative means a decrease in elevation. This figure also shows the subsidence repairs performed since the last five-year review. Attachment 4.C shows the Subsidence Control Point elevations for 2004 through 2011. These data are also shown in a linear graph format in Attachment 4.D for the locations on the Interim Cap and show relatively flat lines.

The average subsidence at the 36 monitoring points across the site since placement of the IRP cap until now is -0.11 feet. The minimal variation in elevations shows that the disposal trenches are relatively stable. This conclusion is also supported by the leachate level stability as explained in the next section. During IRP construction, the trenches underwent passive compaction by use of heavy construction equipment and placement of approximately 250,000 cubic yards of fill. No notable subsidence was observed, nor were any significant changes in leachate levels observed as a result of subsidence, further indicating site stabilization. From 1995 to date, site subsidence observed, both before and after IRP construction, was relatively minor and localized.

Appendix C of the IMP Work Plan requires collection of the subsidence data for evaluation of achievement of Trench Stabilization Criteria, which are to be reviewed and revised as necessary at the five-year review. The following factors have been considered: (1) the number of past subsidence repairs; (2) at least 35 years post waste disposal (landfill open for disposal from 1963-1977); (3) increased exposure risk with exposed geomembrane; and (4) subsidence repairs over the last twelve years have been minor and localized. Based on those factors, the trenches appear to have stabilized.

Interim Cap-Maintenance

Based upon the Commonwealth's annual liner inspection and routine maintenance activities, a total number of 406 liner defects have been identified and repaired through 2011, as shown in Attachment 4.E. A review of the number of defects by year does not reveal a steady increasing trend nor does it reveal a discernable pattern of defects across the liner.

Pursuant to the IMP Work Plan, Appendix D, Operations and Maintenance Requirements Summary, an independent liner inspection was performed as part of this five-year review. This report is included in Attachment 4.F. The results of that review are summarized below. Based on carbon black content and tensile strength testing, the liner has not degraded and does not need replacement at this time. However, one in five samples failed the peel and shear test, requiring that the seam be repaired and retested. Additionally, monitoring of subsurface projections, existing welds, tension in the cap, and ponding of water on and under the cap should be continued and if necessary, the cost-benefit of repairing these conditions should be considered in determining the operations and maintenance activities for the interim cap.

3. Leachate Level Monitoring

Sump leachate levels are collected for two primary purposes: (1) detect recharge conditions that may require leachate management or liner maintenance, and (2) provide data for evaluation of possible horizontal flow barrier in addition to the North Channel installed during the IRP. Leachate levels may also be used in evaluating subsidence as subsidence may affect localized water levels. Leachate level data are included in Attachment 5.A. A graphic presentation of these data are provided in Attachments 5.B and 5.C.

Data analysis during this five-year review period supports the following conclusions:

- The sumps have remained un-pumped for nearly 12 years. The largest geomembrane liner placement over the trenches was placed 9 years ago.

- Leachate levels were relatively stable in the five years prior to IRP pumping.

- The average change of leachate level from prepumping (1998-1997) to 2011 is -0.85 ft. In other words, the average leachate elevation is still 0.85 feet below the pre-pumping elevation.

- The average change of leachate level increased only 0.13 ft. since the last EPA Five-Year Review (which included data through 2006).

- The site-wide leachate level average, excluding sump 7-4, changed only 0.08 ft from 2006 to 2011.

- 87 % (72 out of 83 sumps) changed less than 0.5 ft since 2003.

- 98 % of the 83 sumps show relatively stable elevations in the last five years or more.

- 99% of the elevations of the bottoms of the sumps (point of resistance) changed since 2003, the greatest change being a 2.99 feet higher elevation, the average being an elevation increase of 0.29 feet. The basis for the sump bottom changes is unknown.

- The 2011 average leachate elevation is only 0.2 feet higher than baseline (2003).

- Only one sump (7-4) has used 70% of its freeboard (available sump column from baseline elevation to top of casing elevation). The next closest sumps have used only 12% and 17% of their freeboard (46-2 and 46-1, respectively). The remaining 80 sumps have over 88% of their freeboard available.

- Approximately 87% of the sumps elevations remain below pre-pumping elevations. Only three sumps exhibit a loss of freeboard greater than 10%.

Based on the data analysis and an understanding of the limitations of these data, leachate levels have generally recovered and remain below pre-pumping levels and have nearly stabilized, as shown in Attachments 5.B and 5.C. Based on the requirement for Horizontal Flow Barrier analysis established in the Commonwealth's IMP Work Plan and approved by EPA, these data do not evidence a rise in leachate levels from the exterior of the site to the interior.

The ROD required (page 135) a statistical analysis be performed in reviewing leachate level data and evaluating the need for installation of a horizontal flow barrier. The statistical analysis performed in 2012 included a categorization of sumps based on water level trends. These trends were fit to Theis recovery curves. Residuals from these curves were also analyzed. The results from this analysis were considered to by highly statistically significant. The rate of change for the leachate levels tended to be slow (typically from 0.01 less than 0.1 feet per year). The rates show a decreasing trend and that trend is predicted to continue. Statistically, the system is capable of detecting small changes in leachate levels. Nevertheless, the increases and decreases detected do not appear to indicate the presence of significant horizontal infiltration at any point in the monitoring system. The conclusions of the Statistical Analysis support the overall conclusion that a horizontal flow barrier is not needed based on the requirements set forth in the Record of Decision, Consent Decree/Statement of Work, and IMP Work Plan.

A review of fracture studies performed at Maxey Flats, the slow recharge rate of sump 7-4, and the fact that the performance of sump 7-4 is unique confirm that water level changes observed in sump 7-4 are not indicative of significant horizontal recharge at the site. A loss of freeboard comparison to liner maintenance and site topography is included in Attachment 5.D. No other sump depicted nearly as much change in freeboard use percentage as 7-4. The freeboard comparison table is included in Attachment 5.E.

A pattern of significant horizontal recharge is not evident based upon a review of these data. Leachate levels that have increased were random across the site and were not located at the edges of the liner. When one particular sump may have increased, neighboring sumps did not exhibit similar level changes indicating a lack of connectivity within the trenches. The few sumps that had any increase were dispersed throughout the site. Localized areas of leachate elevation increases that may be present either now or in the future, may require increased monitoring by the Commonwealth and with ultimate incorporation into their Leachate Management plan. Of course, a review of any sump demonstrating an unexpected, sudden and localized increase in levels should include a maintenance review, including liner integrity and associated repairs, pursuant to the Commonwealth's IMP Work Plan.

Pursuant to the Commonwealth's IMP Work Plan, potentiometric surface maps that utilize

leachate levels from the trench sumps and water elevations in perimeter wells are prepared annually and submitted in its annual report to EPA. In December 2011, the Commonwealth submitted a Technical Change request to EPA to eliminate preparation of the potentiometric surface maps as the Commonwealth has deemed these maps inconclusive. This technical change request is pending. Sump bottoms are generally completed in either the Lower Nancy formation or the more shallow Lower Marker Bed. Based upon the construction of these sumps, the water levels measured in the sumps are not ideal for creating a surface map of the leachate. In any case, a review of the Commonwealth's maps confirm what was reported in the RI and ROD that a leachate mound is likely present towards the center of the site and the water level decreases as it approaches the perimeter.

4. EDB Discharge Flow Monitoring

Pursuant to the ROD and IRP Design, discharge from the East Detention Basin should be released to the East Main Drainage Channel at a rate not to exceed predevelopment flow conditions. Following storm events exceeding 2.8 inches rainfall in 24 hours (2-year storm event or greater), the Commonwealth is required to collect recordings and report findings. These results are then evaluated by comparing the actual EDB outflow rates and rainfall to the predicted flow rate/rainfall curve used in the outfall design (included in Appendix E of Appendix C of the IMP Work Plan). If this screening comparison shows flow rates above predevelopment levels, then the design model (SEDCAD version 4.0) must be run to evaluate actual hydrographic conditions. The following table presents the design flows for defined storm events.

Table VI-3

Storm Event Flow Comparison

24-hour Storm Event (years)	Rainfall in a 24-hour period (inches) [1]	Pre-IRP EDB discharge Flow (cfs)[2]	Post IRP EDB Design Discharge Flow (cfs) [2]
2	2.87	48	11
10	4.2	86	24
25	4.9	118	32
100	5.8	146	44

Notes:

(1) – Design Analysis Report, IT Corporation, April 2001, Sheet 8 of 15.

(2) – PSVP, Interim Maintenance Period Work Plan, Appendix C, Commonwealth of Kentucky, March 2003.

During this five-year review period, only one storm event that met the criteria was reported by the Commonwealth. The data from that event are provided in Table VI-4 below.

Table VI-4

Reported Storm Events 2007-2011

Date of Storm Event	**24-hour Maximum Rainfall Interval**	**Accumulated Rainfall for the Rain Interval**	**Peak Flow During Storm Events (CFS)**
May 2, 2010	2MAY10 begin 0315 hours, End 3MAY10 at 0130 hours	5.39 Inches	22.7 cfs

The May 2, 2010 storm event rainfall amount of 5.39 inches was between the criteria for a 25-year and 100-year storm event of 4.9 and 5.8 inches, respectively. In comparing the peak flow from the May 2010 event of 22.7 cubic feet per seconds (cfs) out of the EDB with the predevelopment flow rates the basin and outfall were designed for, 32 cfs for a 25-year storm event and 44 cfs for a 100-year storm event, the actual flow from the EDB was below the design criteria. Therefore it was not necessary for the Commonwealth to run the design model (SEDCAD Version 4.0) pursuant to the IMP Work Plan PSVP.

Although the only storm event during the past five years that met the reporting criteria occurred in 2010, the amount of total rainfall during 2011 affected the East Main Drainage Channel (EMDC) as discussed previously in Section III. A.1, Erosion Monitoring. The Annual Rainfall by year at the site is provided in Table VI-5 below.

Table VI-5

Annual Rainfall at Maxey Flats Disposal Site

Year	Annual Rainfall (inches)
2007	31.63
2008	39.07
2009	45.52
2010	41.85
2011	54.24

B. Contaminant Monitoring

1. Surface Water Sampling Subject to Drinking Water Standard (4 mrem/yr)

Surface water samples were collected in drainage channels and streams both inside and outside the site boundary, at locations 106, 122C, 103E, 102D (REI) and background location 122A.

Based on the Commonwealth's collection of historical data and data obtained during the IRP, the configuration of the site, the mobility of tritium, and the use of realistic exposure pathways, compliance testing and monitoring related to source control focuses on water borne pathways for tritium. Tritium is the most mobile and easily detectable contaminant at the site. Other radiological and chemical contaminants have not been historically detected in soils, groundwater, and surface water unless tritium activities approach action levels. Data relating to the activities of radiological contaminants in different media can be found in Radiation Health Branch historical annual reports and the Remedial Investigation Report (Ebasco, 1989). As the license administrator, Radiation Health Branch collects radiological data in addition to tritium. Although outside of the CERCLA reporting requirements, EPA reviews these data annually.

The IMP Work Plan (Appendix C, PSVP, Figure 13) specifies that sampling and analysis for other contaminants will not occur unless any annual average tritium concentration exceeds 50% of the screening assessment (20 pCi/ml) during the previous five years. None of the surface water sampling locations monitored for the drinking water standards exceeded 50% of the screening assessment for tritium (dose derived equivalent concentration).

Locations 106, 122C, and 103E are within the perennial streams in the buffer zone area. Location 103 E is in Drip Springs Creek, 106 in No Name Creek, and 122C in Rock Lick Creek (See Figure A.1). Access to these streams within the buffer zone will be limited in perpetuity. This action precludes members of the public from being continuously exposed to radionuclides within the buffer zone.

Location 102D is outside of the buffer zone and after confluence of the three creeks surrounding the site. This location serves as the point of compliance for the 4 mrem/yr drinking water standard since it monitors exposure to the reasonably exposed individual (REI).

Location 122A is upstream of the confluence of No Name Creek with Rock Lick Creek and provides a background measurement.

Attachment 6.A.1 shows the annual average tritium concentrations from baseline (2001) through 2011 and the monitoring points location on the aerial map. Graphs for each sampling location are included in Attachments 6.A.2.1 through 6.A.2.5 and compare measured results to the 20 pCi/mL dose-derived annual average concentration for tritium (4 mrem/yr). The dose limit for the Drinking Water Standard (4 mrem/yr annual average) is derived from an annual average tritium concentration of 20 pCi/mL, which is used as a screening level. As shown in Figure A.1 and B.1, the annual average concentrations from baseline measurements through 2011 data were far below the 20 pCi/ml screening level.

Over the last ten years of monitoring data for location 102D, the maximum tritium concentration was 0.93 pCi/ml in 2007. The average concentration over this period is 0.72 pCi/ml. The screening limit of 20 pCi/ml is over two orders of magnitude greater than the maximum concentration of 102D. These data are likely too low to trend accurately. Data from upstream locations such as 103E and 106 exhibit clear downward trends.
The second five-year review noted that pursuant to the IMP Work Plan and based upon the

tritium concentrations over the past five years, location 106 could be dropped from the monitoring program and surface water sampling could be decreased to quarterly at four locations: 102D, 122A, 122C, and 103E. The Commonwealth chose not to implement the reduction in sampling and analysis.

2. Surface Water Sampling at Locations Subject to 25mrem/yr Standard

Compliance with the 25 mrem/yr standard (Section 18 of 902 KAR 100:022) is to be based on combined doses from air, water, drinking water and soil pathways. At the completion of the IRP, the only viable exposure pathway was through surface water runoff. The points of compliance with the 25 mrem/yr standard are at the drainage channels at the former licensed site boundary, measured at locations 107C, 143 and 144. These locations were chosen to be conservative and to ensure early detection of releases from within the Site boundary. A concentration of 125 pCi/ml is the dose-derived concentration for continuous tritium exposure equivalent to 25 mrem/yr total effective dose equivalent. The action level for these locations is 100 pCi/ml.

Attachment 6.B.1 shows annual average tritium concentrations for these locations and where they are on the aerial map. Individual graphs for these locations are included in Attachments 6.B.2.1 through 6.B.2.3.

Average tritium concentration at location C107 during the IMP is 11.17 pCi/ml, which is an order of magnitude below the action level of 100 pCi/ml and data over the IMP exhibit a general downward trend. Tritium concentrations at location 143 also shows a downward trend and the concentrations are over three orders of magnitude under the screening limit of 100 pCi/ml for tritium (IMP average concentration is 0.07 pCi/ml). Location 144 is closer to the restricted area and has higher tritium concentrations than the other two locations further downstream. The IMP average tritium concentration here is near 50 % of the screening level and exhibits more variability than the other locations. During this five-year review period, individual annual average tritium concentrations exceeded the 50% of the screening assessment level, which triggers the need for additional radionuclide, metal, and volatile organic analysis pursuant to the Commonwealth's IMP Work Plan, Appendix C, Performance Standards Verification Plan.

3. Alluvial Wells

The alluvial ground water within the Site boundary is treated as a potential source of drinking water under CERCLA. Fourteen alluvial wells were installed during the IRP to allow radionuclide monitoring or indicator contaminants. Access to the alluvium within the buffer zone is controlled by the Commonwealth; therefore, these wells cannot be used as a drinking water source and do not represent a potential radiological dose. Based on tritium concentrations during the first five years of the IMP, which were inconsequential relative to the drinking water standard or any actionable site-specific criterion, radionuclide sampling was suspended in the following eight alluvial wells: AW-3, 4, 5, 8, 9, 13, 14, 15 and Alt-1. In the PSVP, the four locations listed below were chosen to be monitored quarterly for two years of the IMP (2004 and 2005) and annually thereafter. These locations were selected due to their representation of hydraulic communication with the surrounding creeks and they monitor the area between the site and the surface water monitoring locations.

- AW-6 is representative of ground water leaving the buffer zone via Drip Springs Creek alluvium;

- AW-7 is representative of ground water in the alluvium in No Name creek, downgradient from the East Main Drainage Channel;

- AW-10 is representative of ground water in Rock Lick Creek alluvium, downgradient from the South Drainage Channel; and

- AW-12 is representative of ground water leaving the buffer zone in Rock Lick Creek alluvium.

During this five-year period, the Commonwealth sampled AW-6, AW-10 and AW12 on an annual basis. Based upon slightly higher tritium concentrations than the previously discussed wells, AW-1 and AW-7 continued to be monitored on a quarterly basis. The sampling results are provided in Attachments 6.C.1 and 6.C.2. There were no exceedances of the tritium action level of 20 pCi/ml during the entire monitoring period. The highest average tritium concentrations over the entire IMP (2004 through 2011) are for AW-7, 6.06 pCi/ml, and AW-1, 4.8 pCi/ml, which are still well below the screening concentration of 20 pCi/ml. Individual alluvial well locations are provided in Attachments 6.C.3.

4. Dose Evaluation

Dose evaluations are required annually for the surface water and groundwater monitoring analysis results in accordance with Appendix D (Radiological Dose Calculation Methodology) of Appendix C (Performance Standards Verification Plan) of the approved IMP Work Plan. The Dose evaluation is a two-step process, where the first step is an initial screening assessment comparing analytical results to the dose derived tritium concentrations for the 4 mrem/yr and 25 mrem/yr standards of 20 pCi/ml and 125 pCi/ml, respectively. If annual average concentrations exceed the dose derived requirements, then the second step in the dose evaluation is performed, which includes accounting for actual water availability and actual occupancy using a then current and scientifically accepted method such as ICRP 30). Based on tritium concentrations to date, which have not exceeded the initial screening levels, only the first step of the dose evaluation has been performed.

Site Inspection

The EPA RPM performed a Site Inspection on April 10 and 11, 2012, accompanied by representatives of the Commonwealth of Kentucky and the Settling Private Parties. The inspection checklist is included in Attachment 7.A. Photographs of the inspection and collection of the liner samples for the independent liner inspection are included in Attachment 7.B. The purpose of the inspection was to assess the protectiveness of the remedy, including all barriers to restrict access and the integrity of the interim cap. Institutional controls were evaluated by visiting the Fleming County Clerk's office to review the property deed. EPA and the Commonwealth confirmed that appropriate restrictions to the deed had been filed. A copy of the deed restrictions are included in Attachment 7.C.

No significant issues have been identified at any time regarding the interim cap or surface water drainage structures. At one general site visit and O&M inspection during this review period, an angled pipe in the H-Flume from the East Detention Basin was observed to be missing its cap, allowing water to flow out the side of the H-Flume. The Commonwealth replaced the cap and the amount of flow out of this pipe was conservatively calculated. The flow amount, given the angle and volume, was negligible and would not affect the flow calculated from the outfall of the EDB.

During the inspection, the difficulty to make the extrusion welds adhere to the existing liner was discussed and the extrusion welds, both old and newer welds, were observed. Photos of deteriorating welds are included in the inspection photos in Attachment 7.B. The Commonwealth reports that scarifying the liner aids in adherence of the extrusion weld to the existing liner. Achieving a positive vacuum box test for the extrusion welds increases in difficulty based on the age of the liner.

At various locations around the liner, a round imprint under the liner was observed as seen in the photographs. The liner inspection company collected GPS coordinates at three of these locations but a comparison to abandoned sump locations proved inconclusive. Information as to whether these under the liner protrusion are abandoned or dormant sumps will be investigated prior to final closure. The Commonwealth will continue to monitor these locations with respect to the interim cap.

The institutional controls that are in place include prohibitions on the use of ground water, excavation activities, disturbance of the interim cap, and any other activities or actions that might interfere with the implemented remedy. No activities were observed that would have violated the institutional controls.

Interviews

Interviews were conducted with various parties regarding the site during the site inspection on April 10 and 11, 2012. Copies of the full interviews are included in Attachment 8. Although the Maxey Flats Concerned Citizens Group disbanded during the IRP, EPA RPM Pam Scully tried to contact former President of the Maxey Flats Concerned Citizens Group, Ed Story, but he could not be reached.

Mr. Matthew McKinley, manager of the Radiation Health Branch under the division of Public Health for the Commonwealth of Kentucky, was interviewed on April 11, 2012. He reported he was fairly happy with where the project stood now but that the process had been difficult. He stated that the remedy has decreased the infiltration of water into the trenches and, “any decrease of infiltration is a positive thing.” McKinley suggested the project document discussions for future decision-making and that reports and assessments produced should be more straight forward with less inferences so that “an uninvolved individual could follow and understand this complex project.” McKinley agreed Maxey Flats did not pose an unacceptable risk to human health and the environment at this time.

Mr. Scott Wilburn, the Commonwealth's Environmental Control Supervisor for the Maxey Flats Project was interviewed. Mr. Wilburn expressed concerns that liner repairs are more expensive than anticipated, but had no other concerns relative to O&M at the site. Mr. Wilburn suggested that entry in the FCP [Final Closure Period] is warranted.

Mr. Tom Stewart, an Environmental Technologist for the Maxey Flats Project, was interviewed. Mr. Steward noted problems with the cathodic protection system and difficulty in repairing the exposed liner. He also noted O&M cost savings resulting from changing vials from glass to plastic in the lab.

Mr. Dwayne Price with Fleming County Emergency Management Systems was interviewed by phone on 21AUG12. Mr. Price believes the site has adequately addressed a previous security concern. He said that nearby residents complain about the site due more to fear than about anything currently happening. Mr. Price also reported that the Maxey Flats staff is always good about answering questions and keeping the community informed.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The review of documents, ARARs, risk assumptions, and the results of the site inspection indicates that the remedy is functioning as intended by the ROD. Leachate removal and disposal, building demolition, interim cap construction, and storm water controls are complete. Environmental monitoring and maintenance of the interim cap are ongoing. Institutional controls to protect the containment areas have been implemented.

The primary objective of the interim cap is to allow the trenches to stabilize by natural subsidence prior to construction of the final cap. The monitoring data demonstrates that very little subsidence has occurred since the interim cap was constructed. Based upon the age of the waste (from 35 to nearly 50 years), the passive action of compacting the trenches during cap construction (e.g. use of heavy equipment and the weight of approximately 250,000 cubic yards of soil fill), and the results of subsidence monitoring, EPA does not anticipate substantial trench subsidence in the future.

The interim cap has been effective at preventing recharge of the trenches. Following trench leachate pumping (1998-2000), recharge of the sumps was expected due to the formation water. The extent of recharge and the timeframe was not reasonably predictable, other than recharge (Attachment 5) to pre-pumping conditions was not expected. Only one sump at the site has shown any significant recharge, and both EPA and the Commonwealth agree that this sump 7-4 is anomalous, will likely level off around the pre-pumping level, and is not in any way indicative of site-wide horizontal infiltration. The selected remedy is one of natural stabilization. The remedy requires time to work (half life of tritium is 12.08 years). From visual data presentations (see Attachment 6), tritium concentrations at the monitoring locations are stable or declining. Even though short-term spikes may occur, this overall trend is expected to continue, driven by the physics of tritium decay. Annual concentrations at the REI, location 102D, are too low to trend and well below the tritium screening level of 20 pCi/ml.

Operation and maintenance of the interim cap and storm water controls by the Commonwealth have been effective. The Commonwealth monitors erosion of existing drainage channels, subsidence of the interim cap, leachate levels in the trenches, surface water discharge rates, tritium concentrations

in surface water, and tritium concentrations in ground water. The Commonwealth maintains a significant level of staff at the facility to perform the required operation and maintenance activities

Monitoring frequencies and locations could be optimized based on the data review, pursuant to the Commonwealth's IMP Work Plan, Appendix C, PSVP. Consideration should be given to dropping location 107C and 143 from the monitoring program or modifying their monitoring frequency as the tritium concentrations at both locations are well below the action level and appear to be declining.

Institutional controls have been verified. No activities have been observed or documented that violate the institutional controls.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy.

Changes in Standards and To Be Considered

A list of chemical and action-specific ARARs is included in Attachment 9. In this section, the ARARs as listed in the ROD are compared to the new or modified chemical-specific requirements and are identified in Table VII-1 for groundwater, Table VII-2 for surface water, and Table VII-3 for radionuclides.

Because the Commonwealth's IMP Work Plan, Appendix C (Performance Standards Verification Plan), states that analysis for contaminants other than tritium will not occur unless any annual average concentration of tritium exceeds 50% of the applicable screening assessment during the previous five years, no baseline data or current groundwater or surface water sampling data are available for the complete list of indicator contaminants (other than tritium) in the ROD to compare to the new or modified requirements listed in Tables VII-1, VII-2, and VII-3. The Commonwealth plans to conduct a full suite of sampling for both groundwater and surface water indicator contaminants subsequent to this Five Year review. This sampling is required because, based on the third Five Year review, the annual average concentration of one surface water sampling location exceeded the 50% of the screening assessment for tritium three different years this review period and

therefore triggers the collection of additional analytical data for all contaminants. When the data are available, the EPA will compare the data against the newly promulgated or modified requirements. If a particular contaminant exceeds the new or modified requirement, EPA will evaluate additional actions necessary for assessment, including obtaining data necessary to provide annual average concentrations. While ARARs are generally frozen at the time of the ROD signature, a new cleanup level can be adopted if the currently calculated risk associated with the old standard (in the ROD) is outside of EPA's acceptable risk range for Superfund remediation. In such a case, the old standard would be considered unprotective.

Table VII-1

Applicable, Relevant and Appropriate Requirements Evaluation
For the Maxey Flats Disposal Site Selected Five-Year Review

Surface Water

(criteria in µg/L unless otherwise noted)			
Chemical	1991 ROD ARAR[1]	New or Modified Requirement[2]	Are the New or Modified Different from ROD ARAR?
	Aquatic Life Acute (1-Hour Average)	Warm Water Aquatic Habitat - Acute[3]	
Nickel	790/1400/2500[d]	470[g]	Yes
Vinyl Chloride	[b]	[b]	No
Benzene	5,300[f]	[b]	No
Chloroform	28,900[f]	[b]	No
1,2-Dichloroethane	118,000[f]	[b]	No
Trichloroethylene	45,000[f]	[b]	No
Arsenic	[b]	340	Yes
Lead	34/82/200[d]	65[k]	Yes
Bis-(2-ethylhexyl) phthalate	940	[b]	No
Chlorobenzene	250[f]	[b]	No
Toluene	17,500[f]	[b]	No
	Aquatic Life Chronic (4-Day Average)	Warm Water Aquatic Habitat - Chronic[4]	
Nickel	88/160/280[e]	52[h]	Yes
Vinyl Chloride	[b]	[b]	No
Benzene	[b]	[b]	No
Chloroform	1,240[f]	[b]	No
1,2-Dichloroethane	20,000[f]	[b]	No
Trichloroethylene	21,900[f]	[b]	No
Arsenic	[b]	150	Yes
Lead	1.3/3.2/7.7[e]	2.5[l]	Yes
Bis-(2-ethylhexyl) phthalate	3	[b]	No
Chlorobenzene	50[f]	[b]	No
Toluene	[b]	[b]	No
	Human Health Fish[a]	Human Health Fish[a]	
Nickel	100	4,600	Yes
Vinyl Chloride	5,246[c]	2.4[i]	Yes
Benzene	400[c]	51[i]	Yes
Chloroform	157[c]	470[i]	Yes
1,2-Dichloroethane	2,430[c]	37[i]	Yes
Trichloroethylene	807[c]	30[i]	Yes
Arsenic	0.175[c]	0.14[j]	Yes
Lead	[b]	[b]	No
Bis-(2-ethylhexyl) phthalate	[b]	2.2	Yes
Chlorobenzene	488	1,600	Yes
Toluene	424,000	15,000	Yes

Notes for Table VII-1:

1. From 1991 ROD, Appendix B – Clean Water Act – National Recommended Water Quality Criteria
2. From Kentucky Surface Water Standards, 401 KAR 10:031 (Recodified from 401 KAR 5:031; effective July 6, 2009); incorporating by reference, EPA water quality criterion guidelines in "Water Quality Standards Handbook-Chapter 3", EPA August 1994, EPA-823-B-94-005a.
3. Acute = protective of aquatic life based on one hour exposure that does not exceed the criterion.
4. Chronic = protective of aquatic life based on ninety-six hour exposure that does not exceed the criterion of a given pollutant more than once every three years on average.

a. Fish consumption only; Assumed intake - 6.5 grams of fish per/dy for 70-yr lifetime; adult body weight 70 kg.
b. Numeric Water Quality Criteria are not available for this contaminant. Section 4 of 401 KAR 10:031 provides that in the absence of acute criteria in Table 1, Section 6 of the regulation, for other substances known to be toxic but not listed in the regulation, the allowable instream concentration shall not exceed the LC_1 or one-third LC_{50} concentration derived from toxicity tests on representative indigenous or indicator aquatic organisms.
c. The value was calculated assuming risk level of 10^{-5} per lifetime.
d. The toxicity of nickel and lead are dependent on hardness in the water column. According to 1991 ROD, Appendix B - Water Quality Criteria Table, acute criterion was calculated using the formula: $e^{(0.8460[\ln (\text{hardness})] + 3.3612)}$ assuming hardness equal to 50, 100, and 200 mg/l as $CaCO_3$.
e. According to the 1991 ROD, Appendix B Water Quality Criteria Table, chronic criterion was calculated using the formula: $e^{(0.8460 [\ln (\text{hardness})] + 1.1645)}$ assuming ha3rdness equal to 50, 100, and 200 mg/l as $CaCO_3$.
f. Lowest observable effect.
g. The current acute criterion for nickel is expressed as a formula: $e^{(0.8460 [\ln (\text{hardness})] + 2.255)}$; value provided corresponds to a hardness of 100 mg/L.
h. The current chronic criterion for nickel is expressed as a formula: $e^{(0.8460 [\ln (\text{hardness})] + 0.0584)}$; value provided corresponds to a hardness of 100 mg/L.
i. This criterion is based on carcinogenicity of 10^{-6} risk.
j. State criterion not available for this contaminant. Criterion listed in table is from EPA's National Recommended Water Quality Criteria (last checked September 7, 2012); based on carcinogenicity of 10^{-6} risk.
k. The current acute criterion for lead is expressed as a formula: $e^{(1.273 [\ln (\text{hardness})] - 1.460)}$; value provided corresponds to a hardness of 100 mg/L.
l. The current chronic criterion for lead is expressed as a formula: $e^{(1.273 [\ln (\text{hardness})] - 4.705)}$; value provided corresponds to a hardness of 100 mg/L.

Table VII-2

Applicable, Relevant and Appropriate Requirements Evaluation
For the Maxey Flats Disposal Site Selected Five-Year Review
Groundwater

Ground Water COCs	1991 ROD ARARs (µg/L)	New or Modified Requirement[a] (µg/L)	Different?
Arsenic	50	10	Yes
Benzene	5	5	No
Bis (2-Ethylhexyl) Phthalate	4	6	Yes
Chlorobenzene	100	100	No
Chloroform (Trihalomethanes)	100	80	Yes
1, 2-Dichloroethane	5	5	No
Lead	50	15	Yes
Nickel	100	--[b]	Yes
Toluene	1000	1000	No
Trichloroethylene	5	5	No
Vinyl Chloride	2	2	No

a. Based on National Primary Drinking Water Regulations 40 CFR Part 141, available at: http://water.epa.gov/drink/contaminants/index.cfm (accessed 8/7/12).
b. Proposed standard not promulgated.

Table VII-3

Applicable, Relevant and Appropriate Requirements Evaluation For the Maxey Flats Disposal Site Selected Five-Year Review

Radionuclides

Drinking water standards

Radionuclides	1991 ROD ARARs	New or Modified Requirements	Different?
Beta particle and photon radioactivity	4 mrem/year	4 mrem/year	No
Gross Alpha particles	15 pCi/l	15 pCi/l	No
Radium-226 and Radium-228 (Total)	5 pCi/l	5 pCi/l	No
Uranium	--	30 ug/L	Yes

a. 902 KAR 100:022 and 10 CFR 61.41, Federal Licensing Requirements for Land Disposal of Radioactive Waste

Discharge of Radionuclide to Surface Water[a]

Radionuclide	1991 ROD ARARs [b]	New or Modified Requirements [c]	Different?
Total whole body exposure (all media)	25 mrem/yr[d]	25 mrem/yr[d]	No
Strontium -90	0.5 pCi/ml	0.5 pCi/ml	No
Plutonium -238	0.02 pCi/ml	0.02 pCi/ml	No
Thorium -232	0.03 pCi/ml	0.03 pCi/ml	No
Americium -241	0.02 pCi/ml	0.02 pCi/ml	No
Cobalt -60	3 pCi/ml	3 pCi/ml	No
Cesium -137	1 pCi/ml	1 pCi/ml	No
Carbon -14	30 pCi/ml	30 pCi/ml	No
Hydrogen -3 (Tritium)	1000 pCi/ml	1000 pCi/ml	No
Technetium-99	60 pCi/ml	60 pCi/ml	No
Plutonium -239	0.02 pCi/ml	0.02 pCi/ml	No
Iodine-129	0.2 pCi/ml	0.2 pCi/ml	No
Radium-226	0.06 pCi/ml	0.06 pCi/ml	No

a. Section 8.2 and Appendix B in the ROD identified limits for occupational and general public exposure to radionuclides in air and water "effluents." Limits for exposure to the general public were based on exposure in unrestricted areas. Because the interim cap is in place and air monitoring has already eliminated

concern for "effluent" exposure by the air pathway, only exposure by water pathway is being evaluated in this review to determine if standards have changed since the ROD was signed. 902 KAR 100:019, Section 11, provides that a licensee may show compliance with dose limits for individual members of the public by demonstrating that the annual average concentrations of radioactive material released in gaseous and liquid effluents at the boundary of the restricted area do not exceed values specified in 10 CFR Part 20, Subpart O, Appendix B; *and* if an individual were continually present in an unrestricted area, the total dose from external sources shall not exceed 2 mrem in an hour and 50 mrem in a year.

b. Based on Federal Register notice on NRC revisions to Table II, 56 Federal Register 23409, May 21, 1991.

c. Based on 902 KAR 100:019, Section 11 (formerly 902 KAR 100:025), 10 CFR 61.41 and 10 CFR Part 20, Subpart O, Appendix B: Table 2, Column 2, captioned "Water".

d. 902 KAR 100.022 and 10 CFR 61.41 require that combined doses from air, water, drinking water and soil pathways shall not exceed 25mrem/yr effective dose equivalent to the whole body, 75 mrem to the thyroid, and 25 mrem to any other organ of any member of the public. Compliance with the 25 mrem/yr standard is measured at the current licensed site boundary. Water runoff is the only viable pathway and tritium is the indicator contaminant being used to monitoring compliance with this standard.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

The exposure assumptions used to develop the Risk Assessment included exposures to older child trespassers, adult trespassers, and offsite individuals under a number of different conditions. Changes in the toxicity factors have been accounted for in the new or modified Chemical-Specific requirements above. There is no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy.

Expected Progress Towards Meeting RAOs

Remedial action objectives from the ROD are being met or are expected to be met in the future. The continued release of contaminants to bedrock, groundwater, sediment, and surface water has been mitigated at most of the monitoring points and is expected to be mitigated site wide in the future. Exposures to contaminants are limited and under control. Natural stabilization has been allowed, drainage has been controlled, and a monitoring program has been implemented.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No ecological targets were identified during the baseline ecological risk assessment and none were identified during the five-year review. Therefore, monitoring of ecological targets is not necessary. Surface water meets radiological health-based standards as monitored at the point of compliance. No weather related events have affected the protectiveness of the remedy. There is no information that calls into question the protectiveness of the remedy.

Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD. There have been no changes to the physical conditions of the site that would affect the protectiveness of the remedy. All IRP Performance standards have been met and ARARs pertinent to the IRP and the IMP to date have been met. Most ARARs for treating and containing waste, i.e. the overall remedy, at the site have been met. There have been changes in the toxicity factors for contaminants of concern that will be evaluated when additional data are collected by the Commonwealth. There is no information that calls into question the protectiveness of the remedy.

VIII. Issues

Although no deficiencies that affect the protectiveness of the remedy were noted during the third five-year review, the Commonwealth of Kentucky should have collected additional groundwater and surface water monitoring data pursuant to their IMP Work Plan for the Five-Year Review.

IX. Recommendations

No recommendations or required actions are needed to correct deficiencies affecting protectiveness based on this five-year review.

However, the Commonwealth of Kentucky should collect data pursuant to their IMP Work Plan that remains outstanding at the time of this Five Year Review. EPA will review the analytical data upon receipt and prepare recommendations based on that data, if necessary.

Other comments

Based upon the Horizontal Flow Barrier evaluation and statistical analysis, a Horizontal Flow barrier is not needed at this time. This information will be included in an ESD subsequent to the completion of this Five Year Review. EPA still plans to address the discontinuation of the continuous level monitors in the ESD as well.

As stated in the ROD, "Risks associated with the MFDS are primarily due to potential exposure to radionuclides rather than the very low concentrations of chemical constituents detected at the site" (110). The Commonwealth's IMP Work Plan, Appendix C, the Performance Standard and Verification Plan, states that analysis for other contaminants will not occur unless any annual average concentration of tritium exceeds 50% of the screening assessment (20pCi/ml or 100 pCi/ml as applicable) during the previous five years. Based on the third Five Year review, one sampling location exceeded the 50% of the screening assessment and therefore triggers the collection of additional analytical data, including radionuclides other than tritium and some volatile organic compounds. Inclusion of this tiered sampling approach in the ESD will be evaluated again following review of the sampling data.

Pursuant to the statements in the previous Five-Year Review, the Commonwealth and EPA have had numerous discussions and meetings relative to subsidence completion and initiation of the FCP. The Commonwealth has appropriated additional funding to implement the FCP (in addition to the trust accounts established pursuant to the CD) and, subsequent to the completion of this Five-Year Review, plans to provide documentation to EPA demonstrating that the trench stabilization criteria have been achieved. EPA's written approval of the Commonwealth's submission of meeting the trench stabilization criteria will initiate the FCP.

X. Protectiveness Statement

The selected remedy at the MFDS is expected to be protective of human health and the environment at the conclusion of the RA, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

XI. Next Review

The next five-year review for the review for the MFDS is required by September 2017, five years from the date of this review.

Attachment 1

Site Overview Map

Maxey Flats
Fleming County, Kentucky

Description:

Basemap Source:
Bing Imagery 2010

Map Legend:

Waterway

Spatial Projection:

Coordinate System:
Kentucky State Plane North
FIPS Zone: 1601
Units: Feet
Datum: NAD83

Plot Info:

File: Att1_SiteOverview.mxd
Project No.: 3088
Plot Date: 13 Aug., 2012
Arc Operator: HRVG
Reviewed by: NB

de maximis, inc.
450 Montbrook Lane
Knoxville, TN 37919
Main Phone: (865) 691-5052
www.demaximis.com

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Saint Paul, Minnesota 55108
Main Phone: (651) 842-4224
www.ddmsinc.com

1830000 1831000 1832000 1833000 1834000 1835000 1836000 1837000 1838000

278500 278000 277500 277000 276500 276000 275500 275000 274500 274000 273500 273000 272500

Drip Spring Creek

ROCK LICK CREEK ROAD

Rock Lick Creek

No Name Creek

STATE ROUTE 158

SCALE 0 500 1,000 2,000 3,000 Feet

R:\Projects\DEF\demax-15473088-MaxeyFlats\DataAnal\MXDs

Attachment 2.A

LEGAL NOTICE

The U.S. Environmental Protection Agency (EPA) Region 4 announces the completion of the third Five-Year Review for the Maxey Flats Disposal Site in Hillsboro, Fleming County, Kentucky. Five Year Reviews are intended to evaluate the protectiveness of cleanup actions taken at Superfund sites.

This site was placed on the National Priorities List in 1986. The Site Remedy is outlined in EPA's 1991 Final Record of Decision. The source of the contamination was covered with an interim cap in 2003, followed by an Interim Monitoring Period for monitoring the cap, alluvial groundwater, and surface water. The first Five-Year Review of the site was completed in September 2002 during cap construction. The second review took place in 2007, subsequent to the completion of the Initial Remedial Phase and during the Interim Maintenance Period, which includes maintenance and monitoring of the site. The Balance of the Remedial Phase will conclude with installation of a final earthen cap over the site. The remedy, Natural Stabilization, as implemented thus far is performing as expected and continues to be protective of human health and the environment.

The report is available for public review or copying at the Fleming County Public Library in Flemingsburg, Kentucky.

For further information, please contact:

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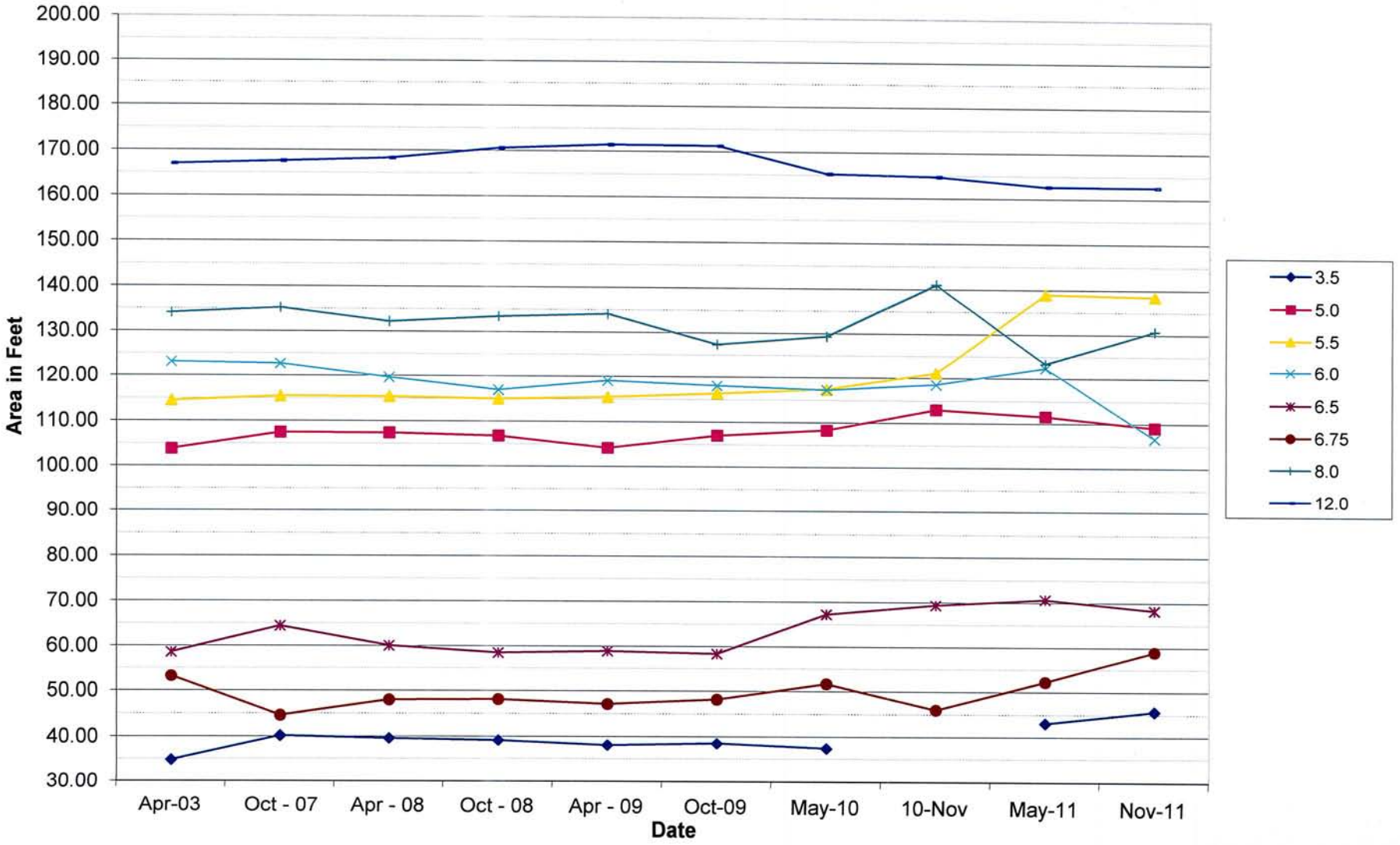
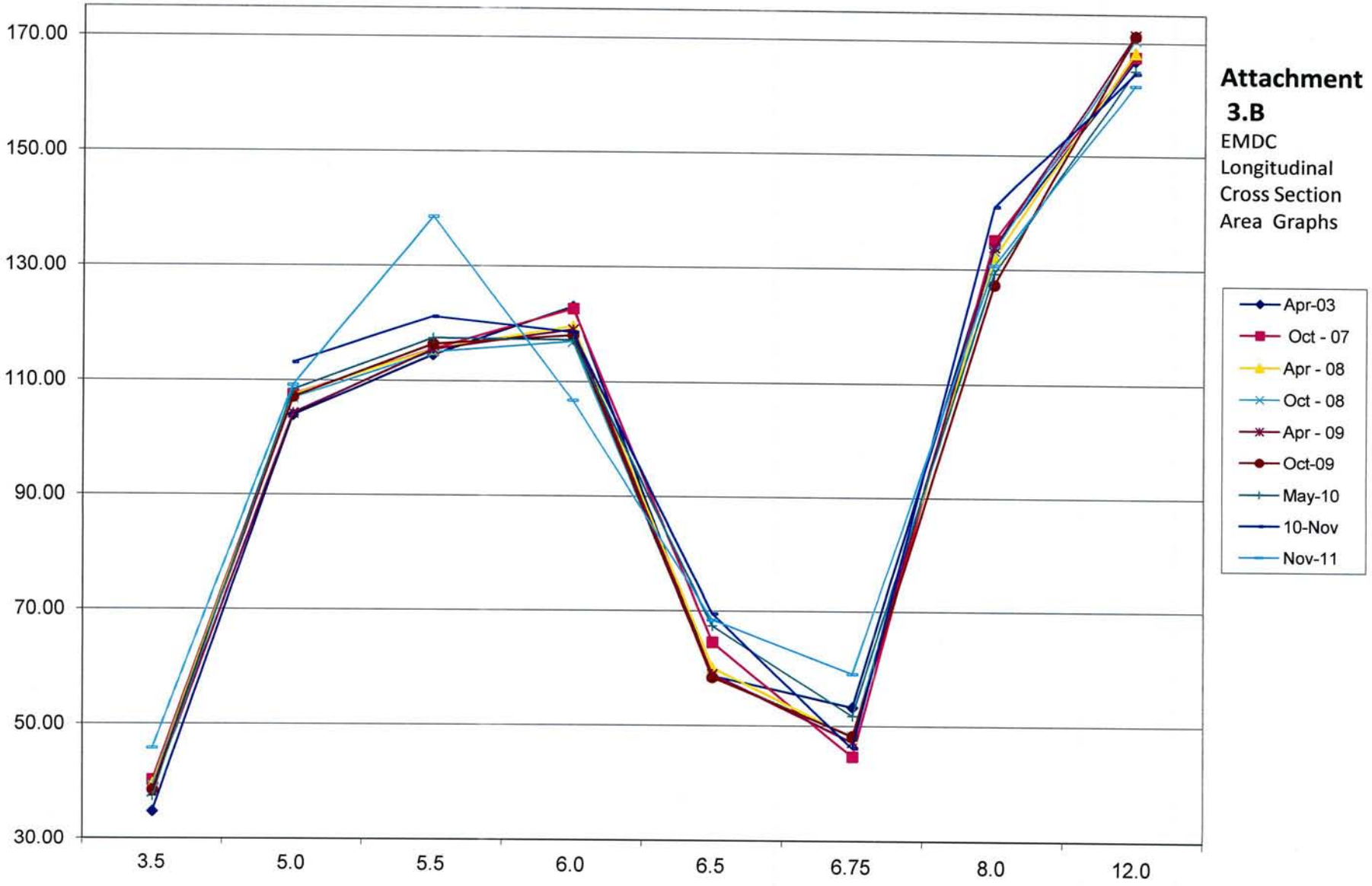
2012 Five-Year Review Correspondence Log
Attachment 2.B

Media Name	Contact	Publication Schedule/Circulation	Comments
Ashland Daily Independent 224 17th Street Ashland, KY 41101 (606) 326-2600	Alison Barlow Abarlow@dailyindependent.com	Daily 15,295 **Sunday** Largest circulation $	Talked to her 3/19/12 Publication on **Sunday, April 1st**
Lexington Herald Leader 100 Midland Avenue Lexington, KY 40508 (859) 231-1361 Legal Clerk Barbara Jarvis (859) 231-1460 Direct Line	Legal Clerk hllegalads@herald-leader.com	Daily 500,060 circulation **Sunday** largest circulation day Must be in by Wed AM	Spoke with Barbara 3/19/12 Publication on **Sunday April 1st**.
Maysville Ledger/Independent 41-43 West Second Street P.O. Box 518 Maysville, KY 41506 (606) 564-9091	Contact is Vanessa Minckler – Ext 231 vanessa.minckler@lee.net	Monday – Saturday 8500 Circulation **Saturday** largest circulation	Spoke with Vanessa on 3/19/12 Publication ran on **Saturday, March 31st**
Morehead News 722 West First Street Morehead, KY 40351 (606) 784-4116 (606) 784-7337 Fax	Sandy Jackson sjackson@themoreheadnews.com	Tuesday and Friday Deadline Friday for Tuesday Wednesday for Friday 5800 circulation **Friday is largest circulation**	Spoke with Sandy on 3/19/12 Publication ran on **Friday, March 30th**.
Fleming Shopper 222 Mt Carmel Avenue Flemingsburg, KY 41041 (606) 845-0771	Bonnie Fleming Flemingshopper@ALTIUSBB.com	Tuesdays only Must have by Friday 7200 circulation	Spoke with Bonnie,on 3/28/12. Ad ran on **Tuesday, April 3rd.**
Flemingsburg Gazette P.O. Box 32 Flemingsburg, KY 41041 (606) 845-9211	Tonya or Charles charles@kynewsgroup.com	Wednesdays only Must have by 1200 Tuesday 2400 paid circulation	Talked to Charles on 3/28/12. Ad ran on **Wednesday, April 4th.**

Attachment 3.A

East Drain Cross-Section Areas




170.00
150.00
130.00
110.00
90.00
70.00
50.00
30.00
3.5
5.0
5.5
6.0
6.5
6.75
8.0
12.0
Attachment 3.B
EMDC Longitudinal Cross Section Area Graphs
Apr-03
Oct - 07
Apr - 08
Oct - 08
Apr - 09
Oct-09
May-10
10-Nov
Nov-11

Statistical Evaluation

Cross Section Areas for MFP East Drain

Attachment 3.C EMDC Statistical Analysis

Cross Section	Baseline Apr-03	(Measured by USGS) Oct - 07	Apr - 08	Oct - 08	Apr - 09	Oct-09	May-10	(Measured by MFP) 10-Nov	May-11	Nov-11	Sample Mean	Sample Standard Deviation	Calculated t value	Table t value (99% CI, one-tail)	Is change statistically significant?	% Change from Baseline	> 25% Change from Baseline?
	Cross Section Data Area in Square Feet										**Statistical Analysis** Student's t-Test Method						
3.5	34.79	40.22	39.62	39.19	38.10	38.50	37.40	[1]	*43.14*[2]	45.72	40.24	14.468	NSD	1.397	NSD	NSD	NSD
5.0	103.90	107.56	107.50	106.89	104.24	107.12	108.40	113.11	111.68	109.19	108.41	2.653	5.100	1.397	Yes	-4.84	No
5.5	114.52	115.51	115.47	115.01	115.48	116.39	117.40	121.16	139.05	138.59	121.56	9.960	2.121	1.397	Yes	-17.37	No
6.0	123.07	122.68	119.62	116.93	119.00	118.02	117.21	118.50	122.31	*106.70*[3]	117.89	4.660	NSD	1.397	NSD	NSD	NSD
6.5	58.68	64.53	60.16	58.62	59.03	58.46	67.31	69.44	70.80	*68.34*[4]	64.08	5.061	NSD	1.397	NSD	NSD	NSD
6.75	53.26	44.65	48.07	48.19	47.18	48.24	51.73	46.06	52.28	*59.08*[5]	49.50	4.338	NSD	1.397	NSD	NSD	NSD
8.0	134.02	135.19	132.17	133.35	134.00	127.36	129.28	140.94	123.35	130.72	131.82	5.013	-1.318	1.397	No	2.52	No
12.0	166.96	167.60	168.31	170.56	171.45	171.25	165.22	164.72	162.67	162.57	167.15	3.521	0.162	1.397	No	2.70	No

Student's t Test Formula:

$$t = \frac{X_{s,\,aver} - X_{base}}{s / \sqrt{n}}$$

where $X_{s,\,aver}$ is the sample mean of the cross sectional area
X_{base} is the baseline cross sectional area
s is the standard deviation of the the sample
n is the sample number

NSD Nonsufficient Data

1 Measurement point damage resulted in wrong cross section being measured, determined by field log.

2 Measurement monuments were reestablished due to flood damage and drain repair, initial measurement.

3 South hillside slump resulted in reference monument S6A being displaced 1.26 ft horizontally and -0.40 ft vertically.

4 South hilside slump narrowed drain width of 6.5 by 1.5 ft.

5 Measurement mounments required resetting do to damage from flooding and fallen timbers. New monuments set 0.8' higher in elevation and 1.5' further apart. This resulted in an increase in area of 15.6 sq.ft. : **Area subtracted from this evaluation**

Attachment 3.D EMDC Erosion Monitoring
Cross Sectional Area

	Baseline 2003 (ft^2)	Fall 2010 (ft^2)	Fall 2011 (ft^2)	Spring 2011 (ft^2)
Section 1[a]	--	420.41	450.56	418.20
Section 2	102.97	144.97	160.33	131.78
Section 3	251.63	248.56	278.37	253.65
Section 4	152.25	229.45	242.16	220.23
Section 5	603.03	734.22	739.06	756.81
Section 6[b]	--	3,156.61	2,980.03	3371.32
Section 7[b]	--	189.42	178.88	192.83
Section 8[b]	--	493.11	453.41	453.41
Section 9[b]	--	82.12	72.12	65.60
Section 10	-0.08	30.42	39.27	38.50
Section 11	20.02	41.26	42.19	42.72

Notes:

a-Monument 1A was re-set in Fall 2010. Baseline for Cross Section 1 is now Fall 2010

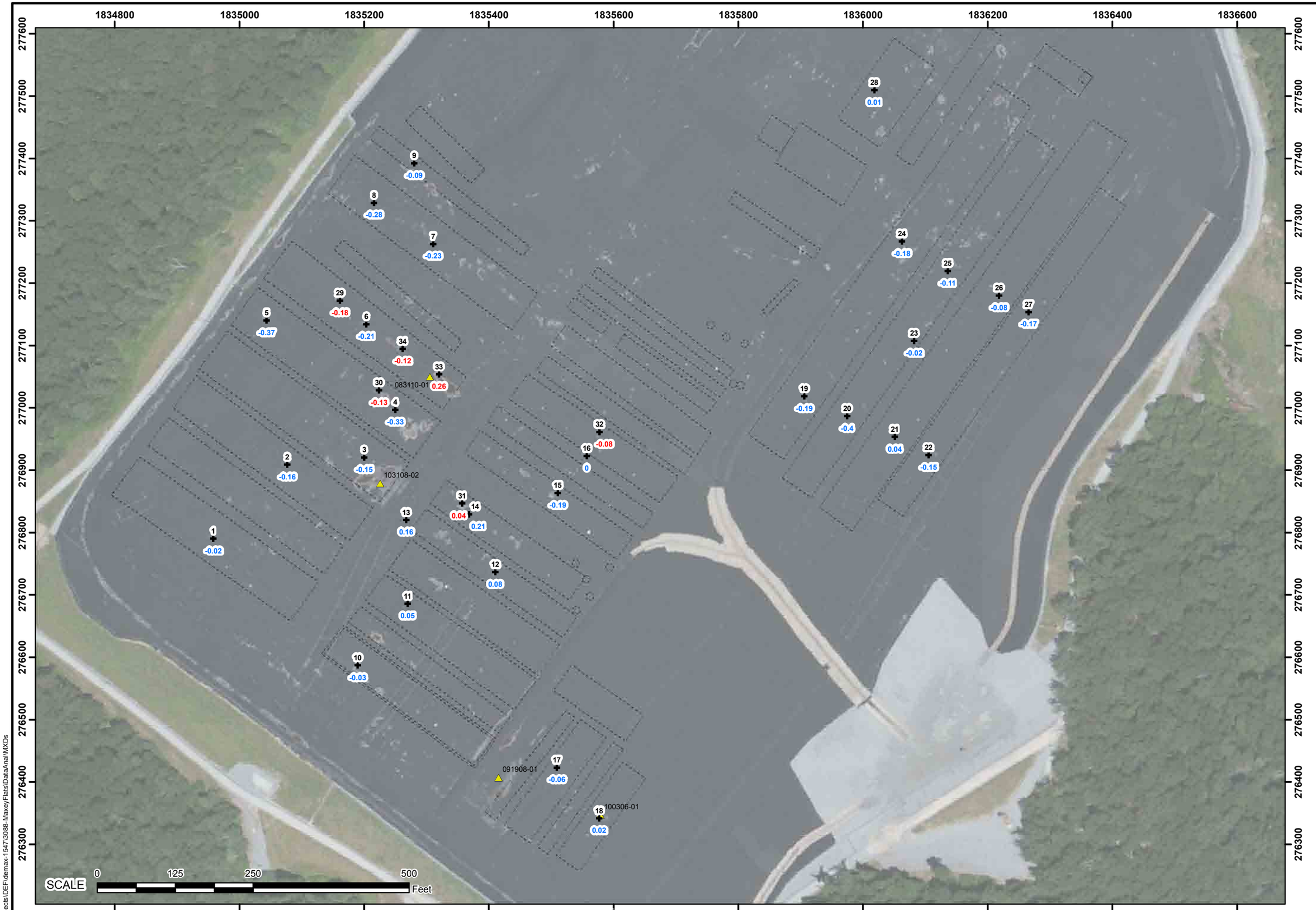
b- Sections 6 thru 9 were reworked during the summer of 2011. Baseline is re-established for these locations as Fall 2011

Methodology for calculating area: A polygon was created for each cross sectional area using ESRI ArcGIS 10 software. More specifically, polygons were produced by re-creating the area represented in the source data by entering X and Y (vertical and horizontal GPS readings in feet) for each datapoint collected in a cross section. The combination of these "coordinates" along with a bounding line that connects the monuments created the representative area. ArcGIS automatically calculates area based on the polygon feature, and this is the data that is provided. It should be noted that in instances where an area above the monument elevations was observed, this area was subtracted from the total area readings to reflect actual area available in the cross section.

Attachment 4.A
Subsidence Tracking Form Maxey Flats Project

Updated 12/31/2011

Subsidence Documented		Subsidence Repair							
Date	**Location**	**Date**	**Topographic Location**	**Subsidence Area** Sq. Ft	**Subsidence Avg. Depth** Inches	**Subsidence Max. Depth** Inches	**Patch Dimensions** Feet	**Fill Type**	**Estimated Fill Quantity** Tons
9/25/2006	Near Center of Trench 46	10/3/2006	N 38° 15.413' W 83° 34.220' 1068 Ft Elev.	63.6	6	6	12 (Circle)	Sand	1
9/8/2008	Trench 37	9/19/2008	N 38° 15.423' W 83° 34.254' 1067 Ft Elev.	988	2	5	80 x 45	Sand	9
10/27/2008	South end of Trench 30	10/31/2008	N 38° 15.501' W 83° 34.293' 1079 Ft Elev.	2800	1.3	4	80 x 70	Sand	15.5
8/31/2010	South end of Trench 32	8/31/2010	N 38° 15.529' W 83° 34.276' 1062 Ft Elev.	1080	1.3	6	81 x 30	Sand	13.5



R:\Projects\DEF\demax-1547\3088-MaxeyFlats\DataAnal\MXDs

Attachment 4.B

Yearly Subsidence Comparison 2004-2011 over Trenches

Maxey Flats
Fleming County, Kentucky

Description:

Basemap Source:
Bing Imagery 2010

Subsidence Elevation Data Source: "Subsidence yearly comparisons.xls" & "Estes Subsidence_2011.xls"

Map Legend:

- ✚ Subsidence Monitoring Pt
- △ Subsidence Repair
- ---- Trench
- -0.01 2011-2004 Subsidence (ft)
- 0.26 2011-2008 Subsidence (ft)

Spatial Projection:

Coordinate System:
Kentucky State Plane North
FIPS Zone: 1601
Units: Feet
Datum: NAD83

Plot Info:

File: Att4B_Subsidence.mxd
Project No.: 3088
Plot Date: 13 Aug., 2012
Arc Operator: HRVG
Reviewed by: NB

de maximis, inc.
450 Montbrook Lane
Knoxville, TN 37919
Main Phone: (865) 691-5052
www.demaximis.com

ddms
1217 Bandana Boulevard North
Saint Paul, Minnesota 55108
Main Phone: (651) 842-4224
www.ddmsinc.com

ATTACHMENT 4C

Subsidence Monitoring Control Point Survey
Maxey Flats Disposal Site

Subsidence Control Point	2004 Elevation (ft)	2005 Elevation (ft)	2006 Elevation (ft)	2007 Elevation (ft)	2008 Elevation (ft)	2009 Elevation (ft)	2010 Elevation (ft)	FALL 2010** Elevation (ft)	2011 Elevation (ft)
1	1061.82'	1061.77'	1061.79'	1061.80'	1061.81'	1061.80'	1061.79'	n/a	1061.80'
2	1064.53'	1064.52'	1064.47'	1064.46'	1064.45'	1064.41'	1064.40'	n/a	1064.37'
3	1064.72'	1064.70'	1064.63'	1064.64'	1064.60'	1064.54'	1064.54'	n/a	1064.57'
4	1063.90'	1063.85'	1063.77'	1063.76'	1063.73'	1063.60'	1063.65'	n/a	1063.57'
5	1058.81'	1058.75'	1058.68'	1058.64'	1058.59'	1058.53'	1058.49'	n/a	1058.44'
6	1063.65'	1063.60'	1063.52'	1063.51'	1063.49'	1063.44'	1063.43'	n/a	1063.44'
7	1061.72'	1061.66'	1061.61'	1061.60'	1061.59'	1061.53'	1061.57'	n/a	1061.49'
8	1059.75'	1059.69'	1059.66'	1059.64'	1059.62'	1059.54'	1059.51'	n/a	1059.47'
9	1060.73'	1060.71'	1060.71'	1060.70'	1060.76'	1060.64'	1060.70'	n/a	1060.64'
10	1057.06'	1057.03'	1056.99'	1056.96'	1056.93'	1056.0'	1056.90'	n/a	1057.03'
11	1060.61'	1060.58'	1060.54'	1060.55'	1060.53'	1060.52'	1060.51'	n/a	1060.66'
12	1062.31'	1062.28'	1062.26'	1062.25'	1062.23'	1062.21'	1062.21'	n/a	1062.39'
13	1063.64'	1063.63'	1063.60'	1063.60'	1063.61'	1063.60'	1063.61'	n/a	1063.80'
14	1063.55'	1063.54'	1063.51'	1063.50'	1063.51'	1063.46'	1063.47'	n/a	1063.76'
15	1060.65'	1060.60'	1060.54'	1060.53'	1060.51'	1060.47'	1060.47'	n/a	1060.46'
16	1058.84'	1058.85'	1058.80'	1058.81'	1058.82'	1058.79'	1058.80'	n/a	1058.84'
17	1054.77'	1054.75'	1054.71'	1054.71'	1054.70'	1054.68'	1054.66'	n/a	1054.71'
18	1050.90'	1050.86'	1050.82'	1050.83'	1050.82'	1050.81'	1050.81'	n/a	1050.92'
19	1047.40'	1047.36'	1047.30'	1047.31'	1047.26'	1047.24'	1047.19'	n/a	1047.21'
20	1045.59'	1045.55'	1045.42'	1045.41'	1045.31'	1045.27'	1045.18'	n/a	1045.19'
21	1042.68'	1042.67'	1042.63'	1042.66'	1042.67'	1042.68'	1042.64'	n/a	1042.72'
22	1039.28'	1039.24'	1039.16'	1039.17'	1039.15'	1039.14'	1039.09'	n/a	1039.13'
23	1049.75'	1049.76'	1049.71'	1049.73'	1049.72'	1049.73'	1049.72'	n/a	1049.73'
24	1053.08'	1053.06'	1052.99'	1052.97'	1052.94'	1052.92'	1052.90'	n/a	1052.90'
25	1052.27'	1052.25'	1052.21'	1052.22'	1052.18'	1052.16'	1052.13'	n/a	1052.16'
26	1048.32'	1048.30'	1048.27'	1048.26'	1048.24'	1048.26'	1048.22'	n/a	1048.24'
27	1045.39'	1045.35'	1045.29'	1045.28'	1045.27'	1045.25'	1045.23'	n/a	1045.22'
28	1059.72'	1059.75'	1059.68'	1059.66'	1059.63'	1059.66'	1059.70'	n/a	1059.73'
29*					1061.42'	1061.34'	1061.30'	n/a	1061.24'
30*					1063.93'	1063.85'	1063.85'	n/a	1063.80'
31*					1063.22'	1063.17'	1063.13'	n/a	1063.26'
32*					1057.30'	1057.24'	1057.20'	n/a	1057.22'
33*					1061.86'	1061.80'	1061.79'	1062.19'	1062.12'
34*					1063.05'	1062.98'	1062.96'	n/a	1062.93'

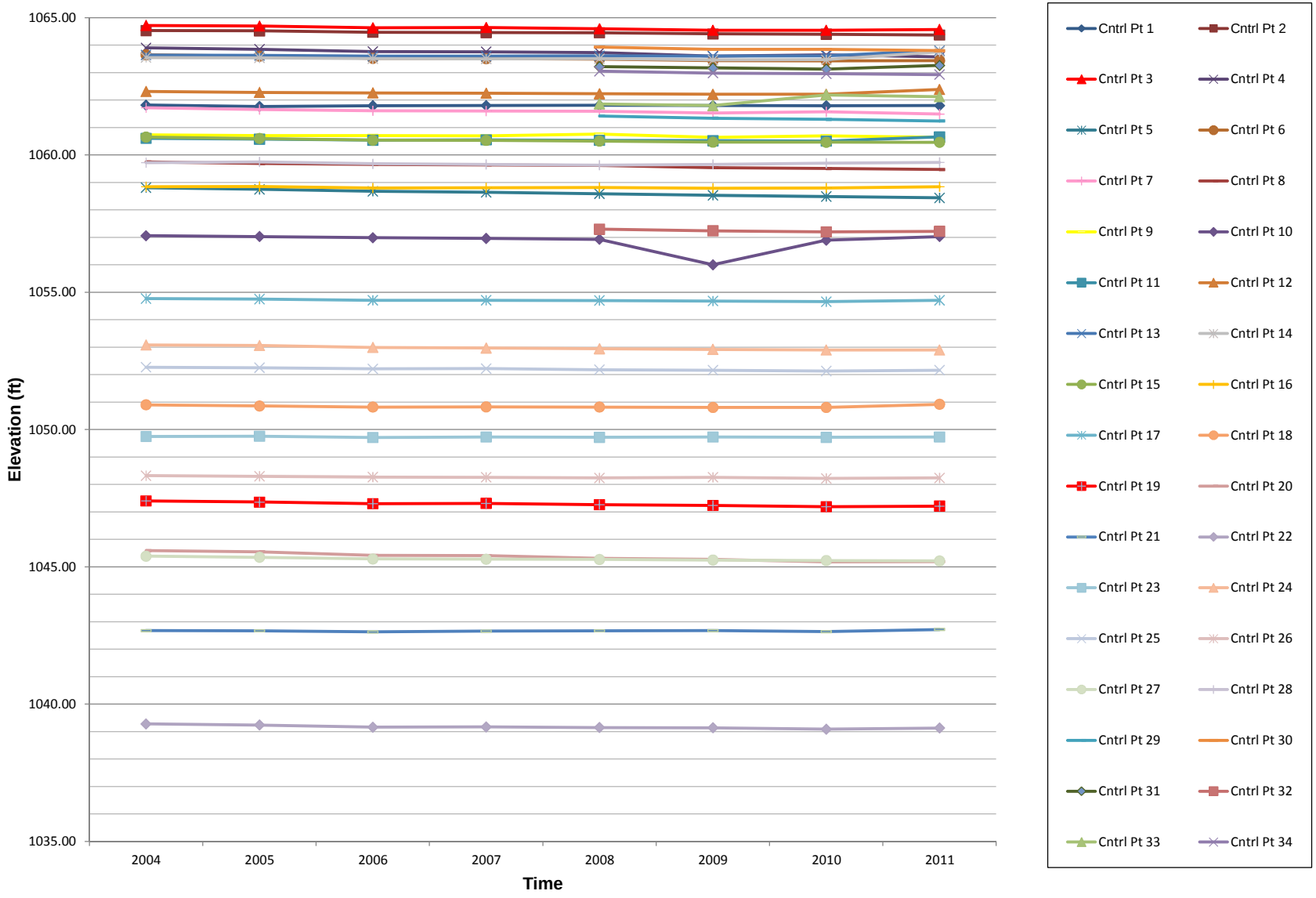
* points 29-34 were added by the Commonwealth of Kentucky in 2008

** point 33 was repaired and remeasured in Fall of 2010

2004-2010 surveys performed by Curd & Newton Surveying (Morehead, KY)

2011 survey performed by Estes Land Surveying (Morehead, KY)

Attachment 4.D
Interim Cap Subsidence Control Points



Attachment 4.E

Liner Maintenance
2003-2011

Maxey Flats
Fleming County, Kentucky

Description:

Basemap Source:
Bing Imagery 2010

Liner Repair data adapted from figures: 2006 Defect Map, 2005 Defect Map, 2004 Defect Map and 2003 Defect Map.

Map Legend:

Liner Defect Year
- 2003-2006
- 2007
- 2008
- 2009
- 2010
- 2011

Liner Defect (area) Year
- 2003-2006
- 2007
- 2008
- 2009
- 2010
- 2011
- Panel
- Trench

Spatial Projection:

Coordinate System:
Kentucky State Plane North
FIPS Zone: 1601
Units: Feet
Datum: NAD83

Plot Info:

File: Att4E_Liner_maint.mxd
Project No.: 3088
Plot Date: 13 Aug., 2012
Arc Operator: HRVG
Reviewed by: NB

Year	Total Defects Repaired
2003	7
2004	26
2005	47
2006	74
2007	43
2008	89
2009	55
2010	21
2011	44
TOTAL	**406**

SCALE 0 125 250 500 750 1,000 Feet

de maximis, inc.
450 Montbrook Lane
Knoxville, TN 37919
Main Phone: (865) 691-5052
www.demaximis.com

ddms
1217 Bandana Blvd.
St. Paul, MN 55108
Main Phone: (651) 842-4224
www.ddmsinc.com

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ATTACHMENT 4F

KENVIRONS

MAXEY FLATS DISPOSAL FACILITY
FLEMING COUNTY, KENTUCKY

FIVE-YEAR LINER EVALUATION

PROJECT NO. 2012085

JULY, 2012

Kenvirons, Inc.

Civil & Environmental Engineering and Laboratory Services

TABLE OF CONTENTS

ATTACHMENT 1

NARRATIVE

NARRATIVE
TABLE OF CONTENTS

1.0 INTRODUCTION

This report specifically presents a record of the required Five-Year Liner Evaluation of the 58-acre exposed geomembrane cap at Maxey Flats Disposal Site. Maxey Flats Disposal Site (MFDS) is a closed, low-level radioactive waste landfill located in Fleming County, Kentucky. The objective of the liner evaluation is to provide a professional engineering opinion regarding the condition of the liner material as it relates to anticipated performance as a barrier to surface water infiltration. The review period is from June, 2007 through the present, satisfying the requirement to evaluate the facility's cap system every five years.

2.0 SCOPE OF WORK

The scope of work for this project is broken into three primary components:

- Historical Documentation Review.
- Site Observations and Cap Liner Sampling.
- Engineering Evaluation and Reporting.

3.0 HISTORICAL DOCUMENTATION REVIEW

Historical documentation relates to the review of ongoing operations and maintenance activities performed by MFDS personnel. The following information was provided by MFDS personnel for review and reference:

- Defect Maps (2007 through 2011)
- Potentiometric Surface Maps (2007 through 2010)
- Sump Liquid Level Data Tabulation

The above-listed documents are included in Attachments 3 and 4 of this report.

3.1 SUMMARY OF ANNUAL INSPECTION DEFECT MAPS REVIEW

The annual inspection consists of visually and physically inspecting the MFDS cap in its entirety. The inspection is administered by MFDS personnel whereby a thorough, all-inclusive, visual observation of the cap geomembrane is conducted as well as physically testing every welded seam that is exposed. The physical integrity of every exposed seam is evaluated in accordance with the permit documents via an air lance test.

The air lance test consists of forcing air through a nozzle 3/32 to 3/16 inch in diameter at 45 pounds per square inch (psi). The tip of the nozzle is to be held not more than 2 inches from the seam edge and directed at the seam weld. The air stream is run along the edge of the seam and any holes in the weld will be detected by a high-pitched sound at the void. The holes are marketed and repaired.

According to the annual inspection defect maps, for any given year out of the last five years, the average number of defects in the cap geomembrane is 52 per year.

All defects discovered during the annual liner inspection and/or routine site investigation were repaired as soon as conditions allowed. Maps showing all defects discovered during the annual liner inspections over the last five years are presented in Attachment 3 of this report.

3.2 SUMMARY OF SUMP LIQUID LEVEL DATA & POTENTIOMETRIC MAPS

3.2.1. Potentiometric Map Review Summary. The liquid level in the sumps are measured and recorded by MFDS personnel. The potentiometric surface maps were generated each year based on the liquid level readings in the sumps. However, the last potentiometric surface map was generated for the 2010 calendar year. A Change Request form submitted to the U.S. Environmental Protection Agency (U.S. E.P.A.) in 2011 has allowed the MFDS to cease the development of the potentiometric surface maps as a means of evaluating sump recharge. The Potentiometric Surface Maps that were created for calendar years 2007 through 2010 are included for reference in Attachment 4. A copy of the Change Request form mentioned above is included in Attachment 8.

3.2.2. Sump Liquid Level Data Review Summary. Upon review of the sump liquid level data provided to Kenvirons by MFDS personnel, it was determined that the majority of the sumps are at a steady state; that is, the liquid level is not rising nor falling over time but rather staying virtually the same. The exception to this trend is sumps 7-4, 15-5 and 46-2 according to the provided data. All of these sumps have shown a steady, and in some cases considerable, rise in the liquid level in the sump over the past five years. The liquid level has risen 3.88 feet in sump 7-4, 1.92 feet in sump 15-5 and 0.92 feet in sump 46-2 from 2007 to 2011.

Reportedly, the sumps were pumped down prior to the installation of the geomembrane cap. As such, an acceptable elevation with freeboard was established for the liquid level in each sump. The purpose of the sump liquid level readings is to evaluate the necessity of pumping to prevent overflow of the sumps with contaminated liquids. Though the above-mentioned sumps indicate a rise in liquid level, they are within the acceptable freeboard limits with the exception of sump 7-4. MFDS personnel are aware of the situation with sump 7-4 and are working to resolve it. A copy of their evaluation of Sump 7-4 is included for reference in Attachment 8 of this report. The annual sump liquid level tabulation spreadsheet is included for reference in Attachment 4.

4.0 SITE OBSERVATIONS AND CAP LINER SAMPLING

4.1 SITE OBSERVATIONS

On April 10, 2012 personnel from Kenvirons and MFDS assembled on-site to conduct a visual inspection of the exposed geomembrane cap. The observation was not necessarily a full reconnaissance of the entire geomembrane cap but rather an overview of the facility by traversing across the cap area on foot.

4.1.1 Ponding Water Under the Cap Liner. It is noted that there was ponding water between the cap liner material and the underlying soil surface in isolated areas. The location of the standing water under the cap liner was generally located along the flat areas on the perimeter of the cap area. More specifically, one such spot was located along the western side of the cap area just north of destruct sample MAX3 and another pool mid-way along the southern side of the cap area.

4.1.2 Ponding Water on the Surface of the Cap Liner. Shallow pools of standing water and evidence of such in the past (dried up water marks) observed on the surface of the geomembrane indicate that some portions of the cap do not maintain drainage due to a lack of positive slope. Pictures showing examples of this can be found in Attachment 7 of this report.

4.1.3 Excessive Tension in Cap Liner. It is also noted that there was a considerable amount of tension in the geomembrane liner along the west-southwestern toe of the bunker mound area exhibiting a "trampoline" effect with the liner. This can be due to variations in temperature and installation of the geomembrane during hot temperatures.

4.1.4 Striations on the Surface of the Liner. MFDS personnel brought to the attention areas of apparent degradation of the exposed surface of the geomembrane liner along the southeastern side of the cap area. Test sample MAX3 was taken directly from the affected area. The area of concern exhibited wear in the top layer of the geomembrane running parallel to the length of the panel. The scrim reinforcement material was showing in some more severe areas but did not seem to be adversely effected. At the time of the evaluation, the liner material in the affected area was in a steady state condition; that is, it was not in a state of excess tension nor compression. Pictures showing this condition can be seen in Attachment 7.

4.1.5 Poor Adhesion of Welds on Existing Liner. MFDS personnel expressed some concern with regards to extrusion welding and/or gluing repair patches on the exposed geomembrane cap liner. They report that it is often times very difficult to achieve sufficient bond between the adhesive (extrusion welded bead and/or glue) and the existing geomembrane cap liner material. Reportedly, any level of pre-scarifying the area to be welded does little to promote a positive weld. This apparently is a wide-spread issue occurring virtually anywhere on the cap. Pictures showing this condition can be seen in Attachment 7.

4.1.6 Isolated Subsurface Projections. During the on-site evaluation, isolated subsurface projections were observed throughout the cap area and are thought to be abandoned or dormant sump risers. The projections were approximately two to three feet in diameter and approximately one and a half feet tall. The projections were observed in seemingly-random locations generalized in the areas overlying the waste trenches. The point locations of three (3) such swells were taken with a consumer-grade, hand-held global position system (GPS) unit. The locations of the

projections are shown on the drawing in Attachment 5 and pictures showing this condition can be seen in Attachment 7.

4.1.7 Failed Seam Welds. In numerous, random locations on the cap, failed seams were observed. The failures were noted as occurring in both, fusion-welded and extrusion-welded seams.

The fusion-welded seam failures were in the form of wrinkled or bunched liner in the weld track. There are several situations that may have caused this during the installation of the material or when repairs were conducted. Soil from the underlying subgrade can clog up the wheels on the welders and cause them to hang up and bunch the material, or improperly setup fusion welding machines can cause the material to wrinkle while welding. However, the most likely cause is attributed to excess slack in the material during welding operations.

There were two forms of failure observed in random extrusion welds on the geomembrane. The first is in the form of adhesion failure where the bead from the extrusion weld has separated from the geomembrane liner. The cause of such a failure is discussed in more detail in Section 4.1.5 above. The second form of failure observed in numerous, randomly-located extrusion welds was "bubbling." "Bubbling" is a void that occurs in the extrusion weld bead. Minor occurrences may only bubble on the surface of the bead. However, in extreme cases, like those observed on the MFDS cap, the bubbles create voids in the weld all the way through the bead and expose the liner below. There are numerous scenarios during installation that can cause this type of failure but the ultimate reason for this failure is inclusion of foreign matter in the weld bead. This can be from wet or dirty welding rod, poorly prepped and/or dirty welding surface, precipitation during installation, among others. The most likely culprit is water inclusion as the moisture will create a little steam pocket inside the weld bead and then burst creating the void. Pictures showing the typical failed seams can be seen in Attachment 7.

4.2 LINER SAMPLING & LABORATORY TESTING RESULTS

The geosynthetic liner material installed on the temporary cap at the Maxey Flat Disposal Site is a scrim-reinforced, flexible polypropylene (fPP-R) geomembrane with a thickness of 45 mils. The installed geomembrane is manufactured as a suitable product for exposed liner systems with great resistance to degradation via weather, ultraviolet light and a wide variety of contaminants that may be encountered. The cap liner material initial installation was completed in 2002 and according to permitted documents for the MFDS, the design service life of the fPP-R synthetic cap is twenty (20) years. Therefore, it is required to conduct performance testing every five years in order to quantitatively assess the condition of the liner.

It was determined that a quantitative assessment of the condition of liner could be determined if the following tests were performed: peel and shear strength of the

seams, tensile strength of the parent liner material and the percentage of carbon black content still remaining in the material.

It is required that a minimum of three liner material samples be taken during the observation; however, to stay consistent with previous liner evaluations, four material samples were taken. The samples were gathered by MFDS personnel at the specific direction of Kenvirons evaluators. Once adequate samples were obtained, the samples were shipped to TRI/Environmental, Inc. (TRI), where they were tested for the following:

- Carbon Black Content,
- Tensile Strength of the Parent Material; and
- Peel and Shear Strength of the Fusion-Welded Seams

The locations of the samples were determined in a collaborative effort with Kenvirons and MFDS personnel to determine the best locations to collect samples representing cap conditions across the entire project area. Samples were uniquely identified as MAX1, MAX2, MAX3 and MAX4. Samples MAX1, MAX2 and MAX4 were taken from fusion-welded (single 2-inch wide weld track via hot wedge welding machine) field seams to test adhesion strength. Sample MAX3 was taken from an individual panel to test the tensile strength of the parent material. A composite sample of geomembrane was collected from various locations around the cap area and used to conduct the carbon black content test. The samples were collected by MFDS personnel, checked for radioactive contamination and cleaned onsite prior to being delivered to Kenvirons where they were sent to TRI for testing.

4.2.1 Geomembrane Carbon Black Content Test Results. As per the current Geosynthetic Research Institute's (GRI) Test Method GM18, the Standard Specification for "Test Methods, Test Properties and Testing Frequencies for Flexible Polypropylene (fPP and fPP-R) Nonreinforced and Reinforced Geomembranes," carbon black content testing was performed following the procedures outlined in ASTM Standard D 1603 (Test Method for Carbon Black in Olefin Plastics) to determine the percentage (by weight) of carbon black content in the parent geomembrane material.

The carbon black content test consists of taking two grams of non-reinforced liner material and subjecting it to a precise temperature for a prescribed length of time as outlined in the above-mentioned ASTM test procedure. The mass of the sample is then re-weighed and the resultant weight is used to determine the percentage of carbon black content in the two-gram sample. The composite sample of the geomembrane liner, as tested by TRI via the standards mentioned above, was found to have an average carbon black content of 3.89 percent. The report from TRI showing the results of the carbon black content test can be found in Attachment 6 of this report.

4.2.2 Geomembrane Tensile Strength Test Results. As per the current GRI Test Method GM18 standard specification, testing was performed following the procedures outlined in ASTM Standard D 7004 (Test Method for Grab Tensile Properties of Reinforced Geomembranes) to determine the grab tensile strength of the parent geomembrane.

Test Sample MAX3 was tested for the grab tensile strength of the parent geomembrane liner material. This consists of cutting five (5), equal-width-sized coupons from the sample and testing the grab tensile strength of the material with a calibrated tensiometer in a controlled laboratory setting. The pounds of force applied to the material that caused it to break were recorded. Test Sample MAX3 was found to have a minimum average break strength of 230 pounds. See Table 1 for sample test results and required properties. The report from TRI showing the results of the tensile strength testing of Sample MAX3 can be found in Attachment 6 of this report.

Table 1

	Grab Tensile Strength Results		Required Grab
Sample ID	Side A	Side B	Tensile Strength
MAX3	238 lbs	222 lbs	220 lbs
	251 lbs	234 lbs	220 lbs
	213 lbs	243 lbs	220 lbs
	233 lbs	233 lbs	220 lbs
	239 lbs	219 lbs	220 lbs
Average	235 lbs	230 lbs	220 lbs

* The required value listed for grab tensile strength is a minimum average of the five test specimens. One of the five test specimens may be as low as 80% of the listed average value per GRI GM18.

4.2.3 Geomembrane Seam Peel and Shear Test Results. As per the current GRI Test Method GM19 standard specification for "Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes," testing was performed following the procedures outlined in the modified ASTM Standard D 751 to determine the peel and shear strength of the fusion-welded geomembrane liner material.

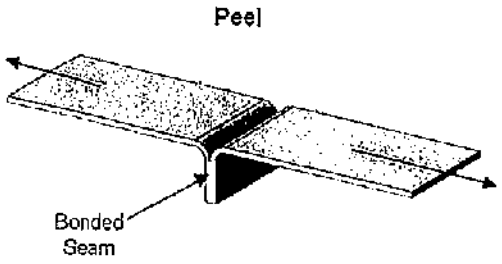

Figure 1

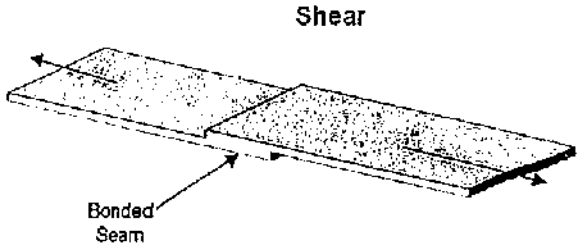

Figure 2

Test Samples MAX1, MAX2 and MAX4 were tested for adhesion strength of the fusion-welded seams. This consists of cutting ten (five for peel and five for shear testing), four-inch wide coupons from each sample and testing the adhesion strength of the seam with a calibrated tensiometer in a controlled laboratory setting based on two types of failure planes – peel and shear. Testing the strength in peel is done by pulling the two pieces of material in opposite directions perpendicular to the weld (See Figure 1 above) until the material and/or bond fail. Testing the strength in shear is done by pulling the two pieces of material in opposite directions parallel to the weld (See Figure 2 Above) until the material and/or bond fail. The load (pounds of force) applied to the test coupon that caused the material and/or bond to fail was recorded. A tabulation of the peel and shear test results and corresponding required strength properties are presented in Table 2.

Test Samples MAX1, MAX2 and MAX4, as tested by TRI via the standards mentioned above, were each found to have strength values greater than the required project-specified minimum strength. However, one of the five test coupons from Test Sample MAX1 had a non-film tear bond failure during the peel test which means the adhesion of the seam failed and the two pieces of liner peeled apart during the test.

The report from TRI showing the results of the peel and shear adhesion strength testing of Samples MAX1, MAX2 and MAX4 can be found in Attachment 6 of this report.

Table 2

Sample ID	Peel Test Results	Peel Test Required Strength*	Shear Test Results	Shear Test Required Strength*
MAX1	58 lbs	20 lbs	310 lbs	200 lbs
	43 lbs	20 lbs	341 lbs	200 lbs
	61 lbs	20 lbs	352 lbs	200 lbs
	53 lbs	20 lbs	365 lbs	200 lbs
	53 lbs	20 lbs	331 lbs	200 lbs
MAX2	47 lbs	20 lbs	288 lbs	200 lbs
	44 lbs	20 lbs	246 lbs	200 lbs
	46 lbs	20 lbs	263 lbs	200 lbs
	52 lbs	20 lbs	291 lbs	200 lbs
	54 lbs	20 lbs	278 lbs	200 lbs
MAX4	67 lbs	20 lbs	270 lbs	200 lbs
	67 lbs	20 lbs	275 lbs	200 lbs
	57 lbs	20 lbs	262 lbs	200 lbs
	59 lbs	20 lbs	248 lbs	200 lbs
	58 lbs	20 lbs	293 lbs	200 lbs

* Required values listed for peel and shear strengths are for 4 out of 5 specimens. One of the five test specimens may be as low as 80% of the listed value per GRI GM19.

5.0 CONCLUSIONS AND RECOMMENDATIONS

According to permitted documents for the MFDS, the design service life of the geomembrane liner is twenty (20) years. As such, it should be noted that initial required property values of the geomembrane will likely not be maintained throughout the expected twenty-year life of the liner due to UV and/or weather-related degradation. Therefore, the ability of the liner to minimize stormwater infiltration through the cap should be the primary criteria for deciding whether or not to replace the liner material. However, the supplied information does not include any design criteria related to maximum acceptable infiltration rates for the cap liner. This

indicates that the liner design process was not established based on specific infiltration criteria. As such, this evaluation will assume the liner met the design intent upon installation and rely primarily on available site-specific information and established industry defect frequency rates to quantify the quality of the current condition of the liner.

These conclusions and recommendations are based on supplied data and observed conditions at the time of the on-site evaluation using that degree of care and skill normally exercised under similar conditions by competent members of the engineering profession. No warranties can be made regarding the suitability of the liner or continuity of conditions between observed areas.

5.1 HISTORICAL DATA – CONCLUSIONS AND RECOMMENDATIONS

5.1.1 Sump Liquid Level Data Review - Conclusions and Recommendations.

According to the Change Request form submitted to the U.S. E.P.A. on December 22, 2011, the waste at the Maxey Flats Disposal Site was disposed of in trenches that were often chambered, therefore the sumps may not be in direct contact with surrounding groundwater; even sumps within the same trench may not be in hydraulic contact with each other. Additionally, the sumps are not reliable groundwater monitoring points because the sump pipes with torch-cut screens were installed by direct push method. This type of installation is likely to produce a clogged pipe with poor communication to the surrounding aquifer. The prominent method of groundwater flow within and surrounding the restricted area is fracture flow, Zehner 1983. Fracture flow is very difficult, if not impossible to model accurately; therefore, the accuracy of the potentiometric surface maps produced from the sumps and wells are unreliable.

In accordance to the above-referenced Change Request form and the provided sump liquid level tabulation spreadsheet, the sumps are still monitored on an individual basis to determine if substantial recharge is occurring that would require development of a leachate management engineering evaluation. The sumps are also still monitored as a whole from exterior/perimeter to interior as a method to evaluate horizontal recharge.

As was mentioned previously, the situation with sump 7-4 is currently being dealt with by MFDS personnel. Outside of rectifying the situation with 7-4, there is no corrective action recommended as it relates to the sump liquid levels.

5.1.2 Annual Inspection Defect Map Review - Conclusions and Recommendations

Industry standards indicate liners may be classified as poor, fair, good or excellent based on the number of defects (holes) per acre. According to the published information provided by Koerner [1], a liner is considered Excellent for one hole (0.1 cm^2 area) per acre; Good for one hole (1 cm^2 area) per acre; and Poor for 30 holes (0.1 cm^2 area) per acre.

The number of defects present in a liner system is directly related to the liner's ability to resist infiltration of surface waters which quantifies its effectiveness. MFDS personnel provided data documenting the annual air lance and visual liner inspections. According to the documents provided (and included in Attachment 3 of this report), the average number of defects per acre discovered (and repaired) during any one-year time period throughout the last five-year time frame is 0.95 holes per acre. It should be noted that the defect/hole size was not indicated on the annual inspection defect maps. However, based on the above-mentioned criteria, the quality of the liner, as it relates to defects and the liner's ability to resist infiltration, is estimated to be between excellent and good quality with 0.95 holes per acre. As such, and in accordance to the definition of a suitable liner for this facility, the classification of "good to excellent" quantifies the liner's effectiveness as an acceptable barrier to water infiltration through the cap during the five year time period this evaluation covers.

5.2 SITE OBSERVATIONS - CONCLUSIONS AND RECOMMENDATIONS

5.2.1 Ponding Water Under the Cap Liner. In regards to the ponding water below the cap liner, there was no apparent damage to the liner material in the vicinity of the pooled water. This could be a display of condensation generating on the underside of the geomembrane due to the liner being exposed to rapid temperature changes throughout the course of the day as is common in this geographic region. It could also be an indication of water infiltration through the geomembrane cap. Regardless of where the liquid under the cap is originating from, the ponding issue is a result of insufficient grading of the subgrade to promote positive drainage. With the information provided and the evaluation of the current layout, it is unclear whether the poor grading situation is a result of the initial grade work prior to lining or if there is differential settlement occurring that is causing areas to hold water that accumulates between the subsurface and the geomembrane liner. It is Kenvirons' recommendation that further investigation be administered to determine the origination of the liquid and an evaluation of the cost/benefit of repairing the grading should be performed.

5.2.2 Ponding Water on the Surface of the Cap Liner. In regards to the ponding water on the surface of the cap liner, the topography of the cap area does not allow for positive drainage in some areas. It is recommended that all such areas be corrected to reduce the potential for water infiltration through the cap. Further evaluation of the cost/benefit of repairing this condition should be performed.

5.2.3 Excessive Tension in Cap Liner. As it relates to the areas of tension in the liner, this is likely due to the liner being installed with little or no slack. However, a zero-stress installation is difficult to achieve. The geomembrane expands and contracts with thermal changes resulting in compressive wrinkles when expanded and areas of tension (especially at peaks and toes of slopes) when contracted. The areas in tension can result in the liner not resting on the subgrade and therefore being held suspended for some distance, thus the "trampoline" effect. Prolonged

tensile stress is generally recognized to cause failure in geomembrane liner systems; therefore, it should be anticipated that the level of effort required to repair defects resulting from excessive, prolonged tensile stress will increase significantly over the liner design life. It is recommended that further evaluation of the tension "trampoline" conditions be performed to determine the cost/benefit of repairing this condition.

5.2.4 Striations on the Surface of the Liner. In regards to the striations occurring on the surface of the geomembrane liner as discussed previously, the damage did not appear to be caused by a foreign object rubbing or chafing the material based on the irregular shape of the affected area.

Similar symptoms can be found with flexible polypropylene liner that has been exposed to UV light and/or weather conditions for a prolonged period of time. UV and/or weather-related degradation are possible but not conclusive causes of the deformity by virtue of the isolated nature of the affected area. If UV and/or weather-related degradation were occurring, it would be expected to see a more wide-spread display of deterioration of the liner material over the entire cap area given that nearly all of the cap geomembrane liner is equally exposed to the elements. Since this issue is a relatively isolated occurrence and is not a wide-spread problem over the entire cap area, it may be a display of factory-flawed material.

Similar symptoms can be found with flexible polypropylene liner that has been exposed to excessive tensile stress for a prolonged period of time. However, the affected area where this condition was observed was not in tension at the time of evaluation and does not appear that the area would go into a state of tension with thermal changes due to the topography of the area and deployment orientation of the material.

With the information provided and obtained during the evaluation, the exact cause of the striations is not immediately apparent. Based on provided information and observations, this condition does not appear to allow any infiltration of water through the liner and testing indicated that the strength of the material in this area still meets project specifications therefore; replacement is not recommended at this time. However, the affected area should be closely observed in the future to determine if the condition is worsening and/or becoming a more wide-spread problem.

5.2.5 Poor Adhesion of Welds on Existing Liner. As it relates to the issues arising with extrusion welding on the existing cap liner, one possible cause could be a film developing on the exposed surface of the geomembrane liner that is causing adhesion problems; however, this notion could not be quantified during the on-site evaluation. Another possible cause of the adhesion problem could be the infant stages of UV and/or weather-related degradation in the form of chalking. Chalking is a condition where the outermost surface of the geomembrane is being broken down over time due to UV and/or weather exposure which causes the surface to become brittle and chalk off when attempting to weld to it. However, a definitive explanation

for the extrusion welding adhesion issue is not apparent at this time. Further evaluation of this condition should be performed to determine a cause and then a means to rectify the situation.

5.2.6 Isolated Subsurface Projections. With the information provided and obtained during the evaluation, it appears that the isolated subsurface projections are from two sources – abandoned sump risers and dormant sump risers. According to MFDFS personnel, dormant sumps are not abandoned sumps; rather the risers just do not extend all the way to the surface but if need be, they can be accessed for leachate monitoring. Reportedly, the swells have been present all along due to the risers' close proximity to the surface. According to MFDS personnel, some of the projections have become more noticeable over time. The method of placement of the soils overlying the abandoned and dormant sumps was not documented in the materials provided. It is speculated that the soils may not be highly compacted and therefore are slowly settling over time. Settlement of the soil around the risers is the likely reason for the sumps becoming more noticeable over time. If such settlement continues, the likelihood of stress on the liner material and even puncturing of the liner material by underlying objects may occur. Therefore, it should be anticipated that the eminent requirement to repair defects resulting from the differential settlement may increase significantly over the liner's design life.

The liner did not exhibit signs of stress or puncture due to the subsurface projections at the time of the on-site evaluation; therefore, no corrective action is recommended at this time. However, it is recommended that careful attention be paid to the projections in the future to determine if the condition is getting worse with time.

5.3 LINER SAMPLING CONCLUSIONS AND RECOMMENDATIONS

5.3.1 Carbon Black Content Test Conclusion and Recommendations. The GRI standard specification GM18 suggests that the geomembrane be formulated from virgin flexible polypropylene in amounts greater than 85% by weight of the total polymer content. The remaining 15% shall be comprised of compatible polymers and/or pigments, stabilizers and colorants that are suitably compounded to satisfy the physical, mechanical and endurance specifications for the applied use of the material.

Testing the exposed geomembrane liner material for carbon black content can be an indicator of gradual UV degradation with time. If the percentage of carbon black content is decreasing, this may suggest that the liner itself is deteriorating. GRI GM18 lists an acceptable range of carbon black content in flexible polypropylene to be between two and three percent. The field sample tested for the Five Year Evaluation of the cap material yielded an average carbon black content of 3.89 percent. Even though this is higher than the range suggested by GRI, it is still considerably lower than the 15% maximum content of such material in the liner and as such, it is Kenvirons' professional opinion that this is a satisfactory level. In regards to the percentage of carbon black content in the liner material, the testing

suggests that the liner has not degraded since being installed and therefore does not warrant being replaced at this time.

5.3.2 Tensile Strength Test Conclusion and Recommendations. Testing the exposed geomembrane liner material for grab tensile strength can be an indicator of degradation of the liner material with time. If the strength of the flexible polypropylene material is decreasing as compared to original specifications and tests prior to installation, it may suggest that the liner is deteriorating. The project specification lists an acceptable minimum average (out of five test coupons) tensile strength of the flexible polypropylene material to be no less than 220 pounds. The field sample tested for the Five Year Evaluation of the cap material shows that the minimum average tensile strength was 230 pounds. This is above the minimum specified value for this project and as such, it is Kenvirons' professional opinion that this is a satisfactory level. Therefore, in regards to the tensile strength of the existing liner material, the testing suggests that the liner has not degraded since being installed and therefore does not warrant being replaced at this time.

5.3.3 Peel and Shear Strength Test Conclusions and Recommendations. As was mentioned previously, all of the samples passed laboratory testing in regards to strength. However, one coupon out of five from sample MAX1 failed in peel. This is considered an unacceptable failure and requires corrective action to be taken. The industry-standard for an adhesion failure is to take additional samples from the same seam at least 10-feet before and 10-feet after the failed sample location. This action may have to be repeated every 10-feet until the failing portion of the seam can be isolated with passing samples on either side of the failed sample. Then the seam between the two passing samples may be repaired by cutting the entire failed section out and welding in a new strip of material to join the two panels of liner material or a cap strip (patch) may be permanently installed over the failed section of the seam. Failure to repair the seam may result in separation of the seam in the field which will promote infiltration of surface water through the cap. It is Kenvirons' professional opinion that the proper corrective action be taken to repair the failed seam from which sample MAX1 was taken.

6.0 REFERENCES

(1) Xuede Qian, Robert M. Koerner and Donald H. Gray, (2002) "Geotechnical Aspects of Landfill Design and Permitting"

ATTACHMENT 2

PROJECT PERSONNEL

The personnel or parties involved with this project were as follows:

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Division of Waste Management
Superfund Branch
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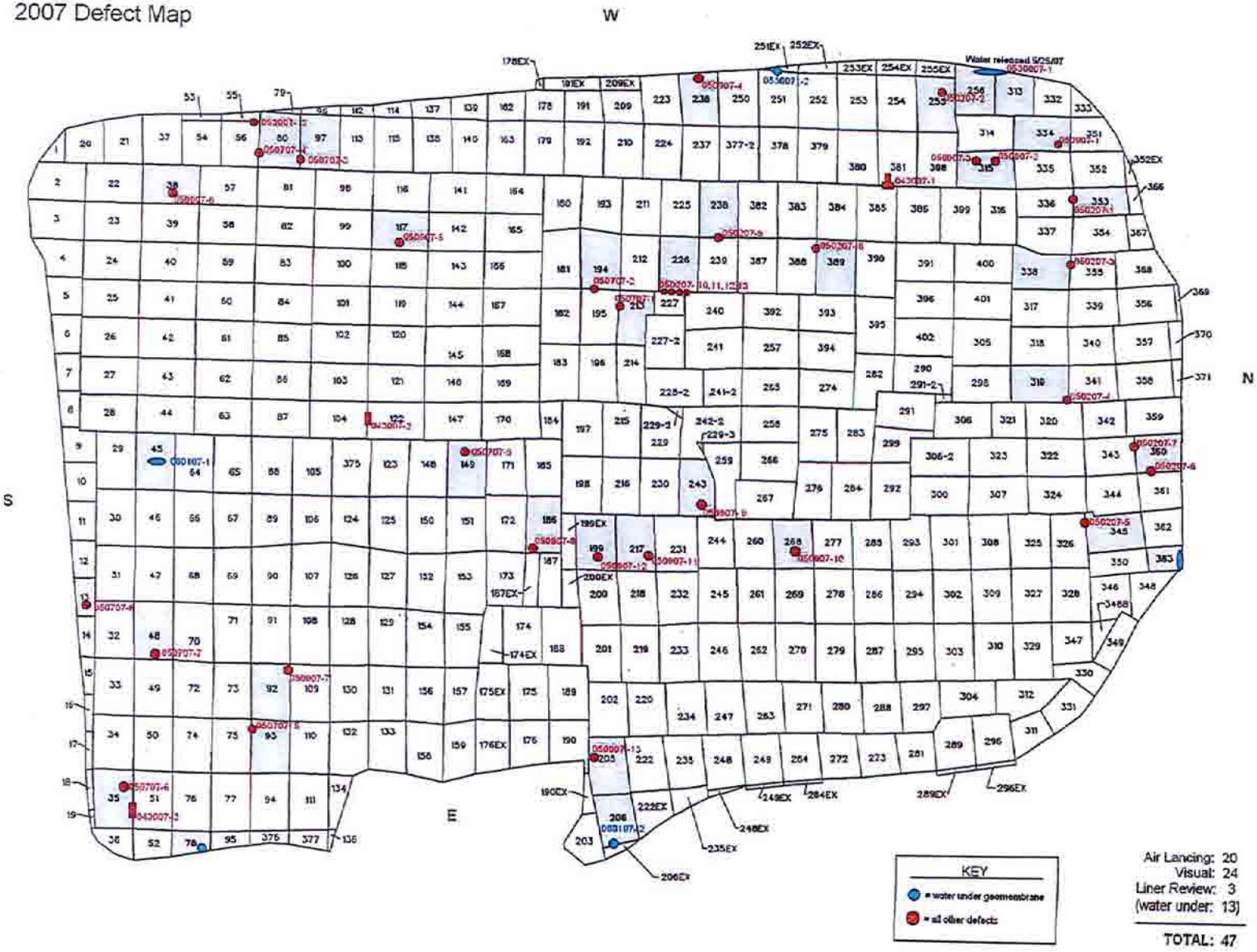
E-mail: JTenney@tri-env.com

ATTACHMENT 3

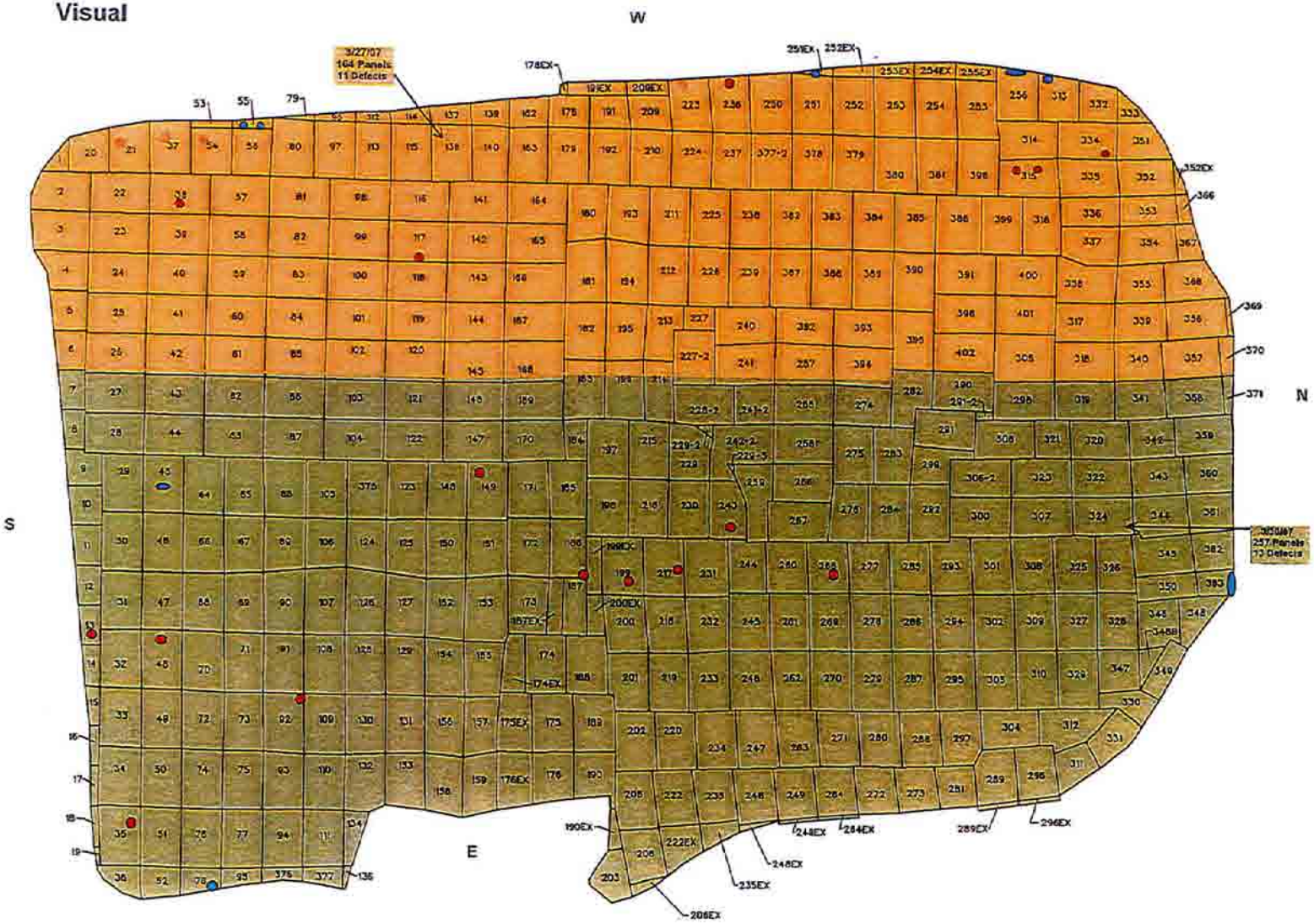
HISTORICAL ANNUAL EVALUATION MAPS

2007 Defect Map



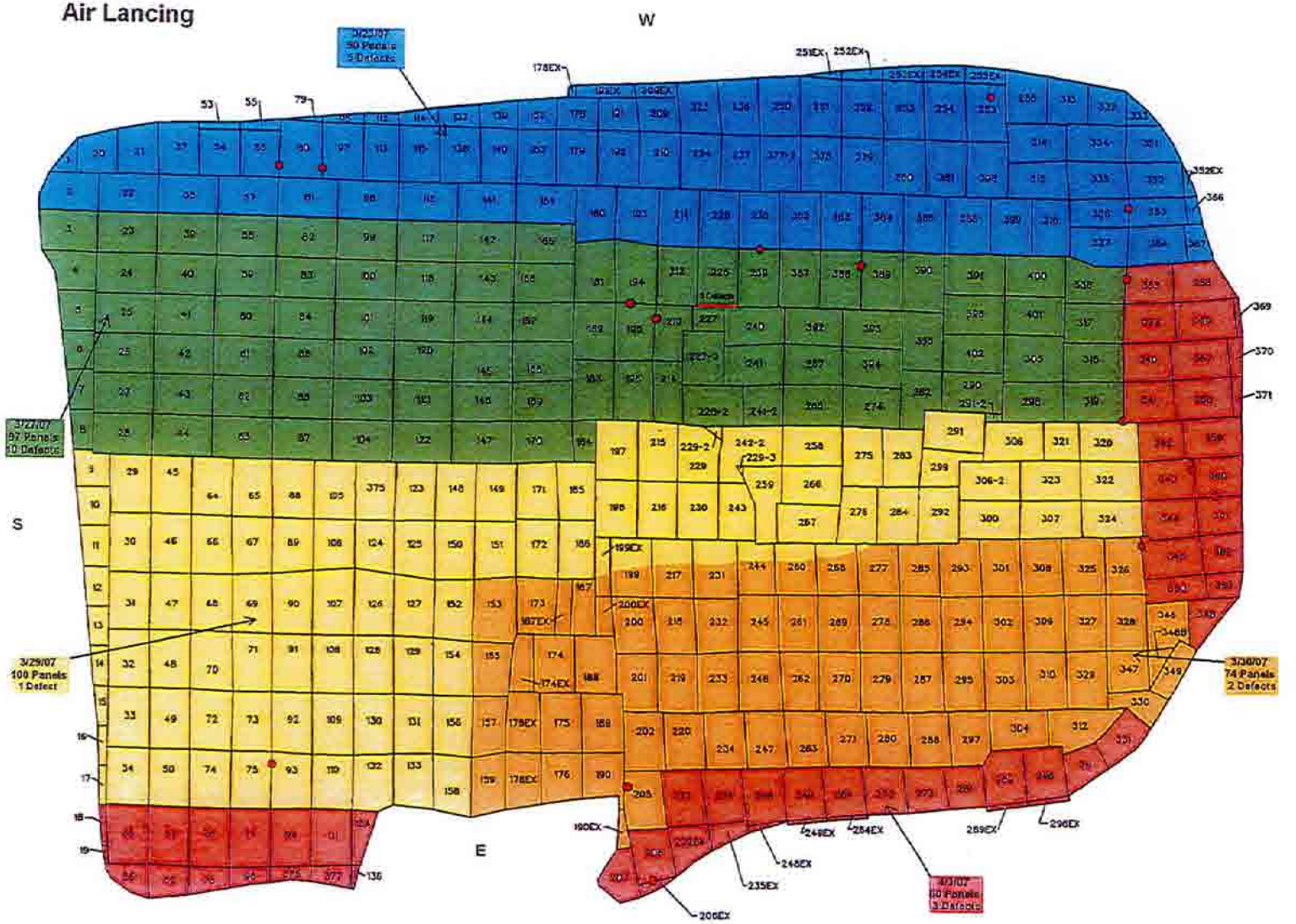
2007 Annual Inspection:

Visual

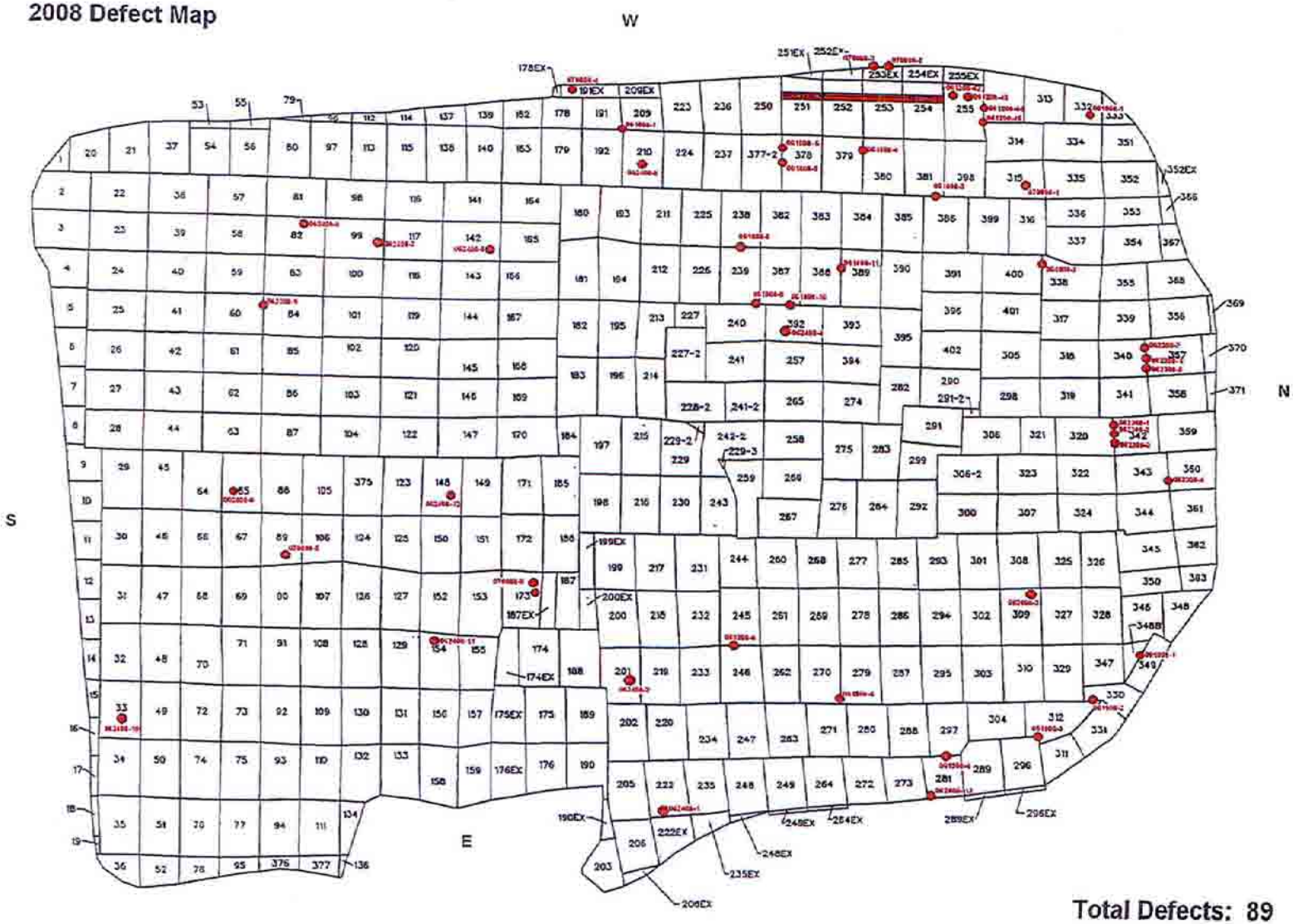


2007 Annual Inspection:

Air Lancing



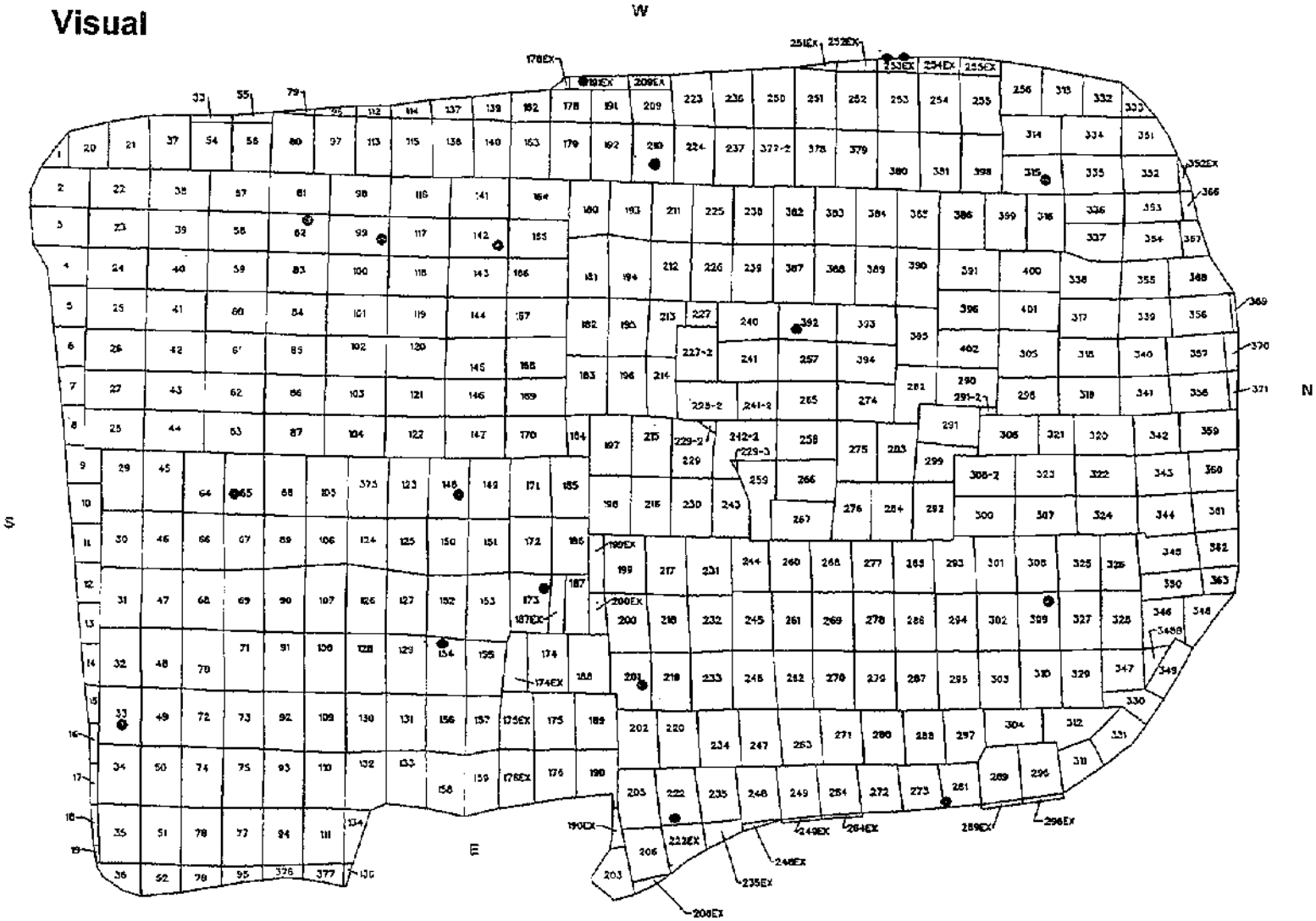
2008 Defect Map



Total Defects: 89

2008 Annual Inspection:

Visual



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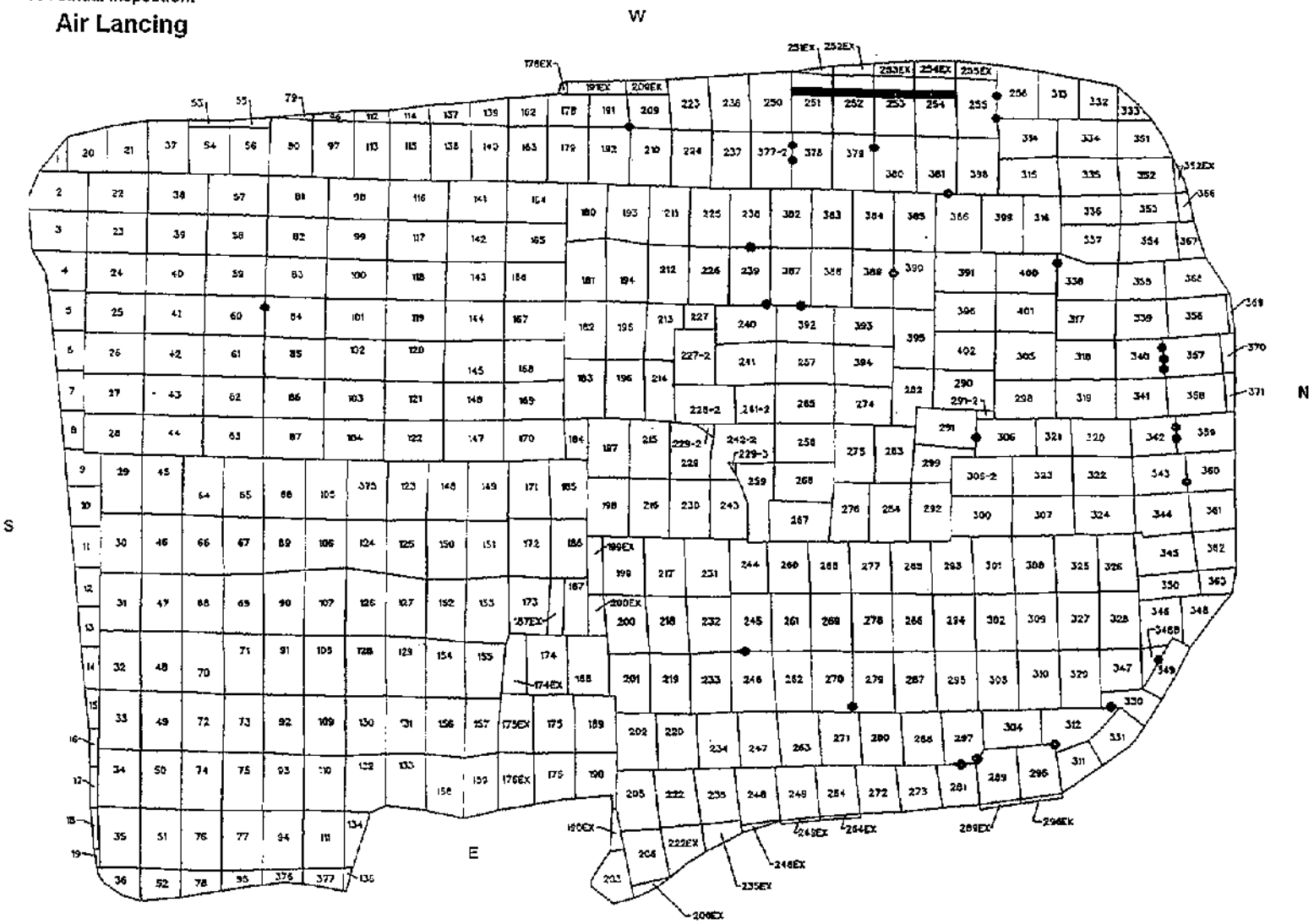
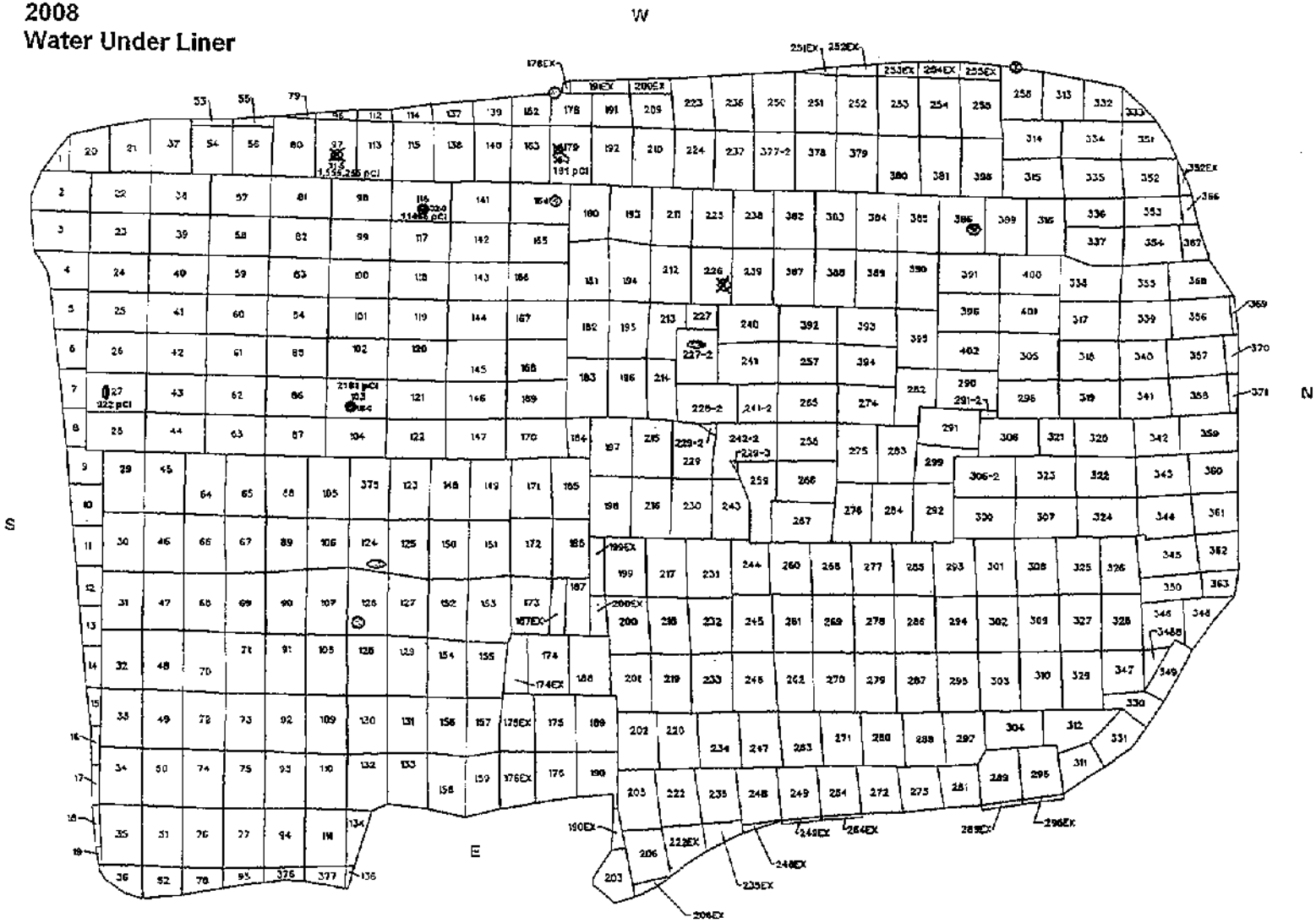
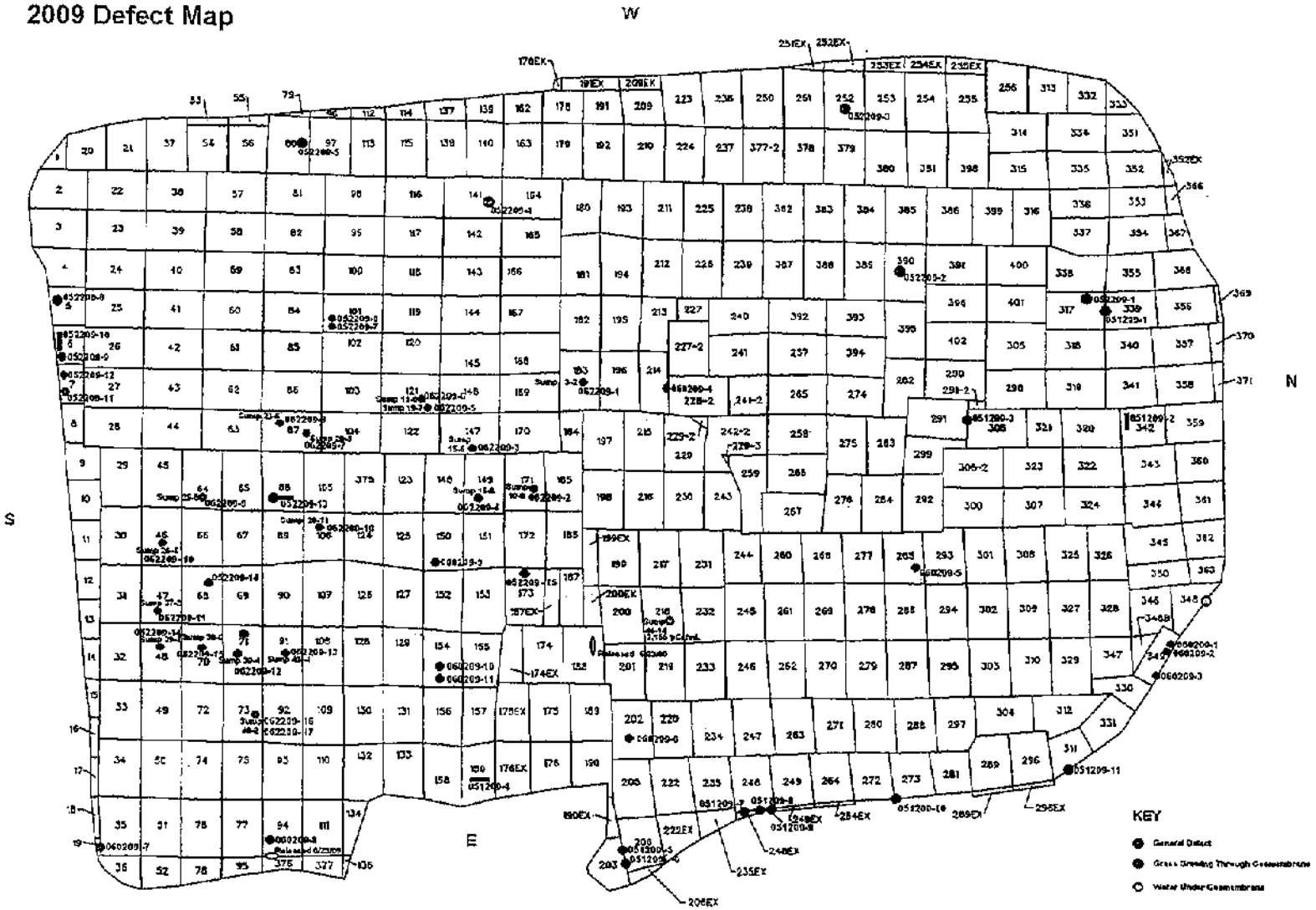
Air Lancing



2008
Water Under Liner

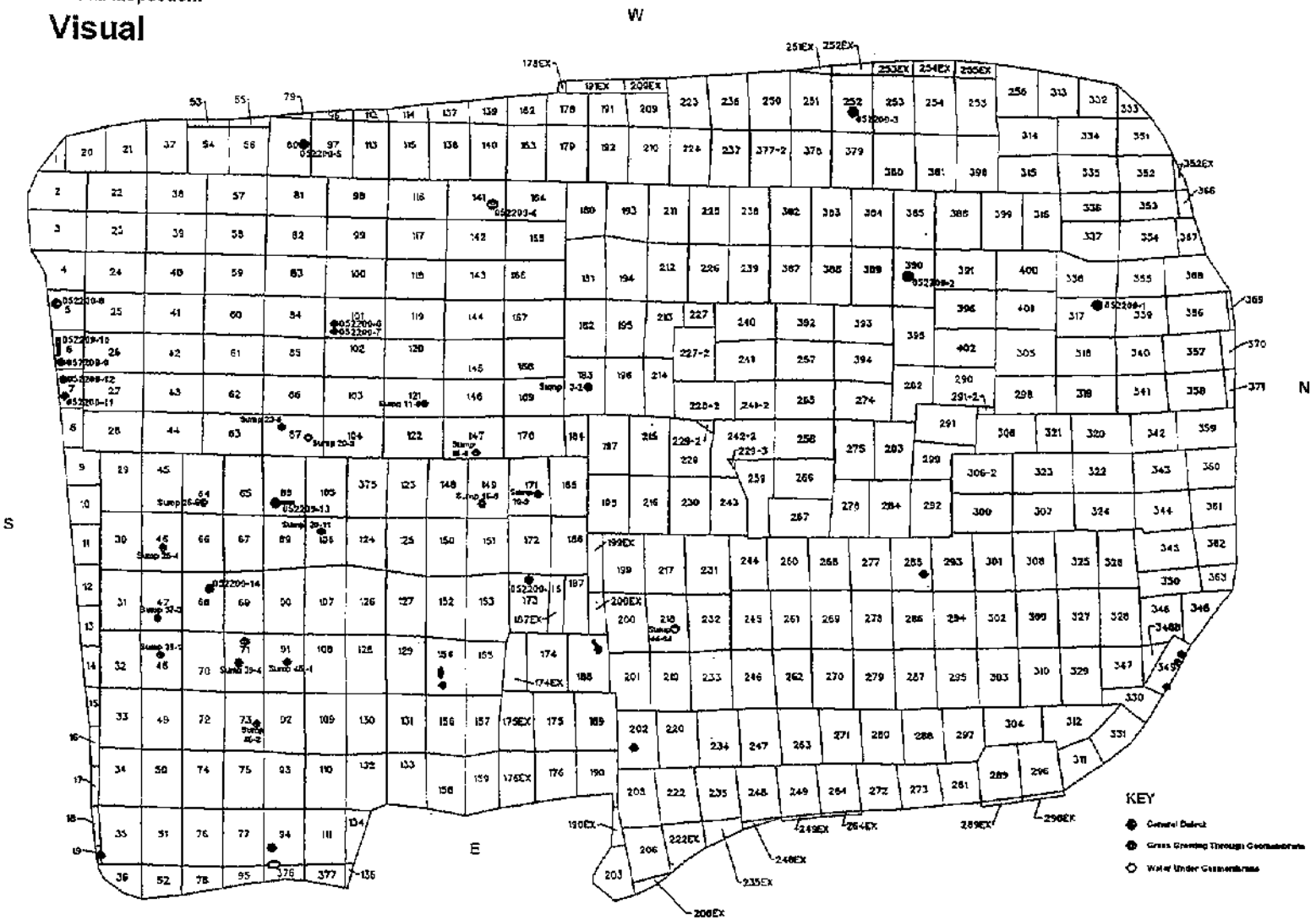


2009 Defect Map



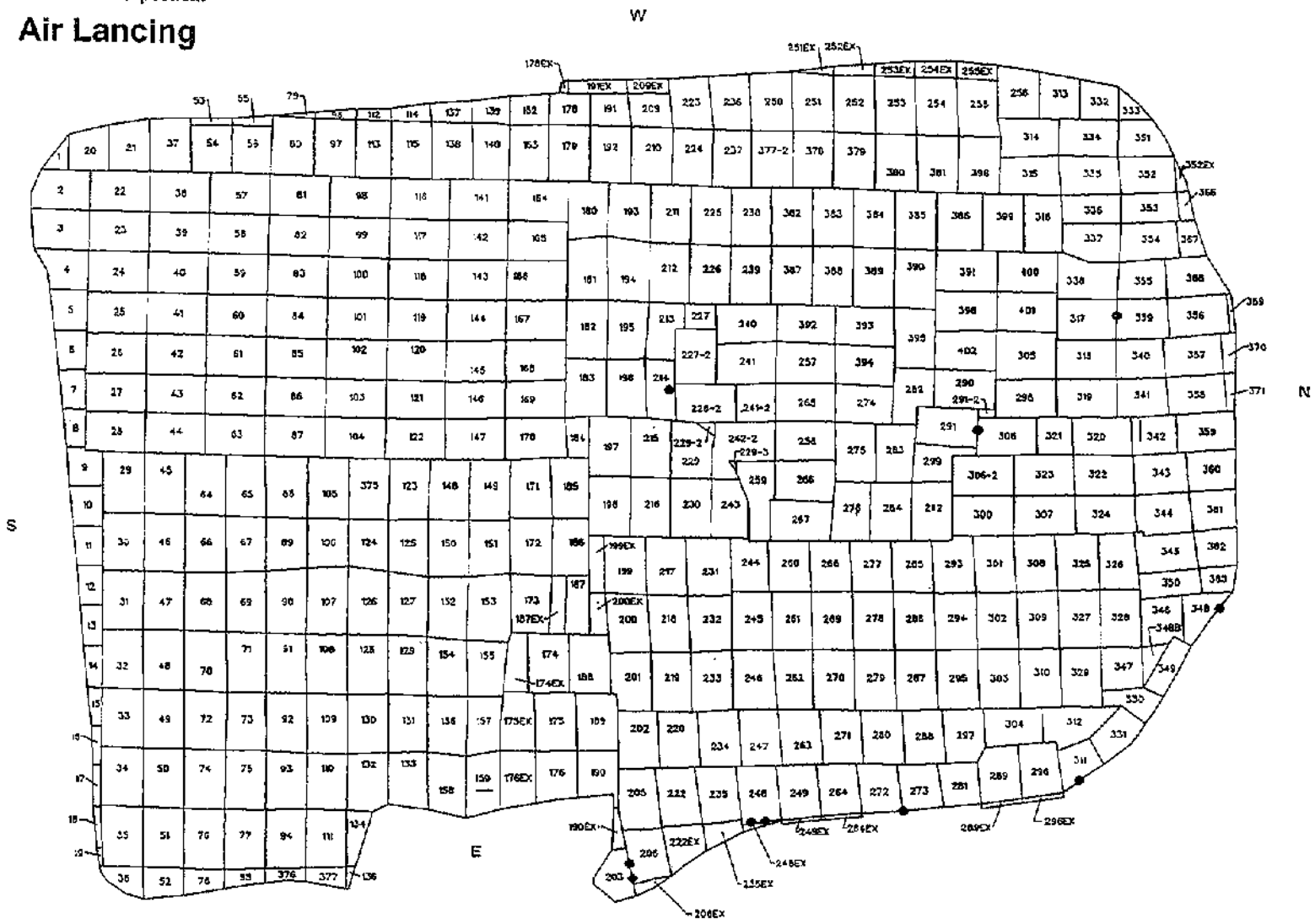
2009 Annual Inspection:

Visual

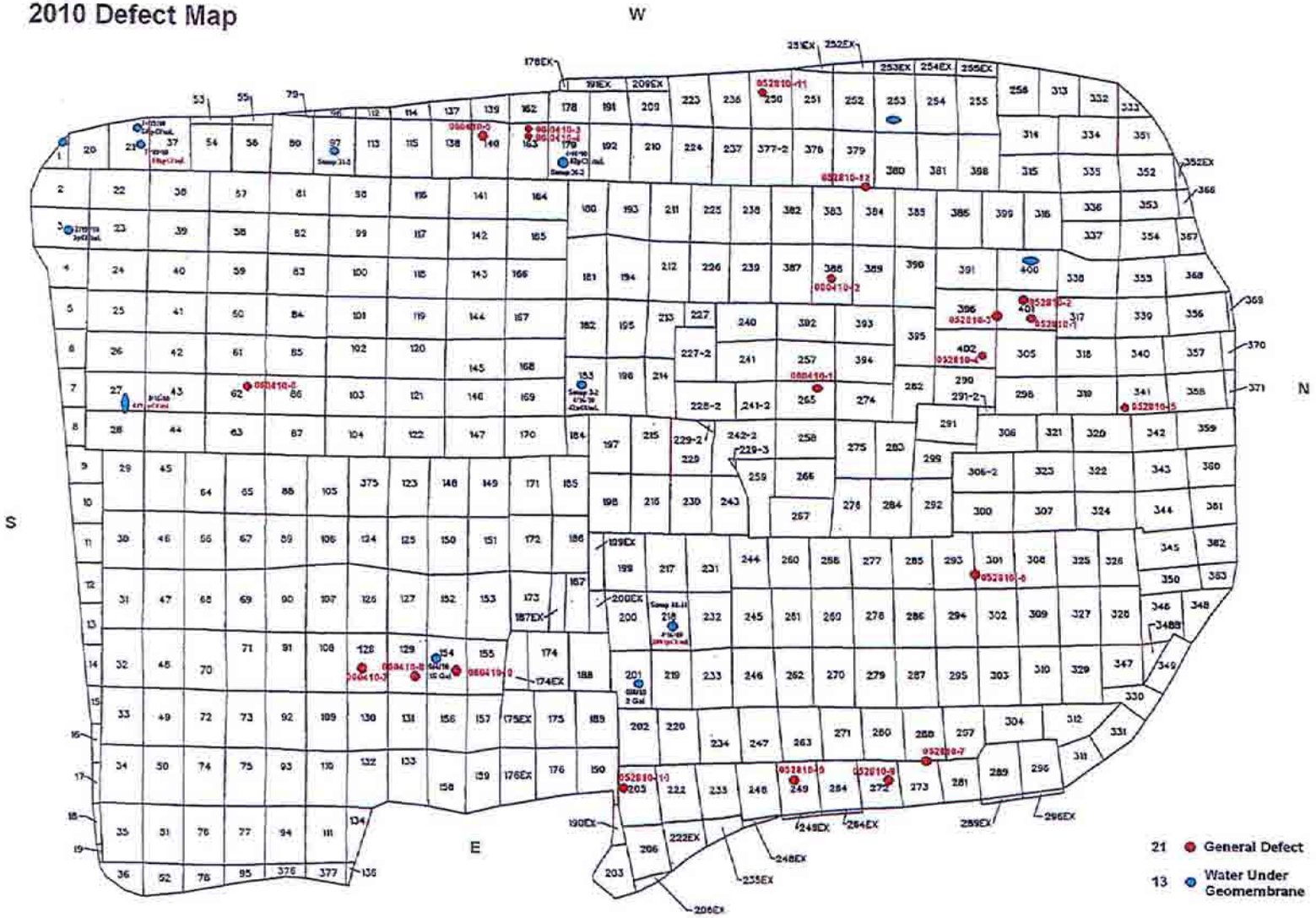


2009 Annual Inspection:

Air Lancing

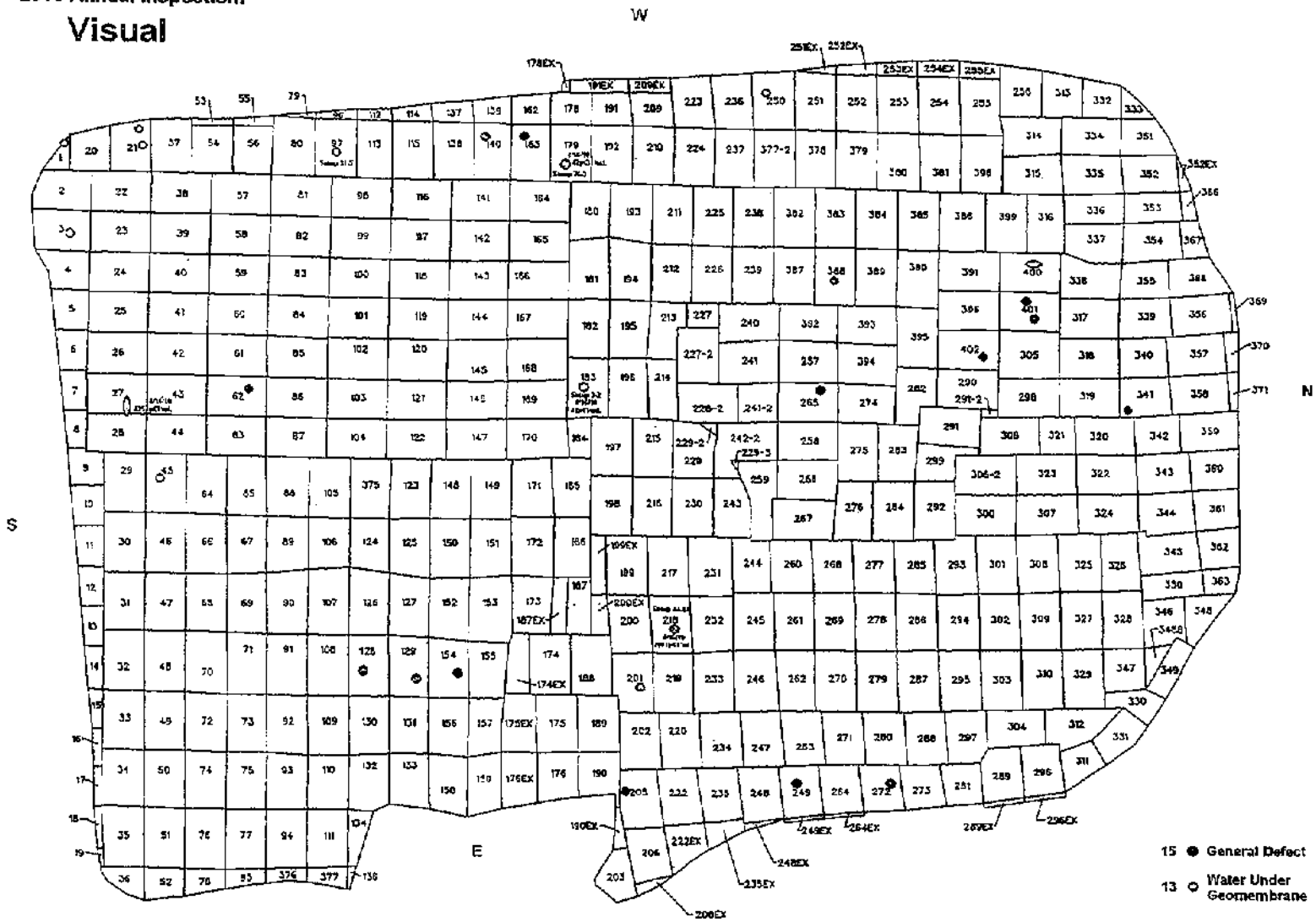


2010 Defect Map



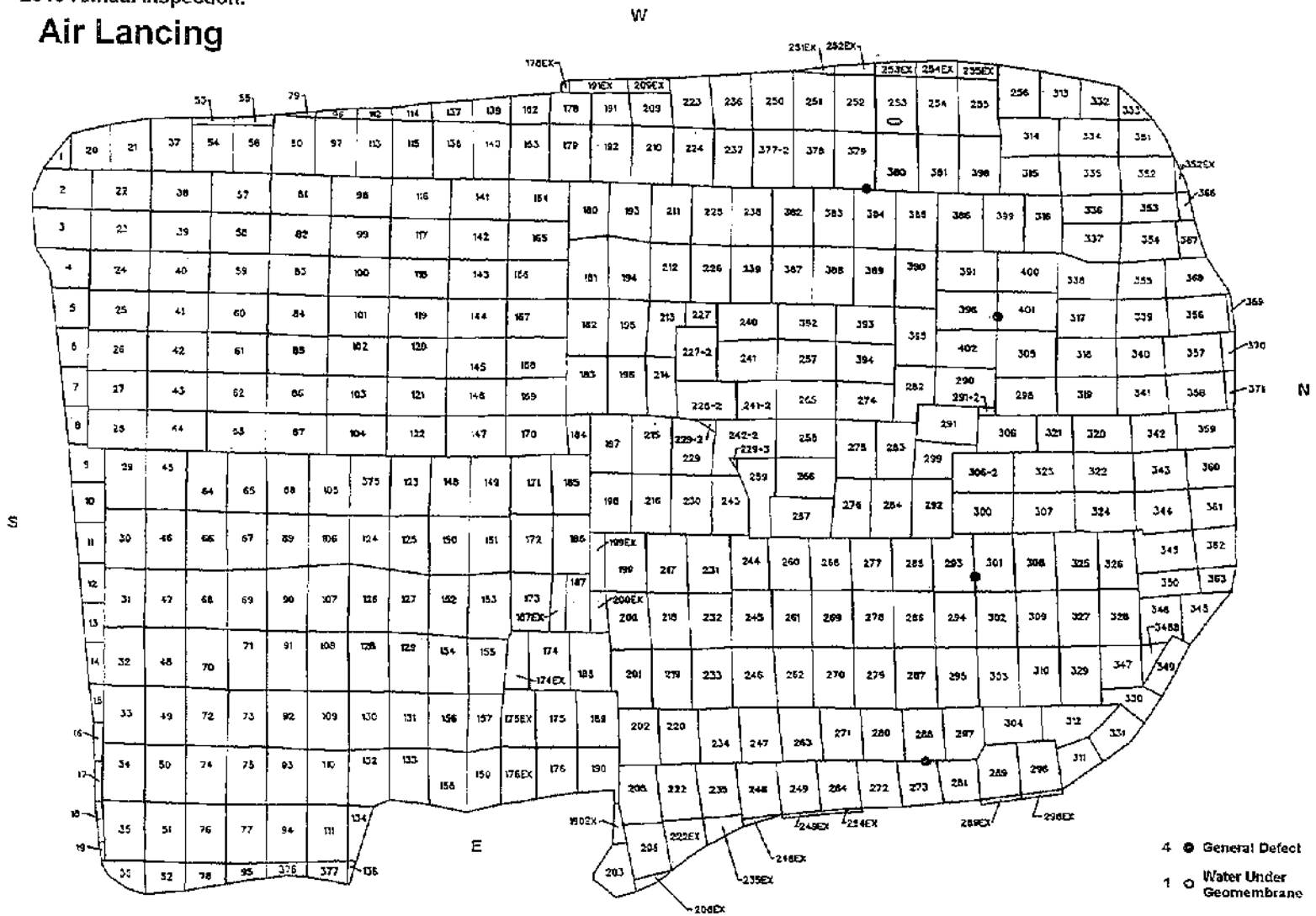
2010 Annual Inspection:

Visual

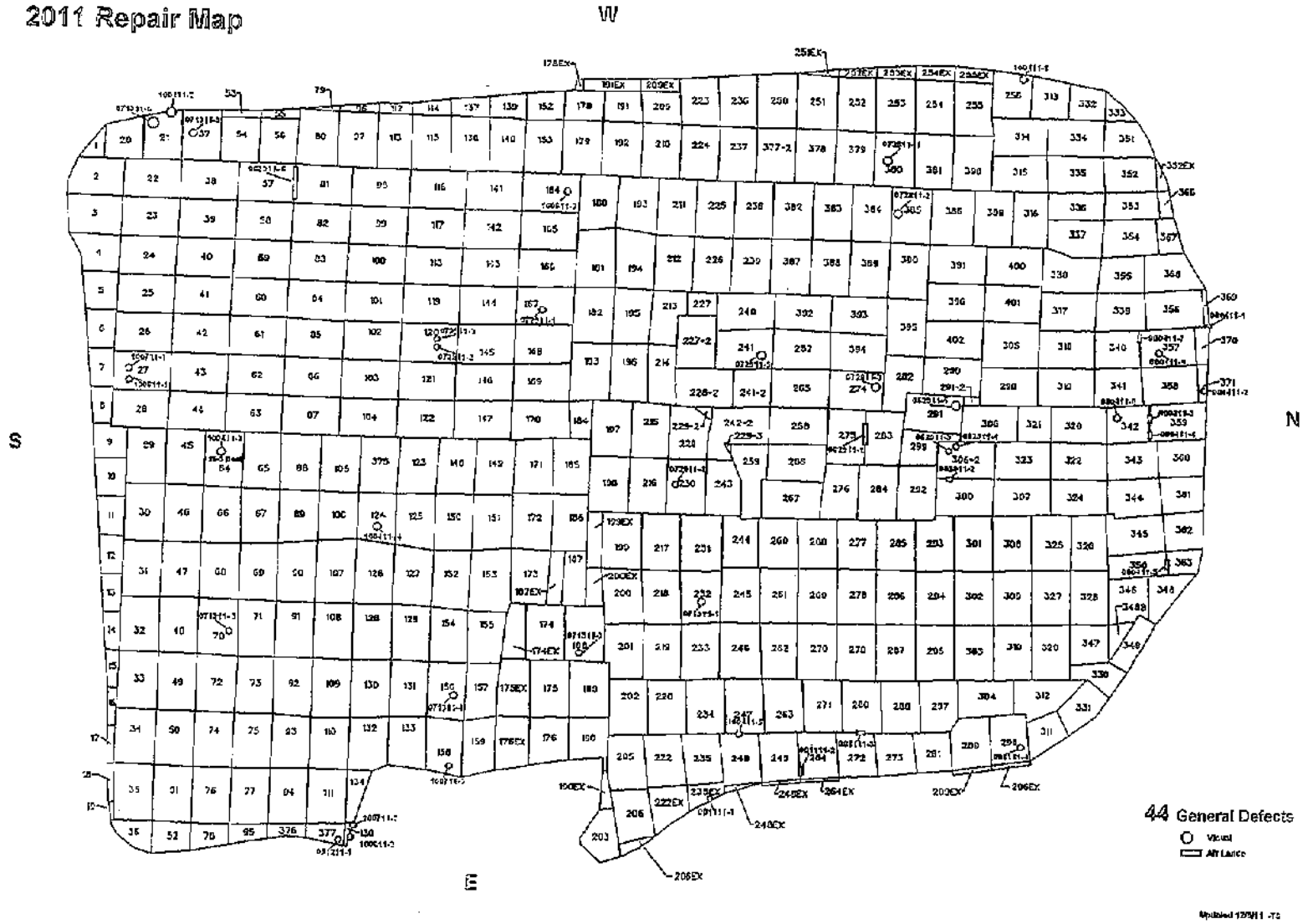


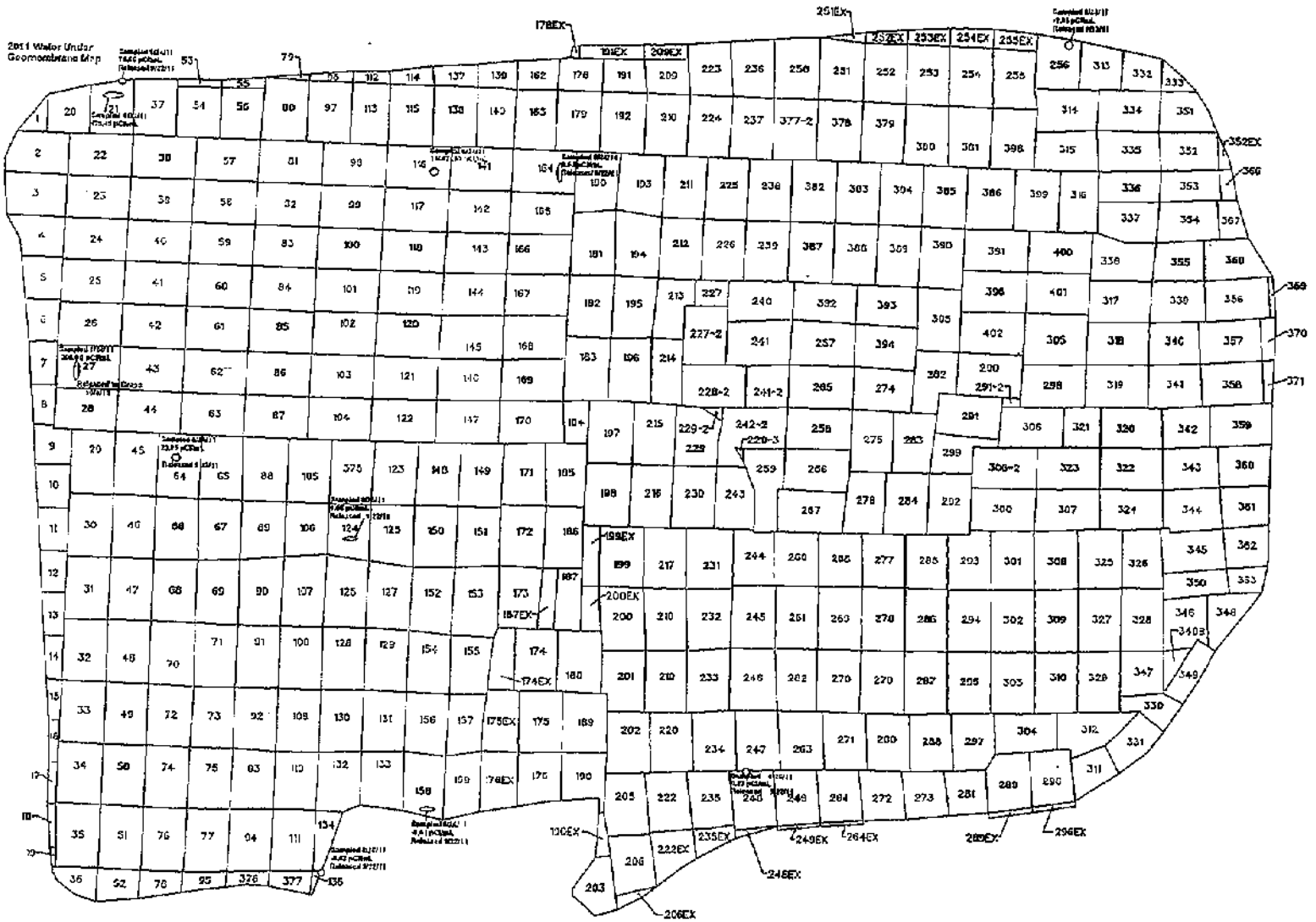
2010 Annual Inspection:

Air Lancing



2011 Repair Map




2011 Water Under
Geomembrane Map

ATTACHMENT 4

SUMP LIQUID LEVEL DATA AND POTENTIOMETRIC SURFACE MAPS

Maxey Flats Project Sump Measurements 2007-2011

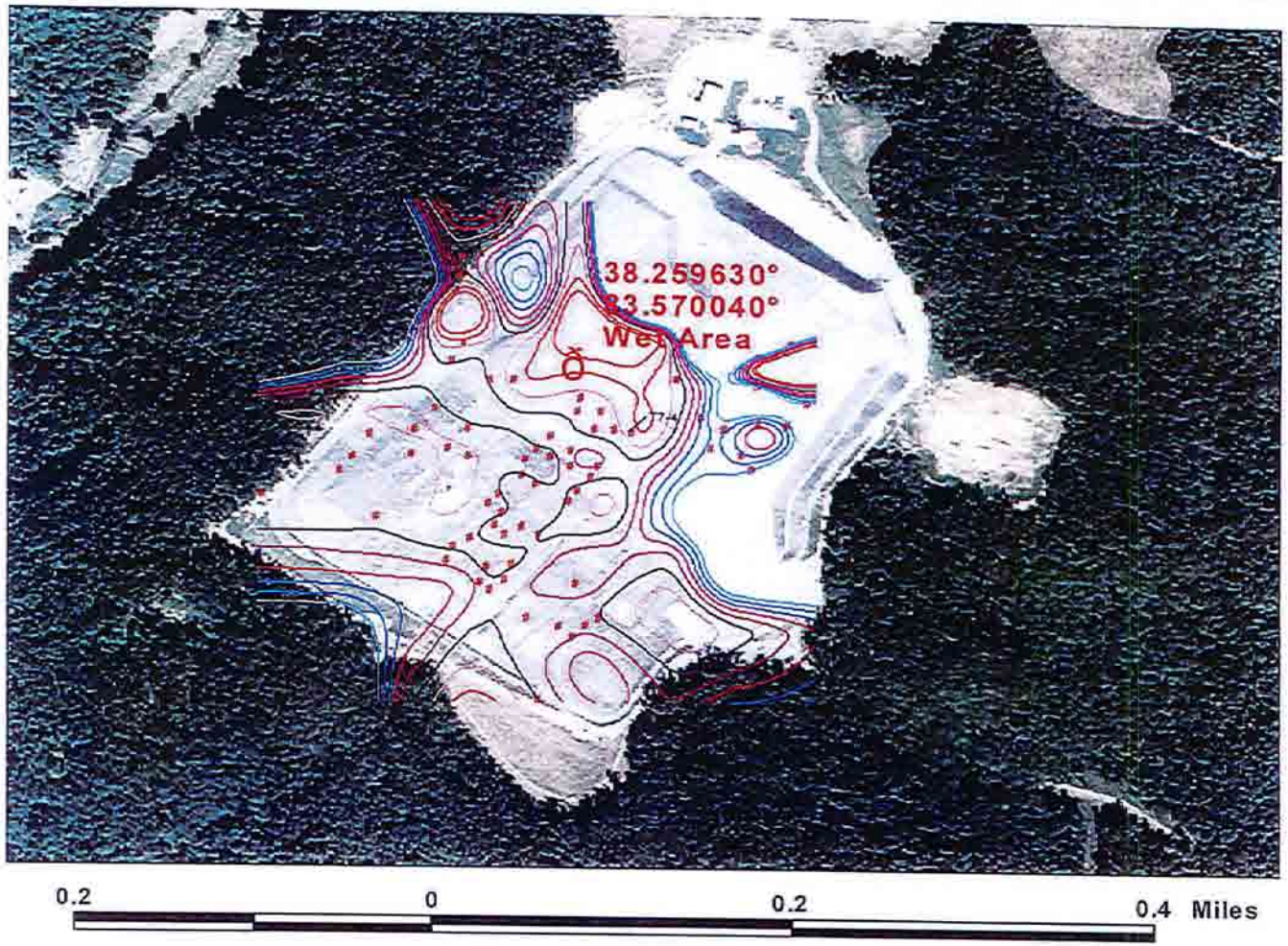
Manual Measurements Only

Italics denote dry sumps

Sump ID	ToC Elev	Oct-07	Oct-08	Oct-09	Oct-10	Oct-11	Sump ID
1-2	1056.17	19.52	19.63	19.76	19.85	19.99	1-2
2-6	1057.51	20.18	20.13	20.09	20.08	20.06	2-6
3-2	1059.45	22.65	*22.85*	*23.10*	23.07	23.10	3-2
3-4	1054.33	15.95	16.02	16.05	16.07	16.12	3-4
7-4	1052.42	9.27	7.78	6.56	6.02	5.39	7-4
7-5	1057.95	19.60	19.87	20.02	20.09	20.18	7-5
7-7	1059.01	20.57	20.78	21.00	21.16	21.30	7-7
10-7	1060.34	27.45	27.38	27.32	27.26	27.21	10-7
10-8	1058.78	27.71	27.68	27.70	27.68	27.68	10-8
10-9	1054.92	24.84	24.64	24.49	24.30	24.15	10-9
11S-5	1057.08	20.95	20.97	21.00	20.98	21.01	11S-5
11S-6	1063.22	24.49	24.57	24.66	24.68	24.72	11S-6
15-4	1062.04	26.62	26.61	26.61	26.61	26.62	15-4
15-5	1061.21	25.03	24.38	23.97	23.66	23.11	15-5
15-6	1059.46	28.25	28.17	28.10	28.01	27.95	15-6
15-8	1055.85	22.39	22.43	22.57	22.61	22.65	15-8
18-6	1065.42	30.23	30.19	30.14	30.10	30.08	18-6
18-9	1059.54	*D*	*21.96*	*21.96*	*21.96*	21.90	18-9
19-5	1063.23	28.88	28.85	28.79	28.72	28.68	19-5
19-6	1058.71	23.15	23.08	23.05	22.97	22.95	19-6
19-7	1064.26	29.86	29.74	29.65	29.57	29.53	19-7
20W	1065.49	28.14	28.14	28.18	28.20	28.22	20W
20-7	1063.29	29.91	29.77	29.64	29.72	29.79	20-7
20-9	1065.36	30.01	29.98	29.98	29.97	29.96	20-9
20-11	1059.06	24.07	24.04	24.02	23.97	23.96	20-11
23-5	1063.61	30.84	30.78	30.75	30.68	30.64	23-5
23-6	1064.28	30.61	30.52	30.45	30.35	30.29	23-6
23-9	1059.08	*D*	*24.26*	*24.24*	*24.24*	*24.23*	23-9
24-5	1058.86	23.31	23.31	23.30	23.29	23.30	24-5
24-6	1062.47	26.43	26.41	26.41	26.38	26.37	24-6
25-5	1059.82	23.37	23.41	23.53	23.49	23.41	25-5
25-7	1060.71	24.86	24.76	24.70	24.65	24.64	25-7
25-9	1057.05	23.48	22.47	22.49	22.45	22.57	25-9
26-2	1059.31	27.45	27.38	27.31	27.24	27.19	26-2
26-3	1058.38	26.45	26.38	26.31	26.23	26.18	26-3
26-4	1056.44	22.05	22.08	22.11	22.05	22.09	26-4
27-9	1062.84	26.52	26.42	26.34	26.23	26.17	27-9
27-11	1064.78	*D*	*25.62*	*25.61*	*25.56*	*25.58*	27-11
28W	1064.15	26.03	26.03	26.03	26.03	26.06	28W

Sump ID	ToC Elev	Oct-07	Oct-08	Oct-09	Oct-10	Oct-11	Sump ID
31-5	1062.13	23.02	23.04	23.04	23.04	23.06	31-5
31-7	1065.30	24.75	24.69	24.69	24.65	24.75	31-7
31-9	1066.46	25.73	25.85	25.97	26.04	26.14	31-9
32-E	1064.75	28.94	28.93	28.95	28.92	28.92	32-E
32-9	1065.27	28.93	28.94	28.96	28.97	28.97	32-9
35-2	1064.08	27.97	28.04	28.14	28.15	28.19	35-2
35-6	1063.00	27.30	27.30	27.30	27.27	27.29	35-6
36-3	1062.52	20.76	20.74	20.76	20.76	20.79	36-3
36-6	1066.55	23.97	23.96	23.97	23.98	23.98	36-6
36-7	1064.64	22.25	22.22	22.20	22.17	22.19	36-7
37-3	1055.27	22.66	22.62	22.59	22.54	22.51	37-3
37-4	1055.86	*D*	*23.44*	23.39	23.35	23.34	37-4
38-4	1055.75	21.44	21.38	21.35	21.29	21.25	38-4
38-5	1055.53	21.09	21.03	21.01	20.95	20.92	38-5
39-4	1056.93	*D*	*19.12*	*19.12*	*19.12*	*19.11*	39-4
40-15	1047.28	*D*	*21.35*	*21.35*	*21.34*	*21.32*	40-15
40-17	1052.66	28.49	28.42	28.33	28.22	28.13	40-17
40-19	1054.59	29.66	29.62	29.58	29.58	29.58	40-19
40-22	1056.95	30.91	31.84	31.81	31.80	31.81	40-22
42-11	1049.49	28.43	28.46	28.48	28.49	28.50	42-11
42-19	1046.99	27.88	27.88	27.92	27.91	27.89	42-19
42-20	1052.04	*D*	*34.96*	*34.96*	*34.96*	*34.96*	42-20
43-7	1047.17	36.26	36.33	36.42	36.50	36.59	43-7
43-9	1045.19	34.48	34.57	34.65	34.71	34.77	43-9
43-13	1041.02	30.57	30.59	30.64	30.66	30.69	43-13
44-5	1057.33	*D*	*40.68*	*40.49*	*40.51*	*40.48*	44-5
44-14	1048.42	34.26	34.26	34.25	34.25	34.24	44-14
44-20	1052.25	38.38	38.36	38.34	38.36	38.33	44-20
44-22	1055.02	40.11	40.04	39.90	39.61	39.52	44-22
45-1	1054.78	29.33	29.29	29.29	29.22	29.20	45-1
46-1	1054.17	22.27	21.93	21.85	21.82	21.87	46-1
46-2	1052.89	20.60	20.34	20.16	19.97	19.68	46-2
46-3	1052.27	18.22	18.62	18.64	18.52	18.79	46-3
Entered by/Verified by		**MK/SW**	**MK/SW**	**MK/DR**	**MK/DR**	**MK/TS**	

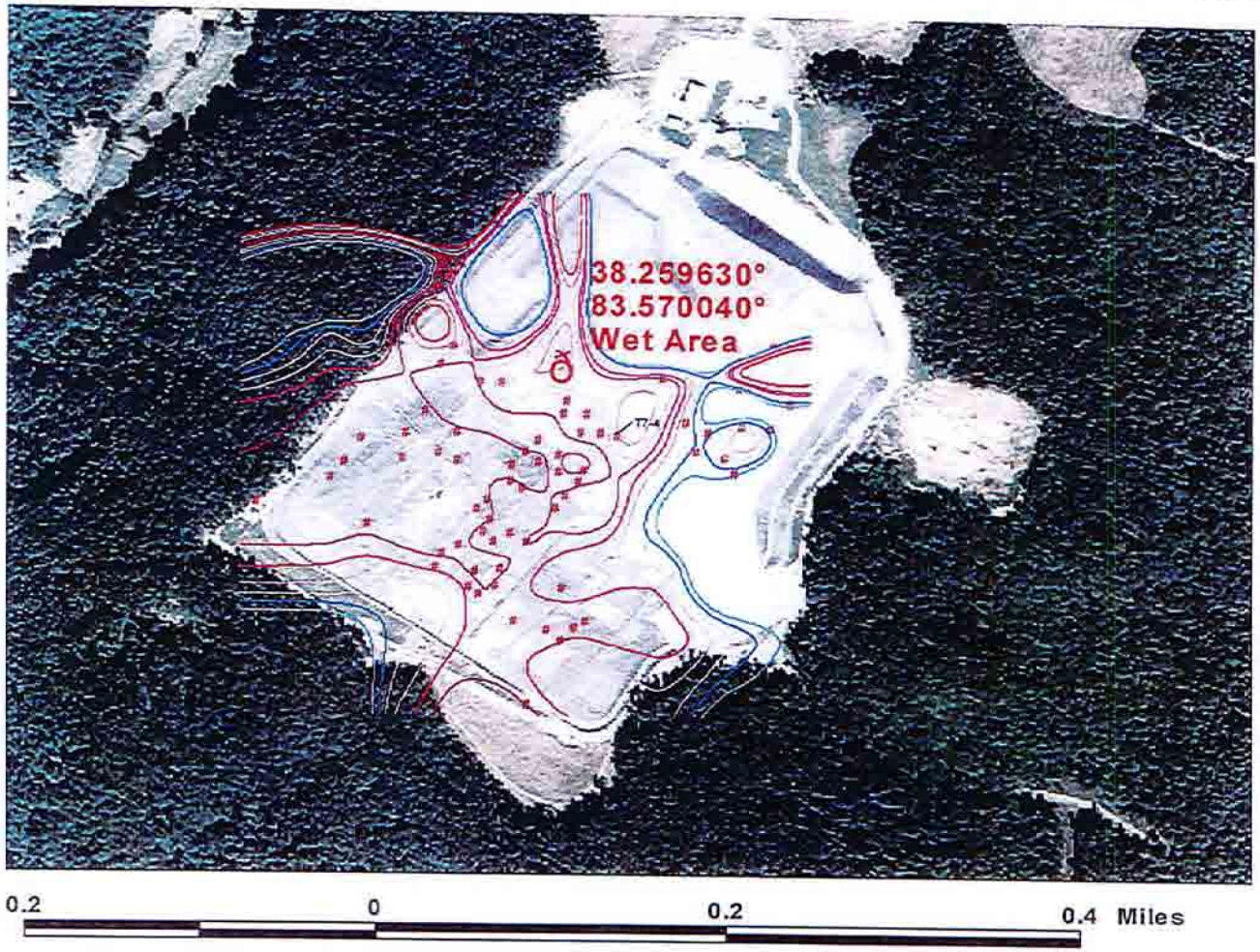
October 2007 Potentiometric Surface



Contours of Wells_sumps_6_5_08.db
1050
1045
1040
1035
1030
1025
1020
1015
1010
County
Wells_sumps_6_5_08.dbf
Quad

N
W
E
S

April 2008 Potentiometric Surface

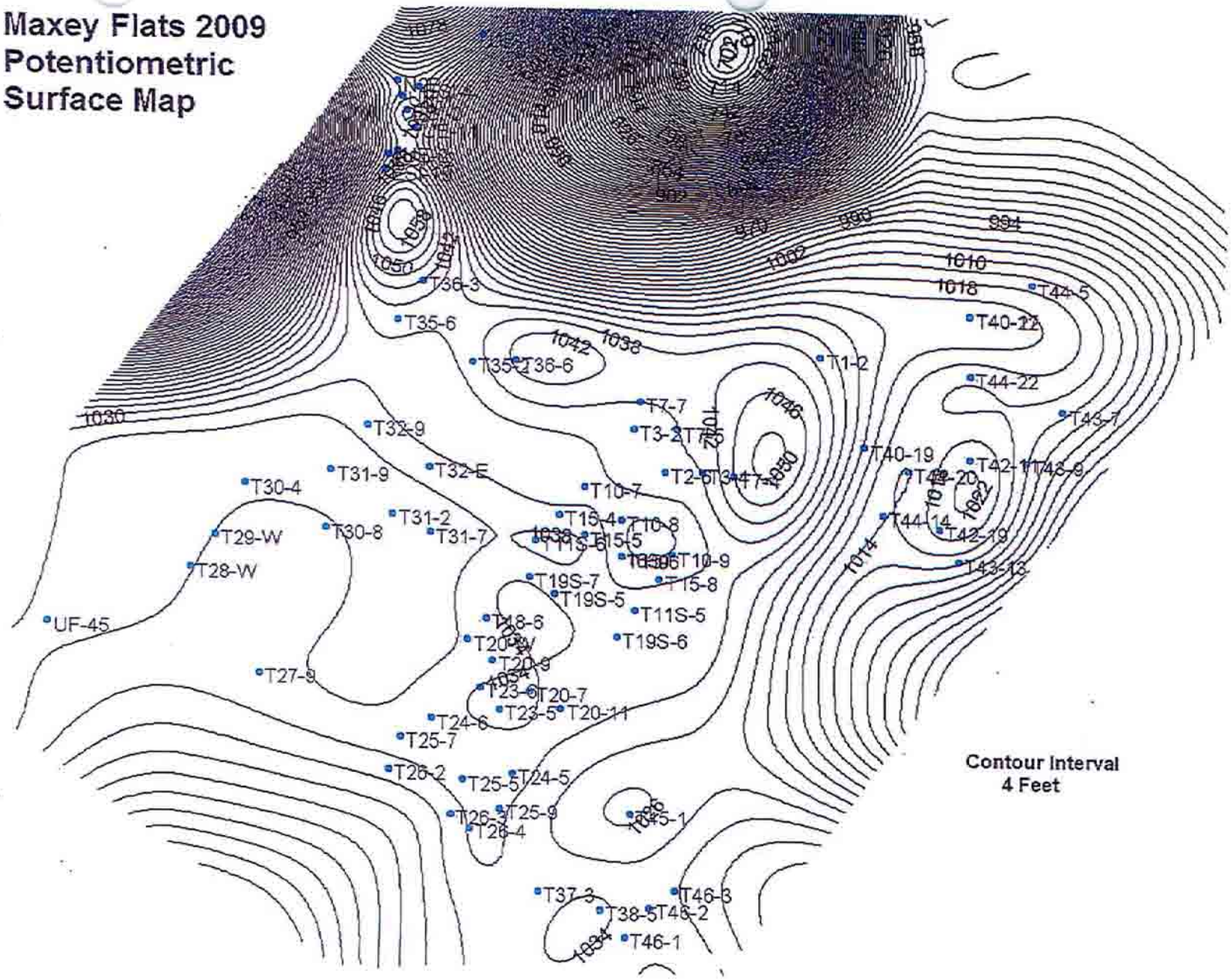


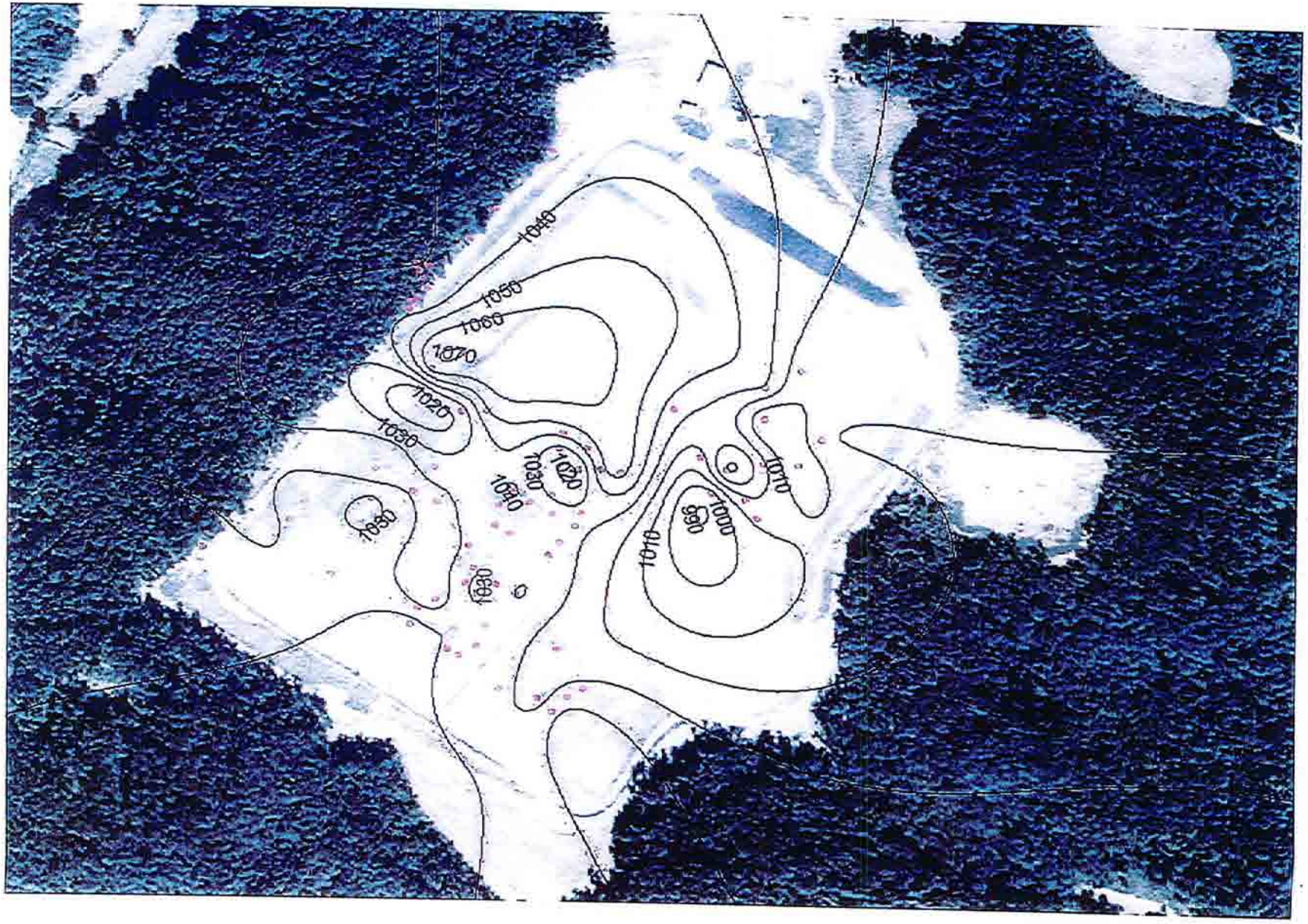
0.2 0 0.2 0.4 Miles

Contours of Wells_sumps_6_5_08.dbf
1050
1045
1040
1035
1030
1025
1020
1015
1010
County
Wells_sumps_6_5_08.dbf
Quad

N
W E
S

Maxey Flats 2009 Potentiometric Surface Map

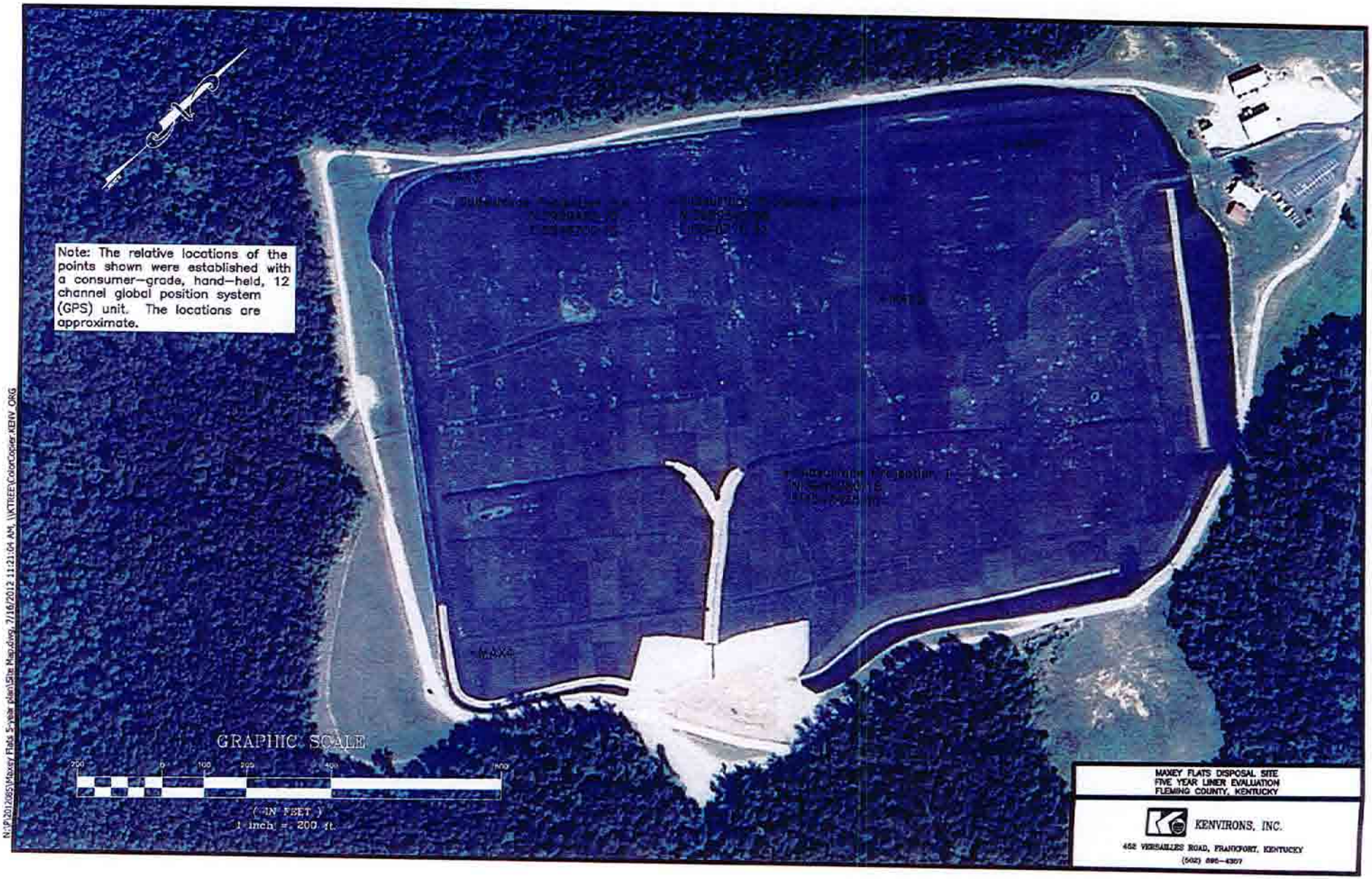




Maxey Flats Project
2010 Potentiometric Map

ATTACHMENT 5

5-YEAR GEOMEMBRANE SAMPLE LOCATION MAP



N:\P\2012\095\Maxey Flats 5-year plan\Site Mapping, 7/16/2012 11:21:04 AM, \\KTREE\ColorCopier.KENV.ORG

ATTACHMENT 6

CAP LINER MATERIAL TEST REPORTS

April 30, 2012

Mail To:

Tim Oakes, P.E.
Kenvirons, Inc.
452 Versailles Road
Frankfort, KY 40601

email: Toakes@kenvirons.com

Bill To:

<= Same

Dear Mr. Oakes:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs.
TRI is pleased to submit this final report for laboratory testing.

Project:	**Maxey Flats - 5 Year Review**
TRI Job Reference Number:	E2366-43-07
Material(s) Tested:	3 , 45 mil Scrim Reinforced Polypropylene Seam(s) 1 , 45 mil Scrim Reinforced Polypropylene material(s)
Test(s) Requested:	SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54? D 751, Mod./D413) Grab Tensile (ASTM D 7004)

Codes	
AD	Adhesion failure (100% Peel)
BRK	Break in sheeting away from Seam edge
SE	Break in sheeting at edge of seam
AD-BRK	Break in sheeting after some adhesion failure - partial peel
SIP	Separation in the plane of the sheet (leaving the bond intact)
FTB	Film tearing bond (all non "AD" failures)
NON-FTB	100% peel

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Patel

Mansukh Patel
Sr. Laboratory Coordinator
Geosynthetic Services Division
www.GeosyntheticTesting.com

GeosyntheticTesting.com
9063 Bee Caves Road / Austin, TX 78733 / 512 263 2101 / fax: 512 263 2558

DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS

TRI Client: Kenvirons, Inc.

Project: Maxey Flats - 5 Year Review

Material: 45 mil. Scrim Reinforced Polypropylene Seam

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/D751, mod./D413)

TRI Log #: E2366-43-07

PARAMETER		TEST REPLICATE NUMBER 1	2	3	4	5	MEAN	PROJ. SPEC.
Sample ID:	#1							
Weld:	Single Track Heat Fusion							
							Peel	
Peel Strength (ppi)		58	43	61	53	53	54	
Peel Incursion (%)		<10	100	<10	<10	<10		
Peel Locus of Failure Code		SIP	AD	SIP	SIP	SIP		
Peel NSF Failure Code		FTB	NON-FTB	FTB	FTB	FTB		
							Shear	
Shear Strength (lbs)		310	341	352	365	331	340	
Shear Elongation @ Break (%)		27	51	52	58	17		

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS

TRI Client: Kenvirons, Inc.

Project: Maxey Flats - 5 Year Review

Material: 45 mil. Scrim Reinforced Polypropylene Seam

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/D751, mod./D413)

TRI Log #: E2366-43-07

PARAMETER		TEST REPLICATE NUMBER 1	2	3	4	5	MEAN	PROJ. SPEC.
Sample ID:	#2							
Weld:	Single Track Heat Fusion							
							Peel	
Peel Strength (ppi)		47	44	46	52	54	48	
Peel Incursion (%)		<10	<10	<10	<10	<10		
Peel Locus of Failure Code		SIP	SIP	SIP	SIP	SIP		
Peel NSF Failure Code		FTB	FTB	FTB	FTB	FTB		
							Shear	
Shear Strength (lbs)		288	246	263	291	278	273	
Shear Elongation @ Break (%)		34	34	35	38	40		

GeosyntheticTesting.com
9063 Bee Caves Road / Austin, TX 78733 / 512 263 2101 / fax: 512 263 2558

DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS

TRI Client: Kenvirons, Inc.

Project: Maxey Flats - 5 Year Review

Material: 45 mil. Scrim Reinforced Polypropylene Seam

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/D751, mod./D413)

TRI Log #: E2366-43-07

PARAMETER		TEST REPLICATE NUMBER 1	2	3	4	5	MEAN	PROJ. SPEC.
Sample ID:	#4							
Weld:	Single Track Heat Fusion							
							Peel	
Peel Strength (ppi)		67	67	57	59	58	62	
Peel Incursion (%)		<10	<10	<10	<10	<10		
Peel Locus of Failure Code		SIP	SIP	SIP	SIP	SIP		
Peel NSF Failure Code		FTB	FTB	FTB	FTB	FTB		
							Shear	
Shear Strength (lbs)		270	275	262	248	293	270	
Shear Elongation @ Break (%)		37	40	38	37	42		

GeosyntheticTesting.com
9063 Bee Caves Road / Austin, TX 78733 / 512 263 2101 / fax: 512 263 2558

LABORATORY TEST RESULTS

TRI Client: Kenvirons, Inc.
Project: Maxey Flats - 5 Year Review

Material: Reinforced Poplypropylene Geomembrane
Sample Identification: #3
TRI Log #: E2366-43-07

PARAMETER	1	2	3	4	5	MEAN	MIN
Grab Tensile (ASTM D 7004)							
A Load at Scrim Break(lbf)	238	251	213	233	239	235	213
B Load at Scrim Break(lbf)	222	234	243	233	219	230	219
A Strain (%) at Scrim Break	12	13	11	12	12	12	11
B Strain (%) at Scrim Break	13	13	14	13	12	13	12
A Max Load (lbf)	253	252	248	261	244	251	244
B Max Load (lbf)	222	235	244	233	219	230	219
A Strain (%) at Max. Load	43	13	47	47	35	37	13
B Strain (%) at Max. Load	13	13	14	13	12	13	12

GeosyntheticTesting.com
9063 Bee Caves Road / Austin, TX 78733 / 512 263 2101 / fax: 512 263 2558

TRI / Environmental, Inc.
A Texas Research International Company

April 30, 2012

Mail To:

Attn: Tim Oakes
Kenvirons, Inc.
452 Versailles Road
Frankfort, KY 40601

email: toakes@kenvirons.com

Bill To:

<= Same

Dear Mr. Oakes:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project:	**Maxey Flats - 5 Year Review**
TRI Job Reference Number:	E2366-55-04
Material(s) Tested:	1 Edge of RGM without Scrim Reinforce Fiber
Test(s) Requested:	Carbon Black Content (ASTM D 1603, mod.)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

MPatel

Mansukh Patel
Sr. Laboratory Coordinator
Geosynthetic Services Division
www.GeosyntheticTesting.com

cc: Sam R. Allen, Vice President and Division Manager

GeosyntheticTesting.com
9063 Bee Caves Road / Austin, TX 78733 / 512 263 2101 / fax: 512 263 2558

GEOMEMBRANE TEST RESULTS

TRI Client: Kenvirons, Inc.
Project: Maxey Flats - 5 Year Review

Material: Edge of RGM without Reinforce Fiber
Sample Identification: Sample # 5
TRI Log #: E2366-55-04

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Carbon Black Content (ASTM D 1603, mod.)												
% Carbon Black	3.95	3.82									3.89	0.09

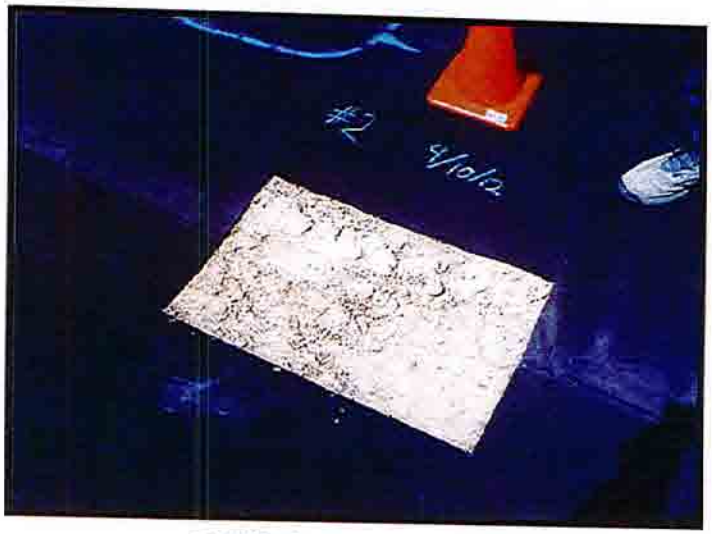
Ash content is not substracted from the Carbon Black Content Reported here.

GeosyntheticTesting.com
9063 Bee Caves Road / Austin, TX 78733 / 512 263 2101 / fax: 512 263 2558

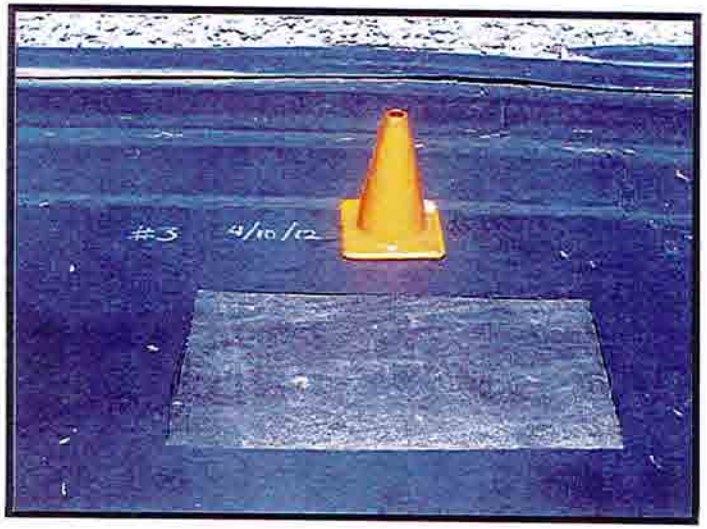
ATTACHMENT 7

PHOTOGRAPHS

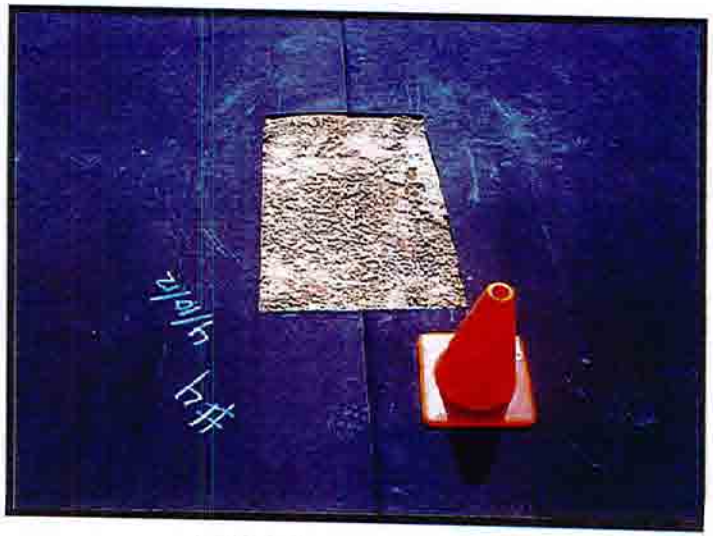
MAX1 Sample Location



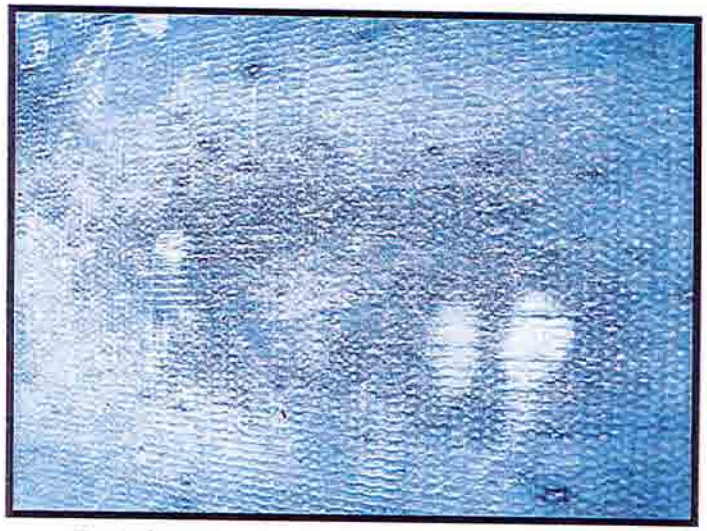
MAX2 Sample Location



MAX3 Sample Location

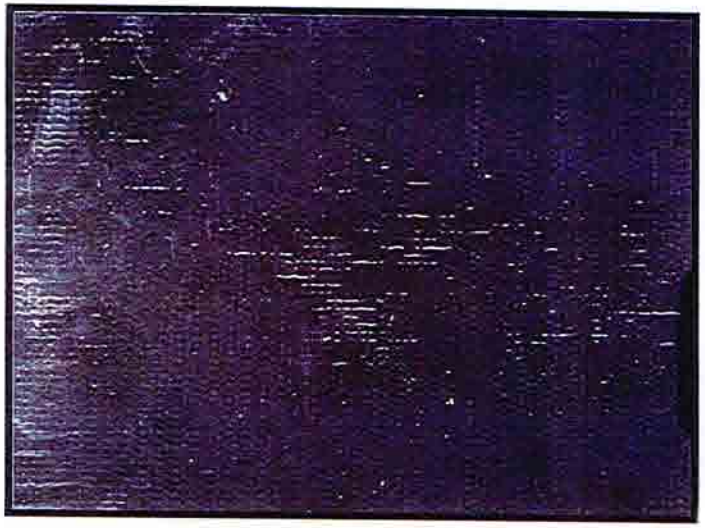


MAX4 Sample Location

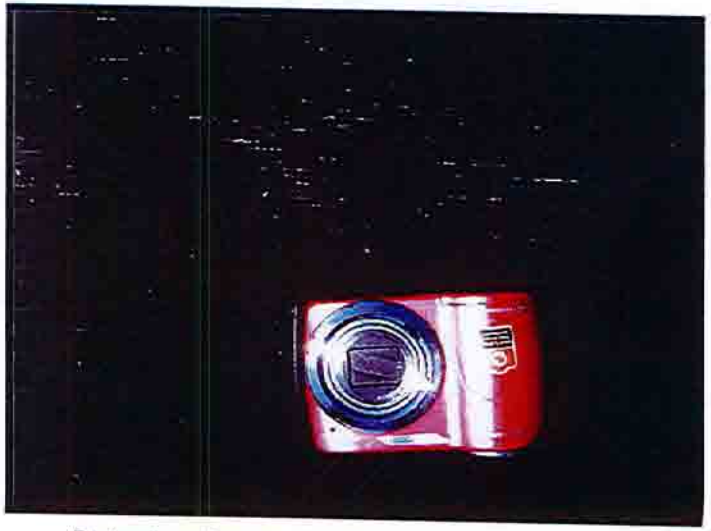


Deterioration on Surface of Liner (typical)

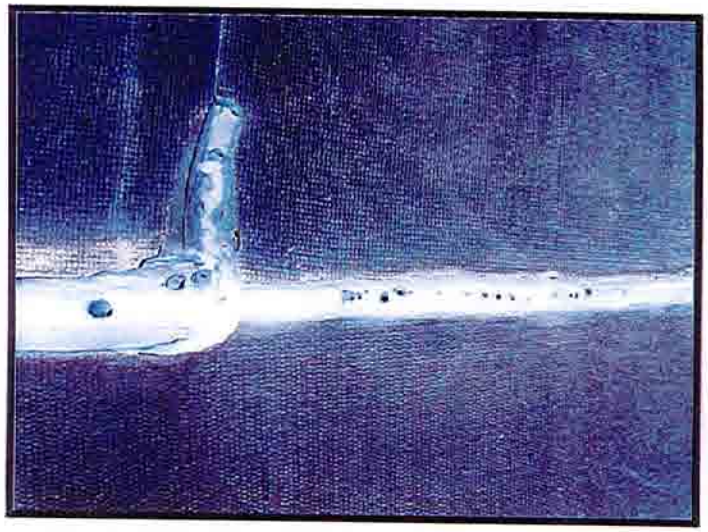
Deterioration on Surface of Liner (typical)



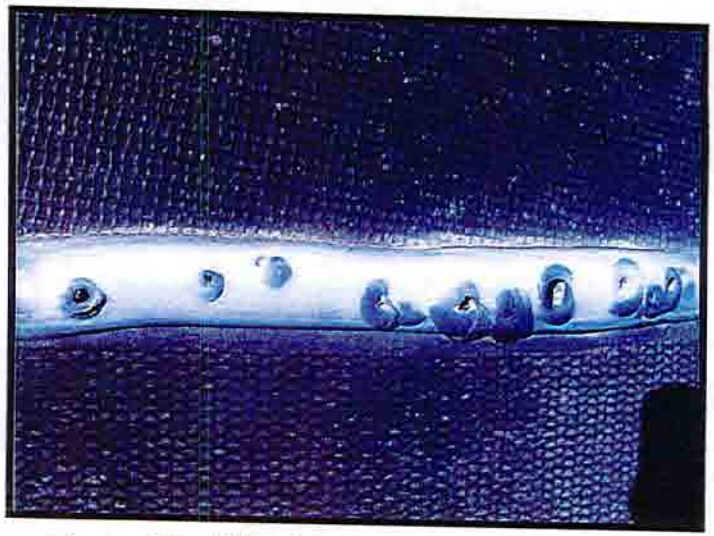
Deterioration on Surface of Liner (typical)



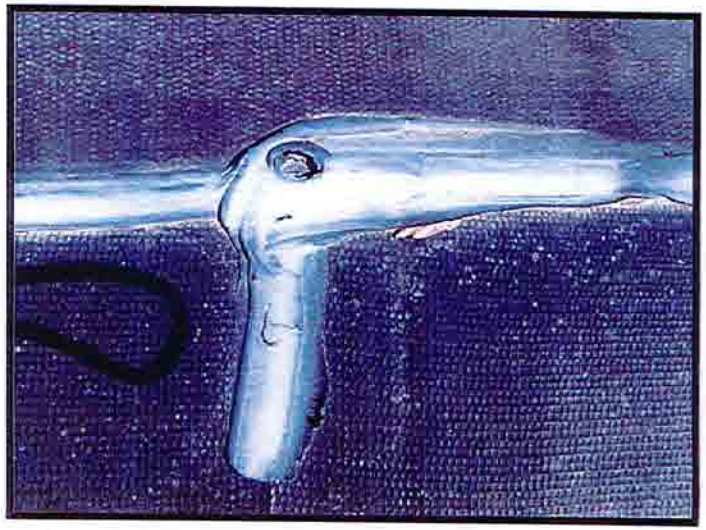
Deterioration on Surface of Liner (typical)



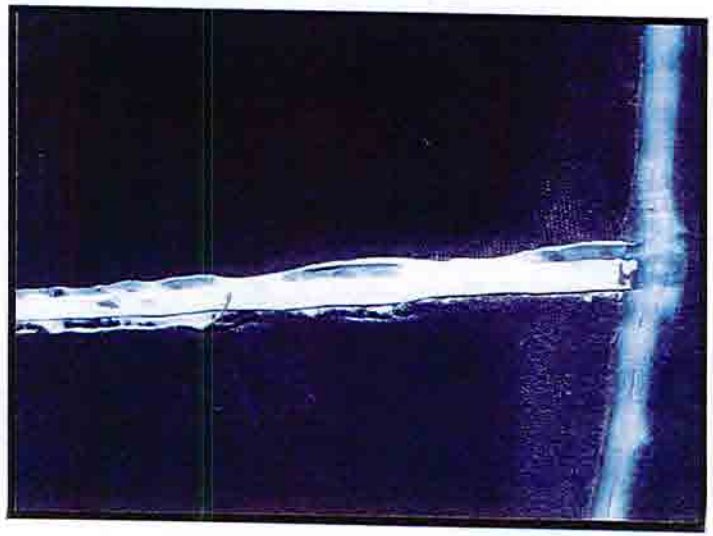
Typical "Bubbling" Failure of Extrusion Weld



Typical "Bubbling" Failure of Extrusion Weld



Typical "Bubbling" Failure of Extrusion Weld



Typical Peel Failure of Extrusion Weld

Typical Peel Failure of Extrusion Weld

Typical Peel Failure of Extrusion Weld

Typical Poor Quality Fusion Weld

Typical Poor Quality Fusion Weld

Typical Poor Quality Fusion Weld

Typical Abandoned Sump Riser Protrusion

Typical Evidence of Pooling Water on Cap Surface

Personnel Conducting the Site Evaluation

North Perimeter Channel

Perimeter Channel in Northwest Corner of Cap

West Side of Bunker Mound

West Side of Cap Area Looking South

West Side of Cap Area Looking North

Perimeter Channel in Southwest Corner of Cap

Typical Sump Riser Pipe

South End of Cap Looking East

Central Cap Area Looking North from South End

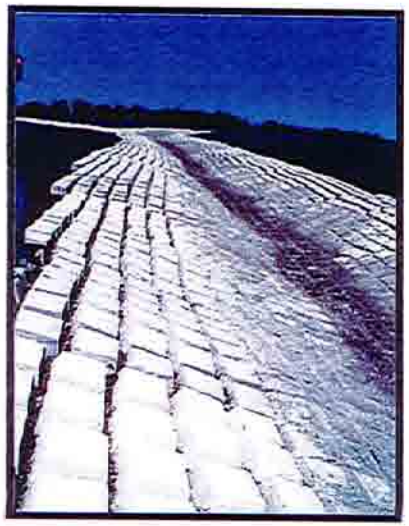
Perimeter Ditch along South Side of Cap Area

Perimeter Channel at Southeast Corner of Cap

Central Cap Area looking Northwest

East Detention Basin

Y-Channel Ditch into East Detention Basin



Concrete Mat in Y-Channel Looking West

Y-Channel Ditch into East Detention Basin

Typical Concrete Mat in Concrete Lined Ditches

Typical Diversion Berm into Lined Ditch

Y-Channel Ditch Looking East into Detention Basin

Central Cap Area Looking South

Central Cap Area Looking Southwest

Central Cap Area Looking West

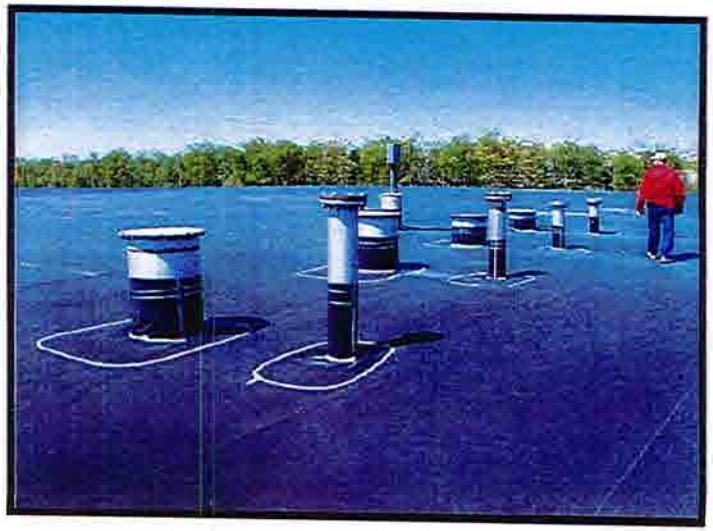
Central Cap Area Looking Northwest

Central Cap Area Looking North

Central Cap Area Looking Northeast

Top of Bunker Mound Looking South

Access Risers on Top of Bunker Mound



Access Risers on Top of Bunker Mound

Looking Northeast from Bunker Mound

Looking East from Bunker Mound

Looking Southeast from Bunker Mound

Looking South from Bunker Mound

Looking Southwest from Bunker Mound

Looking West from Bunker Mound

ATTACHMENT 8

MISCELLANEOUS REFERENCE DOCUMENTS

CHANGE REQUEST FORM

Date Change Requested: 12-22-11

Change Request Number: 10

Maxey Flats Project
2597 Maxey Flat Road
Hillsboro, KY 41049

Initiator: Thomas Stewart

Brief Description of Change:

The Maxey Flats Project (MFP) is requesting to discontinue the development and use of potentiometric surface maps to evaluate sump recharge. The MFP is required by the IMP PSVP- Section 2.3.1-*Data collection and Evaluation* to produce a potentiometric surface map and a potentiometric surface change map to evaluate trends and recharge across the Restricted Area. These maps are to be developed using sump leachate levels, well water levels, and noted subsidence areas.

Reason for Change:

Potentiometric maps are not an effective tool for evaluating sump recharge. Because waste was disposed of in trenches that were often chambered, sumps may not be in direct contact with surrounding groundwater; even sumps within the same trench may not be in hydraulic contact with each other. The sumps are not reliable groundwater monitoring points because sump pipes with torch-cut screens were installed by direct push method. This type of installation is likely to produce a clogged pipe with poor communication to the surrounding aquifer. The prominent method of groundwater flow within and surrounding the restricted area is fracture flow, Zehner 1983. Fracture flow is very difficult, if not impossible to model accurately. Therefore, the accuracy of potentiometric surface maps produced from the IMP stipulated sumps and wells are unreliable.

Sumps will continue to be evaluated on an individual basis to determine if substantial recharge is occurring that would require development of a leachate management engineering evaluation. Sumps and wells will also continue to be evaluated as a whole from exterior/perimeter to interior as a method to evaluate horizontal recharge.

☐ Minor

[x] **Major**

If a Major Change:
Date EPA Notified by Telephone 12-22-11
Date Approved by EPA, or _____
Date Denied by EPA, or _____
Implemented w/o Comment on _____
(i.e., implemented because EPA did not respond within 30 days)

Signatures (If Needed):

Tom Stewart — 12-22-11
Thomas Stewart, Initiator — Date

Scott Wilburn — 12-22-11
Scott Wilburn, Maxey Flats Project — Date

_____ — _____
Pam Scully, U.S. Environmental Protection Agency — Date

Maxey Flats Project
Leachate Management Engineering Evaluation
For
Trench Sump 7-4

A re-evaluation of the August 6, 2008 Leachate Management Engineering Evaluation

March 29, 2011

Maxey Flats Project
2597 Maxey Flats Road
Hillsboro, KY 41049
606-783-8680

Trench Sump 7-4
Leachate Management Engineering Re-evaluation

Purpose

As required by the Maxey Flats Project (MFP) Interim Maintenance Period (IMP) Work Plan, a Leachate Management Engineering Evaluation (LMEE) for Sump 7-4 was submitted to Pam Scully of the US EPA Region IV August 6, 2008. The LMEE was triggered due to a 50% loss of freeboard (difference between baseline leachate level and ground surface) in sump 7-4. This re-evaluation plan is being submitted in light of additional data and an additional explanation to the rise in water level within sump 7-4. This additional data and explanation will not impact the current course of action for sump 7-4; quarterly monitoring with comparison to pre-pump water level elevation.

Update

In comparison to freeboard, sump 7-4 remains the only sump that has significantly increased in liquid level since the certification of completion in October of 2003. A freeboard loss of approximately 10% annually has been observed in sump 7-4 since monitoring began in 2004. As of January 2011, sump 7-4 obtained 67.17 % loss of freeboard. The January liquid elevation of sump 7-4 is 1046.45, which is 0.55 feet short of its 1998 pre-pumping elevation of 1047.20. See chart below for additional monitoring data.

Sump 7-4 Liquid Level and Freeboard Monitoring			
Date	**Percentage of Freeboard Used**	**Liquid Level Elevation (ft)**	**Feet to Pre-pump Elevation of 1047.2**
Nov. 2002	0.00%	1037.14	9.86
Oct. 2004	17.17%	1039.52	7.48
Oct. 2005	27.99%	1041.02	5.98
Mar. 2006	31.60%	1041.52	5.48
May 2006	32.32%	1041.62	5.38
Oct. 2006	37.73%	1042.37	4.63
Feb. 2007	40.69%	1042.78	4.22
Apr. 2007	41.99%	1042.96	4.04
Jul. 2007	42.78%	1043.07	3.93
Oct. 2007	43.36%	1043.15	3.85
Jan. 2008	47.84%	1043.77	3.23
Apr. 2008	53.10%	1044.50	2.50
Jul. 2008	54.55%	1044.70	2.30
Oct. 2008	54.11%	1044.64	2.36
Feb. 2009	57.29%	1045.08	1.92
Apr. 2009	59.02%	1045.32	1.68
Jul. 2009	60.97%	1045.59	1.41
Oct. 2009	62.91%	1045.86	1.14
Jan. 2010	64.43%	1046.07	0.93
Apr. 2010	64.50%	1046.08	0.92
Jul. 2010	67.97%	1046.56	0.44
Oct. 2010	66.81%	1046.40	0.60
Jan. 2011	67.17%	1046.45	0.55

Source: MFP Database, Sump Levels Verified

The original Leachate Management Engineering Evaluation of Sump 7-4 was completed by the Maxey Flats Project (MFP) with technical assistance from Registered Professional Geologists in the Technical Services Section of the Groundwater Branch at the KY Division of Water. This re-evaluation includes an two additional theories to the liquid level rise of sump 7-4 that was developed by the MFP and Professional Geologist within the KY Superfund Branch. The original evaluation included sump freeboard comparisons, development of several hydrogeologic investigation maps and a topographic area flow map. The new theories, lack of hydraulic transmissivity and trench leachate stabilization were develop from: IRP pump data, pre IRP pumping and post IRP pumping water level comparison, review of a 1983 USGS Study and knowledge of basic applied hydrogeology. The three original theories for the rise in liquid level of sump 7-4 are: liner failure, fracture flow, and a historic seep.

Additional Causative Theories

Poor Hydraulic Transmissivity - this theory considers the possibility that the earth and waste materials of sump 7 have poor hydraulic conductivity when transmitting water.

During IRP pumping operations from October 1999 to June 2000, only seventy-two total gallons of water were pumped from sump 7-4. Sump 7-4 was pumped a total of fifteen times during the IRP with 34 gallons being the highest yield of any pumping event (see table below). It is important to know that IRP pumping protocol never placed the pump at the bottom of the sump, preventing the sump from being pumped completely dry, nor was the pump placed at consistent depths.

Sump 7-4 IRP Pumping Data	
Pump Date	**Gallons**
10/21/1999	34
10/22/1999	5
10/25/1999	1
10/26/99	0
10/27/1999	0
10/28/1999	0
11/3/1999	0
11/4/1999	0
11/5/1999	0
11/8/1999	10
11/22/1999	1
11/29/1999	0
4/26/2000	20
6/5/2000	1
Total	**72**

Source: Remedial Action Construction Report, Final Volume II, June 2003.

Pre-pump measurements of sump 7-4 indicate a sump volume of 62 gallons. Based on historic documentation; only 72 gallons of leachate was pumped from the sump. This indicates that only 10 gallons of recovery occurred over the 8 month pumping period. This is evidence that the surrounding soil and material media are of very low transmissivity.

The pumping data and well volume data also indicate the pumping activity of sump 7-4 had no impact on the storage of water in the surrounding media. Based on this information, one would expect the level within sump 7-4 to return to its pre-pump elevation over time. To further support that the earthen and waste material within Trench 7 are of low hydraulic conductivity the 1983 USGS study entitled: HYDROGEOLOGIC INVESTIGATION OF THE MAXEY FLAT RADIOACTIVE WASTE BURIAL SITE, FLEMING COUNTY, KENTUCKY indicates Trench 7 had never been very productive for water and that additional sumps were installed in the trench in 1977 due to heavy silting within the existing sumps.

The installation technique of the sumps could also impact the sumps ability to recover. This particular sump is a 12 inch diameter, quarter inch thick pipe that has torch cut screens and was driven into the trench, as opposed to drilled or pushed. This driving method would also promote bounding (silting off) of the screens that would decrease transmissivity. This means the sump will not recover or provide the hydraulic information typically obtained from a monitoring well.

Trench Leachate Stabilization – This theory addresses the possibility that the decreasing leachate elevations observed in other sumps within Trench 7 are impacting sump 7-4. Waste disposal techniques commonly created chambers (vertical fill separating the waste) in the trenches that may prevent groundwater migration within a trench. This is likely the case for Trench 7. As the graph in appendix B titled Trench 7 Sump Comparison indicates, sump 7-4 leachate elevations respond independently to sumps 7-5 and 7-7. Sump 7-4 has a higher leachate elevation than sumps 7-5 and 7-7 and continues to increase in elevation while 7-5 and 7-7 decrease. Therefore, the decreasing leachate elevations of 7-5 and 7-7 are not the source of increase leachate level in sump 7-4.

Previously Presented Causative Theories

Liner Failure – This theory considers the possibility of up-gradient defects in the liner cap. These defects allow rainwater to penetrate the liner and flow toward sump 7-4. To facilitate locating defects, a topographic runoff map of the area surrounding 7-4 was completed. This topographic runoff map also indicated that sump 7-4 is not in a high flow area. Extensive liner evaluations of up-gradient areas have revealed only minimal defects. These defects have been repaired as of July 2008.

Fracture Flow – This theory refers to ground water flowing through fractures in the rock and recharging the sump. If this is the case it is anticipated, that the leachate level will stabilize at or near pre-pump level. It is unlikely the leachate level can increase above pre-pump level because there is no recharge source available that is elevated high enough to create an artisan effect.

Historic Seep – This theory considers the possibility of an up-gradient seep impacting sump 7-4. A seep located at coordinates 38.259630/83.570040 near the EMC bunker is still present beneath the liner. Results of the topographic area flow map indicate sump 7-4, although down-gradient of the seep, is not within its surface flow path.

Conclusion

The transmissivity and the possibility of the screen of sump 7-4 silting off (as documented to occur within Trench 7) are controlling the rate of water level recovery within sump 7-4. Although all four theories could be impacting the water level of sump 7-4 to some degree, hydrological principals indicate that the low transmissivity is the primary contributor. Based on the total volume of water pumped from sump 7-4 (72 gallons) and a pre-pump well water volume 62 gallons it is clear that IRP pumping had little to no impact on the surrounding water level. The presence of low transmissivity soils and materials is evident by the slow recovery documented during IRP pumping. It is also possible that the pumping contributed to silting off of the screens within the casing of sump 7-4. Combining all this knowledge, results in the conclusion that trench sump 7-4 will stabilize at or near the pre-pump water elevation of 1047.2 feet. There are no other obvious hydraulic conditions that could impact the surrounding water level eliminating the concern of trench water releasing to the surface.

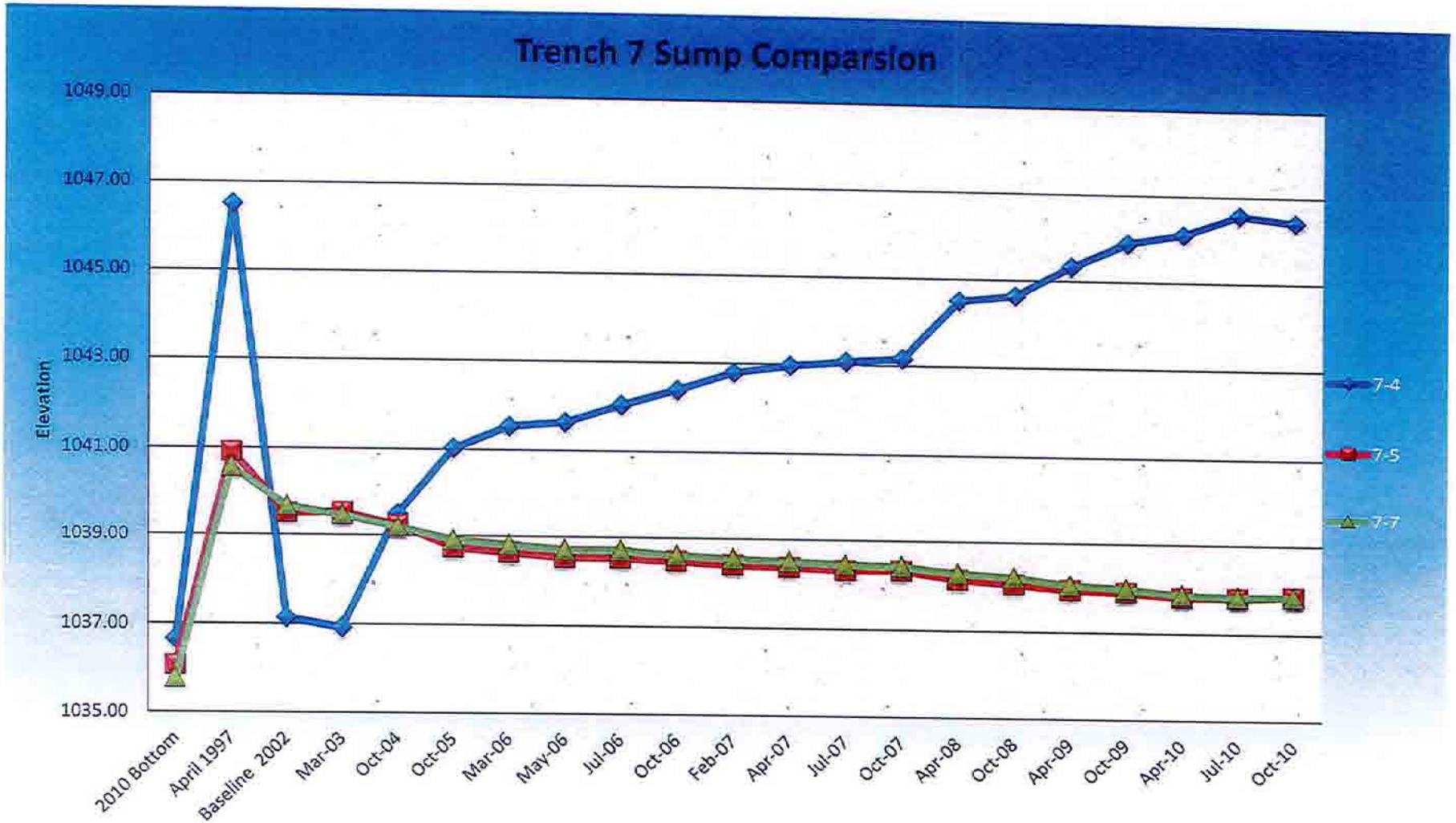
Course of Action

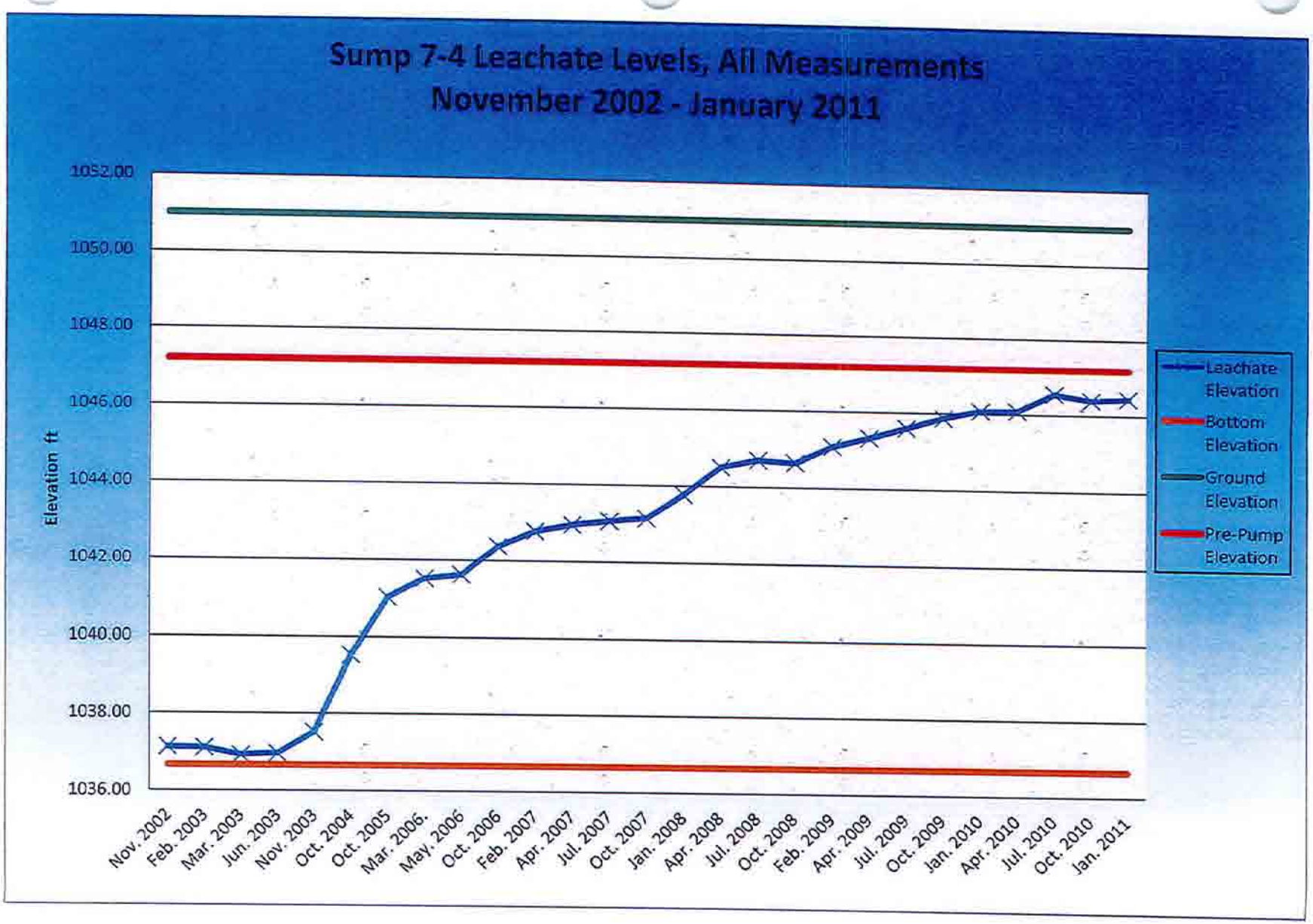
At this time the MFP recommends no changes to the current course of action. The current action is to continue quarterly monitoring of the sump until it stabilizes at or exceeds pre-pump level. If the sump stabilizes near pre-pump levels, monitoring will continue with additional attention focused on the other two sumps within trench 7. If the sump liquid level significantly exceeds pre-pump level, a leachate management plan will be developed. If USEPA would prefer a different course of action, please advise the Maxey Flats Project Office.

Attachments:

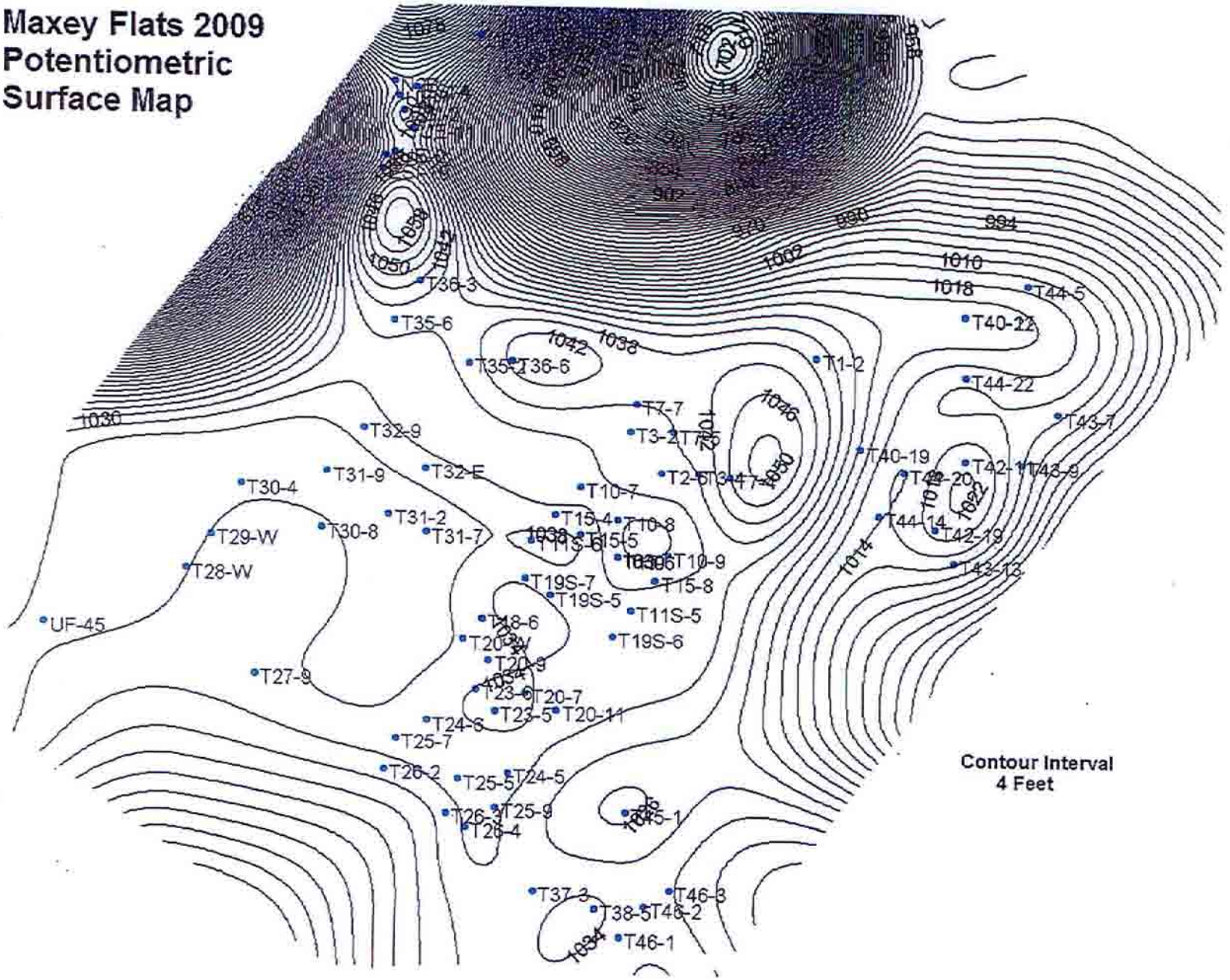
Materials used in the Hydrogeological Evaluation:

- Trench 7 Sump Comparison, Graph
- Sump 7-4 Leachate Levels, Graph
- 2009 Potentiometric Map
- 2008 Potentiometric Map
- 2007 Potentiometric Map
- 2003 Potentiometric Map
- 2008 minus 2003 Water Level map

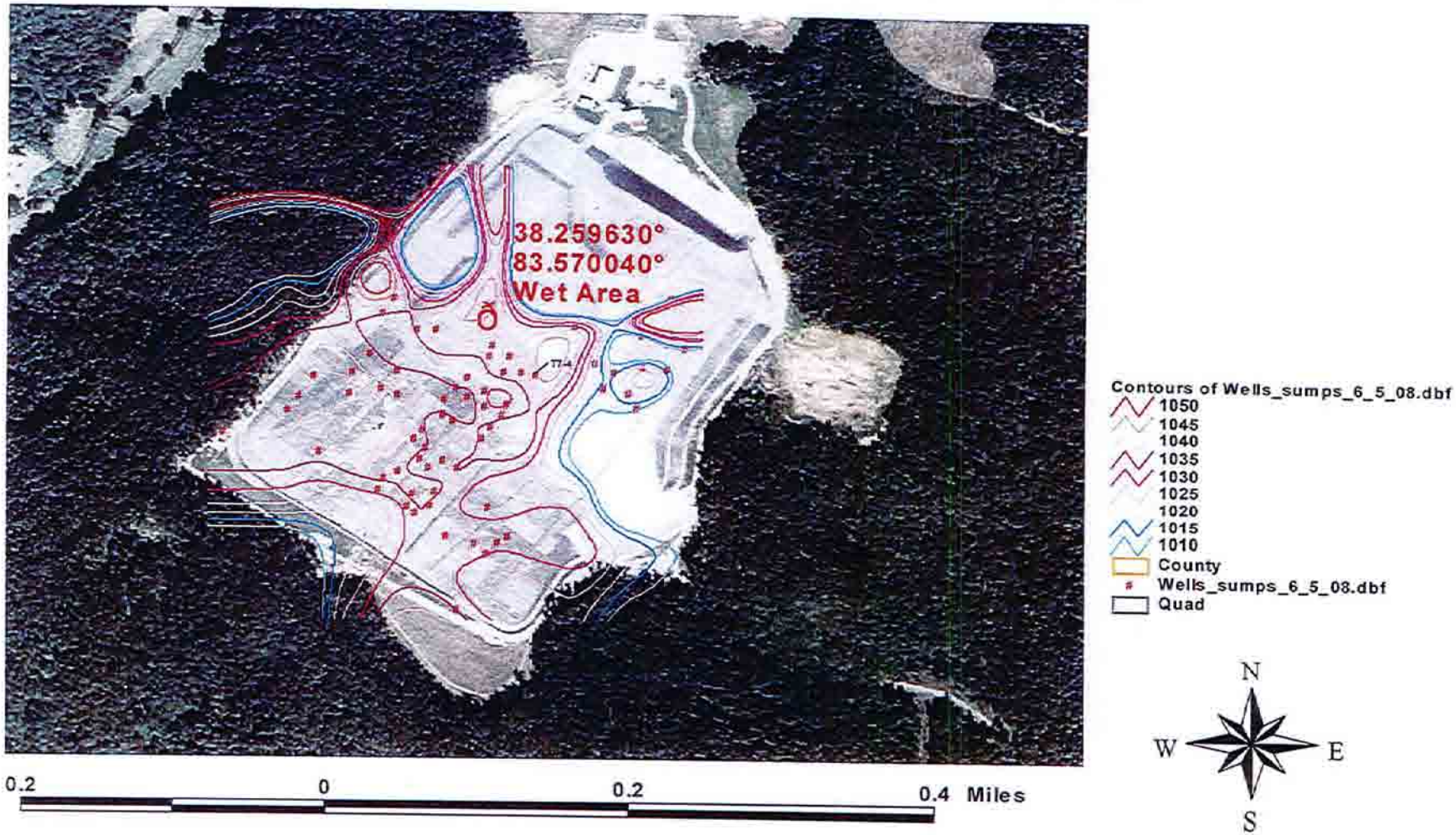

Trench 7 Sump Comparsion
Elevation
1049.00
1047.00
1045.00
1043.00
1041.00
1039.00
1037.00
1035.00
2010 Bottom
April 1997
Baseline 2002
Mar-03
Oct-04
Oct-05
Mar-06
May-06
Jul-06
Oct-06
Feb-07
Apr-07
Jul-07
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09
Apr-10
Jul-10
Oct-10
7-4
7-5
7-7


Sump 7-4 Leachate Levels, All Measurements
November 2002 - January 2011
Elevation ft
1052.00
1050.00
1048.00
1046.00
1044.00
1042.00
1040.00
1038.00
1036.00
Nov. 2002
Feb. 2003
Mar. 2003
Jun. 2003
Nov. 2003
Oct. 2004
Oct. 2005
Mar. 2006.
May. 2006
Oct. 2006
Feb. 2007
Apr. 2007
Jul. 2007
Oct. 2007
Jan. 2008
Apr. 2008
Jul. 2008
Oct. 2008
Feb. 2009
Apr. 2009
Jul. 2009
Oct. 2009
Jan. 2010
Apr. 2010
Jul. 2010
Oct. 2010
Jan. 2011
Leachate Elevation
Bottom Elevation
Ground Elevation
Pre-Pump Elevation

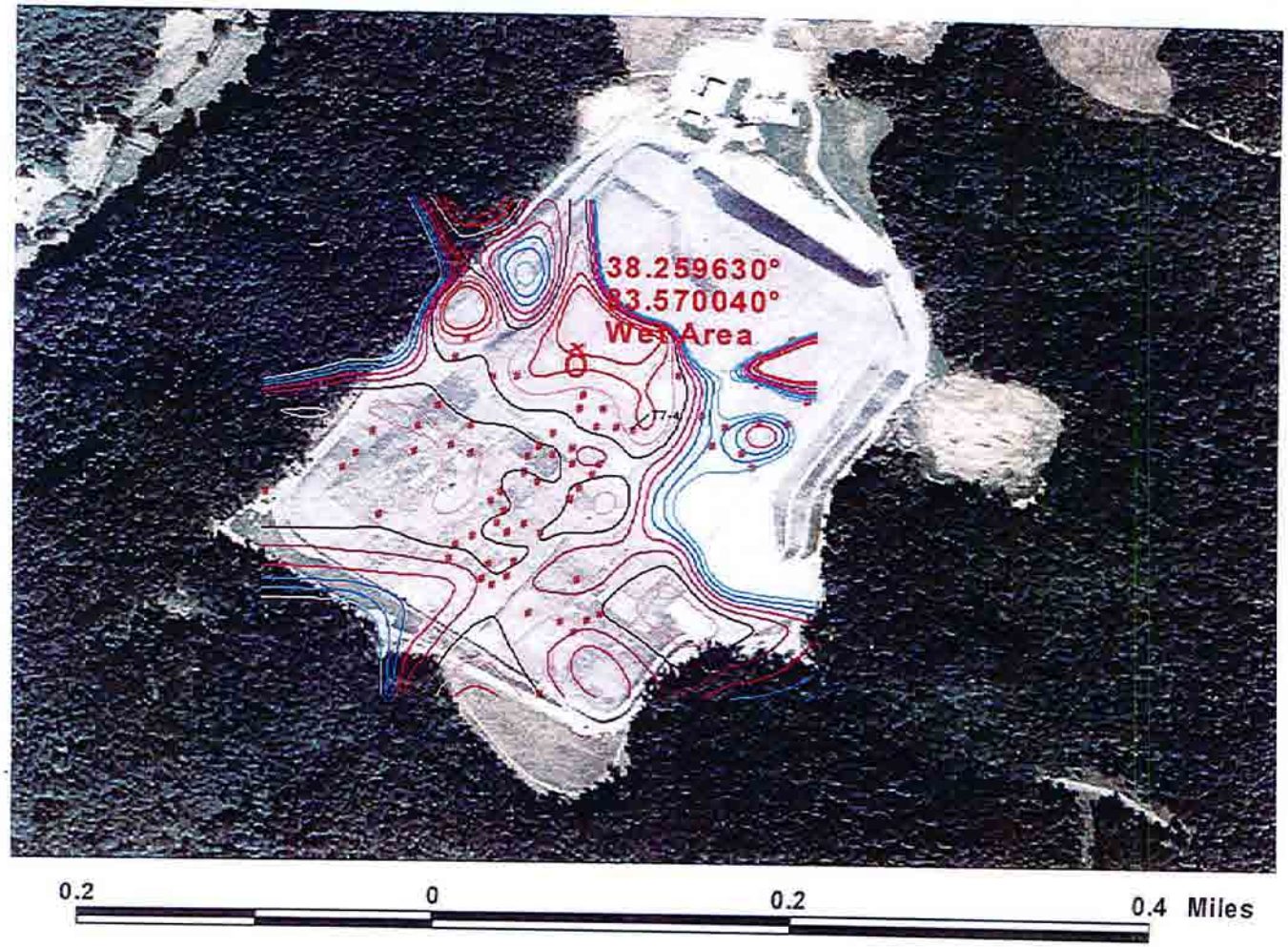
Maxey Flats 2009 Potentiometric Surface Map



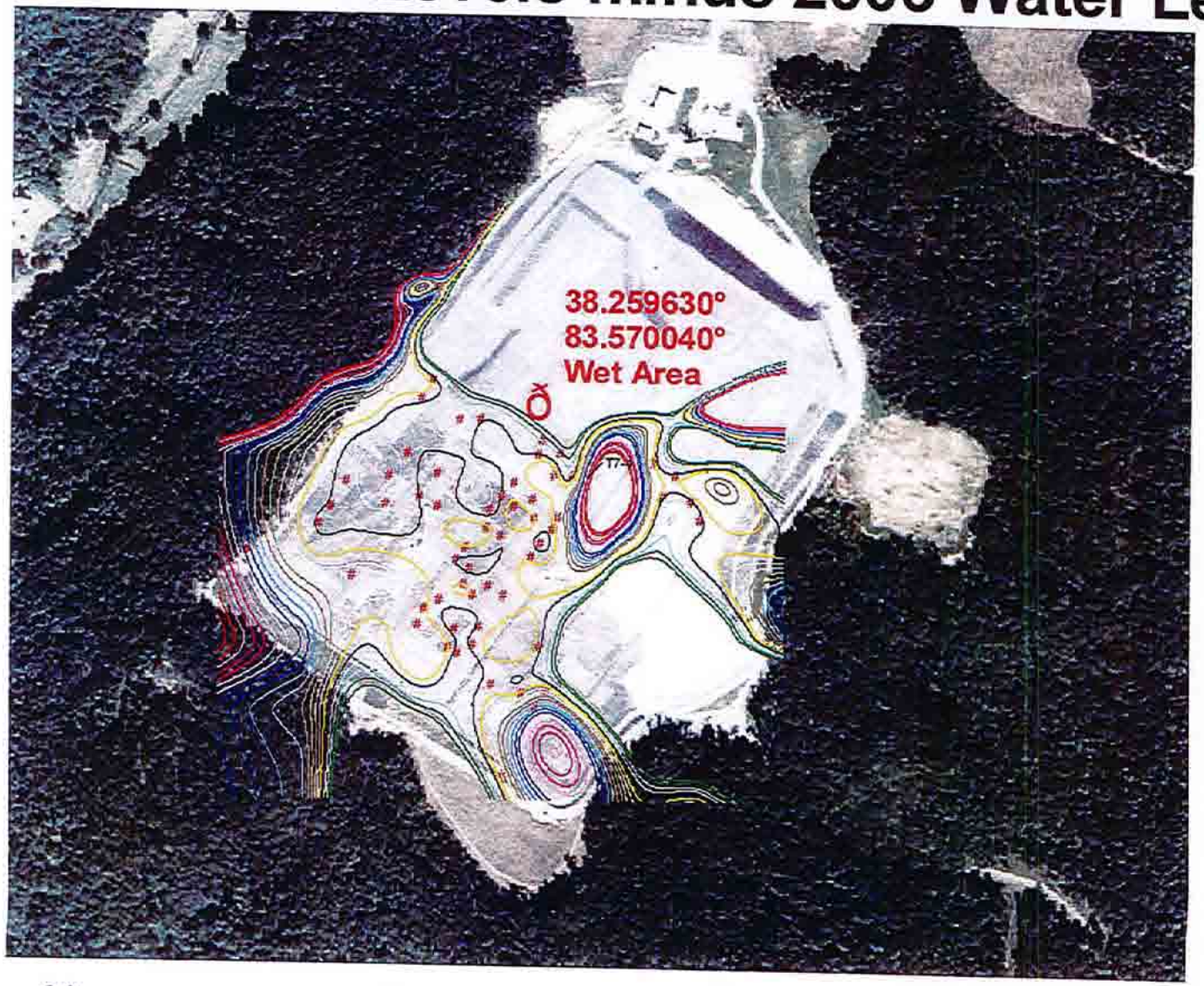
April 2008 Potentiometric Surface



October 2007 Potentiometric Surface



2008 Water Levels minus 2003 Water Levels in Ft.

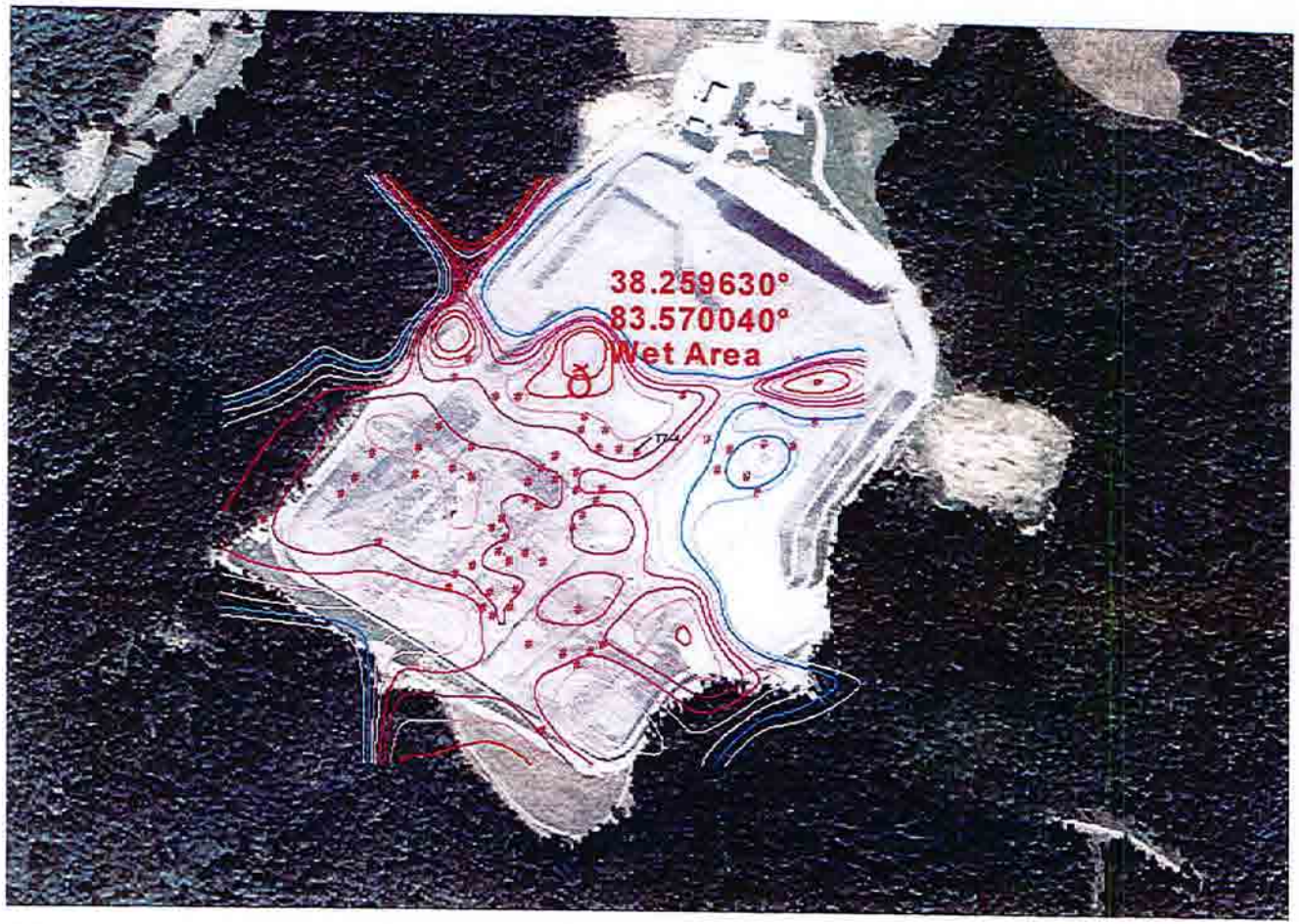


Contours of Wells_sumps_6_5_08.dbf
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
County
Wells_sumps_6_5_08.dbf
Quad

N
W
E
S

0.2 0 0.2 0.4 Miles

October 2003 Potentiometric Surface



Contours of Wells_sumps_6_5_08.dbf
1010
1015
1020
1025
1030
1035
1040
1045
1050
County
Wells_sumps_6_5_08.dbf
Quad

0.2 0 0.2 0.4 Miles

N
W E
S

Attachment 5.A
Leachate Level Comparison

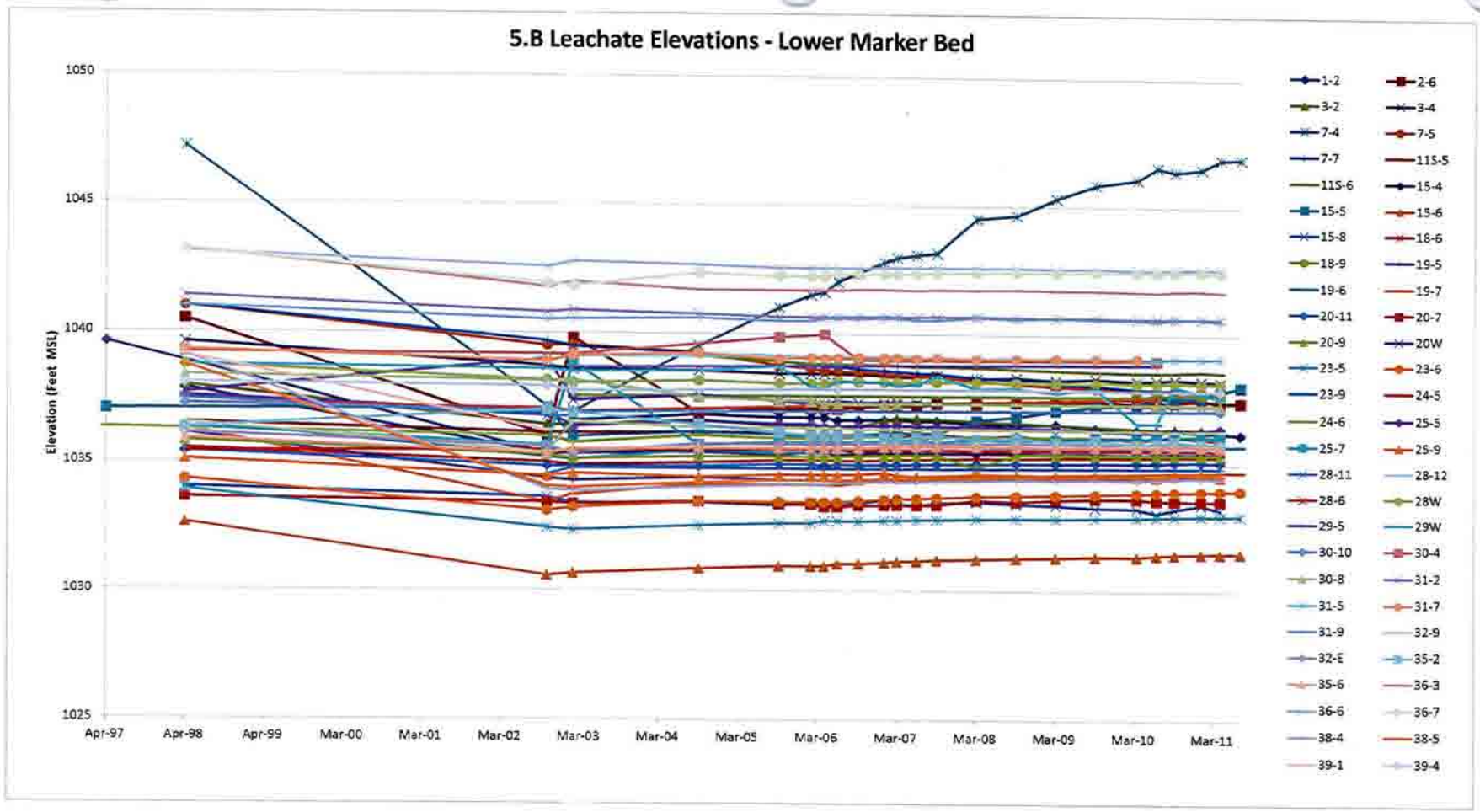
ToC - ToL Manual Measurement Only

Italisized numbers denote dry sumps

Sump ID	ToC Elev	Pre-Pumping level (1998)	Mar-03	Oct-04	Oct-05	Mar-06	May-06	Jul-06	Oct-06	Feb-07	Apr-07	Jul-07	Oct-07	Apr-08	Oct-08	Apr-09	Oct-09	Apr-10	Jul-10	Oct-10	Sump ID	Feb-11	Apr-11	Aug-11	APR 2011 Leachate Elevation	Change from prepumping to 2011	Changes from 1998 to 2006	Change since last five year review	Changes from Baseline
1-2	1056.17	1037.80	19.55	19.30	19.40	19.40	19.40	19.50	19.50	19.48	19.48	19.53	19.52	19.60	19.63	19.63	19.76	19.84	19.87	19.85	1-2	19.90	19.94	19.99	1036.23	-1.57	-1.13	-0.44	0.39
2-6	1057.51	1040.50	17.69	20.60	20.40	20.40	20.40	20.40	20.32	20.28	20.28	20.28	20.18	20.19	20.13	20.19	20.09	20.16	20.14	20.08	2-6	20.03	20.10	20.10	1037.41	-3.09	-3.31	0.22	2.41
3-2	1059.45	1037.90	22.99	22.80	23.00	23.00	23.10	23.10	23.04	22.78	22.69	22.70	22.65	23.03	*22.85*	*23.08*	*23.10*	*23.10*	*23.08*	23.07	3-2	23.09	23.16		1036.29	-1.61	-1.49	-0.12	0.17
3-4	1054.33	1039.60	15.77	15.80	15.90	15.90	15.90	15.90	15.93	15.96	16.02	16.00	15.95	16.07	16.02	16.12	16.05	16.14	16.11	16.07	3-4	16.12	16.17		1038.16	-1.44	-1.20	-0.24	0.40
7-4	1052.42	1047.20	15.49	12.90	11.40	10.90	10.80	10.40	10.05	9.64	9.46	9.35	9.27	7.92	7.78	7.10	6.56	6.34	5.86	6.02	7-4	5.90	5.52	5.51	1046.90	-0.30	-4.83	4.53	-9.97
7-5	1057.95	1041.00	18.40	18.70	19.20	19.30	19.40	19.40	19.45	19.52	19.55	19.61	19.60	19.78	19.87	19.98	20.02	20.12	20.12	20.09	7-5	20.15	20.17		1037.78	-3.22	-2.50	-0.72	1.77
7-7	1059.01	1041.00	19.53	19.80	20.10	20.20	20.30	20.30	20.39	20.45	20.49	20.55	20.57	20.71	20.78	20.94	21.00	21.13	21.16	21.16	7-7	21.20	21.27		1037.74	-3.26	-2.38	-0.88	1.74
10-7	1060.34	1032.51	27.89	27.60	27.60	27.60	27.60	27.60	27.57	27.49	27.47	27.47	27.45	27.39	27.38	27.33	27.32	27.29	27.29	27.26	10-7	27.24	27.24	27.22	1033.10	0.59	0.26	0.33	-0.65
10-8	1058.78	1032.40	27.59	27.60	27.70	27.70	27.80	27.70	27.72	27.68	27.71	27.71	27.71	27.68	27.68	27.68	27.70	27.72	27.71	27.68	10-8	27.68	27.63		1031.15	-1.25	-1.34	0.09	0.04
10-9	1054.92	1032.50	25.90	25.40	25.30	25.20	25.20	25.10	25.08	24.94	24.94	24.91	24.84	24.73	24.64	24.58	24.49	24.42	24.39	24.30	10-9	24.24	24.23	24.20	1030.69	-1.81	-2.66	0.85	-1.67
11S-5	1057.08	1036.50	20.92	20.90	20.90	21.00	21.00	21.00	20.96	21.00	21.04	21.01	20.95	21.05	20.97	21.13	21.00	21.12	21.05	20.98	11S-5	21.06	21.10		1035.98	-0.52	-0.38	-0.14	0.18
11S-6	1063.22	1039.60	24.11	24.10	24.30	24.40	24.40	24.40	24.42	24.42	24.45	24.49	24.49	24.52	24.57	24.62	24.66	24.70	24.70	24.68	11S-6	24.64	24.68		1038.54	-1.06	-0.80	-0.26	0.57
15-4	1062.04	1036.00	26.68	26.60	26.70	26.60	26.60	26.70	26.67	26.64	26.64	26.64	26.62	26.61	26.61	26.62	26.61	26.63	26.62	26.61	15-4	26.61	26.61		1035.43	-0.57	-0.63	0.06	-0.07
15-5	1061.21	1037.00	25.21	25.00	25.10	25.20	25.20	25.20	25.12	25.05	25.03	25.04	25.03	24.53	24.38	24.14	23.97	23.88	23.65	23.66	15-5	23.62	23.41	23.23	1037.80	0.80	-0.91	1.71	-1.80
15-6	1059.46	1032.60	28.79	28.60	28.50	28.50	28.50	28.40	28.40	28.35	28.31	28.29	28.25	28.21	28.17	28.14	28.10	28.10	28.04	28.01	15-6	27.98	27.97	27.96	1031.49	-1.11	-1.54	0.43	-0.82
15-8	1055.85	1034.00	22.44	22.40	22.50	22.40	22.50	22.50	22.42	22.29	22.41	22.51	22.39	22.35	22.43	22.48	22.57	22.59	22.78	22.61	15-8	22.43	22.64		1033.21	-0.79	-0.57	-0.22	0.20
18-6	1065.42	1035.50	30.50	30.40	30.30	30.30	30.30	30.30	30.32	30.27	30.26	30.24	30.23	30.19	30.19	30.16	30.14	30.14	30.12	30.10	18-6	30.10	30.08		1035.34	-0.16	-0.40	0.24	-0.42
18-9	1059.54	dry	22.00	*D*	*D*	*D*	*D*	*D*	*D*	22.01	*D*	*D*	*D*	*21.98*	*21.96*	*21.96*	*21.96*	*21.95*	*21.89*	*21.96*	18-9	21.83	21.88		1037.66	dry	dry	0.00	-0.12
19-5	1063.23	1036.10	28.94	28.80	28.90	28.90	28.90	28.90	28.89	28.89	28.89	28.88	28.88	28.85	28.85	28.85	28.79	28.77	28.74	28.72	19-5	28.72	28.68		1034.55	-1.55	-1.76	0.21	-0.26
19-6	1058.71	1036.50	23.59	23.20	23.30	23.30	23.30	23.20	23.24	23.19	23.19	23.18	23.15	23.16	23.08	23.08	23.05	23.05	23.03	22.97	19-6	22.97	22.99	22.97	1035.72	-0.78	-1.03	0.25	-0.60
19-7	1064.26	1036.30	30.51	30.10	30.10	30.10	30.10	30.10	30.03	29.94	29.91	29.89	29.86	29.74	29.74	29.68	29.65	29.62	29.59	29.57	19-7	29.57	29.54	29.54	1034.72	-1.58	-2.07	0.49	-0.97
20W	1065.49	1037.60	28.10	27.90	28.10	28.20	28.20	28.10	28.15	28.15	28.13	28.15	28.14	28.14	28.14	28.17	28.18	28.20	28.20	28.20	20W	28.20	28.20		1037.29	-0.31	-0.26	-0.05	0.10
20-7	1063.29	1033.60	29.90	29.80	29.90	29.90	30.00	30.00	29.94	29.93	29.92	29.93	29.91	29.72	29.77	29.69	29.64	29.64	29.71	29.72	20-7	29.73	29.73		1033.56	-0.04	-0.25	0.21	-0.17
20-9	1065.36	1035.80	30.20	30.10	30.10	30.10	30.10	30.10	30.06	30.05	30.02	30.03	30.01	30.53	29.98	29.98	29.98	29.98	29.97	29.97	20-9	29.97	29.96		1035.40	-0.40	-0.50	0.10	-0.24
20-11	1059.06	1035.40	24.23	24.20	24.10	24.10	24.20	24.10	24.13	24.11	24.11	24.09	24.07	24.07	24.04	24.04	24.02	24.02	24.00	23.97	20-11	23.96	23.98		1035.08	-0.32	-0.47	0.15	-0.25
23-5	1063.61	1033.90	31.28	31.10	31.00	31.00	30.90	30.90	30.92	30.88	30.88	30.85	30.84	30.80	30.78	30.78	30.75	30.73	30.70	30.68	23-5	30.66	30.66	30.65	1032.95	-0.95	-1.21	0.26	-0.62
23-6	1064.28	1034.30	31.04	30.80	30.80	30.80	30.80	30.80	30.75	30.70	30.66	30.64	30.61	30.55	30.52	30.49	30.45	30.40	30.38	30.35	23-6	30.33	30.31	30.29	1033.97	-0.33	-0.77	0.44	-0.73
23-9	1059.08	1034.53	24.30	*D*	*D*	*D*	*D*	*D*	*D*	24.30	*D*	*D*	*D*	*24.30*	*24.26*	*24.26*	*24.24*	*24.24*	*24.24*	*24.24*	23-9	*24.24*	*24.23*		1034.85	dry	dry	0.00	-0.07
24-5	1058.86	1035.40	23.41	23.30	23.30	23.30	23.30	23.30	23.36	23.31	23.32	23.32	23.31	23.31	23.31	23.31	23.30	23.30	23.30	23.29	24-5	23.29	23.30		1035.56	0.16	0.10	0.06	-0.11
24-6	1062.47	1036.30	26.69	26.40	26.50	26.50	26.60	26.50	26.44	26.44	26.49	26.50	26.43	26.40	26.41	26.42	26.41	26.43	26.48	26.38	24-6	26.34	26.39		1036.08	-0.22	-0.27	0.05	-0.30
25-5	1059.82	1037.50	23.41	23.20	23.30	23.30	23.40	23.40	23.35	23.35	23.34	23.37	23.37	23.35	23.41	23.44	23.53	23.55	23.55	23.49	25-5	23.49	23.40		1036.42	-1.08	-1.03	-0.05	-0.01
25-7	1060.71	1036.30	21.89	25.00	24.90	24.90	24.90	24.90	24.88	24.84	24.82	24.82	24.86	24.76	24.76	24.76	24.70	24.70	24.67	24.65	25-7	24.64	24.64		1036.07	-0.23	-0.47	0.24	2.75
25-9	1057.05	1035.10	22.47	22.60	22.50	22.50	22.50	22.50	22.48	22.41	22.51	22.55	23.48	22.47	22.47	22.50	22.49	22.52	22.54	22.45	25-9	22.39	22.51		1034.54	-0.56	-0.53	-0.03	0.04
26-2	1059.31	1032.20	28.17	27.90	27.70	27.60	27.60	27.60	27.57	27.52	27.49	27.48	27.45	27.40	27.38	27.34	27.31	27.29	27.26	27.24	26-2	27.21	27.21	27.19	1032.10	-0.10	-0.46	0.36	-0.96
26-3	1058.38	1031.90	26.91	26.70	26.60	26.60	26.60	26.60	26.58	26.52	26.49	26.47	26.45	26.40	26.38	26.35	26.31	26.25	26.24	26.23	26-3	26.23	26.18	26.18	1032.20	0.30	-0.10	0.40	-0.73
26-4	1058.44	1034.40	21.81	21.90	22.00	22.10	22.10	22.00	22.08	22.09	22.10	22.05	22.05	22.11	22.08	22.17	22.11	22.25	22.10	22.05	26-4	22.22	22.07		1034.37	-0.03	-0.04	0.01	0.26
27-9	1062.84	1037.50	35.49	27.20	26.90	26.80	26.90	26.80	26.69	26.59	26.59	26.59	26.52	26.42	26.42	26.42	26.34	26.32	26.31	26.23	27-9	26.18	26.19	26.20	1036.65	-0.85	-1.35	0.50	-9.30
27-11	1064.78	1038.30	25.80	*D*	*D*	*D*	*D*	*D*	*D*	*D*	25.66	25.64	*D*	*25.64*	*25.62*	*25.62*	*25.61*	*25.60*	*25.59*	*25.56*	27-11	*25.56*	*25.56*		1039.22	0.92	dry	dry	-0.24
28W	1064.15	1038.70	26.10	26.00	26.10	26.10	26.10	26.00	26.04	26.04	26.04	26.04	26.03	26.03	26.03	26.03	26.03	26.04	26.04	26.03	28W	26.04	26.04		1038.11	-0.59	-0.59	0.00	-0.06
28-6	1064.58	1037.20	27.60	*D*	*D*	*D*	*D*	*D*	*D*	*D*	27.28	*D*	*D*	*27.25*	*27.14*	*27.14*	*27.07*	*27.04*	*27.03*	*27.00*	28-6	*27.00*	*27.00*		1037.58	0.38	dry	dry	-0.60
28-11	1063.79	1037.40	27.00	*D*	*D*	*D*	*D*	*D*	*D*	*D*	26.98	*D*	*D*	*26.95*	*26.95*	*26.95*	*26.92*	*26.92*	*26.92*	*26.90*	28-11	*26.90*	*26.91*		1036.88	-0.52	dry	dry	-0.09
28-12	1065.48	dry	26.40	*D*	*D*	*D*	*D*	*D*	*D*	*D*	*D*	26.35	*D*	*26.35*	*26.34*	*26.34*	*26.32*	*26.32*	*26.32*	*26.32*	28-12	*26.32*	*26.34*		1039.14		dry	dry	-0.06

Sump ID	ToC Elev	Pre-Pumping level (1998)	Mar-03	Oct-04	Oct-05	Mar-06	May-06	Jul-06	Oct-06	Feb-07	Apr-07	Jul-07	Oct-07	Apr-08	Oct-08	Apr-09	Oct-09	Apr-10	Jul-10	Oct-10	Sump ID	Feb-11	Apr-11	Aug-11	APR 2011 Leachate Elevation	Change from prepumping to 2011	Changes from 1998 to 2006	Change since last five year review	Changes from Baseline
29W	1063.52	1038.70	25.04	25.00	24.80	25.60	25.70	25.40	25.42	25.45	25.56	25.50	25.17	25.65	25.63	25.79	25.62	26.92	26.92	25.55	29W	25.76	25.98		1037.54	-1.16	-0.60	-0.56	0.94
29-5	1066.43	dry	27.79	D	D	D	D	D	D	D	27.67	D	D	27.65	27.65	27.65	27.63	27.63	27.59	27.60	29-5	27.60	27.60		1038.83		dry	dry	-0.19
29-6	1064.24	1038.90	25.61	D	D	D	D	D	D	25.60	25.60	25.62	25.66	25.66	25.65	25.65	25.65	25.65	25.66	25.73	29-6	25.73	25.73		1038.51	-0.39	dry	dry	0.12
30-4	1062.29	1039.20	23.11	D	22.40	D	22.30	D	23.30	23.32	D	D	D	23.29	23.29	23.29	23.29	23.29	23.28	23.28	30-4	23.28	23.30		1038.99	-0.21	-0.21	0.00	0.19
30-8	1067.21	1038.30	29.06	29.70	29.80	29.80	29.90	29.90	29.98	29.92	29.89	D	D	29.94	29.92	29.92	29.92	29.92	29.89	29.92	30-8	29.92	29.91		1037.30	-1.00	-1.07	0.07	0.85
30-10	1066.15	1037.20	29.20	D	D	D	D	D	D	D	D	29.19	D	29.05	29.05	29.05	29.04	29.04	29.07	29.06	30-10	29.06	29.06		1037.09	-0.11	dry	dry	-0.14
31-2	1065.86	1041.40	24.98	25.10	25.20	25.20	25.20	25.20	25.18	25.18	25.18	25.18	25.16	25.16	25.18	25.19	25.18	25.21	25.21	25.20	31-2	25.20	25.20		1040.66	-0.74	-0.72	-0.02	0.22
31-5	1062.13	1039.30	23.00	22.90	D	D	D	23.10	D	23.05	23.08	23.07	23.02	23.05	23.04	23.08	23.04	23.08	23.08	23.04	31-5	23.04	23.03		1039.10	-0.20	dry 2006		0.03
31-7	1065.30	1041.00	24.76	24.70	24.80	24.80	24.70	24.70	24.71	24.68	24.68	24.76	24.75	24.63	24.69	24.63	24.69	24.69	24.75	24.65	31-7	24.65	24.72		1040.58	-0.42	-0.41	-0.01	-0.04
31-9	1066.46	1042.70	25.04	25.20	25.50	25.50	25.60	25.70	25.60	25.58	25.67	25.79	25.73	25.74	25.85	25.85	25.97	26.02	26.14	26.04	31-9	25.96	26.06		1040.40	-2.30	-1.84	-0.46	1.02
32-E	1064.75	1036.10	29.37	29.00	29.00	29.00	29.00	29.00	28.97	28.97	28.94	28.95	28.94	28.94	28.93	28.94	28.95	28.93	28.94	28.92	32-E	28.92	28.92		1035.83	-0.27	-0.32	0.05	-0.45
32-9	1065.27	1036.50	28.69	28.90	28.90	28.90	28.90	28.90	28.95	28.94	28.94	28.94	28.93	28.93	28.94	28.94	28.96	28.95	28.95	28.97	32-9	28.95	28.95		1036.32	-0.18	-0.18	0.00	0.26
35-2	1064.08	1036.30	27.15	27.60	27.90	28.00	28.00	28.00	28.00	28.06	28.09	28.05	27.97	28.12	28.04	28.22	28.14	28.28	28.24	28.15	35-2	28.25	28.29		1035.79	-0.51	-0.22	-0.29	1.14
35-6	1063.00	1035.90	27.46	27.40	27.40	27.40	27.40	27.40	27.38	27.34	27.34	27.31	27.30	27.30	27.30	27.31	27.30	27.29	27.29	27.27	35-6	27.27	27.29		1035.71	-0.19	-0.28	0.09	-0.17
36-3	1062.52	1043.20	20.51	20.80	20.80	20.80	20.80	20.80	20.76	20.76	20.77	20.79	20.76	20.76	20.74	20.76	20.76	20.79	20.81	20.76	36-3	20.75	20.79		1041.73	-1.47	-1.44	-0.03	0.28
36-6	1066.55	1043.10	23.78	23.90	24.00	24.00	24.00	24.00	24.00	23.98	23.98	23.98	23.97	23.97	23.96	23.98	23.97	24.00	24.00	23.98	36-6	23.96	23.97		1042.58	-0.52	-0.55	0.03	0.19
36-7	1064.64	1043.20	22.80	22.30	22.40	22.40	22.40	22.30	22.32	22.31	22.31	22.28	22.25	22.24	22.22	22.21	22.20	22.20	22.20	22.17	36-7	22.17	22.19		1042.45	-0.75	-0.88	0.13	-0.61
37-3	1055.27	1032.80	23.03	22.90	22.80	22.80	22.80	22.80	22.76	22.71	22.71	22.70	22.66	22.65	22.62	22.62	22.59	22.59	22.58	22.54	37-3	22.52	22.54		1032.73	-0.07	-0.29	0.22	-0.49
37-4	1055.86	1032.80	23.57	D	D	D	D	D	23.50	23.51	23.46	23.46	D	23.22	23.44	23.44	23.39	23.39	23.39	23.35	37-4	23.35	23.36		1032.50	-0.30	-0.44	0.14	-0.21
38-4	1055.75	1039.10	21.86	21.70	21.60	21.60	21.60	21.50	21.50	21.47	21.49	21.48	21.44	21.42	21.38	21.38	21.35	21.36	21.34	21.29	38-4	21.28	21.29		1034.46	-4.64	-4.85	0.21	-0.57
38-5	1055.53	1038.70	21.51	21.30	21.20	21.20	21.20	21.20	21.18	21.13	21.13	21.13	21.09	21.09	21.03	21.04	21.01	21.01	21.01	20.95	38-5	20.93	20.95		1034.58	-4.12	-4.35	0.23	-0.56
39-4	1056.93	1038.00	19.20	D	D	D	D	19.10	D	19.20	D	D	D	19.12	19.12	19.12	19.12	19.12	19.12	19.12	39-4	19.12	19.11		1037.82	-0.18	dry	dry	-0.09
40-15	1047.28	1025.80	21.08	D	D	D	D	21.40	D	21.36	D	D	D	21.35	21.35	21.35	21.35	21.36	21.37	21.34	40-15	21.34	21.32		1025.96	0.16	dry	dry	0.24
40-17	1052.66	1026.80	28.79	28.50	28.70	28.60	28.60	28.60	28.58	28.52	28.52	28.51	28.49	28.42	28.42	28.38	28.33	28.29	28.24	28.22	40-17	28.17	28.16	28.13	1024.50	-2.30	-2.72	0.42	-0.63
40-19	1054.59	1023.80	30.24	29.70	29.80	29.80	29.80	29.80	29.76	29.68	29.71	29.70	29.66	29.64	29.62	29.62	29.58	29.59	29.59	29.58	40-19	29.58	29.58		1025.01	1.21	1.03	0.18	-0.66
40-22	1056.95	1026.90	32.49	32.10	32.10	32.00	32.00	32.00	31.98	31.93	31.94	31.92	30.91	30.86	31.84	31.84	31.81	31.84	31.81	31.80	40-22	31.80	31.80	31.80	1025.15	-1.75	-1.93	0.18	-0.69
42-11	1049.49	1022.00	28.57	28.20	28.40	28.40	28.40	28.40	28.45	28.43	28.46	28.46	28.43	28.46	28.46	28.51	28.48	28.52	28.52	28.49	42-11	28.49	28.50		1020.99	-1.01	-0.96	-0.05	-0.07
42-19	1046.99	1019.60	27.66	27.70	27.80	27.80	27.80	27.90	27.88	27.83	27.88	27.89	27.88	27.88	27.88	27.91	27.92	27.95	27.96	27.91	42-19	27.87	27.90		1019.09	-0.51	-0.49	-0.02	0.24
42-20	1052.04	1017.30	35.22	D	D	D	D	D	D	35.02	D	D	D	34.97	34.96	34.96	34.96	34.96	34.97	34.96	42-20	34.96	34.96		1017.08	-0.22	dry	dry	-0.26
43-7	1047.17	1010.80	35.95	36.00	36.10	36.20	36.20	36.20	36.20	36.21	36.23	36.24	36.26	36.30	36.33	36.38	36.42	36.46	36.49	36.50	43-7	36.53	36.53		1010.64	-0.16	0.17	-0.33	0.58
43-9	1045.19	1011.00	34.12	34.10	34.40	34.40	34.90	34.40	34.43	34.44	34.44	34.48	34.48	34.52	34.57	34.61	34.65	34.68	34.69	34.71	43-9	34.73	34.74		1010.45	-0.55	-0.24	-0.31	0.62
43-13	1041.02	1010.10	30.49	30.50	30.60	30.60	30.60	30.60	30.60	30.58	30.58	30.58	30.57	30.59	30.59	30.61	30.64	30.64	30.66	30.66	43-13	30.68	30.69		1010.33	0.23	0.32	-0.09	0.20
44-5	1057.33	1015.00	41.46	41.50	41.50	41.50	41.50	41.30	41.30	41.30	D	40.93	D	40.70	40.68	40.68	40.49	40.49	40.55	40.51	44-5	40.48	40.48	40.48	1016.85	1.85	1.03	0.82	-0.98
44-14	1048.42	1014.20	34.34	34.10	34.30	34.30	34.30	34.30	34.28	34.26	34.26	34.26	34.26	34.26	34.26	34.26	34.25	34.28	34.25	34.25	44-14	34.24	34.24		1014.18	-0.02	-0.06	0.04	-0.10
44-20	1052.25	1013.80	23.84	38.40	38.40	38.40	38.40	38.40	38.40	38.38	38.37	38.38	38.38	38.35	38.36	38.34	38.34	38.34	38.36	38.36	44-20	38.35	38.35		1013.90	0.10	0.05	0.05	14.51
44-22	1055.02	1015.00	39.85	39.70	40.00	40.10	40.10	40.00	40.05	40.08	40.07	40.07	40.11	39.55	40.04	39.98	39.90	39.88	39.63	39.61	44-22	39.73	39.39	39.54	1015.63	0.63	-0.03	0.66	-0.46
45-1	1054.78	1028.00	31.03	29.50	29.40	29.40	29.40	29.40	29.40	29.33	29.34	29.35	29.33	29.30	29.29	29.29	29.29	29.26	29.26	29.22	45-1	29.21	29.21		1025.57	-2.43	-2.62	0.19	-1.82
46-1	1054.17	1039.00	25.79	25.30	24.20	23.60	23.50	23.30	22.91	22.64	22.64	22.55	22.27	22.12	21.93	21.90	21.85	21.98	21.92	21.82	46-1	21.93	21.96	21.89	1032.21	-6.79	-7.74	0.95	-3.83
46-2	1052.89	1039.40	22.16	21.20	20.90	21.00	21.00	20.90	20.78	20.83	20.84	20.74	20.60	20.56	20.34	20.36	20.16	20.25	20.12	19.97	46-2	19.96	19.86	19.74	1033.03	-6.37	-7.29	0.92	-2.30
46-3	1052.27	1038.90	21.52	18.20	18.20	18.80	19.20	19.00	18.46	18.88	19.44	19.11	18.22	19.52	18.62	19.85	18.64	20.18	19.42	18.52	46-3	19.47	19.87		1032.40	-6.50	-5.09	-1.41	-1.65

"D" denotes dry sump


5.B Leachate Elevations - Lower Marker Bed
Elevation (Feet MSL)
1050
1045
1040
1035
1030
1025
Apr-97
Apr-98
Apr-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
1-2
2-6
3-2
3-4
7-4
7-5
7-7
11S-5
11S-6
15-4
15-5
15-6
15-8
18-6
18-9
19-5
19-6
19-7
20-11
20-7
20-9
20W
23-5
23-6
23-9
24-5
24-6
25-5
25-7
25-9
28-11
28-12
28-6
28W
29-5
29W
30-10
30-4
30-8
31-2
31-5
31-7
31-9
32-9
32-E
35-2
35-6
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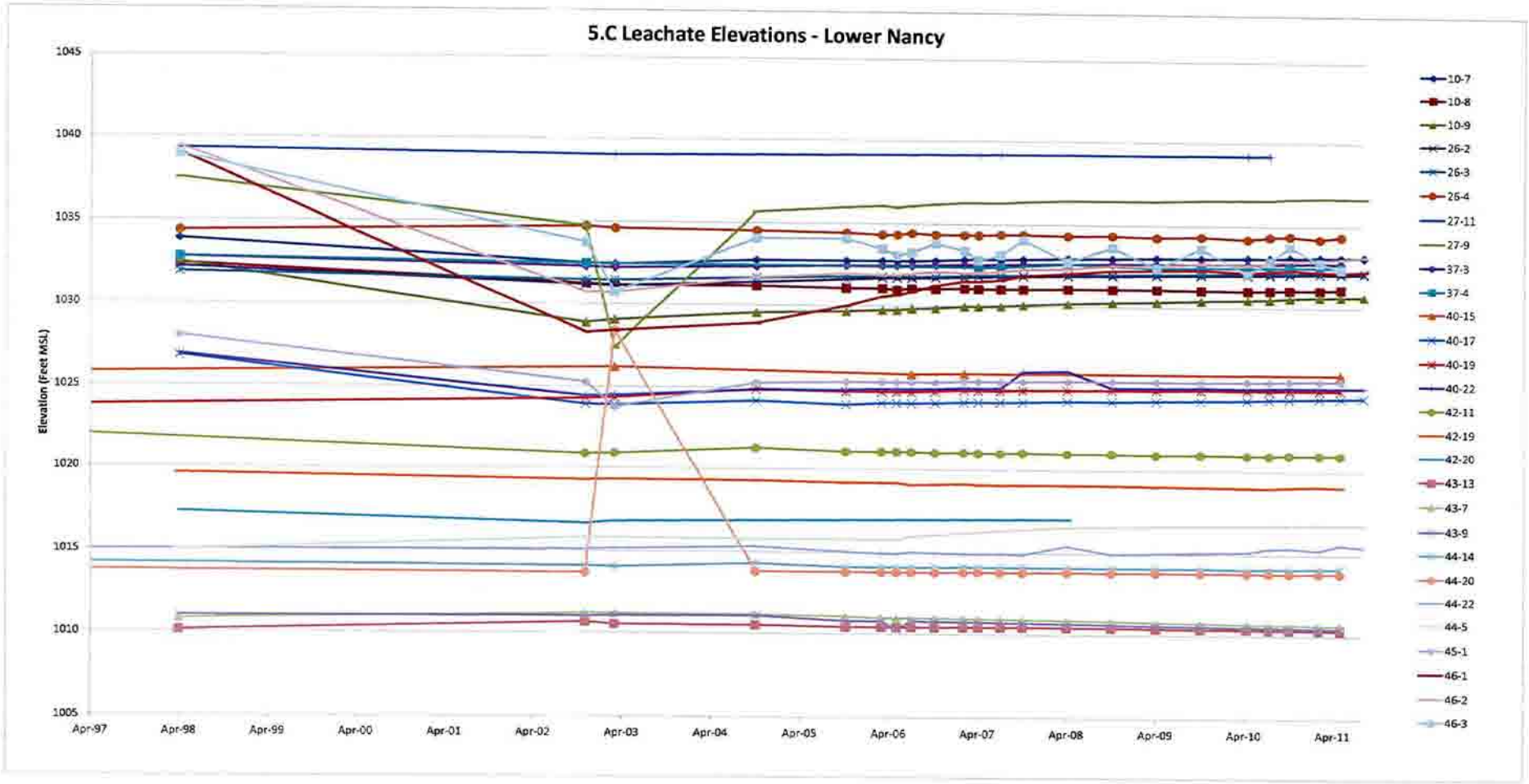
36-6
36-7
38-4
38-5
39-1
39-4


5.C Leachate Elevations - Lower Nancy
Elevation (Feet MSL)
1045
1040
1035
1030
1025
1020
1015
1010
1005
Apr-97
Apr-98
Apr-99
Apr-00
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43-9
44-14
44-20
44-22
44-5
45-1
46-1
46-2
46-3

Attachment 5.D

Liner Maintenance and Sumps with Freeboard Loss 2003-2011

Maxey Flats
Fleming County, Kentucky

Description:

Basemap Source:
Bing Imagery 2010

Sump Water Level Elevation Data calculated from Source: "Sump Liquid Level Monitoring.xls" & "Sump Meas Levels2003.xls" Values taken from "2010 MFP Trench Freeboard Table.xls"

Map Legend:

- % Freeboard
  - 10-20
  - 20-30
  - 30-40
  - 40-50
  - 50-60
  - 60-70
  - 70-80
- Sumps
- Liner Defect Year
  - 2003-2006
  - 2007-2011
- Site Topography
  - 5 ft contour
  - 20 ft contour
  - 100 ft contour
  - Panel
  - Waterway

Spatial Projection:

Coordinate System:
Kentucky State Plane North
FIPS Zone: 1601
Units: Feet
Datum: NAD83

Plot Info:

File: Att5D_Sumps_wTopo.mxd
Project No.: 3088
Plot Date: 13 Aug., 2012
Arc Operator: HRVG
Reviewed by: NB

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www.ddmsinc.com

SCALE 0 125 250 500 750 1,000 Feet

R:\Projects\DEF\demax-1547\3088-MaxeyFlats\DataAnal\MXDs

ATTACHMENT 5.E
FREEBOARD COMPARISON

Maxey Flats Leachate Freeboard Calculations

TRENCH SUMP ID	Baseline available Freeboard	2010 feet of freeboard used	2011 feet of freeboard used	2010 % of freeboard used	2011 % of freeboard used
1-2	19.93	0.95	0.81	4.77%	4.06%
2-6	19.53	1.37	1.39	7.01%	7.12%
3-2	21.38	-0.07	-0.10	-0.33%	-0.47%
3-4	14.29	-0.44	-0.49	-3.08%	-3.43%
7-4	13.86	9.26	9.89	66.81%	71.36%
7-5	16.16	-1.66	-1.75	-10.27%	-10.83%
7-7	18.23	-1.83	-1.97	-10.04%	-10.81%
10-7	26.02	0.57	0.62	2.19%	2.38%
10-8	25.91	-0.17	-0.17	-0.66%	-0.66%
10-9	23.84	1.76	1.91	7.38%	8.01%
11-5	19.26	-0.06	-0.09	-0.31%	-0.47%
11-6	22.63	-0.65	-0.69	-2.87%	-3.05%
15-4	24.94	0.07	0.06	0.28%	0.24%
15-5	22.70	0.48	1.03	2.11%	4.54%
15-6	27.05	0.87	0.93	3.22%	3.44%
15-8	20.03	-0.40	-0.44	-2.00%	-2.20%
18-6	29.00	0.31	0.33	1.07%	1.14%
18-9	20.66	0.04	0.10	0.19%	0.48%
19-5	27.39	0.13	0.17	0.47%	0.62%
19-6	21.18	0.53	0.55	2.50%	2.60%
19-7	29.00	1.23	1.27	4.24%	4.38%
20W	24.71	-1.70	-1.72	-6.88%	-6.96%
20-7	28.01	0.13	0.06	0.46%	0.21%
20-9	27.98	0.09	0.10	0.32%	0.36%
20-11	22.47	0.24	0.25	1.07%	1.11%
23-5	29.07	0.52	0.56	1.79%	1.93%
23-6	29.14	0.82	0.88	2.81%	3.02%
23-9	22.08	0.31	0.32	1.40%	1.45%
24-5	21.36	0.08	0.07	0.37%	0.33%
24-6	24.38	0.07	0.08	0.29%	0.33%
25-5	21.14	-0.58	-0.50	-2.74%	-2.37%
25-7	23.55	0.40	0.41	1.70%	1.74%
25-9	20.43	0.14	0.02	0.69%	0.10%
26-2	26.18	0.87	0.92	3.32%	3.51%
26-3	24.00	0.67	0.72	2.79%	3.00%
26-4	19.65	-0.35	-0.39	-1.78%	-1.98%
27-9	25.98	1.85	1.91	7.12%	7.35%
27-11	23.47	0.24	0.22	1.02%	0.94%
28W	23.29	-0.03	-0.06	-0.13%	-0.26%
28-6	25.08	0.50	0.50	1.99%	1.99%
28-11	25.23	0.10	0.08	0.40%	0.32%
28-12	24.94	0.08	0.02	0.32%	0.08%
29W	23.08	-0.60	-0.79	-2.60%	-3.42%
29-5	25.56	0.50	0.47	1.96%	1.84%
29-6	23.28	-0.40	-0.40	-1.72%	-1.72%
30-4	21.09	0.12	0.11	0.57%	0.52%
30-8	28.15	-0.82	-0.81	-2.91%	-2.88%
30-10	27.40	0.14	0.10	0.51%	0.36%
31-2	23.73	-0.15	-0.16	-0.63%	-0.67%
31-5	20.77	0.19	0.17	0.91%	0.82%
31-7	23.22	0.13	0.03	0.56%	0.13%
31-9	22.54	-1.09	-1.19	-4.84%	-5.28%
32E	27.83	0.21	0.21	0.75%	0.75%
32-9	27.46	-0.08	-0.08	-0.29%	-0.29%
35-2	23.96	-1.11	-1.15	-4.63%	-4.80%
35-6	25.46	0.38	0.36	1.49%	1.41%

ATTACHMENT 5.E
FREEBOARD COMPARISON

Maxey Flats Leachate Freeboard Calculations

TRENCH SUMP ID	Baseline available Freeboard	2010 feet of freeboard used	2011 feet of freeboard used	2010 % of freeboard used	2011 % of freeboard used
36-3	19.35	-0.03	-0.06	-0.16%	-0.31%
36-6	20.51	0.02	0.02	0.10%	0.10%
36-7	20.24	0.53	0.51	2.62%	2.52%
37-3	21.15	0.43	0.46	2.03%	2.17%
37-4	21.11	0.02	0.03	0.09%	0.14%
38-4	19.15	0.51	0.55	2.66%	2.87%
38-5	19.25	0.50	0.53	2.60%	2.75%
39-4	16.45	-0.10	-0.09	-0.61%	-0.55%
40-15	19.93	0.16	0.18	0.80%	0.90%
40-17	27.09	0.53	0.62	1.96%	2.29%
40-19	28.83	0.72	0.72	2.50%	2.50%
40-22	30.40	0.73	0.72	2.40%	2.37%
42-11	27.20	0.11	0.10	0.40%	0.37%
42-19	24.59	-0.21	-0.19	-0.85%	-0.77%
42-20	33.17	0.39	0.39	1.18%	1.18%
43-7	34.66	-0.55	-0.64	-1.59%	-1.85%
43-9	32.72	-0.56	-0.62	-1.71%	-1.89%
43-13	29.62	-0.31	-0.34	-1.05%	-1.15%
44-5	39.29	0.94	0.97	2.39%	2.47%
44-14	32.50	0.05	0.06	0.15%	0.18%
44-20	35.83	0.14	0.17	0.39%	0.47%
44-22	37.97	0.29	0.38	0.76%	1.00%
45-1	26.74	0.28	0.30	1.05%	1.12%
46-1	23.27	4.08	4.03	17.53%	17.32%
46-2	19.63	2.18	2.47	11.11%	12.58%
46-3	14.32	-0.02	-0.29	-0.14%	-2.03%

Attachment 6.A.1

Contaminant Monitoring of Surface Water Sampling Locations subject to 4 mrem/yr Standard

Maxey Flats
Fleming County, Kentucky

Description:

Basemap Source:
Bing Imagery 2010

Annual average calculated from each years sampling records.
Sources:
2004 Data.xls,
2005 Report Data.xls,
2006 Report Data.xls,
2007 Report Data.xls,
2008 Report Data.xls,
2009 Report Data.xls,
2010 Report Data.xls, and
2011 Report Data.xls

Map Legend:
- Surface Water Sampling Pt
- Waterway

Spatial Projection:

Coordinate System:
Kentucky State Plane North
FIPS Zone: 1601
Units: Feet
Datum: NAD83

Plot Info:

File: Fig6A1_SW_4MREM.mxd
Project No.: 3088
Plot Date: 13 Aug., 2012
Arc Operator: EJI
Reviewed by: NB

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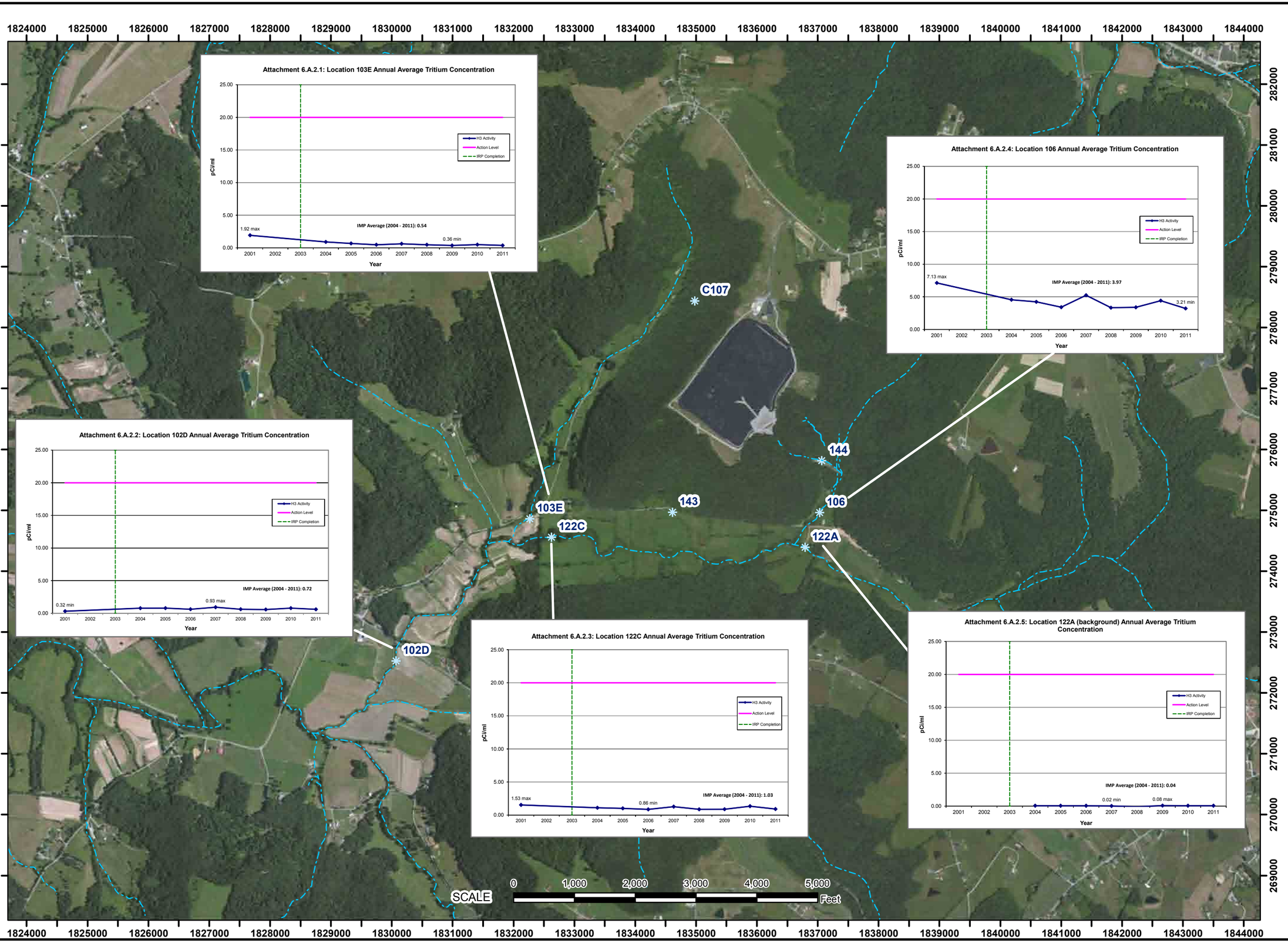
Attachment 6.A.2.1: Location 103E Annual Average Tritium Concentration

Attachment 6.A.2.2: Location 102D Annual Average Tritium Concentration

Attachment 6.A.2.3: Location 122C Annual Average Tritium Concentration

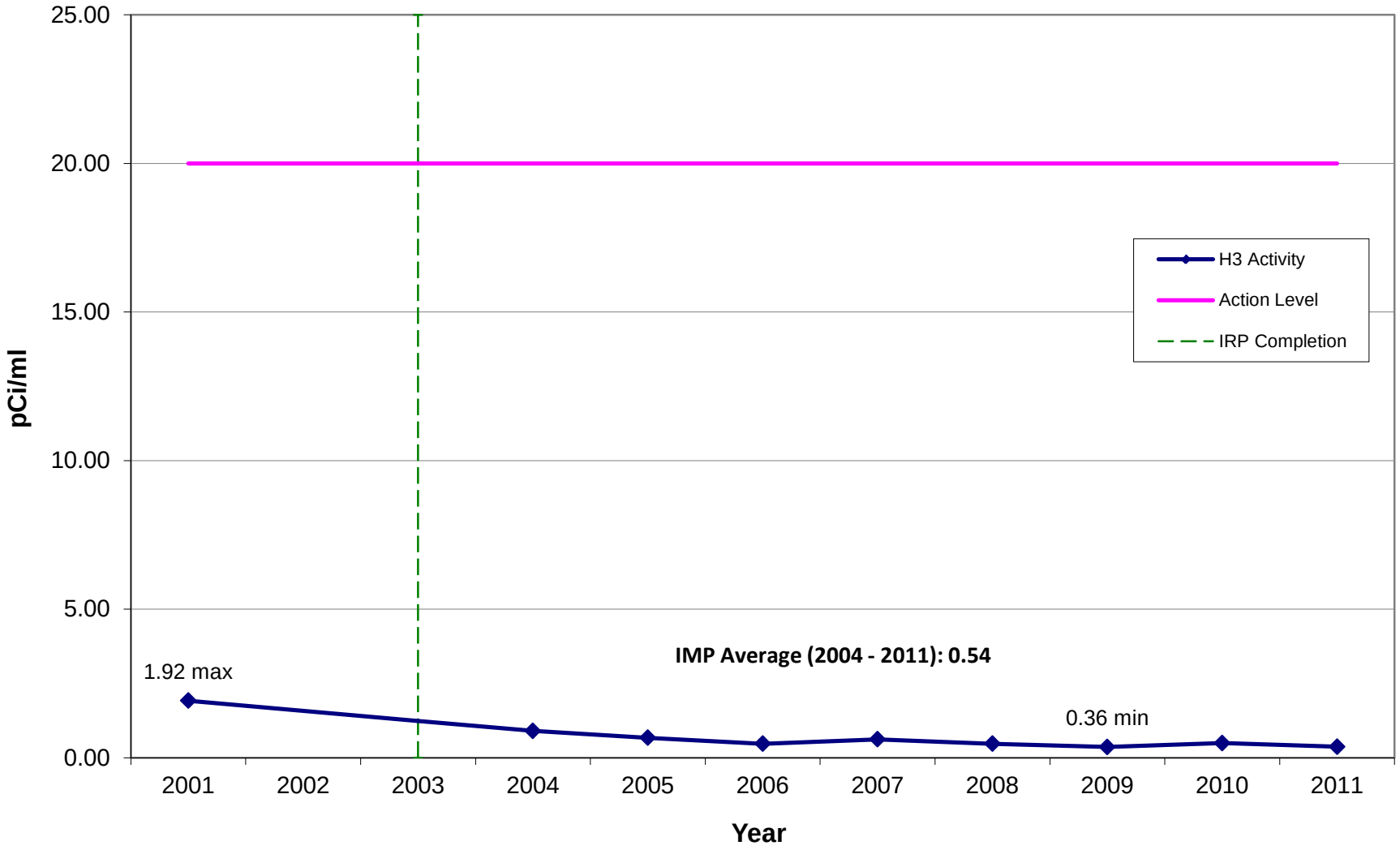
Attachment 6.A.2.4: Location 106 Annual Average Tritium Concentration

Attachment 6.A.2.5: Location 122A (background) Annual Average Tritium Concentration

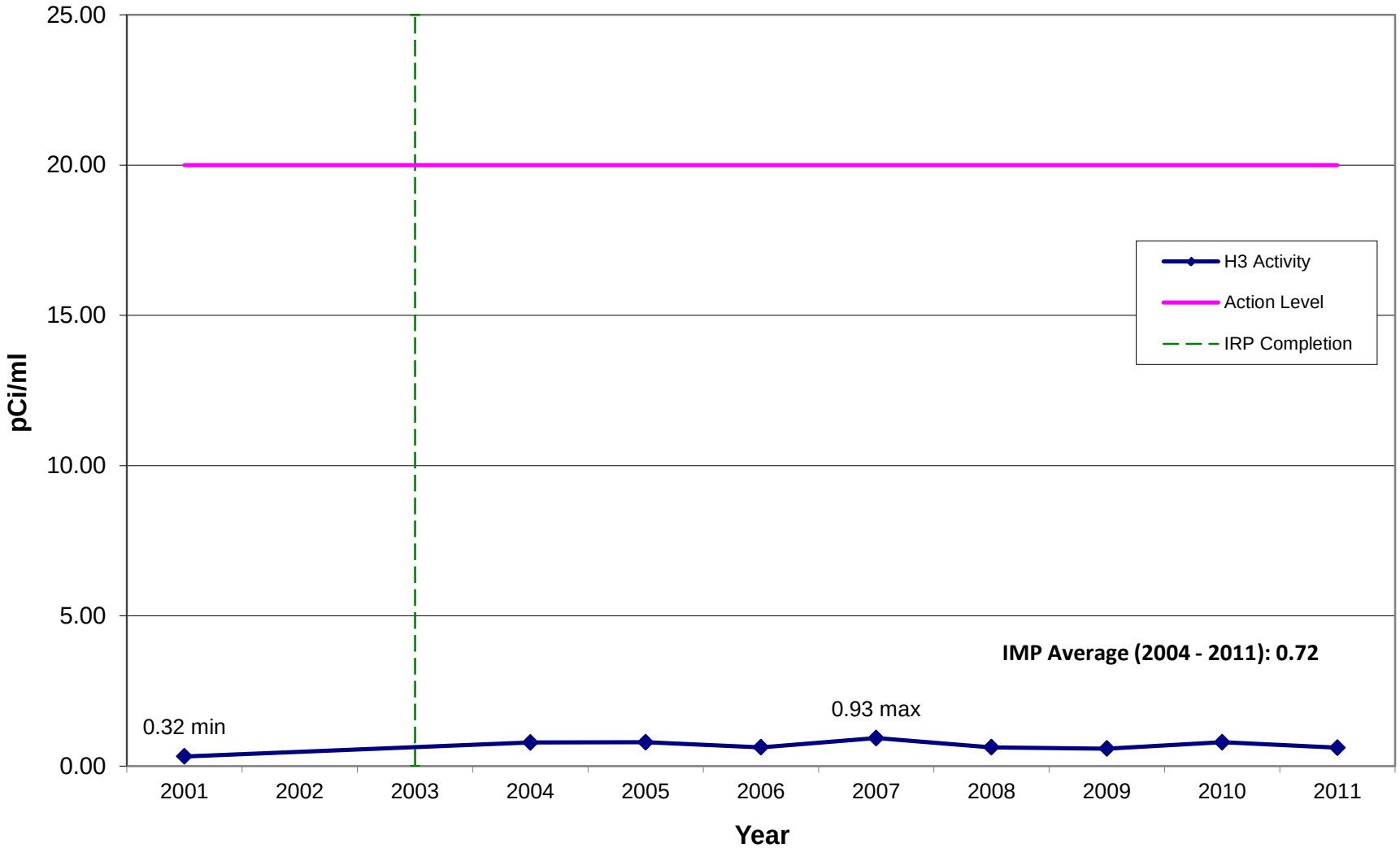


R:\Projects\DEF\demax-1547\3088-MaxeyFlats\DataAnalysis\MXDs\2012

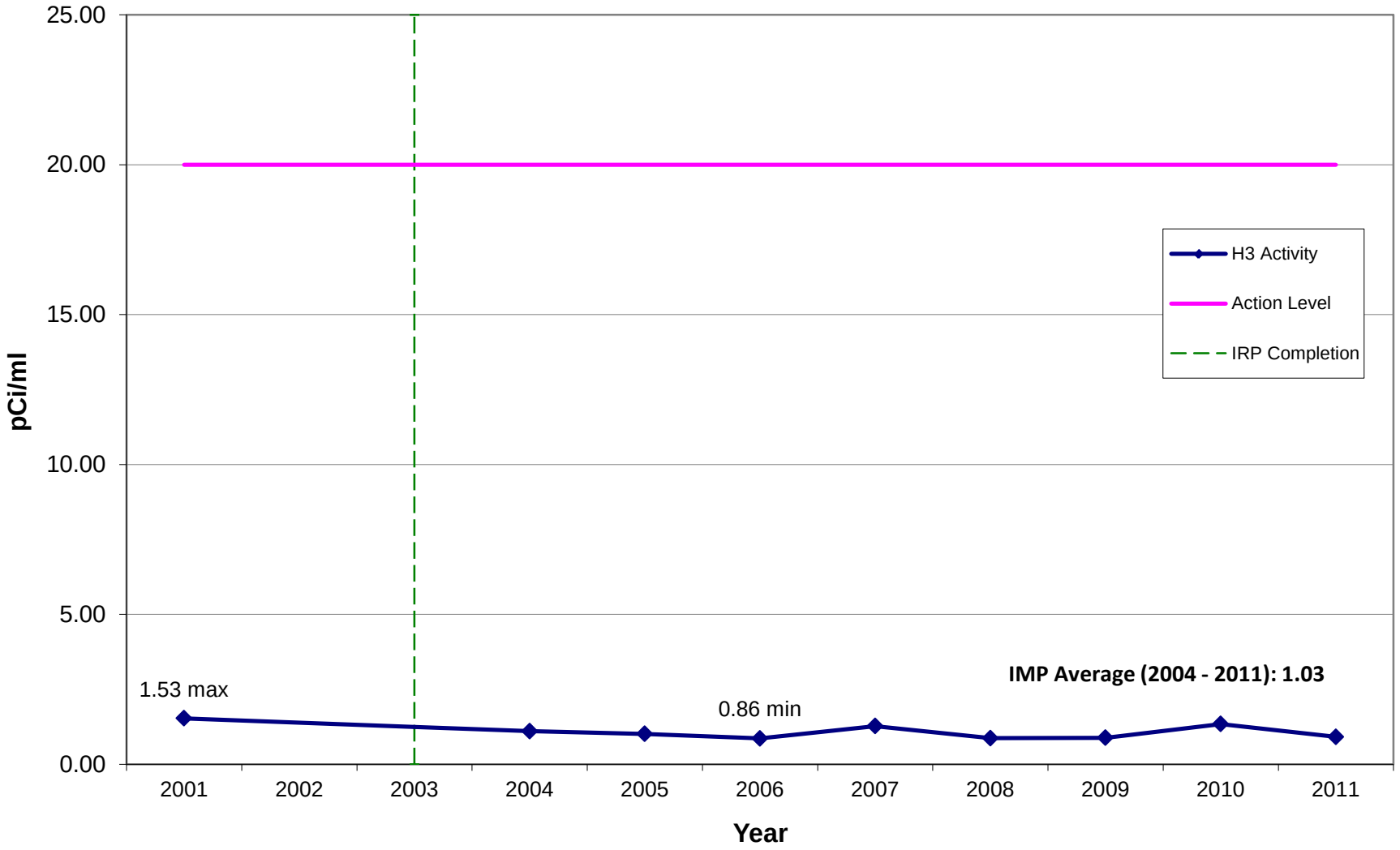
Attachment 6.A.2.1: Location 103E Annual Average Tritium Concentration



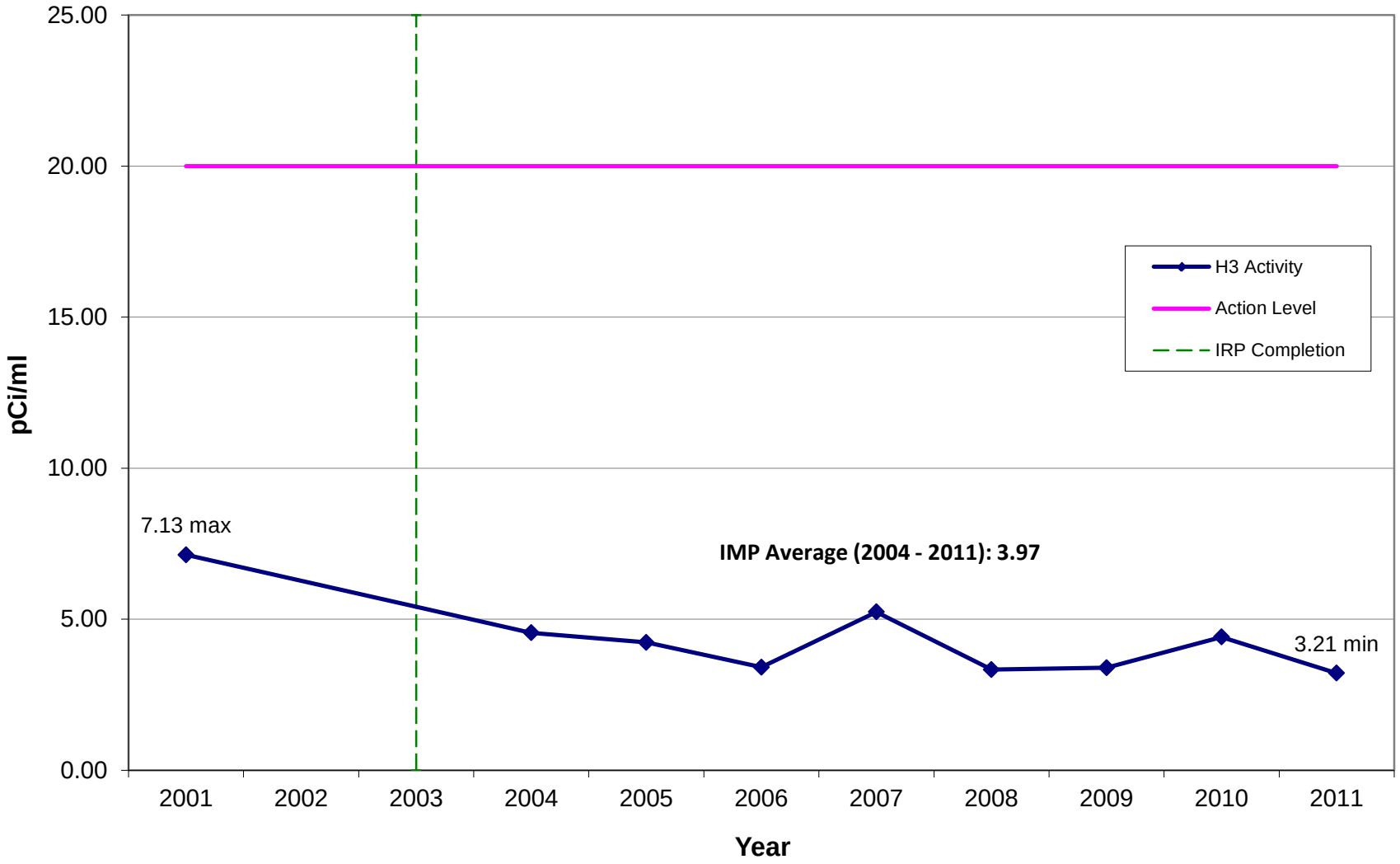
Attachment 6.A.2.2: Location 102D Annual Average Tritium Concentration



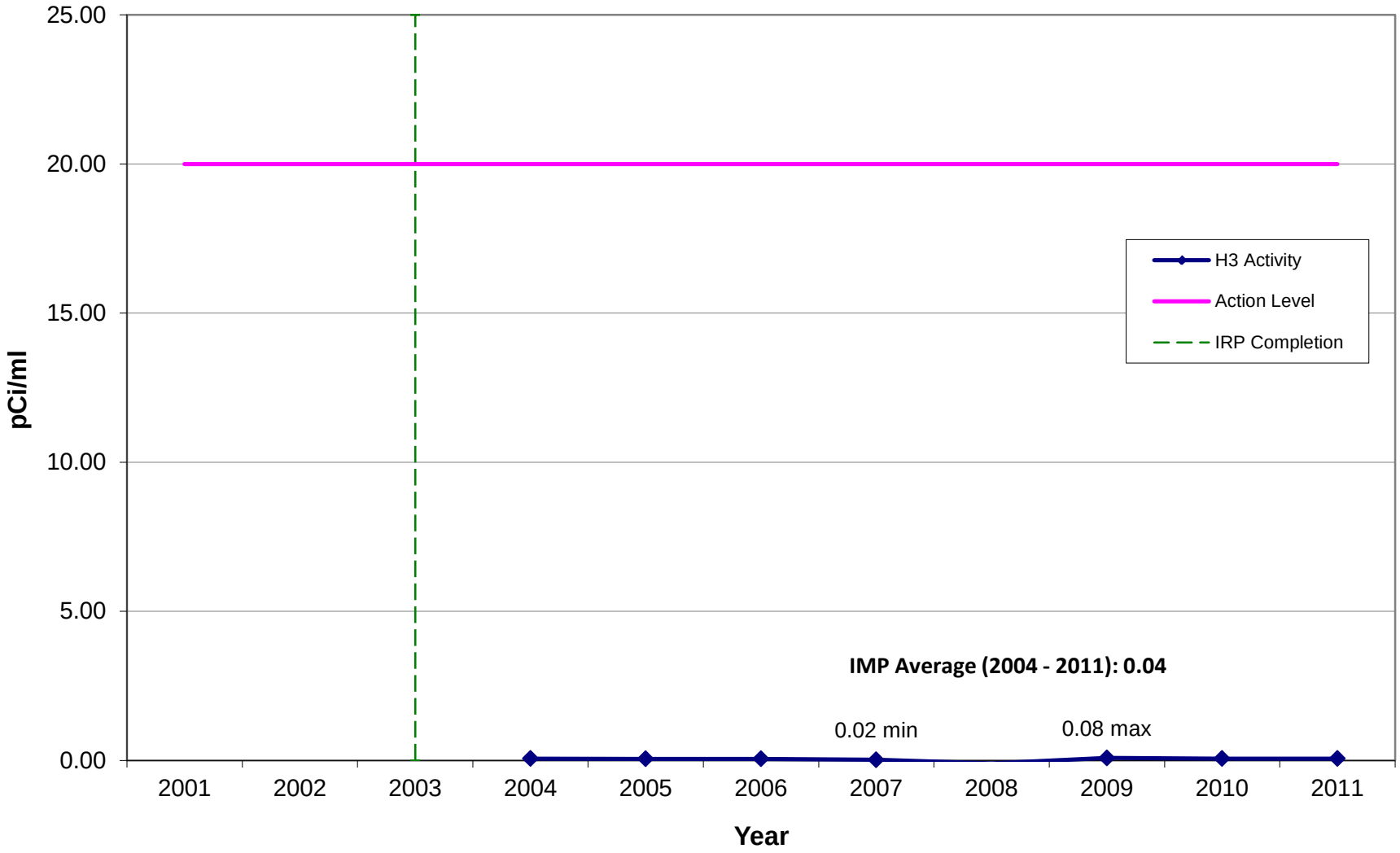
Attachment 6.A.2.3: Location 122C Annual Average Tritium Concentration



Attachment 6.A.2.4: Location 106 Annual Average Tritium Concentration



Attachment 6.A.2.5: Location 122A (background) Annual Average Tritium Concentration



Attachment 6.B.1

Contaminant Monitoring of Surface Water Sampling Locations subject to 25 mrem/yr Standard

Maxey Flats
Fleming County, Kentucky

Description:

Basemap Source:
Bing Imagery 2010

Annual average calculated from each years sampling records.
Sources:
2004 Report Data.xls,
2005 Report Data.xls,
2006 Report Data.xls,
2007 Report Data.xls,
2008 Report Data.xls,
2009 Report Data.xls,
2010 Report Data.xls, and
2011 Report Data.xls.

Map Legend:
- Surface Water Sampling Pt
- Waterway

Spatial Projection:

Coordinate System:
Kentucky State Plane North
FIPS Zone: 1601
Units: Feet
Datum: NAD83

Plot Info:

File: Fig6B1_SW_25MREM.mxd
Project No.: 3088
Plot Date: 13 Aug., 2012
Arc Operator: EJI
Reviewed by: NB

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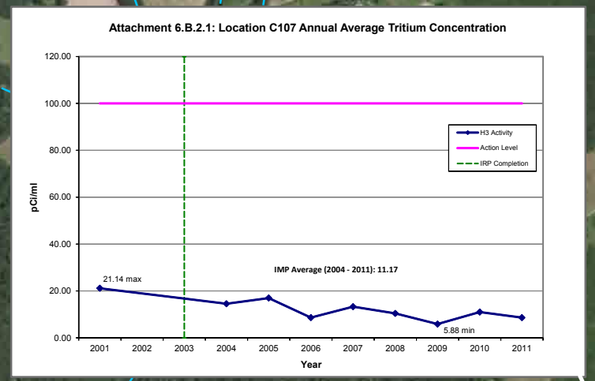
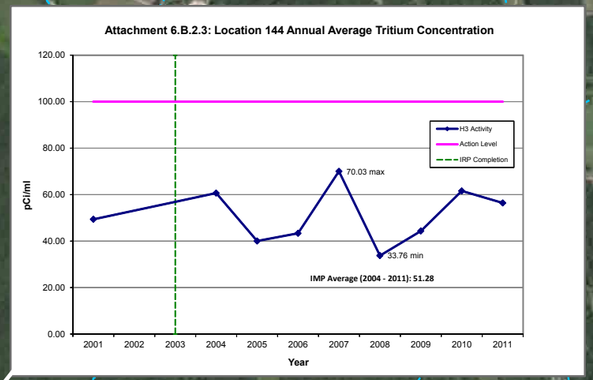
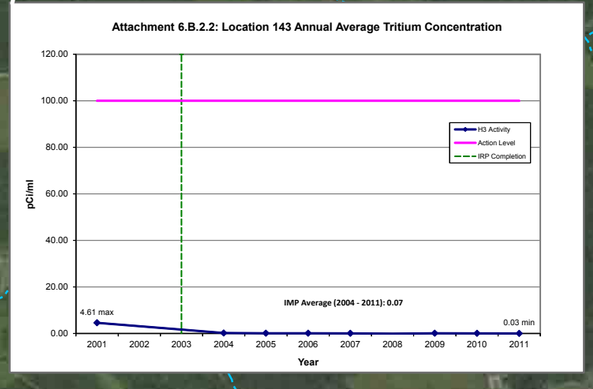
Main Phone: (651) 842-4224
www.ddmsinc.com





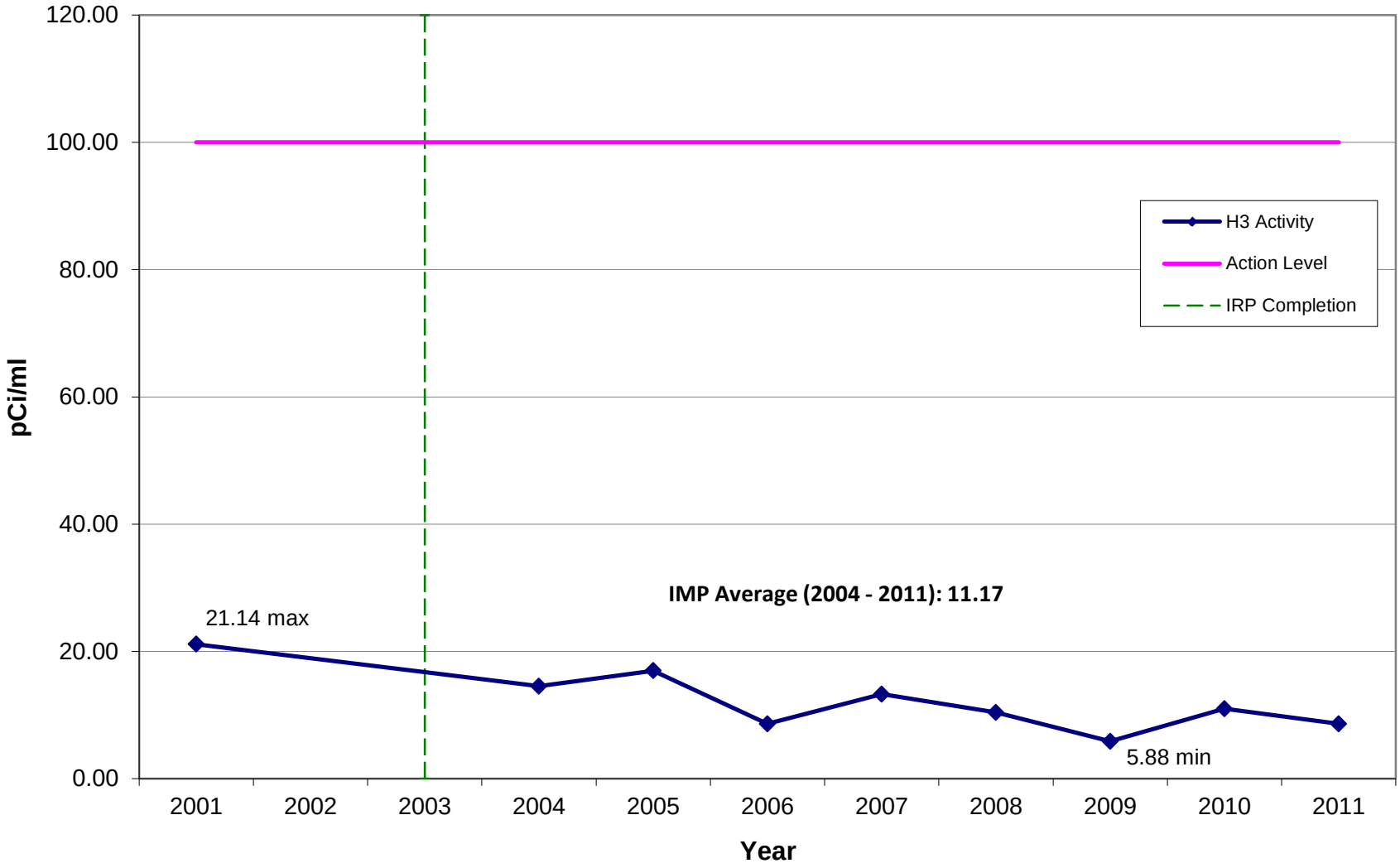


C107
144
106
122A
122C
103E
143
102D

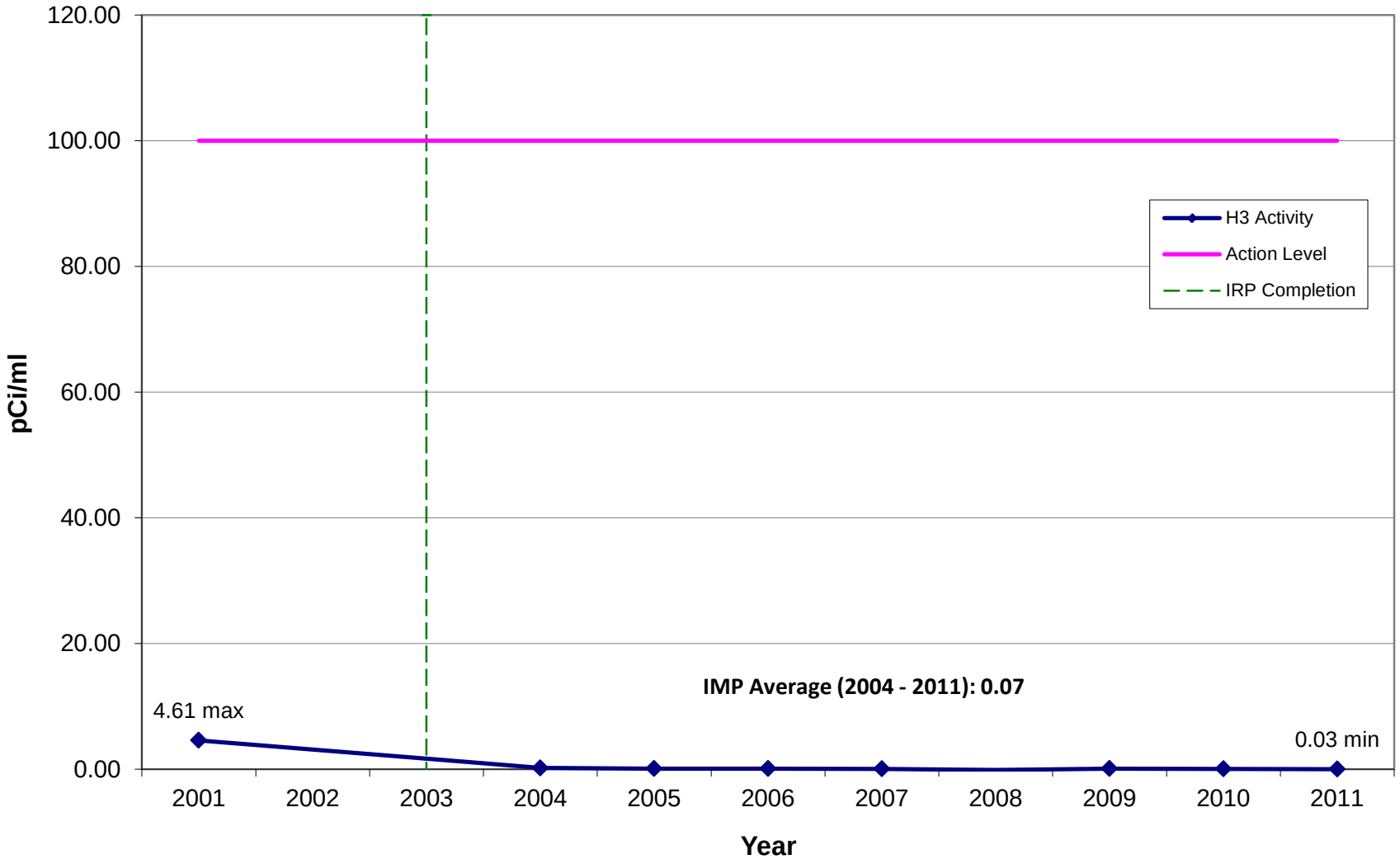
SCALE 0 1,000 2,000 3,000 4,000 5,000 Feet

R:\Projects\DEF\demax-1547\3088-Maxey Flats\DataAnalysis\MXDs\2012

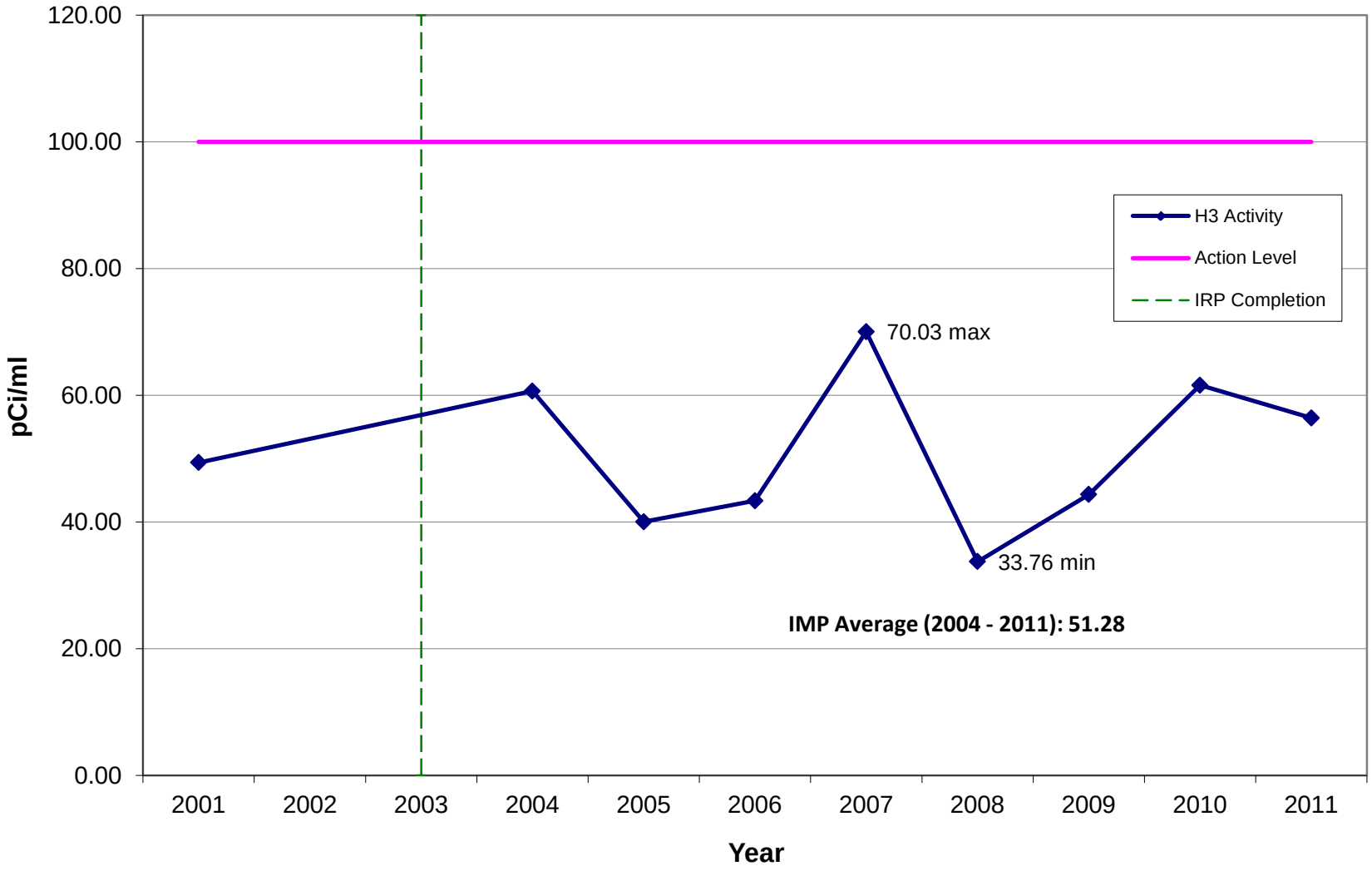
Attachment 6.B.2.1: Location C107 Annual Average Tritium Concentration



Attachment 6.B.2.2: Location 143 Annual Average Tritium Concentration



Attachment 6.B.2.3: Location 144 Annual Average Tritium Concentration



Attachment 6.C.1

Contaminant Monitoring of Alluvial Well Locations (odd numbered) subject to 4mrem/yr Standard

Maxey Flats
Fleming County, Kentucky

Description:

Basemap Source:
Bing Imagery 2010

Annual average calculated from each years sampling records.
Sources:
2004 Report Data.xls,
2005 Report Data.xls,
2006 Report Data.xls,
2007 Report Data.xls,
2008 Report Data.xls,
2009 Report Data.xls,
2010 Report Data.xls, and
2011 Report Data.xls

Map Legend:

- Alluvial Well
- Waterway

Spatial Projection:

Coordinate System:
Kentucky State Plane North
FIPS Zone: 1601
Units: Feet
Datum: NAD83

Plot Info:

File: Fig6C1_AW_odd.mxd
Project No.: 3088
Plot Date: 13 Aug., 2012
Arc Operator: EJI
Reviewed by: NB

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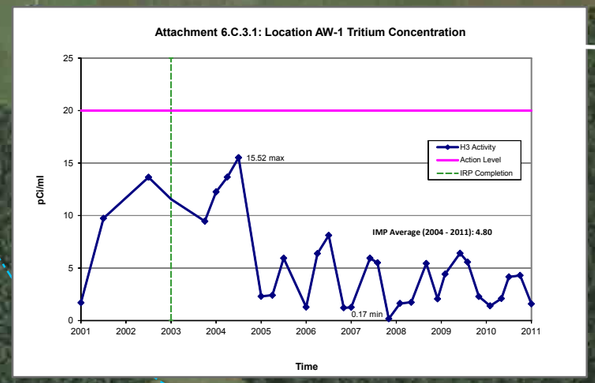

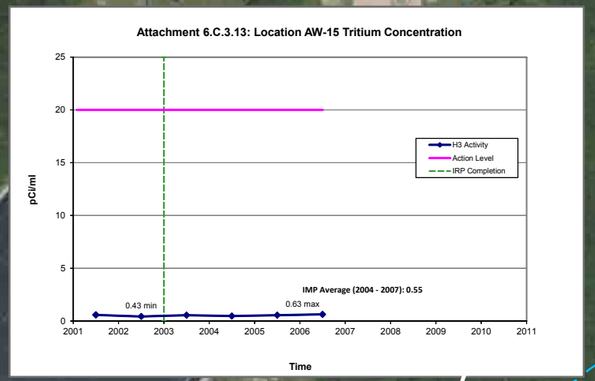

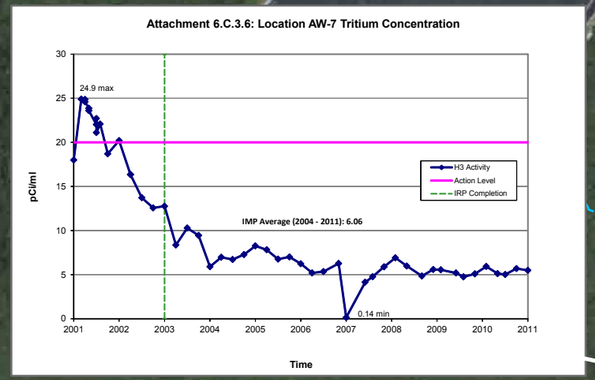

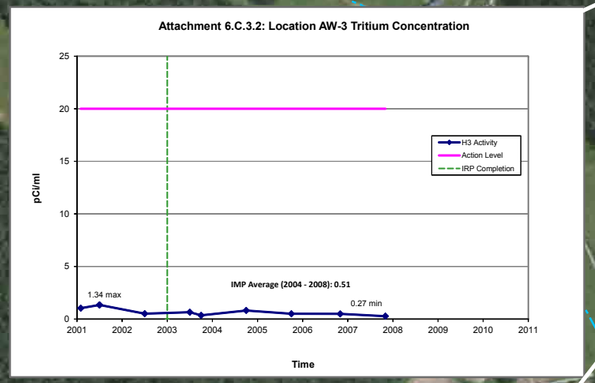

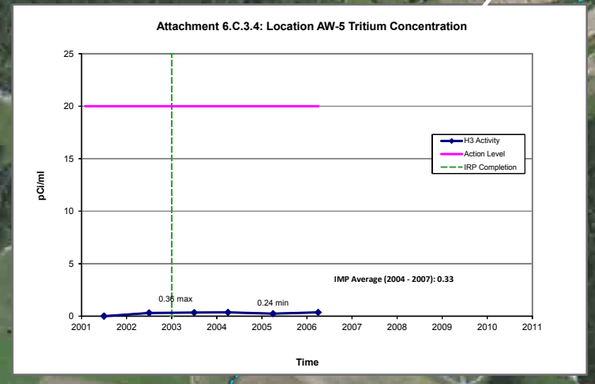

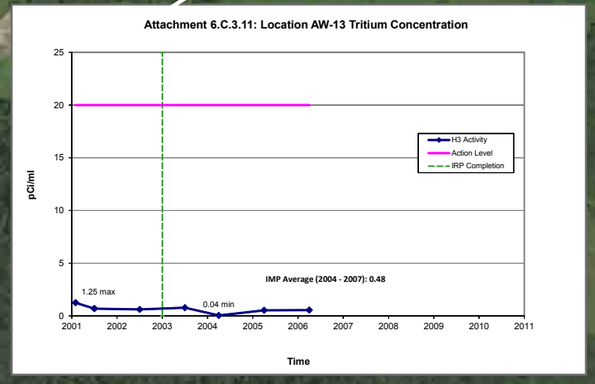

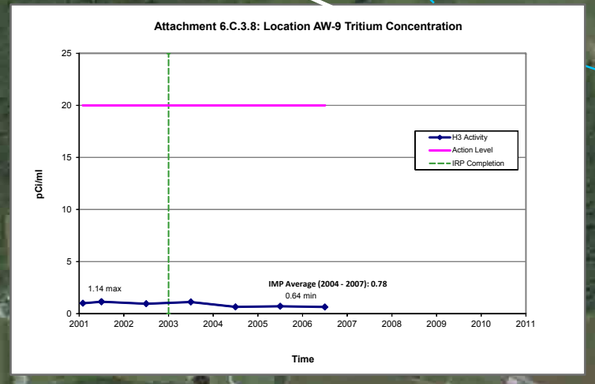

R:\Projects\DEF\demax-1547\3088-MaxeyFlats\DataAnalysis\MXDs\2012

Attachment 6.C.2

Contaminant Monitoring of Alluvial Well Locations (even numbered) subject to 4mrem/yr Standard

Maxey Flats
Fleming County, Kentucky

Description:

Basemap Source:
Bing Imagery 2010

Annual average calculated from each years sampling records.
Sources:
2004 Report Data.xls,
2005 Report Data.xls,
2006 Report Data.xls,
2007 Report Data.xls,
2008 Report Data.xls,
2009 Report Data.xls,
2010 Report Data.xls, and
2011 Report Data.xls

Map Legend:
- Alluvial Well
- Waterway

Spatial Projection:

Coordinate System:
Kentucky State Plane North
FIPS Zone: 1601
Units: Feet
Datum: NAD83

Plot Info:

File: Fig6C2_AW_even.mxd
Project No.: 3088
Plot Date: 13 Aug., 2012
Arc Operator: EJI
Reviewed by: NB

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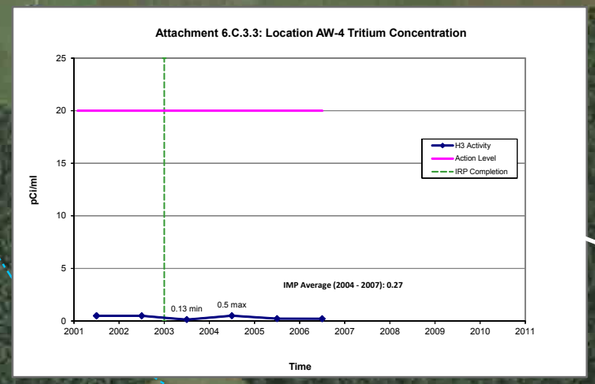

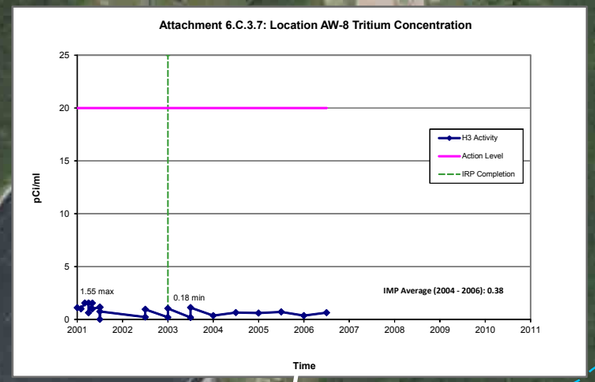

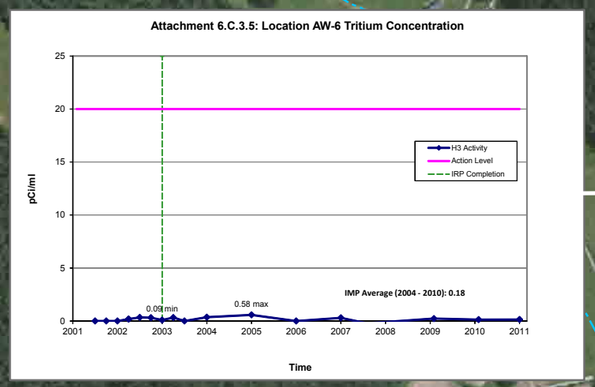

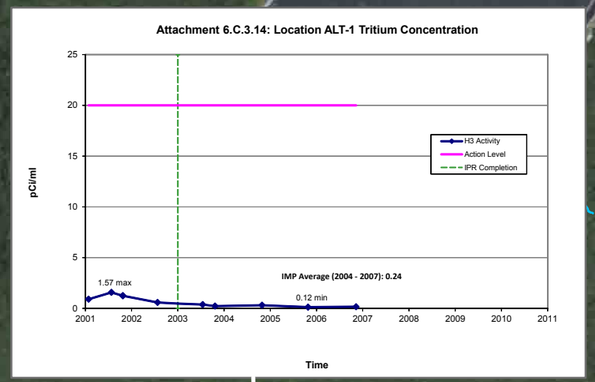

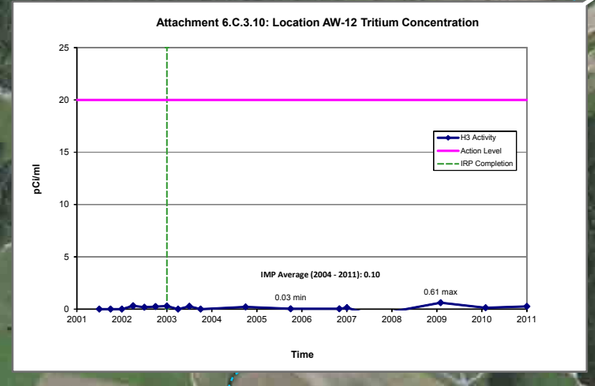

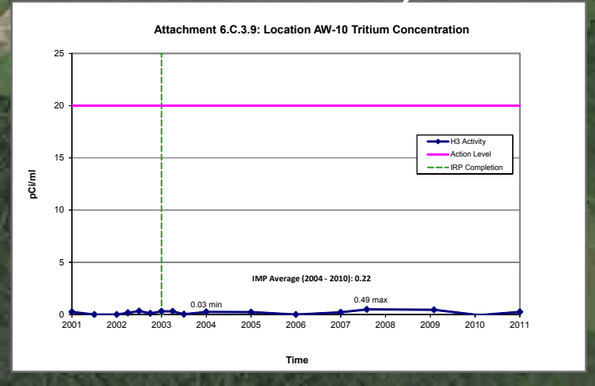

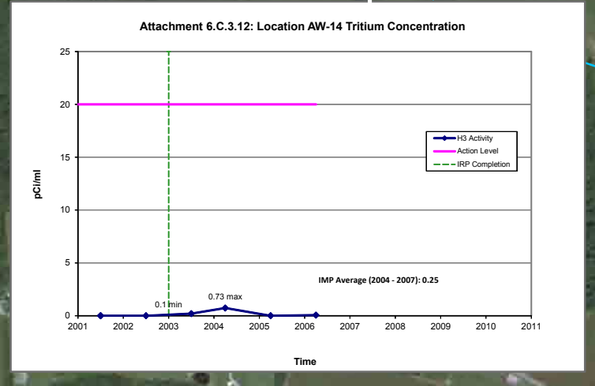

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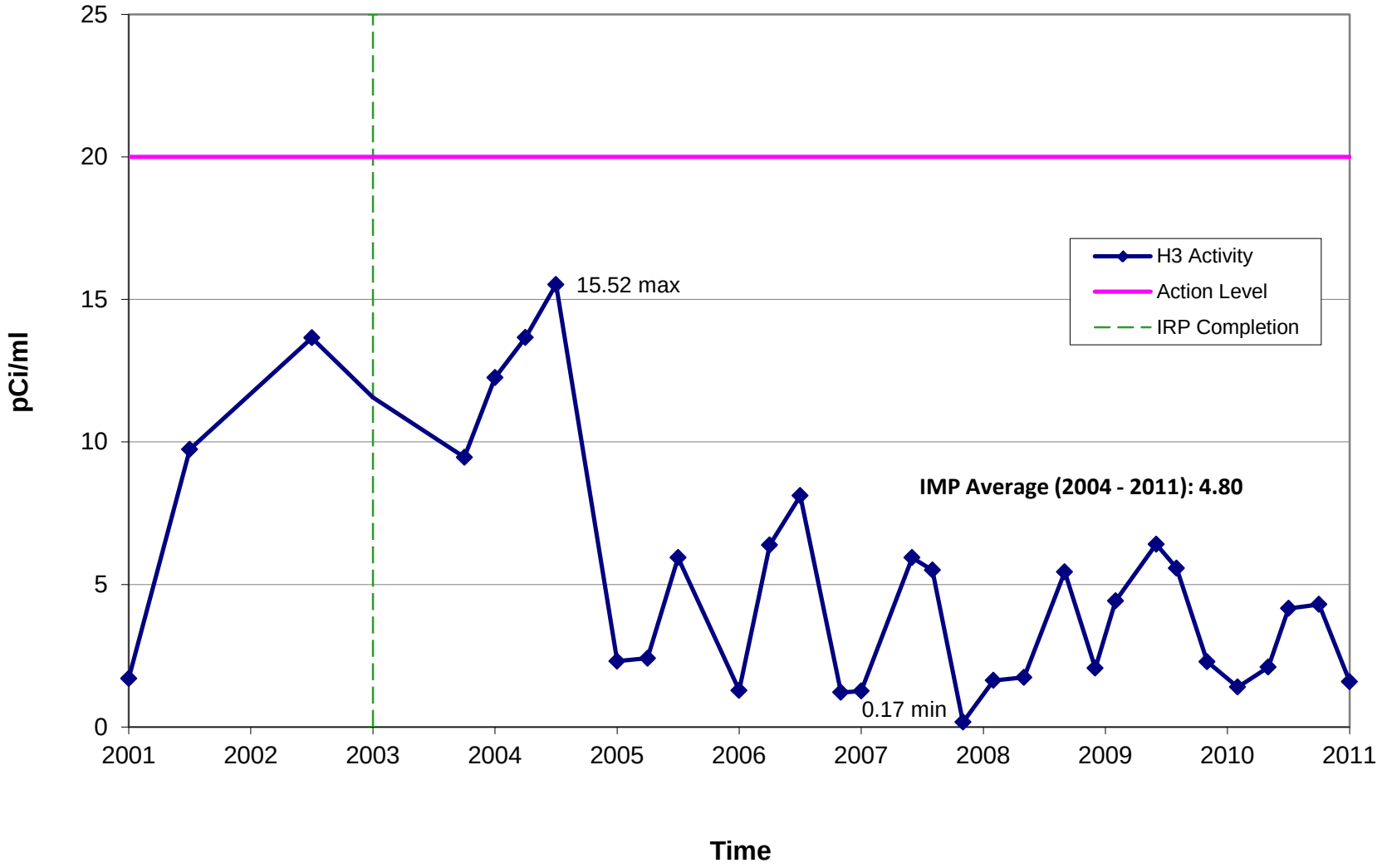
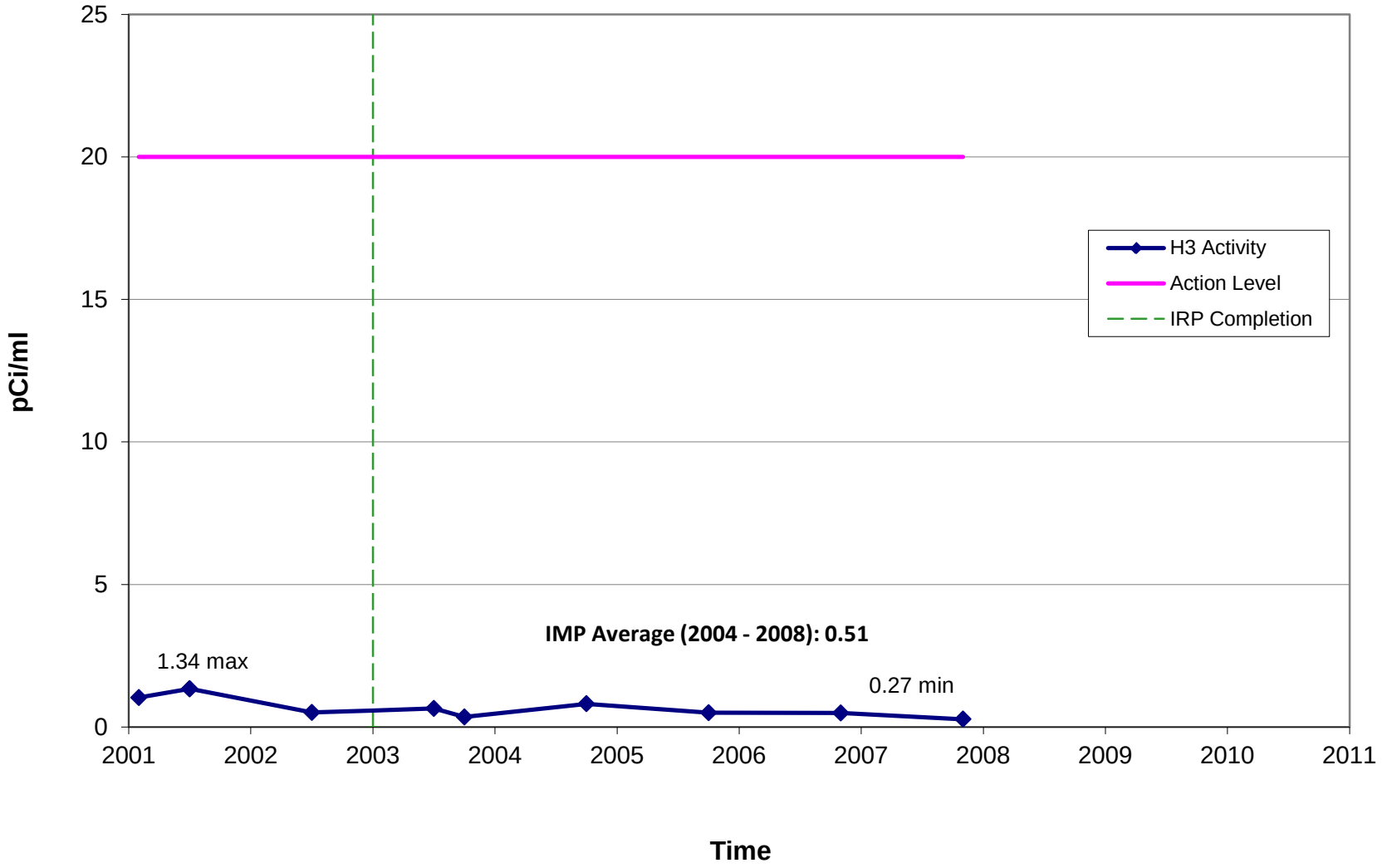
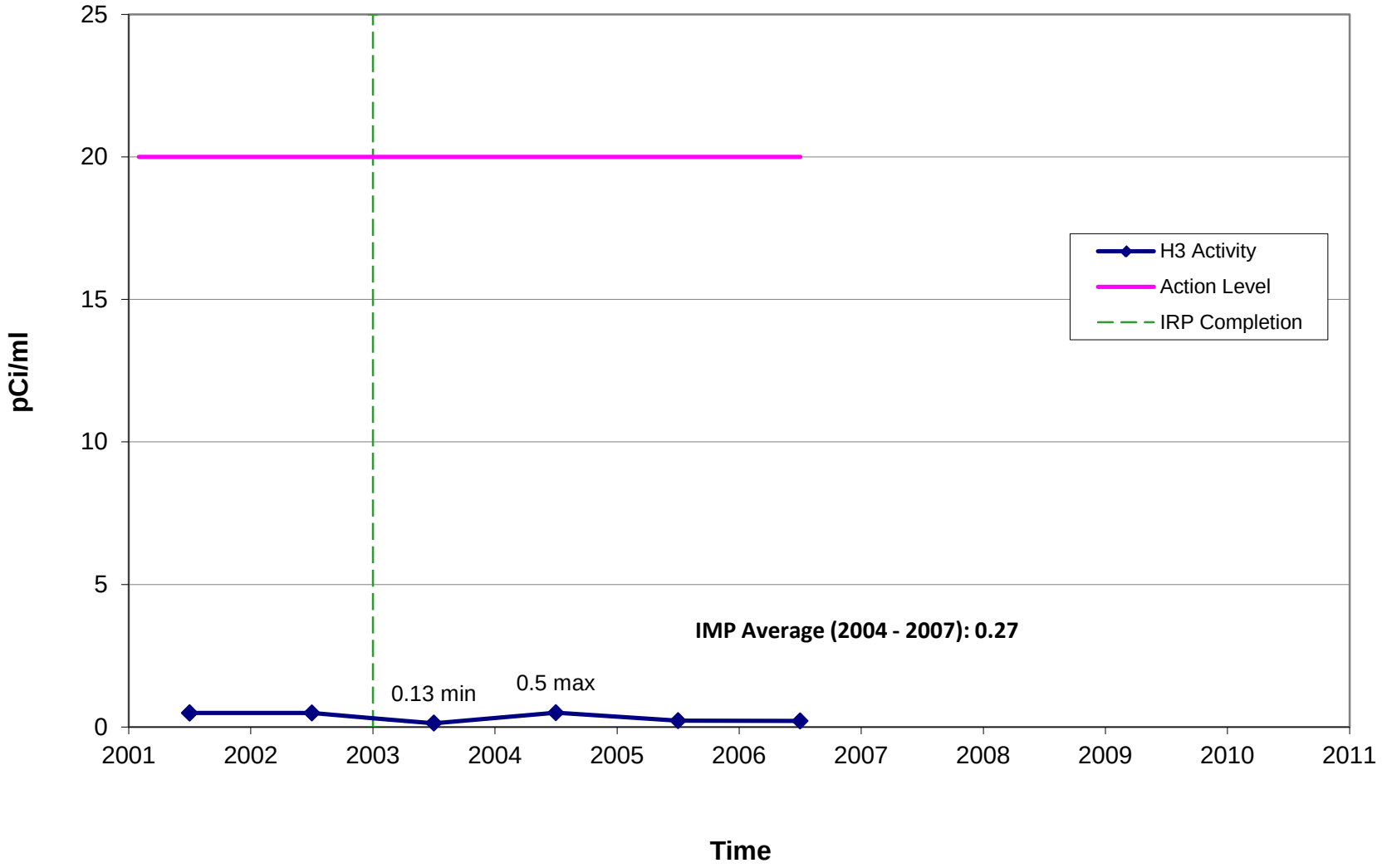
Attachment 6.C.3.1: Location AW-1 Tritium Concentration



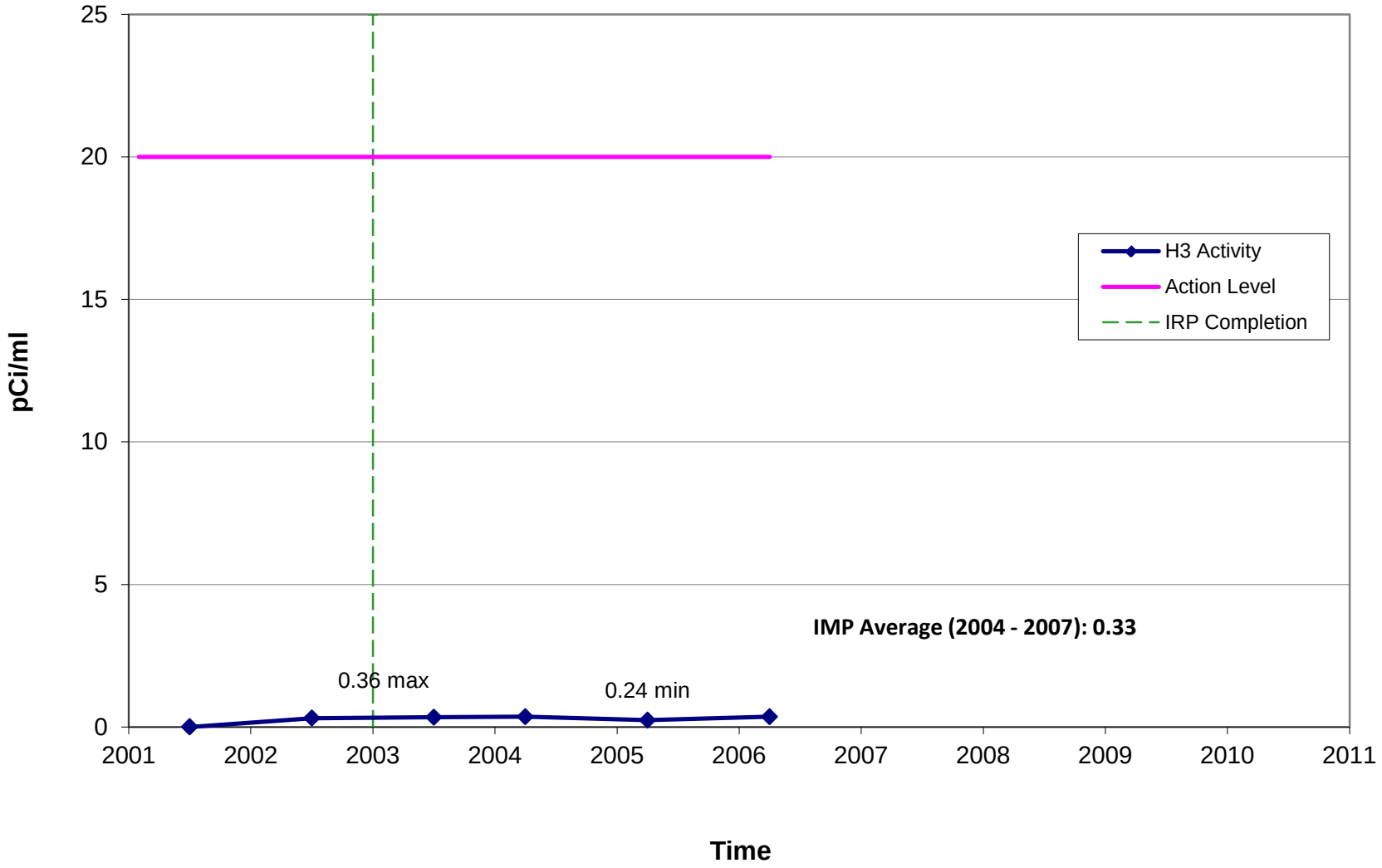
Attachment 6.C.3.2: Location AW-3 Tritium Concentration



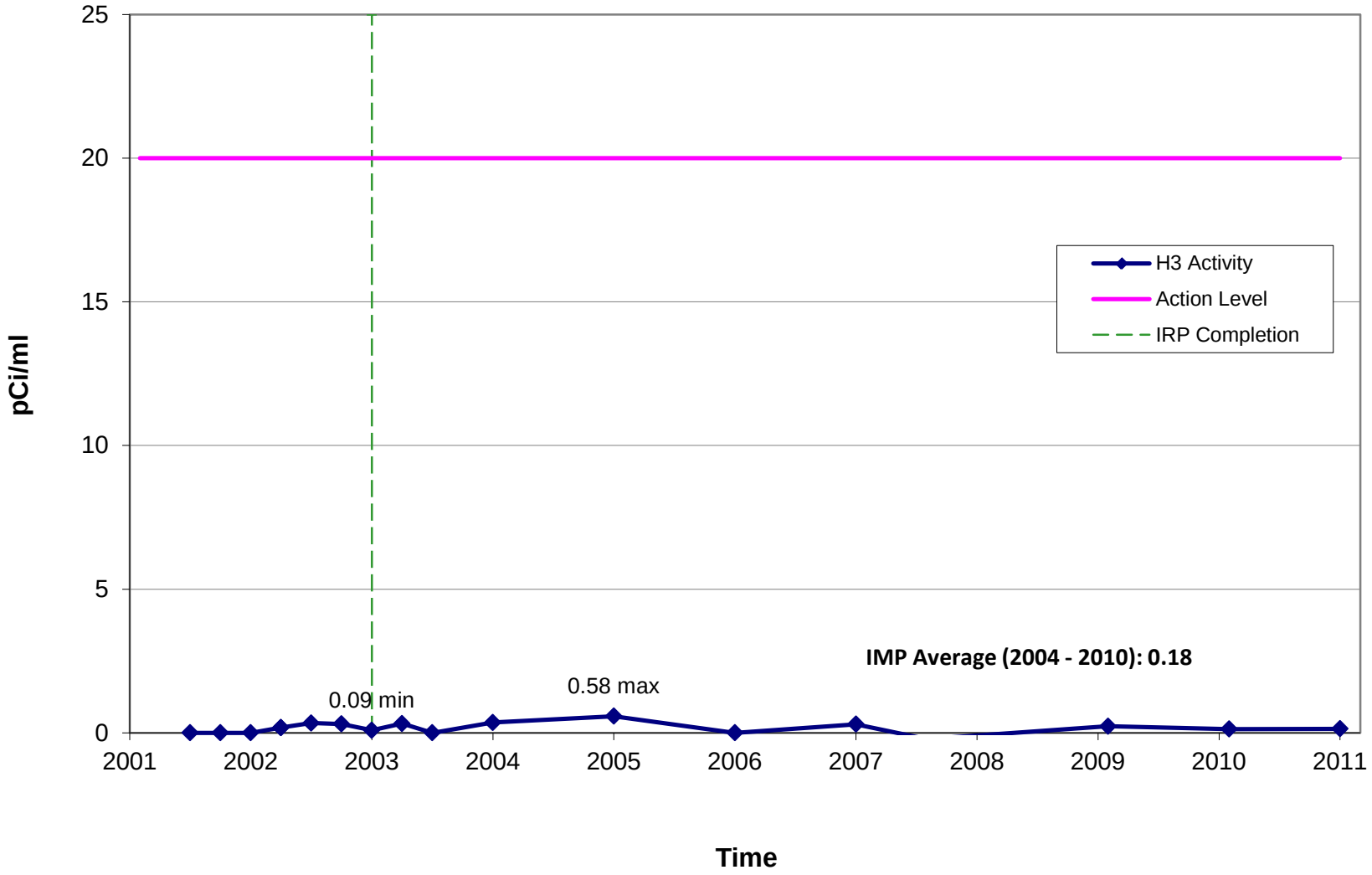
Attachment 6.C.3.3: Location AW-4 Tritium Concentration



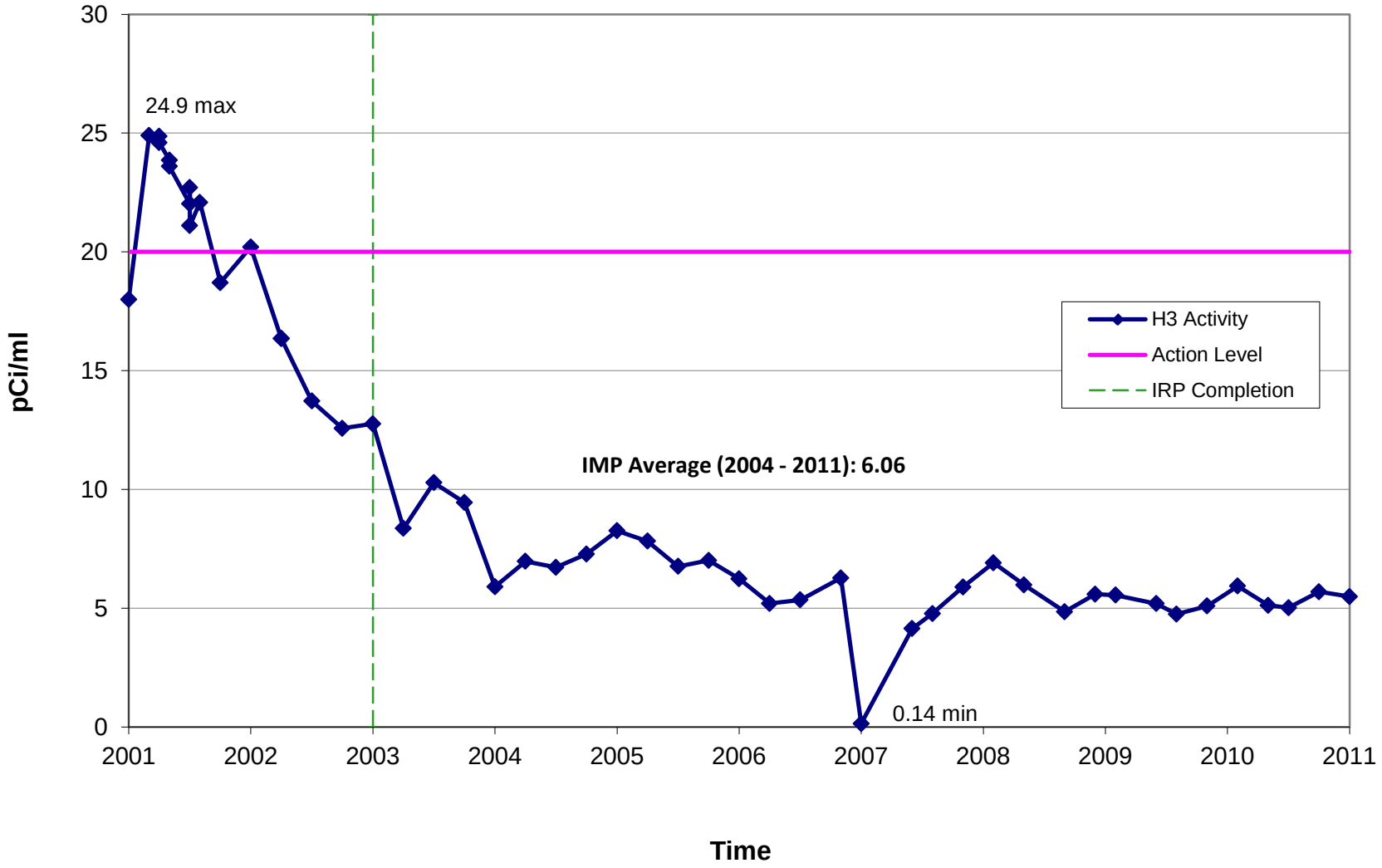
Attachment 6.C.3.4: Location AW-5 Tritium Concentration



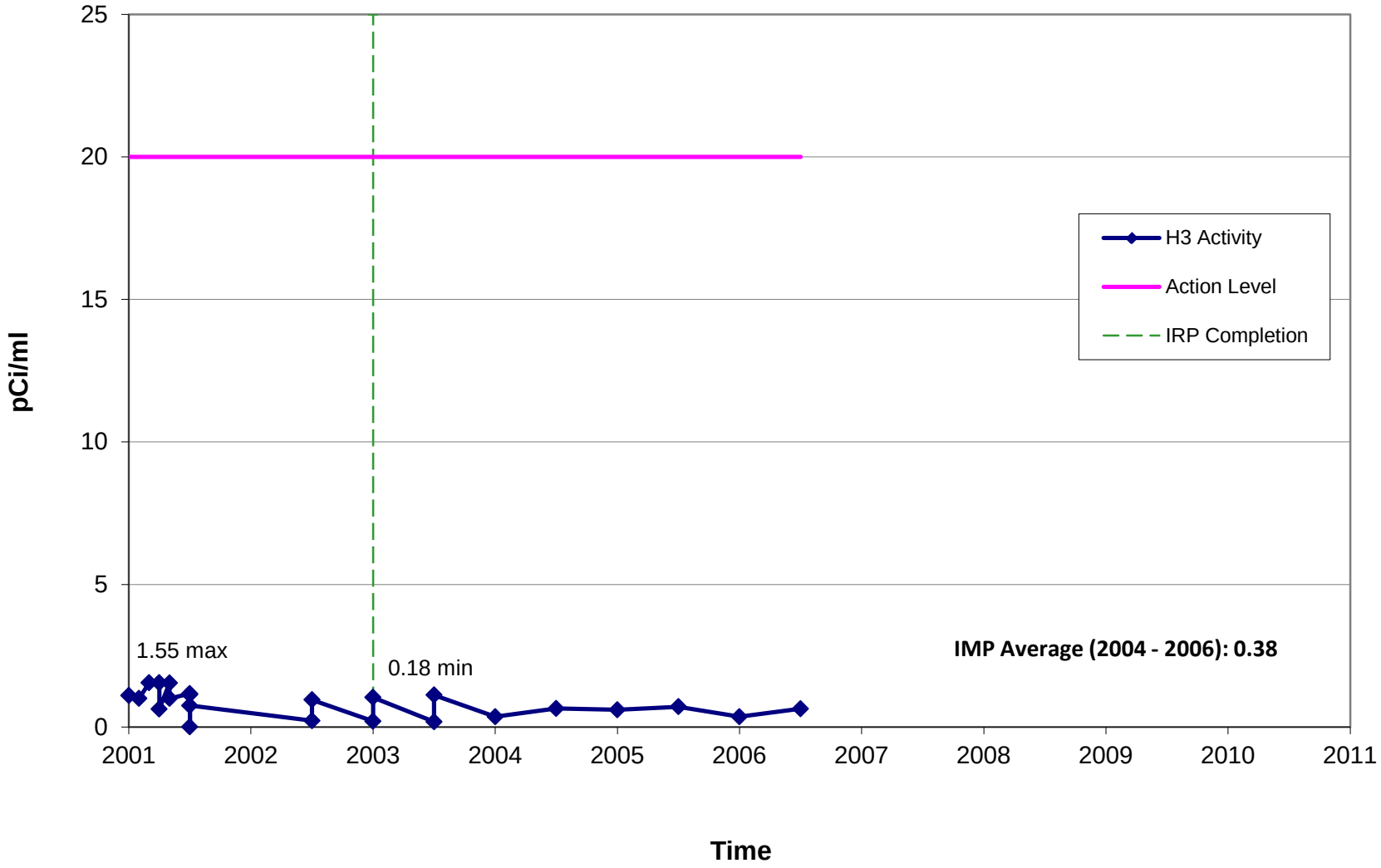
Attachment 6.C.3.5: Location AW-6 Tritium Concentration



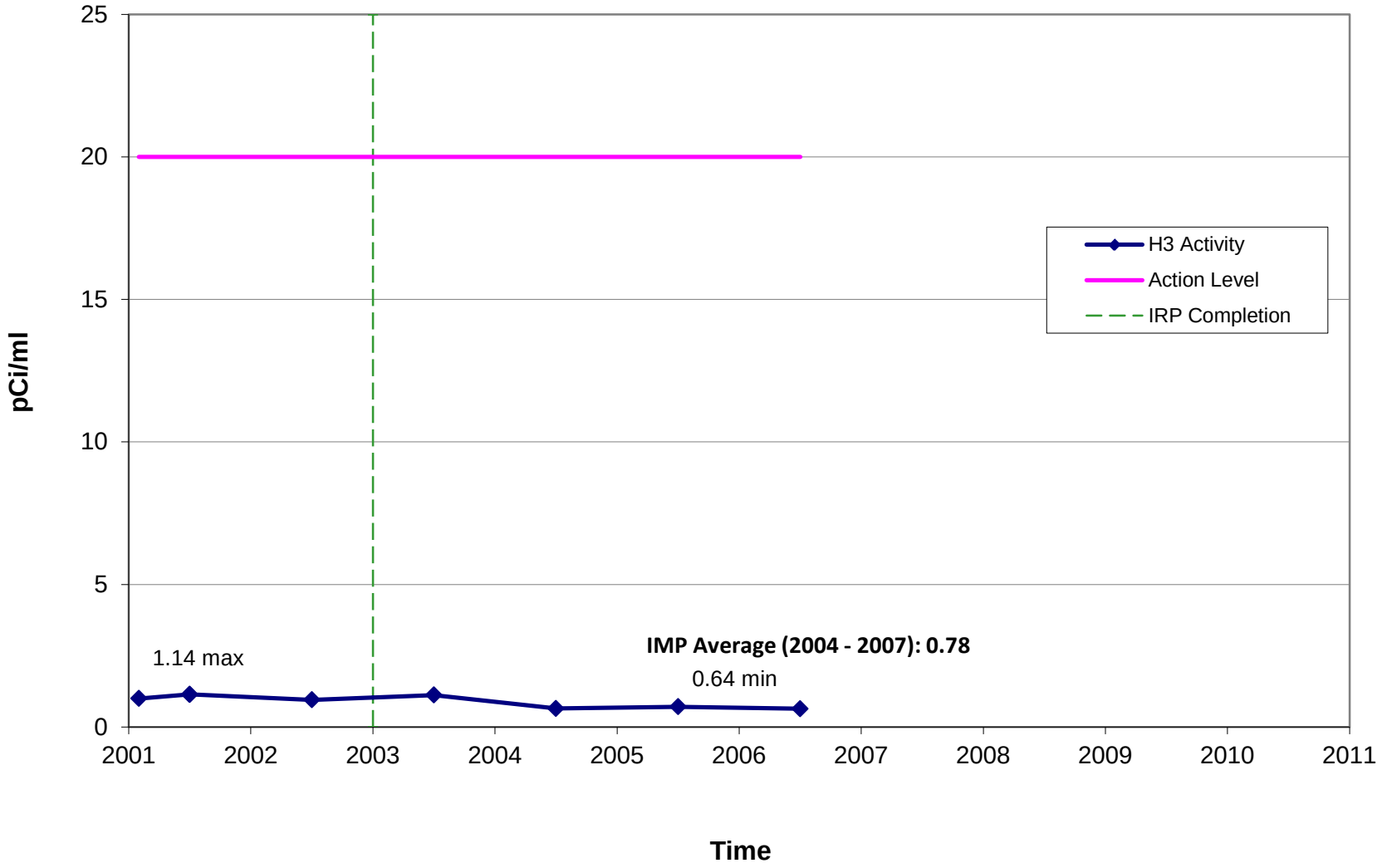
Attachment 6.C.3.6: Location AW-7 Tritium Concentration



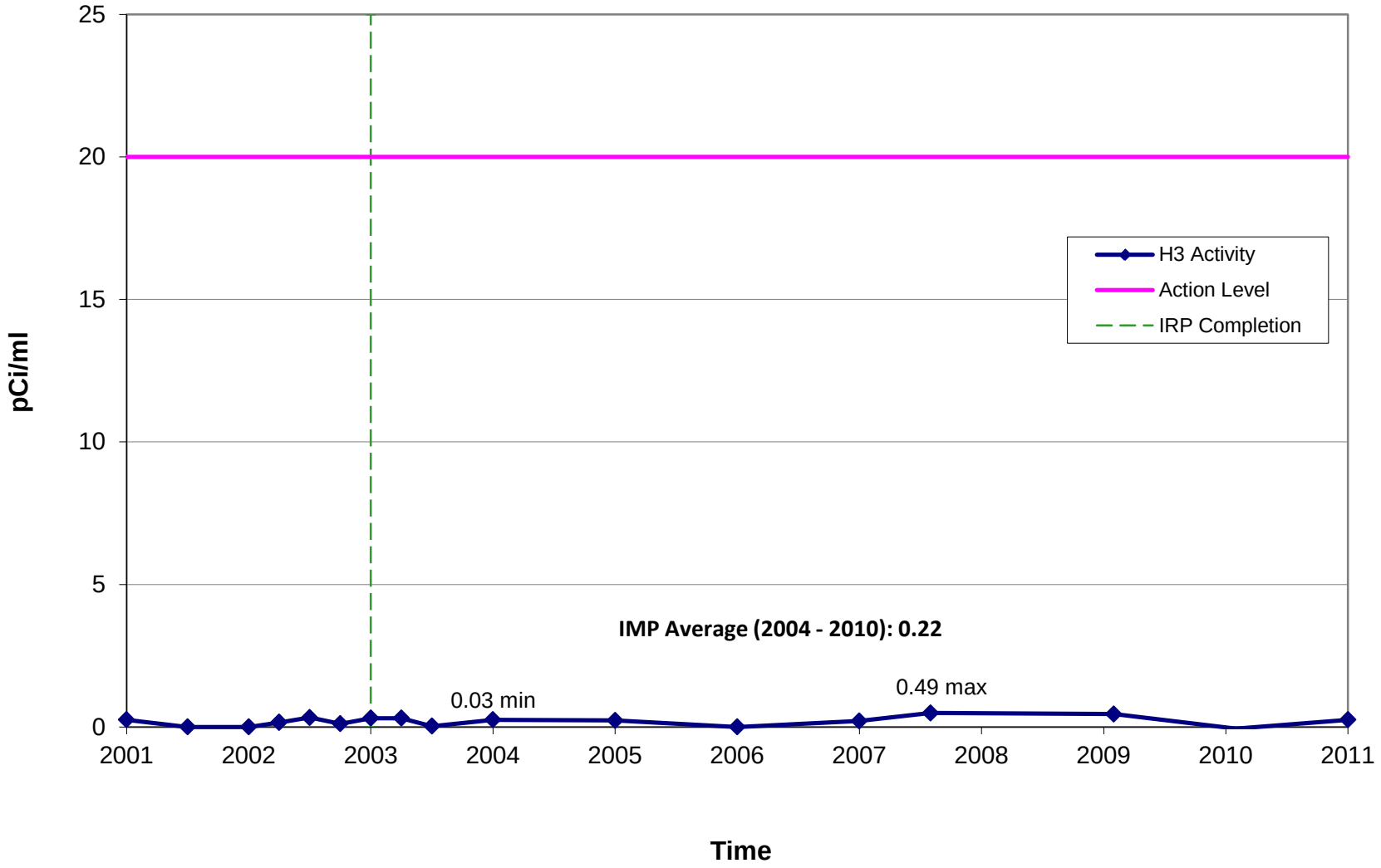
Attachment 6.C.3.7: Location AW-8 Tritium Concentration



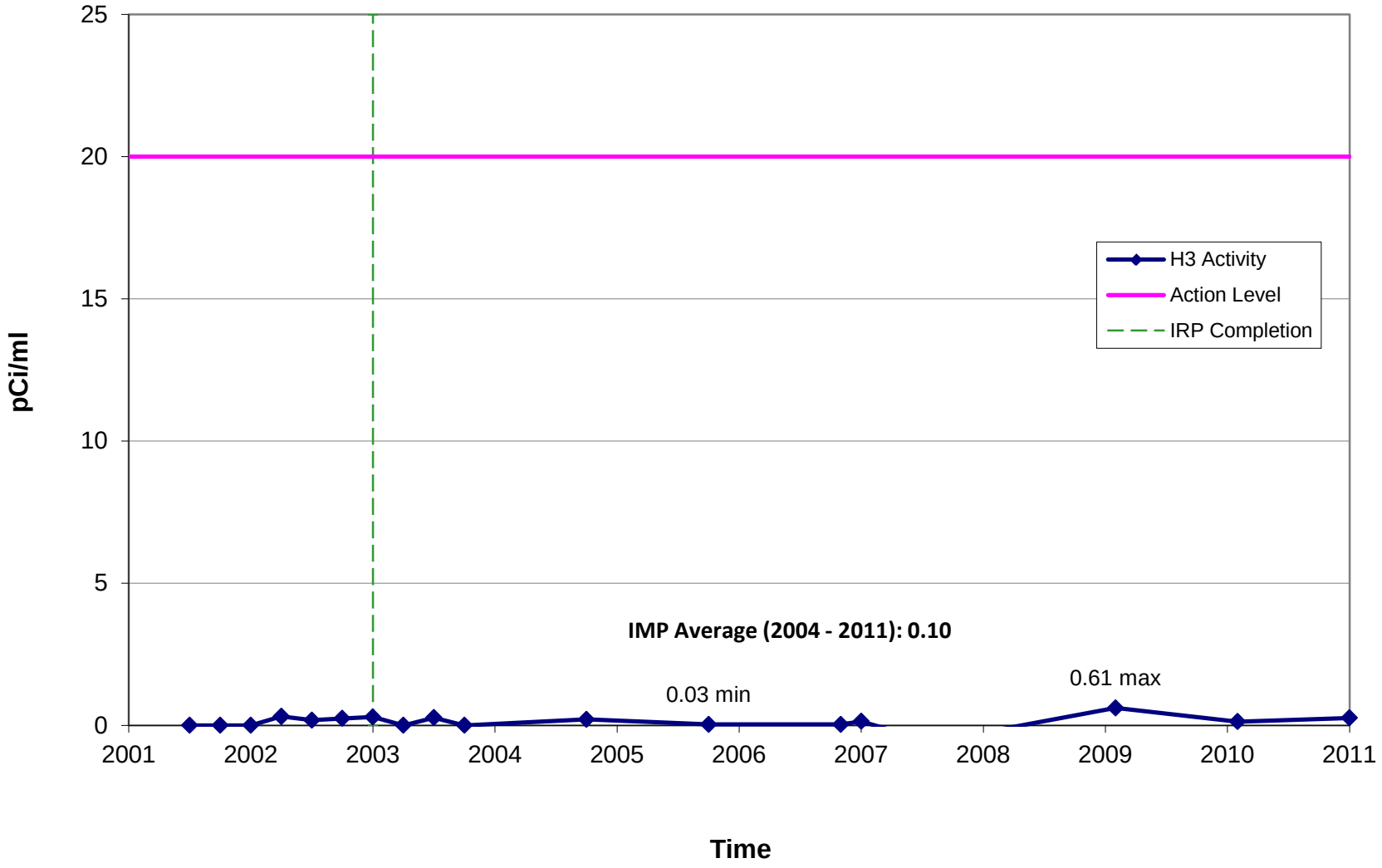
Attachment 6.C.3.8: Location AW-9 Tritium Concentration



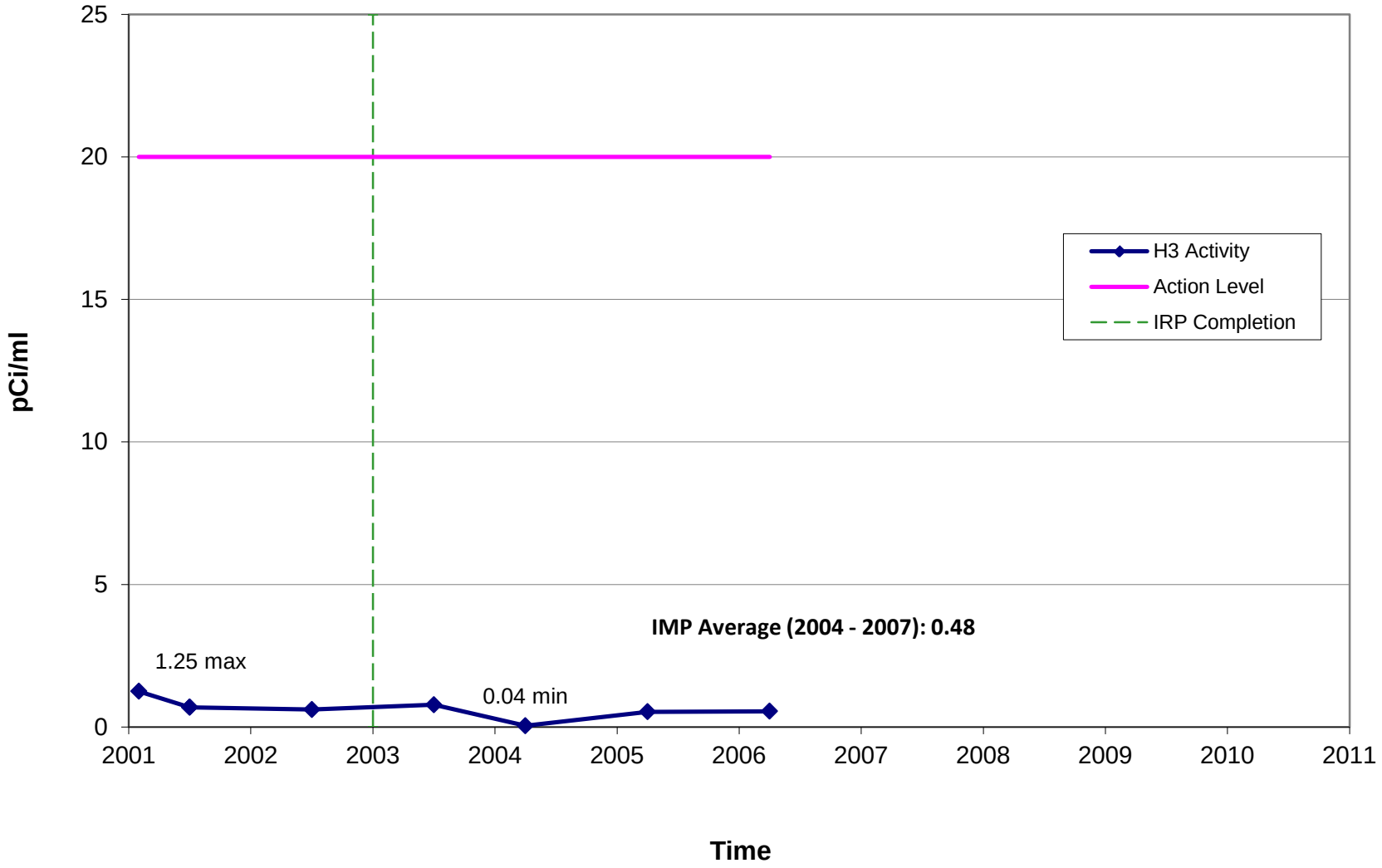
Attachment 6.C.3.9: Location AW-10 Tritium Concentration



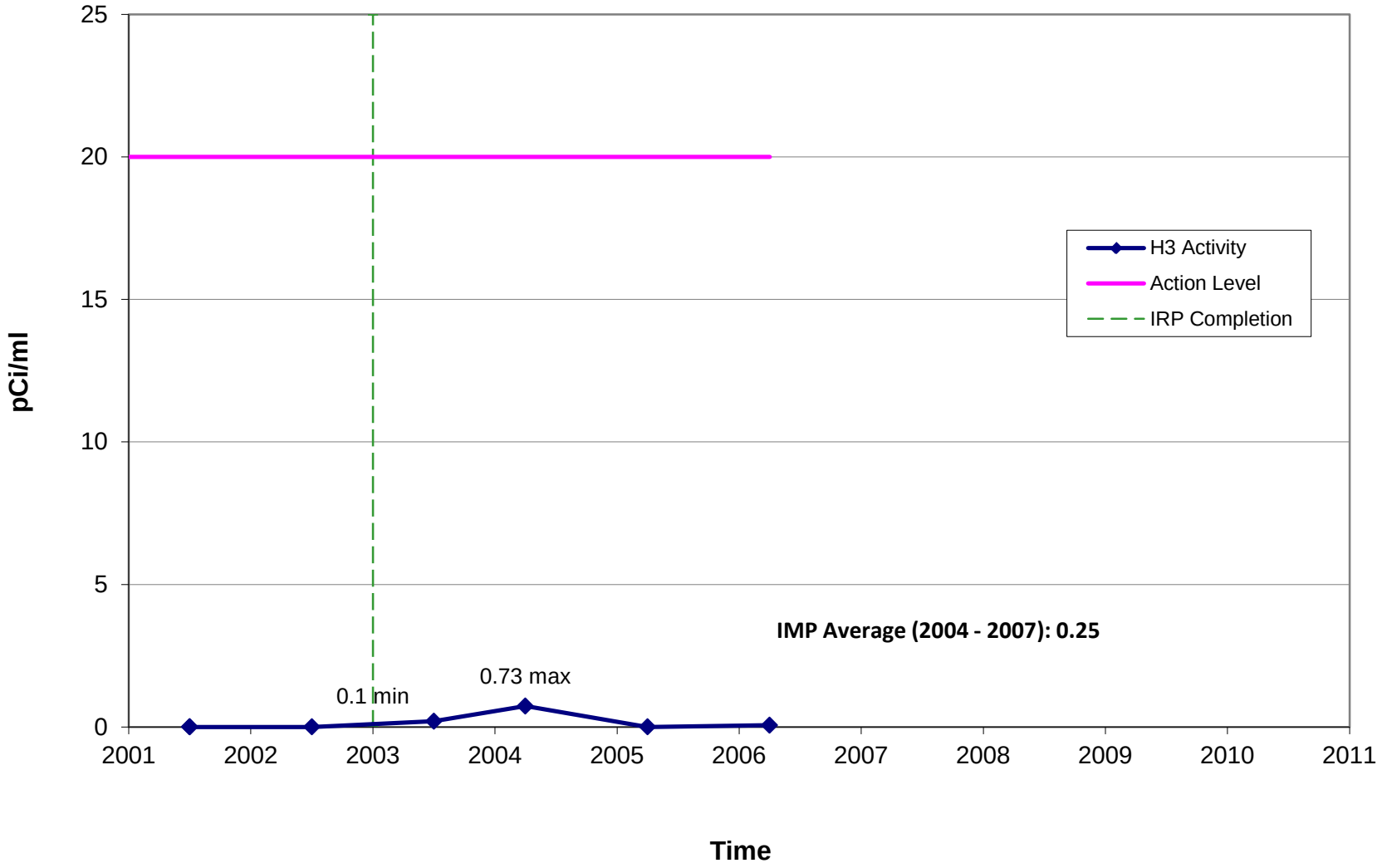
Attachment 6.C.3.10: Location AW-12 Tritium Concentration



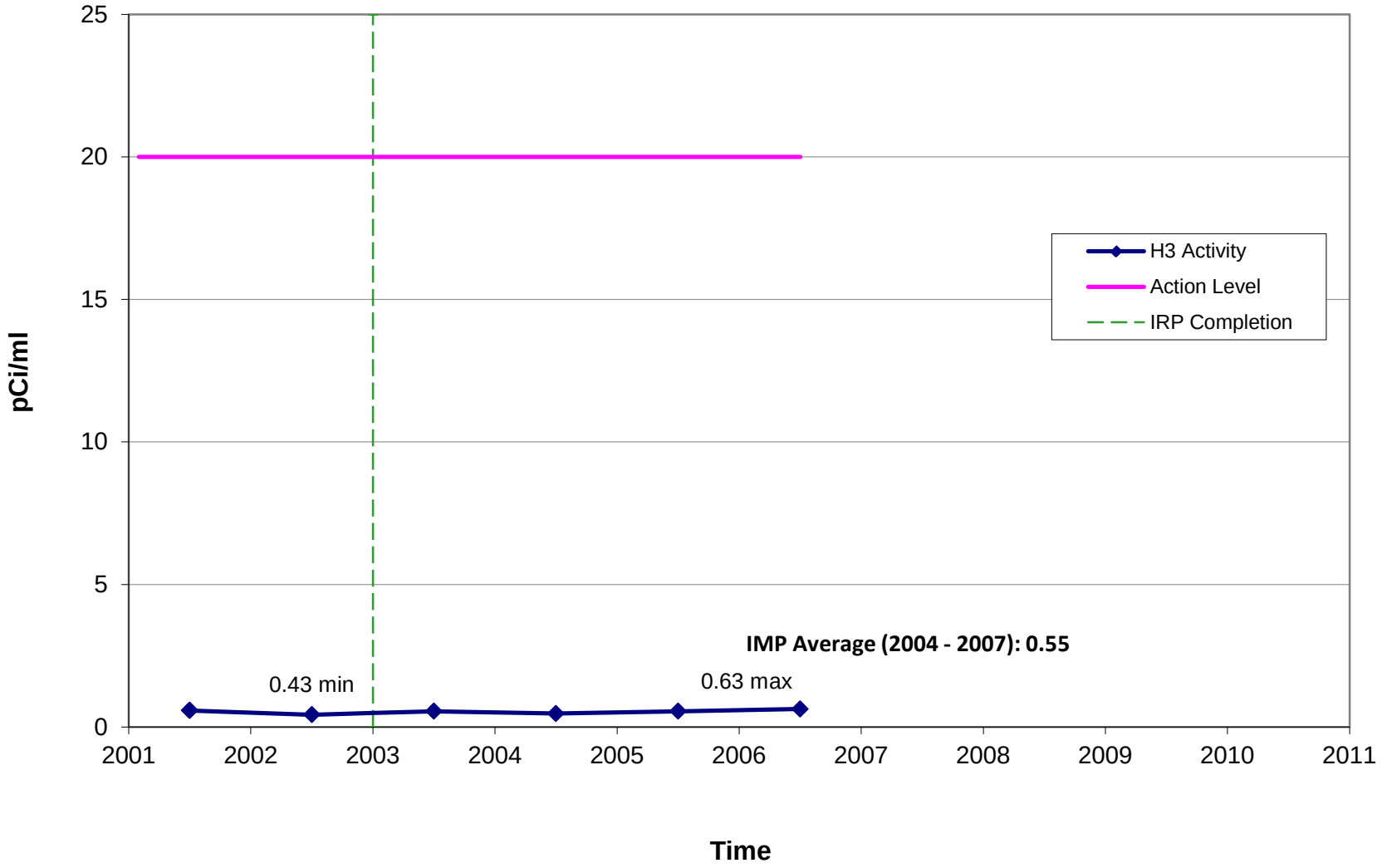
Attachment 6.C.3.11: Location AW-13 Tritium Concentration



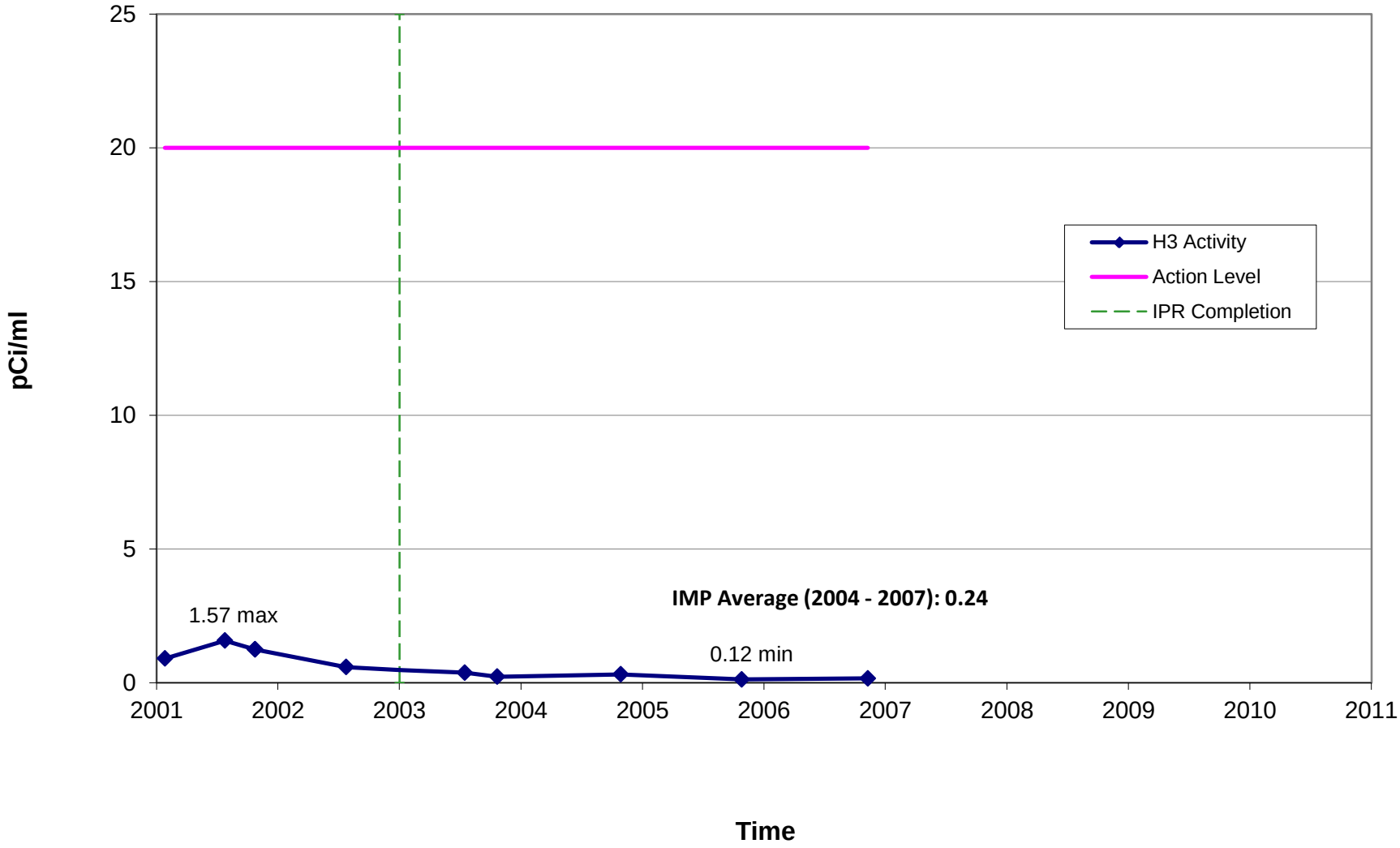
Attachment 6.C.3.12: Location AW-14 Tritium Concentration



Attachment 6.C.3.13: Location AW-15 Tritium Concentration



Attachment 6.C.3.14: Location ALT-1 Tritium Concentration



ATTACHMENT 7.A

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: Maxey Flats Disposal Site	**Date of inspection**: April 10-11, 2012
Location and Region: Region IV	**EPA ID:** KYD980729107
Agency, Office, or company leading the five-year review: USEPA	**Weather/temperature:** Wind: 16 mph Sunny, 56 degrees F 35% humidity

Remedy Includes:

Natural Stabilization

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. O&M site manager: Scott Wilburn (**Name**) Site Manager (**Title**) __11APR12_____ (**Date**)

Interviewed **at site** **by phone** **Phone no.**

Problems, suggestions; **Report attached** _____

_____

2. O&M staff: Tom Stewart (**Name**) Environmental Technologist 3 (**Title**) April 10, 2012 (**Date**)

Interviewed **at site** **by phone** **Phone no.** _____

Problems, suggestions; **Report attached** _____

_____

3. Local regulatory authorities and response agencies (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc) Fill in all that apply.

Agency: None Available

Contact: _____ _____ _____
Name **Title** **Date** **Phone no.**

Problems, suggestions; _____

_____

4. Other interviews (optional) Report attached.

Matthew McKinley, Radiaion Health Program Administrator, Cabinet for Health & Family Services, Department of Public Health, Commonwealth of Kentucky

_____

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Documents

IMP Work Plan documents	Readily available	Up to date	N/A
O&M manual	Readily available	Up to date	N/A
As Built drawings	Readily available	Up to date	N/A
Maintenance logs	Readily available	Up to date	N/A

Remarks: _____
_____

2. O&M and OSHA Training Records Readily available Up to date N/A

Remarks: _____
_____

3. Settlement Monument Records Readily available Up to date N/A

Remarks: _____

4. Leachate Extraction Records	Readily available	Up to date	N/A

Remarks: Currently not applicable. IRP extraction data provided in RA Construction Report (2003); Pumping operations completed August 2000 .

5. Daily Access/Security Logs	Readily available	Up to date	N/A

Remarks:.

IV. O&M COSTS

1. O&M Organization

State in-house

2. O&M Cost Records

Commonwealth of Kentucky to provide separately for inclusion in the review.

3. Unanticipated or Unusually High O&M Costs During Review Period

Describe costs and reasons: _____
_____
_____

V. ACCESS AND INSTITUTIONAL CONTROLS Applicable N/A

A. Fencing

1. Fencing damage Location shown on site map Gates secured N/A
Remarks _____
_____

B. Other Access Restrictions Deed restrictions included in Five Year Review Report

1. Signs and other security measures Location shown on site map Gates secured N/A
Remarks _____
_____

C. Institutional Controls (ICs) Included in Five Year Review Report

1. Deed Restriction:

Remarks _____

_____

D. General

1. Vandalism/trespassing Location shown on site map No vandalism evident

Remarks _____

_____

2. Land use changes on site N/A

Remarks _____

_____

3. Land use changes off site N/A

Remarks _____

_____

VI GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. Roads damaged **Location shown on site map** **Roads adequate** **N/A**

Remarks _____In good condition_____

_____

B. Other Site Conditions

Remarks _____

_____

VII. LANDFILL COVERS Applicable N/A

A. Landfill Surface:

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____Few spots observed: see subsidence monitoring evaluation

_____

_____

_____

2. **Holes /Geomembrane damage** Location shown on site map Holes/Damage not evident
   Areal extent_____ Depth_____
   Remarks_____See defect map included in report

_____

_____

_____

3. SE Cap

Vegetative Cover Grass Cover properly established/maintained No sign of Stress

Trees/shrubs (indicate size and locations on a diagram)

Remarks_____

_____

_____

B. Benches Applicable N/A

1. **Interior Y-Channel** Location shown on site map N/A or okay
Remarks_____all ok
_____

2. **Interior Anchor Trenches** Location shown on site map N/A or okay
Remarks_____Ok, some pillowing around perimeter;
_____
_____

C. Letdown Channels Applicable N/A
SE Perimeter Channel
West Perimeter Channel
North Channel
NE Corner Piping
East Perimeter Channel

1. **Settlement** Location shown on site map Settlement not evident
Areal extent_____ Depth_____
Remarks_____See 2011-2003 comparison in the Final Report
_____
_____
_____

2. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channles does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____
_____
_____

3. **Material Degradation** Location shown on site map No evidence of degredation
Material Type _____ Areal extent_____ Remarks_____
Extrusion Rod shows signs of weathering (see photo documentation)
Round dimple imprints are evident under the liner. Cannot verify cause but GPS coordinates need verified to determine if abandoned or dormant sumps are cause. (see photo documentation)

D. Cover Penetrations Applicable N/A

1. **Sumps**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs maintenance N/A
Remarks_____
_____
_____

2. **Settlement Monuments** Located Routinely Surveyed N/A
Remarks_____
_____
_____

3. Leachate Storage Facility Located Cathodic Protection Maintained
Properly secured/locked Functioning Good condition
Evidence of leakage at penetration Needs maintenance N/A
Remarks_____Cathodic protection has been an issue over the years, the Commonwealth has addressed these O&M issues _____

E. Gas Collection and Treatment Applicable N/A

F. Cover Drainage Layer Applicable N/A

G. Detention/Sedimentation Ponds – East Detention Basin

1. **Siltation** Areal extent _____ Depth _____ N/A
   Siltation no evident

Remarks _____
_____

2. **Erosion** Areal extent _____ Depth _____ N/A
   Erosion not evident

Remarks Repairs made in 2010 and 2011, see final report

3. **Outlet Works** Functioning N/A

Remarks _____
_____

4. **Dam** Functioning N/A

Remarks _____

H. Retaining Walls Applicable N/A

I. Perimeter Ditches/Off Site Discharge Applicable N/A

VIII. VERTICAL BARRIER WALLS

Applicable N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES

Applicable N/A

SEE DATA INCLUDED IN REPORT. NO EXCEEDANCES NOTED.

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

A reduction of vertical infiltration into the trenches has been achieved through the Interim cap. Direct exposure to radiological contaminants has been reduced through the Interim Cap, buffer zone acquisition and institutional controls. Long-term monitoring assures that the site remains in compliance with ARARs.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Cap maintenance is critical to minimize infiltration into the trenches. Defects over the years have been repaired although extrusion welding has become more difficult for the Commonwealth. The Commonwealth was required to collect additional environmental monitoring data pursuant to their PSVP as part of the Five Year Review but the requirement was not identified until late in the review. Data will be reviewed upon receipt.

2012 Five Year review
Site Inspection April 2012

Outfall of Y Channel into East Detention Basin (EDB).

Riser Pipe in EDB.

H-Flume looking in the East Main Drainage Channel (EMDC).

H-Flume looking in the East Main Drainage Channel (EMDC).

Inside of H-Flume.

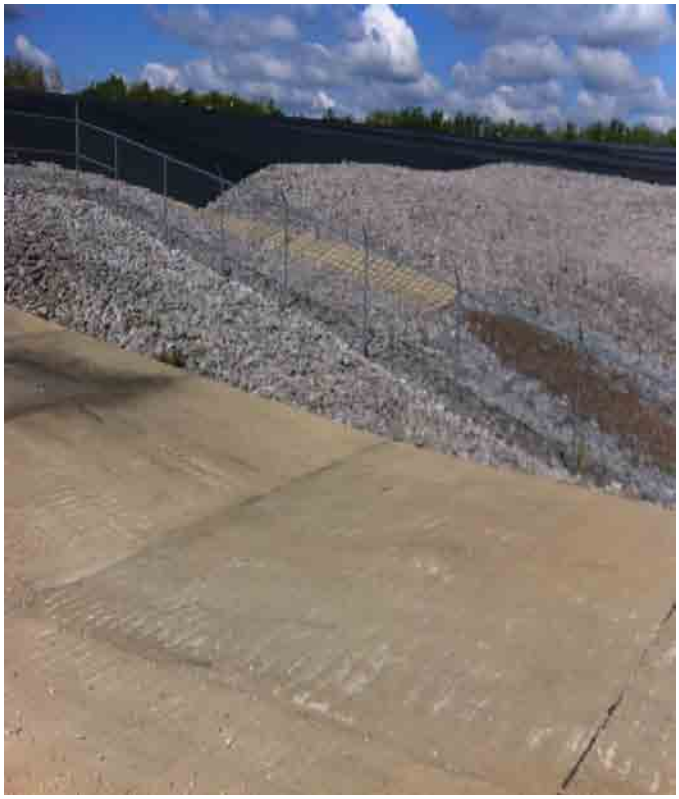
Top of EMDC, looking East.

Top of EDB emergency spillway.

EPA RPM Pam Scully standing in the rip rap outside the EDB at the top of EMDC.

EDB and outfall of Y channel

Southeast cap looking southeast



EDB emergency spillway.

Southeast cap looking west. Survey tower in background.

Bottom of EMDC, looking east.

South bank near bottom of EMDC, note orange USGS survey marker.

Commonwealth personnel gazing at rip-rap channel around SE cap.

EMDC looking west into channel.

Scott Wilburn, Commonwealth of Kentucky site personnel, on south bank of EMDC near USGS survey marker.

Pam Scully, USEPA, and Shawn Cecil, Commonwealth of Kentucky, in EMDC looking west.

EMDC looking west into channel.

EMDC west of RHB sampling station 114.

EMDC at Radiation Health Branch (RHB) sampling station 114.

Independent liner inspection liner sample collection in northwest portion of interim cap.

North channel looking east.

Independent liner inspection liner sample collection in northwest portion of interim cap.

Independent liner inspection liner sample collection in northwest portion of interim cap.

Independent liner inspection sample #1, looking north to Commonwealth buildings.

Independent liner inspection liner sample collection in northwest portion of interim cap.

Inspection crew heading southwest over EMC bunkers.

Close-up picture of liner subsurface after collecting liner sample.

Close up of observed liner “pimple”.

Sump protrusion through interim cap.

Observed liner striations along SW perimeter of interim cap.

Observed liner “pimples” facing north from southwest portion of interim cap.

Close-up of liner striations on SW perimeter of interim cap.

Close-up of liner striations.

View of liner striations and cut liner sample revealing underlying geotextile.

View of liner striation and anchor trench.

Small area of ponded water on interim cap.

White extrusion weld exhibiting bubbling and holes.

Independent liner sample collection in southwest portion of interim cap.

Sump protrustion in interim cap facing northwest from southeast corner.

Previous subsidence repair in southeast portion of interim cap.

Independent liner sample collection in southwest portion of interim cap.

Previous subsidence repair in southeast portion of interim cap.

Previous subsidence repair in southeast portion of interim cap.

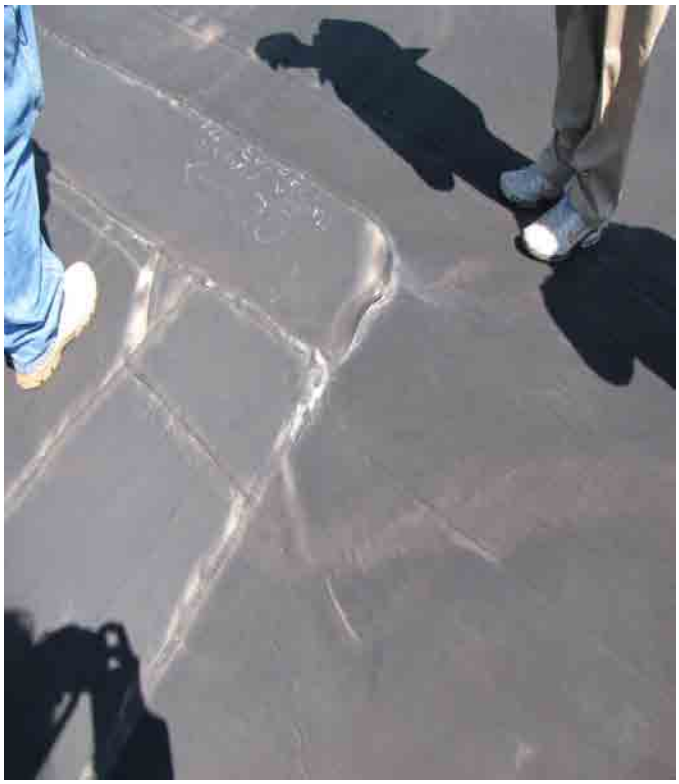
Interior diversion berm of interim cap, south of y-channel.

View of interim cap from southeast portion of liner; y-channel on right.

Interior diversion berm of interim cap, south of y-channel.

Interior diversion berm of interim cap, south of y-channel.

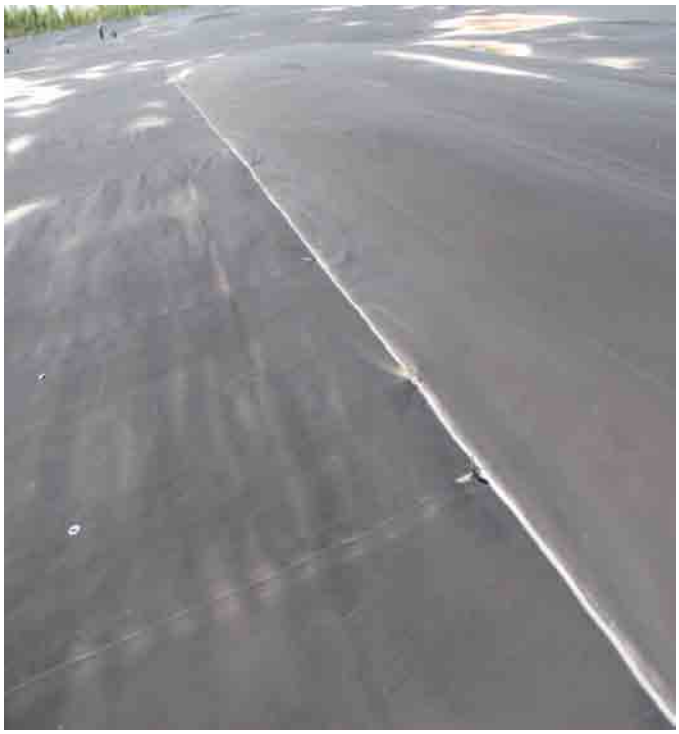
Gap in liner/weld next to the interior diversion berm.



Corner of interior diversion berm of interior cap. Note evidence of flow from corner.

Folded liner material near liner patch.

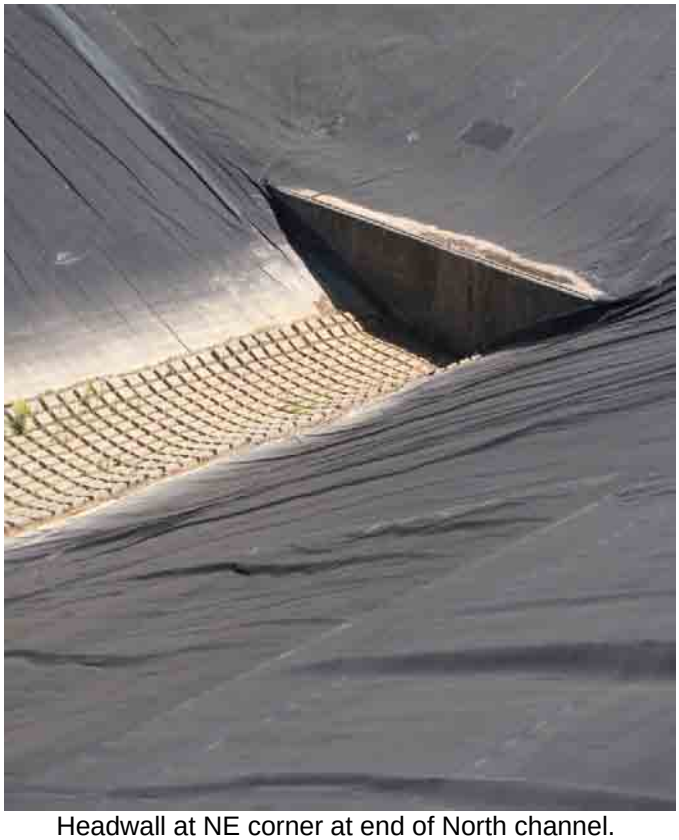
Solar panel for continuous sump level monitors (no longer used).



Extrusion weld seam of interior anchor trench/diversion berm.

Top of the former leachate storage facility; viewing tank access extensions that are cathodically protected.

Close-up of grate into NE corner piping at Eastern end of north channel.



Headwall at NE corner at end of North channel.

Commonwealth access points to 20,000 stainless steel tanks and cathodic protection system.

Top of previous leachate storage facility; Commonwealth access point to 20,000 stainless steel tank below.

Independent liner inspection; liner sample collection.

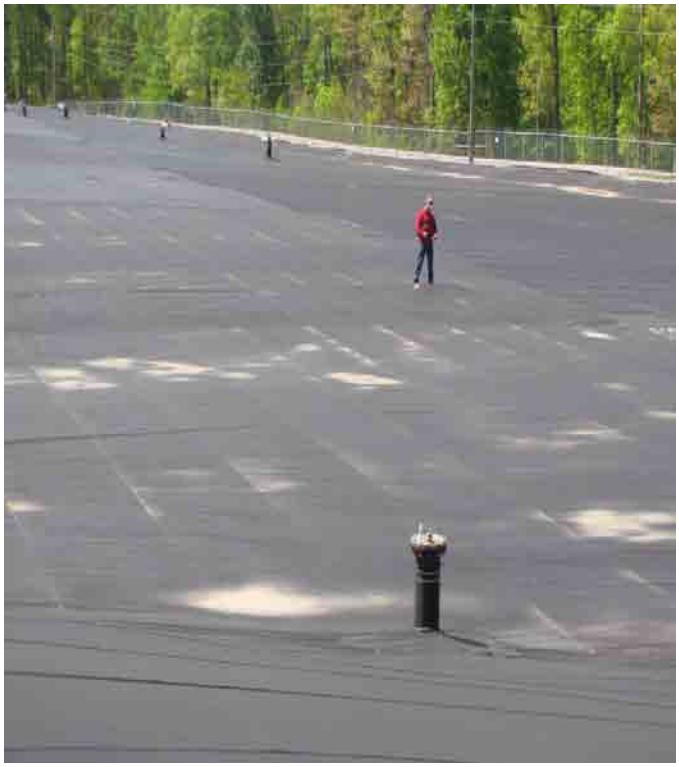
Independent liner inspection; liner sample collection.

View of interim cap from EMC bunker looking southwest.

View of interim cap from EMC bunker looking southwest.

View of interim cap from EMC bunker looking southwest.

View of interim cap from EMC bunker looking southwest.



View of interim cap from EMC bunker looking southwest.

ATTACHMENT 7C

DEED RESTIRCTIONS

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Department for Natural Resources and Environmental Protection as provided in Executive Order 79-170 (Declarant).

WHEREAS, Declarant is the owner of real property located at 2597 Maxey Flats Road, Hillsboro, (in Fleming County), Kentucky 41049 (the Property), more particularly described in Deed Book 120, Page 274, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 96-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the site pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

MAXEY FLAT
DEED DESCRIPTION

Beginning at a set stone in the southwest right of way line of KY 1895; thence S 26°59'45"W, 744.25 feet to an iron pin in a fence post; thence S 55°48'12"E, 180.19 feet to an iron pin in a 14" black oak stump; thence S 21°46'03"E, 128.61 feet to an iron pin in a 24" black oak stump; thence S 09°12'09"E, 200.17 feet to an iron pin; thence S 06°34'53"W, 115.91 feet to an iron pin; thence S 13°27'16"E, 167.65 feet to an iron pin in a fence corner; thence S 06°18'00"W, 132.39 feet to an iron pin in a 30" white oak tree; thence S 20°38'34"W, 264.36 feet to an iron pin in a 6" white oak tree; thence S 02°06'07"E, 352.95 feet to an iron pin in a 30" white oak tree, said point also being a fence corner; thence S 85°00'49"E, 484.75 feet to an iron pin in a 15" maple tree; thence S 33°23'31"W, 1167.05 feet to an iron pin; thence S 28°57'56"E, 299.37 feet to an iron pin in an 18" black oak tree; thence S 37°22'57"W, 982.00 feet to an iron pin in a poplar and dogwood tree; thence S 32°50'53"W, 1376.27 feet to an iron pin in a black oak stump; thence N 88°49'24"E, 1395.07 feet to an iron pin; thence S 79°41'01"E, 221.80 feet to an iron pin; thence S 01°03'00"W, 1299.17 feet to a point in the north right of way line of KY 158; thence N 62°35'05"E, 1125.23 feet to a tack in a 40" white oak tree; thence N 17°41'13"E, 497.63 feet to an iron pin; thence S 76°40'00"E, 594.01 feet to an iron pin; thence N 28°23'50"E, 258.24 feet to an iron pin in a 12" white oak stump; thence N 88°35'28"E, 567.87 feet to an iron pin in a white oak stump; thence N 06°30'40"E, 1102.81 feet to an iron pin in a 36" white oak stump; thence N 21°30'38"W, 548.72 feet to an iron pin in an 18" black oak stump; thence N 39°04'07"W, 438.44 feet to an iron pin in an 18" white oak tree; thence N 39°01'34"W, 511.22 feet to an iron pin; thence N 23°41'43"W, 672.60 feet to an iron pin in a 26" white oak stump; thence N 48°35'07"W, 31.31 feet to an iron pin in existing fence; thence with the existing fence N 07°27'50"W, 649.39 feet to an iron pin in a fence post; thence N 32°07'04"E, 135.03 feet to an iron pin in a fence post, said point also being in the southwest right of way line of KY 1895; thence with said right of way line N 47°18'24"W, 174.61 feet, N 47°09'36"W, 207.76 feet, N 45°20'29"W, 182.89 feet, N 41°10'10"W, 194.06 feet, N 37°14'20"W, 210.19 feet, N 34°08'09"W, 185.87 feet, N 31°26'48"W, 139.44 feet, N 29°46'28"W, 185.78 feet, N 33°09'33"W, 228.48 feet; N 37°40'06"W, 198.12 feet, N 43°23'04"W, 310.64 feet, N 53°33'47"W, 120.97 feet to the point of beginning, containing 278.94 acres.

DOCUMENT# 12849
DATE: 1-6-04 TIME: 9:42
DEED TAX_____
MARILYN SPENCER, FLEMING CO CLERK
BY Darnella Jones DC
BOOK D217 PAGE 182

STATE OF KENTUCKY }
COUNTY OF FLEMING }

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING WAS FOUND IN BOOK D217 PAGE 182 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 4 20 12

JARROD R. FRITZ, CLERK

Darnella Jones DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5 2003 by the Commonwealth of Kentucky, for the use and benefit of the Department for Natural Resources and Environmental Protection as provided in Executive Order 79-170 (Declarant).

WHEREAS, Declarant is the owner of real property located at 2597 Maxey Flats Road, Hillsboro, (in Fleming County), Kentucky 41049 (the Property), more particularly described in Deed Book 148, Page 65, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the site pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

BEGINNING at the fence post by the County road on the boundary between W. G. Cox and Sterl Cox; thence S 34 deg. 14 minutes W 129.9 feet to a fence post; thence S 9 degrees 47 minutes E 680.6 feet to an 18 inch white oak; thence W 45 degrees 33 minutes W 2288.0 feet; thence N 27 degrees 18 minutes E 800.0 feet to county road; thence S 36 degrees 31 minutes E 400.0 feet; thence S 31 degrees 30 minutes E 464.0 feet; thence S 37 degrees 35 minutes E 506.0 feet; thence S 46 degrees 18 minutes E 601.9 feet to the beginning, containing 27.586 acres.

DOCUMENT# 12851
DATE: 1-5-04 TIME: 9:44
DEED TAX
MARILYN SPENCER, FLEMING CO CLERK
BY Dawnella Davis DC
BOOK D217 PAGE 188

STATE OF KENTUCKY)
COUNTY OF FLEMING)

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING WAS FOUND IN BOOK D217 PAGE 188 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 4 20 04

JARROD R. FRITZ, CLERK

Dawnella Davis, DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 181, Page 548, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Michael T. Meredith
Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

TRACT NO. I. A certain tract or parcel of land lying in Fleming County, Kentucky, on the waters of Rocklick, bounded as follows: BEGINNING at a stone; thence N 78 E 122 poles, Robinson corner; thence N 69 E 125 poles to a black oak S 30 W 125 poles to a white oak; thence with an agreed straight line to the beginning, containing 100 acres, more or less. This land is sold by the boundary and not by the acre.

TRACT NO. II.: A certain tract or parcel of land lying in Fleming County, Kentucky, on the waters of Rock Lick Creek and described by boundary in the absence of a general survey. Bounded on the North by the lands of R.Y. Hutton, on the East by the lands of W.G. Cox, on the South by the lands of Russell McLain, and on the West by the lands of Bert Johnson, and containing 75 acres, more or less, be what it may.

TRACT NO. III.: A certain tract or parcel of land lying and being in Fleming County, Kentucky, and bounded and described as follows: On the waters of Rock Lick Creek, bounded on the North by the lands of R.M. Bowalin and Thomas L. McClain; on the East by the lands of A.T. Denton Heirs; on the South by the lands of A.T. Denton Heirs and on the West by the lands of R.M. Bowalin, containing 25 acres, more or less.

This being the same property conveyed to the Grantors by C.L. Armstrong and Freda Armstrong, his wife; Paul J. Reynolds and Mable C. Reynolds, his wife; and Homer Gregory and Ada Gregory, his wife by Deed dated June 30, 1972 and recorded in Deed Book 134, Page 255, in the Office of the Fleming County Clerk.

DOCUMENT# 12845
DATE: 1-5-04 TIME: 9:38
DEED TAX
MARILYN SPENCER, FLEMING CO CLERK
BY Darrella Davis DC
BOOK D217 PAGE 170

STATE OF KENTUCKY)
COUNTY OF FLEMING)

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING REST FOUND IN BOOK D21 PAGE 172 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 4 20 12

JARROD R. FRITZ, CLERK

Darrella Davis DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 182, Page 105 193, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

BEGINNING at a point corner to Rock Lick Road and the land of Roscoe Johnson at an iron stake 150 feet E. to an iron stake; thence 292 feet S. to a stake; thence at a right angle 150 feet W. to a stake; thence a right angle 292 feet N. to the stake at the beginning, containing 1 acre, more or less.

Being the same property conveyed Marcus Ball, married, by Deed from Glenna Ball (now Rawlings) and Roland Rawlings, her husband, dated August 28, 1985, and recorded in Deed Book 160, Page 506 in the Fleming County Clerk's Office.

DOCUMENT# 12846
DATE: 1-5-04 TIME: 9:39
DEED TAX_____
MARILYN SPENCER, FLEMING CO.CLERK
BY Darnella Davis DC
BOOK D217 PAGE 173

STATE OF KENTUCKY }
COUNTY OF FLEMING }

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING DEED FOUND IN BOOK D217, PAGE 173 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 4 2012

JARROD R. FRITZ, CLERK

Darnella Davis, DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 182, Page 178, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

"Exhibit A"

D E E D D E S C R I P T I O N

PARCEL 37B

A certain tract or parcel of land located in Flemming County, Kentucky, on the waters of Rock Lick Creek, situated along Rock Lick Road, 1 mile east of KY 158 and being more particularly described as follows:

Beginning at a PK Nail in the center of Rock Lick Road, corner to Willie Skaggs, thence with Rock Lick Road and Willie Skaggs;

South 80°59'06" West 16.05 feet to a Nail & Cap, thence;

South 83°35'13" West 61.12 feet to a Nail & Cap, thence;

South 85°16'31" West 63.59 feet to a Nail & Cap, thence;

South 86°16'09" West 75.92 feet to a Nail & Cap, thence;

South 89°55'51" West 62.13 feet to a PK Nail, corner to John Vise, thence leaving Rock Lick Road with John Vise;

North 06°16'54" West 16.33 feet to an Iron Pin, thence;

North 34°30'09" East 397.96 feet to an Iron Pin at a 48" Beech, corner to Willie Skaggs, thence with Willie Skaggs;

South 09°28'32" East 308.00 feet to an 8" Oak, thence;

South 09°34'41" East 21.10 feet to a the beginning.

Parcel 37B contains 1.12± Acres and is the same property as conveyed to Wendell McCarty from Willie Skaggs, by deed, dated February 1990, as recorded in Deed Book 171, Page 765, in the Flemming County Clerk's Office.

This description prepared by Palmer Engineering from a survey performed March 1995.

DOCUMENT# 12847
DATE: 1-5-24 TIME: 9:40
DEED TAX
MARILYN SPENCER, FLEMING CO CLERK
BY Darrella Fairs DC
BOOK D317 PAGE 176

STATE OF KENTUCKY }
COUNTY OF FLEMING }

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING DEED FOUND IN BOOK D317, PAGE 176 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 4 2024

JARROD R. FRITZ, CLERK

Darrella Fairs DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 189, Page 501, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

A certain parcel fronting on the Old County Road, (formerly known as the King Road), leading off the Upper Rock Lick Road, in Fleming County, Kentucky and BEGINNING at a point in the center of the old County Road; thence in a general Westerly direction 157 feet; thence in a general Northerly direction 186 feet; thence in a general Easterly direction 121 feet; thence in a general Southerly direction 139 feet to the point of beginning.

This being the same property conveyed to the Grantors by Rufus McRoberts and Helen McRoberts, his wife, by Deed dated January 6, 1975 and recorded in Deed Book 138, Page 586, in the Office of the Fleming County Clerk.

DOCUMENT# 12849
DATE: 1-5-04 TIME: 9:41
DEED TAX
MARILYN SPENCER, FLEMING CO CLERK
BY Darrella Faris DC
BOOK D217 PAGE 179

STATE OF KENTUCKY)
COUNTY OF FLEMING)

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING WAS FOUND IN BOOK D217 PAGE 179 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 9 2020

JARROD R. FRITZ, CLERK

Darrella Faris DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of January 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 182, Page 173, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

"E ___ A"

DEED DESCRIPTION

PARCEL 37A

A certain tract or parcel of land located in Flemming County, Kentucky, on the waters of Rock Lick Creek, situated along Rock Lick Road, 1.1 miles east of KY 158 and being more particularly described as follows:

Beginning at a PK Nail the center of Rock Lick Creek Road, corner to Willie Skaggs, thence with Rock Lick Road and Willie Skaggs;

North 81°25'48" West 78.03 feet to a Nail & Cap, thence;

North 78°35'42" West 91.32 feet to a PK Nail, corner to Willie Skaggs, thence leaving Rock Lick Road with Willie Skaggs;

North 13°57'52" East 22.47 feet to a 20" White Oak, thence;

North 13°57'47" East 111.67 feet to a 15" Tulip Poplar, thence;

South 71°49'24" East 169.53 feet to an 8" Maple, thence;

South 14°02'45" West 84.73 feet to a 26" White Oak, thence;

South 14°02'44" West 25.55 feet to the beginning.

Parcel 37A contains 0.48± Acres and is the same property as conveyed to Willie Skaggs, Jr. by deed from Willie Skaggs, dated October 27, 1990, as recorded in Deed Book 170, Page 527, in the Flemming County Clerk's Office.

This description prepared by Palmer Engineering from a survey performed March 1995.

DOCUMENT# 12850
DATE: 1-5-04 TIME: 9:43
DEED TAX ____
MARILYN SPENCER, FLEMING CO CLERK
BY Darnella Davis DC
BOOK D217 PAGE 185

STATE OF KENTUCKY)
COUNTY OF FLEMING)

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING WAS FOUND IN BOOK D210 PAGE 185 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 4 2012

JARROD R. FRITZ, CLERK

Darnella Davis DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 182, Page 168, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions: (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

"Exhibit A"

D E E D D E S C R I P T I O N

PARCEL 37

A certain tract or parcel of land located in Flemming County, Kentucky, on the waters of Rock Lick Creek, situated along Rock Lick Road, 1 mile east of KY 158 and being more particularly described as follows:

Beginning at a spike in the center of Rock Lick Road, corner to John Vise and Wendell McCarty, thence with Rock Lick Road and Wendell McCarty;

North 89°55'51" East 62.13 feet to a Nail & Cap, thence;

North 86°16'09" East 75.92 feet to a Nail & Cap, thence;

North 85°16'31" East 63.59 feet to a Nail & Cap, thence;

North 83°35'13" East 61.12 feet to a Nail & Cap, thence;

North 80°59'06" East 16.05 feet to a PK Nail, thence leaving Rock Lick Road with Wendell McCarty;

North 09°34'41" West 21.10 feet to an 8" Oak, thence;

North 09°28'32" West 308.00 feet to an Iron Pin at 48" Beech, corner to John Vise, thence leaving Wendell McCarty with John Vise;

North 38°34'07" East 677.42 feet to an Iron Pin at a 30" White Oak, thence;

North 45°39'15" East 601.03 feet to an Iron Pin, corner to the Commonwealth of Kentucky, thence leaving John Vise with the Commonwealth of Kentucky;

South 82°10'17" East 221.31 feet to an Iron Pin, thence;

South 00°57'17" East 1299.17 feet to an Iron Pin, thence;

North 60°41'52" East 1124.08 feet to a 40" White Oak, corner to Roscoe Johnson, thence leaving the Commonwealth of Kentucky with Roscoe Johnson;

South 11°29'07" West 672.30 feet to a spike in the center of Rock Lick Road, corner to John Vise, thence leaving Roscoe Johnson with John Vise;

South 05°23'35" East 216.96 feet to a 24" Sweet Gum, thence;

South 04°15'30" East 1488.01 feet to an iron pin, corner to Charles Blevins, thence leaving John Vise with Charles Blevins;

North 76°30'28" West 989.78 feet to an iron pin, corner to Edson Whitt, thence leaving Charles Blevins with Edson Whitt;

North 58°11'17" West 378.79 feet to an iron pin at a 14" Maple, thence;

North 56°33'16" West 524.98 feet to an iron pin at a 24" Maple, thence;

South 83°08'12" West 445.16 feet to an iron pin, corner to Edson Whitt and John Vise, thence leaving Edson Whitt with John Vise;

North 06°16'57" West 1184.13 feet to the beginning.

Parcel 37 contains (by this description) 100.62± Acres, however, there is included within this boundary a parcel of land owned by Willie Skaggs, Jr. (Parcel 37A) which contains 0.48± Acre, and is deducted from the net area, leaving a remainder of 100.14± Acres, and is a part of the same property as conveyed to Willie Skaggs from Arvel Ratliff, by deed, dated July 19, 1974, as recorded in Deed Book 137, Page 765, in the Flemming County Clerk's Office.

This description prepared by Palmer Engineering from a survey performed March 1995.

DOCUMENT# 12852
DATE: 1-5-04 TIME: 9:45
DEED TAX:
MARILYN SPENCER, FLEMING CO CLERK
BY Darnella Jarvis DC
BOOK D217 PAGE 191

STATE OF KENTUCKY)
COUNTY OF FLEMING)

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING FOUND IN BOOK D217 PAGE 191 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 1 2004

JARROD R. FRITZ, CLERK

Darnella Jarvis DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 182, Page 368, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C. above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

"Exhibit A"

D E E D D E S C R I P T I O N

PARCEL 41

A certain tract or parcel of land located in Flemming County, Kentucky, on the waters of Rock Lick Creek, situated along Rock Lick Road, 1.3 miles east of KY 158 and being more particularly described as follows:

Beginning at a Spike in the center of Rock Lick Road, corner to John Vise, thence with Rock Lick Road and John Vise;

North 89°13'32" West 87.97 feet to a Nail & Cap, thence;

South 89°22'26" West 58.85 feet to a Nail & Cap, thence;

North 89°43'24" West 55.49 feet to a Nail & Cap, thence;

North 87°39'21" West 59.73 feet to a Nail & Cap, thence;

North 84°50'08" West 61.02 feet to a Nail & Cap, thence;

North 83°36'50" West 57.62 feet to a Nail & Cap, thence;

North 85°13'30" West 200.13 feet to a Nail & Cap, thence;

North 85°47'00" West 59.28 feet to a Nail & Cap, thence;

North 86°21'13" West 60.75 feet to Spike, corner to Willie Skaggs, thence leaving Rock Lick Road and John Vise, with Willie Skaggs;

North 11°29'07" East 672.30 feet to a 40" White Oak, corner to Commonwealth of Kentucky, thence leaving Willie Skaggs with the Commonwealth of Kentucky;

North 15°35'15" East 500.08 feet to an Iron Pin, thence;

South 78°40'17" East 594.01 feet to an Iron Pin, thence;

North 26°23'33" East 258.24 feet to an Iron Pin in a Stump, thence;

North 86°35'11" East 567.87 feet to an Iron Pin, corner to Alla Huffman, thence leaving the Commonwealth of Kentucky with Alla Huffman;

South 21°09'38" East 616.63 feet to an iron pin, thence;

South 21°09'38" East 616.63 feet to an iron pin, corner to Roscoe Johnson, thence leaving Alla Huffman with Roscoe Johnson;

South 63°08'19" West 663.34 feet to a Spike in the center of Rock Lick Road, thence continuing with Roscoe Johnson and Rock Lick Road;

North 73°17'51" West 73.84 feet to a Nail & Cap, thence;

North 67°19'09" West 58.81 feet to a Nail & Cap, thence;

North 63°27'43" West 62.97 feet to a Spike, thence;

North 70°16'43" West 56.42 feet to a Nail & Cap; thence;

North 80°03'38" West 55.82 feet to a Spike, thence leaving Rock Lick Road and continuing with Roscoe Johnson;

South 09°15'43" West 123.10 feet to an Iron Pin, thence;

South 80°00'44" East 72.69 feet to an Iron Pin at a 8" Wild Cherry tree, thence;

South 29°31'03" West 373.31 feet to an Iron Pin, thence;

South 22°23'26" West 69.87 feet to an Iron Pin, corner to John Vise, thence leaving Roscoe Johnson with John Vise;

North 08°18'39" West 37.59 feet to a point in Rock Lick Creek, thence continuing with John Vise and Rock Lick Creek;

North 58°24'25.221" West 57.4366 feet to a point in the creek, thence;

North 38°36'39.214" West 25.0614 feet to a point in the creek, thence;

North 14°03'53.401" West 36.4538 feet to a point in the creek, thence;

North 05°12'51.819" East 72.4890 feet to a point in the creek, thence;

North 52°36'44.337" West 23.4814 feet to a point in the creek, thence;

North 63°03'32.289" West 54.0442 feet to a point in the creek, thence;

North 82°32'56.976" West 44.3646 feet to a point in the creek, thence;

South 77°30'18.395" West 49.1050 feet to a point in the creek, thence;

South 82°00'02.823" West 65.1267 feet to a point in the creek, thence;

South 86°36'16.725" West 67.5386 feet to a point in the creek, thence;

North 87°18'23.589" West 78.8641 feet to a point in the creek, at a ditch, thence leaving Rock Lick Creek with the ditch;

North 59°03'53.852" East 63.3051 feet to a point in the ditch, thence;

North 44°16'04.840" East 111.5849 feet to a point in the ditch, thence;

North 42°45'57.592" East 30.4931 feet to a point in the ditch, thence;

North 26°29'36.273" East 14.3064 feet to a point in the ditch, thence;

North 10°59'50.283" East 29.2929 feet to a point in the ditch, thence;

North 01°29'34.342" West 46.3677 feet to a point in the ditch, thence;

North 11°54'02.983" East 19.3969 feet to a point in the ditch, thence;

North 16°42'29.301" East 35.7848 feet to a point in the ditch, thence;

North 27°33'26.479" East 54.9265 feet to the beginning.

Parcel 41 contains (by this description) 50.72± Acres, however, there is included within this boundary a parcel of land owned by Marcus Ball (Parcel 39) which contains 1.00± Acre, and is deducted from the net area, leaving a remainder of 49.72± Acres, and is a part of the same property as conveyed to Roscoe Johnson from Lois McKee, by by deed, dated April 12, 1971, as recorded in Deed Book 132, Page 201, in the Flemming County Clerk's Office.

This description prepared by Palmer Engineering from a survey performed March 1995.

DOCUMENT# 12853
DATE: 1-5-04 TIME: 9:46
DEED TAX
MARILYN SPENCER, FLEMING CO CLERK
BY Dawnella Farris DC
BOOK D217 PAGE 195

STATE OF KENTUCKY)
COUNTY OF FLEMING)

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY, DO HEREBY CERTIFY THE FOREGOING WAS FOUND IN BOOK D217 PAGE 195 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE.
WITNESS IN HAND AND SEAL THIS THE 14 DAY OF 4 2010

JARROD R. FRITZ, CLERK

Dawnella Farris DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 182, Page 64, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

PARCEL 34

A certain tract or parcel of land located in Fleming County, Kentucky, on the waters of Rock Lick Creek, situated along Rock Lick Creek Road, 0.6 mile east of KY 158 and being more particularly described as follows:

Beginning at a spike in the center of Rock Lick Creek Road, corner to Bill Hall and Richard Brumagen, thence leaving Rock Lick Creek Road with Richard Brumagen;

North 01 degree 12'43" East 577.50 feet to an iron pin, thence;

North 66 degrees 14'57" West 435.94 feet to a 6" Hickory, corner to Parcel 34A, thence with Parcel 34A;

North 04 degrees 48'35" East 109.50 feet to a 24" Poplar, thence;

North 19 degrees 13'20" East 224.95 feet to a 16" Chestnut Oak, thence;

North 33 degrees 12'46" East 100.57 feet to a 22" Tulip Poplar, thence;

South 85 degrees 25'56" East 167.48 feet to a 36" White Oak, corner to Ray Lambert, thence with Ray Lambert;

South 64 degrees 14'07" East 623.86 feet to an iron pin, corner to Hurl Johnson, thence with Hurl Johnson;

South 67 degrees 05'58" East 159.56 feet to a point in the center of the gravel road, thence with the gravel road and Hurl Johnson;

North 01 degree 46'42" West 46.74 feet to a point in the center of the gravel road, thence;

North 04 degrees 48'07" East 62.83 feet to a point in the gravel road, thence;

North 07 degrees 28'08" East 46.43 feet to a point in the center of the gravel road, corner to Ray Lambert, thence with Ray Lambert;

North 10 degrees 52'22" East 74.07 feet to a point in the center of the gravel road, thence;

North 13 degrees 16'35" East 61.29 feet to a point in the center of the gravel road, thence;

North 18 degrees 33'37" East 75.53 feet to a point in the center of the gravel road, thence;

North 80 degrees 26'33" East 467.56 feet to an iron pin, corner to Commonwealth of Kentucky, Maxey Flats, thence with Commonwealth of Kentucky;

North 86 degrees 49'17" East 1395.07 feet to an iron pin, corner to Willie Skaggs, thence with Willie Skaggs;

South 45 degrees 39'15" West 601.03 feet to an iron pin at a 30" White Oak, thence;

South 38 degrees 34'07" West 677.42 feet to an iron pin at a 48" Beech, corner to Wendell McCarty, thence with Wendell McCarty;

South 34 degrees 30'09" West 397.96 feet to an iron pin, thence;

South 06 degrees 16'54" East 16.33 feet to a spike in the center of Rock Lick Creek Road, corner to Willie Skaggs, thence with Willie Skaggs;

South 06 degrees 16'57" East 1184.13 feet to an iron pin, corner to Edson Whitt, thence with Edson Whitt;

South 82 degrees 00'56" West 1641.96 feet to an iron pin, corner to Bill Hall, thence with Bill Hall;

North 01 degree 12'43" East 1373.00 feet to the beginning.

Parcel 34 contains 99.530 Acres and is the same or a part of the same property as conveyed to John Vise from Linda Denton, by deed dated April 11, 1953, as recorded in Deed Book 111, Page 219, in the Fleming County Clerk's Office.

This description prepared by Palmer Engineering from a survey performed January 1995.

PARCEL A

A certain tract or parcel of land located in Fleming County, Kentucky, on the waters of Rock Lick Creek, and being more particularly described as follows:

Beginning at a 6" Hickory, corner to John Vise and Richard Brumagen, thence with Richard Brumagen;

North 63 degrees 49'14" West 924.55 feet to an iron pin, thence;

North 40 degrees 56'11" East 496.64 feet to an iron pin, corner to Ray Lambert, thence with Ray Lambert;

South 64 degrees 14'07" East 898.94 feet to a 36" White Oak, corner to John Vise, thence with John Vise;

North 85 degrees 25'56" West 167.48 feet to a 22" Tulip Poplar, thence;

South 33 degrees 12'46" West 100.57 feet to a 16" Chestnut Oak, thence;

South 19 degrees 13'20" West 224.95 feet to a 24" Poplar, thence;

South 04 degrees 48'35" West 109.50 feet to the beginning.

Parcel A contains 9.120 Acres and may be a part of property owned by Ray Lambert or John Vise. Deed descriptions of Ray Lambert and John Vise do not precisely describe the area (Parcel A) in question. Both Ray Lambert and John Vise believe Parcel 34A to be part of their respective lands.

This description prepared by Palmer Engineering from a survey performed January 1995.

PARCEL 38

A certain tract or parcel of land located in Fleming County, Kentucky, on the waters of Rock Lick Creek, situated along Rock Lick Creek Road, 1.3 miles east of KY 158, and being more particularly described as follows:

Beginning at a spike in the center of Rock Lick Creek Road, corner to Willie Skaggs and Roscoe Johnson, thence with the center of Rock Lick Creek Road and Roscoe Johnson;

South 86 degrees 21'13" East 60.75 feet to a nail and cap in the center of the road, thence;

South 85 degrees 47'00" East 59.28 feet to a nail and cap in the center of the road, thence;

South 85 degrees 13'00" East 200.13 feet to a nail and cap in the center of the road, thence;

South 83 degrees 36'50" East 57.62 feet to a nail and cap in the center of the road, thence;

South 84 degrees 50'08" East 61.02 feet to a nail and cap in the center of the road, thence;

South 87 degrees 39'21" East 59.73 feet to a nail and cap in the center of the road, thence;

South 89 degrees 43'24" East 55.49 feet to a nail and cap in the center of the road, thence;

North 89 degrees 22'26" East 58.85 feet to a nail and cap in the center of the road, thence;

South 89 degrees 13'32" East 87.97 feet to a spike in the center of the road, at the ditch, thence leaving the road continuing with Roscoe Johnson down and meandering with the ditch;

South 27 degrees 33'26.479" West 54.9265 feet to an iron pin, thence;

South 16 degrees 42'29.301" West 35.7848 feet to a point, thence;

South 11 degrees 54'02.983" West 19.3969 feet to a point, thence;

South 01 degree 29'34.342" East 46.3677 feet to a point, thence;

South 10 degrees 59'50.283" West 29.2929 feet to a point, thence;

South 26 degrees 29'36.273" West 14.3064 feet to a point, thence;

South 42 degrees 45'57.592" West 30.4931 feet to a point, thence;

South 44 degrees 16'04.840" West 111.5849 feet to an iron pin, thence;

South 59 degrees 03'53.852" West 63.3051 feet to a point in Rock Lick Creek, thence down and meandering with Rock Lick Creek;

South 87 degrees 18'23.589" East 78.8641 feet to a point, thence;

North 86 degrees 36'16.725" East 67.5386 feet to a point, thence;

North 82 degrees 00'02.823" East 65.1267 feet to a point, thence;

North 77 degrees 30'18.395" East 49.1050 feet to a point, thence;

South 82 degrees 32'56.976" East 44.3646 feet to a point, thence;

South 63 degrees 03'32.289" East 54.0442 feet to a point, thence;

South 52 degrees 36'44.337" East 23.4814 feet to a point, thence;

South 05 degrees 12'51.819" West 72.4890 feet to a point, thence;

South 14 degrees 03'53.401" East 36.4538 feet to a point, thence;

South 38 degrees 36'39.214" East 25.0614 feet to a point, thence;

South 58 degrees 24'25.221" East 57.4366 feet to a point at the mouth of a drain, thence up and meandering with the drain;

South 08 degrees 18'39.377" East 37.5938 feet to a point, thence;

South 25 degrees 19'12.958" West 158.6171 feet to a point, thence;

South 19 degrees 17'25.797" West 101.5081 feet to a point, thence;

South 28 degrees 22'16.338" West 45.7740 feet to a point, thence;

South 10 degrees 31'35.301" West 40.6043 feet to a point, thence;

South 34 degrees 37'56.069" West 40.9532 feet to a point, thence;

South 21 degrees 25'58.962" West 55.7450 feet to a point, thence;

South 32 degrees 20'21.707" West 40.5341 feet to a point, thence;

South 49 degrees 45'04.050" West 29.8371 feet to a point, thence;

South 00 degrees 50'07.788" West 31.8894 feet to a point, thence;

South 00 degrees 13'26.221" West 30.4452 feet to a point, thence;

South 31 degrees 41'40.921" West 21.0928 feet to a point, thence;

South 12 degrees 29'04.052" East 20.5991 feet to a point, thence;

South 17 degrees 49'03.108" East 28.6712 feet to a point, thence;

South 06 degrees 10'43.593" East 21.4808 feet to a point, thence;

South 26 degrees 10'10.682" West 20.8013 feet to a point, thence;

South 03 degrees 23'43.878" East 38.0899 feet to a point, thence;

South 11 degrees 24'51.212" West 12.7134 feet to a point, thence;

South 06 degrees 11'38.969" West 40.1212 feet to a point, thence;

South 52 degrees 57'05.072" West 14.1081 feet to a point, thence;

South 11 degrees 02'23.488" East, 13.9379 feet to a point, thence;

South 33 degrees 04'50.615" West 15.3347 feet to a point, thence;

South 09 degrees 06'46.741" West 21.3282 feet to a point, thence;

South 14 degrees 33'11.765" East 80.4720 feet to a point, thence;

South 04 degrees 53'12.185" West 61.8177 feet to a point, thence;

South 02 degrees 20'44.689" West 57.0248 feet to a point, thence;

South 05 degrees 41'22.104" East 18.0861 feet to a point, thence;

South 04 degrees 35'14.098" West 59.9922 feet to a point, thence;

South 05 degrees 03'19.826" East 37.4146 feet to a point, thence;

South 22 degrees 31'14.454" West 44.4811 feet to a point, thence;

South 15 degrees 27'19.237" West 85.8090 feet to a point, thence;

South 14 degrees 01'04.208" West 52.8437 feet to a point, thence;

South 14 degrees 13'53.067" West 87.0815 feet to a 24" Gum, corner to Gary Johnson, thence with Gary Johnson;

North 65 degrees 23'25" West 383.44 feet to an iron pin, corner to Virginia Reeder, thence with Virginia Reeder;

North 65 degrees 23'25" West 137.52 feet to an iron pin, corner to Charles Blevins, thence with Charles Blevins;

North 65 degrees 23'25" West 25.29 feet to an iron pin, corner to Willie Skaggs, thence with Willie Skaggs;

North 04 degrees 15'30" West 1488.01 feet to an iron pin at a 24" Sweet Gum, thence;

Parcel 38 contains 27.705 Acres and is the same property as conveyed to John Vise from Charles R. Molton, by deed, dated April 18, 1957, as recorded in Deed Book 114, Page 352, in the Fleming County Clerk's Office.

This description prepared by Palmer Engineering from a survey performed January 1995.

DOCUMENT# 12854
DATE: 1-5-04 TIME: 9:47
DEED TAX
MARILYN SPENCER, FLEMING CO CLERK
BY Darnella Davis DC
BOOK D317 PAGE 200

STATE OF KENTUCKY)
COUNTY OF FLEMING)

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING DEED FOUND IN BOOK D317 PAGE 200 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 13 DAY OF 4 20 13

JARROD R. FRITZ, CLERK

Darnella Davis, DEPUTY CLERK

Interview with Nicole Barkasi, Maxey Flats Project Coordinator and Matthew McKinley, Radiation Health Branch Manager, Cabinet for Health & Family Services, Commonwealth of Kentucky
April 11, 2012

1. What is your overall impression of the project? (general sentiment)

   Throughout the CERCLA process, RHB's (Radiation Health Branch) position was not sufficiently represented in the resulting project documentation. This has made it more difficult in recent discussions to justify RHB's consistent position. I am generally satisfied with where we are, but the process has been difficult.

2. Is the remedy functioning as expected? How well is the remedy performing?

   Actions called for in the remedy are being implemented; however, simply carrying out an action does not guarantee that the RAO [remedial action objective] will be met.

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

   Reported results are below our effluent release limits. If only the raw results are looked at, almost all locations have consistently decreasing levels due to radioactive decay, but a few locations are increasing. If radioactive decay is compensated for, many of the locations show increasing levels.

4. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

   There is no continuous on-site presence from our cabinet, but we collect surface water samples continuously and various other water samples on a monthly basis. In regard to DEP's radioactive materials license, we inspect the site every three years.

5. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

   As far as our cabinet is concerned there is nothing significant. We did reduce the monitoring frequency at certain locations. Some locations that were previously sampled monthly have been reduced to quarterly.

6. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

   Not that I know of.

7. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

   As detailed in question #5.

8. Do you have any comments, suggestions, or recommendations regarding the project?

   Reports and assessments produced, as well as documentation of discussions for future decision making, should be more straightforward and include fewer inferences so that an uninvolved individual could follow and understand this complex project.

9. What is your position in the Commonwealth of Kentucky?

   Manager of the Radiation Health Branch, Department for Public Health

10. Are you aware of any noncompliances with the project?

    In regard to DEP's radioactive materials license, we issued an NOV [Notice of Violation] in reference to sump level monitoring. The license required quarterly monitoring of the sump levels but the site moved to semi-annual monitoring. The site has returned to compliance.

11. Are you aware of any exceedances of regulatory standards?

    No.

12. Is there unacceptable risk to human health and the environment posed by the site?

    Not at this time.

13. Is the Commonwealth of Kentucky complying with the elements of the Consent Decree?

    As far as I know.

Interview with Pam Scully, USEPA and Tom Stewart, Commonwealth of Kentucky site personnel,
April 11, 2012

1. What is your overall impression of the project? (general sentiment)

   Until FCP everything was handled by the book and remedy performing as designed.

2. Is the remedy functioning as expected? How well is the remedy performing?

   I believe so. Performing as expected.

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
   Not really much change yet.

4. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.
   Yes. Five people, 5 days/week, 7 ½ hrs/day

5. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.
   No.

6. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

   Yes, the cathodic protections system problems. Exposed liner is difficult to repair.

7. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

   Changed type of vials from glass to plastic in lab.

8. Do you have any comments, suggestions, or recommendations regarding the project?

   Move to Final Closure Period.

9. What is your position in the Commonwealth of Kentucky?

   Environmental Technologist 3

10. Are you aware of any noncompliances with the project?

NOV for changes sump measurement frequency.

11. Are you aware of any exceedances of regulatory standards?

No.

12. Is there unacceptable risk to human health and the environment posed by the site?

No.

13. Is the Commonwealth of Kentucky complying with the elements of the Consent Decree?

Yes.

Interview with Pam Scully, USEPA and Scott Wilburn, Commonwealth of Kentucky site personnel,
April 11, 2012

1. What is your overall impression of the project? (general sentiment)

   Accurate, on track

2. Is the remedy functioning as expected? How well is the remedy performing?

   Yes it is meeting expectations.

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

   The data shows that we are protecting public health and the environment; the levels are low.

4. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

   Yes. Five days/week, 7 ½ hour/day. Five staff. Meeting all requirements of IMP &RML.

5. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

   No big changes

6. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

   Liner repair is more expensive than anticipated; the ability to complete the repairs is unexpected.

7. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

   What is being done now is appropriate and relevant.

8. Do you have any comments, suggestions, or recommendations regarding the project?

Entering into Final Closure Period is warranted.

9. What is your position in the Commonwealth of Kentucky?

   Environmental Control Supervisor

10. Are you aware of any noncompliances with the project?

    No.

11. Are you aware of any exceedances of regulatory standards?

    No.

12. Is there unacceptable risk to human health and the environment posed by the site?

    No.

13. Is the Commonwealth of Kentucky complying with the elements of the Consent Decree?

    Yes

Site Name: Maxey Flats Disposal Site **EPA ID No.: _____**
Interviewer Name: Pam Scully **Affiliation: EPA RPM**
Subject's Name: Dwayne Price **Affiliation: Fleming County Emergency Mgmt**
Subject's Contact Information: 606-845-1419
Time: __3:00 P.M. **Date: August 21, 2012**
Type of Interview (Underline one): In Person Phone Mail Other_____
Location of Interview: N/A

1. *What is your overall impression of the project?*
   Don't live near site. Comfortable now project now. Security was once a concern; That has been fixed. Mock exercise at the site went well. Do think staff at the site does a great job.

2. *What effect has this Site had on the surrounding community, if any?*
   Some people who still live near the site complain, but that is more due to fear about what could happen that about anything that is currently happening. They are concerned with their proximity to the Site.

3. *How well do you believe the remedy currently in place is performing?*
   It is performing well.

4. *Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?*
   Again, just close residents express concern. There is high incidence of cancer in Kentucky.

5. *Are you aware of any changes in projected land use at or near the Site?*
   Built airport in Rowan County is has a flight path directly in line with the site. There is some concern about how a planes crash might cause a problem.

6. *Do you feel well informed about the Site's activities and progress?*
   Well informed with open houses that are held regularly. Staff is always good at answering questions and keeping the community informed.

7. *Do you have any comments, suggestions or recommendations regarding the Site's management or operation?*
   No other comments.

ATTACHMENT 9A - ARAR Table – Chemical Specific

MEDIUM/ AUTHORITY	Contaminant-Specific ARAR Contaminant-specific ARARs listed in the ROD include some requirements that are also listed as Action Specific ARARs.	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
All Pathways (TEDE) AEA (Atomic Energy Act)	902 KAR 100:020 Section 7 and 8 and Table II of 100:025 Kentucky Standards for Protection Against Radiation Allowable Doses in Unrestricted Areas	Applicable	This ARAR at the time of the 1991 ROD limited the total effective dose equivalent to individual members of the public from licensed operations to less than 100 mrem/yr. The current regulation limits the dose to 50 mrem/yr as measured in gaseous and liquid effluents in unrestricted areas.	Compliance was demonstrated at the peak of IRP operations using liquid discharge, air emissions and direct dose monitoring. During IMP, Commonwealth monitors liquid discharge (remaining viable pathway) as indicator with TEDE at less than 25 mrem/yr at the current licensed site boundary.
All Pathways (TEDE) AEA	10 CFR 20 Federal Standards for Protection Against Radiation (Allowable Doses in Unrestricted Areas), 10 CFR 20.105, 20.106 and Appendix B, Table II	Relevant and Appropriate	This ARAR at the time of the 1991 ROD limited the total effective dose equivalent to individual members of the public from licensed operations to less than 100 mrem/yr. The current regulation limits the dose to 50 mrem/yr as measured in gaseous and liquid effluents in unrestricted areas.	Compliance was demonstrated at the peak of IRP operations using liquid discharge, air emissions and direct dose monitoring. During IMP, Commonwealth monitors liquid discharge (remaining viable pathway) as indicator with TEDE at less than 25 mrem/yr at the current licensed site boundary.
Surface Water CWA	401 KAR 5:026 – 035, Kentucky Surface Water Quality Standards	Applicable	This ARAR limits contaminant loading to waters of the Commonwealth.	Compliance is demonstrated currently with data collected by the Commonwealth at multiple monitoring locations prescribed by the PSVP (102D, 103, 106, 122C and 122A). During the IMP (with continued maintenance), after the Final Closure Period and considering radioactive decay, water quality is expected to remain within the surface water quality standards.
Surface Water CWA	Section 304(a)(1) of the Clean Water Act – Ambient Water Quality Criteria, EPA criteria for protection of aquatic life from acute or chronic toxic effects or the human health criteria for consumption of fish	Relevant and Appropriate	This ARAR limits contaminant loading to waters of the Commonwealth.	Compliance is demonstrated currently with data collected by the Commonwealth at multiple monitoring locations

MEDIUM/ AUTHORITY	Contaminant-Specific ARAR Contaminant-specific ARARs listed in the ROD include some requirements that are also listed as Action Specific ARARs.	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
				prescribed by the PSVP (102D, 103, 106, 122C and 122A). During the IMP (with continued maintenance), after the Final Closure Period and considering radioactive decay, water quality is expected to remain within the surface water quality standards.
Ground Water/SDWA Surface Water/CWA	401 KAR 6:015, Kentucky Drinking Water Standards	Relevant and Appropriate	Compliance with the 4 mrem/yr drinking water standard for tritium is judged beginning at the contact of the alluvium with the hillside and ending at the streams.	Commonwealth compiles data from 14 monitor wells located in the alluvium (within the buffer zone), and at a stream location outside the buffer zone (102D) where adequate water is available to be used as a possible drinking water source. Current data show all sampled wells below the dose derived standard. Given the relatively short decay rate of tritium, drinking water limits are expected to continue to show compliance after the final cap is constructed.
Ground Water/SDWA Surface Water/CWA	40 CFR 141, 142, and 143, Federal Drinking Water Regulations *same as State Standards* Section 304(a)(1) Ambient Water Quality Criteria *same as State Standards*	Relevant and Appropriate	Compliance with the drinking water standard is judged beginning at the contact of the alluvium with the hillside and ending at the streams.	Commonwealth compiles data from 14 monitor wells located in the alluvium (within the buffer zone), and at a stream location outside the buffer zone (102D) where adequate water is available to be used as a possible drinking water source. Current data show all sampled wells below the dose derived standard. Given the relatively short decay rate of tritium, drinking water limits are expected to continue to show compliance after the final cap is constructed.
Ground Water/RCRA	401 KAR 34:060 (section 5) – Ground Water Protection… maximum ground water concentration limits for certain metals and organic compounds.	Applicable	EPA determined and the Commonwealth agreed that compliance testing/monitoring	Based on current data, information provided by the Commonwealth and data collected during the RI/FS, constituents

MEDIUM/ AUTHORITY	Contaminant-Specific ARAR Contaminant-specific ARARs listed in the ROD include some requirements that are also listed as Action Specific ARARs.	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
			will focus on water borne pathways for tritium, and that unless tritium levels substantially exceed the criteria, organic and metal analyses will not be required. If tritium levels increase substantially, indicating changed site conditions, expanding the analyte list will be in accordance with the EPA approved PSVP.	regulated pursuant to the hazardous waste management groundwater regulations are in compliance at the compliance locations and that exceedances of standards in the future are not expected.
Air/CAA	40 CFR Part 61.92, subpart H, National Emission Standards for Hazardous Air Pollutants (NESHAPS)	Relevant and Appropriate	This ARAR limits dose to the public via the air pathway to 10 mrem/yr. Monitoring during IRP RA demonstrated levels less than 10 percent of limit. Monitoring discontinued during IMP unless/until Commonwealth initiates solidification activities, then monitoring resumed.	Air releases during IMP are negligible. Should the Commonwealth perform solidification during the IMP, the affect of air dose will need to be considered. Air dose after final cap construction is expected to be negligible.
All Pathways/AEA	902 KAR 100:022, Kentucky Licensing Requirements for Land Disposal of Radioactive Waste	Relevant and Appropriate	Combined doses from air, water, drinking water and soil pathways should not exceed 25 mrem/yr effective dose equivalent at the current licensed site boundary. Water runoff is the only viable pathway and tritium is selected for monitoring compliance (PSVP).	Monitoring locations (107C, 143 and 144) were in compliance at the end of IRP RA, and continue to show compliance. The Commonwealth will control access to these locations in perpetuity. Therefore, the potential dose to members of the public now and in the future is negligible.
All Pathways/AEA	10 CFR 61.41, Federal Licensing Requirements for Land Disposal of Radioactive Waste *same as State Requirements*	Relevant and Appropriate	Combined doses from air, water, drinking water and soil pathways should not exceed 25 mrem/yr effective dose equivalent at the current licensed site boundary. Water runoff is the only viable pathway and tritium is selected	Monitoring locations (107C, 143 and 144) were in compliance at the end of IRP RA, and continue to show compliance. The Commonwealth will control access to these locations in perpetuity. Therefore, the potential dose to members of the public now and in the

MEDIUM/ AUTHORITY	Contaminant-Specific ARAR Contaminant-specific ARARs listed in the ROD include some requirements that are also listed as Action Specific ARARs.	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
			for monitoring compliance (PSVP).	future is negligible.
Soil/AEA	40 CFR Part 192, Federal Standards for Uranium and Thorium Mill Tailings	Relevant and Appropriate	Standard for uranium and thorium mill tailings requires radium-226 concentrations in the top 15 cm of soil to be less than 5 pCi/g.	The pre-existing soil cover, placement of the IRP Cap with fill of 1 to 3 feet, along with the 45 mil reinforced polypropylene liner, satisfy this requirement. In addition, placement of the final cap by the Commonwealth to complete the RA will ensure this ARAR will continue to be met in the future.

ATTACHMENT 9B – ARAR Table – Action Specific

MEDIUM/ AUTHORITY	Action-Specific ARAR ARARs Action Specific ARARs listed in the ROD include some requirements that are also listed as Contaminant-specific.	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
All Pathways, Safety/OSHA	Occupational Safety and Health Standards (OSHA) 29 CFR 1910.120, 1910.1000 – 1910.1500	Applicable	Acceptable employee exposure levels, including, without limitation, training, have been promulgated to control exposures and safety in workplace environments.	Compliance with OSHA standards is achieved through implementation of the EPA approved Health and Safety Plan (HASP) for the IMP. Continued implementation of the HASP is expected to achieve compliance in the future.
All Pathways, Safety/OSHA	Occupational Safety and Health Standards (OSHA) 29 CFR 1926.53, 1926.650 – 1926.653	Relevant and Appropriate	Acceptable general duty safety requirements have been promulgated to control personnel safety in workplace environments.	Compliance with OSHA standards is achieved through implementation of the EPA approved Health and Safety Plan (HASP) for the IMP. Continued implementation of the HASP is expected to achieve compliance in the future.
Air/CAA	National Emission Standards for Hazardous Air Pollutants (NESHAPS) 40 CFR Part 61, Subpart I	Applicable	This ARAR limits dose to the public via the air pathway to 10 mrem/yr. Monitoring during IRP RA demonstrated levels less than 10 percent of limit. Monitoring discontinued during IMP unless/until Commonwealth initiates solidification activities, then monitoring resumed.	Air releases during IMP are negligible. Should the Commonwealth perform solidification during the IMP, the affect of air dose will need to be considered. Air dose after final cap construction is expected to be negligible.
All Pathways/AEA	Kentucky Standards for Protection Against Radiation 902 KAR 100:020 Because Kentucky is an Agreement State, its radiation protection standards (902KAR 100:020) are the applicable standards.	Applicable	This ARAR establishes radiation protection standards for workers within a restricted area.	Compliance is achieved through implementation of the Radiation Protection Program as part of the site specific, EPA approved HASP. Continued implementation is expected to achieve compliance in the future.
All Pathways/AEA	10 CFR 20 Federal Standards for Protection Against Radiation (Allowable Doses in Restricted Areas).	Relevent and Appropriate	This ARAR establishes radiation protection standards for workers within a restricted area.	Compliance is achieved through implementation of the Radiation Protection Program as part of the site specific, EPA approved HASP. Continued implementation is expected to achieve compliance in the future.

MEDIUM/ AUTHORITY	Action-Specific ARAR ARARs Action Specific ARARs listed in the ROD include some requirements that are also listed as Contaminant-specific.	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
All Pathways/AEA	General Kentucky Requirements Concerning Radiological Sources (ALARA) 902 KAR 100:015	Applicable	This ARAR establishes the requirement for a program to achieve radiation protection standards "as low as reasonably achievable" (ALARA).	Compliance is achieved through implementation of the Radiation Protection Program as part of the site specific, EPA approved HASP. Continued implementation is expected to achieve compliance in the future.
Air/CAA	Kentucky Fugitive Air Emissions Standards 401 KAR 63:010	Applicable	This ARAR establishes air standards for fugitive emissions related to site activities.	The waste area is covered by a 45 mil reinforced polypropylene geomembrane, Commonwealth has paved the access road and the perimeter road has infrequent use. Monitoring of fugitive emissions will not be required until/unless there is major repair to IRP Cap, replacement of the geomembrane or construction of the final cap. The Commonwealth will comply if and when required.
Waste/AEA	Kentucky Standards for the Disposal of Radioactive Material 902 KAR 100:021, sections 7 and 8	Applicable	This ARAR establishes requirements for analysis and classification of waste for disposal.	The Commonwealth evaluates, analyzes and classifies all waste disposed on site. Records are maintained in accordance with the approved IMP work plan. Initiation of solidification will require a process control program, including sampling and testing of grout.
Waste/AEA	Kentucky Licensing Requirements for Land Disposal of Radioactive Waste 902 KAR 100:022 sections 14, 19, 21, 23, 24 (1) – (11), 25(3) and 27(2)	Relevant and Appropriate	This ARAR establishes standards for facility construction relative to land disposal of radioactive waste. Compliance was previously demonstrated. During the BoRP, the Commonwealth will perform post-closure surveillance of the site, which includes a monitoring system that provides early warning of the release of radionuclides before they reach the site boundary.	Compliance during the BoRP will be achieved through implementaion of the EPA approved IMP work plan. During the FCP and the ICP, the Commonwealth will be required to comply.

MEDIUM/ AUTHORITY	Action-Specific ARAR ARARs Action Specific ARARs listed in the ROD include some requirements that are also listed as Contaminant-specific.	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
Waste/AEA	Federal Licensing Requirements for Land Disposal of Radioactive Waste 10 CFR 61.29, 61.42, 61.44, 61.51(a), 61.52(a)(1) – (11), 61.53 (d), 61.55, 61.56	Relevant and Appropriate	This ARAR establishes standards for facility construction relative to land disposal of radioactive waste. Compliance was previously demonstrated. During the BoRP, the Commonwealth will perform post-closure surveillance of the site, which includes a monitoring system that provides early warning of the release of radionuclides before they reach the site boundary.	Compliance during the BoRP will be achieved through implementaion of the EPA approved IMP work plan. During the FCP and the ICP, the Commonwealth will be required to comply.
Soil and Water/Kentucky Law	KRS 262, Kentucky Soil and Water Conservation Requirements	Relevant and Appropriate	Standards have been adopted to provide for conservation of Commonwealth of Kentucky soil and water. In general, implementation of a surface water and erosion control plan will achieve compliance.	The Commonwealth will be required to implement a surface water and erosion control plan if and when there is major repair to IRP Cap, replacement of the geomembrane or construction of the final cap.

MEDIUM/ AUTHORITY	Action-Specific ARAR ARARs Action Specific ARARs listed in the ROD include some requirements that are also listed as Contaminant-specific.	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
Waste/RCRA	Kentucky Hazardous Waste Management Regulations 401 KAR Chapter 34 The following Kentucky Hazardous Waste Management Regulations are ARARs that must be met by the selected remedy:	Applicable	This ARAR establishes standards for ground water protection, including monitoring, detection and concentration limits.	A groundwater monitoring detection program, including data validation, data evaluation and corrective action requirements, was established in the EPA approved IMP PSVP. Based on current data, information provided by the Commonwealth and data collected during the RI/FS, constituents regulated pursuant to the hazardous waste management groundwater regulations are in compliance at the compliance locations and that exceedances of standards in the future are not expected.
	• **401 KAR 34:060 – Ground Water Protection,** - Sections 8 and 9, Monitoring and Detection - Sections 10 and 11, Standards for Compliance			
	• **401 KAR 34.070 (Sections 2, 5, 7, 8, and 10) – Closure and Post-Closure** - Section 2, Closure performance standards - Section 5, Disposal or decontamination of equipment, structures, and soils - Section 7, Plat survey to local zoning authority and the Commonwealth - Section 8, Post-closure care and use - Section 10, Notation of the deed to the property noting the previous management of hazardous wastes and the resulting land use restrictions.		This ARAR sets requirements for closure and post-closure care of facilities.	Interim closure requirements for the IRP RA were achieved pursuant to the EPA approved IRP RA Construction Report. IRP post-closure care is the responsibility of the Commonwealth in accordance with the EPA approved IMP work plan.
	• **401 KAR 34.190 – Tanks used for treatment and storage of hazardous waste**		ARAR establishes requirements for tanks, including secondary containment and off-gas controls.	Tanks used for the IRP RA met these requirements, including the LSF underground tank left for Commonwealth use during the BoRP. Tanks used by the Commonwealth during the BoRP will be subject to this ARAR, including the above ground storage facility and any tanks associated with future leachate pumping or the FCP/ICP.
	• **401 KAR 34.230 – Landfill Closure Standards** -Section 6, Closure and Postclosure Care. This ARAR applies to the Final Cap to be constructed by the Commonwealth		This ARAR establishes final closure and post-closure care requirements for caps, specifically applicable to the FCP and ICP	The Commonwealth will be required to comply with requirements during the FCP and ICP.

MEDIUM/ AUTHORITY	Action-Specific ARAR ARARs Action Specific ARARs listed in the ROD include some requirements that are also listed as Contaminant-specific.	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
Waste/RCRA	Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Standards 40 CFR Part 264, In Part.	Relevant and Appropriate	Same as 401 KAR Chapter 34 above.	Same as 401 KAR Chapter 34 above.
Waste/RCRA	Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Standards 40 CFR Chapter 268. The land disposal restrictions for leachate were waived for remedial action at the MFDS (ROD, Section 8.3).	Applicable	RCRA Hazardous Wastes not subject to the ARAR waiver and other wastes that cannot be disposed on-site (e.g. liquids such as oil, ethylene glycol) must be disposed off-site pursuant to 40 CFR 300.440.	The Commonwealth will comply with requirements through implementation of the approved IMP work plan.

NOTES:

1. Compliance with ARARs during the Balance of the Remedial Phase (BoRP) is the responsibility of the Commonwealth of Kentucky.
2. At Maxey Flats, the chosen remedy requires time to work. The remedial action construction will not be complete until the Commonwealth of Kentucky constructs the final closure cap. Therefore, the EPA has recognized in the PSVP that ARARs that are used to determine final remediation levels only apply at the completion of the action. See 55 CFR 8755. As a result, this Five Year Review Report will show compliance with contaminant specific ARARs either now or in the future.