INDUSTRIAL WASTE CONTROL SUPERFUND SITE

SEBASTIAN COUNTY, ARKANSAS

SECOND FIVE-YEAR REVIEW FINAL REPORT

MAY 2002

CONCURRENCES

SECOND FIVE-YEAR REVIEW

for the

Industrial Waste Control (IWC) Site

6/10/02

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FIVE-YEAR REVIEW

Industrial Waste Control Site
Sebastian County, Arkansas

This memorandum documents EPA's approval of the Industrial Waste Control Site's Second Five-Year Review Report prepared by Forbes Environmental Engineering on behalf of the Environmental Protection Agency.

Summary of Second Five-Year Review Findings

The second five-year review consisted of review of data generated during the second five-year review period, post closure care monitoring and Site inspections.

The following observations support the premise that the remedy at the Industrial Waste Control Site meets the intent and purposes of the remedy design and is protective of human health and the environment.

- The second five-year review did not identify any changes in Federal or State standards that impact the site remedy selection.
- The second five-year review did not identify any significant changes in site conditions.
- Toxicity or other characteristics of the constituents of concern have not changed significantly.
- The Site is inspected on a regular basis and maintenance is performed as necessary.
- The remedy is currently functioning as the original Remedial Action Plan intended.
- Institutional controls are in place and there are no changes or planned changes in land use.
- Fences and gates are maintained and provide an adequate means to restrict access onto the Site.

Actions Needed

Site maintenance will continue to be conducted, as in the past. These actions include:

- Site mowing;
- Cover maintenance;
- Well repairs;

- Sign Replacements;
- Repair of the west recharge will be completed;
- Continued semiannual Site inspections.

Determinations

I have determined that the remedy for the Industrial Waste Control Site is protective of human health and the environment, and will remain so provided the action items identified in the Second Five-Year Review Report are addressed as described above.

Myron O. Knudson

7/19/02

Myron O. Knudson, P.E.
Director, Superfund Division
U.S. Enivronmental Protection Agency
Region 6

Date

SECOND FIVE-YEAR REVIEW

INDUSTRIAL WASTE CONTROL SITE
SEBASTIAN COUNTY, ARKANSAS

Prepared by

Stephen Forbes
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San Antonio, Texas
On behalf of
EPA

May 2002

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SECOND FIVE YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION					
Site Name: Industrial Waste Control Site					
EPA ID: ARD980496368					
Region: 6	**State:** Arkansas	**City/County:** Fort Smith/Sebastian County			
SITE STATUS					
NPL Status	☒ Final	☐ Deleted	☐ Other(specify) *Delisting Pending*		
Remediation Status(choose all that apply)		☐ Under Construction	☐ Operating	☒ Complete	
Multiple OUs?	☐ YES	☒ NO	**Construction Completion Date:** March 1991		
Has site been put into reuse?		☐ YES	☒ NO		
REVIEW STATUS					
Reviewing Agency:	☒ EPA	☐ State	☐ Tribe	☐ Other Federal Agency_____	
Author Name: Mr. Shawn Ghose, M.S., P.E.					
Author Title: Remedial Project Coordinator		**Author Affiliation:** EPA			
Review Period: 3/1996 to 3/2001					
Date(s) of site inspection: Semi-annual monitoring events					
Type of Review:	☒ Statutory ☐ Policy	☒ 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#_____ ☐ Construction Completion ☐ Other(specify)			☐ Actual RA Start at OU#_____ ☒ Previous Five-Year Review Report		
Triggering Action Date: March 1996					
Due Date(five years after triggering action date): March 2001					

FIVE-YEAR REVIEW SUMMARY FORM

Deficiencies:

No significant deficiencies have been identified. The west recharge well will be repaired to prevent plugging-up.

Follow-up Actions:

Site maintenance will be conducted, as in the past. These actions include:

- Site mowing;
- Cover maintenance;
- Well repairs;
- Sign Replacements;
- Repair of the west recharge will be completed;
- Continued semi-annual Site inspections.

Protectiveness Statements:

Current Site Status

- Water elevations in the landfill monitor wells (MW-1, 6, 7, 8 and 9) have remained relatively stable and there have been no changes corresponding to area rainfall. There has not been sufficient water in these wells to be able to collect water samples.

- Water elevation in the upgradient French Drain piezometers (P-1 and 3) are significantly higher than those reported in their respective down gradient piezometers (P-2 and 4). {Note: P-2 is consistently dry and P-4 elevation is consistently at 513.33 ±0.18 ft. msl.} The changes of water elevations in the upgradient piezometers(1-6 ft.) with respect to area rainfall are much more pronounced than those reported in the downgradient piezometers.

- The French Drain flow and the Cap drainage both correspond with area rainfall.

- No offsite migration of constituents of concern have been detected in mine void downgradient monitor wells (MW-10, 11, and 103D) or property line monitor well (MW-15).

- All site maintenance and activity is coordinated through the EPA and ADEQ, and no activity is undertaken without their knowledge and concurrence. The Site monitoring and maintenance activities ensure the remedies function as designed.

These observations indicate that the remedy is effectively minimizing groundwater flow into the remediated area contained by the French Drain, slurry wall, and the Cap and Cover in accordance the objectives the remediation design.

Therefore, remedies that were implemented at the Industrial Waste Control Site continue to be protective of human health and the environment.

Other Comments:

None.

List of Acronyms

ADEQ	Arkansas Department of Environmental Quality
ADPC&E	Arkansas Department of Pollution Control and Ecology
ARARS	Applicable or Relevant and Appropriate Requirements
ASTM	American Society of Testing Materials
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CORP	U.S. Army Corps of Engineers
CWA	Clean Water Act
EA	Endangerment Assessment
EPA	Environment Protection Agency, Region VI
FS	Feasibility Study
HDPE	High Density Polyethylene
HWQS	Hydrogeologic and Waste Quantification Study
IWC	Industrial Waste Control
MCL	Maximum Concentration Limit
MW	Monitor Well
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
OSHA	Occupational Safefty and Health Act
PCAP	Post Closure Activity Plan
PID	Photoionization Detector
PRP	Potentially Responsible Party
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
RAP	Remedial Action Plan
RA	Remedial Action
RAS	Remedial Alternative Selection
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
Superfund	CERCLA(see above)
TCLP	Toxicity Characteristic Leaching Procedure
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This Second Five Year Review is a summary of the significant documents and events which have occurred at the Industrial Waste Control landfill(referred to hereinafter as the "Site") located south of Ft. Smith, Arkansas(see Figure 1.0). The review is prepared in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act(CERCLA), as amended by section 121(c), which 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.

This review is also prepared in accordance with section 300.430(f)(4)(ii) of the National Oil and Hazardous Substance Pollution Contingency Plan(NCP), which 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 initiation of the selected remedial action.

This report is equivalent to a Level I Review and summarizes the conditions after remediation and during the second 5-year post-closure monitoring period from March 1996 through March 2001. It was completed in accordance with the draft Comprehensive Five-Year Review Guidance, as directed by the EPA. It includes the only field work completed since the First Five Year Report; that is the construction information in regard to MW-15, which was completed in November 1996, as well as, establishing action levels for downgradient wells (MW-12, 13, 14, and 15).

While the intent is to include enough description so that the report will be a stand alone document for general purposes, if does not include a description of the ancillary construction procedural plans(e.g. Contingency Plan, Health and Safety Plans, etc.) or the interim construction facilities(e.g. temporary drum staging and soil facilities). These and all other activities are described in detail in the listed referenced documents, which are incorporated into this report by reference.

Annual aerial photographs were taken in accordance with the Post-closure Activity Plan during the first five years. After the first five-year period, aerial photographs are to be taken every five years. Accordingly, the five-year aerial photographs were taken during the March 2001 monitoring event, as well as Site photographs showing the existing Site conditions. All the photographs are located at the end to the report.

2.0 SITE CHRONOLOGY

The following is a list of the primary milestones completed to date:

• EPA Remedial Investigation Report(RI)	March 1986
• EPA Endangerment Assessment (EA)	March 1986
• EPA Feasibility Study (FS)	June 1986
• Supplemental RI: Hydrological and Waste Quantification Study (HWQS)	October 1987
• Supplemental Endangerment Assessment	February 1988
• Supplemental Feasibility Study	February 1988
• EPA Remedial Alternative Selection(RAS)	June 1988
• Record of Decision (ROD) including Remedial Action Plan (RAP)	June 1989
• Consent Decree	July 1989
• Remediation Construction-Startup	October 1989
• Remediation Construction-Completion	March 1991
• Post-closure Care-Startup	March 1991

•	Area C Assessment	January 1994
•	Downgradient Monitor Well Installation	March 1995
•	Post-closure Monitoring Events	March 1991-1996
•	First 5 Year Review	March 1996
•	Monitor Well MW-15 Installation	November 1996
•	Post-closure Monitoring Events	March 1996-2001
•	Second 5 Year Review	March 2001

3.0 BACKGROUND

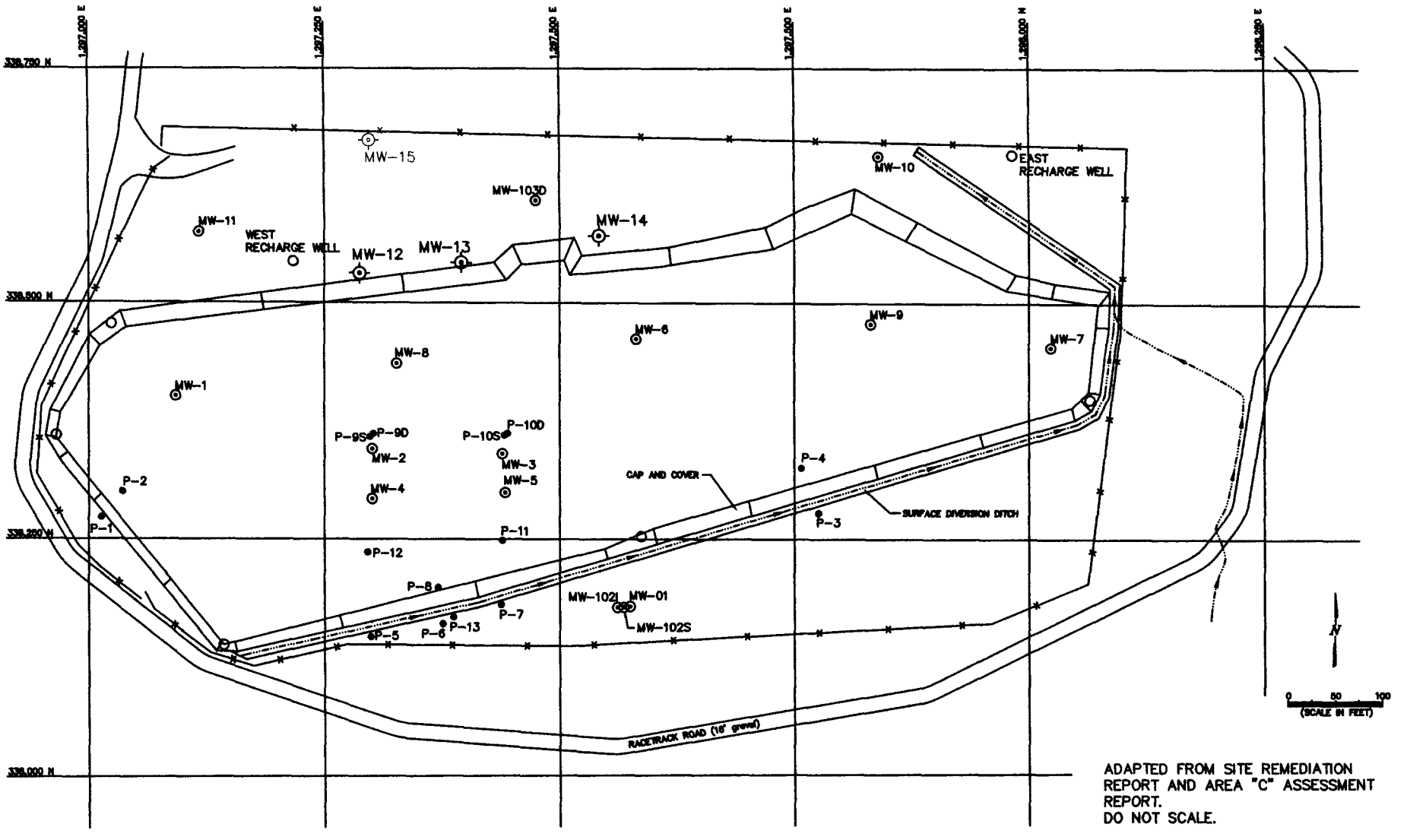
The following is a summary of the Site location and a brief discussion of the history of the Site.

3.1 SITE LOCATION

The IWC Site is a closed industrial landfill on an approximately eight-acre tract located about 8 miles southeast of Ft. Smith and 1 mile west of Jenny Lind, Arkansas in Sebastian County. The town of Bonanza is approximately 4.5 miles to the west of the Site(Figure 1.0). Access to the Site is via a paved county maintained road(Racetrack Road) south of Bonanza Road.

The Site as referred to within this report refers to the property within the property fence line. The remediated areas are all located under the Cap and Cover and all monitor wells lie within the Site boundary. Figure 2.0 presents the current general Site Plan and Figure 3.0 shows a block diagram of the Site through Area C.

FIGURE 2.0 CURRENT GENERAL SITE PLAN



ADAPTED FROM SITE REMEDIATION REPORT AND AREA "C" ASSESSMENT REPORT.
DO NOT SCALE.

LEGEND

- ⊙ MONITOR WELL
- • PIEZOMETER
- ○ FRENCH DRAIN MANWAY
- ⊙ DOWN GRADIENT MONITOR WELLS BELOW MINE VOIDS

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CURRENT SITE LAYOUT
INDUSTRIAL WASTE CONTROL SITE
SEBASTIAN COUNTY ARKANSAS

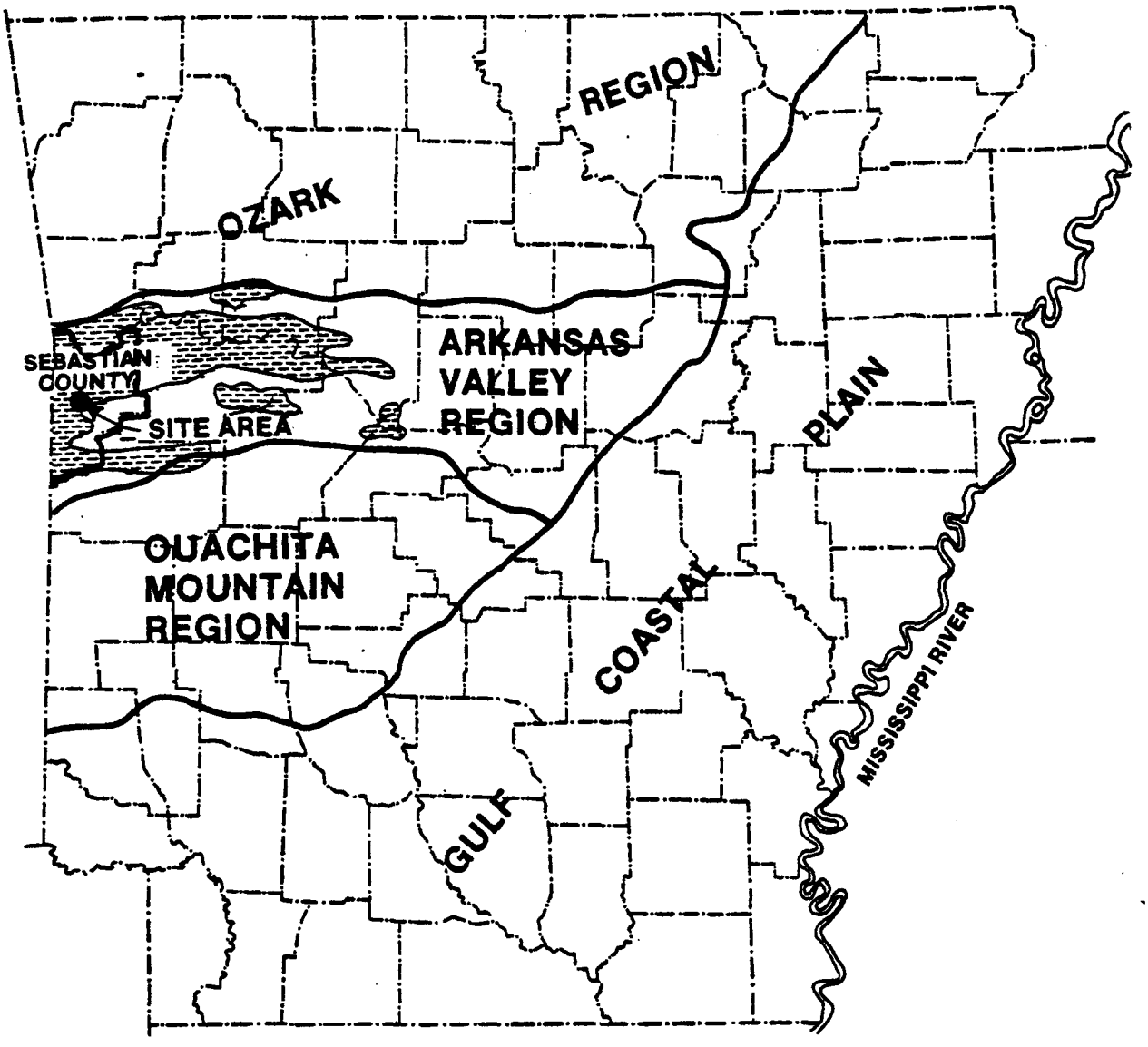
FIGURE 2.0

3.2 SITE HISTORY

Initially, the Site was the location of a surface mining operation, which mined coal from a shallow coal seam in the mid-1940's by strip mining methods. An extensive network of abandoned underground coal mines just north of the old strip mine were operated from the 1890's through the 1932. The western portion of the strip mine was ultimately converted to the landfill in the late 1960s.

An application for permit to operate the facility as an industrial landfill was filed November 18, 1971, and a temporary permit was issued by the Arkansas Department of Pollution Control and Ecology(ADPC&E) on November 23, 1971. *{Note: The name of the ADPC&E has been changed to the Arkansas Department of Environmental Quality(ADEQ).}* A full permit to receive industrial waste at the Site under the name of GNJ, Inc. was issued by the ADPC&E on May 24, 1974. In August of l974 the Site was sold and came under the name of Industrial Waste Control(IWC).

The IWC operations included the landfill and surface impoundments. The facility received primarily industrial waste including wood shavings, miscellaneous rubbish and drummed solvents from industrial plants in and around Ft. Smith. The surface impoundments referred to as "evaporation ponds" were constructed sometime in the late summer or early fall of 1975. These ponds were reportedly used to store and evaporate drummed liquid wastes received at the Site. In addition, drums were deposited in two isolated drum disposal areas, one in the south area of the surface impoundments and the other located in the southwest corner of the property. The operations were inspected regularly by the ADPC&E. ADPC&E inspection reports noted that the ponds were constructed in clay and underlain by shale and that vertical migration of fluids from the pond should be minimal.



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LOCATION OF THE ARKANSAS VALLEY
COAL FIELD AND SITE AREA
INDUSTRIAL WASTE CONTROL SITE
SEBASTIAN COUNTY, ARKANSAS

FIGURE 4.0

In general, quarterly ADPC&E inspection reports indicated satisfactory Site conditions. However, in the mid-1977s, concerns and issues were raised by the local residents and the agency in regard to a surface impoundment release. In response to ADPC&E directives, the operator notified the Agency that liquid solvents were no longer accepted. Closure activities were initiated shortly thereafter. On August 8, 1978, the ADPC&E was notified that the landfill had been closed and covered with compacted material(believed to be the spoils from the former strip mine) and graded to ensure adequate surface drainage. The status of the surface impoundments at the time is unclear, but in late 1979 the ADPC&E inspection reports indicated that a leachate problem existed, and the EPA was notified.

4.0 GENERAL SITE PHYSICAL FEATURES

The following is a brief description of the important demographic and physical features as they apply to the Site. The Site is located in the southern portion of the Arkansas Valley Region, as shown in Figure 4.0. The features are described in more detail in the referenced documents.

4.1 TOPOGRAPHY AND DRAINAGE

The Site Location Map(Figure 1.0) shows the general vicinity topography. The Site area is characterized by a series of parallel ridges. The Site lies at the foot of Long Ridge, which runs parallel and north of the Backbone Mountain. The elevation of Long Ridge is approximately 718 feet above mean sea level(msl). The terrain drops to approximately 465 feet at Prairie Creek, which is about one half mile north of the Site. Prior to remediation the Site elevation was 540 feet at the base of Long Ridge and approximately 510 feet along the north property line.

FIGURE 4.0 ARKANSAS VALLEY REGION

The Cap and Cover is the most significant topographic feature as a result of remediation. It has raised the overall Site elevation to an average elevation of approximately 530 feet sloping to the north and northeast from the southwest corner.

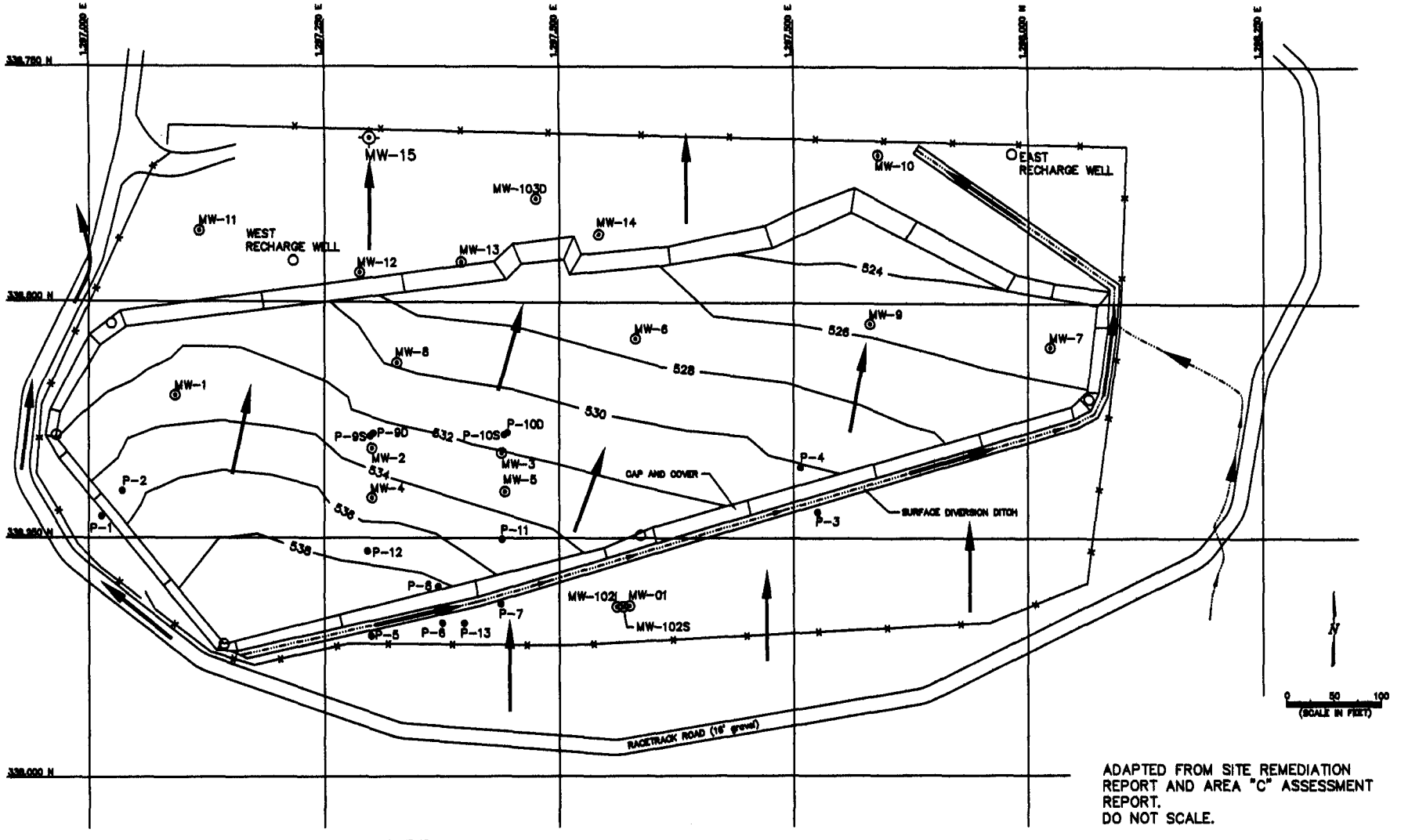
Runoff from Long Ridge is diverted around the Cap and Cover by the diversion ditch along its southern and eastern perimeter. The diverted drainage returns to its normal flow pattern north of the Site. The Cap and Cover surface runoff is primarily sheet flow off the northern bank. Figure 5.0 shows the current surface drainage pattern.

Infiltration on the Cap and Cover surface is captured by the sand layer and discharges at the toe of the northern bank and returns to its natural course without entering into the covered remediated area. Figure 6.0 shows a cross section of the cap and cover.

4.2 DEMOGRAPHICS AND LAND USE

The nearest population centers are the villages of Old Jenny Lind approximately 1.5 miles to the east of the Site, and New Jenny Lind approximately 2.5 miles to the northeast. Both villages are within the Rogers Township, which has a total population of an estimated 900. The population estimate within one mile of the Site in 1980 was 375. Ft. Smith lies about 8 miles to the north. While there has been an increase in population over the past five years, it remains very low.

The EPA/RI determined that there are 45 to 50 residences within a half-mile of the Site with an estimated population of 167. Most of the residences were located to the east and north of the Site above Racetrack Road along Long Ridge. There were no residences to the west of the Site for more than one mile. While some of the residences had water wells, none were reported to be in use and the primary water source was and remains the Sebastian County Rural Water Users Association. Figure 7.0 indicates the general locations of the residences in the near vicinity of the Site.



ADAPTED FROM SITE REMEDIATION REPORT AND AREA "C" ASSESSMENT REPORT.
DO NOT SCALE.

LEGEND

- ⊙ MONITOR WELL
- • PIEZOMETER
- ○ FRENCH DRAIN MANWAY
- ← DRAINAGE FLOW ARROW

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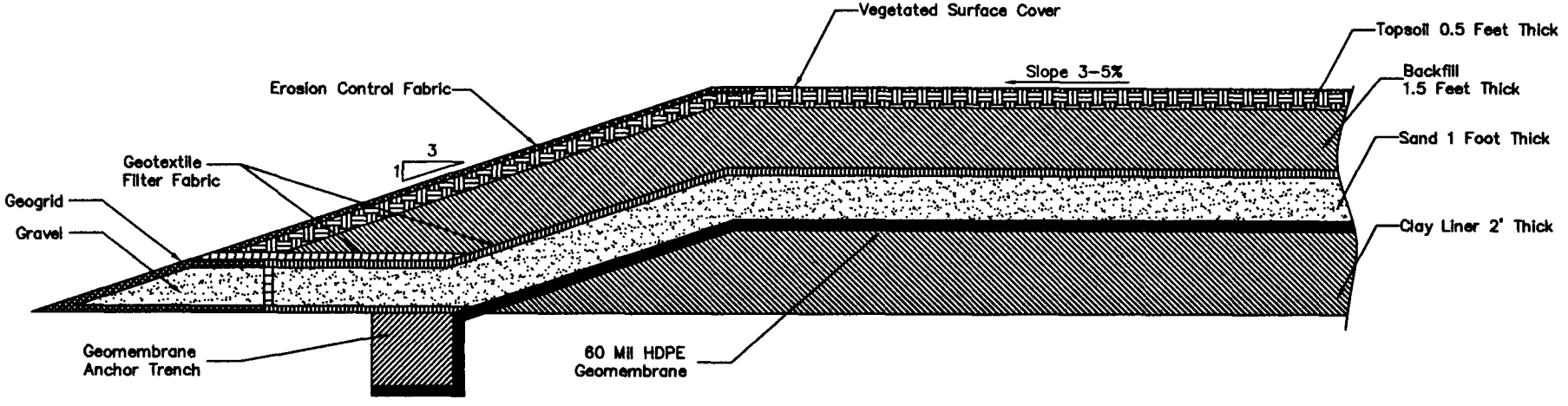
CURRENT SITE SURFACE DRAINAGE PATTERN
INDUSTRIAL WASTE CONTROL SITE
SEBASTIAN COUNTY, ARKANSAS

FIGURE 5.0



Adapted from Site Remediation Report
Volume II, Cap and Cover Details
DO NOT SCALE

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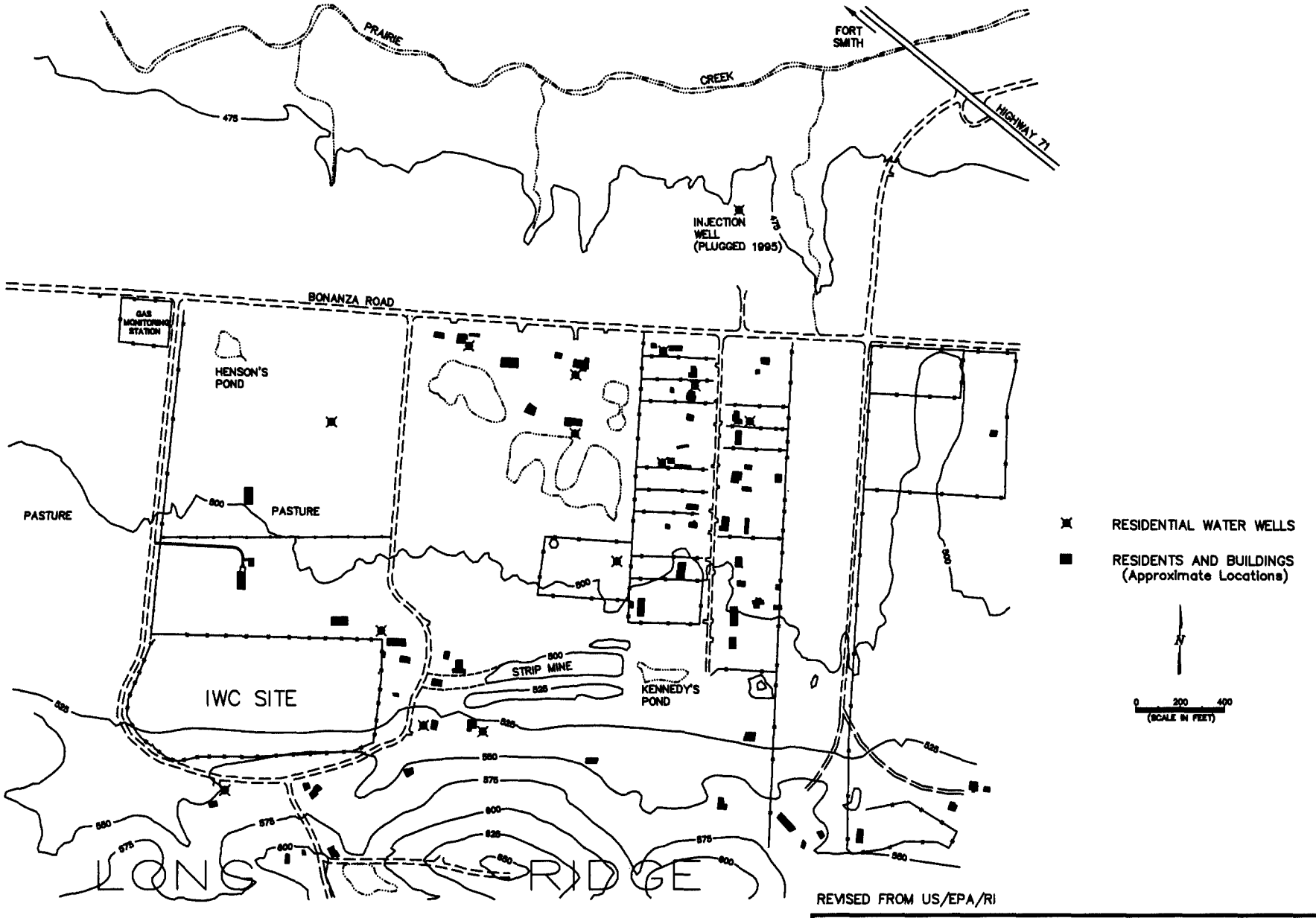
CROSS SECTION OF NORTHERN END OF CAP AND COVER
INDUSTRIAL WASTE CONTROL SITE
SEBASTIAN COUNTY, ARKANSAS

FIGURE 6.0



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GENERAL AREA MAP AND RESIDENTIAL WELLS
INDUSTRIAL WASTE CONTROL SITE
SEBASTIAN COUNTY, ARKANSAS

FIGURE 7.0

The water wells downgradient and North of the Site are completed in the upper McAlester and possibly the old mine workings. No water wells were reported to be completed below the old mine workings north of the Site. The known water wells located within a half mile of the Site are indicated in Figure 7.0.

There is an old gas well approximately 0.5 miles to northeast of the Site(see Figure 7.0) which had been used as a salt water injection well. The well was plugged in the spring of 1995. It was completed to a depth of approximately 7000 feet below ground surface reportedly in the Hale and Hunter Formation below the Atoka.

Family residences have been constructed on the land directly north of the Site, which had been used for pasture in the past. The north slope of Long Ridge(south and east of the Site) is heavily forested.

4.3 SOURCES OF DRINKING WATER

The Sebastian County Rural Water Users Association supplies drinking water to the immediate area of the Site. The EPA/RI conducted a residential well survey within a half mile radius north of the Site and reported that no residences within the area depended on private water wells for drinking water.

4.4 GEOLOGY

The Site lies within the Arkansas Coal Field area of the Arkansas Valley Region(see Figure 4.0). The area is structurally complex due to intense folding and faulting. The Site lies between two faults, the Backbone Fault to the south, which is a distinctive and predominant feature for the area, and a less defined normal fault between Prairie Creek and Bonanza Road approximately 0.5 miles to the north. The displacement of the normal fault to the north has been reported as 20 to 63 feet. The exact location of the Backbone fault is not known but is reportedly a few hundred feet to the south of the Site. Apparently there has been relatively minor tectonic activity between these faults in the

general vicinity of the Site itself. However, faults were identified in the old mine working maps to the north of the Site.

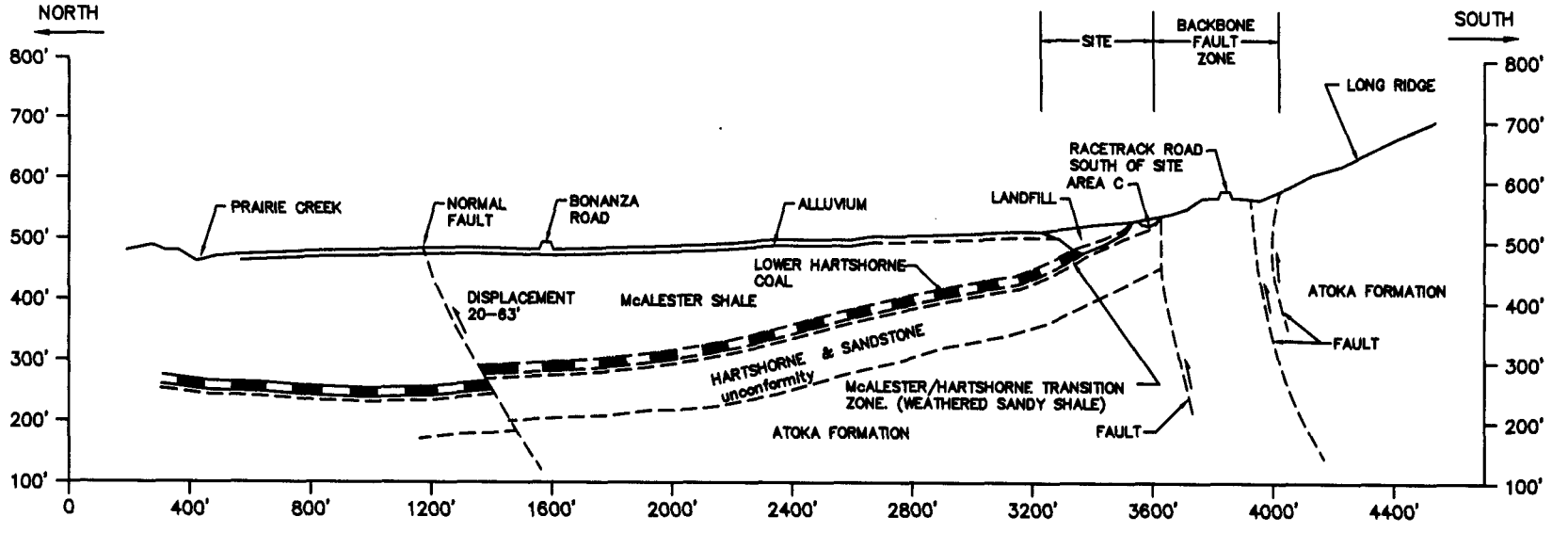
There are three geologic formations of importance in relation to the Site groundwater hydrology. These formations in descending order from near surface(i.e. youngest to oldest) are: The McAlester Shale, the Hartshorne Sandstone, and the Atoka Formation. A relatively thin layer of alluvium overlies the McAlestar. In the immediate vicinity of the Site the alluvium was difficult to distinguish from the surface mine spoils and was referred to generically as colluvium in previous studies. Figure 8.0 represents a conceptual geologic cross-section for the Site Area.

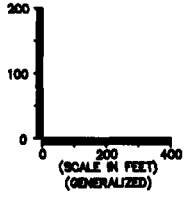
4.4.1 McAlester Shale

The McAlester Shale is dark gray micaceous shale. During a recent excavation to repair a drain line on the northside of the landfill, an excellent cross-section of the formation was exposed and logged by an Arkansas registered geologist. The shale was described as a dark gray to black massively bedded strata with silt to very fine sand size particles. No distinct sand laminations were observed in this shale, which were distinctive in the sandy shale underlying the Site south of the landfill and the mine workings to the north, as reported by the same geologist. In the immediate area north of the landfill, the upper portion of the McAlester has been eroded away and is overlain by 9-12 feet of alluvium above which spoils can be easily identified.

The McAlester Formation includes the Upper and Lower Hartshorne coal seams. The Lower Hartshorne Coal bed was the coal seam mined in the past, both underground and in the strip mine. The base of the McAlester is placed at the top of the first sandstone below the Lower Hartshorne Coal. At least 2 feet of shale underlie the coal and overlie the sandstone at the Site. It is this underlying weathered shale that is referred to as weathered bedrock in the HWQS and remedial action documents and underlies the entire

FIGURE 8.0 CONCEPTUAL GEOLOGIC CROSS SECTION





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NOTE:
GEOLOGIC CROSS SECTIONS BASED ON ON-SITE DRILLING DATA AND EXISTING GEOLOGIC LITERATURE.

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N-S GEOLOGICAL CROSS SECTION FOR THE SITE AREA
INDUSTRIAL WASTE CONTROL SITE
SEBASTIAN COUNTY, ARKANSAS

FIGURE 8.0

Site and the coalmines. It is believed to be the transition zone between the McAlester and the Hartshorne Formations.

Some of the investigational and remedial boring logs reported coal south of the landfill. The boring log for MW-2 located in Area C reported a 5' coal seam at a depth of 8.5 feet. The weathered shale bedrock outcrops near the toe of the Long Ridge hillside in the vicinity of the southern perimeter of the Site. The remnants of Lower Hartshorne coal bed may also have extended to the Long Ridge hillside, assumed to be uneconomical to mine.

To the north of the landfill, the upper portion of the McAlester lies above the Coal seam and underlies the entire surface all the way to Fort Smith and beyond. Its thickness in the Fort Smith area is reported as 500 to 1,800 feet. In the immediate vicinity of the Site just north of the landfill it is approximately 60 feet thick. To the South of the landfill, the 2-5 foot weathered shale may be the remaining remnants of the McAlester overlain by alluvium and/or colluvium and spoils.

4.4.2 Hartshorne Sandstone

The weathered gray McAlester shale below the Lower Hartshorne coal seam is apparently the transition zone between the McAlester and the Hartshorne Formations. The weathered shale becomes increasingly more sandy with depth until it becomes hard sandy shale, as indicated by point of refusal for augers and rotary drag bits. Point of refusal was typically encountered in all investigation and remediation borings taken to this depth. This hard contact was presumed to be the Hartshorne Sandstone. Subsequent diamond core sampling retrieved from the "sandstone" on the north and south sides of the Cap and Cover showed unweathered alternating layers of sandstone and hard black sandy shale confirming that the strata was indeed the Hartshorne Sandstone.

The Hartshorne Sandstone is typically placed below the first laterally continuous sandstone beneath the Lower Hartshorne coal seam separated by the intervening lower

McAlester shale(weathered bedrock) or transition zone. On a regional basis the Hartshorne is a massive, well-cemented white to buff sandstone interbedded with shales. The thickness in the Fort Smith region is reported to vary from 10 to 300 feet.

The Hartshorne Sandstone lies below the weathered transition zone both to the north and south of the landfill and together underlie the entire Site and mine workings. In the vicinity of the Site it is reported to be approximately 50 feet thick until the Atoka is encountered.

4.4.3 The Atoka Formation

The Atoka Formation underlies the McAlester and Hartshorne sequence. It is predominantly hard massive shale with a reported thickness of 6,500 feet in the Fort Smith area, which becomes considerably thicker as it reaches the Site.

4.4.4 Strike and Dip

In general, the formations strike is east-west. South of the Site the formations dip to the north at 80°, decreasing to 25° below the Site, and flattening to less than 5 degrees north of the Site.

4.4.5 The Coal Mine Workings

Coal mining activity in the Arkansas Valley Coal Field has been confined principally to the Lower Hartshorne Coal bed of the McAlester Shale. The Site is in what is known as the Jenny Lind Mining District. Two mining operations are important with respect to the Site, the underground mine(Mine No. 17) and the surface mine which later became the IWC landfill. There is a third mine operation (underground Mine No. 18) to the west of Mine No. 17 which is a totally separate mine not directly connected to Mine No. 17. Figure 9.0 shows the mine workings in relation to the Site. Figure 10.0 is a reproduction

of an old mine map of a portion of Mine No. 17 north of the Site. The map does not show the workings in their entirety, but illustrates how extensive the workings are.

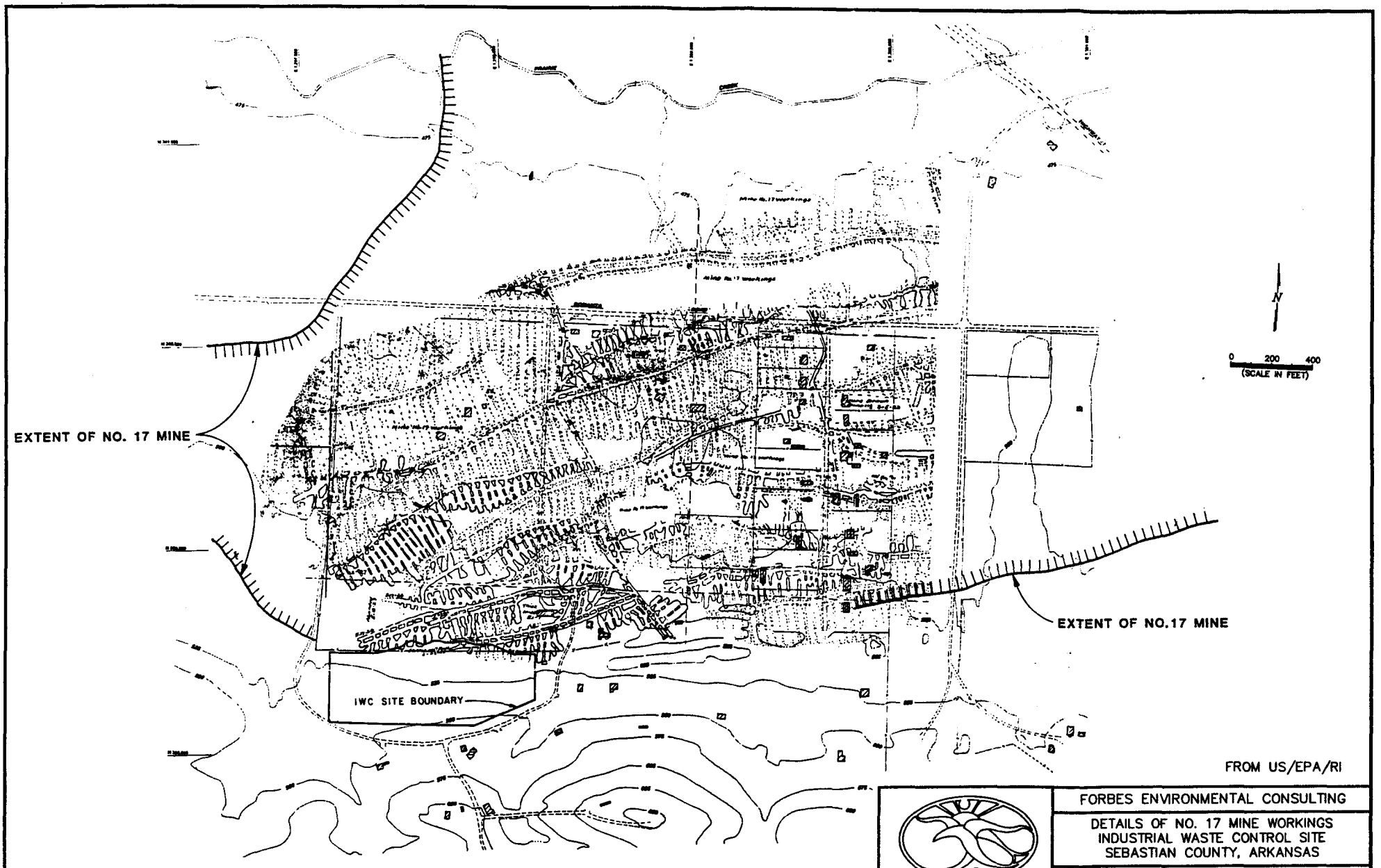
The mine workings are underlain by the same weathered and unweathered shale bedrock, which underlies the Site interpreted by the geologist to be the transition zone between the McAlester and the Hartshorne, and underlain by the Atoka. The McAlester Shale and surface alluvium overlie the underground mines.

The underground mines operated from the late 1800's through the early 1940's. The nearest "slope" or passageway into the underground mine workings near the Site was known as Mama No. 3 which is reportedly exposed in the strip mine to the east of the Site. The extensive workings extend to the east of the Site by approximately one half mile and at least a mile to the west, and over one mile to the north. The depth of the mine would be over 200 feet one mile from the Site.

The underground mine workings were mined by the mining method referred to as "room and pillar". As the coal was excavated large mined out rooms or "voids" were created. The sizes of the rooms are estimated to be approximately 36 feet long and 8 to 12 feet wide. The room height ranged from approximately 2 feet(mined in prone position) to ten feet. In some areas the "slopes" were high enough for mules to be used to pull the coal wagons. Columns of coal or "pillars" of varying dimensions were left in place to support the roof and minimize caving and subsidence.

The surface mine was operated as a strip mine from the mid 1940's through some time in the early 1950's. The underground workings are within 30 feet of the north bank of the surface mine pit. Reportedly the surface mine and underground mine workings had been interconnected by small "shafts", possibly air shafts, which were subsequently plugged. It is not known with certainty whether or not there is direct communication between the

FIGURE 9.0 DETAILS OF THE NO. 17 MINE WORKINGS NEAR THE IWC SITE



FROM US/EPA/RI

FORBES ENVIRONMENTAL CONSULTING

DETAILS OF NO. 17 MINE WORKINGS
INDUSTRIAL WASTE CONTROL SITE
SEBASTIAN COUNTY, ARKANSAS

FIGURE 9.0

landfill and the underground mine workings, but the remediation containment system including the Site Slurry Wall and Cap and Cover were designed to minimize seepage into the landfill and consequently into the mine voids.

The underground mine workings are now flooded reportedly due to a collapsed pillar resulting in cracks in the bottom of Prairie Creek. The cracks were physically sealed with clay, but may serve as a pathway for recharge. In addition, recharge may occur directly through openings into the exposed strip mine east of the Site. According to the HWQS, recharge along a fault plane is unlikely since the strata is primarily shale which are not very permeable and would tend to be sealed by "weathered shale clay" as observed in faults exposed in road cuts east of the Site.

The mine voids nearest the strip mine do not have water; however, within a short distance the voids have several feet as observed in monitor wells. Further to the north the workings are completely submerged.

4.5 HYDROGEOLOGY

The Site hydrogeology is relatively complex due to the difficulty of distinguishing between the major geological components and the presence of underground mine workings. The complexities were increased by low recovery rates and atypical responses in the upper zones, which inhibited accurate determination of the relative hydraulic characteristics. In general, there are five separate groundwater units in the general vicinity of the Site. A distinct definitive system for each unit was not established. The five apparent systems are:

- Hartshorne/Atoka Aquifer upgradient of Site
- Groundwater in weathered/unweathered shale underlying Site. (McAlester/Hartshorne transition zone.)

- Limited on-site perched system in the colluvium between the landfill above the weathered shale subsequently addressed by remedy containment design.
- Perched system in McAlester north of the Site above mine workings
- Artesian groundwater system in Mine No. 17.

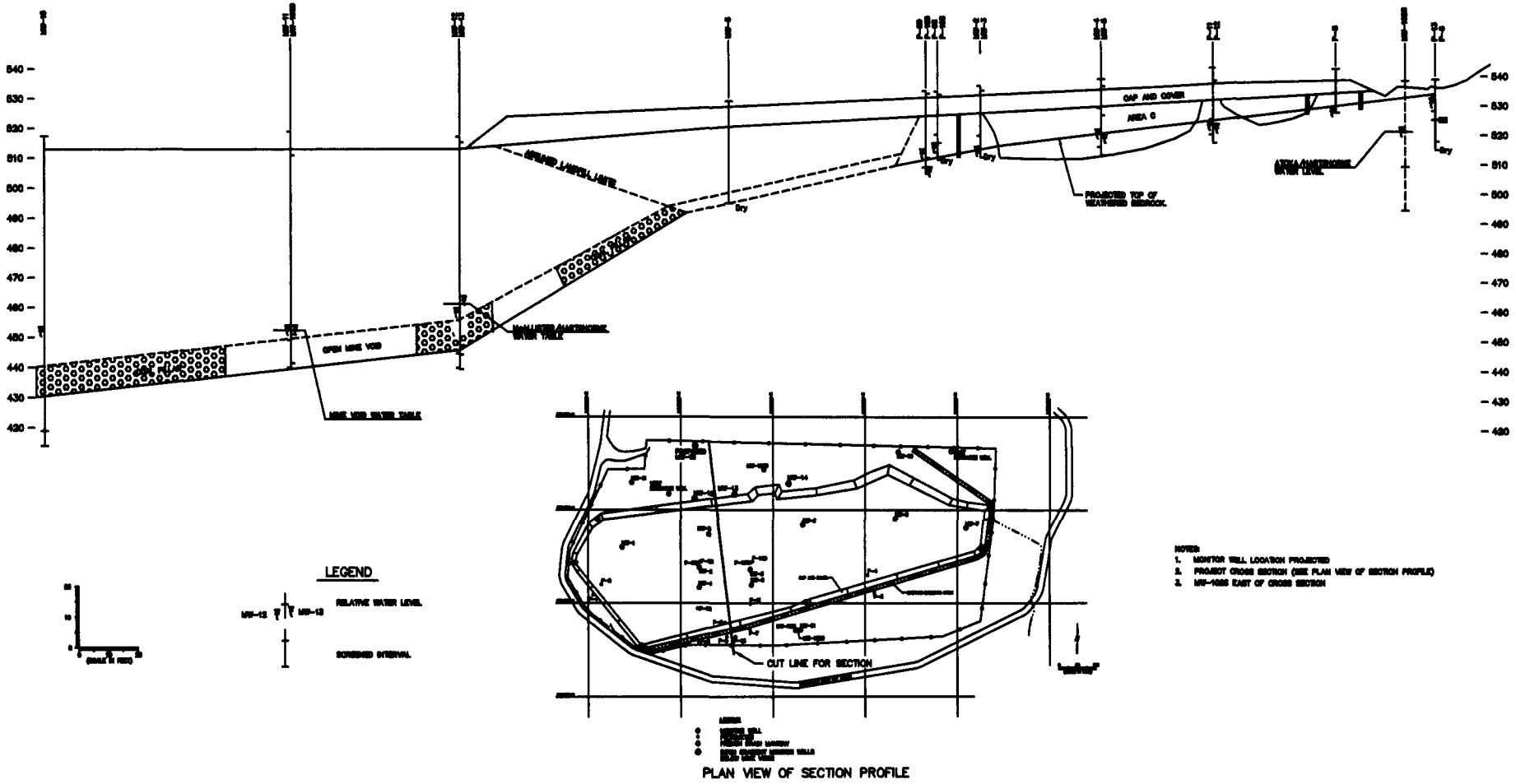
Each of these systems is briefly described below, and described in detail in the referenced documents- primarily the HWQS and the EPA/RI and RAS. Figure 11.0 shows a generalized cross section indicating the respective groundwater elevations based on recent water level measurements from the existing Site monitor wells.

4.5.1 Hartshorne/Atoka Aquifer

Due to the difficulty of differentiating between the Hartshorne and Atoka Shales in the vicinity of the Site, the upgradient aquifer could not be definitively identified as one or the other, and/or may be an interconnected system. Consequently the aquifer was referred to as the Hartshorne/Atoka. Whether or not the system is a confined or unconfined aquifer is not well established. According to the HWQS the system is an artesian aquifer. Water elevations reported in this system at approximately 518 feet msl were higher than those reported in the other systems in the natural strata. The elevations in the on-site perched zones in the colluvium and fill above the shales were slightly higher-approximately 519 feet msl. The water level elevation in the weathered bedrock of the Site was about 486 feet msl.

The recharge was determined to be from formation outcrops south of the Site, which flowed along bedding planes. Flow was reported to be confined to the bedding planes. No interconnection with the other systems was established, but it has not been determined with clarity that this system and that in the upper shales of the Hartshorne are not one and the same.

FIGURE 11.0 WATER SURFACE ELEVATIONS



FORBES ENVIRONMENTAL CONSULTING

WATER SURFACE ELEVATIONS(9/14/2000)
INDUSTRIAL WASTE CONTROL SITE
SEBASTIAN COUNTY, ARKANSAS

FIGURE 11.0

Pump test results conducted during the HWQS determined a hydraulic conductivity of 7.8 to 9.2E-04 cm/sec(transmissivity of 293-330 gpd/ft) for this system. Vertical permeability was reported to be <2E-08 cm/sec.

The system to the south of the Site is not hydraulically upgradient of those located below the Site, but is apparently structurally uplifted within the Backbone fault zone. No investigation wells were placed in this system north of the Site which is overlain by the flooded mine workings. To place wells in this location would have been difficult.

Monitor wells tested in this zone to the south(MW-102s and MW-102I) could only sustain continuous flow of 0.5 and 1.0 gpm, respectively. There are a couple of inactive private water wells further to the south believed to be completed in this horizon, but no water wells have been identified north of the Site below the mine workings. Reportedly, well yield in both the Hartshorne and the Atoka is dependent on secondary porosity and locating a producing well is difficult since the strata itself is essentially impermeable. However, water wells have been installed in both of these formations on a regional basis.

Since county-provided water is available, it was considered unlikely that a water well would be placed in this horizon south of the Site, but if so, the Site would have no impact. It would be difficult to construct a water well in this system north of the Site due to the difficulty of locating an adequate yield and the intervening mine workings. To place a water well north of the Site in the Atoka/Hartshorne Aquifer would probably require locating a mine pillar (since it would be difficult to set surface casing to isolate the mine groundwater system) and drilling through to a depth of at least 150 feet, which would increase substantially further to the north.

4.5.2 McAlester/Hartshorne Groundwater System

Groundwater occurs in the upper McAlester/Hartshorne transition zone underlying the Site and mine workings. This unit is the weathered bedrock between the McAlester coal bed, and the Hartshorne unweathered shale/sandstone. According to the most recent

measurements of the Area C Assessment piezometers, which are completed in the weathered bedrock above the Hartshorne north of Area C, and stratigraphically downgradient of Atoka/Hartshorne monitor well MW-102D, the water elevation measured in the weathered shale is almost 6 feet higher than those measured in the topographically upgradient Atoka/Hartshorne monitor wells.

The recovery rate in a respective HWQS monitor well (MW-101D) was not sufficient to conduct a pump test and bailer tests were conducted to determine hydraulic conductivities. Slug tests were performed in the weathered shale above the Hartshorne during the Area C Assessment in an upgradient piezometer(P-5). The recovery rate was very slow and the hydraulic conductivity was calculated to range from 2.3E-06 to 4.8E-06 cm/sec.

Recharge into the transition zone is from rain infiltration along the exposed bedding planes south of the Site. According to the EPA and HWQS reports, the flow is confined to the bedding planes due to the reported low vertical permeability, and migrates along the planes directly below the Site and the mine workings.

Recent water elevations measured in the downgradient monitor wells(MW-12, MW-13) completed in the McAlester/Hartshorne strata directly below the mine workings north of the landfill are higher than the elevations measured in the monitor wells completed in the mine voids(MW-10, MW-11) by about six feet, indicating that the two horizons are two separate systems and not interconnected. The water elevations measured in MW-14 and MW-15 are equivalent to that measured in the mine voids indicating an interconnection, possibly due to the sand filter pack being completed above the mine void bottom. Water was not encountered in the MW-14 mine void exploration borings, but the mine voids were flooded in the MW-15 exploratory boring. Therefore, MW-14 is apparently located south of the water line. Slug tests have not been performed on these wells, but based on recovery rates, the hydraulic conductivity is relatively low in all three wells. The recovery rate in MW-12 is faster than that in the MW-13 and MW-14, indicating that it may have been completed in area of secondary porosity, such as a fracture. MW-15 water

levels indicate that it corresponds to the mine void water elevation. MW-15 exploration borings encountered the totally saturated and flooded mine voids.

As the VOCs detected in MW-12 migrated down dip, the concentrations would decrease through natural attenuation, and if they should migrate off-site the impacted groundwater would migrate down dip along the bedding planes below the mine voids. Based on the information available this strata does not appear to be interconnected with either the mine voids or the Atoka/Hartshorne Aquifer. No VOCs have been reported in monitor well MW-15, which is located downgradient of the monitor wells completed in the McAlester/Hartshorne strata.

No water wells are known to be completed in this stratum or the underlying Hartshorne or Atoka below the mine workings. Due to the excellent yield obtained in the mine voids, and the difficulty of constructing a conventional water well through the mine voids, as well as the difficulty of locating adequate yield, it is unlikely that a water well would be installed in the weathered bedrock directly below the mine workings, or the deeper Atoka/Hartshorne aquifer.

4.5.3 Mine No. 17 Groundwater System

As discussed, the underground mine workings were flooded due to a collapsed pillar in the vicinity of Prairie Creek and sealed with clay. Whether there was significant water in the mines prior to this event is not known, but the sealed cracks are reported to be a source of recharge to the water in the mines. In addition, the adjacent mine Mine No. 18 is flooded with a hydrostatic head 30 feet higher than the water table reported in Mine No. 17. While a direct connection between the mines was not reported, there is the possibility that a hydrogeological interconnection exists creating at least partial recharge into Mine No. 17. The HWQS reports openings(e.g. slope Mama No. 3) in the strip mine east of the Site as another possibility for recharge as a result of direct surface runoff entering the openings east of the Site.

Based on the difference in the water elevations in the downgradient monitor wells completed in the weathered bedrock as compared to those in the mine voids, the water in the mine workings is apparently not directly interconnected as a result of the reported vertical permeability of <2E-08 cm/sec in the shales; however, there is the possibly of secondary interconnections due to the corresponding water levels reported in MW-14 and MW-15.

There are several water wells completed at depth, which may be completed in either the mine voids or the McAlester Aquifer system directly above them.

Prior to Site remediation there was a possibility of limited seepage from the on-site perched system into underground workings along the base of the landfill. The remedial design specifically addressed the on-site perched zones to mitigate this potential source of seepage.

4.5.4 McAlester Aquifer

Perched groundwater was identified in the upper elevations of the McAlester shale north of the Site above the mine workings. There are several isolated perched zones, including a lower zone just above the mine voids. It was not clearly established whether this lower zone is interconnected with the Mine No. 17 system.

Recharge for the perched zones was reported to be infiltration due to rain. Two wells were known to be completed in the zone. It was considered unlikely that the system was hydraulically interconnected with the on-site perched system, primarily due to the landfill, which acts as an interceptor trench. While small pockets of water were encountered in the landfill, for the most part it was dry and not considered saturated. Water seepage from the on-site perched zones in the south bank of the landfill would tend to flow down the bank to the bottom of the landfill. Therefore, on-site groundwater was effectively cut off from the upper McAlester north of the Site. The on-site groundwater, as discussed in the next section, was ultimately addressed by the remedial design.

4.5.5 On-site Perched System

Limited discontinuous on-site perched groundwater systems were identified by the EPA and HWQS in the fill and spoils south of the landfill above the weathered bedrock. These systems were addressed by the remediation plan(French Drain, Site Slurry Wall and Cap and Cover) and currently do not exist in the same state. The following summarizes the on-site perched system as described in the EPA RAS and the HWQS prior to remediation.

Generally, the eastern portion of the Site was saturated with groundwater, and the western portion contained limited perched groundwater. The recharge for the system was mainly infiltration and some seepage from the south hillside. The perched zones were confined to the colluvium by the underlying shale due to its low vertical permeability of <2E-08cm/sec. As a result surface springs were reported. The HWQS reported that there was no apparent direct connection between the shallow perched zones in the colluvium and the underlying aquifers.

During the EPA/RI and HWQS, monitor wells MW-09B and MW-101S had the highest concentrations of organic constituents. Both of these wells were completed in the on-site perched zones. The EA concluded that only the water in MW-09B presented a potential risk. The HWQS indicated that off-Site groundwater contamination had not occurred, nor had it occurred to any significant depth vertically.

The EPA reported that the yield of the perched zones was too low to be considered a usable source. The main concern was that potentially impacted groundwater from the zones would flow into the Mine No.17 system which was considered a usable source.

This limited on-site perched system was the focus of the remedial design. The remedial action included reduction of the perched groundwater mobility(French Drain and Slurry

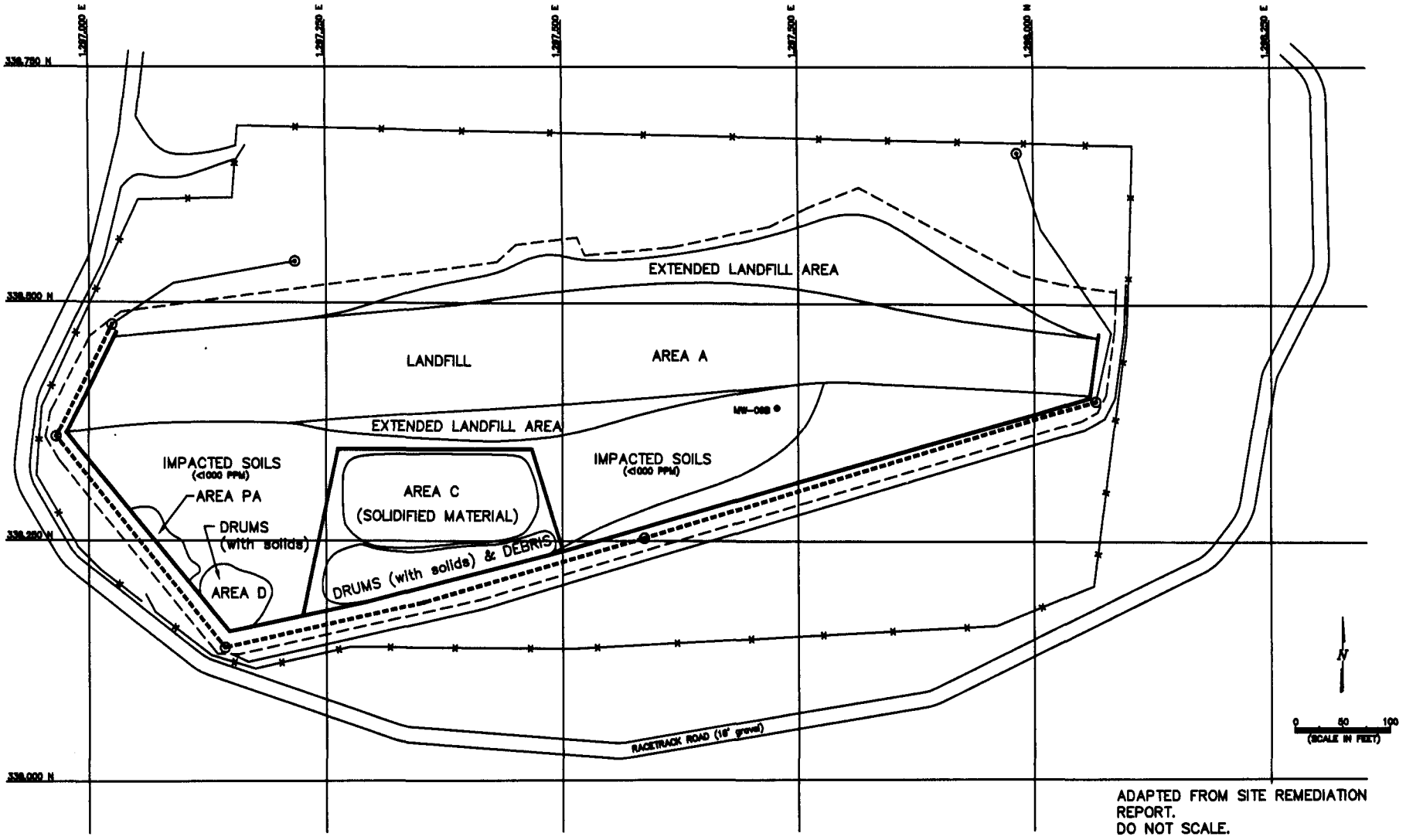
Wall), and minimization of recharge to the system(Cap and Cover and French Drain/Slurry wall).

4.6 REMEDIATED AREAS

The areas referred to as “the remediated areas” are the areas, which currently underlie the multi-layer Cap and Cover(see Figure 12.0). The French Drain and Slurry Wall bound the remediated areas beneath the Cap and Cover to the south, east and west and the north bank of the landfill to the north. The remediated areas lie above the strata referred to as the weathered bedrock, as described in Section 4.4.1. The remediated areas are:

- Areas A(landfill);
- Area B;
- Area C(surface impoundments);
- Area D;
- Area PA;
- On-Site perched water zones lying in between the Site Slurry wall and the south bank of the landfill and above the weathered bedrock.

FIGURE 12.0 REMEDIATED AREA BELOW CAP AND COVER



ADAPTED FROM SITE REMEDIATION REPORT.
DO NOT SCALE.

LEGEND

- SLURRY WALL
- FRENCH DRAIN
- TOE OF CAP AND COVER
- FRENCH DRAIN MANWAY

NOTES:

LANDFILL BOUNDARY APPROXIMATE.

NO KNOWN DRUMS (with liquid) LEFT ON SITE.

FORBES ENVIRONMENTAL CONSULTING

REMEDIATED AREA BELOW CAP AND COVER INDUSTRIAL WASTE CONTROL SITE SEBASTIAN COUNTY, ARKANSAS

FIGURE 12.0

A general description of the remediated areas is summarized below:

4.6.1 Area A

Area A is that portion of the old surface mine which was operated as a commercial industrial landfill under IWC.

4.6.1.1 Surface Mine Operations

The natural soils over the coal("overburden") were excavated and cast to the side of the strip mine as "spoils". The exposed coal seam was excavated("stripped") and transported off-site. The base of the mine was the barren stratum directly below the coal, which is referred to as the weathered bedrock, which underlies the entire Site. The average depth of the strip mine was 30 feet, and was 40 feet at its deepest depth. The width from the crest of the north bank to the south bank was approximately 100 feet.

4.6.1.2 Landfill Operations

The IWC landfill as addressed by the EPA NPL is approximately 1200 feet of the strip mine in which waste material was placed as a commercial facility, which ultimately operated under the IWC permit. It extends from the west end of the property to the east end where the industrial waste disposal operations ended. Open remnants of the old strip mine lie to the east Site across Race Track Road. The landfill depth is equivalent to that reported for the strip mine. The landfill operations extended portions of the south bank of the strip mine an additional 125 feet. The overall width at its widest point(north of Area C) was approximately 225 feet.

The waste material placed in the landfill was predominantly:

- Wood(60-75%),
- Soils(20-40%),
- Metals including drums(1.5%),

- Paper(1%),
- Plastics(1%), and
- Insulation(<1%).

While some biodegradation was observed and isolated discontinuous pockets of water were encountered, for the most part the material was dry and well preserved. There was not a continuous saturated zone of groundwater with a uniform water table encountered in the landfill. The relatively minor volumes of groundwater seepage into the landfill along the south bank from the on-site perched zones would flow to the bottom and dissipate, some of which could conceivably enter the underground mine working but reportedly there was not a direct connection. The isolated pockets of water located at higher elevations in the landfill were probably from infiltration, which would collect on impermeable barriers of debris or clay soils disposed in the landfill.

Upon closure of the landfill the strip mine spoils stockpiled on Site were used to contour the Site and provide cover over the landfill.

4.6.2 Area B

Area B was a surface area that apparently had been impacted by surface activities as a result of the landfill operations. An area of contaminated soils above Clean-Up Criteria was located during installation of the Site Slurry Wall. The impacted area was either an extension of Area B or, due to migration from Area D. This area was referred to as Area PA during remediation construction. It is considered as part of Area B for the purposes of this report.

4.6.3 Area C

Area C was a surface impoundment area reportedly used as evaporation ponds for liquid wastes received at the Site. The surface impoundment was placed above the weathered bedrock, which was considered the confining layer for the ponds and minimized vertical migration of the stored solutions. Upon closure of the impoundments the free liquid was removed and the impoundments were backfilled with clean soils and spoils. The base of the surface impoundment was estimated to be approximately 15-18 feet at its deepest point following the dip of the weathered bedrock which outcrops just to the south of the impoundment. A covered subsurface drum disposal area, which included drums filled with liquid and empty crushed drums was discovered during the HWQS along the south portion of the impoundments.

During the Site investigations, monitor wells were placed in a cluster at various depths just outside and downgradient of the impoundment. Analytical results from water samples collected from these wells did not report significant concentrations of volatile organic compounds (VOCs).

4.6.4 Area D

Area D was a subsurface drum depository area in the southwest corner of the Site discovered during the HWQS. It was estimated that approximately 200 drums containing liquids and solid wastes were placed in this area.

4.6.5 Area 09B

Area 09B was the area around an EPA investigation monitor well(MW-09B). The monitor well was completed in a shallow perched aquifer in the colluvium above the bedrock in which anomalous concentrations of contamination were reported in groundwater. Since the positive results did not correlate with the relatively low concentrations reported in other monitor wells completed in the same material, the area was removed during remediation.

5.0 REMEDIAL ACTION DESIGN

The Remedial Action Plan presented the basic conceptual tasks to be completed, general procedures to be implemented, and tentative schedules to be followed during the Site remediation phase to meet the objectives presented in the Record of Decision(ROD). The conceptual plan presented in the RAP was based on the findings of the Endangerment Assessment. The RAP detailed designs and specifications were prepared during the Remediation Design Phase.

5.1 ENDANGERMENT ASSESSMENT

An Endangerment Assessment(EA) was conducted to develop the remedial action objectives and criteria to mitigate potential threat to public health and the environment. The following procedure was used to identify and evaluate the objectives and criteria:

- The possible remedial objectives were identified for each potential migration pathway;
- Remedial objectives were evaluated and selected;
- Target compounds for each pathway were selected based on concentration, prevalence, persistence, mobility and toxicity;
- Possible criteria for each objective were identified; and
- Remedial criteria were developed for the selected remedial objectives.

The EA determined that migration and exposure pathways of potential concern were:

- <u>Groundwater</u>
  - ◊ On-Site

- ◊ Off-Site

- Surface Soils (0-2 feet)

- Subsurface Soils (>2 feet)

- <u>Wastes</u>
  - ◊ Area A
  - ◊ Area B
  - ◊ Area C
  - ◊ Area D

- <u>Surface Water</u>
  - ◊ Prairie Creek
  - ◊ Henson's Pond

Air was ultimately determined not to be a potential pathway of concern.

The remedial objectives for the groundwater pathway related to migration control actions, while those for the other exposure pathways related to source control actions. The EA conclusions based on the data evaluated are summarized as follows:

- There were no "unacceptable" risks under the exposure pathways.

- There was no evidence that significant concentration of waste contaminants had migrated off-site via soil, surface water or ground water.

- The majority of polynuclear aromatics, many of the metals, and some of the volatiles present on-site are also naturally occurring in

coal and coal combustion products. These compounds did not appear to be related to the IWC Site industrial activities.

- The majority of the identified IWC contaminants in wastes and in soils were non-carcinogens. There was not a significant presence of carcinogenic contaminants at the Site.

- Concentrations of Site indicator chemicals in surface soil did not present a significant public health risk under the residential exposure scenario postulated.

- Contamination in the subsurface soils did not appear to have migrated and did not present an unacceptable risk to groundwater at the time. A future risk could occur if all of the following conditions were to exist: a leaching mechanism existed; significant toxicological concentrations of contaminants were to leach; a transport mechanism was present to carry the leachate to a receptor, exposure to the leachate could occur; and the affected water was consumed for a lifetime.

- Off-site residential well samples indicated that the Site had not added an unacceptable health risk. This finding was based on the conservative scenario, which assumed that the water was relied upon for sole source domestic use; actually, water is supplied by the rural water association purveyor.
- It was very unlikely that on-site groundwater would be used domestically in the future. However, if it were, insignificant incremental risks to human health was predicted with the exception of one isolated monitoring well(MW-09B).

5.2 RAP OBJECTIVES AND SELECTION CRITERIA

As mandated by SARA, the following factors were considered:

5.2.1 ARARs

The Superfund Amendments and Reauthorization Act (SARA) required that remedy selection meet all legally applicable or relevant and appropriate requirements(ARARs). However, a SARA provision did allow a remedy that was protective, cost effective, and adequately satisfied statutory preferences, if it was viewed as the all around best remedial alternative and other alternatives were not acceptable due to: fund balancing, technical impracticability, interim remedy, greater risk to health and the environment, attained equivalent standard of performance, and inconsistent application of state standards. ARARs utilized to consider remedy alternatives were:

- Containment Specific ARARs
  - ◊ Safe Drinking Water Act (SDWA)
  - ◊ Arkansas Regulations
  - ◊ Arkansas Hazardous Waste Management Code
  - ◊ Arkansas Air Pollution Control Code
  - ◊ Regulation No. 2(pertaining to surface water quality)
  - ◊ Occupational Safety and Health Act (OSHA)

- Site Specific ARARs
  - ◊ Clean Air Act (CAA)
  - ◊ Clean Water Act (CWA)

- Technology Specific ARARs
  - ◊ Resource Conservation and Recovery Act (RCRA)

- General ARARs
  - ◊ CERCLA/SARA
  - ◊ NCP

5.2.2 EPA Selection Criteria

The RAP was designed to comply with the National Oil and Hazardous Substance Pollution Contingency Plan(NCP), the Comprehensive Environmental Response, Compensation and Liability Act(CERCLA or "Superfund"); the Superfund Amendments and Reauthorization Act(SARA), and the EPA guidance documents. SARA mandated that the remediation option selected by the Agency must consider the following criteria:

- Overall protection of public health and the environment
- Compliance with ARARs;
- Long-term effectiveness or performance;
- Reduction of toxicity, mobility, and volume of contaminants;
- Short-term effectiveness;
- Implementability;
- Cost;
- State acceptance; and
- Community acceptance.

The EPA included as part of the ROD a Remedial Alternative Selection Report(RAS) which outlined the various alternatives considered and the basis for selecting the alternative which became the RAP and was incorporated into the Consent Decree. The RAS listed the four main areas where wastes were disposed as:

- Area A(landfill);
- Area B(surface area south of strip pit);
- Area C(surface impoundments); and
- Area D(drum disposal).

The selected alternative consisted of the following tasks:

- Continued monitoring;
- Surface water diversion;
- Site security fencing;
- Multi-layer cap;
- French drain;
- Excavation and on-site stabilization of Areas C and D soils;
- Off-site disposal or reuse of Area D liquid filled drums;
- Slurry wall constructed around the stabilized waste area;
- Land use restrictions;
- Long term Site mowing.

The remediation alternative selected by the EPA was chosen on the basis of the nine evaluation criteria mandated by SARA , i.e.:

- Alternatives could be designed to meet ARARs.

- Toxicity reduced by treatment; mobility of contaminants reduced by installation of containment system and volume reduced by treatment and disposal.

- All known soils encountered which exceeded Cleanup Criteria were treated to meet TCLP and compressive strength limits and placed in Area C.

- All drums which contained solid waste or were empty were replaced in the excavations from which they were removed in Areas C and D backfilled with compacted clay in 12 inch lifts and capped with cap and cover.

- Remediation and investigation derived solid waste were placed in the Area C drum area, backfilled with compacted soil and capped with Cap and Cover.

- The French Drain was installed from the south bank of the landfill around the outside perimeter of the Site to intercept shallow groundwater and divert it around the outside the remediated area.

- The Site Slurry Wall was installed from the north bank of the east and west ends of the landfill around the perimeter of the Site inside and parallel to the French Drain. It was keyed 3' into the weathered bedrock or until point of refusal was encountered.

- Area C was completed 3-5 feet in the weathered bedrock and was enclosed by a slurry wall keyed into the weathered bedrock.

- The entire Site from the outside of the French Drain to the northern bank of the landfill was covered with a multi-layer RCRA Cap and Cover.

- Monitor wells were placed upgradient and downgradient of the remediated area, and within Area C and the landfill.

- Two sets of piezometers were placed on both sides of the Slurry Wall and French Drain system.

- A permanent security fence was installed around the Site.

6.0 POST-CLOSURE ACTIVITIES

The Post-closure Activity Plan(PCAP-January 1991), as approved by the EPA, specified the actions to be carried out during the Post-closure Period. The Post-closure Activity period commenced upon completion of remediation construction(3/29/91) and has continued as amended through the date of this Report. Post-closure Activity Plan requirements include:

- Baseline quarterly monitoring(collection of water measurements and samples) of the upgradient monitor well(MW-102D), the landfill monitor wells(MW-1, 6, 7, 8 and 9), downgradient mine void monitor wells(MW-10, 11 and 103D), recharge wells and additional downgradient wells installed later, as discussed in Section 6.2. In general, the baseline period was three years for all the monitor wells.

- Upon establishing baseline action levels, Site monitor wells were to be monitored on a semiannual basis to include; monitor well water level measurements and sampling, as well as a Site inspection.

- Site inspections to coincide with monitoring events;

- Contingency plan;

- Annual aerial photographs, five-year aerial photographs, thereafter;
- Maintenance of vegetation;
- Site maintenance;
- Five-Year Report.

Post-closure Monitoring Reports were prepared and submitted to the EPA and ADPC&E for each monitoring event conducted to date. The monitoring events numbered 1-18 are discussed in the First Five-Year Review report. The subsequent monitoring events numbered 19 - 32 listed below were conducted during the second five-year period and addressed in this report.

19. July 19, 1996
20. November 6, 1996
21. January 28, 1997
22. March 24, 1997
23. July 3, 1997
24. November 18, 1997
25. January 28, 1998
26. June 16, 1998(with statistical analysis and final action limits for downgradient monitor wells)
27. January 6, 1999
28. June 10, 1999
29. November 18, 1999
30. April 15, 2000
31. February 20, 2001

The following subsections discuss the principle activities that occurred during this post-closure period.

6.1 ACTION LIMITS

During the first five-year review period, action limits were established for the Site downgradient monitor wells numbers MW-10, MW-11, MW-102S, MW-103D and both recharge wells(landfill monitor wells MW-1, MW-6, MW-7, MW-8 and MW-9 were dry).

During the second five year period, action limits were established for the Site downgradient monitor wells MW-12, -13, -14 and –15. The action limits for MW-15 were based on the first two year baseline monitoring sample results and MW-12, -13 and –14, which started a year earlier, was extended to coincide with that of MW-15 in accordance with the methods presented in the PCAP(refer to Post-closure Monitoring Report, No. 26 Quarter, 6/98). The Action Limits are presented in Table 1.1 and 1.2. The limits are constituent and well specific.

TABLE 1.1 ACTION LIMITS

TABLE 1.1
STATISTICAL ACTION LIMITS FOR CONSTITUENTS DETECTED ABOVE DETECTION LIMITS DURING QUARTERLY BASELINE MONITORING PERIODS

CONSTITUENT	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	MW-102S	MW-103D	East Recharge	West Recharge
Trichloroethylene	10ug/l		0.117 mg/l						6.2ug/l	8.0ug/l
Carbon Disulfide		15ug/l								
1,1,1-Trichloroethane									10.0ug/l	
Cis-1,2-Dichloroethylene			0.682 mg/l						10.9ug/l	14.9ug/l
Trans-1,2-Dichloroethylene									24ug/l	
Nickel	0.09mg/l		0.06 mg/l	0.2 mg/l	0.0560 mg/l	0.012 mg/l			0.08mg/l	0.08mg/l
Chloroform				0.033 mg/l						
Vinyl Chloride			0.286 mg/l							

Ref: Statistical Analyses to Establish Constituent Action Limits for Detection Monitoring(Ross, D.L., see Post Closure Monitoring Report Eigth Quarter, 6/93) for MW-10, 11, 102S, 103D and Recharge Wells Statistical Analysis of Baseline Groundwater Samples(Ross, D.L., see *Post Closure Semi-Annual Monitoring Event No. 26*, 6/98) for MW-12, 13, 14, 15.

NOTE: Refer to Table 1.2 for detection limits for constituents which were not detected above detection limit during quarterly baseline monitoring periods.

TABLE 1.2
NON DETECT ACTION LIMITS
(values reported as mg/l)

PARAMETER	DETECTION LIMIT	ACTION LIMIT	PARAMETER	DETECTION LIMIT	ACTION LIMIT
Nickel	0.010	0.020			
Acetone	0.01	0.02	trans-1,2-Dichloroethene	0.003	0.006
Acetonitrile	0.01	0.02	1,2-Dichloropropane	0.003	0.006
Acrolein	0.01	0.02	1,3-Dichloro-2-propanol	0.1	0.2
Acrylonitrile	0.01	0.02	cis- 1,3-Dichloropropene	0.003	0.006
Allyl Alcohol	0.005	0.01	trans-1,3-Dichloropropene	0.003	0.006
Allyl Chloride	0.005	0.01	1,4-Dioxane	0.1	0.2
Benzene	0.003	0.006	Ethyl Benzene	0.003	0.006
Benzyl Chloride	0.003	0.006	Ethyl Methacrylate	0.01	0.02
Bromoacetone	0.01	0.02	Ethylene Oxide	0.01	0.02
Bromodichloromethane	0.003	0.006	2-Hexanone	0.01	0.02
Bromoform (Tribromoethane)	0.003	0.006	Isobutyl Alcohol	0.01	0.02
Bromomethane	0.005	0.01	Methacrylonitrile	0.01	0.02
2-Butanone (MEK)	0.01	0.02	Methylene Chloride (Dichloromethane)	0.003	0.006
Carbon Disulfide	0.003	0.006	Methyl Iodide	0.003	0.006
Carbon Tetrachloride (Tetrachloromethane)	0.003	0.006	Methyl Methacrylate	0.01	0.02
Chlorobenzene	0.003	0.006	4-Methyl-2-Pentanone	0.01	0.02
Chlorodibromomethane	0.003	0.006	Pentachloroethane	0.003	0.006
Chloroethane	0.005	0.01	Propargyl Alcohol	0.1	0.2
2-Chloroethanol	0.05	0.1	Propionitrile	0.01	0.02
2-Chicroethylvinyl Ether	0.005	0.01	Styrene	0.003	0.006
Chloroform(Trichloromethane)	0.003	0.006	1,1,1,2-Tetrachloroehtane	0.003	0.006
Chloromethane	0.005	0.01	1,1,2,2-Tetrachloroethane	0.003	0.006
Chloroprene	0.005	0.01	Tetrachloroethene	0.003	0.006
1,2-Dibromo-3-chloropropane	0.003	0.006	Toluene	0.003	0.006
1,2-Dibromoethane	0.003	0.006	1,1,1-Trichlorethane	0.003	0.006
Dibromomethane	0.003	0.006	1,1,2-Trichloroethane	0.003	0.006
1,4-Dichloro-2-butene	0.003	0.006	Trichloroethene	0.003	0.006
Dichlorodifluoromethane	0.005	0.01	1,2,3-Trichloropropane	0.003	0.006
1,1-Dichloroethane	0.003	0.006	Vinyl Acetate	0.005	0.01
1,2-Dichloroethane	0.003	0.006	Vinyl Chloride	0.005	0.01
1,1-Dichloroethene	0.003	0.006	Xylene (Total)	0.009	0.018
cis-1,2-Dichloroethene	0.003	0.006			

NOTES: VOC per EPA Method 8240
Nickel per EPA Method 6010

- Short-term risks associated with construction were moderate relative to other alternatives.

- Long-term effectiveness monitored and maintained.

- Although a complex alternative, relatively easy to construct and implement.

- Cost moderately low.

- No opposition was expressed by the public and therefore considered acceptable to community.

- State was favorable to proposed remedy.

- Provided protection by reducing risks due to treatment and containment.

5.3 SITE REMEDIATION

The Remedial Action Plan outlined the general procedures to be followed during actual Site remediation, as discussed in detail in the Site Remediation Report. The following is a summary of the various remediation tasks completed during the Site remediation phase:

- All known drums of liquids from Area D and Area C were removed from the Site.

6.2 MW-15 INSTALLATION

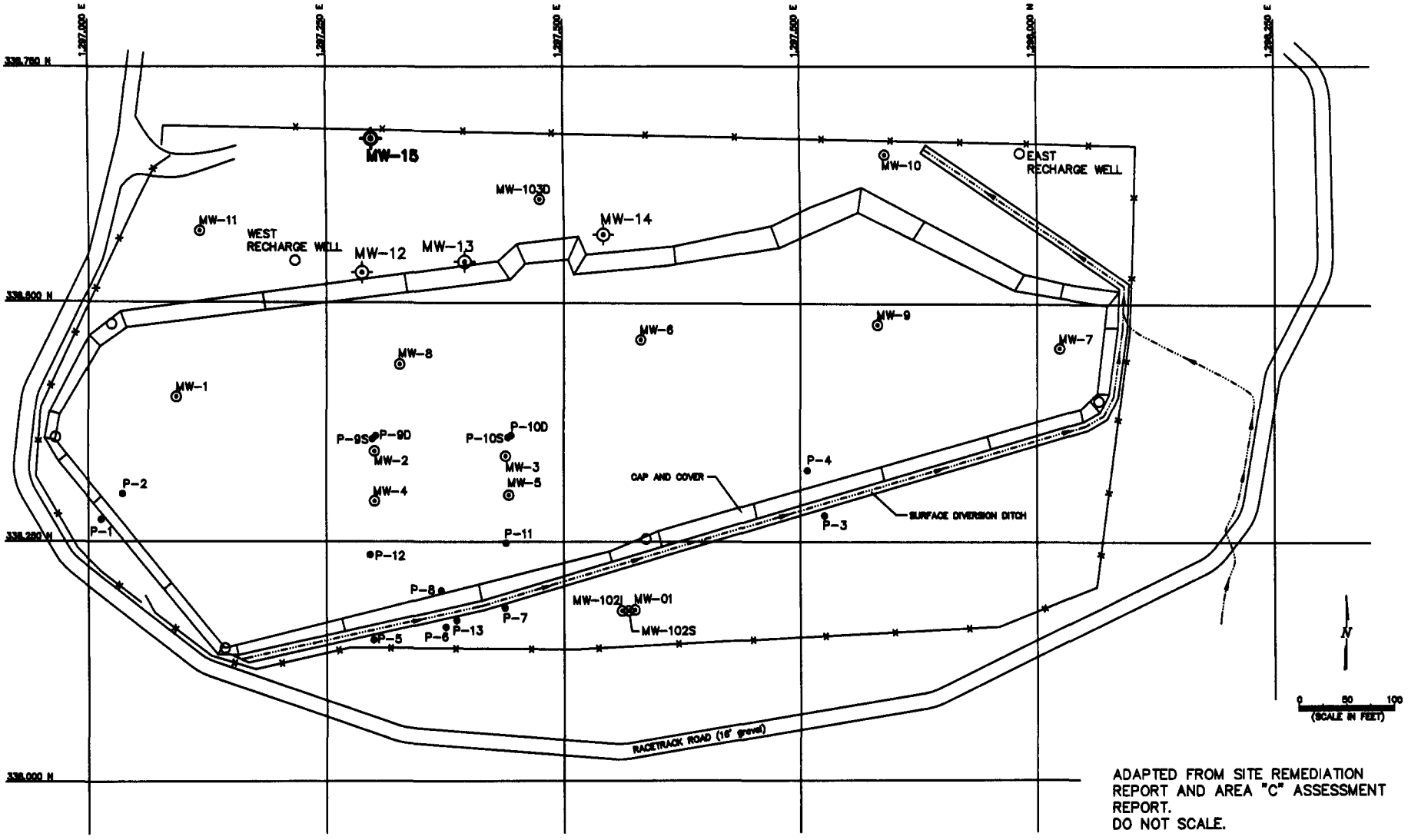
Installation of downgradient mine void monitor wells MW-12, -13, and 14 is discussed in the First Five Year Review. The installation of the furthest downgradient mine void monitor well MW-15 was completed in June 1998, during the first quarter of the second five-year period.

As directed by the Arkansas Department of Pollution Control and Ecology(ADPC&E) MW-15 was installed downgradient(i.e. north) of MW-12 near the Site property line to determine if positive volatile organic compounds(VOC) reported in MW-12 had migrated to the property line. A report describing the installation of the well was prepared (November, 1996) and MW-15 was incorporated into the PCAP sampling schedule. Initially, the well was sampled on a quarterly basis, with every other event corresponding with the semiannual events of the original PCAP monitor wells. The location of the well is highlighted in Figure 13.0. A well completion diagram is shown in Figure 14.0.

Monitor well MW-15 was completed with 2" flush joint Schedule 40 PVC well casing and well screen. The bottom five feet were screened with 0.010" slotted well screen from 100.5 to 95 feet with a threaded end cap. The monitor well screen interval includes the weathered bedrock(approximately 2.5 feet) and the upper portion of the unweathered bedrock.

The sand filter pack was placed with a tremie pipe in the annulus around the screen from the bottom to approximately 1.0 foot above the screen(94 ft bgs). The sand filter above the screen was purposely limited in order to screen as close to the bottom of the coal beds as practical and maintain at least a two-foot bentonite seal between the coal and the upper strata.

FIGURE 13.0 MW-15 LOCATION MAP



ADAPTED FROM SITE REMEDIATION REPORT AND AREA "C" ASSESSMENT REPORT.
DO NOT SCALE.

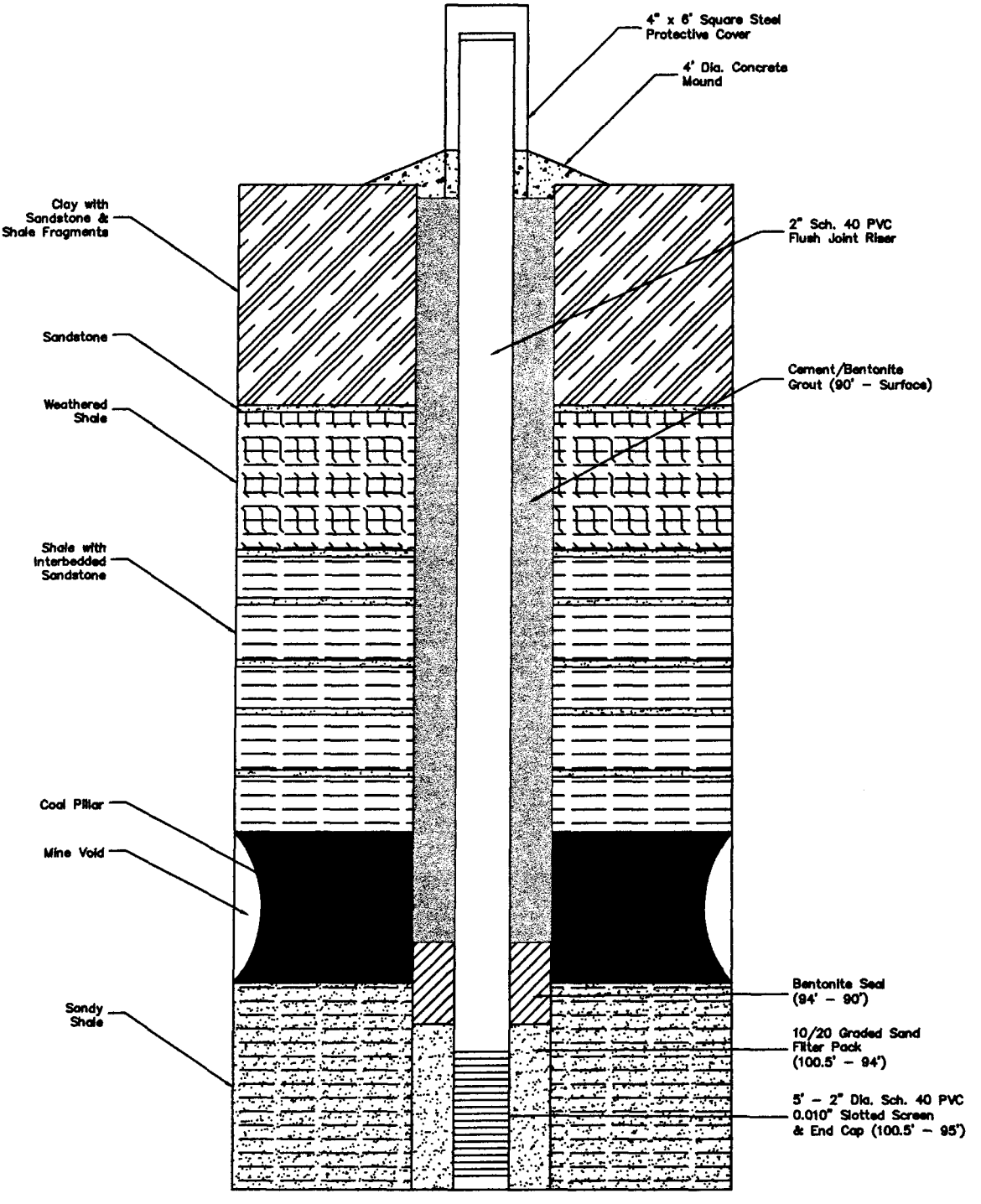
LEGEND

- ⊙ MONITOR WELL
- • PIEZOMETER
- ○ FRENCH DRAIN MANWAY
- ⊙ DOWN GRADIENT MONITOR WELLS BELOW MINE VOIDS

FORBES ENVIRONMENTAL CONSULTING

MONITOR WELL MW-15 LOCATION MAP
INDUSTRIAL WASTE CONTROL SITE
SEBASTIAN COUNTY ARKANSAS

FIGURE 13.0



NOT TO SCALE

NOTE:
There are slight differences well to well.

FORBES ENVIRONMENTAL CONSULTING

MONITOR WELL MW-15 COMPLETION DIAGRAM
INDUSTRIAL WASTE CONTROL SITE
SEBASTIAN COUNTY, ARKANSAS

FIGURE 14.0

Five exploratory borings were drilled in order to locate a pillar in which to complete the well. Water was encountered in the mine voids in each boring. The mine voids were completely flooded.

Water has been continuously measured in MW-15. Its recovery rate has been relatively slow, but sufficient to collect samples. The water elevation in MW-15 is approximately 0.5 feet lower than the elevation measured in MW-14 and almost 6.5 feet lower than reported in MW-12.

6.3 POST-CLOSURE MONITORING EVENTS

The following summarizes the information included Post-closure Monitoring Reports for the second 5 year period as covered by this report and listed in Section 6.0.

6.3.1 Introduction

The remediation of the Industrial Waste Control Site was completed on March 29, 1991. At that time post-closure care and monitoring of the Site began in accordance with the Post-Closure Activity Plan(PCAP) dated January 1991. Currently, monitor wells MW-1, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-102S, MW-103D and both the east and west recharge wells are being monitored on a semi-annual schedule in accordance with the PCAP.

Monitor well MW-102S is the Site upgradient monitor well. Monitor wells MW-103D, MW-10 and MW-11 are downgradient monitor wells completed in the mine voids. Monitor wells MW-12, MW-13, MW-14 and MW-15 are downgradient monitor wells completed in the stratum below the mine voids. Monitor wells MW-1, MW-6, MW-7, MW-8 and MW-9 are monitor wells completed in the landfill. All monitor wells except the landfill monitor wells yield sufficient water to collect samples.

Each monitoring report presents the data obtained during its respective post-closure monitoring event. Generally, the water levels measured in monitor wells are purged on one day and are sampled on the following day. A Site inspection is also conducted during this time frame.

Each report contains the following information:

- Field parameters
- Water table elevations
- Groundwater chemical data from the collected samples
- Chain of custody
- Request for analysis forms
- Field activity reports
- Data evaluation
- Action Limits

6.3.2 Field Parameters

Field parameters are measured at each of the monitoring wells prior to collecting samples. The data collected for field measurements is taken during well purging prior to the collection of the groundwater samples. The field parameters are: temperature; conductance; and pH. A summary of the field parameter logs is included at the end of each monitoring report. Purging is completed when the field parameter measurements are stabilized, as indicated by being within 10% of the previous readings or when three well volumes have been removed or when the well is bailed dry, whichever occurs first.

6.3.3 Water Table Elevations

Prior to groundwater sampling, water levels are measured for each of the monitor wells to be sampled. Table 2.0 summarizes the water level measurements collected during the second five-year review period.

TABLE 2.0
SECOND FIVE YEAR SUMMARY OF WATER LEVEL ELEVATIONS
(msl)

Well Number	TOC (msl)	BOC (msl)	EVENT NUMBERS													
			19	20	21	22	23	24	25	26	27	28	29	30	31	32
Site Monitor Wells and Piezometers																
P-1	534.50	516.40	519.49	520.47	NR	522.81	NR	518.67	NR	522.82	520.12	521.61	516.89	520.99	522.86	523.25
P-2	537.98	519.23	NA	DRY	NR	DRY	NR	DRY	NR	DRY	DRY	DRY	DRY	DRY	DRY	DRY
P-3	531.70	516.92	518.50	519.78	NR	522.88	NR	517.54	NR	523.53	DRY	521.74	517.75	520.35	521.23	525.39
P-4	533.10	512.92	513.21	513.30	NR	513.59	NR	513.22	NR	513.74	513.20	513.48	513.21	513.20	513.31	513.21
P-13	537.93	522.35	526.31	531.02	NR	529.73	NR	526.11	NR	531.05	526.41	529.79	525.66	527.79	528.85	530.95
MW-1	535.47	504.70	505.05	505.09	NR	505.10	NR	505.08	NR	505.02	DRY	505.00	DRY	DRY	DRY	505.07
MW-6	529.78	495.05	DRY	495.75	NR	DRY	NR	DRY	NR	DRY	494.95	495.03	DRY	DRY	DRY	DRY
MW-7	527.44	496.54	497.13	497.11	NR	497.17	NR	497.17	NR	497.16	497.11	497.42	497.27	497.23	497.25	497.23
MW-8	532.06	498.41	DRY	DRY	NR	DRY	NR	DRY	NR	DRY	DRY	DRY	DRY	DRY	DRY	DRY
MW-9	527.30	486.65	487.05	487.05	NR	487.07	NR	487.09	NR	487.05	DRY	487.07	487.10	487.10	487.13	487.10
MW-10	511.30	449.65	452.08	452.01	NR	460.36	NR	449.70	NR	460.72	449.66	456.55	DRY	451.58	452.50	462.08
MW-11	523.84	442.44	452.35	452.29	NR	460.66	NR	449.97	NR	461.01	449.91	456.83	449.40	451.84	453.05	462.32
MW-12	522.08	444.70	458.29	457.94	459.75	462.94	458.23	456.37	459.75	463.19	456.16	461.35	456.33	458.33	459.27	463.82
MW-13	520.03	443.81	461.49	458.67	462.23	465.47	461.49	459.09	463.14	466.64	459.02	465.18	459.66	462.16	463.27	467.27
MW-14	519.11	442.48	452.00	451.98	454.91	460.08	451.95	449.78	456.03	460.52	449.94	456.34	449.60	451.78	453.46	461.85
MW-15	517.11	413.92	451.56	451.52	454.93	459.87	451.58	449.12	455.71	459.42	449.06	456.06	448.66	450.97	452.11	461.62
MW-102S	537.76	494.59	518.96	520.37	NR	523.87	NR	516.62	NR	523.31	518.06	524.00	518.31	520.38	521.39	523.46
MW-103D	515.83	446.63	452.13	452.08	NR	460.42	NR	449.76	NR	460.77	449.74	456.61	449.24	451.64	452.81	462.13
Area C Monitor Wells and Piezometers																
MW-2	535.90	513.29	515.11	515.68	NR	515.06	NR	514.75	NR	514.36	514.64	515.39	514.85	523.29	514.55	514.28
MW-3	534.80	511.58	DRY	DRY	NR	DRY	NR	DRY	NR	DRY	DRY	DRY	DRY	DRY	DRY	DRY
MW-4	537.27	514.46	518.71	518.88	NR	519.23	NR	519.12	NR	519.67	519.58	519.97	519.77	519.94	520.80	520.12
MW-5	535.47	512.39	517.25	517.39	NR	517.51	NR	517.76	NR	517.96	518.10	518.21	518.38	518.32	518.29	518.50
P-5	541.00	523.66	527.12	532.01	NR	530.27	NR	528.34	NR	530.24	527.54	529.71	526.43	528.70	530.18	530.85
P-6	538.66	528.15	DRY	DRY	NR	530.24	NR	DRY	NR	530.61	DRY	527.76	DRY	DRY	DRY	DRY
P-7	536.84	518.52	526.26	531.91	NR	529.63	NR	527.61	NR	530.33	527.01	528.37	525.71	527.85	528.89	530.68
P-8	541.55	527.53	528.19	528.19	NR	528.24	NR	528.20	NR	538.51	DRY	528.17	528.14	528.13	528.11	533.38
P-9s	534.50	514.07	515.07	515.26	NR	514.90	NR	525.01	NR	514.76	514.99	514.75	514.75	514.74	514.73	514.74
P-9d	534.35	508.92	513.88	514.34	NR	513.81	NR	513.99	NR	507.40	513.98	513.32	513.52	513.10	512.86	513.15
P-10s	533.65	511.47	DRY	DRY	NR	DRY	NR	DRY	NR	DRY	DRY	DRY	DRY	DRY	DRY	DRY
P-10d	533.78	506.50	506.85	507.04	NR	506.87	NR	506.85	NR	506.83	506.83	506.80	506.80	506.78	506.75	506.78
P-11	537.52	517.11	522.39	522.51	NR	523.06	NR	521.87	NR	523.28	522.19	522.91	523.19	522.52	522.27	522.84
P-12	540.94	519.15	524.11	524.24	NR	524.72	NR	523.73	NR	524.86	523.88	524.53	523.99	523.84	523.66	524.27

NR = No Reading collected.

6.3.4 Groundwater Analytical Data

Groundwater samples collected from the monitor wells are obtained in the field in accordance with Section 6.5 of the Post-Closure Activity Plan. A duplicate sample is collected from randomly selected monitor wells for quality assurance/quality control purposes.

All the samples collected are packed in ice and hand delivered to the laboratory. The laboratory used is ERMI of Allen, Texas. ERMI is a laboratory certified by the ADEQ. The samples are analyzed for volatile organic compounds (VOC) by EPA method 8240 and for nickel by EPA method 200.7. The laboratory analytical reports and Chain of Custody and Request for Analysis forms are located in the appendix of each monitoring report. Tables 3.1 and 3.2 summarize the sample analytical results over the second five-year period.

6.3.5 Data Evaluation

The following is a summary of analytical data compiled during the second five-year review period. Since there was insufficient water in the landfill monitor wells to be able to collect water samples, these wells are not discussed below.

MW-102S

Monitor well MW-102S was sampled during monitoring events 22, 24, 26 – 30 and 32. Volatile Organic Compounds(VOCs) and nickel have not been detected during these monitoring events.

TABLE 3.1
SECOND 5-YEAR SUMMARY OF POST CLOSURE MONITOR WELLS POSITIVE ANALYTICAL READINGS
(values reported as mg/l)

Monitoring Events	Tri chloro ethylene	Cis 1,2-Dichloro ethylene	Nickel
MW-102S			
Event No. 19,21, 23, 25	NS	NS	NS
Event No. 31	NR	NR	NR
Event No. 20,22, 24, 26-30,32	ND	ND	ND
MW-103D			
Event No. 19, 21, 23, 25	NS	NS	NS
Event No. 29	ND	ND	0.032
Event No. 31	NR	NR	NR
Event No. 20, 22, 24, 26-28, 30,32	ND	ND	ND
MW-10			
Event No. 19, 21, 23, 25	NS	NS	NS
Event No. 20	ND	ND	0.038
Event No.24	ND	ND	0.175
Event No. 27	DRY	DRY	DRY
Event No.28	ND	ND	0.014
Event No.29	ND	ND	0.011
Event No. 30	ND	ND	0.053
Event No. 31	NR	NR	NR
Event No. 22,26,32	ND	ND	ND
MW-11			
Event No. 19, 21, 23, 25	NS	NS	NS
Event No. 22	ND	ND	0.010
Event No.26	ND	ND	0.010
Event No.28	ND	ND	0.014
Event No. 29	NS	NS	0.011
Event No. 20,24,27,30	ND	ND	ND
Event No. 31	NR	NR	NR
Eveno No. 32	ND	ND	0.014
E. Recharge Well			
Event No. 19, 21, 23, 25, 29	NS	NS	NS
Event No.20	0.004	0.01	0.024
Event No. 22	0.003	0.004	0.016
Event No.24	ND	0.004	0.064
Event No. 26	ND	0.004	0.016
Event No. 27	ND	0.004	0.145
Event No. 28	ND	0.004	0.152
Event No. 30	ND	ND	0.016
Event No. 31	NR	NR	NR
Event No. 32	ND	0.004	0.013
W. Recharge Well			
Event No. 19, 23, 25, 29	NS	NS	NS
Event No. 20	0.013	0.031	0.101
Event No. 21	0.009	0.008	0.027
Event No. 22	0.008	0.013	0.110
Event No. 24	ND	0.017	0.050
Event No. 26	0.015	0.021	0.056
Event No. 27	0.018	0.037	0.015
Dec-98 Resample Event	0.009	0.026	0.038
Jan-99 Resample Event	0.011	0.016	0.035
Event No. 28	0.01	0.029	0.042
Event No. 30	0.011	0.016	0.017
Apr-00 Resample Event	0.01	0.007	NA
Event No. 31	NR	NR	NR
Event No. 32	0.003	0.008	ND

NA = Not Analyzed
ND = Not Detected
NR = No Results; Event No. 31 samples lost in transit.
NS = Not Sampled

NOTE: Monitoring event numbers 19, 21, 23 and 25 were quarterly sampling events for monitor wells MW-12 - MW-15.

TABLE 3.2
SUMMARY OF DOWNGRADIENT MONITOR WELLS POSITIVE ANALYTES
(values reported as mg/l)

Monitoring Events	cis-1,2-Dichloro-ethene	Tri-chloro-ethene	Vinyl Chloride	Nickel	Other Compounds Detected
MW-12					
Event No. 19	0.516	0.091	0.167	ND	ND
Event No. 20	0.502	0.078	0.111	0.021	ND
Event No. 21	0.649	0.101	0.207	0.027	ND
Event No. 22	0.530	0.080	0.174	0.010	MEK-0.02
Event No. 23	0.512	0.083	0.189	0.014	ND
Event No. 24	0.600	0.083	0.177	0.012	ND
Event No. 25	0.690	0.078	0.190	0.012	ND
Event No. 26	0.630	0.075	0.330	ND	ND
Event No. 27	0.590	0.089	0.168	0.014	ND
Event No. 28	0.580	0.063	0.243	0.018	ND
Event No. 29	0.330	0.056	0.237	0.020	ND
Event No. 30	0.730	0.090	0.220	0.012	ND
Apr-00 Resample Event	0.800	0.097	0.201	NA	ND
Jul-00 Resample Event	0.440	0.055	0.200	NA	ND
Event No. 31	NR	NR	NR	NR	NR
Event No. 32	0.72	0.07	0.17	0.014	ND
MW-13					
Event No. 19	ND	ND	ND	0.011	ND
Event No. 20	ND	ND	ND	0.026	ND
Event No. 21	ND	ND	ND	ND	MEK-0.078
Event No. 22	ND	ND	ND	0.014	ND
Event No. 23	ND	ND	ND	0.047	ND
Event No. 24	ND	ND	ND	0.023	ND
Event No. 25	ND	ND	ND	0.028	ND
Event No. 26	ND	ND	ND	0.01	ND
Event No. 27	ND	ND	ND	0.027	ND
Event No. 28	ND	ND	ND	0.02	ND
Event No. 29	ND	ND	ND	0.025	ND
Event No. 30	ND	ND	ND	0.026	ND
Event No. 31	NT	NT	NT	NT	NT
Event No. 32	ND	ND	ND	0.014	ND
MW-14					
Event No. 19	ND	ND	ND	ND	ND
Event No. 20	ND	ND	ND	0.013	CS_2-0.011
Event No. 21	ND	ND	ND	0.015	ND
Event No. 22	ND	ND	ND	ND	ND
Event No. 23	ND	ND	ND	ND	ND
Event No. 24	ND	ND	ND	0.01	ND
Event No. 25	ND	ND	ND	ND	ND
Event No. 26	ND	ND	ND	ND	ND
Event No. 27	ND	ND	ND	0.014	ND
Event No. 28	ND	ND	ND	0.012	ND
Event No. 29	ND	ND	ND	NT	ND
Event No. 30	ND	ND	ND	ND	ND
Event No. 31	NT	NT	NT	NT	NT
Event No. 32	ND	ND	ND	ND	CS_2-0.003
MW-15					
Event No. 19	ND	ND	ND	0.012	ND
Event No. 20	ND	ND	ND	ND	ND
Event No. 21	ND	ND	ND	ND	ND
Event No. 22	ND	ND	ND	ND	ND
Event No. 23	ND	ND	ND	ND	ND
Event No. 24	ND	ND	ND	ND	ND
Event No. 25	ND	ND	ND	ND	ND
Event No. 26	ND	ND	ND	ND	ND
Event No. 27	ND	ND	ND	ND	ND
Event No. 28	ND	ND	ND	ND	ND
Event No. 29	ND	ND	ND	ND	ND
Event No. 30	ND	ND	ND	ND	ND
Apr-00 Resample Event	ND	ND	ND	NA	ND
Jul-00 Resample Event	ND	ND	ND	NA	ND
Event No. 31	NR	NR	NR	NR	NR
Event No. 32	ND	ND	ND	ND	ND

NA = Not Analyzed
ND = Not Detected
NR = No Results; Event No. 31 samples lost in transit.
NS = Not Sampled

NOTE: Monitoring event numbers 19, 21, 23 and 25 were quarterly sampling events for monitor wells MW-12 - MW-15.

MW-103D

Monitor well MW-103D was sampled during monitoring events 20, 22, 24, 26 – 30 and 32. VOCs were not detected during these monitoring events. Nickel was detected during monitoring event number 29(0.032 mg/L), but was not detected during any other monitoring event.

MW-10

Monitor well MW-10 was sampled during events 20, 22, 24, 26, 28 – 30 and 32. During monitoring events 22, 26 and the most recent monitoring event 32, VOCs and nickel were not detected. Nickel was detected during events 20, 24, 28, 29 and 30 ranging from 0.011 mg/L (event 29) to 0.175 mg/L (event 24).

Nickel was above action limits for nickel(0.09 mg/L) during event number 24(0.175 mg/L), but was below action limits during the next sampling event(event 28) and has remained below since.

MW-11

Monitor well MW-11 was sampled during events 20, 22, 24, 26, 27 – 30 and 32. During monitoring events 20, 24, 27 and 30, VOCs and nickel were not detected. Nickel was detected during events 22, 26, 28, 29 and 32 ranging from 0.010 mg/L (event 22 and 26) to 0.014 mg/L (event 28 and 32). All positive concentrations of nickel reported in MW-11 were below its respective action limit(0.02 mg/L).

MW-12

Monitor well MW-12 consistently exhibits positive values of cis-1,2-dichloroethene, trichloroethene, vinyl chloride and nickel. Tricholorethene and nickel have not been detected above their respective action limits during the second five-year review. Vinyl Chloride was detected above its action limit during monitoring event number 26, but has been below action limits during all other events.

Cis-1,2-dichloroethene was detected above its respective action limit(0.682 mg/L) during event number 25(0.690 mg/L) and 30(0.730 mg/L). Therefore, two additional quarterly resample events were conducted in April and July 2000. Cis-1,2-Dichloroethene remained above its action limit during the April resample event(0.80 mg/L), but showed a decrease and was reported below its action limit during the July resample event(0.44 mg/L). During the most recent monitoring event(event 32) conducted in March 2001, cis-1,2-dichloroethene was, again, reported above its action limits at 0.72 mg/L. However, no correlative VOCs have ever been detected in the downgradient monitor wells(MW-15 and mine void wells MW-10, 11 and 103D) or the lateral wells(MW-13 and –14).

The cis-1,2-dichloroethene occurrence observed in MW-12 corresponds with the degradation pathway of trichoroethene that is indicative of mitigation through natural attenuation. Consequently, the well is an inappropriate monitoring point to detect off-Site migration or establish a set action limit for cis-1,2-dichloroethene or vinyl chloride. MW-15 was specifically installed downgradient of MW-12 to determine if off-Site migration is occurring. It has been suggested to the U.S. EPA and ADEQ that continued sampling of MW-12 is not constructive or cost effective and should be deleted from the semi-annual monitoring schedule.

MW-13

VOCs have not been detected in monitor well MW-13 during the second five year review. Nickel has been detected throughout the second five year review ranging from 0.010 mg/L(event 26) to 0.047 mg/L(event 23), but below its respective action limit(0.2 mg/L).

MW-14

VOCs have not been detected in monitor well MW-14 during the second five year review. Nickel has been detected during events 20, 21, 24, 27 and 28 ranging from 0.012 mg/L(event 28) to 0.015 mg/L(event 21), but below its respective action limit(0.056 mg/L).

MW-15

Monitor well MW-15 is the furthest downgradient monitor well located on-Site(see Figure 13.0). VOCs have never been reported in MW-15 and nickel was reported only during event 19, which were the first time samples were collected from MW-15. Data compiled from MW-15 during the second five-year review, indicates constituents originating from the Site are not migrating off-Site.

East Recharge Well

Trichloroethylene was detected in the east recharge well during events 20 and 22(0.004 and 0.003 mg/L, respectively), but below its action limit(0.0062 mg/L). Cis-1,2-dichloroethene and nickel have consistently been detected throughout the second five year review. Cis-1,2-dichloroethene has never been detected above its action limit. Nickel has been reported above action limits during monitoring events 27 and 28, but has been below action limits since.

Frequently, the east recharge well screen will become plugged with algae causing water to back up in the manway. The well screen is easily unplugged using a PVC pipe to clear the screen.

West Recharge Well

Trichloroethene and cis-1,2-dichloroethene have been detected in the west recharge well above their action limit(0.008 and 0.0149 mg/L, respectively). Trichloroethene was detected below its action limit during the most recent monitoring event(event 32). Nickel has been detected in all of the monitoring events conducted at this well, except for the most recent monitoring event(event 32). Nickel has only been detected above its action limit(0.08 mg/L) during event 20 and 22.

The cause of the higher trichloroethene and cis-1,2-dichloroethene may be due to the constant plugging up of the recharge well causing water to back up into the manway. The west recharge well cannot be unplugged as easily as the east recharge well, and requires aggressive purging with air. The west recharge well can be unplugged using air, but the results have not been sustained. Therefore, more long-term solutions will be implemented during the third five-year period, as agreed to by the ADEQ and EPA.

6.3.5 Inspection Findings

The following is a summary of the findings encountered during each of the monitoring events Site inspections:

Event 19

During the Event 19 Site inspection, there were no significant findings reported and in general the Site appeared to be in good condition. The French Drain flow into the recharge wells was good indicating that the drainpipe repair, conducted during the first five-year period, was successful.

The Site was scheduled to be mowed after completion of the sampling event, but due to unseasonable rains the mowing was postponed until mid July 1996.

Racetrack Road was paved with asphalt, and a lot of brush clearing occurred along the road near the Site entrance and at the crest of the hill above the Site.

Event 20

During the Event 20 Site inspection, there were no significant findings observed and the Site was reported to be in good condition. It was reported that the chain and lock into the main entrance had been cut. There was no indication on-site that the wells had been tampered with or any damage or vandalism had occurred. The original chain and lock were replaced with a heavy-duty chain and lock.

Event 21

During the Event 21 Site inspection, there were no significant findings observed and in general the Site appeared to be in good condition.

Event 22

During the Event 22 Site inspection, it was reported that the locks on MW-103, MW-8, P-6 and the West Recharge Well had been cut. The wells themselves did not appear to be tampered with, as confirmed by the analytical results. The locks were replaced and replacement keys provided to the EPA and ADPC&E.

Some of the warning signs along the west property fence(fronting Racetrack Road) were missing. All warning signs were replaced.

The area had experienced heavy rains and no significant pooling was observed on the Cap surface, but there was substantial drainage north of the capped area indicating that the cap drain system was functioning as intended. There was some minor erosion occurring on the Cap surface and along the north bank, which was backfilled.

Event 23

During the Event 23 Site inspection, there were no significant findings observed and in general the Site appeared to be in good condition. The adjacent property owner built a wood fence extending the north property fence to the county road.

Event 24

During the Event 24 Site inspection, there were no significant findings observed and in general the Site appeared to be in good condition.

Event 25

During the Event 25 Site inspection, there were no significant findings observed and in general the Site appeared to be in good condition.

Event 26

During the Event 26 Site inspection, there were some minor disturbances that had occurred at the Site, although there was no evidence of forced entry and no significant damage was discovered. A single drum of purged water had been removed from the cap surface, another drum was overturned and an empty drum was missing. No other damage or tampering was observed.

Construction of a two-story home had been started on the northern property adjacent to the Site and a second house to the north of it. The houses are hooked up to the rural water supply and no water wells were observed.

Event 27

During the Event 27 Site inspection, there were no significant findings reported, and in general the Site appeared to be in good condition.

Event 28

There were no signs of disturbances observed at the Site and no evidence of forced entry or damage was discovered. However, there were a relatively large number of animal burrows observed in the south bank of the cap and cover near MH-4.

Event 29

There were no signs of disturbances observed at the Site and no evidence of forced entry or damage was discovered. The following observations were made:

- Grass cover was high and arrangements for mowing were made.

- There was a large animal burrow in the cap and cover near MH-4.

- High brush between the property fence and Racetrack Road, south of the Site, has been cut and was lying across the Site fence. The fence was not significantly damaged and the brush was removed.

Event 30

There were no signs of disturbances observed at the Site and no evidence of forced entry or damage was discovered. The following observations were made:

- There were several animal burrows located around P-4, MW-3, MW-6, MW-7 and MW-8.

- The burrowing around MW-3 caused the well pad to become loose.

- The paint on the well covers for P-13, MW-14 and MW-15 was deteriorating.
- Several Site identification signs were missing.

- Site needed mowing.

- There is a dense growth of large stemmed weeds spreading over the Site, including the cap and cover.

Event 31

During the Event 31 Site inspection, there was no sign of disturbances at the Site and no evidence of forced entry or damage was discovered. During this event, the following Site improvements were made:

- The front entrance gate and fencing was moved forward toward Racetrack Road (see Figure 15.0).

- The animal burrows located around P-4, MW-3, MW-6, MW-7 and MW-8 were backfilled. The loose well pads caused by the burrowing were repaired.

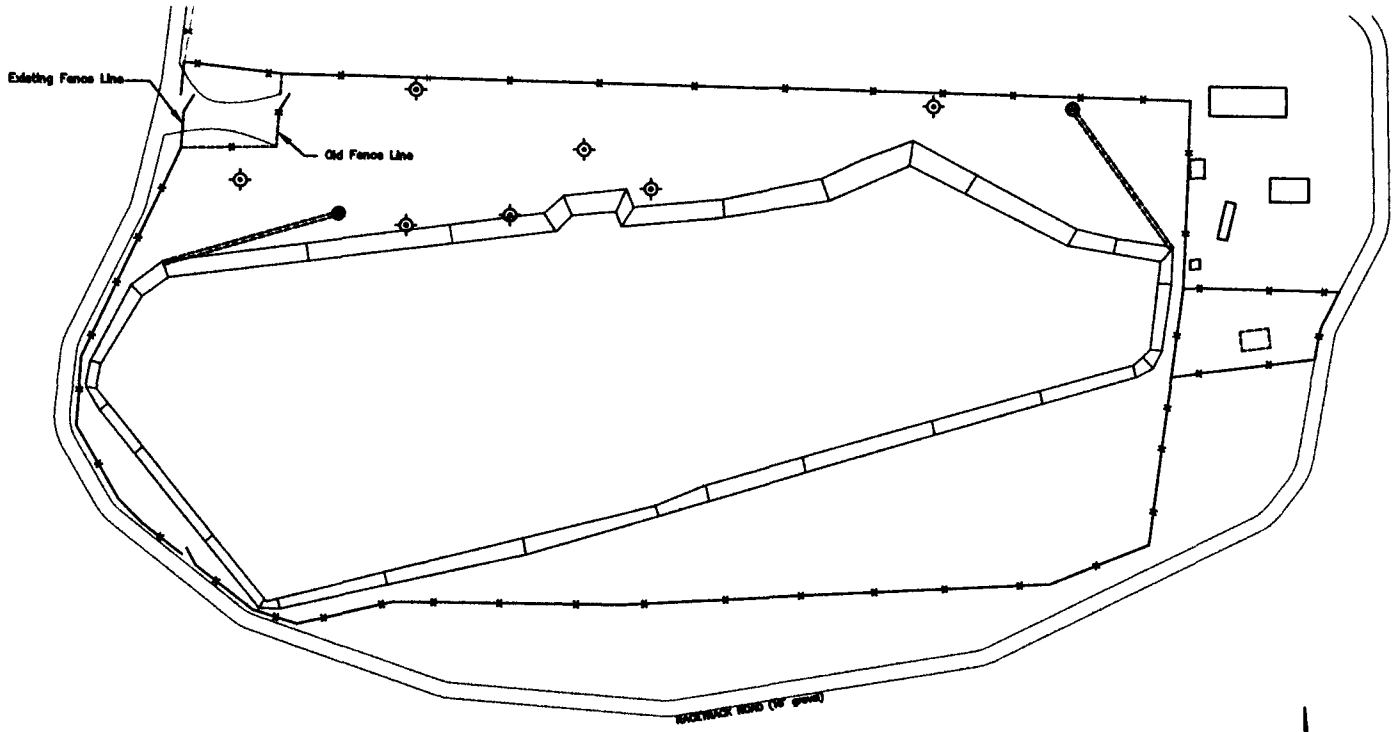
- The deteriorating paint on the well covers was removed and the covers were repainted.

- The old locks and keys on all monitor wells, piezometers and recharge wells were replaced with new locks and keys.

- The Site was mowed and weeds were removed.

- New signs were mounted on the Site fence around the perimeter of the Site.

FIGURE 15.0 FRONT ENTRANCE GATE MODIFICATION



N

0 100 200
(APPROXIMATE SCALE IN FEET)

PROPERTY BOUNDARIES APPROXIMATED

DO NOT SCALE FOR LEGAL OR REAL ESTATE PURPOSES OR ENGINEERING DESIGN

- EXISTING STRUCTURES
- PREVIOUSLY EXISTING STRUCTURES
- ROADWAYS
- IWC CAP AND COVER
- IWC FENCE LINE
- PRIVATE FENCE
- IWC DOWNGRADIENT MONITOR WELLS (IWC UPGARDIENT MONITOR WELLS NOT SHOWN)
- IWC RECHARGE WELLS
- UNDERGROUND DRAINAGE LINES

FORBES ENVIRONMENTAL CONSULTING

FRONT ENTRANCE GATE MODIFICATIONS INDUSTRIAL WASTE CONTROL SITE SEBASTIAN COUNTY, ARKANSAS

FIGURE 15.0

Event 32

During the most recent Site inspection, there were no signs of disturbances observed at the Site and no evidence of forced entry or damage was discovered. The Site is considered to be in good condition and secure. The second five-year aerial photograph was taken during this monitoring event and is shown at the end of this text. The vegetative cover is in good condition. The West recharge well was plugged.

6.4 PROPERTY BOUNDARY

At the request of the adjacent land owner and ADEQ, and without objection from the EPA, the original land restrictions, which included all of Tract 1, were revised to apply to only that portion of the tract which in fact lies within the boundaries of the IWC Site. The boundaries of the IWC Site are defined by the EPA and Site Remediation documents as the fence that encloses the Site, including the existing gate as shown in Figure 15.0. These revisions do not remove any restrictions or change any land use limitations on the IWC Site itself, but do remove the restrictions from private property adjacent to the Site to accommodate the owners.

7.0 FIVE-YEAR REVIEW PROCESS

Shawn Ghose, EPA Remedial Project Manager for the Site, is leading the Industrial Waste Control Site second five-year review. Other persons involved in the review include the following:

•	Stephen Forbes, Project Coordinator	Forbes Environmental Consulting
•	Steven Willis, Committee Chairman	IWC PRP Committee
•	Jerry R. Neill, MSc, P.G.	ADEQ

The second five-year review consisted of review of data generated during the second five-year review period and post-closure care monitoring and Site inspections, and the EPA Review guidelines.

The following observations support the premise that the remedy at the Industrial Waste Control Site meets the intent and purposes of the remedy design and is protective of human health and the environment.

7.1 REMEDY PERFORMANCE EVALUATION

The assumptions used at the time of remedy approval are considered to be still valid, because:

- The second five-year review did not identify any changes in Federal or State standards that impact the Site remedy selection.

- The second five-year review did not identify any significant changes in Site conditions.

- Toxicity or other characteristics of the constituents of concern have not changed significantly. *{Note: Increases in cis-1,2-dicholorethene and decreases in trichloroethylene correspond with the natural degradation of trichloroethylene, as discussed in Section 6.3.5.}*

- The Site is inspected on a regular basis and maintenance is performed as necessary.

- The remedy is currently functioning as the original design intended (as summarized in Section 7.2.).

- Institutional controls are in place and there are no changes or planned changes in land use.

- Fences and gates are maintained and provide an adequate means to restrict access onto the Site.

7.2 REMEDIAL ACTION PERFORMANCE

The EPA selected the final remedial action alternative based on the selection criteria mandated by CERCLA. The primary focus of the Remedial Action Plan was to minimize the potential risks to the groundwater system in the mine voids by conducting the following tasks:

- Reduce toxicity and volume

  ◊ Treat impacted soils encountered in Areas B(PA), C, D, 09B, and along the slurry wall pathway which exceeded Clean Up Criteria to meet treatment standards. Clean Up Criteria were:

Total VOC	<1000 ppm
Lead	<1000 ppm
Nickel	<1000 ppm
Cadmium	<1000 ppm

  Treatment Standards were:

  Allowable leachate concentrations per the EPA Toxicity Concentration Leachate Procedure(TCLP) for the Hazardous Substance List Constituents

  ◊ Remove drums of liquid from Area D and C and transport to off-site permitted commercial facility.

  ◊ Place treated soils back into the excavation of Area C, solidify, and contain within a slurry wall tied into the weathered bedrock and Site Slurry Wall.

- Reduce Mobility

  The objective of reducing mobility was to minimize groundwater flow into the remediated area above the weathered bedrock in order to limit recharge of the on-

site perched groundwater zones, thereby limiting the leachate transport mechanism. This is accomplished by:

◊ Installing French Drain upgradient of Site to intercept shallow groundwater flow above weathered bedrock and divert it around the Site.

◊ Installing Site Slurry Wall downgradient and parallel to the French Drain to cutoff backflow from the impacted Site soils into the French Drain, and provide backup for the French Drain.

◊ Covering the entire remediated area including the landfill, French Drain and Slurry Wall with a multi-layer RCRA Cap and Cover to prevent rainfall infiltration into the remediated area.

- Long Term Security

◊ Installation of Slurry Wall around Area C.

◊ Cap and Cover over remediated area.

◊ Post-closure Activity Plan.

◊ Site Security Fence.

- Site Monitoring and Maintenance

  Site operations consist of repair and maintenance of the on-Site cap and cover, side slopes and the perimeter fence, and well protective covers. As reported in the Section 6.3.5, there have been relatively minor and normal Site repair, which completed when and as needed contingent upon agency approval, weather and contractor availability.

The most significant repairs have been and continue to be to concerned with the West Recharge Well. During the first five year period this involved replacing the French drain drainpipe. During this five year period, unplugging the well itself with air has been

necessary on a regular basis. In an attempt to provide a long-term solution, the well is scheduled for major repair during the early phases of the third five-year period.

8.0 PROTECTIVENESS STATEMENT

No major deficiencies have been observed that would affect the performance or integrity of the remedy, and the remedies that were implemented at the Industrial Waste Control Site continue to be protective of human health and the environment.

The effectiveness of the remedy is supported by the following observations:

- Water elevations in the landfill monitor wells (MW-1, 6, 7, 8 and 9) have remained relatively stable and there have been no changes corresponding to area rainfall. There has not been sufficient water in these wells to be able to collect water samples.

- Water elevation in the upgradient French Drain piezometers (P-1 and 3) is significantly higher than those reported in their respective downgradient piezometers (P-2 and 4). {Note: P-2 is consistently dry and P-4 elevation is consistently at 513.33 ± 0.18 ft. msl.} The changes of water elevations in the upgradient piezometers(1-6 ft.) with respect to area rainfall are much more pronounced than those reported in the downgradient piezometers.

- The French Drain flow and the Cap drainage both correspond with area rainfall.

- No off-site migration of constituents of concern have been detected in mine void downgradient monitor wells (MW-10, 11, and 103D) or the property line monitor well (MW-15).

- All Site maintenance and activity is coordinated through the EPA and ADEQ, and no activity is undertaken without their knowledge and concurrence. The Site monitoring and maintenance activities ensure the remedies function as designed.

These observations indicate that the remedy is effectively minimizing groundwater flow into the remediated area contained by the French Drain, slurry wall, and the Cap and Cover in accordance the objectives the remediation design.

9.0 NEXT FIVE-YEAR REVIEW

The next five-year review will be conducted in March 2006. The draft report will be completed by May of 2006.