INSTITUTIONAL CONTROLS EVALUATION (ICE) REPORT:

Summary of Supporting Information for the Identification and Evaluation of Institutional Controls for the Weldon Spring Site

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U.S. Department of Energy
Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

Institutional Controls Evaluation (ICE) Report:

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prepared by

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prepared for

U.S. Department of Energy, Office of Legacy Management, Weldon Spring Site Remedial Action Project, Weldon Spring, Missouri, under Contract W-31-109-Eng-38

**CHECKLIST FOR INSTITUTIONAL CONTROL (IC)
PACKAGE FOR THE WELDON SPRING SITE**

For identifying, evaluating, selecting the IC mechanisms for the Weldon Spring Site, the items in the checklist below are included in this report.

__√__ 1. Provide maps and figures showing boundaries of the land use controls (Section 4 and Appendix A).

__√__ 2. Document risk exposure assumptions and reasonably anticipated land uses, as well as any known prohibited uses that might not be obvious on the basis of reasonably anticipated land uses (Section 3).

__√__ 3. Describe the risks necessitating the ICs (Section 3).

__√__ 4. State the IC performance objectives (Sections 4, 5, and 6).

__√__ 5. Generally describe the ICs, the logic for their selection, and any related deed restrictions/notifications (Section 6).

__√__ 6. Describe duration language (Section 6).

__√__ 7. Include language indicating that the U.S. Department of Energy (DOE) is the lead agency responsible for implementing, maintaining, reporting on, and enforcing the land use or ICs and that the U.S. Environmental Protection Agency (EPA) is the lead regulatory agency and the State is the support regulatory agency (Section 6).

__√__ 8. Include monitoring and reporting language: “Monitoring of the environmental use restrictions and controls will be conducted annually or more or less frequently as may be determined to be necessary based upon site activities or conditions by DOE. The monitoring results will be included in the annual report provided to the EPA and the State. The annual reports will be used in preparation of the Five Year Review to evaluate the effectiveness of the remedy.” (Section 6).

__√__ 9. Provide a comprehensive list of ICs considered or evaluated for the purpose of selecting appropriate IC mechanisms to be implemented (Section 5).

__√__ 10. Provide a comparison of requirements for ICs specified in the RODs with the ICs planned to be implemented at the site (Section 7).

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NOTATION

AEA	Atomic Energy Act
ALARA	as low as reasonably achievable
ANL	Argonne National Laboratory
ARAR	applicable or relevant and appropriate regulation
BRA	baseline risk assessment
CALM	Cleanup Levels for Missouri
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CPOU	Chemical Plant Operable Unit
DA	U.S. Department of the Army
DOE	U.S. Department of Energy
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
FFA	Federal facility agreement
GSA	General Services Administration
GWOU	Groundwater Operable Unit
IC	institutional control
ICE	institutional controls evaluation
LTS&MP	*Long-Term Surveillance and Maintenance Plan for the Weldon Spring, Missouri, Site*
MDC	Missouri Department of Conservation
MDNR	Missouri Department of Natural Resources
MNA	monitored natural attenuation
MoDOT	Missouri Department of Transportation
MOU	memorandum of understanding
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
O&M	operating and maintenance
OU	operable unit
PCFFA	post-closure Federal facility agreement
QROU	Quarry Residuals Operable Unit
ROD	record of decision
ROW	right-of-way

SUMMARY OF SUPPORTING INFORMATION FOR THE IDENTIFICATION AND EVALUATION OF INSTITUTIONAL CONTROLS FOR THE WELDON SPRING SITE

1 INTRODUCTION

This report presents the information that served as the basis for identifying and evaluating the institutional controls (ICs) that are planned for the Weldon Spring site. Remedial actions for three of four site operable units (OUs) require the implementation of ICs as part of the remedy. The approach used to determine the appropriate ICs for the Weldon Spring site is consistent with guidance presented in the U.S. Environmental Protection Agency (EPA) document entitled *Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups* (EPA 2000).

The Weldon Spring site, which consists of two nearby but distinct areas — the Chemical Plant area and the Quarry area — is located about 48 km (30 mi) west of St. Louis, in St. Charles County (Figure 1.1). The U.S. Department of Energy (DOE) complies with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in conducting remedial activities at this site. (Consistent with DOE policy, National Environmental Policy Act [NEPA] values have also been incorporated into remedial decisions and activities associated with this site.)

Cleanup of the Weldon Spring site was addressed through a series of response actions that included implementing removal actions to address immediate risks and stabilizing site conditions. The work that remained was organized into four OUs as follows. (The dates when the records of decision [RODs] were approved are indicated in parentheses.)

- Operable Unit 1, Quarry Bulk Waste (Interim ROD approved in March 1991 [DOE 1991])
- Operable Unit 2, Chemical Plant (ROD approved in Sept. 1993 [DOE 1993])
- Operable Unit 3, Quarry Residuals (ROD approved in Sept. 1998 [DOE 1998b])
- Operable Unit 4, Groundwater (Interim ROD approved in Sept. 2000 [DOE 2000] and Final ROD approved in Feb. 2004 [DOE 2004a])

The remedy for the Quarry Bulk Waste OU did not require ICs because the Quarry Residuals OU (QROU), which was implemented as the follow-on OU, addressed any remaining cleanup at the Quarry area after the quarry bulk waste remedial action was completed. Hence, the ICs identified for the QROU took into account those needed for the Quarry Bulk Waste OU, if any. For the groundwater OU (GWOU), no ICs were specified in the Interim GWOU ROD because they were addressed in the Final GWOU ROD (DOE 2004a).

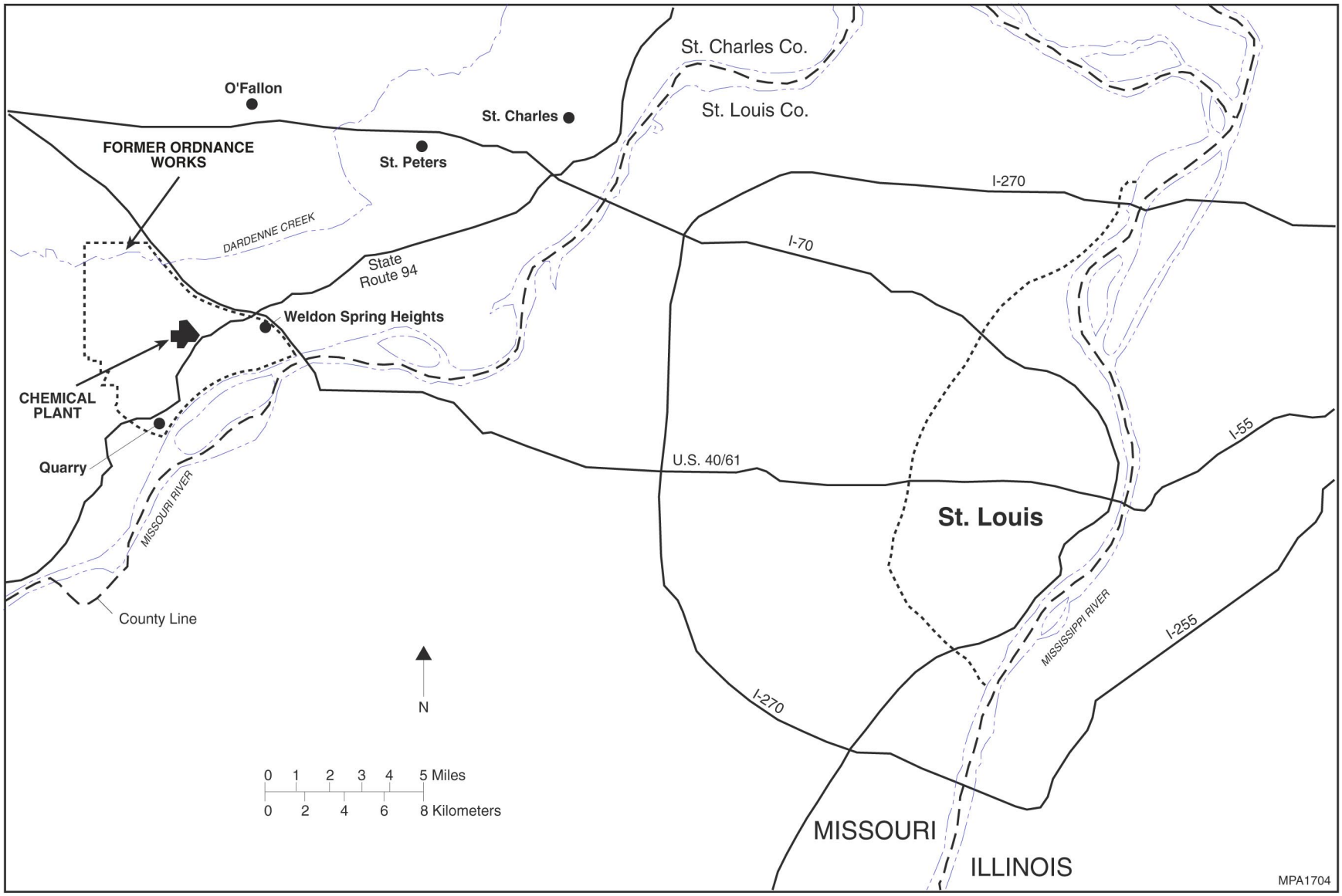

FIGURE 1.1 Location of the Weldon Spring Site

2 PURPOSE, SCOPE, AND ORGANIZATION OF REPORT

This report serves as the primary reference source for information on how ICs were determined for implementation as described in the *Long Term Surveillance and Maintenance Plan for the Weldon Spring, Missouri, Site* (LTS&MP) (DOE 2004b). It also provides a comparison of the IC requirements specified in the RODs (see Section 7) with the ICs planned for the site (as described in this report and as implemented via the LTS&MP).

The objective for implementing ICs for the Weldon Spring site is twofold: (1) protect remedies that are in place so that protection to human health and the environment is maintained and (2) restrict land and groundwater use until site residual soil or groundwater contaminant concentrations are at levels that allow unrestricted use and unlimited exposure. The primary site remedy component that needs to be maintained to provide protection to human health and the environment is the disposal cell and its buffer area at the Chemical Plant proper. The remedies implemented and the ICs required in the RODs are discussed in Section 3. The post-ROD statuses of the various site areas are also summarized in Section 3 in order to identify the geographic areas that need ICs on the basis of post-cleanup or post-ROD risk assessments. The site areas or components addressed by the remedial action conducted for the three OUs were evaluated to determine whether ICs are warranted on the basis of residual or remaining contaminant levels. The EPA requires ICs when site levels do not allow unrestricted use and unlimited exposure.

The areas that have been identified as requiring ICs are discussed in Section 4. The land areas that require ICs are either federally owned or state-owned properties. No privately owned property is affected by the residual contamination or included in the groundwater attenuation area. Legal descriptions for these areas and maps are provided in Appendix A.

Section 5 presents the results from screening various mechanisms for their potential applicability in meeting the requirements for ICs at the site. The screening considered mechanisms in the four categories of institutional or land use controls recommended by EPA guidance (EPA 2000). Mechanisms that were retained from the screening step were evaluated against the nine criteria stipulated under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (EPA 1990).

Section 6 describes the ICs that are planned for the various site areas, commensurate with the requirements for each of the three OUs. Section 7 compares the IC requirements stipulated in the RODs with the ICs discussed in Section 6. This comparison was performed to determine if the primary objective of the Weldon Spring site remedial action project — protecting human health and the environment — is being met by the current status of the site with implementation of the ICs as described in the LTS&MP.

3 REMEDIES IMPLEMENTED AND REQUIREMENTS FOR INSTITUTIONAL CONTROLS

The RODs for the Chemical Plant OU (CPOU), QROU, and GWOU stipulated implementation of ICs to support the selected remedies. The overall remediation goal for the Weldon Spring site is to provide protection consistent with current and reasonable future land use. For the CPOU, soil cleanup was designed to remove contamination to as low as reasonably achievable (ALARA) levels. For the QROU, cleanup was performed to be protective of recreational land use that is consistent with current and foreseeable future land use at the Quarry area. For the GWOU, cleanup standards are based on drinking water standards to restore the aquifer to beneficial use.

Table 3.1 summarizes the residual or post-ROD risk status at various site areas addressed by the three OUs and incorporates risk results presented in post-remediation reports for remediated areas (e.g., the post-remediation risk assessment report prepared for the former Chemical Plant soils, structures, and raffinate pits [DOE 2002]) and in the baseline risk assessment (BRA) reports for areas that did not undergo remediation, such as Femme Osage Slough, Quarry groundwater, and Chemical Plant groundwater and springs (including Burgermeister Spring). For the areas that did not undergo remediation, DOE reviewed more recent data to determine whether risk results presented in the BRAs still reflect current conditions, and risk estimates were updated as appropriate.

3.1 CHEMICAL PLANT OPERABLE UNIT

The remedial action conducted for the CPOU addressed the conditions at 44 buildings and structures, including foundations; the dewatering and dredging of four raffinate pits; and the removal of contaminated soil and sediment within the boundaries of the Chemical Plant (including areas at Frog Pond and Ash Pond). Removal of contaminated soil was also conducted at several vicinity properties, most of which were located in the adjacent U.S. Department of the Army (DA) property. Removal of contaminated soil or sediment was also conducted at select locations at the Southeast Drainage and at Route 94 (at Southeast Drainage) and Highway D (at Frog Pond) culverts. Contaminated soil that was accessible was removed. However, potentially contaminated soil could be present beneath the culverts; this soil is inaccessible until the culverts are removed. The Route 94 (at Southeast Drainage) culvert itself also potentially has fixed radioactivity. All waste generated from site cleanup (including waste from the Quarry cleanup) is now contained in the disposal cell located at the Chemical Plant. The cell contains approximately 1.48 million yd^3 of waste.

The CPOU ROD (DOE 1993) stipulates that "DOE would maintain custody and accountability for the disposal area, but the remainder of the site could be released for other use. However, the final disposition of the site will not be determined until after the decision is made for the GWOU. Any institutional controls pertinent to the future use of this property, such as the use of land or groundwater, would be determined at that time." The ROD further specifies that "following completion of the site cleanup activities, an assessment of the residual risks based on actual site conditions will be performed to determine the need for any future land use restrictions. This assessment would consider the presence of the on-site disposal cell, the buffer zone, the

TABLE 3.1 Post-ROD Risk Status at the Weldon Spring Site

Operable Unit/Site Area	End State Achieved or Risk Status	Exposure Scenario Basis	Scenario Assumptions and Intake Parameters	Report Reference	Allow for Unrestricted Use and Unlimited Exposure?
Chemical Plant Operable Unit					
Disposal cell[a]	Similar to background (based on design and construction)	Recreational visitor	Wastes are contained within an engineered cell constructed from clean materials having a leachate collection system. The radon barrier limits radon flux to near-background levels that are well below pertinent standards.	CPOU Remedial Action Report	No[b]
Chemical Plant soil (including soil at 300 ft buffer area for the disposal cell)	Similar to background[c]	Resident	Assumed exposure for 350 days per year for 30 years. Evaluated the ingestion, inhalation (including radon), and external gamma pathways.	Post-Remediation Risk Assessment (DOE 2002)	Yes
Vicinity properties	Similar to background[c]	Resident	Assumed exposure for 350 days per year for 30 years. Evaluated the ingestion, inhalation (including radon), and external gamma pathways.	Post-Remediation Risk Assessment (DOE 2002)	Yes
Southeast Drainage	Within acceptable risk range	Recreational visitor	Assumed 20 visits per year for 30 years. Evaluated the external gamma and ingestion pathways.	EE/CA (DOE 1996)	No[b]
	Within acceptable risk range	Child resident	Assumed visits for 90 days per year for 10 years. Evaluated the external gamma and ingestion pathways.	EE/CA (DOE 1996)	No[b]

TABLE 3.1 (Cont.)

Operable Unit/Site Area	End State Achieved or Risk Status	Exposure Scenario Basis	Scenario Assumptions and Intake Parameters	Report Reference	Allow for Unrestricted Use and Unlimited Exposure?
Route 94 (at Southeast Drainage) and Highway D (at Frog Pond) culverts	Within acceptable risk range	Utility construction worker	Assumed exposure for 8 hours per day for 5 working days. Evaluated the external gamma, inhalation, and ingestion pathways.	ANL 2000	No[b, d]
	Within acceptable risk range	Recreational visitor	Assumed exposure for 1 hour per day for 10 days per year for 10 years. Evaluated the external gamma, inhalation, and ingestion pathways.	ANL 2000	No[b, d]
Quarry Residuals Operable Unit					
Quarry proper soil	Within acceptable risk range	Recreational visitor	Assumed exposure for 20 visits per year for 30 years. Evaluated the ingestion, inhalation, external gamma pathways.	QROU BRA (DOE 1998a)	No[b]
Quarry cracks/fissures	Within acceptable risk range	Recreational visitor	Assumed exposure for 20 visits per year for 30 years. Evaluated the ingestion, inhalation, external gamma pathways.	QROU BRA (DOE 1998a)	No[b]
Quarry area groundwater north of Slough	Greater than acceptable risk range	Resident	Assumed ingestion of groundwater at 2 L per day for 350 days per year for 30 years.	QROU BRA (DOE 1998a)	No
Quarry area groundwater south of Slough	Within acceptable risk range	Resident	Assumed ingestion of groundwater at 2 L per day for 350 days per year for 30 years.	QROU BRA (DOE 1998a)	Yes

TABLE 3.1 (Cont.)

Operable Unit/Site Area	End State Achieved or Risk Status	Exposure Scenario Basis	Scenario Assumptions and Intake Parameters	Report Reference	Allow for Unrestricted Use and Unlimited Exposure?
Femme Osage Slough and Little Femme Osage Creek	Within acceptable risk range	Recreational visitor	Assumed ingestion of sediment, surface water, and fish.	QROU BRA (DOE 1998a)	Yes
	Within acceptable risk range	Hypothetical resident	Assumed exposure to sediment and surface water. Evaluated the ingestion and external gamma pathways.	QROU BRA (DOE 1998a)	Yes
Groundwater Operable Unit					
Chemical Plant groundwater and springs (including Burgermeister Spring)	Within acceptable risk range	Recreational visitor	Assumed ingestion at 1 cupful (200 mL) per visit for 20 visits per year for 30 years.	GWOU BRA (DOE and DA 1997)	No[b]
	Greater than acceptable risk range	Resident	Assumed ingestion at 2 L per day for 350 days per year for 30 years.	GWOU BRA (DOE and DA 1997)	No

[a] Disposal cell requires ICs to maintain its integrity and protectiveness.

[b] The risk scenarios evaluated are consistent with current and foreseeable future land uses (recreational and industrial). However, to comply with EPA guidance for ICs (EPA 2000), restrictions for this area are required until contaminant concentrations are at levels that allow unrestricted use and unlimited exposure (generally equivalent to a resident scenario).

[c] The background concentrations for the five major radionuclides at the site (radium-226, radium-228, thorium-230, thorium-232, and uranium-238) were measured in soil at nearby off-site locations unaffected by historical site releases, as identified in Table 9-3 of the CPOU ROD (DOE 1993). The average concentration of each radionuclide was reported to be 1.2 pCi/g. A carcinogenic risk of 3×10^{-4} was used as a benchmark value to evaluate locations that could be released for future use without ICs. This risk level corresponds to an annual radiation risk of approximately 15 mrem/yr.

[d] Culverts have been determined to require restrictions so that when they are removed, the currently inaccessible subsurface material that gets exposed will be disposed of properly.

adjacent Army site, and any other relevant factors necessary to ensure that appropriate measures are taken to protect human health and the environment for the long term." Finally, the CPOU ROD specifies that "perpetual care be taken of the committed land within the disposal cell footprint because waste would retain its toxicity for thousands of years." It stipulates that the cell cover be inspected and that the groundwater be monitored.

The post-cleanup risk assessment performed for the Chemical Plant and vicinity properties (DOE 2002) incorporated all the soil data collected during the confirmation process. These data represent the levels of the contaminants of concern that remained in the soil before backfilling or regrading was done to achieve the final condition designed for the site. The risk assessment considered each confirmation unit as being a separate 0.5-acre exposure unit. The 95% upper confidence limit of the arithmetic mean of all samples collected for each confirmation unit was used as the exposure point concentration for calculating potential risk on the basis of a hypothetical resident scenario. The ingestion, inhalation (including radon), and external gamma pathways were evaluated. The assessment indicated that soil concentrations and risks are at levels similar to background on the basis of the assumptions used, including the assumption that land uses are similar to those at other locations outside the site boundary.

For the Southeast Drainage, post-removal data that were collected for the locations remediated were also evaluated to determine the residual risk and the risk reduction that was achieved. It was found that the removal action significantly reduced the potential risk posed by the Southeast Drainage (Argonne National Laboratory [ANL] 1999). Current conditions at the Southeast Drainage allow for use consistent with current and reasonable future recreational land use, as described in the engineering evaluation/cost analysis (EE/CA) report (DOE 1996); that is, for recreational visitor use and resident child use scenarios, in which the Southeast Drainage is used frequently by a child (about twice a week) for recreational purposes. However, the remaining contaminant levels at the Southeast Drainage do not allow for unrestricted use and unlimited exposure.

Finally, as noted previously, potentially contaminated subsurface soil exists beneath the Route 94 (at Southeast Drainage) and at Highway D (at Frog Pond) culverts. The Route 94 culvert also potentially has fixed radioactivity. Proper disposal is planned for this soil or the culvert itself when the culverts are removed for replacement.

3.2 QUARRY RESIDUALS OPERABLE UNIT

At the Quarry, contaminated bulk waste was removed and transported to the Chemical Plant for permanent disposal (in the disposal cell), and the remaining contaminated soil was removed to meet cleanup standard levels established for soils at the Chemical Plant (i.e., ALARA levels). However, inaccessible contaminated residual soils remain in the cracks and fissures of the Quarry at levels that do not allow for unrestricted use and unlimited exposure. Several feet of clean fill has been placed on top of these cracks and fissures as part of the Quarry restoration effort intended to protect the public from physical injuries due to accidents (e.g., falling into the Quarry). A long-term groundwater monitoring well network has also been implemented.

The QROU ROD (DOE 1998b) stipulates that "institutional controls will be necessary to prevent uses inconsistent with recreational use, or uses that would adversely affect contaminant migration. This was intended to prevent exposure to contaminated groundwater beneath the Quarry proper and its immediate surrounding area north of the Femme Osage Slough. The conditions at the Quarry area were determined to be protective for its current and reasonable future recreational land use because contaminated groundwater would not be accessible under this scenario."

Data evaluated in the BRA (DOE 1998a) for Femme Osage Slough and Little Femme Osage Creek were reevaluated to estimate their potential risk by using a hypothetical resident scenario. Results indicate that contaminant levels in the sediment and surface water are also within the acceptable risk range for the hypothetical resident scenario (ANL 2003). The initial evaluation in the BRA was based on a recreational visitor scenario and was consistent with current and reasonable future land use.

Finally, Quarry groundwater levels north of the Slough remain similar to those presented in the BRA and are greater than acceptable levels for the resident scenario but are within the acceptable risk range for the recreational visitor scenario postulated in the BRA (DOE 1998a). The groundwater beneath the Quarry north of the Slough was considered an unusable aquifer by the EPA (DOE 1998b). The uranium concentrations in the groundwater beneath the Quarry area north of the Slough are at levels that do not allow unrestricted use and unlimited exposure. The uranium concentrations in the groundwater beneath the Quarry area south of the Slough are at levels similar to background and allow unrestricted use and unlimited exposure.

3.3 GROUNDWATER OPERABLE UNIT

The selected remedy for the GWOU is monitored natural attenuation (MNA) with ICs to limit the use of groundwater during the period of remediation (i.e., attenuation period). MNA involves the collection of monitoring data to verify the effectiveness of naturally occurring processes to reduce contaminant concentrations over time. The monitoring network is in place to ensure that performance goals described in the GWOU ROD (DOE 2004a) are being met. This ROD also stipulated that ICs "be implemented to restrict use of contaminated groundwater and springwater and to provide a buffer zone around the contaminated groundwater and springwater to prevent human-induced impacts on groundwater flow."

Contaminant concentrations in groundwater at the Chemical Plant area are at acceptable levels for the recreational scenario (consistent with current and reasonable future land use), but they are at greater than acceptable levels for the resident scenario and exceed drinking water standards or cleanup standards specified in the GWOU ROD (DOE 2004a). Likewise, contaminant concentrations at Burgermeister Spring are at acceptable levels for the recreational scenario (consistent with current and reasonable future land use) but at greater than acceptable levels for the resident scenario. Hence, these levels do not allow for unrestricted use and unlimited exposure.

4 SITE AREAS IDENTIFIED AS REQUIRING INSTITUTIONAL CONTROLS

On the basis of the discussion presented in Section 3, areas needing ICs were identified (Table 4.1). Figure 4.1 shows the general location of these areas. Figures 4.2 and 4.3 indicate the various owners of the areas that require ICs at the Chemical Plant area and Quarry area, respectively.

DOE had a title search done (Investors Title Company 2004) to ensure that all property owners and parties that have easements or rights-of-way (ROWs) in these areas are identified and their concerns are addressed in planning the ICs. A follow-up title search is currently being conducted to obtain additional details. The results of this second title search will augment the information in this report, as appropriate. Legal descriptions of these areas and survey drawings from a survey company are provided in Appendix A.

For the CPOU, the primary need for implementing ICs is to protect the remedy in place, mainly the disposal cell and its buffer area. Soil concentrations within the boundaries of the Chemical Plant (including those within the cell footprint) are comparable to background and should allow for uses similar to those elsewhere outside the site. Soil or sediment concentrations within the Southeast Drainage remain at levels that do not allow for unrestricted use and unlimited exposure. A 200-ft corridor along the Southeast Drainage has been identified, providing an adequate buffer. Finally, DOE expects to enter into an agreement with the Missouri Department of Transportation (MoDOT) Highway Maintenance Facility to ensure that DOE is notified when the two culverts beneath Route 94 and Highway D are scheduled to be removed so that any potentially contaminated soil beneath them gets sampled, analyzed, and (if contaminated) properly disposed of. Figure 4.2 illustrates the areas that are to be restricted at the Chemical Plant and the Southeast Drainage as part of the ICs planned for the CPOU.

For the QROU, restrictions are needed to prevent all access to contaminated groundwater north of the Slough and to prevent access to the cracks and fissures at the Quarry proper. Disturbance at the peapod-shaped land area immediately north of the Slough needs to be prevented to allow naturally occurring reduction of uranium to continue. Access to groundwater south of the Slough within the 1,000-ft buffer zone identified on the basis of the maximum hydraulic capture of a well in this area also needs to be restricted. This buffer zone will prevent the placement of a well, which could draw contaminants toward it. Figure 4.3 illustrates the areas that are included for restrictions.

For the GWOU, restrictions are needed to prevent access to the contaminated groundwater in the shallow aquifer for residential uses and for all other uses so that the hydraulic gradient of the area is not disturbed. This will protect the MNA remedy that is in place. The area identified for restrictions (see Figure 4.2) includes a 1,000-ft buffer area that accounts for the groundwater gradient and flow conditions at the site.

TABLE 4.1 Properties Requiring Institutional Controls to Support Weldon Spring Site Remedies

Property	Figure No. and Key[a]	Pertinent OU	Property Owner	Approx. Acreage	Existing ROWs
Chemical Plant disposal cell and buffer area	4.2, C1D	CPOU	DOE	90	None
Southeast Drainage (200-ft corridor along the entire drainage)	4.2, C2C	CPOU	MDC	NA[b]	Explorer Pipeline, Union Electric, MDNR Parks (see figure in Appendix A)
Route 94 (at Southeast Drainage) and Highway D (at Frog Pond) culverts	C3T	CPOU	MDC	NA	MoDOT
Quarry proper residual soil in cracks and fissures	4.3, Q1D	QROU	DOE	9	None
Quarry proper underlying groundwater	4.3, Q1D	QROU	DOE	9	None
Quarry area groundwater north and south of Femme Osage Slough	4.3, Q2C	QROU	MDC, MDNR Parks	211	Explorer Pipeline, St. Charles County Water Department, MDNR Parks (see figure in Appendix A)
Peapod-shaped soil area south of the Katy Trail ROW and north of Slough	4.3, Q3C	QROU	MDC	4.7	MDNR Parks, Katy Trail ROW
Chemical Plant proper underlying shallow groundwater	4.2, G1D	GWOU	DOE	220	St. Charles County Water Department, Union Electric, Missouri American Water Co., Southwestern Bell Telephone
August A. Busch Memorial Conservation Area and Weldon Spring Conservation Area	4.2, G2C	GWOU	MDC	734	Explorer Pipeline, Union Electric, Southwestern Bell Telephone, Public Water District No. 2 (see figure in Appendix A)

TABLE 4.1 (Cont.)

Property	Figure No. and Key[a]	Pertinent OU	Property Owner	Approx. Acreage	Existing ROWs
Weldon Spring Training Area	4.2, G3A	GWOU	U.S. Army	183	St. Charles County Water Department, Public Water District No. 2; Union Electric, Southwestern Bell Telephone (see figure in Appendix A)
Highway Maintenance Facility	4.2, G4T	GWOU	MoDOT	4.3	Union Electric, Missouri American Water Co.

[a] The figure key is intended to facilitate identification of the properties discussed in Section 4 (Table 4.1) and Section 6 (Table 6.1). The first letter designates whether the area is being restricted as part of the CPOU (designated as C), the QROU (designated as Q), or the GWOU (designated as G). The number denotes the number of the property being restricted as part of the OU. The last letter designates the property owner: D is for DOE, C is for MDC, T is for MoDOT, and A is for U.S. Army. For example, C1D is the key to represent an area (in this case, the Chemical Plant proper, which is designated as number 1) that is being restricted as part of the CPOU and is owned by DOE.

[b] NA = not available.

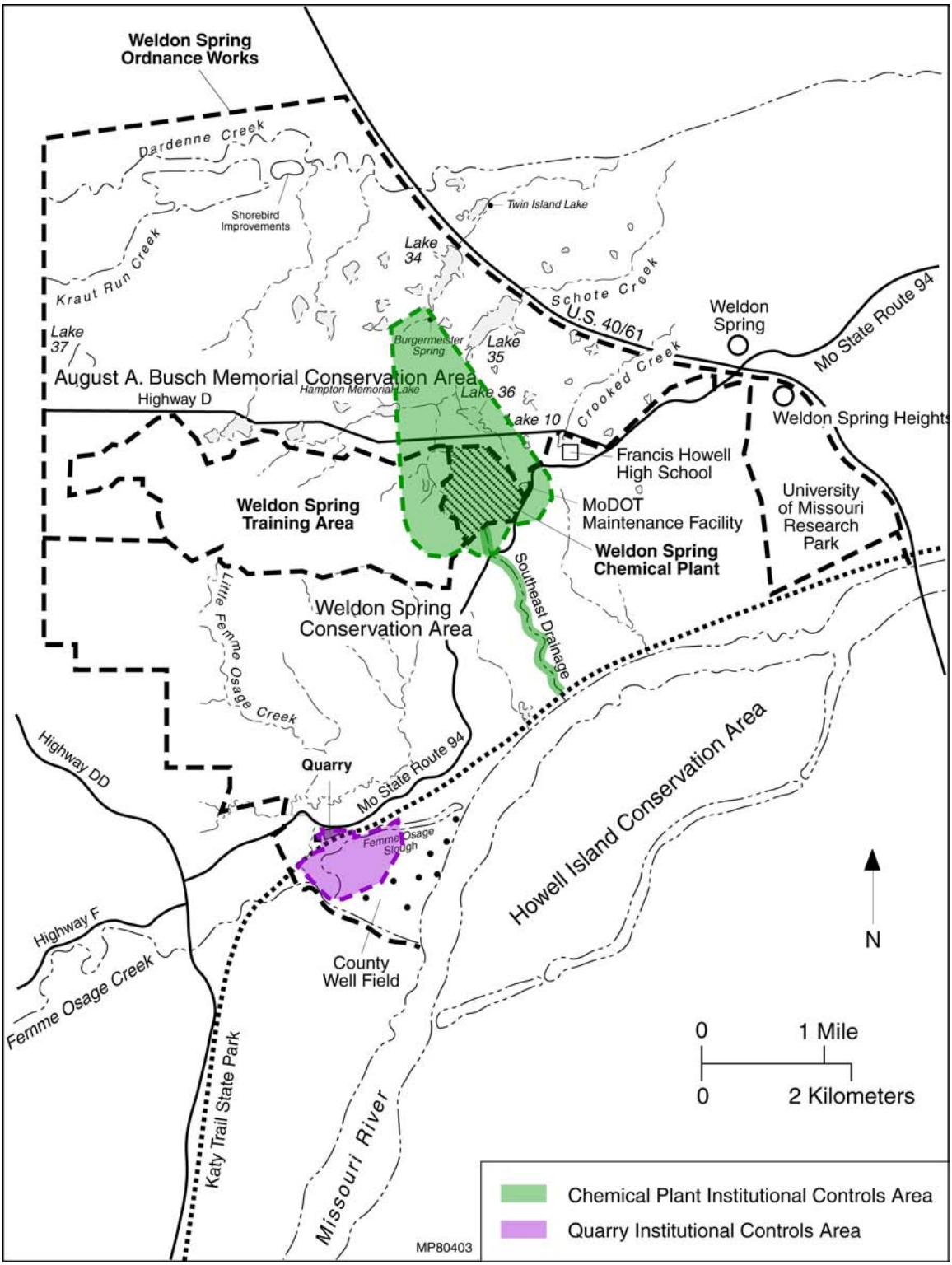

FIGURE 4.1 Location of Institutional Control Areas for the Weldon Spring Site

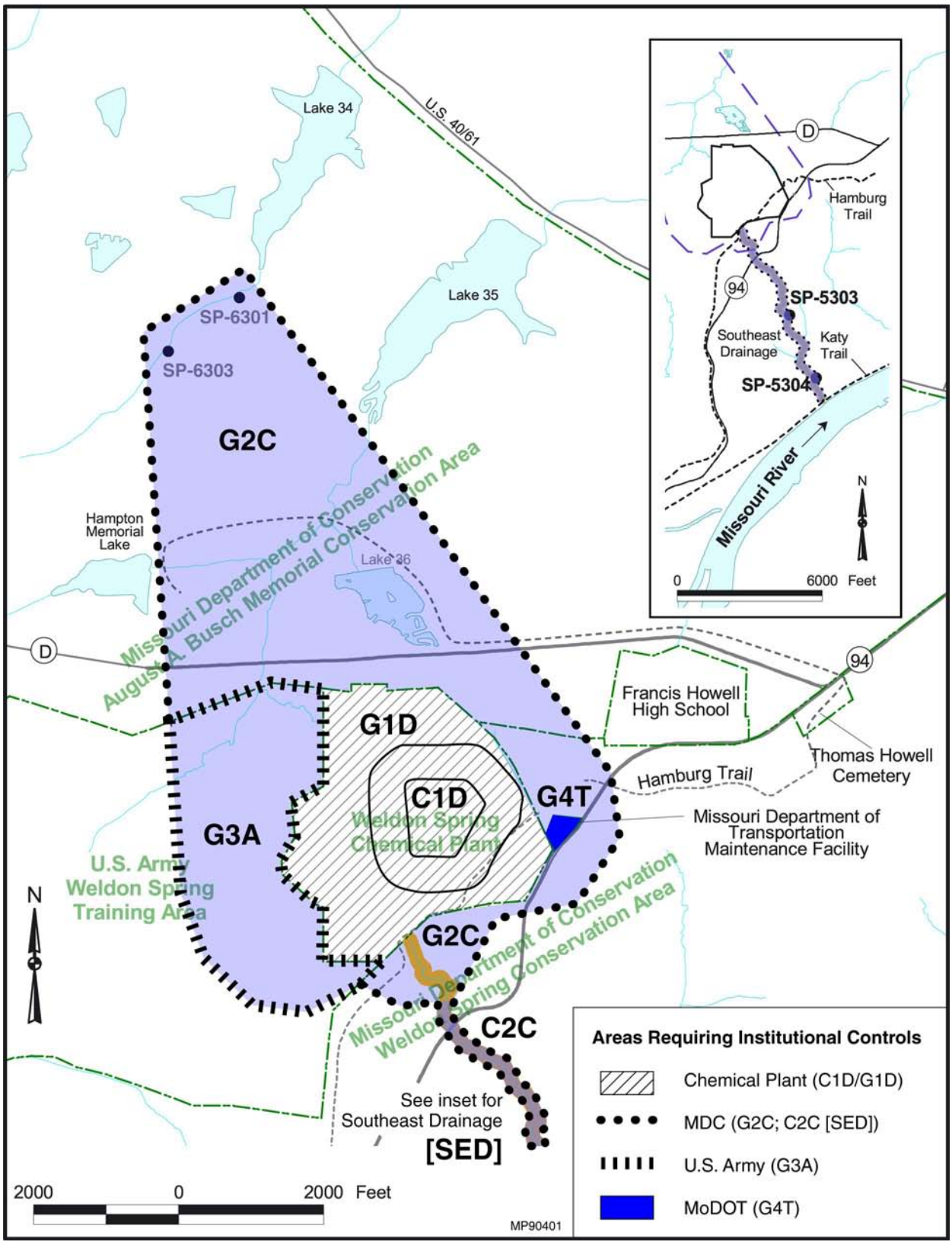

FIGURE 4.2 Institutional Control Areas for the Chemical Plant and Groundwater Operable Units

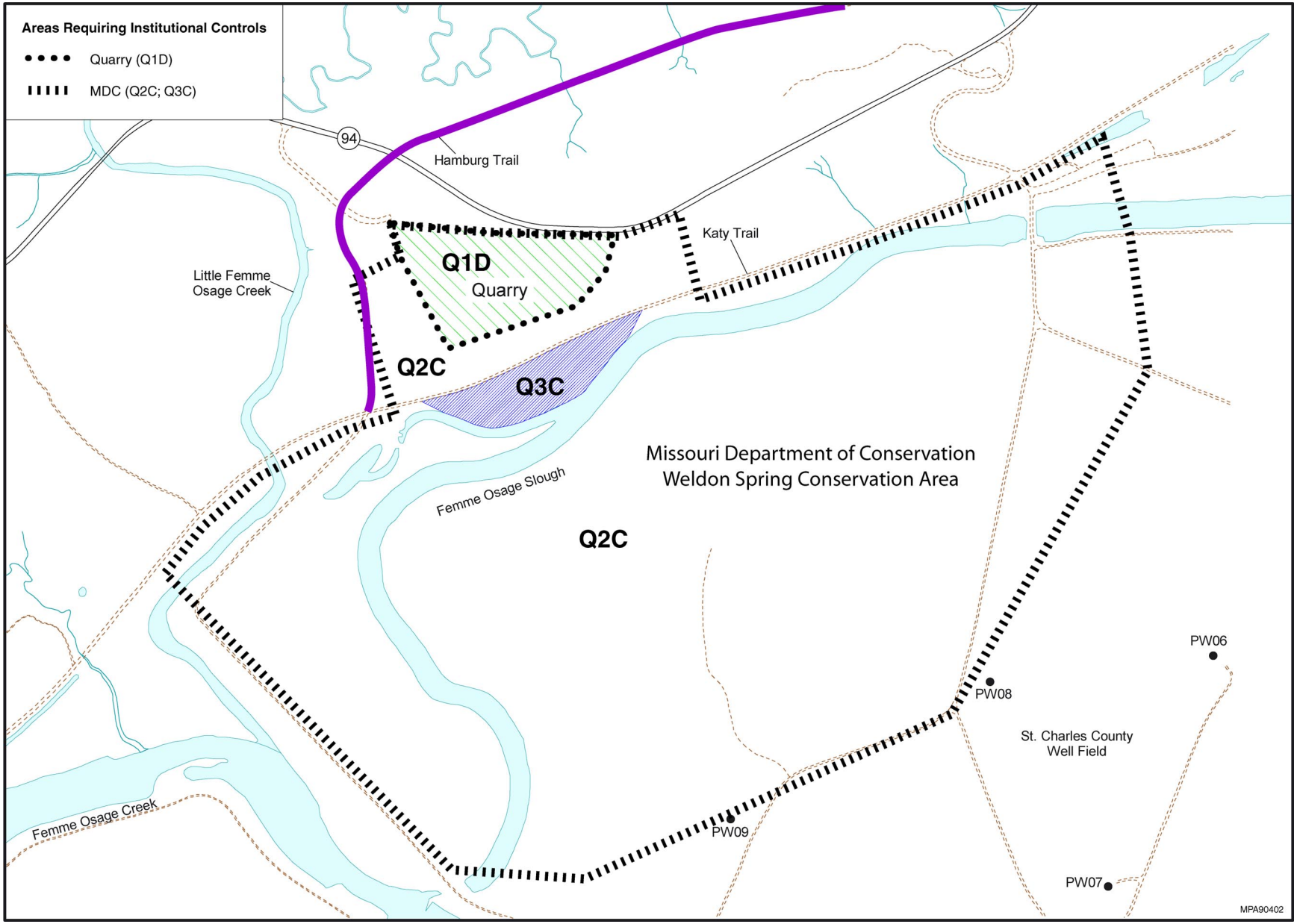

FIGURE 4.3 Institutional Control Areas for the Quarry Residuals Operable Unit

5 SCREENING AND EVALUATION OF POTENTIALLY APPLICABLE INSTITUTIONAL CONTROL MECHANISMS FOR THE WELDON SPRING SITE

The IC mechanisms identified for consideration were those included in EPA guidance (EPA 2000) and others that have been implemented and proven to be effective in supporting project activities at the Weldon Spring site. Impacted areas that require ICs are either Federally owned or State-owned properties; no privately owned areas are affected. The IC mechanisms were categorized into the four categories recommended by the EPA as follows: governmental controls, proprietary controls, enforcement tools, and informational devices.

These mechanisms were screened for their general applicability, effectiveness, and implementability. Results are presented in Tables 5.1 and 5.2. Their applicability to Federally owned properties was evaluated separately from their applicability to State-owned properties. Mechanisms retained in Tables 5.1 and 5.2 were evaluated further against the nine criteria specified in the NCP (EPA 1990) (Tables 5.3 and 5.4). (To facilitate reading this section, Tables 5.1 through 5.4 are presented after the text, at the end of this section.)

5.1 RESULTS OF SCREENING

For Federally owned properties, the following IC mechanisms were retained for further consideration in Section 5.2 (see Table 5.3):

- Governmental Controls: Federal ownership
  Notation on federal ownership record
  Missouri Well Drilling Regulations (10 CSR 23)[1]
- Proprietary Controls: Real estate use license/permit
  Easement
  Memorandum of understanding (MOU)
- Enforcement Tools: Administrative order
  Federal facility agreement (FFA)
  Post-closure federal facility agreement (PCFFA)
  Consent decree
- Informational Devices: Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques)
  Historical markers

[1] The Missouri Well Drilling Regulations require that wells in this area be cased to a minimum of 80 ft below the surface.

For State-owned properties, the following IC mechanisms were retained for further consideration in Section 5.2 (see Table 5.4):

- Governmental Controls: State ownership
  Zoning/local permit/ordinance
  Groundwater use restriction
  Missouri Well Drilling Regulations (10 CSR 23)
  Condemnation of property

- Proprietary Controls: Easement
  Covenant
  State use restriction
  Conservation easement
  Real estate use license/permit
  MOU

- Enforcement Tool: PCFFA

- Informational Devices: State Registry of Hazardous Waste Sites
  Historical markers

5.2 EVALUATION OF POTENTIALLY APPLICABLE IC MECHANISMS AGAINST NINE CRITERIA

Potentially applicable ICs retained in Section 5.1 were evaluated against the nine criteria specified in the NCP (EPA 1990). This evaluation is summarized in Table 5.3 for Federally owned properties and in Table 5.4 for State-owned properties. The nine criteria used in the evaluation are as follows:

1. *Overall protection of human health and the environment:* Addresses whether each mechanism provides adequate protection of human health and the environment.

2. *Compliance with applicable or relevant and appropriate requirements (ARARs):* Addresses whether all applicable or relevant and appropriate State and Federal laws and regulations are met.

3. *Long-term effectiveness and permanence:* Addresses the risk remaining at the OUs after remediation goals have been met.

4. *Reduction of toxicity, mobility, or volume:* Addresses the statutory preference for selecting alternatives that permanently and significantly reduce the toxicity, mobility, or volume of hazardous substances at a site. The evaluation focuses on the extent to which this is achieved by each mechanism.

5. *Short-term effectiveness:* Addresses the potential impacts to workers, the general public, and the environment during implementation of each mechanism.

6. *Implementability:* Addresses each mechanism's technical and administrative feasibility, considering the availability and reliability of resources or materials required during implementation, and the need to coordinate with other agencies.

7. *Cost:* Addresses both capital costs and annual operating and maintenance (O&M) costs, as well as the combined net present worth of each mechanism.

8. *State acceptance:* Addresses the statutory requirements for substantial and meaningful State involvement.

9. *Community acceptance:* Assesses the community's apparent preference for, or concerns about, the mechanisms being considered.

5.3 COMPARATIVE ANALYSIS OF POTENTIALLY APPLICABLE IC MECHANISMS

- Criterion 1: All the IC mechanisms evaluated provide administratively for overall protection of human health and the environment.

- Criterion 2: All of the mechanisms comply with ARARs by allowing restrictions to be implemented until remedial objectives are met.

- Criterion 4: None of the mechanisms reduce toxicity, mobility, or volume since no treatment is involved with this part of the remedy (i.e., implementation of ICs). Treatment technologies were considered, as appropriate, with the primary remedy components already completed for the site (e.g., removal and containment of site waste in the disposal cell).

- Criterion 5: Short-term effectiveness does not generally apply to the mechanisms being evaluated, since field or construction work is associated only with monitoring and inspections, with routine well installations or abandonment occurring as necessary. The implementation of IC mechanisms is primarily an administrative and enforcement function.

5.3.1 Federally Owned Properties

This section addresses (1) the Chemical Plant and the Quarry proper that are owned by the United States and are under DOE's jurisdictional control and (2) a portion of the adjacent

U.S. Army Weldon Spring Training Area. For these Federally owned properties, governmental control of ownership appears to provide the best assurance that the restrictions could "run with the land," and Federal ownership would therefore provide long-term effectiveness by keeping the restrictions in place for as long as needed. A notation on the federal ownership record has been issued by DOE and filed at the St. Charles County Recorders Office. This notation is effective as of November 12, 2003, with no expiration date. It is expected to provide a layer of effectiveness and durability to restrictions implemented at the Chemical Plant and Quarry proper.

For the U.S. Army Weldon Spring Training Area, an MOU would add a layer of effectiveness and durability for enforcing restrictions needed to support the MNA remedy for the GWOU. DOE already has an MOU with the DA that gives it access to Army property for sampling and monitoring purposes. This MOU has been effective for more than a decade and is expected to be just as effective for the additional time needed.

Implementability of the governmental control IC mechanisms at both the DOE and Army properties should not be an issue because both agencies have exclusive jurisdictional authority over their properties. The proprietary controls, enforcement tools, and informational devices may also be implementable, but these mechanisms are being considered as additional layers of controls to be implemented.

The main cost associated with all the mechanisms evaluated would be administrative, for preparing the paperwork to file with St. Charles County, as appropriate. The cost for monitoring and inspection would be the same for any of the applicable mechanisms. As federal landholding agencies, both DOE and the DA must comply with federal regulations, including CERCLA and the associated requirements set forth in ICs identified in RODs and FFAs, including the PCFFA. These requirements would be included in any real property transfers unless the RODs or other legal restrictions were changed.

The Missouri Department of Natural Resources (MDNR) has expressed a preference for layering several mechanisms to ensure durability. Other governmental and proprietary controls (e.g., real estate use permits or licenses, Missouri Well Drilling Regulations [10 CSR 23], and easements) and informational devices (e.g., Interpretive Center, prairie, native plant garden, ramp, and platform, plaques, and historical markers) are good controls that could provide additional layers that would contribute to the overall effectiveness and durability of the restrictions imposed.

MDNR has also expressed interest in becoming a signatory party to a tri-party (DOE, EPA, and State) PCFFA that would allow it to be the support regulatory agency to the EPA. Discussions are currently being held among the three agencies to finalize the details of such an agreement.

The community is expected to be favorable to any layers of ICs that are identified as being effective for the long term and that "run with the land"; thus, future land owners would also be aware of and adhere to the restrictions. The community has also expressed a preference for implementing multiple layers of ICs to ensure the durability of the restrictions, as indicated by the public's response to this topic at public meetings and workshops held by DOE. A series of

public meetings or focus area work sessions (starting in October 2002) have been held to discuss site long-term stewardship issues, including ICs that are being planned. The focus session held on December 5, 2002, specifically included a presentation of ICs being considered for the site as of that date. The ICs described in this report are consistent with those presented at the focus work session.

5.3.2 State-Owned Properties

As for Federally owned properties, continued ownership by the government (i.e., the State entities involved) would provide an effective control for the long term. Proprietary controls, such as covenants or easements, which would be entered into by DOE and the State entities (i.e., Missouri Department of Conservation [MDC], MDNR Parks, or MoDOT) and filed with St. Charles County, would provide continued commitment by the parties involved to enforce the restrictions. The covenants or easements would contain language describing the specific restrictions required. This information in the proprietary controls would be available to notify future owners, as appropriate, of the restrictions that are in place. These are fairly common instruments that have been used in the past and have proven to be effective, implementable, durable, and enforceable.

Implementability of covenants or easements is not expected to be an issue, since the State entities have expressed a preference for these types of agreements as a layer of control on State properties.

Costs are mainly those associated with the administrative paperwork and with the monitoring and inspections that would be performed by DOE. MDC has indicated that it might require compensation as part of the agreement that allows DOE to impose restrictions on its property. Additional costs, including costs for real estate title research and commitments, real estate appraisals, and land surveys for acquisition of any additional Federal real property interests, would be borne by DOE.

As for Federally owned properties, MDNR has expressed a preference for layering several mechanisms to ensure durability. Adherence to the Missouri Well Drilling Regulations and the existence of the Interpretive Center, historical markers, and other informational devices provide this durability.

MDNR has also expressed interest in becoming a signatory party to a tri-party (DOE, EPA, and State) PCFFA that would allow it to be the support regulatory agency to the EPA for enforcing restrictions at these properties.

As for Federally owned properties, the community is expected to be favorable to implementing multiple layers of ICs that would be effective for the long term, enforceable, and durable.

TABLE 5.1 Screening to Identify Potentially Applicable Institutional Control Mechanisms for Federally Owned Property at the Weldon Spring Site

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
Governmental Controls *Controls use the regulatory authority of a governmental entity (Federal, State, local) to impose restrictions on the property under its jurisdiction.*	**Federal Ownership** Article I, Sec. 8, Clause 17 of the U.S. Constitution gives the Federal government authority over purchased land within the boundaries of a State, provided that the State legislature consents to the purchase and cedes State jurisdiction over the purchased property. States may cede exclusive or partial jurisdiction. In RSMo, Chapter 12, "Acquisition of Land by the United States Government," the Missouri legislature has consented to Federal purchases of land for purposes such as the purpose for which the Weldon Spring site was acquired.	Retained	Missouri has ceded exclusive jurisdiction to the Federal government with respect to Federally owned properties at the Weldon Spring site. Hence, the Federal government has exclusive jurisdiction over these properties, and DOE has authority to impose and enforce use restrictions on the properties that it owns (i.e., the Chemical Plant and Quarry). Similarly, the DA has such authority on property that it owns (i.e., the Weldon Spring Training Area). Hence, as long as DOE owns the Chemical Plant and Quarry properties, DOE will be able to impose and enforce use restrictions on these properties to support the final remedy. In addition, the DA has exclusive jurisdiction on its property (Weldon Spring Training Area), and arrangements can be made between DOE and DA regarding the imposition and enforcement of use restrictions on that property (see Category II, "Proprietary Controls").	Chemical Plant/CPOU/GWOU; Weldon Spring Quarry/QROU.
	Notation on Federal Ownership Record Notations are restrictions that are documented in the ownership record that would be conveyed with the property if ownership was transferred.	Retained	This mechanism is expected to effectively "run with the land." It was implemented by DOE when it placed the notation on the ownership records for the Chemical Plant and the Quarry that are filed with St. Charles County.	Chemical Plant/CPOU/GWOU; Weldon Spring Quarry/QROU.

TABLE 5.1 (Cont.)

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
	Zoning RSMo § 64.090 grants the county commissions in Missouri the power to zone areas within their boundaries that are not incorporated or used for certain agricultural or forestry purposes. It authorizes the counties to designate that land be used for specific purposes.	Not retained	The Federal government has exclusive jurisdiction due to Federal ownership. Local zoning ordinances are not applicable to any activities that are foreseeable on DOE-owned land at the Weldon Spring site or on the Weldon Spring Training Area property owned by the Army. Hence, zoning would not be an effective mechanism for imposing use restrictions on the Chemical Plant and Quarry properties or the Weldon Spring Training Area property.	Not applicable
	Local Permit This is a special permit that may be used by a local government to impose specific requirements with which compliance must be verified before an activity will be authorized.	Not retained	The Federal government has exclusive jurisdiction due to Federal ownership. Local permitting requirements are not applicable to any activities that are foreseeable on DOE-owned land at the Weldon Spring site or on the Weldon Spring Training Area property owned by the Army. Hence, local permitting requirements would not be an effective mechanism for imposing use restrictions on the Chemical Plant and Quarry properties or the Weldon Spring Training Area property.	Not applicable
	Local Ordinance This is a control that a local government may place on the access to certain areas or on their use in order to protect public health and safety.	Not retained	The Federal government has exclusive jurisdiction due to Federal ownership. Local ordinances are not applicable to any activities that are foreseeable on DOE-owned land at the Weldon Spring site or on the Weldon Spring Training Area property owned by the Army. Hence, local ordinances would not be an effective mechanism for imposing use restrictions on the Chemical Plant and Quarry properties or the Weldon Spring Training Area property.	Not applicable

TABLE 5.1 (Cont.)

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
	Groundwater Use Restriction This restriction is directed at limiting or prohibiting certain uses of groundwater that may include limitations or prohibitions on well drilling.	Not retained	The Federal government has exclusive jurisdiction due to Federal ownership. Groundwater use restrictions in Missouri would not apply to groundwater on the Weldon Spring Chemical Plant and Quarry properties owned by DOE or on the Weldon Spring Training Area property owned by the Army. Hence, groundwater use restrictions, if they exist in Missouri, would not be an effective mechanism for imposing use restrictions on the Chemical Plant and Quarry properties or the Weldon Spring Training Area property, unless DOE and the Army elected to voluntarily comply. Preliminary investigations indicate that Missouri has no existing groundwater use restrictions that could potentially be applied at the Weldon Spring site.	Not applicable

TABLE 5.1 (Cont.)

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
	Missouri Well Drilling Regulations (10 CSR 23) These protect groundwater by setting standards for the water well drilling industry and imposing duties on it.	Retained	The Missouri Well Drilling Regulations (10 CSR 23) that are in effect require well drillers to be permitted, establish standards for well construction, call for certification forms to be filed when new wells are installed, and call for registration forms to be filed when existing wells are plugged or repaired. The durability of groundwater use controls imposed by DOE at the Weldon Spring site will be enhanced by this state regulatory program because the regulations will ensure that qualified well drillers are available if additional groundwater monitoring wells are needed. In addition, DOE may be able to use state well certification and registration records as one method for checking compliance with groundwater use controls at the Weldon Spring site. For these reasons, DOE will require the Weldon Spring site to comply with the Missouri Well Drilling Regulations, even though (on the basis of the assumption that the Federal government has exclusive jurisdiction due to Federal ownership) such state regulations do not apply on DOE-owned land or on the Weldon Spring Training Area property owned by the Army.	Chemical Plant/CPOU/GWOU; Weldon Spring Quarry/QROU.
	Condemnation of Property This is taking over the title of a property by condemning it under a government entity's eminent domain authority.	Not retained	The Federal government has exclusive jurisdiction due to Federal ownership. State and local condemnation authority cannot be applied to DOE-owned land at the Weldon Spring site or on the Weldon Spring Training Area property owned by the Army. Hence, condemnation by a State or local government would not be an effective mechanism for imposing use restrictions on the Chemical Plant and Quarry properties or the Weldon Spring Training Area property.	Not applicable

TABLE 5.1 (Cont.)

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
Proprietary Controls *These controls are based on private property law and are designed to restrict or limit use of property.*	**Real Estate Use License/Permit** This provides permission to enter land belonging to permitter or licensor.	Retained	DOE could agree to grant real estate permits or licenses on the Chemical Plant and Quarry properties. DOE has already issued a real estate use permit to Lindenwood University (a local entity), which provides permission for use of areas within the Chemical Plant property.	Former site administrative building now used by Lindenwood University for classrooms/CPOU.
	Easement An easement is a property right conveyed by a landowner to another party that gives the second party rights with regard to use of the land. An affirmative easement allows the holder to enter upon or use the landowner's property for a particular purpose. A negative easement imposes limits on how the landowner can use his or her own property.	Retained	The Federal government has exclusive jurisdiction due to Federal ownership. No state or local authority could force easements to be placed on the DOE-owned land at the Weldon Spring site or on the Weldon Spring Training Area property owned by the Army. On DOE-owned land, DOE, as the lead agency at a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) site, expects to employ mechanisms other than easements to restrict property use and provide access, when desirable, to non-DOE entities, including regulatory agencies that may need to enter the property to implement a remedy. Should DOE transfer ownership of the Chemical Plant or Quarry properties, DOE may opt to employ easements for imposing use restrictions on the new owners.	Chemical Plant/CPOU/GWOU; Weldon Spring Quarry/QROU.

TABLE 5.1 (Cont.)

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
	Covenant A covenant is an agreement between one landowner and another, made in connection with a conveyance of property, to use or refrain from using the property in a certain manner. Covenants are closely related to equitable servitudes, but whereas equitable servitudes are enforceable by injunction or specific performance, covenants are enforceable by the award of monetary damages.	Not retained	The Federal government has exclusive jurisdiction due to Federal ownership. No state or local authority could force covenants to be placed on the DOE-owned land at the Weldon Spring site or on the Weldon Spring Training Area property owned by the Army. Should DOE transfer ownership of the Chemical Plant or Quarry properties, DOE may opt to employ covenants for imposing use restrictions on the transferred property. However, in the absence of a property transfer, covenants would not be an appropriate mechanism for imposing use restrictions on the Chemical Plant and Quarry properties or the Weldon Spring Training Area property.	Not applicable
	Equitable Servitude Closely related to covenants, equitable servitudes arose when courts of equity enforced agreements that did not meet all of the formal requirements of covenants. Whereas covenants are enforceable by the award of monetary damages, equitable servitudes are enforceable by injunction or specific performance.	Not retained	The Federal government has exclusive jurisdiction due to Federal ownership. No state or local authority could force an equitable servitude to be placed on the DOE-owned land at the Weldon Spring site or on the Weldon Spring Training Area property owned by the Army. Should DOE transfer ownership of the Chemical Plant or Quarry properties, DOE may opt to employ an equitable servitude for imposing use restrictions on the transferred property. However, in the absence of a property transfer, an equitable servitude would not be an appropriate mechanism for imposing use restrictions on the Chemical Plant and Quarry properties or the Weldon Spring Training Area property. Furthermore, since an equitable servitude is a promise to either do or not do something on land for the benefit of that land, an equitable servitude would not be an appropriate mechanism for use by DOE to obtain a right of access to the Army-owned Weldon Spring Training Area property for the purpose of implementing a remedy.	Not applicable

TABLE 5.1 (Cont.)

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
	Reversionary Interest A reversionary interest is created when a landowner deeds property to another, but the deed specifies that the property will revert to the original owner under specified conditions. It places a condition on the transferee's right to own and occupy the land. If the condition is violated, the property is returned to the original owner or the owner's successors.	Not retained	The Federal government has exclusive jurisdiction due to Federal ownership. No state or local authority could force a reversionary interest to be placed on the DOE-owned land at the Weldon Spring site or on the Weldon Spring Training Area property owned by the Army. Should DOE transfer ownership of the Chemical Plant or Quarry properties, DOE may opt to employ a reversionary interest. However, in the absence of a property transfer, a reversionary interest would not be an appropriate mechanism for imposing use restrictions on the Chemical Plant and Quarry properties or the Weldon Spring Training Area property. Furthermore, since a reversionary interest can be created only when a landowner deeds property to another person, a reversionary interest would not be an appropriate mechanism for use by DOE to obtain a right of access to the Army-owned Weldon Spring Training Area property for the purpose of implementing a remedy.	Not applicable

TABLE 5.1 (Cont.)

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
	State Use Restriction This is a state statute that gives the owners of contaminated property the authority to establish use restrictions specifically for the contaminated property.	Not retained	The State has implemented a Voluntary Cleanup Program that allows contaminated properties to be cleaned with State oversight. When a property is cleaned under this program and contaminants that exceed cleanup levels are left on the site, a restrictive covenant must be placed in the property chain of title to ensure that future use of the land remains consistent with the assumptions used for establishing cleanup levels and that engineering controls are properly installed and maintained. An integral part of this restrictive covenant is an easement giving the State access to the property for the duration of the covenant for the purpose of inspections. However, to qualify for the Missouri Voluntary Cleanup Program, the property must not be an NPL site. Because the Weldon Spring site is an NPL site, the Missouri Voluntary Cleanup Program is not available to DOE for imposing use restrictions on the Chemical Plant and Quarry properties. This program also is not available for imposing use restrictions on the Weldon Spring Training Area owned by the Army.	Not applicable
	Conservation Easement This is a statute adopted by some States that establishes easements to conserve and protect property and natural resources.	Not retained	The Federal government has exclusive jurisdiction due to Federal ownership. No state authority could establish a conservation easement on the DOE-owned land at the Weldon Spring site or on the Weldon Spring Training Area property owned by the Army. Hence, conservation easements would not be an effective mechanism for imposing use restrictions on the Chemical Plant and Quarry properties or the Weldon Spring Training Area property.	Not applicable
	Memorandum of Understanding (MOU)	Retained	An MOU between the Department of the Army and DOE is currently in effect. DOE could also enter into an MOU with the State on issues of interest.	GWOU

TABLE 5.1 (Cont.)

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
Enforcement Tools (with IC components) *Federal enforcement tools prohibit a party from using land in certain ways or from carrying out certain activities at a specified property.*	**Administrative Order** This order directly restricts the use of property by a named party.	Retained	The U.S. Environmental Protection Agency (EPA) has authority to issue administrative orders to compel response actions at CERCLA sites.	Chemical Plant proper/CPOU/GWOU; Quarry proper/QROU.
	Federal Facility Agreement (FFA)	Retained	The existing FFA identifies the roles and responsibilities of all signatory parties (e.g., DOE and EPA) for response action at the site.	All OUs
	Post-Closure Federal Facility Agreement (PCFFA)	Retained	A PCFFA would bind all signatory parties (e.g., DOE, EPA, and the State) to implement, monitor, and enforce restrictions needed to support site remedies that have been implemented.	All OUs
	Consent Decree A consent decree is signed by a judge and documents the settlement of an enforcement case. Similar to an administrative order, it is used to specify restrictions on use of land by the settling party.	Retained	The EPA has authority to request that the U.S. Department of Justice enter into a consent decree or seek a judicial order at a CERCLA site.	Chemical Plant proper/CPOU/GWOU; Quarry proper/QROU.
Informational Devices *These tools, which often rely on property record systems, provide public information about risks from contamination.*	**Deed Notice** This commonly refers to a nonenforceable, purely informational document filed in public land records that notes important information about the property.	Not retained	Until DOE disposes of the property, it will include information on the use restrictions on all cadastral records associated with the land. Upon the transfer of property, DOE could include a deed notice. The mechanism is not retained because deed notices have limited value.	Not applicable
	State Registry of Hazardous Waste Sites Such registries contain elements that can be used as ICs.	Not retained	Since the Weldon Spring Site was not included in the registry before site remediation was performed, it does not seem justifiable to place it on the registry now, especially considering that the land is federally controlled and its current condition is protective and consistent with reasonably foreseeable land uses.	Not applicable

TABLE 5.1 (Cont.)

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
	Advisory This is a warning that provides notice to potential users of land, surface water, or groundwater of some existing or impending risk associated with their use. Advisories are usually issued by public health agencies at the Federal, State, or local level.	Not retained	Advisories are commonly issued for contaminated media that are easily encountered (e.g., surface water, fish, and game). Because the contaminated media at the Weldon Spring site include groundwater and some soil, which are not so easily accessible, and because use of the DOE-owned land will be restricted to DOE-approved uses, an advisory does not seem necessary.	Not applicable
	Interpretive Center (and Prairie, Native Plant Garden, Ramp, and Platform, with Plaques)	Retained	These informational devices, which are located on DOE land, can be an effective mechanism for communicating the history and status of the site area. DOE expects to maintain the Interpretive Center, prairie, native plant garden, ramp, and platform (with plaques) as part of enforcing the IC protocol.	Entire site/all OUs
	Historical Markers	Retained	Historical markers can serve as reminders of the status of the area. They can be maintained in conjunction with the Interpretive Center.	Chemical Plant Proper/CPOU; Hamburg Trail/CPOU and QROU.

[a] Based on the four categories per EPA guidance (EPA 2000).

[b] Mechanisms under each category that have been identified for consideration.

[c] Mechanisms retained for further evaluation against the nine criteria specified in the NCP (EPA 1990).

[d] Preliminary evaluation focused on applicability, effectiveness, and implementability.

[e] OUs where mechanism might be applied. CPOU = Chemical Plant Operable Unit; QROU = Quarry Residuals Operable Unit; GWOU = Groundwater Operable Unit.

TABLE 5.2 Screening to Identify Potentially Applicable Institutional Control Mechanisms for State-Owned Property at the Weldon Spring Site

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
Governmental Controls *Controls use the regulatory authority of a governmental entity (Federal, State, local) to impose restrictions on the property under its jurisdiction.*	**State Ownership**	Retained	Although DOE does not have any control over State of Missouri-owned land (State land), this mechanism is retained because State ownership can contribute to the effectiveness and durability of land use restrictions because of the powers the State has to control use of its land.	Buffer area for groundwater attenuation/GWOU; reduction zone area/QROU
	Zoning Zoning is used by local governments to allow land to be used for a specific purpose.	Retained	DOE does not have the authority to apply this mechanism on State land. It is retained as a possible IC because the State may allow its property to be zoned in ways that are compatible with use restrictions.	Buffer area for groundwater attenuation/GWOU; reduction zone area/QROU
	Local Permit This special permit may be used by a local government to impose specific requirements with which compliance must be verified before an activity will be authorized.	Retained	DOE does not have the authority to require that local permits be imposed or that the State adhere to permit requirements on State land. It is retained as a possible IC because there may be local permit requirements that could contribute to the durability of the use restrictions and because the State may be or agree to be bound by those permit requirements.	Buffer area for groundwater attenuation/GWOU; reduction zone area/QROU
	Ordinance This is a control that a State or local government may place on the access to certain areas or on their use in order to protect public health and safety.	Retained	DOE cannot force the State or local governments to develop an ordinance that would restrict use of State land. However, any existing ordinances that apply to the conservation areas or the MoDOT Highway Maintenance Facility and restrict use in ways that are compatible with the use restrictions planned for the Weldon Spring Site could contribute to the durability of the land use restrictions.	Buffer area for groundwater attenuation/GWOU; reduction zone area/QROU
	Groundwater Use Restriction This restriction is directed at limiting or prohibiting certain uses of groundwater that may include limitations or prohibitions on well drilling.	Retained	If the State has a groundwater restriction program and if it applies to State land, the program could contribute to the durability of the land use controls because it could provide another layer of protection against groundwater use on State land.	Groundwater attenuation area/GWOU; groundwater monitoring area/QROU

TABLE 5.2 (Cont.)

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
	Missouri Well Drilling Regulations (10 CSR 23) They protect groundwater by setting standards for the water well drilling industry and imposing duties on it.	Retained	If the State is bound to comply with the Missouri Well Drilling Regulations (10 CSR 23) (i.e., if the State must use permitted well drillers), and if permitted well drillers are informed of lands in which wells cannot be drilled, this mechanism can contribute to the effectiveness of the ban on groundwater use.	Groundwater attenuation area/GWOU; groundwater monitoring area/QROU
	Condemnation of Property This is taking over the title of a property by condemning it under a government entity's eminent domain authority.	Retained	This option is available for a Federal government entity such as DOE to use to take over the other properties per its eminent domain authority. In such a case, the Federal government would own the land and impose and enforce use restrictions under its authority.	Groundwater attenuation area/GWOU; reduction zone area and groundwater monitoring area at the Quarry/QROU
Proprietary Controls *These controls are based on private property law and are designed to restrict or limit use of property.*	**Easement** An easement is a property right conveyed by a landowner to another party that gives the second party rights with regard to use of the land. An affirmative easement allows the holder to enter upon or use the landowner's property for a particular purpose. A negative easement imposes limits on how the landowner can use his or her own property.	Retained	DOE can hold an easement on State-owned (MDC, MoDOT) properties if the landowner conveys the right. Easements could be effectively implemented at the Weldon Spring site because the nature and scope of the easements could be made clear and because the parties that are involved are known; conditions that support enforceability and durability of the use restrictions exist.	Groundwater attenuation area/GWOU; reduction zone area and groundwater monitoring area at the Quarry/QROU

TABLE 5.2 (Cont.)

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
	Covenant A covenant is an agreement between one landowner and another, made in connection with a conveyance of property, to use or refrain from using the property in a certain manner. Covenants are closely related to equitable servitudes. Whereas equitable servitudes are enforceable by injunction or specific performance, covenants are enforceable by the award of monetary damages.	Retained	Cleanup Levels for Missouri (CALM) includes restrictive covenants as mechanisms for providing notification that contaminants remain on a site at levels determined to exceed unrestricted use concentrations. This mechanism is retained as a possible IC if State land is subject to CALM because it would inform future landowners of the use restrictions if the State were to ever dispose of the land to private parties.	Groundwater attenuation area/GWOU; reduction zone area and groundwater monitoring area at the Quarry/QROU
	Equitable Servitude Closely related to covenants, equitable servitudes arose when courts of equity enforced agreements that did not meet all of the formal requirements of covenants. Whereas covenants are enforceable by the award of monetary damages, equitable servitudes are enforceable by injunction or specific performance.	Not retained	Should the State decide to dispose of its property, an equitable servitude could be found at some point and become enforceable. However, since other mechanisms such as easements and covenants provide more assurance of longevity and predictability, equitable servitude is not retained here.	Not applicable

TABLE 5.2 (Cont.)

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
	Reversionary Interest A reversionary interest is created when a landowner deeds property to another, but the deed specifies that the property will revert to the original owner under specified conditions. It places a condition on the transferee's right to own and occupy the land. If the condition is violated, the property is returned to the original owner or the owner's successors.	Not retained	DOE could not force the State to attach a reversionary interest when the State disposes of State land.	Not applicable
	State Use Restriction This is a State statute that gives the owners of contaminated property the authority to establish use restrictions specifically for the contaminated property.	Retained	CALM includes restrictive covenants as mechanisms for providing notification that contaminants remain on a site at levels determined to exceed unrestricted use concentrations. This mechanism is retained as a possible IC if State land is subject to CALM because it would inform future land owners of the use restrictions if the State were to ever dispose of the land to a private party.	Groundwater attenuation area/GWOU; reduction zone area and groundwater monitoring area at the Quarry/QROU
	Conservation Easement This is a statute adopted by some States that establishes easements to conserve and protect property and natural resources.	Retained	If the State of Missouri would adopt a conservation easement statute, it could include its own land under a conservation easement, and the terms of the easement could (depending on how they are written) contribute to the durability of the land use restrictions.	Groundwater attenuation area/GWOU; reduction zone area and groundwater monitoring area at the Quarry/QROU
	Real Estate Use License/Permit This provides permission to enter land belonging to permitter or licensor.	Retained	DOE cannot force the State to issue DOE a license or permit to enter State land. Permits and licenses are retained as possible mechanisms because they are available and could contribute to the durability of the land use restrictions.	Entire site/All OUs
	Memorandum of Understanding (MOU)	Retained	The DOE and the State could enter into MOUs regarding topics of interest.	Entire site/All OUs

TABLE 5.2 (Cont.)

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
Enforcement Tools (with IC components) *Federal enforcement tools prohibit a party from using land in certain ways or from carrying out certain activities at a specified property.*	**Administrative Order** This order directly restricts the use of property by a named party.	Not retained	DOE could not issue an administrative order to the state related to DOE-generated contamination.	Not applicable
	Consent Decree A consent decree is signed by a judge and documents the settlement of an enforcement case. Similar to an administrative order, it is used to specify restrictions on use of land by the settling party.	Not retained	DOE cannot force the State to be a party to a consent decree.	Not applicable
	Post-Closure Federal Facility Agreement (PCFFA)	Retained	A PCFFA would bind all signatory parties (e.g., DOE, EPA, and the State) to implement, monitor, and enforce restrictions needed to support site remedies that have been implemented.	All IC areas/CPOU, QROU, GWOU
Informational Devices *These tools, which often rely on property record systems, provide public information about risks from contamination.*	**Deed Notice** This commonly refers to a nonenforceable, purely informational document filed in public land records that notes important information about the property.	Not retained	DOE cannot force the State to include notices of land use restriction in the records that the State maintains on its real property. This mechanism is not retained as a possible IC because such a record has limited effectiveness and durability.	Not applicable
	State Registry of Hazardous Waste Sites Such registries contain elements that can be used as ICs.	Retained	DOE cannot force the State to include on its registry the State land for which land use restrictions are appropriate. The mechanism is retained because it could contribute to the durability of the use restrictions by communicating information about the use restrictions if the State records its property on the registry.	Groundwater attenuation area/GWOU; groundwater monitoring area/QROU

TABLE 5.2 (Cont.)

Category[a]	Mechanism[b]	Screening Result[c]	Comment[d]	Pertinent Site Area/OU[e]
	Advisory This is a warning that provides notice to potential users of land, surface water, or groundwater of some existing or impending risk associated with their use. Advisories are usually issued by public health agencies at the Federal, State, or local level.	Not retained	Advisories are more commonly issued for contaminated media that are more easily encountered (e.g., surface water, fish, and game). Because the contaminated media at the Weldon Spring site include groundwater and some soil, an advisory does not seem necessary.	Not applicable
	Interpretive Center	Not retained	An Interpretive Center, located on Federal property, was retained for evaluation as an option for Federally owned properties. Another such center is probably not needed on the State land.	Not applicable
	Historical Markers	Retained	Historical markers can serve as reminders of the status of the area. They can be maintained in conjunction with the Interpretive Center.	Hamburg Trail/QROU

[a] Since this document deals with the ICs potentially available to DOE, this table was compiled from the perspective of ICs that DOE could apply to State of Missouri-owned land. It is understood that the State of Missouri could apply many of the ICs described in Table 5.2 to its own land. Those ICs will be effective and implementable to the extent they are adopted and enforced by the State.

[b] Based on the four categories per EPA guidance (EPA 2000).

[c] Mechanisms under each category that have been identified for consideration.

[d] Mechanisms retained for further evaluation against the nine criteria specified in the NCP (EPA 1990).

[e] Preliminary evaluation focused on applicability, effectiveness and implementability.

[f] Site areas and OUs where mechanism is applicable. CPOU = Chemical Plant Operable Unit; QROU = Quarry Residuals Operable Unit; GWOU = Groundwater Operable Unit.

TABLE 5.3 Evaluation of Institutional Control Mechanisms Applicable to Federally Owned Property against Nine Criteria

	Governmental Controls			Proprietary Controls		
Criterion	**Federal Ownership**	**Notation on Federal Ownership Record**	**Missouri Well Drilling Regulations (10 CSR 23)**	**Real Estate Use License/Permit**	**Easement**	**Memorandum of Understanding (MOU)**
1. Overall protection of human health and the environment	Provides protection by maintaining the disposal cell and buffer area and by restricting inappropriate land uses at the Chemical Plant, a portion of the adjacent Army property, and the Quarry proper until residual soil and/or groundwater contaminant concentrations allow for unrestricted use and unlimited exposure.	Provides protection by maintaining the disposal cell and buffer area and by restricting inappropriate land uses at the Chemical Plant and the Quarry proper until residual soil and/or groundwater contaminant concentrations allow for unrestricted use and unlimited exposure.	Provides protection by controlling well drilling activities in the contaminated shallow aquifer until concentrations decrease to cleanup standards.	Provides protection by authorizing specific land use by other entities when needed and only if deemed protective.	Provides protection by granting DOE or another party the right to enter certain property within the Weldon Spring site for a specific purpose deemed to be necessary and protective.	Provides protection through the activities (e.g., monitoring, enforcement, reporting) it addresses.
2. Compliance with ARARs	DOE ownership (Chemical Plant and Quarry proper) and DA ownership (Army training area) are expected to allow the site remedies to comply with ARARs by providing needed restrictions while remedies are being completed (GWOU) and after the remedies have been completed (CPOU and QROU).	DOE ownership (Chemical Plant and Quarry proper) is expected to allow the site remedies to comply with ARARs by providing needed restrictions while the remedies are being completed (GWOU) and after the remedies have been completed (CPOU and QROU).	This control helps ensure that well drilling activities will not interfere with the attenuation of groundwater contaminants to comply with ARARs or cleanup standards.	This control restricts land uses to those that are consistent with allowing the remedies to comply with ARARs established in the RODs (e.g., restrict land uses to allow the attenuation of groundwater contaminants to comply with ARARs or cleanup standards).	This control restricts property use or provides access for the purpose of implementing a remedy. As such, it furthers compliance with ARARs. It also allows for restrictions on land and groundwater use until ARARs are met.	This control helps ensure the effectiveness of the restrictions on land and groundwater use until ARARs are met.
3. Long-term effectiveness and permanence	Long-term effectiveness is assured through routine and thorough monitoring and inspections by DOE, with participation from the EPA and State. The Chemical Plant and Quarry proper have been in DOE jurisdictional authority effectively for the last 60 years.	A notation has been included by DOE to further communicate and document the restrictions being implemented. This notation should effectively run with the land to provide the durability for enforcing the restrictions.	Long-term effectiveness is assured through routine monitoring and inspections by DOE, with participation from the EPA and State. This control allows appropriate restrictions to be maintained until cleanup standards are met. This mechanism would be effective given that it is a State code and well drillers are required to have permits, which are a means of enforcement.	Long-term effectiveness is assured through routine monitoring and inspections by DOE, with participation from the EPA and State. This control allows appropriate restrictions to be maintained until cleanup standards are met.	Long-term effectiveness is assured through enforceability by the holder of the easement in the State court having jurisdiction over the property's location.	This control contributes to the long-term effectiveness of land use restrictions.
4. Reduction of toxicity, mobility, or volume through treatment	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.
5. Short-term effectiveness	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.

TABLE 5.3 (Cont.)

Criterion	Governmental Controls			Proprietary Controls		
	Federal Ownership	Notation on Federal Ownership Record	Missouri Well Drilling Regulations (10 CSR 23)	Real Estate Use License/Permit	Easement	Memorandum of Understanding (MOU)
6. Implementability	Access and use restrictions for the Chemical Plant and Quarry proper are implementable by DOE because it owns the properties and has exclusive jurisdictional authority to implement the needed restrictions.	A notation has been included for the Chemical Plant and Quarry proper.	This control covers the Chemical Plant, Army property, and the Quarry proper. The State requires well drilling contractors to obtain permits and file reports. Only compliant contractors would be selected to engage in well drilling activities at the Weldon Spring site.	DOE has utilized this control to allow state entities to access DOE properties.	Easements are commonly used proprietary control mechanisms. DOE has created and obtained them on prior occasions at the Weldon Springs site.	An MOU can be implemented through agreement by all involved parties.
7. Cost	Only costs expected are for monitoring and inspection ($20,900).	Only costs expected are for monitoring and inspection ($20,900).	Only costs expected are for monitoring and inspection ($20,900).	Only costs expected are for monitoring and inspection ($20,900).	Costs expected are those associated with administrative activities needed to put the easement agreement in place and costs for monitoring and inspection ($20,900).	Costs are expected to be minimal, depending on terms of the MOU, and in addition to costs for monitoring and inspection ($20,900).
8. State acceptance	The State is not confident that ownership, as the sole means of IC, will be durable and provide for long-term effectiveness. The State has expressed preference for layering several IC mechanisms.	The State is not confident that notation, as the sole means of IC, will be durable and provide for long-term effectiveness. The State has expressed preference for layering several IC mechanisms.	The State does not consider this control to be effective on its own. It has expressed preference for layering several IC mechanisms.	DOE has used this control in the past and expects it to be acceptable to implement as one of the IC layers. The State has expressed preference for layering several IC mechanisms.	This control is expected to be an acceptable mechanism to implement as one of the IC layers. The State has expressed preference for layering several IC mechanisms.	This control is expected to be an acceptable mechanism to implement as one of the IC layers. The State has expressed preference for layering several IC mechanisms.
9. Community acceptance	The community supports continued ownership by DOE as a means of maintaining the current level of protection. However, at several public meetings when ICs were discussed, the public had expressed concern over funding mechanisms to support continued maintenance of the site.	The community is expected to be favorable to this control to be layered with continued ownership. The community has been receptive to the need for implementing ICs, as indicated at past public meetings and workshops held by DOE on this topic.	The community is subject to this code already for its own properties and is expected to support implementation of this control for the Weldon Spring site. The community has been receptive to the need for implementing ICs, as indicated at past public meetings and workshops held by DOE on this topic.	The community has not objected to the use of this control in the past. The community has been receptive to the need for implementing ICs, as indicated at past public meetings and workshops held by DOE on this topic.	The community has not objected to the use of this control in the past. The community has been receptive to the need for implementing ICs, as indicated at past public meetings and workshops held by DOE on this topic.	The community has not objected to the use of this control in the past. The community has been receptive to the need for implementing ICs, as indicated at past public meetings and workshops held by DOE on this topic.

TABLE 5.3 (Cont.)

Criterion	Enforcement Tools				Informational Devices	
	Administrative Order	Federal Facility Agreement (FFA)	Post-Closure Federal Facility Agreement (PCFFA)	Consent Decree	Interpretive Center (and Prairie, Native Plant Garden, Ramp, and Platform, with Plaques)	Historical Markers
1. Overall protection of human health and the environment	Provides protection by permitting restrictions to be imposed where needed.	Provides protection by joint EPA and DOE enforcement of the restrictions.	Provides protection by joint state, EPA, and DOE enforcement of the restrictions by virtue of this agreement.	Provides protection by permitting restrictions to be imposed where needed.	Provides protection by communicating the history and status of site properties.	Provide protection by communicating the status of the property.
2. Compliance with ARARs	This tool allows administrative action to be taken to ensure that groundwater is not used until cleanup standards are met.	This tool allows regulatory and administrative actions to be taken to ensure that restrictions are appropriately implemented and effective and durable throughout the time they are needed.	This tool allows regulatory and administrative actions to be taken to ensure that restrictions are appropriately implemented and effective and durable throughout the time they are needed.	This tool allows administrative actions to be taken to ensure that groundwater is not used until cleanup standards are met.	The information provided by the Interpretive Center and other devices allows time for the remedies to comply with ARARs.	The information provided by the markers gives warnings that should deter interference with ICs and allow time for the remedies to comply with ARARs.
3. Long-term effectiveness and permanence	Long-term effectiveness is assured through routine monitoring and inspections by DOE, with participation from the EPA and State. This tool allows administrative actions to be taken to ensure that groundwater is not used until cleanup standards are met.	The agreement is expected to be effective for the long term as long as it is in place. This tool allows appropriate restrictions to be maintained until cleanup standards are met.	The tri-party agreement is expected to be effective for the long term as long as it is in place. This tool allows appropriate restrictions to be maintained until cleanup standards are met.	Long-term effectiveness is assured through routine monitoring and inspections by DOE, with participation from the EPA and State. This tool allows administrative actions to be taken to ensure that groundwater is not used until cleanup standards are met.	The history and current status of the Weldon Spring site is effectively communicated by the Interpretive Center and other devices. DOE is committed to maintaining the center to support long-term protection of human health and the environment provided by the remedies implemented.	The status of the property is effectively communicated by the markers. Continued maintenance by DOE is expected to make this device durable.
4. Reduction of toxicity, mobility, or volume through treatment	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.
5. Short-term effectiveness	No worker injuries or fatalities are expected; this tool does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this tool does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this tool does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this tool does not involve construction and is primarily an administrative and enforcement function.	Construction of the center and other devices has been completed; the center is in operation and the prairie, native plant garden, ramp, and platform are in place.	Installation of historical markers has been completed.
6. Implementability	Administrative orders can be used to effectively limit access to groundwater.	An FFA is currently in place and has proven to be an adequate enforcement tool for current and past site activities.	An agreement is currently being negotiated among DOE, EPA, and the State. Once finalized, implementability should be similar to that of the existing FFA.	Consent orders can be used to effectively limit access to groundwater.	The Interpretive Center and other devices are functioning as intended. No implementablity issues are expected. The center has been successful at communicating information about the site, as indicated by the number of visitors who have a positive reaction to the center. DOE expects to maintain this center and the other devices for as long as they are needed.	Historical markers are in place. No implementability issues are expected.

TABLE 5.3 (Cont.)

Criterion	Enforcement Tools				Informational Devices	
	Administrative Order	Federal Facility Agreement (FFA)	Post-Closure Federal Facility Agreement (PCFFA)	Consent Decree	Interpretive Center (and Prairie, Native Plant Garden, Ramp, and Platform, with Plaques)	Historical Markers
7. Cost	Only costs expected are those for monitoring and inspection ($20,900).	Only costs expected are those for monitoring and inspection ($20,900).	Only costs expected are those for monitoring and inspection ($20,900).	Only costs expected are those for monitoring and inspection ($20,900).	Costs are expected for maintaining the center and other devices and continued communication with the interested public.	Costs are expected for maintenance and periodic replacement, as appropriate.
8. State acceptance	This tool has not been considered in the past. The State is interested in being a party to the PCFFA.	The State is interested in being a party to an agreement. The existing FFA does not include the State as a signatory party.	The State is interested in being a party to the PCFFA.	This tool has not been considered in the past. The State is interested in being a party to the PCFFA.	The State supports the Interpretive Center and other devices for their intended purpose of communicating to the public the history and status of the site.	The State supports the use of historical markers as a means of communicating the status of the site.
9. Community acceptance	This tool is expected to be acceptable to the community if proposed to be implemented as an IC layer.	The community has supported the FFA as long as it has been in existence.	The community supports this tri-party agreement.	This tool is expected to be acceptable to the community if proposed to be implemented as an IC layer.	The community supports the presence of the center and other devices, as indicated by the number of visitors who have had a positive reaction to the center.	The community supports the use of historical markers for communicating the status of the site. Some members of the community have expressed a preference for warning signs to be put in place.

TABLE 5.4 Evaluation of Institutional Control Mechanisms Applicable to State-Owned Property against Nine Criteria

	Governmental Controls					Proprietary Controls	
Criterion	**State Ownership**	**Zoning/Local Permit/ Ordinance**	**Groundwater Use Restriction**	**Missouri Well Drilling Regulations (10 CSR 23)**	**Condemnation of Property**	**Easement**	**Covenant**
1. Overall protection of human health and the environment	Provides protection by maintaining State ownership and using State authority to restrict land use of the properties that need restrictions until Weldon Spring site residual soil or groundwater concentrations meet levels for unrestricted use and unlimited exposure.	Provide protection if their provisions apply to State land and if they contribute to the effectiveness of the land use restrictions.	If the State has a groundwater protection program and the State is subject to it, the program provides protection by restricting groundwater use in the contaminated shallow aquifer until concentrations decrease to cleanup standards.	Provides protection by monitoring well drilling activity in the contaminated shallow aquifer until concentrations decrease to cleanup standards.	Provides protection by having DOE assume ownership of the State properties that are involved in the remedy. Protection would be similar to that provided for currently DOE owned properties.	Depending on their terms, easements provide protection by permitting access to State land and allowing implementation of restrictions until site concentrations are at levels that allow unrestricted use and unlimited exposure.	Provides protection by permitting access and use restrictions to be implemented until site concentrations are at levels that allow for unrestricted use and unlimited exposure.
2. Compliance with ARARs	Continued State ownership of the properties identified to be in the IC area for the Weldon Spring site could ensure that restrictions would be effective and enforced during the time needed for the remedies to comply with ARARs.	These controls ensure the effectiveness of the restrictions on land and groundwater use until ARARs are met.	This control, if the State has a groundwater restriction program, provides needed restrictions to allow attenuation of groundwater contaminants to comply with ARARs (i.e. cleanup standards).	This control helps ensure that well drilling activities will not interfere with attenuation of groundwater contaminants to comply with ARARs (i.e., cleanup standards).	This control allows DOE to restrict land use at State properties for the time needed for groundwater contaminants to meet cleanup standards or ARARs.	This control allows for access and restrictions on land and groundwater use until ARARs are met.	This control allows for access and restrictions on land and groundwater use until ARARs are met.
3. Long-term effectiveness and permanence	Long-term effectiveness is assured through routine and thorough monitoring and inspections as stipulated in agreements.	These controls can contribute to the long-term effectiveness of land use restrictions.	If the State has a groundwater protection program, this control could contribute to long-term effectiveness. Effectiveness would further be strengthened by DOE's performance of routine inspections and monitoring.	Long-term effectiveness is assured through state enforcement of the well drilling code.	Long-term effectiveness is assured through ownership by a Federal entity and enforced through continued long-term monitoring and inspections.	Long-term effectiveness is assured through continued commitment by the State entities to enforce this mechanism. DOE would perform the necessary monitoring and inspections to ensure long-term effectiveness and durability of the restrictions needed.	Long-term effectiveness is assured through continued commitment by the State entities to enforce this mechanism. DOE would perform the necessary monitoring and inspections to ensure long-term effectiveness and durability of the restrictions needed.
4. Reduction of toxicity, mobility, or volume through treatment	Not applicable as no treatment is involved	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.
5. Short-term effectiveness	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries and fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries and fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.

TABLE 5.4 (Cont.)

Criterion	Governmental Controls					Proprietary Controls	
	State Ownership	Zoning/Local Permit/ Ordinance	Groundwater Use Restriction	Missouri Well Drilling Regulations (10 CSR 23)	Condemnation of Property	Easement	Covenant
6. Implementability	Restrictions needed are enforceable on State-owned properties with the consent and cooperation of the State entities involved.	Implementable and enforceable through powers of State and local governments.	Implementability depends on the existence of a groundwater protection program and its robustness.	This control relies on State implementation of the well drilling code.	Land condemnation is a control available to the Federal government under its eminent domain authority.	This control relies on MDNR acceptance and commitment for implementation. State entities that own the properties (MDC and MoDOT) also need to agree to restrict land use on their properties via this control.	This control relies on MDNR acceptance and commitment for implementation. State entities that own the properties (MDC and MoDOT) also need to agree to allow restrictions on their property via this control.
7. Cost	Only costs expected are for monitoring and inspection ($20,900).	Only costs expected are for monitoring and inspection ($20,900).	Only costs expected are for monitoring and inspection ($20,900).	Only costs expected are for monitoring and inspection ($20,900).	Costs expected are those associated with administrative activities and monitoring and inspection ($20,900).	Costs expected are costs associated with administrative activities associated with putting the easement agreement in place and costs for monitoring and inspection ($20,900).	Costs expected are costs associated with administrative activities associated with putting the agreement in place and costs for monitoring and inspection ($20,900).
8. State acceptance	DOE is currently in discussion with the State entities involved to establish the necessary commitments.	This control is expected to be acceptable to the State.	A groundwater protection program could be an acceptable layer of IC if used in conjunction with other mechanisms.	This control is expected to be acceptable to the State.	This control would not be considered reasonable by the State. DOE is not expecting to select this control without exhausting all other available and applicable options.	The State would consider this control an acceptable layer of IC if used in conjunction with other mechanisms.	The State would consider this control an acceptable layer of IC if used in conjunction with other mechanisms.
9. Community acceptance	The community supports restrictions using this control.	This control is expected to be acceptable to the community.	The community would consider a groundwater protection program an acceptable layer of IC if used in conjunction with other mechanisms.	This control is expected to be acceptable to the community.	The community does not generally support this control.	The community would consider this control an acceptable layer of IC if used in conjunction with other mechanisms.	The community would consider this control an acceptable layer of IC if used in conjunction with other mechanisms.

TABLE 5.4 (Cont.)

Criterion	Proprietary Controls (Cont.)				Enforcement Tool	Informational Devices	
	State Use Restriction	Conservation Easement	Real Estate Use License/Permit	Memorandum of Understanding (MOU)	Post-Closure Federal Facility Agreement (PCFFA)	State Registry of Hazardous Waste Sites	Historical Markers
1. Overall protection of human health and the environment	Provides protection by permitting restrictions (such as the restrictive covenant associated with CALM) to be implemented until site concentrations are at levels that allow for unrestricted use and unlimited exposure.	If the State adopts a conservation easement, it provides protection by permitting restrictions to be implemented until site concentrations are at levels that allow for unrestricted use and unlimited exposure.	Provides protection by permitting specific land uses by DOE (e.g., access to Katy Trail for monitoring purposes) to ensure remedy effectiveness.	Provides protection through the activities (e.g., monitoring, enforcement, reporting) it addresses.	Provides protection by joint EPA, DOE, and State implementation, monitoring, and enforcement of the restrictions pursuant to its terms.	Provides protection by informing present and subsequent land users of use restrictions.	Provide protection by communicating the status of the property.
2. Compliance with ARARs	This control allows for restrictions on land and groundwater use until ARARs are met.	This control allows for restrictions on land and groundwater use until ARARs are met.	This control allows DOE to perform activities at State properties to monitor if the remedies are complying with ARARs as projected.	This control ensures the effectiveness of the restrictions on land and groundwater use until ARARs are met.	This tool allows regulatory and administrative actions to be implemented as agreed upon by the three parties until residual soil and groundwater contaminant conditions are in compliance with ARARs.	This device could ensure the effectiveness of the restrictions on land and groundwater use until ARARs are met.	Through information provided by markers, remedy protection is provided to allow sufficient time for the remedies to comply with ARARs (i.e., cleanup standards).
3. Long-term effectiveness and permanence	Long-term effectiveness is assured through continued commitment by the State entities to enforce this mechanism. DOE would perform the necessary monitoring and inspections to ensure long-term effectiveness and durability of the restrictions needed.	Long-term effectiveness is assured through continued commitment by the State entities to enforce this mechanism. DOE would perform the necessary monitoring and inspections to ensure long-term effectiveness and durability of the restrictions needed.	Long-term effectiveness is assured through routine monitoring and inspections by DOE, with participation from the EPA and State. This control allows appropriate restrictions to be maintained until cleanup standards for groundwater are met.	This control contributes to the long-term effectiveness of land use restrictions.	The PCFFA is expected to be effective in implementing necessary restrictions because it gives the EPA and State oversight authority.	This device can contribute to the long-term effectiveness of land use restrictions.	The status of the site is effectively communicated by the markers. Continued maintenance by DOE is expected to make this device durable.
4. Reduction of toxicity, mobility, or volume through treatment	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.	Not applicable as no treatment is involved.
5. Short-term effectiveness	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this control does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this tool does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this device does not involve construction and is primarily an administrative and enforcement function.	No worker injuries or fatalities are expected; this device involves very light construction work to fabricate and install the markers.

TABLE 5.4 (Cont.)

Criterion	Proprietary Controls (Cont.)				Enforcement Tool	Informational Devices	
	State Use Restriction	**Conservation Easement**	**Real Estate Use License/Permit**	**Memorandum of Understanding (MOU)**	**Post-Closure Federal Facility Agreement (PCFFA)**	**State Registry of Hazardous Waste Sites**	**Historical Markers**
6. Implementability	The control relies on MDNR acceptance and commitment for implementation. State entities that own the properties (MDC and MoDOT) also need to agree to restrict land use on their properties via this control.	The control relies on MDNR acceptance and commitment for implementation. State entities that own the properties (MDC and MoDOT) also need to agree to restrict land use on their properties via this control.	This control is expected to be implementable once granted by State entities to DOE. This type of control is currently in place for similar purposes.	This control can be implemented through agreement by all involved parties.	An agreement is currently being negotiated among the EPA, DOE, and the State. Once it is finalized, its implementability should be similar to that of the existing FFA.	A registry is already in place; implementation depends on State action to place the impacted state land on the registry.	Historical markers are in place. No implementability issues are expected.
7. Cost	Costs are expected to be those associated with administrative activities associated with putting this mechanism in place and costs for monitoring and inspection ($20,900).	Costs are expected to be those associated with administrative activities associated with putting this mechanism in place and costs for monitoring and inspection ($20,900).	Only costs expected are for monitoring and inspection ($20,900).	Costs are expected to be minimal, depending on terms of the MOU, in addition to costs for monitoring and inspection ($20,900).	Costs are expected for administrative resources used to negotiate and finalize the agreement.	Costs are expected to be minimal (i.e., cost of placement on registry).	The cost for making the historical markers that are already in place was small.
8. State acceptance	The State would consider this control an acceptable layer of IC if used in conjunction with other mechanisms.	The State would consider this control an acceptable layer of IC if used in conjunction with other mechanisms.	This control is currently in effect between MDC and DOE and is expected to continue to be acceptable to the MDNR as another layer of IC.	This control is expected to be acceptable to the State.	The State is interested in a tri-party agreement.	This device is expected to be acceptable to the State.	The State supports this device for communicating site information.
9. Community acceptance	The community would consider this control an acceptable layer of IC if used in conjunction with other mechanisms.	The community would consider this control an acceptable layer of IC if used in conjunction with other mechanisms.	The community has supported the existing licenses and permits.	This control is expected to be acceptable to the community.	The community supports this tool.	This device is expected to be acceptable to the community.	The community supports this device.

6 INSTITUTIONAL CONTROLS PLANNED FOR THE WELDON SPRING SITE

The goal for establishing ICs for the Weldon Spring site is to select mechanisms that provide long-term effectiveness and are easily implementable, durable, and enforceable. The IC protocols for the Weldon Spring site include multiple mechanisms so that layers of ICs are implemented, ensuring the long-term protection required for the site (Figures 6.1 and 6.2). The ICs planned are described in the text that follows and summarized in Table 6.1 at the end of this section.

6.1 CHEMICAL PLANT OPERABLE UNIT

For the CPOU, multiple layers of restrictions that include mechanisms from each of the four EPA categories are planned for the Chemical Plant disposal cell and buffer area, Southeast Drainage, and Route 94 (at Southeast Drainage) and Highway D (at Frog Pond) culverts.

6.1.1 Chemical Plant Disposal Cell and Buffer Area (C1D)

DOE has exclusive jurisdictional authority to implement the restrictions needed for the Weldon Spring site. Exclusive jurisdiction was ceded by the State of Missouri to the United States. DOE also has the authority to dispose of its real property under section 161(g) of the Atomic Energy Act (AEA) and under sections 646(c) through(f) and section 649 of the DOE Organization Act. Under section 161(g) of the AEA, DOE has the authority to "sell, lease, grant, and dispose of such real property as provided in this Act." The DOE Organization Act gives the agency the authority to lease its land. DOE also has the option of reporting to the General Services Administration (GSA) that the property is no longer needed for mission accomplishment. GSA will then dispose of the real property under its authority.

Long-term effectiveness is being provided by routine monitoring and inspection of the site, with specific consideration being given to maintaining the integrity of the disposal cell and its buffer area. Data collected and any other findings would be provided in an annual report that would be incorporated into the CERCLA reviews conducted no less often than every 5 years. The restrictions are expected to be implemented for an indefinite period of time or as decided during a 5-year CERCLA review period.

A notation on the Federal ownership record has been issued by DOE and filed at the St. Charles County Recorders Office to communicate the restrictions needed. This notation would be maintained with the ownership record, would surface during future title searches, and would effectively "run with the land" to provide durability for the restrictions. No ROWs have been granted, and no other parties could be affected by the restriction imposed to protect the disposal cell and its buffer area. Further enforceability is also being provided through the PCFFA that enables the EPA, State, and DOE to jointly maintain and enforce the restrictions required.

- **Layer 1**
  - Federal Ownership (GC)
  - State Ownership (GC)
- **Layer 2**
  - State Well Drilling Code (GC)
- **Layer 3**
  - Post-Closure Federal Facility Agreement (ET)
- **Layer 4**
  - Notation on Federal Ownership Record (GC)
    - *Chemical Plant*
  - Real Estate Notations and Agreements (PC)
    - *MDC*
    - *U.S. Army*
    - *MoDOT*
- **Layer 5**
  - Educational ICS (ID)
    (Interpretive center, prairie and garden, historical markers, ramp and platform (with plaques))

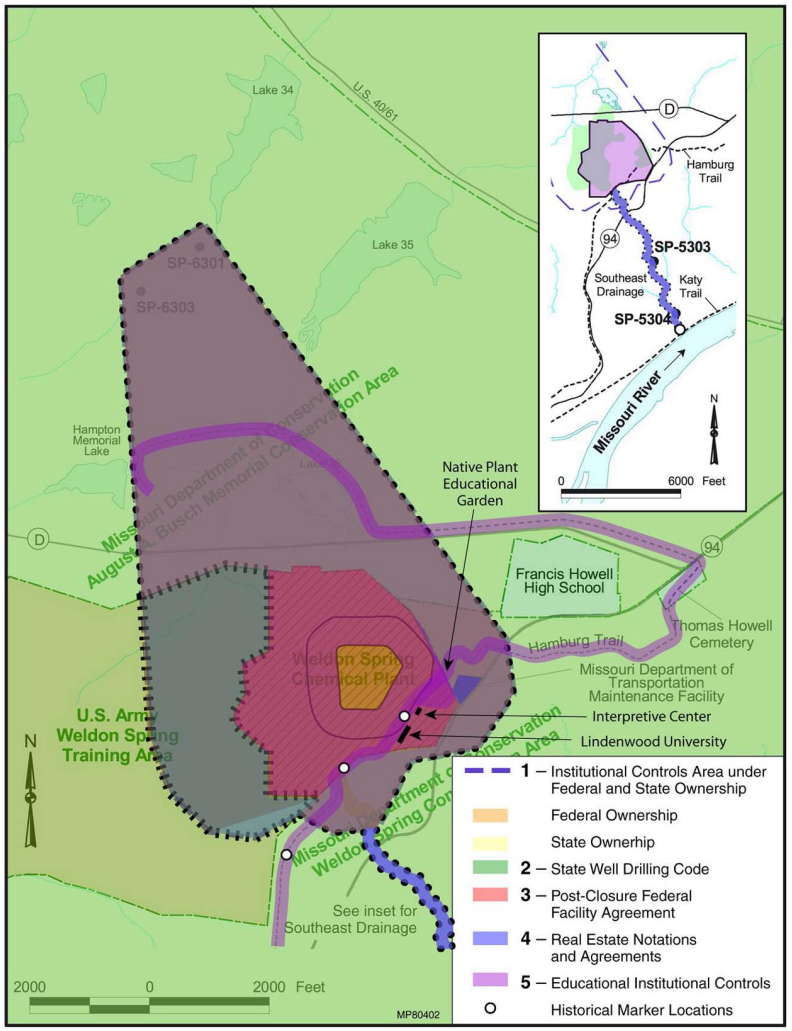

FIGURE 6.1 Multiple Layers of Institutional Controls at the Weldon Spring Chemical Plant Area

- **Layer 1**
  - Federal Ownership (GC)
  - State Ownership (GC)
- **Layer 2**
  - State Well Drilling Code (GC)
- **Layer 3**
  - Post-Closure Federal Facility Agreement (ET)
- **Layer 4**
  - Notation on Federal Ownership Record (GC)

    ▮▮▮▮ *Quarry*
  - Real Estate Notations and Agreements (PC)

    •••• *MDC*
- **Layer 5**
  - Educational ICS (ID)
    (Historical markers and signage)

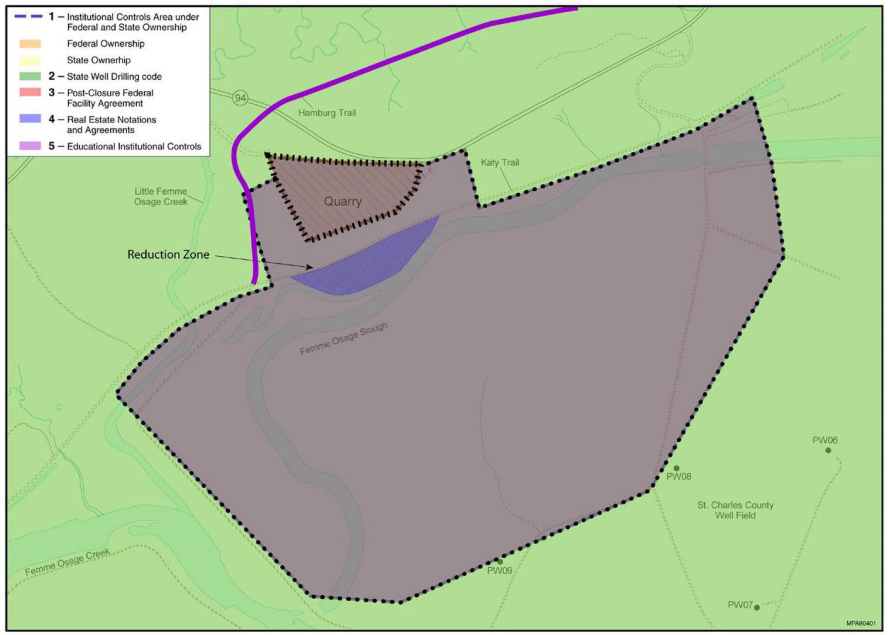

FIGURE 6.2 Multiple Layers of Institutional Controls at the Weldon Spring Quarry Area

6.1.2 Southeast Drainage (C2C)

DOE expects to enter into a real estate agreement (either a covenant or an easement, as appropriate) with the MDC to restrict construction of a residence within the 200-ft corridor of the drainage. This IC mechanism is expected to be effective for the long term because DOE would perform monitoring and inspections of this corridor. Data collected and any other findings would be provided in an annual report that would be incorporated into the CERCLA reviews conducted no less often than every 5 years. The restrictions are expected to be implemented for as long as contaminant concentrations in the sediment, springwater, and underlying groundwater do not allow for unrestricted use and unlimited exposure. The PCFFA would provide enforceability of the restrictions by DOE, with the EPA and MDNR as lead and support regulatory agencies, respectively.

The Explorer Pipeline and Union Electric utilities have ROWs within the 200-ft corridor identified for restrictions. However, the restrictions are not expected to impinge on these ROWs. A portion of the restricted area is MDNR Parks property. DOE also expects to enter into a real estate agreement (either a covenant or an easement) to implement the restrictions needed. Although the above IC mechanisms would not be the only ones implemented for the Southeast Drainage, continued ownership by the MDC and MDNR of those properties and adherence to the Missouri Well Drilling Regulations (10 CSR 23) would add to the effectiveness and durability of the restrictions.

The durability of the restrictions is enhanced (1) by ensuring that contractors for well replacement and abandonment adhere to the requirements of the Missouri Well Drilling Regulations (10 CSR 23) and (2) by the presence of the Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques) and historical markers. The latter informational devices continue to communicate the status of the site and serve as constant reminders of continued DOE presence. These devices add not only to the durability but also to the enforceability and overall effectiveness of the ICs being implemented.

6.1.3 Route 94 (at Southeast Drainage) and Highway D (at Frog Pond) Culverts (C3T)

DOE expects to have an agreement in place with MoDOT so that DOE would be notified when the culverts are scheduled to be replaced. A similar agreement would be entered into by DOE and MDC (as owner of the property). The notification would allow DOE to sample, analyze, and dispose of any contaminated soil that would be generated from replacing the culverts. Soil that might be contaminated (with uranium) may be present beneath the culverts; this soil is inaccessible under current conditions (with the culverts in place). The Route 94 (at Southeast Drainage) culvert itself also potentially has fixed radioactivity and would have to be disposed of properly. Data collected from accessible areas under current conditions indicate that concentrations would be protective for a utility worker scenario. The agreement is expected to be in effect as long as the current culverts are in place and the soil beneath them is inaccessible. No other ROWs have been identified from the survey of this area.

6.2 QUARRY RESIDUALS OPERABLE UNIT

For the QROU, multiple layers of restrictions are planned to be implemented for the Quarry proper, the underlying groundwater at the Quarry proper and at the MDC property (outside the Quarry proper) north and south of the Slough, and the peapod-shaped area of soil north of the Slough that is also owned by MDC. ROWs identified from the survey of these areas are presented in Table 4.1. The restrictions planned to be implemented are not expected to infringe on these ROWs.

6.2.1 Quarry Proper Residual Soil in Cracks and Fissures and Underlying Groundwater (Q1D)

As it has for the Chemical Plant, DOE has exclusive jurisdictional authority to implement the restrictions needed at the Quarry proper (see Section 6.1.1) to prevent exposure to the cracks and fissures that contain residual contaminant concentrations. Elevated gamma readings were measured at the cracks and fissures where residual contamination is not accessible. The elevated readings indicated that levels are protective for a recreational visitor scenario (someone visiting the Quarry intermittently; see Table 3.1 for scenario assumptions). The cracks and fissures are now covered with several feet of fill as a result of the restoration that was completed at the Quarry proper. Uranium concentrations in the underlying groundwater are at levels that do not allow for unrestricted use and unlimited exposure. Under current (and reasonable future) land use conditions, the contaminated groundwater is not accessible and therefore would not result in any direct exposure. However, if exposure was possible, the levels would be protective for a recreational scenario but not for a resident scenario.

No ROWs have been granted by DOE at the Quarry proper. The long-term effectiveness of the restrictions is being provided by continued routine monitoring and inspection of the Quarry by DOE. Data collected and any other findings would be provided in the same document prepared each year to report Chemical Plant information. The data from the Quarry proper would be incorporated into the CERCLA reviews to be conducted no less than every five years. The restrictions for the Quarry proper would be implemented as long as the contaminant concentrations did not allow for unrestricted use and unlimited exposure.

A notation on the Federal ownership record has been issued by DOE and filed at the St. Charles County Recorders Office to communicate the restrictions needed for the Quarry proper. Like the notation for the Chemical Plant, this notation would be maintained with the ownership record, would surface during future title searches, and would effectively “run with the land” to provide durability for the restrictions. Per the PCFFA, DOE would be the lead agency in implementing and enforcing the restrictions, with the EPA and MDNR acting as lead and support regulatory agencies, respectively.

Moreover, DOE would ensure that contractors for well replacement and abandonment adhered to the Missouri Well Drilling Regulations (10 CSR 23). Finally, the Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques) at the Chemical Plant and the historical markers (by the Hamburg Trail) continue to communicate the history and status of the

properties. These informational devices would be maintained by DOE, thereby adding to the durability, enforceability, and long-term effectiveness of the ICs implemented to restrict access to the Quarry proper.

6.2.2 Quarry Area Groundwater North and South of Femme Osage Slough (Q2C)

DOE expects to enter into a real estate agreement (either a covenant or an easement) with MDC to implement the restrictions needed. Restrictions would be implemented to (1) protect human health and the environment from the contaminated groundwater north of the slough (groundwater south of the slough is at levels similar to background), (2) prevent mobilization of the contaminated groundwater, and (3) maintain the monitoring well network that is in place. These restrictions are expected to be in effect for as long as uranium groundwater concentrations beneath the Quarry proper and at the MDC property north of the slough are greater than 300 pCi/L.

The long-term effectiveness of the restrictions implemented would be provided by DOE's continued routine monitoring and inspections. The PCFFA would enforce the restrictions, with the EPA and MDNR having lead and support regulatory authority, respectively. The Missouri Well Drilling Regulations for monitoring well replacement or abandonment would be adhered to by DOE contractors. The Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques) and historical markers also add to the durability and overall effectiveness of the restrictions by communicating the status of the site and the need for restrictions.

6.2.3 Peapod-Shaped Soil Area South of the Katy Trail ROW and North of Slough (Q3C)

The ICs implemented to restrict access to this property would prevent disturbance of the naturally occurring soil located in this area that absorbs uranium from the groundwater. The ICs implemented for this area would be similar to ICs described for the MDC property north and south of the slough groundwater area discussed above. However, an additional agreement with MDNR Parks would be required to address the MDNR Parks ROW south of the Katy Trail (see figure in Appendix A).

6.3 GROUNDWATER OPERABLE UNIT

The ICs planned for groundwater underlying (1) the Chemical Plant proper, (2) MDC properties surrounding the Chemical Plant, (3) a portion of the U.S. Army Weldon Spring Training area, and (4) the MoDOT Highway Maintenance Facility area consist of multiple layers, similar to those planned for the other OUs. ROWs identified from the survey of those areas are presented in Table 4.1. The restrictions planned to be implemented are not expected to infringe on these ROWs.

6.3.1 Chemical Plant Proper Underlying Shallow Groundwater (G1D)

DOE expects to implement multiple layers of ICs similar to those described in Section 6.1.1 for the Chemical Plant proper.

6.3.2 MDC Properties (G2C)

DOE expects to implement needed restrictions by entering into a real estate agreement (either a covenant or an easement) with the MDC. Continued MDC ownership of these properties is expected to add to the long-term effectiveness of the restrictions needed. Implementation of additional layers of controls similar to those described for the MDC properties at the Quarry area would add to the overall effectiveness, enforceability, and durability of the restrictions.

The restrictions are expected to be in place until groundwater contaminant concentrations meet cleanup standards established in the ROD for the GWOU. These restrictions would allow for the attenuation period to occur without disrupting the natural groundwater gradient or the natural attenuation processes that are being relied upon to decrease contaminant levels.

6.3.3 U.S. Army Weldon Spring Training Area (G3A)

DOE expects to implement restrictions needed via an MOU with DA. The existing MOU could be amended to include the restrictions needed to protect human health and the environment from contaminated shallow groundwater beneath this property. The existing MOU allows DOE to access Army property for sampling purposes. Continued Federal ownership of this property by the Army is expected to provide long-term effectiveness of the restrictions needed. Under the PCFFA, DOE would be the lead agency for implementing the restrictions, with the EPA and MDNR as lead and support oversight agencies, respectively.

Adherence to the Missouri Well Drilling Regulations (10 CSR 23) for well installation and abandonment is considered another layer of controls that adds to the durability of the ICs. Informational devices already in place (i.e., Interpretive Center, prairie, native plant garden, ramp, and platform, with plaques, and historical markers) also add to the durability of the controls.

6.3.4 MoDOT Property (G4T)

DOE expects to implement the same IC mechanisms for this property as those implemented for the MDC properties. DOE and MoDOT would enter into a real estate easement or covenant that would allow DOE to implement the necessary restrictions.

TABLE 6.1 Planned Institutional Controls for the Weldon Spring Site

Property	Figure Key[a]	Pertinent OU	Purpose of Restriction	IC Layers	Duration	Monitoring and Enforcement	Implementing and Enforcing Agencies
Chemical Plant disposal cell and buffer area	C1D	CPOU	Maintain the integrity of the disposal cell that contains radioactive waste for the long term	• Federal ownership • Notation on federal ownership record • Missouri Well Drilling Regulations • PCFFA • Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques) • Historical markers	Indefinite	Annual inspections and long-term monitoring; data reporting; 5-year CERCLA reviews	DOE as lead agency for implementing and enforcing the restrictions, with the EPA and MDNR as lead and supporting regulatory agencies
Southeast Drainage (200-ft corridor along the entire drainage)	C2C	CPOU	Restrict residential use of the entire Southeast Drainage and the springs within it.	Under discussion: • State ownership • Real estate agreements • Missouri Well Drilling Regulations • PCFFA • Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques)	Until concentrations meet unrestricted use and unlimited exposure or as determined based on 5-year CERCLA reviews	Annual inspections and long-term monitoring; data reporting; 5-year CERCLA reviews	DOE as lead agency for implementing and enforcing the restrictions, with the EPA and MDNR as lead and supporting regulatory agencies

TABLE 6.1 (Cont.)

Property	Figure Key[a]	Pertinent OU	Purpose of Restriction	IC Layers	Duration	Monitoring and Enforcement	Implementing and Enforcing Agencies
Route 94 (at Southeast Drainage) and Highway D (at Frog Pond) culverts	C3T	CPOU	Provide proper disposal of contaminated pipes or subsurface soil generated when the existing culverts are removed for future for replacement by MoDOT	Under discussion: • State ownership • Real estate agreements • PCFFA • Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques)	As long as potentially contaminated soil remains beneath the culverts	Annual inspections and long-term monitoring; data reporting; 5-year CERCLA reviews	DOE as lead agency for implementing and enforcing the restrictions, with the EPA and MDNR as lead and supporting regulatory agencies
Quarry proper residual soil in cracks and fissures	Q1D	QROU	Prevent exposure to residual soil contamination within cracks and fissures of the Quarry	• Federal ownership • Notation on federal ownership record • Missouri Well Drilling Regulations • PCFFA • Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques) • Historical markers	Until concentrations meet unrestricted use and unlimited exposure or as determined on the basis of 5-year CERCLA reviews	Annual inspections and long-term monitoring; data reporting; 5-year CERCLA reviews	DOE as lead agency for implementing and enforcing the restrictions, with the EPA and MDNR as lead and supporting regulatory agencies

TABLE 6.1 (Cont.)

Property	Figure Key[a]	Pertinent OU	Purpose of Restriction	IC Layers	Duration	Monitoring and Enforcement	Implementing and Enforcing Agencies
Quarry proper underlying groundwater	Q1D	QROU	Prevent exposure to contaminated groundwater	• Federal ownership • Notation on federal ownership record • PCFFA • Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques) • Historical markers	Until groundwater uranium concentrations decrease to 300 pCi/L[b]	Annual inspections and long-term monitoring; data reporting; 5-year CERCLA reviews	DOE as lead agency for implementing and enforcing the restrictions, with the EPA and MDNR as lead and supporting regulatory agencies
Quarry area groundwater north and south of Femme Osage Slough	Q2C	QROU	Prevent exposure to contaminated groundwater; prevent potential mobilization of contaminated groundwater	Under discussion: • State ownership • Real estate agreements • Missouri Well Drilling Regulations • PCFFA • Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques) • Historical markers	Until groundwater uranium concentrations decrease to 300 pCi/L[b]	Annual inspections and long-term monitoring; data reporting; 5-year CERCLA reviews	DOE as lead agency for implementing and enforcing the restrictions, with the EPA and MDNR as lead and supporting regulatory agencies

TABLE 6.1 (Cont.)

Property	Figure Key[a]	Pertinent OU	Purpose of Restriction	IC Layers	Duration	Monitoring and Enforcement	Implementing and Enforcing Agencies
Peapod-shaped soil area south of the Katy Trail ROW and north of Slough	Q3C	QROU	Prevent any activity that would disturb the naturally occurring uranium reduction zone in the soil south of the Katy Trail	Under discussion: • State ownership • Real estate agreements • Missouri Well Drilling Regulations • PCFFA • Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques)	Until groundwater uranium concentrations decrease to 300 pCi/L[b]	Annual inspections and long-term monitoring; data reporting; 5-year CERCLA reviews	DOE as lead agency for implementing and enforcing the restrictions, with the EPA and MDNR as lead and supporting regulatory agencies
Chemical Plant proper underlying shallow groundwater	G1D	GWOU	Prevent access to shallow groundwater for residential use; prevent human-induced impacts to hydraulic gradient; protect long-term groundwater monitoring wells	• Federal ownership • Notation on federal ownership record • Missouri Well Drilling Regulations • PCFFA • Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques) • Historical markers	Until groundwater concentrations meet cleanup standards or as determined by 5-year CERCLA reviews	Annual inspections and long-term monitoring; data reporting; 5-year CERCLA reviews	DOE as lead agency for implementing and enforcing the restrictions, with the EPA and MDNR as lead and supporting regulatory agencies

TABLE 6.1 (Cont.)

Property	Figure Key[a]	Pertinent OU	Purpose of Restriction	IC Layers	Duration	Monitoring and Enforcement	Implementing and Enforcing Agencies
August A. Busch Memorial Conservation Area and Weldon Spring Conservation Area	G2C	GWOU	Prevent access to shallow groundwater for residential use; prevent human-induced impacts to hydraulic gradient; protect long-term groundwater monitoring wells	Under discussion: • State ownership • Real estate agreements • Missouri Well Drilling Regulations • PCFFA • Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques)	Until groundwater concentrations meet cleanup standards or as determined by 5-year CERCLA reviews	Annual inspections and long-term monitoring; data reporting; 5-year CERCLA reviews	DOE as lead agency for implementing and enforcing the restrictions, with the EPA and MDNR as lead and supporting regulatory agencies
U.S. Army Weldon Spring Training Area	G3A	GWOU	Protect long-term groundwater monitoring wells; protect hydraulic gradient	Under discussion: • Federal ownership • MOU with DA • Missouri Well Drilling Regulations • Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques)	Until groundwater concentrations meet cleanup standards or as determined by 5-year CERCLA reviews	Annual inspections and long-term monitoring; data reporting; 5-year CERCLA reviews	DOE as lead agency for implementing and enforcing the restrictions, with the EPA and MDNR as lead and supporting regulatory agencies

TABLE 6.1 (Cont.)

Property	Figure Key[a]	Pertinent OU	Purpose of Restriction	IC Layers	Duration	Monitoring and Enforcement	Implementing and Enforcing Agencies
MoDOT Highway Maintenance Facility	G4T	GWOU	Prevent access to shallow groundwater for residential use; prevent human-induced impacts to hydraulic gradient; protect long-term groundwater monitoring wells	Under discussion: • State ownership • Real estate agreements • Missouri Well Drilling Regulations • PCFFA • Interpretive Center (and prairie, native plant garden, ramp, and platform, with plaques)	Until groundwater concentrations meet cleanup standards or as determined by 5-year CERCLA reviews	Annual inspections and long-term monitoring; data reporting; 5-year CERCLA reviews	DOE as lead agency for implementing and enforcing the restrictions, with the EPA and MDNR as lead and supporting regulatory agencies

[a] The figure key is intended to facilitate identification of the properties discussed in Section 4 (Table 4.1) and Section 7 (Table 7.1). The first letter designates whether the area is being restricted as part of the CPOU (designated as C), the QROU (designated as Q), or the GWOU (designated as G). The number denotes the number of the property being restricted as part of the OU. The final letter designates the property owners: D is for DOE, C is for MDC, T is for MoDOT, and A is for U.S. Army. For example, "C1D" is the key to represent an area (in this case, the Chemical Plant proper is designated as number 1) that is being restricted for the CPOU and is owned by DOE.

[b] Groundwater beneath the Quarry proper and north of the Slough is not a usable aquifer. Restrictions until 300 pCi/L levels are obtained are protective to the area south of the Slough and St. Charles County well field.

7 COMPARISON OF ROD REQUIREMENTS FOR ICS WITH ICS PLANNED FOR THE WELDON SPRING SITE

The Weldon Spring site was remediated to be consistent with the remedies described in the RODs for four OUs as identified in Section 1. The RODs for three of these OUs included ICs that were to be implemented as part of the selected remedy. The IC commitments in these three RODs were compared with those specified in the LTS&MP to ensure that all such IC commitments would be met by implementation of this plan (see Table 7.1). The ICs in the LTS&MP are consistent with those described here in this report.

TABLE 7.1 Comparison of Institutional Controls Specified in RODs with Those Planned for the Weldon Spring Site[a]

ROD Language	ICs Planned
Chemical Plant Operable Unit	
p. 53 of CPOU ROD (DOE 1993) The DOE would continue to maintain custody of and accountability for the disposal area, but the remainder of the site could be released for other use. However, the final disposition of the site will not be determined until after the final remedy is selected for the chemical plant area; i.e., until after the decision is made for the groundwater operable unit within the next several years. Any institutional controls pertinent to the future use of this property, such as restrictions on the use of land or groundwater, would be identified at that time.	Soil cleanup achieved levels similar to background. However, restrictions are required for underlying groundwater. Access to the entire Chemical Plant, which includes the cell, is being restricted to protect the remedy in place (i.e., disposal cell and MNA remedy for groundwater) and to prevent access to the underlying groundwater for residential and other uses that would have impacts on groundwater flow.
p. 87 of CPOU ROD (DOE 1993) Following completion of site cleanup activities, an assessment of the residual risks based on actual site conditions, including measured concentrations of site contaminants, will be performed to determine the need for any future land use restrictions. This assessment will consider the presence of the on-site disposal cell, the buffer zone, the adjacent Army site, and any other relevant factors necessary to ensure that appropriate measures are taken to protect human health and the environment for the long term. The remedy selected in this ROD will be re-examined at least every five years to ensure that it is protective.	Post-cleanup risk assessment was performed (DOE 2002), and site areas that need restrictions were identified (i.e., Southeast Drainage, culverts) (see Section 6 for description of ICs planned).
p. 112 of CPOU ROD (DOE 1993) Perpetual care will be taken of the committed land because the waste would retain its toxicity for thousands of years. For example, the cover will be visually inspected, groundwater will be monitored, and the effectiveness of the overall system at the Weldon Spring site will be reviewed at least every five years.	Restrictions are planned to protect the integrity of the cell for an indefinite period of time through continued ownership of the property by DOE (see Section 6 for ICs planned).

TABLE 7.1 (Cont.)

ROD Language	ICs Planned
Quarry Residuals Operable Unit	
p. 31 of QROU ROD (DOE 1998b) Institutional controls will be necessary to prevent uses inconsistent with recreational use, or uses that would adversely affect contaminant migration. DOE will continue to coordinate with the Missouri Department of Conservation and the Missouri Department of Natural Resources-Parks to establish a written agreement, such as a license agreement, memorandum of understanding, or deed attachment, outlining and agreeing to the terms of the institutional controls. Terms may include limiting access to groundwater north of the slough for the following uses: irrigation, consumption, or as a surface water source. The terms of the agreement will be evaluated at each five-year review, at which time changes or deletions to the terms would be made, as appropriate.	Restrictions are planned to prevent access to the Quarry proper cracks and fissures, Quarry groundwater north and south of the Slough, and a peapod-shaped soil area north of the Slough (see Section 6 for description of ICs planned).
Groundwater Operable Unit	
pp. 41 to 43 of GWOU ROD (DOE 2004a) The primary purpose of the ICs that will be implemented is to restrict use of contaminated groundwater and springwater and to provide a buffer zone around contaminated groundwater and springwater to prevent human-induced impacts on groundwater flow.	Restrictions are planned to prevent access to contaminated shallow groundwater and springwater at the Chemical Plant proper and at MDC and MoDOT properties (see Figure 4.2).
For the IC component of the selected remedy, instruments or mechanisms that are appropriate with regard to land ownership and that are considered to be implementable, reliable, and enforceable were considered. The affected land area would involve federally owned and state-owned properties. To restrict groundwater and springwater use effectively, restrictions on groundwater use would be implemented within the Chemical Plant boundary that is under the jurisdictional control of DOE, while restrictions on groundwater and springwater use would be implemented at the MDC, MDNR, MoDOT, and DA properties surrounding the Chemical Plant. The IC area extends to Burgermeister Spring to the north and includes the Southeast Drainage to the south. A hydraulic buffer zone of 305 m (1,000 ft) to preclude well placement (which could alter the flow path of contaminated groundwater) would also be included in the IC area from the site to the Burgermeister Spring. This buffer zone encompasses the preferential flow paths that connect to Burgermeister Spring. Also, groundwater flow within the IC boundary is toward the spring.	See Section 6 for ICs planned.

TABLE 7.1 (Cont.)

ROD Language	ICs Planned
Groundwater Operable Unit (Cont.)	
For the Chemical Plant property, a notation would be placed on the federal acquisition land records, with specified restrictions to accrue to succeeding owners of the land. Restrictions that derive from the Chemical Plant Operable Unit would prohibit the construction of a residential dwelling or facility for human occupancy. Except for giving DOE access to the groundwater for sampling and investigative purposes, the notation would prohibit access to groundwater for any use (primarily to prevent human-induced impacts on the contaminated groundwater flow). These restrictions would be for an indefinite term. If the land was conveyed to another party, notice of the restrictions or prohibitions would be placed within the conveyance document.	The notation has been placed on the ownership record filed with St. Charles County effective November 12, 2003. See Section 6 for ICs planned.
For properties in the area surrounding but outside the Chemical Plant (e.g., those owned by MDC, MDNR, MoDOT, or DA), indefinite-term licenses, easements, and permits, as applicable, are being considered. These instruments would specify groundwater and springwater access restrictions for the current owners or users of the land. These instruments would also give DOE continued access to monitor and analyze the groundwater for a period of time to be defined. Decisions on which ICs would be used will be made during the remedial design process.	See Section 6 for ICs planned.
Implementation of these long-term activities will be incorporated into the site LTS&MP (DOE 2004b). This document will serve as an Operation and Maintenance Plan under CERCLA. It will contain the monitoring and maintenance requirements from the Chemical Plant Operable Unit, Quarry Residuals Operable Unit, and GWOU RD/RA Work Plans. It will also provide for the implementation of the ICs.	See Section 6 for ICs planned. The LTS&MP describes the implementation of ICs (see Appendix E of DOE 2004b).

[a] RD/RA = remedial design/remedial action.

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DOE and U.S. Department of the Army, 1997, *Baseline Risk Assessment for the Groundwater Operable Units at the Chemical Plant Area and the Ordnance Works Area, Weldon Spring, Missouri*, DOE/OR/21548-568, prepared by Argonne National Laboratory, Argonne, IL., for U.S. Department of Energy, Weldon Spring Site Remedial Action Project, Weldon Spring, MO, and U.S. Department of the Army, Corps of Engineers, Kansas City District, Kansas City, MO, July.

EPA, 1990, "National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule (40 CFR Part 300)," *Federal Register* 55(46):8666-8865, March 8.

EPA, 2000, *Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups*, EPA 540-F-00-005, September.

EPA, 2002, *Institutional Controls: A Guide to Implementing, Monitoring and Enforcing Institutional Controls at Superfund, Brownfields, Federal Facility, UST and RCRA Corrective Action Cleanups*, Draft, December.

Investors Title Company, 2004, letter report with results from title search, from Investors Title Company, St. Louis, MO, charged to S.M. Stoller Corp. (title holders are Conservation Commission of the State of Missouri, Curators of the University of Missouri, and Missouri Conservation Commission), March 10.

MDNR (Missouri Department of Natural Resources), 2001, *Cleanup Levels for Missouri (CALM)*, Hazardous Waste Program, Air & Land Protection Division, September.

APPENDIX A:

LEGAL DESCRIPTIONS AND SURVEY DRAWINGS OF WELDON SPRING SITE AREAS CONSIDERED FOR INSTITUTIONAL CONTROLS

WELDON SPRING SITE REMEDIAL ACTION PROJECT, MO
BOUNDARY SURVEY FOR SITE

All those two parcels of land located in St. Charles County, Missouri, as shown on maps dated February 2002 prepared by St. Charles Engineering & Surveying, Inc. and titled *Dept. of Energy, Weldon Spring Site Remedial Action Project, MO, Boundary Survey for WSSRAP Site.* The bearings and distances are based on the Missouri State Plane Coordinate System (NAD 83). Said parcels are more particularly described as follows:

Parcel 1 – Plant Site Proper

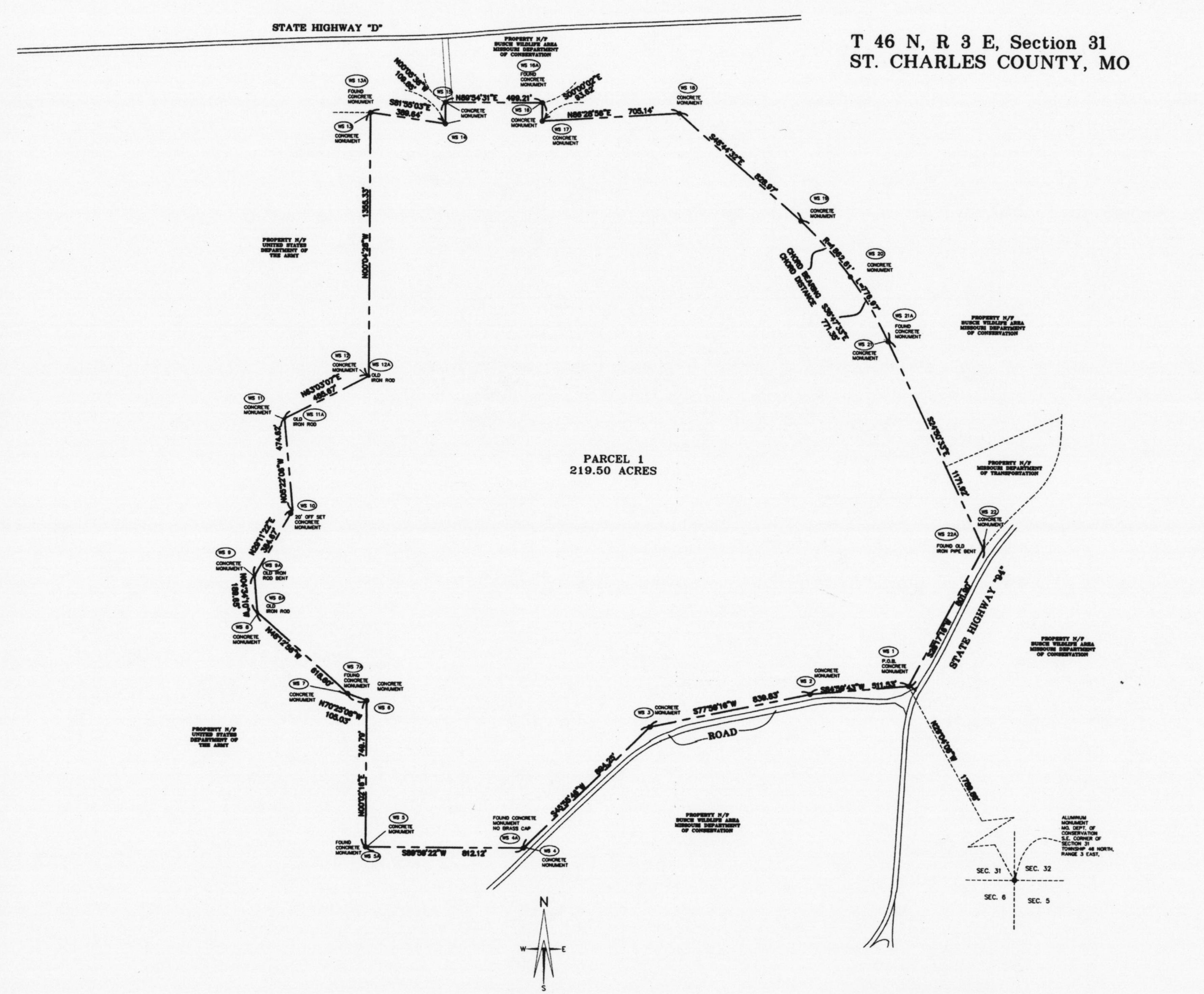
Being a parcel of land situated in part of U.S. Survey 1798 and Section 31, Township 46 North, Range 3 East of the Fifth Principal Meridian, St. Charles County, Missouri. Commencing at a point at the southeast corner of said Section 31 at an aluminum monument located at Missouri State Plane Coordinates N=1,040,489.6750 and E=757,094.1204, thence N 29°04'06'' W, 1789.86 feet to the true point of beginning of the herein described parcel; thence along the following bearings and distances marked with concrete monuments,

S 84°59'43'' W, 511.53 feet,
S 77°59'16'' W, 839.83 feet,
S 45°55'46'' W, 894.25 feet,
S 89°59'22'' W, 812.12 feet,
N 00°02'16'' E, 749.79 feet,
N 70°25'08'' W, 105.03 feet,
N 48°12'56'' W, 618.60 feet,
N 04°34'10'' W, 189.65 feet,
N 29°11'22'' E, 384.67 feet,

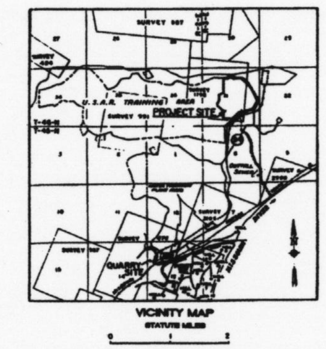
N 05°22'06'' W, 474.62 feet,
N 63°03'07'' E, 485.67 feet,
N 00°04'28'' W, 1355.33 feet,
S 81°55'03'' E, 389.64 feet,
N 00°05'38'' W, 109.85 feet,
N 89°54'31'' E, 499.21 feet,
S 00°00'02'' E, 93.62 feet,
N 86°28'56'' E, 705.14 feet,
S 48°44'32'' E, 828.98 feet,

Thence along a curve to the right having a radius of 1862.61 feet with a chord bearing and distance of S 36°47'33' E, 771.35 feet, for an arc distance of 776.9 feet; thence

S 24°50'33'' E, 1171.92 feet
S 28°17'16'' W, 801.90 feet to the point of beginning, containing 219.50 acres more or less.



T 46 N, R 3 E, Section 31
ST. CHARLES COUNTY, MO



GENERAL NOTES:

1. BASIS OF BEARING OF THIS SURVEY IS MISSOURI STATE PLANE COORDINATE SYSTEM (NAD 83).
2. A CURRENT TITLE COMMITMENT WAS NOT FURNISHED FOR THIS SURVEY AND THEREFORE IT IS SUBJECT TO THE FOLLOWING CONDITIONS:
   A. DEFECTS ENCUMBRANCES, ADVERSE CLAIMS OR OTHER MATTERS IF ANY.
   B. RIGHTS OR CLAIMS OF PARTIES IN POSSESSION NOT SHOWN BY THE PUBLIC RECORDS.
   C. EASEMENT OR CLAIMS OF EASEMENTS NOT SHOWN BY THE PUBLIC RECORDS.
   D. EASEMENTS OF RECORD
3. (WS 4) INDICATES THE WELDON SPRING CONTROL POINT NUMBER FOR THAT CORNER.
   (WS 4A) INDICATES A CORNER THAT HAS A FIVE FOOT OFFSET.
4. TRAVERSE CLOSURE 1 : 63,000
5. LEGAL DESCRIPTION PROVIDED ON A SEPERATE SHEET AS DIRECTED BY CLIENT.
6. AT THE REQUEST OF THE CLIENT, THE ENCROACHING FENCE IS NOT SHOWN FOR CLARITY.

MONUMENT COORDINATE TABLE

MONUMENT IDENTIFIER	NORTHING	EASTING	DESCRIPTION
WS 1	1042054.0867	756224.5074	CONCRETE MONUMENT
WS 2	1042009.4625	755714.9269	CONCRETE MONUMENT
WS 3	1041834.6787	754893.4896	CONCRETE MONUMENT
WS 4	1041216.1702	754254.5787	CONCRETE MONUMENT
WS 4A	1041212.6925	754250.9863	CONCRETE MONUMENT
WS 5	1041212.5432	753443.8646	CONCRETE MONUMENT
WS 5A	1041212.5422	753438.8646	CONCRETE MONUMENT
WS 6	1041962.3337	753439.3605	CONCRETE MONUMENT
WS 7	1041995.8593	753345.1108	CONCRETE MONUMENT
WS 7A	1041997.5350	753340.4000	CONCRETE MONUMENT
WS 8	1042406.3947	752882.8676	CONCRETE MONUMENT
WS 8A	1042409.7264	752879.1393	CONCRETE MONUMENT
WS 9	1042593.7857	752864.4291	CONCRETE MONUMENT
WS 9A	1042598.7698	752864.0308	CONCRETE MONUMENT
WS 10	1042917.1336	753041.8817	CONCRETE MONUMENT
WS 11	1043402.1504	753007.6984	CONCRETE MONUMENT
WS 11A	1043407.1285	753007.2306	CONCRETE MONUMENT
WS 12	1043624.9578	753435.7066	CONCRETE MONUMENT
WS 12A	1043627.2238	753440.1637	CONCRETE MONUMENT
WS 13	1044977.5534	753438.4114	CONCRETE MONUMENT
WS 13A	1044982.5534	753438.4049	CONCRETE MONUMENT
WS 14	1044927.7711	753824.1731	CONCRETE MONUMENT
WS 15	1045037.6180	753823.9932	CONCRETE MONUMENT
WS 16	1045038.4060	754318.2050	CONCRETE MONUMENT
WS 16A	1045038.4140	754323.2050	CONCRETE MONUMENT
WS 17	1044944.7966	754323.2061	CONCRETE MONUMENT
WS 18	1044988.0628	755027.0225	CONCRETE MONUMENT
WS 19	1044441.4043	755650.1979	CONCRETE MONUMENT
WS 20	1044156.7289	755913.5121	CONCRETE MONUMENT
WS 21	1043828.2352	756110.0676	CONCRETE MONUMENT
WS 21A	1043823.7007	756112.1743	CONCRETE MONUMENT
WS 22	1042764.7573	756602.4254	CONCRETE MONUMENT
WS 22A	1042760.2200	756604.5260	CONCRETE MONUMENT

SURVEYOR'S CERTIFICATE

DEPT. OF ENERGY

WELDON SPRING SITE
REMEDIAL ACTION PROJECT, MO.

BOUNDARY SURVEY FOR WSSRAP SITE

SHEET 1 OF 2 SEP 2002

LEGAL DESCRIPTION
FOR
300-FOOT BUFFER LIMITS OF DISPOSAL CELL
WELDON SPRING SITE REMEDIAL ACTION PROJECT, MO

All that parcel of land located in part of Fractional Section 31 and part of U.S. Survey 1798, Township 46 North, Range 3 East of the 5th Principal Meridian, St. Charles County, Missouri, as shown on a map dated May, 2004, prepared by ABNA Engineering, Inc. and titled "*Dept. of Energy, Weldon Spring Site Remedial Action Project, MO, Survey for 300-Foot Buffer Limits of Disposal Cell*", the basis of bearing being the Missouri State Plane Coordinate System of 1983– East Zone (adopting the 1993 adjustment values for first-order control points used), and being more particularly described as follows:

Commencing at an aluminum disk marking the Southeast corner of Section 31, Township 46 North, Range 3 East of the Fifth Principal Meridian, thence North 12° 52' 09" West a distance of 2950.67 feet to set Monument WS 23 having coordinates of N=1,043,428.02 and E=756,295.20, and being the point of beginning of the 300 foot buffer limit of disposal cell of the Weldon Spring Site Remedial Action Project. Thence along the following bearing and distances:

South 30° 44' 40" West for a distance of 462.46 feet to iron pipe WS 24P,
South 30° 44' 40" West for a distance of 499.04 feet to iron pipe WS 25P,
South 30° 44' 40" West for a distance of 498.13 feet to a point witnessed by a brass cap and identified as WS 26 which bears South 88° 17' 31" East a distance of 35.00 feet,
North 88° 17' 31" West for a distance of 689.97 feet to iron pipe WS 27P,
North 88° 17' 31" West for a distance of 690.00 feet to Monument WS 28,
North 3° 43' 25" West for a distance of 523.66 feet to an iron pipe WS 29P,
North 3° 43' 25" West for a distance of 523.66 feet to iron pipe WS 30P,
North 3° 43' 25" West for a distance of 523.67 feet to iron pipe WS 31P,
North 3° 43' 25" West for a distance of 523.65 feet to Monument WS 32,
North 88° 58' 37" East for a distance of 516.13 feet to iron pipe WS 33P,
North 88° 58' 37" East for a distance of 516.14 feet to iron pipe WS 34P,
North 88° 58' 37" East for a distance of 516.13 feet to Monument WS 35,
South 39° 59' 11" East for a distance of 569.72 feet to iron pipe WS 36P,
South 39° 59' 11" East for a distance of 454.14 feet to Monument WS 37,
South 24° 48' 28" East for a distance of 132.23 feet to Monument WS 23
being the point of beginning and containing 89.81 acres, more or less.

PART OF FRACTIONAL SECTION 31
AND PART OF U.S. SURVEY 1798
TOWNSHIP 46 NORTH, RANGE 3 EAST
ST. CHARLES COUNTY, MISSOURI

LEGEND

WS35.4 - 300 FOOT BUFFER ZONE PERMANENT MONUMENT DESIGNATION

WS36P.0 - 300 FOOT BUFFER ZONE INTERMEDIATE IRON PIPE DESIGNATION

——— - DISPOSAL CELL 300 FOOT BUFFER ZONE DELIMITER

VICINITY MAP

MONUMENT	NORTHING	EASTING	ELEVATION	DESCRIPTION
WS23	1043428.02	756295.29	635.35	BRASS CAP IN CONC. MON.
WS24P	1043530.55	756053.79	NOT SET	IRON ROD WITH CAP
WS25P	1042921.65	755803.67	NOT SET	IRON ROD WITH CAP
WS26	1042172.48	755584.01	657.20	BRASS CAP IN CONC. SLAB
WS27P	1042154.09	754809.36	NOT SET	IRON ROD WITH CAP
WS28	1042214.86	754168.66	640.25	BRASS CAP IN CONC. MON.
WS29P	1042737.21	754135.65	NOT SET	IRON ROD WITH CAP
WS30P	1043259.77	754101.65	NOT SET	IRON ROD WITH CAP
WS31P	1043782.33	754067.64	NOT SET	IRON ROD WITH CAP
WS32	1044304.89	754033.63	626.40	BRASS CAP IN CONC. MON.
WS33P	1044314.09	754568.67	NOT SET	IRON ROD WITH CAP
WS34P	1044323.30	755068.73	NOT SET	IRON ROD WITH CAP
WS35	1044332.52	755581.78	624.86	BRASS CAP IN CONC. MON.
WS36P	1043836.00	755543.89	NOT SET	IRON ROD WITH CAP
WS37	1043548.05	756235.72	631.76	BRASS CAP IN CONC. MON.

NOTE 1:
BASIS OF BEARING AND COORDINATES SHOWN ARE MISSOURI STATE PLANE COORDINATE SYSTEM OF 1983 - EAST ZONE (USING THE 1983 ADJUSTMENT VALUES FOR CONTROL POINTS). THE FOLLOWING VALUES (FEET) AND FIRST ORDER CONTROL POINTS WERE USED:

ST. CHARLES GEOGRAPHIC REFERENCE SYSTEM

STATION NAME: SC-11
1983 MISSOURI EAST ZONE STATE PLANE COORDINATE DATA:
NORTHING: 1045946.64
EASTING: 760377.60

STATION NAME: SC-14
1983 MISSOURI EAST ZONE STATE PLANE COORDINATE DATA:
NORTHING: 1037658.05
EASTING: 753457.86

STATION NAME: SC-15
1983 MISSOURI EAST ZONE STATE PLANE COORDINATE DATA:
NORTHING: 1029826.44
EASTING: 750334.42

NOTE 2:
THE WSSRAP SITE BOUNDARY AND TOPOGRAPHIC FEATURES WERE SUPPLIED BY THE CLIENT FOR VISUAL REFERENCE ONLY.

NOTE 3:
THIS PLAT IS INTENDED TO SHOW THE LIMITS OF A 300 FOOT BUFFER ZONE AROUND THE WELDON SPRING SITE REMEDIAL ACTION PROJECT DISPOSAL CELL AND IS NOT INTENDED AS A PROPERTY BOUNDARY SURVEY OR FOR THE TRANSFER OR SUBDIVISION OF ANY PARCELS.

SURVEYOR'S CERTIFICATION

This is to certify that ABNA Engineering, Inc. has, during the month of Nov. 2001, at the request of, and for the exclusive use of the United States Department of Energy, performed a field survey to set a permanent 300 foot buffer zone around the disposal cell of the Weldon Spring Site Remedial Action Project in Weldon Spring, Missouri; and that the results of said field survey are shown hereon. No warranty or add title commitment or report was provided and this plat does not constitute a property boundary survey as detailed in MISSOURI MINIMUM STANDARDS FOR PROPERTY BOUNDARY SURVEYS" (10 CSR 30-2.01 to 10 CSR 30-2.110). Documentation of this buffer zone does meet "MISSOURI MINIMUM STANDARDS FOR PROPERTY BOUNDARY SURVEYS" (10 CSR 30-2.060). At the request of the client, a metes and bounds description of the 300 foot buffer limits perimeter is provided on a separate sheet.

ABNA Engineering, Inc.
Suite 900
625 N. Euclid Avenue
St. Louis, Missouri 63108
314-454-0202

Corporate LS Reg. No. 3608

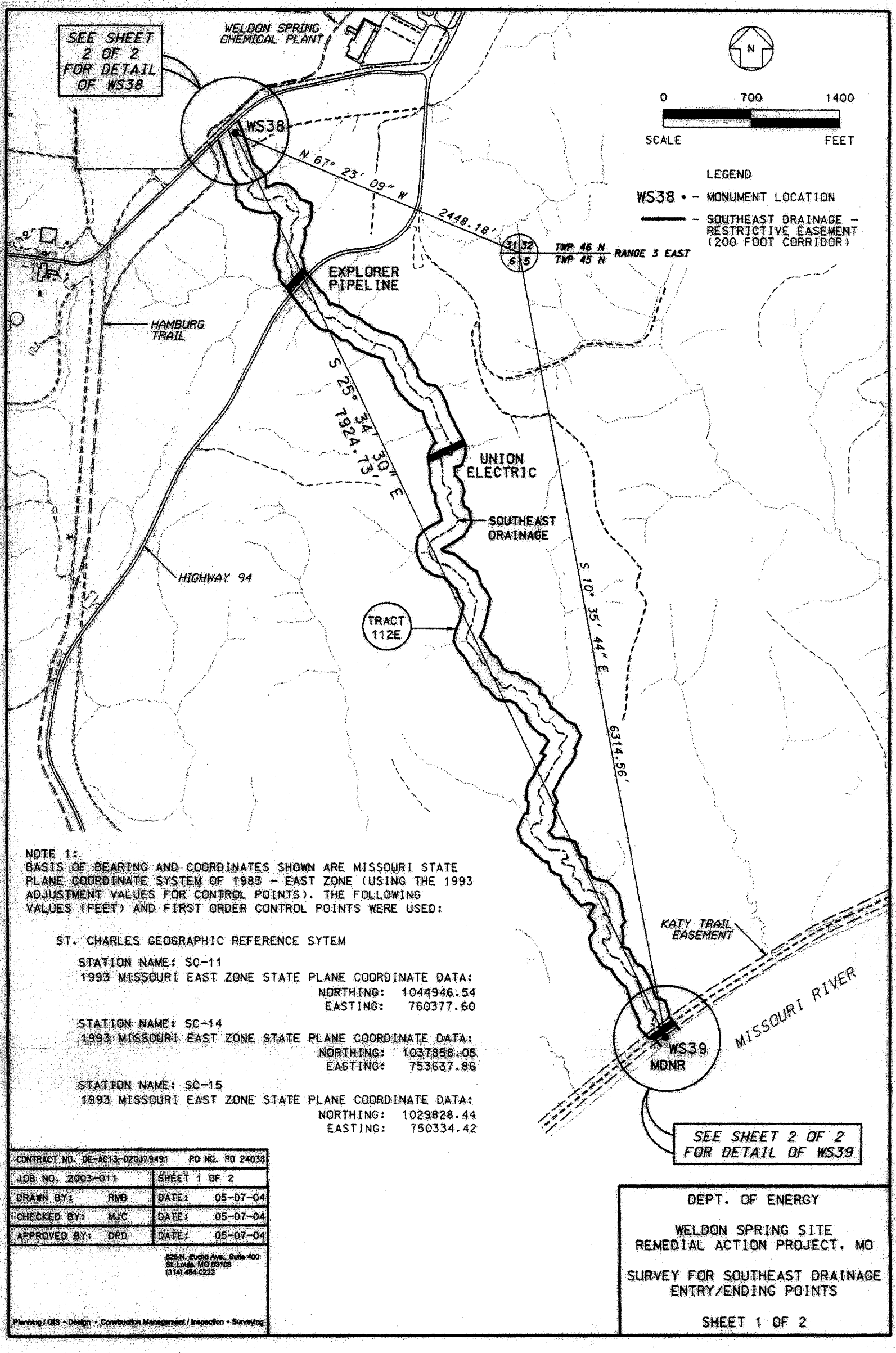
Michael J. Conroy, PLS
MO PLS No. 2000011460

DEPT. OF ENERGY

WELDON SPRING SITE
REMEDIAL ACTION PROJECT, MO

SURVEY FOR 300-FOOT BUFFER
LIMITS OF DISPOSAL CELL

ABNA Engineering



NOTE 1:
BASIS OF BEARING AND COORDINATES SHOWN ARE MISSOURI STATE PLANE COORDINATE SYSTEM OF 1983 - EAST ZONE (USING THE 1993 ADJUSTMENT VALUES FOR CONTROL POINTS). THE FOLLOWING VALUES (FEET) AND FIRST ORDER CONTROL POINTS WERE USED:

ST. CHARLES GEOGRAPHIC REFERENCE SYTEM

STATION NAME: SC-11
1993 MISSOURI EAST ZONE STATE PLANE COORDINATE DATA:
NORTHING: 1044946.54
EASTING: 760377.60

STATION NAME: SC-14
1993 MISSOURI EAST ZONE STATE PLANE COORDINATE DATA:
NORTHING: 1037858.05
EASTING: 753637.86

STATION NAME: SC-15
1993 MISSOURI EAST ZONE STATE PLANE COORDINATE DATA:
NORTHING: 1029828.44
EASTING: 750334.42

CONTRACT NO. DE-AC13-02GJ79491 PO NO. PO 24038	
JOB NO. 2003-011	SHEET 1 OF 2
DRAWN BY: RMB	DATE: 05-07-04
CHECKED BY: MJC	DATE: 05-07-04
APPROVED BY: DPD	DATE: 05-07-04

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Planning / GIS • Design • Construction Management / Inspection • Surveying

DEPT. OF ENERGY

WELDON SPRING SITE
REMEDIAL ACTION PROJECT, MO

SURVEY FOR SOUTHEAST DRAINAGE ENTRY/ENDING POINTS

SHEET 1 OF 2

MONUMENT / POINT NO.	NORTHING	EASTING	DESCRIPTION
WS38	1041492.85	754692.44	BRASS CAP IN CONC. MON.
WS39	1034344.57	758113.47	BRASS CAP IN CONC. MON.

N

0 100 200

SCALE FEET

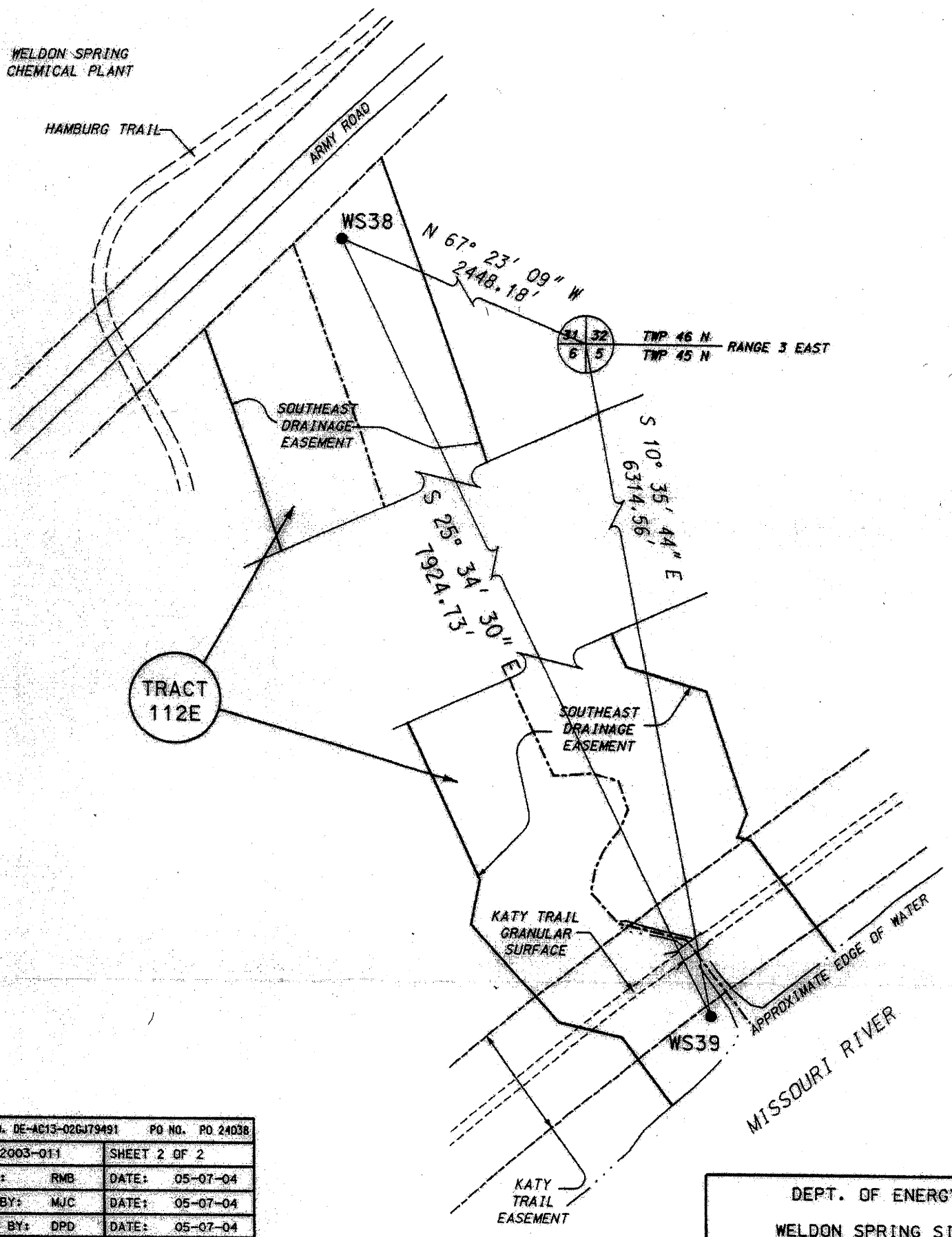
LEGEND

WS38 ● – PERMANENT MONUMENT LOCATION

——— – SOUTHEAST DRAINAGE – RESTRICTIVE EASEMENT

NOTE 1:
BASIS OF BEARING AND COORDINATES SHOWN ARE MISSOURI STATE PLANE COORDINATE SYSTEM OF 1983 – EAST ZONE (USING THE 1993 ADJUSTMENT VALUES FOR CONTROL POINTS).

NOTE 2:
SEE SHEET 1 OF 2 FOR STATE PLANE CONTROL POINTS USED.



CONTRACT NO. DE-AC13-02GJ79491	PO NO. PO 24038
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DEPT. OF ENERGY

WELDON SPRING SITE
REMEDIAL ACTION PROJECT, MO

SURVEY FOR SOUTHEAST DRAINAGE ENTRY/ENDING POINTS

SHEET 2 OF 2

WELDON SPRING SITE REMEDIAL ACTION PROJECT, MO
BOUNDARY SURVEY FOR QUARRY

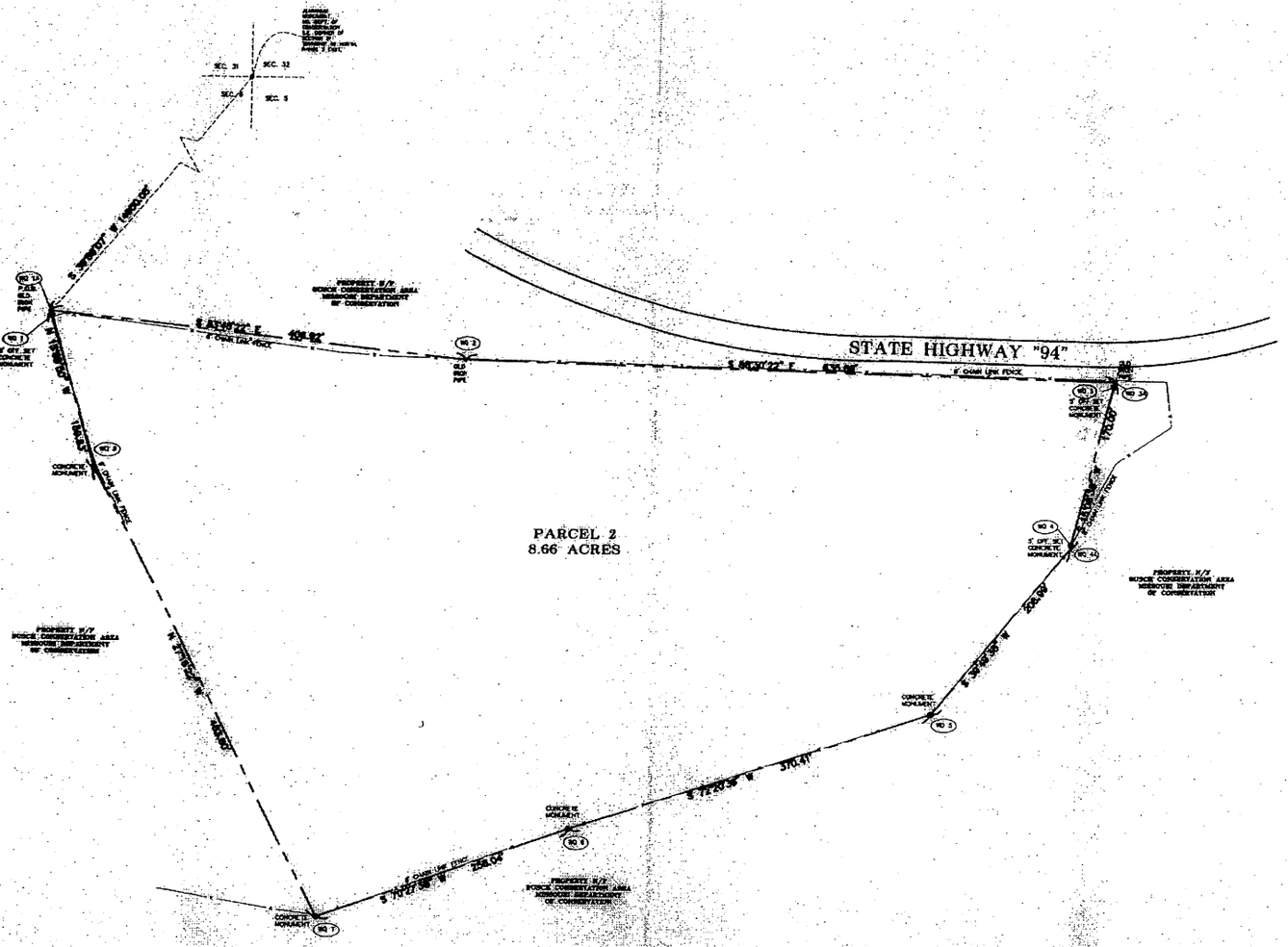
All those two parcels of land located in St. Charles County, Missouri, as shown on maps dated February 2002 prepared by St. Charles Engineering & Surveying, Inc. and titled *Dept. of Energy, Weldon Spring Site Remedial Action Project, MO, Boundary Survey for WSSRAP Site.* The bearings and distances are based on the Missouri State Plane Coordinate System (NAD 83). Said parcels are more particularly described as follows:

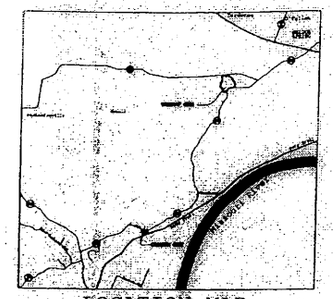
Parcel 2 – Quarry Site Proper

Being a parcel of land situated in part of Section 13, Township 45 North, Range 2 East of the Fifth Principal Meridian, St. Charles County, Missouri. Commencing at a point at the southeast corner of Section 31, Township 46 North, Range 3 East of the Fifth Principal Meridian, St. Charles County, Missouri, at an aluminum monument located at Missouri State Plane Coordinates N=1,040,489. 6750 and E=757,094.1204, thence S 39°59'07'' W, 14950.05 feet to the true point of beginning of the herein described parcel; thence along the following bearings and distances marked with concrete monuments,

S 83°48'22'' E, 406.92 feet,
S 88°30'22'' E, 635.69 feet,
S 15°08'38'' W, 170.00 feet,
S 39°49'38'' W, 208.99 feet,
S 72°20'38'' W, 370.41 feet,
S 70°27'38'' W, 258.04 feet,
N 27°15'22'' W, 483.80 feet,
N 15°59'50'' W, 159.83 feet to the point of beginning, containing 8.66 acres more or less.

T 45 N, R 2 E, Section 13
ST. CHARLES COUNTY, MO





LOCATION MAP

GENERAL NOTES:

1. BASIS OF BEARING OF THIS SURVEY IS MISSOURI STATE PLANE COORDINATE SYSTEM (NAD 83).
2. T.B.S. INDICATES A CONCRETE MONUMENT TO BE SET BY ST. CHARLES ENGINEERING AND SURVEYING, INC.
3. A CURRENT TITLE COMMITMENT WAS NOT FURNISHED FOR THIS SURVEY AND, THEREFORE IT IS SUBJECT TO THE FOLLOWING CONDITIONS:
   A. DEFECTS, ENCUMBRANCES, ADVERSE CLAIMS OR OTHER MATTERS IF ANY.
   B. RIGHTS OR CLAIMS OF PARTIES IN POSSESSION NOT SHOWN BY THE PUBLIC RECORDS.
   C. EASEMENT OR CLAIMS OF EASEMENTS NOT SHOWN BY THE PUBLIC RECORDS.
   D. EASEMENTS OF RECORD.
4. (MQ 1) INDICATES THE WELDON SPRING QUARRY CONTROL POINT NUMBER FOR THAT CORNER.
5. TRAVERSE CLOSURE 1 : 46,000
6. LEGAL DESCRIPTION PROVIDED ON SEPERATE SHEET AS DIRECTED BY CLIENT.

MONUMENT COORDINATE TABLE

MONUMENT IDENTIFIER	NORTHING	EASTING	DESCRIPTION
MQ1	1029029.9933	747488.7453	CONCRETE MONUMENT
MQ1A	1029034.7497	747487.3680	OLD IRON PIPE
MQ2	1028990.6853	748191.8125	OLD IRON PIPE
MQ3	1028963.4153	748526.0802	CONCRETE MONUMENT
MQ3A	1028924.3223	748527.3864	OLD IRON PIPE
MQ4	1028815.0528	748484.2611	CONCRETE MONUMENT
MQ4A	1028810.2260	748482.9746	CONCRETE MONUMENT
MQ5	1028649.7261	748343.1219	CONCRETE MONUMENT
MQ6	1028537.3178	747956.1603	CONCRETE MONUMENT
MQ7	1028451.0170	747752.9804	CONCRETE MONUMENT
MQ8	1028881.1600	747531.4155	CONCRETE MONUMENT

N

GRAPHIC SCALE

SURVEYOR'S CERTIFICATE

DEPT. OF ENERGY

WELDON SPRING SITE
REMEDIAL ACTION PROJECT, MO.

BOUNDARY SURVEY FOR WSSRAP SITE

SHEET 2 OF 2 SEP 2002

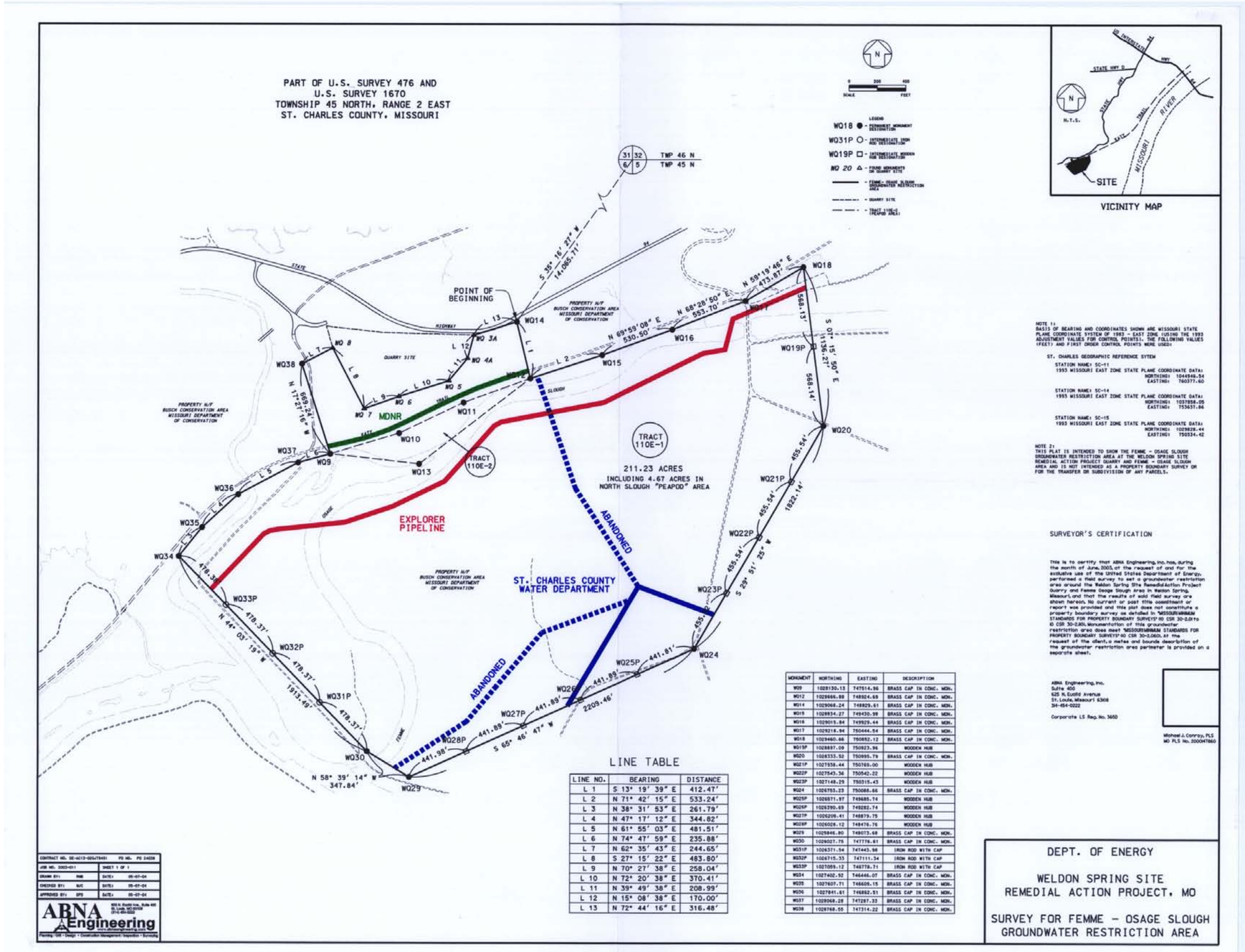
LEGAL DESCRIPTION
FOR
FEMME-OSAGE SLOUGH GROUNDWATER RESTRICTION AREA
WELDON SPRING SITE REMEDIAL ACTION PROJECT, MO

All that parcel of land identified as Tract 110E-1 and located in part of U.S. Survey 476 and part of U.S. Survey 1670, Township 45 North, Range 2 East of the 5th Principal Meridian, St. Charles County, Missouri, as shown on a map dated May, 2004, prepared by ABNA Engineering, Inc. and titled "*Dept. of Energy, Weldon Spring Site Remedial Action Project, MO, Survey for Femme-Osage Slough Groundwater Restriction Area*", the basis of bearing being the Missouri State Plane Coordinate System of 1983 – East Zone (adopting the 1993 adjustment values for first-order control points used), and being more particularly described as follows:

Commencing at an aluminum disk marking the northeast corner of Section 6, Township 45 North, Range 3 East of the Fifth Principal Meridian, thence South 35° 16' 27" West a distance of 14,065.71 feet to Monument designated as WQ 14, having coordinates of N=1,029,068.24 and E=748,829.61, and being the point of beginning of the restriction area of the Femme-Osage Slough area of the Weldon Spring Site Remedial Action Project. Thence along the following bearings and distances:

South 13° 19' 39" East for a distance of 412.47 feet to Monument WQ 12,
North 71° 42' 15" East for a distance of 533.24 feet to Monument WQ 15,
North 69° 59' 08" East for a distance of 530.50 feet to Monument WQ 16,
North 68° 28' 50" East for a distance of 553.70 feet to Monument WQ 17,
North 59° 19' 46" East for a distance of 473.87 feet to Monument WQ 18,
South 7° 15' 50" East for a distance of 568.13 feet to a wooden hub WQ 19P,
South 7° 15' 50" East for a distance of 568.14 feet to Monument WQ 20,
South 29° 51' 25" West for a distance of 455.54 feet to a wooden hub WQ 21P,
South 29° 51' 25" West for a distance of 455.54 feet to a wooden hub WQ 22P,
South 29° 51' 25" West for a distance of 455.54 feet to a wooden hub WQ 23P,
South 29° 51' 25" West for a distance of 455.52 feet to Monument WQ 24,
South 65° 46' 47" West for a distance of 441.81 feet to a wooden hub WQ 25P,
South 65° 46' 47" West for a distance of 441.89 feet to a wooden hub WQ 26P,
South 65° 46' 47" West for a distance of 441.89 feet to a wooden hub WQ 27P,
South 65° 46' 47" West for a distance of 441.89 feet to a wooden hub WQ 28P,
South 65° 46' 47" West for a distance of 441.98 feet to Monument WQ 29,
North 58° 39' 14" West for a distance of 347.84 feet to Monument WQ 30,
North 44° 03' 19" West for a distance of 478.37 feet to iron pipe WQ 31P,
North 44° 03' 19" West for a distance of 478.37 feet to iron pipe WQ 32P,
North 44° 03' 19" West for a distance of 478.37 feet to iron pipe WQ 33P,
North 44° 03' 19" West for a distance of 478.38 feet to Monument WQ 34,

North 38° 31' 53" East for a distance of 261.79 feet to Monument WQ 35,
North 47° 17' 12" East for a distance of 344.82 feet to Monument WQ 36,
North 61° 55' 03" East for a distance of 481.51 feet to Monument WQ 37,
North 74° 47' 59" East for a distance of 235.88 feet to Monument WQ 9;
North 17° 27' 16" West for a distance of 669.24 feet to Monument WQ 38,
North 62° 35' 43" East for a distance of 244.65 feet to Monument WQ 8,
South 27° 15' 22" East for a distance of 483.80 feet to Monument WQ 7,
North 70° 27' 38" East for a distance of 258.04 feet to Monument WQ 6,
North 72° 20' 38" East for a distance of 370.41 feet to Monument WQ 5,
North 39° 49' 38" East for a distance of 208.99 feet to iron pipe WQ 4A,
North 15° 08' 38" East for a distance of 170.00 feet to iron pipe WQ 3A,
North 72° 44' 16" East a distance of 316.48 feet to Monument WQ 14 being the point of beginning and containing 211.23 acres, more or less. Said acreage includes 4.67 acres, more or less, overlapped into Tract 110E-1 identified as the North Slough "peapod" area and that portion of the above which falls within the right-of-way of State Highway 94.



LINE TABLE

LINE NO.	BEARING	DISTANCE
L 1	S 13° 19' 39" E	412.47'
L 2	N 71° 42' 15" E	533.24'
L 3	N 38° 31' 53" E	261.79'
L 4	N 47° 17' 12" E	344.82'
L 5	N 61° 55' 03" E	481.51'
L 6	N 74° 47' 59" E	235.88'
L 7	N 62° 35' 43" E	244.65'
L 8	S 27° 15' 22" E	483.80'
L 9	N 70° 27' 38" E	258.04'
L 10	N 72° 20' 38" E	370.41'
L 11	N 39° 49' 38" E	208.99'
L 12	N 15° 08' 38" E	170.00'
L 13	N 72° 44' 16" E	316.48'

MONUMENT	NORTHING	EASTING	DESCRIPTION
WQ9	1028130.13	747514.96	BRASS CAP IN CONC. MON.
WQ12	1029666.88	748924.68	BRASS CAP IN CONC. MON.
WQ14	1029068.24	748829.61	BRASS CAP IN CONC. MON.
WQ15	1028934.27	749430.98	BRASS CAP IN CONC. MON.
WQ16	1029015.84	749929.44	BRASS CAP IN CONC. MON.
WQ17	1029218.94	750444.54	BRASS CAP IN CONC. MON.
WQ18	1029460.66	750852.12	BRASS CAP IN CONC. MON.
WQ19P	1028837.09	750923.96	WOODEN HUB
WQ20	1028333.52	750995.79	BRASS CAP IN CONC. MON.
WQ21P	1027958.44	750769.00	WOODEN HUB
WQ22P	1027543.36	750542.22	WOODEN HUB
WQ23P	1027148.29	750315.43	WOODEN HUB
WQ24	1026753.23	750088.66	BRASS CAP IN CONC. MON.
WQ25P	1026871.97	749685.74	WOODEN HUB
WQ26P	1026590.69	749282.74	WOODEN HUB
WQ27P	1026209.41	748879.75	WOODEN HUB
WQ28P	1026028.12	748476.76	WOODEN HUB
WQ29	1025846.80	748073.68	BRASS CAP IN CONC. MON.
WQ30	1026027.75	747776.61	BRASS CAP IN CONC. MON.
WQ31P	1026371.54	747443.98	IRON ROD WITH CAP
WQ32P	1026715.33	747111.34	IRON ROD WITH CAP
WQ33P	1027059.12	746778.71	IRON ROD WITH CAP
WQ34	1027402.92	746446.07	BRASS CAP IN CONC. MON.
WQ35	1027607.71	746605.15	BRASS CAP IN CONC. MON.
WQ36	1027841.61	746862.51	BRASS CAP IN CONC. MON.
WQ37	1028068.28	747287.33	BRASS CAP IN CONC. MON.
WQ38	1028768.55	747314.22	BRASS CAP IN CONC. MON.

NOTE 1:
BASIS OF BEARING AND COORDINATES SHOWN ARE MISSOURI STATE PLANE COORDINATE SYSTEM OF 1983 - EAST ZONE (USING THE 1993 ADJUSTMENT VALUES FOR CONTROL POINTS). THE FOLLOWING VALUES (FEET) AND FIRST ORDER CONTROL POINTS WERE USED:

ST. CHARLES GEOGRAPHIC REFERENCE SYTEM

STATION NAME: SC-11
1993 MISSOURI EAST ZONE STATE PLANE COORDINATE DATA:
NORTHING: 1044948.34
EASTING: 760377.60

STATION NAME: SC-14
1993 MISSOURI EAST ZONE STATE PLANE COORDINATE DATA:
NORTHING: 1037858.05
EASTING: 753637.86

STATION NAME: SC-15
1993 MISSOURI EAST ZONE STATE PLANE COORDINATE DATA:
NORTHING: 1027838.44
EASTING: 750534.42

NOTE 2:
THIS PLAT IS INTENDED TO SHOW THE FEMME - OSAGE SLOUGH GROUNDWATER RESTRICTION AREA AT THE WELDON SPRING SITE REMEDIAL ACTION PROJECT QUARRY AND FEMME - OSAGE SLOUGH AREA AND IS NOT INTENDED AS A PROPERTY BOUNDARY SURVEY OR FOR THE TRANSFER OR SUBDIVISION OF ANY PARCELS.

SURVEYOR'S CERTIFICATION

This is to certify that ABNA Engineering, Inc. has, during the month of June, 2005, at the request of and for the exclusive use of the United States Department of Energy, performed a field survey to set a groundwater restriction area around the Weldon Spring Site Remedial Action Project Quarry and Femme Osage Slough area in Weldon Spring, Missouri, and that the results of said field survey are shown hereon. No current or past title commitment or report was provided and this plat does not constitute a property boundary survey as defined in "MISSOURI MINIMUM STANDARDS FOR PROPERTY BOUNDARY SURVEYS" 10 CSR 30-2.010 to 10 CSR 30-2.050. Monumentation of this groundwater restriction area does meet "MISSOURI MINIMUM STANDARDS FOR PROPERTY BOUNDARY SURVEYS" 10 CSR 30-2.060. At the request of the client, a metes and bounds description of the groundwater restriction area perimeter is provided on a separate sheet.

ABNA Engineering, Inc.
Suite 400
625 N. Euclid Avenue
St. Louis, Missouri 63108
314-454-0222

Corporate LS Req. No. 3650

Michael J. Conroy, PLS
MO PLS No. 2000147860

CONTRACT NO. DE-AC13-02GJ79491 PO NO.: PO 24038
JOB NO.: 2003-011 SHEET 1 OF 1
DRAWN BY: MMB DATE: 05-07-04
CHECKED BY: MJC DATE: 05-07-04
APPROVED BY: SPD DATE: 05-07-04

ABNA Engineering
Planning • GIS • Design • Construction Management • Inspection • Surveying

DEPT. OF ENERGY

WELDON SPRING SITE
REMEDIAL ACTION PROJECT, MO

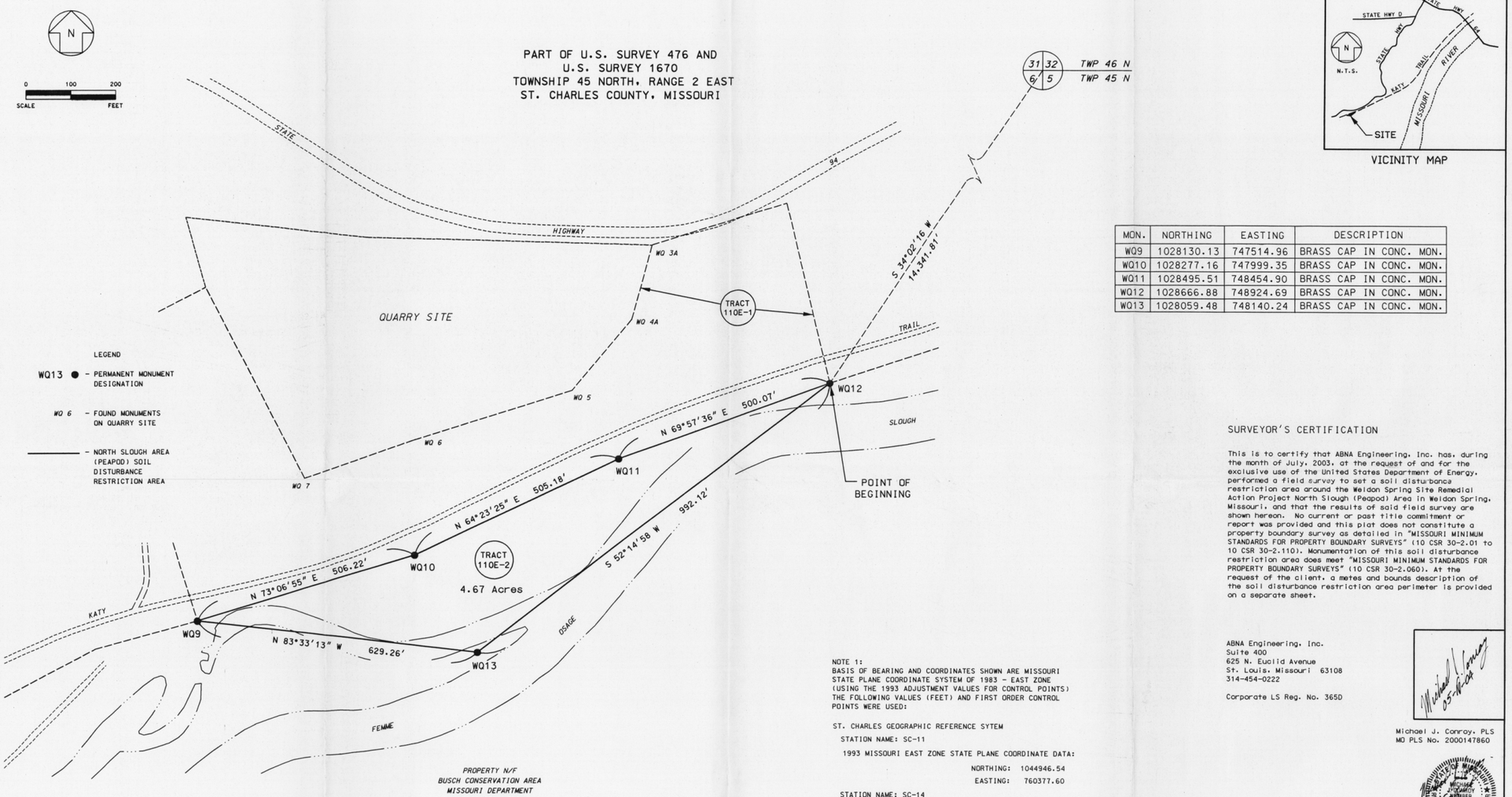
SURVEY FOR FEMME - OSAGE SLOUGH
GROUNDWATER RESTRICTION AREA

LEGAL DESCRIPTION
FOR
NORTH SLOUGH (PEAPOD) AREA
WELDON SPRING SITE REMEDIAL ACTION PROJECT, MO

All that parcel of land identified as Tract 110E-2 and located in part of U.S. Survey 476 and part of U.S. Survey 1670, Township 45 North, Range 2 East of the 5th Principal Meridian, St. Charles County, Missouri, as shown on a map dated May, 2004, prepared by ABNA Engineering, Inc. and titled "*Dept. of Energy, Weldon Spring Site Remedial Action Project, MO, Survey for North Slough Area (Peapod), Soil Disturbance Restriction Area*", the basis of bearing being the Missouri State Plane Coordinate System of 1983 – East Zone (adopting the 1993 adjustment values for first-order control points used), and being more particularly described as follows:

Commencing at an aluminum disk marking the northeast corner of Section 6, Township 45 North, Range 3 East of the Fifth Principal Meridian, thence South 34°02' 16" West for a distance of 14,341.81 feet to Monument designated as WQ 12 having coordinates of N=1,028,666.88 and E=748,924.69, and being the point of beginning of the soil disturbance restriction area of the North Slough area of the Weldon Spring Site Remedial Action Project. Thence along the following bearings and distances:

South 52° 14' 58" West for a distance of 992.12 feet to Monument WQ 13,
North 83° 33' 13" West for a distance of 629.26 feet to Monument WQ 9,
North 73° 06' 55" East for a distance of 506.22 feet to Monument WQ 10,
North 64° 23' 25" East for a distance of 505.18 feet to Monument WQ 11,
North 69° 57' 36" East for a distance of 500.07 feet Monument WQ 12, being the point of beginning and containing 4.67 acres, more or less.



MON.	NORTHING	EASTING	DESCRIPTION
WQ9	1028130.13	747514.96	BRASS CAP IN CONC. MON.
WQ10	1028277.16	747999.35	BRASS CAP IN CONC. MON.
WQ11	1028495.51	748454.90	BRASS CAP IN CONC. MON.
WQ12	1028666.88	748924.69	BRASS CAP IN CONC. MON.
WQ13	1028059.48	748140.24	BRASS CAP IN CONC. MON.

NOTE 1:
BASIS OF BEARING AND COORDINATES SHOWN ARE MISSOURI STATE PLANE COORDINATE SYSTEM OF 1983 – EAST ZONE (USING THE 1993 ADJUSTMENT VALUES FOR CONTROL POINTS) THE FOLLOWING VALUES (FEET) AND FIRST ORDER CONTROL POINTS WERE USED:

ST. CHARLES GEOGRAPHIC REFERENCE SYTEM

STATION NAME: SC-11

1993 MISSOURI EAST ZONE STATE PLANE COORDINATE DATA:

NORTHING: 1044946.54
EASTING: 760377.60

STATION NAME: SC-14

1993 MISSOURI EAST ZONE STATE PLANE COORDINATE DATA:

NORTHING: 1037858.05
EASTING: 753637.86

STATION NAME: SC-15

1993 MISSOURI EAST ZONE STATE PLANE COORDINATE DATA:

NORTHING: 1029828.44
EASTING: 750334.42

NOTE 2:
THIS PLAT IS INTENDED TO SHOW THE LIMITS OF A SOIL DISTURBANCE RESTRICTION AREA AT THE WELDON SPRING SITE REMEDIAL ACTION PROJECT NORTH SLOUGH (PEAPOD) AREA AND IS NOT INTENDED AS A PROPERTY BOUNDARY SURVEY OR FOR THE TRANSFER OR SUBDIVISION OF ANY PARCELS.

SURVEYOR'S CERTIFICATION

This is to certify that ABNA Engineering, Inc. has, during the month of July, 2003, at the request of and for the exclusive use of the United States Department of Energy, performed a field survey to set a soil disturbance restriction area around the Weldon Spring Site Remedial Action Project North Slough (Peapod) Area in Weldon Spring, Missouri, and that the results of said field survey are shown hereon. No current or past title commitment or report was provided and this plat does not constitute a property boundary survey as detailed in "MISSOURI MINIMUM STANDARDS FOR PROPERTY BOUNDARY SURVEYS" (10 CSR 30-2.01 to 10 CSR 30-2.110). Monumentation of this soil disturbance restriction area does meet "MISSOURI MINIMUM STANDARDS FOR PROPERTY BOUNDARY SURVEYS" (10 CSR 30-2.060). At the request of the client, a metes and bounds description of the soil disturbance restriction area perimeter is provided on a separate sheet.

ABNA Engineering, Inc.
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314-454-0222

Corporate LS Reg. No. 365D

Michael J. Conroy, PLS
MO PLS No. 2000147860

CONTRACT NO. DE-AC13-02GJ79491		PO NO. PO 24038	
JOB NO. 2003-011		SHEET 1 OF 1	
DRAWN BY:	RMB	DATE:	05-07-04
CHECKED BY:	MJC	DATE:	05-07-04
APPROVED BY:	DPD	DATE:	05-07-04

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DEPT. OF ENERGY

WELDON SPRING SITE
REMEDIAL ACTION PROJECT, MO

SURVEY FOR NORTH SLOUGH AREA
(PEAPOD)
SOIL DISTURBANCE RESTRICTION AREA

EXCEPTION NO. 1
WELDON SPRING SITE REMEDIAL ACTION PROJECT, MO
BOUNDARY SURVEY FOR SITE

All those two parcels of land located in St. Charles County, Missouri, as shown on maps dated February 2002 prepared by St. Charles Engineering & Surveying, Inc. and titled *Dept. of Energy, Weldon Spring Site Remedial Action Project, MO, Boundary Survey of WSSRAP Site.* The bearings and distances are based on the Missouri State Plane Coordinate System (NAD 83). Said parcels are more particularly described as follows:

Parcel 1 – Plant Site Proper

Being a parcel of land situated in part of U.S. Survey 1798 and Section 31, Township 46 North, Range 3 East of the Fifth Principal Meridian, St. Charles County, Missouri. Commencing at a point at the southeast corner of said Section 31 at an aluminum monument located at Missouri State Plane Coordinates N=1,040,489.6750 and E=757,094.1204, thence N 29°04'06" W, 1789.86 feet to the true point of beginning of the herein described parcel; thence along the following bearings and distances marked with concrete monuments,

S 84°59'43" W, 511.53 feet,
S 77°59'16" W, 839.83 feet,
S 45°55'46" W, 894.25 feet,
S 89°59'22" W, 812.12 feet,
S 00°02'16" E, 749.79 feet,
N 70°25'08" W, 105.03 feet,
N 48°12'56" W, 618.60 feet,
N 04°34'10" W, 189.65 feet,
N 29°11'22" E, 384.67 feet,

N 05°22'06" W, 474.62 feet,
N 63°'03'07" E, 485.67 feet,
N 00°04'28" W, 1355.33 feet,
S 81°55'03" E, 389.64 feet,
N 00°05'38" W, 109.85 feet,
N 89°54'31" E, 499.21 feet,
S 00°00'02" E, 93.62 feet,
N 86°28'56" E, 705.14 feet,
S 48°44'32" E, 828.98 feet,

Thence along a curve to the right having a radius of 1862.61 feet with a chord bearing and distance of S 36°47'33' E, 771.35 feet, for an arc distance of 776.9 feet; thence

S 24°50'33" E, 1171.92 feet
S 28°17'16" W, 801.90 feet to the point of beginning, containing 219.50 acres more or less.

CHEMICAL PLANT GROUNDWATER RESTRICTION AREA

EXCEPTION NO.2 – DEPARTMENT OF THE ARMY

BEING IN U.S. SURVEY 1798 OF TOWNSHIP 46 NORTH, RANGE 2 EAST AND TOWNSHIP 46 NORTH, RANGE 3 EAST, SECTION 36, TOWNSHIP 46 NORTH, RANGE 2 EAST, SECTION 31, TOWNSHIP 46 NORTH, RANGE 3 EAST, SECTION 6, TOWNSHIP 45 NORTH, RANGE 3 EAST OF ST. CHARLES COUNTY, MISSOURI AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS;

BEGINNING AT A CONCRETE MONUMENT WITH A BRASS DISK MARKED WS44, MISSOURI STATE PLANE COORDINATES (NAD83, ADJUSTMENT OF 1993) NORTH 1,040,926.55 AND EAST 753,940.51, THENCE, THE FOLLOWING COURSES AND DISTANCES:

SOUTH 53°00'20" WEST 454.35 FEET TO WS45P,
SOUTH 53°00'20" WEST 233.47 FEET TO WS46,
NORTH 82°26'24" WEST 478.94 FEET TO WS47P,
NORTH 82°26'24" WEST 451.86 FEET TO WS48,
NORTH 50°52'03" WEST 448.49 FEET TO WS49P
NORTH 50°52'03" WEST 293.49 FEET TO WS50,
NORTH 23°31'58" WEST 519.51 FEET TO WS51P,
NORTH 23°31'58" WEST 495.37 FEET TO WS52,
NORTH 08°59'03" WEST 706.90 FEET TO WS53P,
NORTH 08°59'03" WEST 493.35 FEET TO WS 54P,
NORTH 08°59'03" WEST 482.48 FEET TO WS55P,
NORTH 08°59'03" WEST 568.70 FEET TO WS56P,
NORTH 08°59'03" WEST 194.93 FEET TO A POINT IN FENCE LINE,
NORTH 70°23'55" EAST 1,854.01 FEET TO FENCE CORNER,
SOUTH 87°57'05" EAST 585.24 FEET TO FENCE CORNER,
SOUTH 00°15'05" EAST 84.30 FEET TO WS13,
SOUTH 00°04'28" EAST 1,355.33 FEET TO WS12,
SOUTH 63°03'07" WEST 485.67 FEET TO WS11,
SOUTH 05°22'06" EAST 474.62 FEET TO WS10,
SOUTH 29°11'22" WEST 384.67 FEET TO WS9,
SOUTH 04°34'10"EAST 189.65 FEET TO WS8,
SOUTH 48°12'56" EAST 618.60 FEET TO WS7,
SOUTH 70°25'08" EAST 105.03 FEET TO WS6,
SOUTH 00°02'16" WEST 749.79 FEET TO WS5,
NORTH 89°59'22" EAST 812.12 FEET TO WS4,
SOUTH 47°19'10" WEST 427.22 FEET BACK TO THE "POINT OF BEGINNING", AND CONTAINING 183.46 ACRES MORE OR LESS.

CHEMICAL PLANT GROUNDWATER RESTRICTION AREA

EXCEPTION NO.3 – MODOT

BEING IN SECTION 31, TOWNSHIP 46 NORTH, RANGE 3 EAST OF ST. CHARLES COUNTY, MISSOURI AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS;

BEGINNING AT A CONCRETE MONUMENT WITH A BRASS DISK MARKED WS22, MISSOURI STATE PLANE COORDINATES (NAD83, ADJUSTMENT OF 1993) NORTH 1,042,764.7573 AND EAST 756,602.4254, THENCE NORTH 24°50'33" WEST 463.35 FEET TO A POINT (THE WESTERN MOST PIONT OF SAID PROPERTY DESCRIBED IN DEED BOOK 314, PAGE 349 IN THE COLE COUNTY, MISSOURI RECORDER'S OFFICE), THENCE NORTH 65°09'37" EAST 612.41 FEET TO A POINT IN WEST RIGHT-OF-WAY LINE OF MISSOURI STATE HIGHWAY 94, THENCE IN A SOUTHWESTERLY DIRECTION ALONG SAID RIGHT-OF-WAY BACK TO THE "POINT OF BEGINNING", AND CONTAINING 4.33 ACRES MORE OR LESS.

CHEMICAL PLANT GROUNDWATER RESTRICTION AREA

EXCEPTION NO.4 – MISSOURI DEPARTMENT OF CONSERVATION

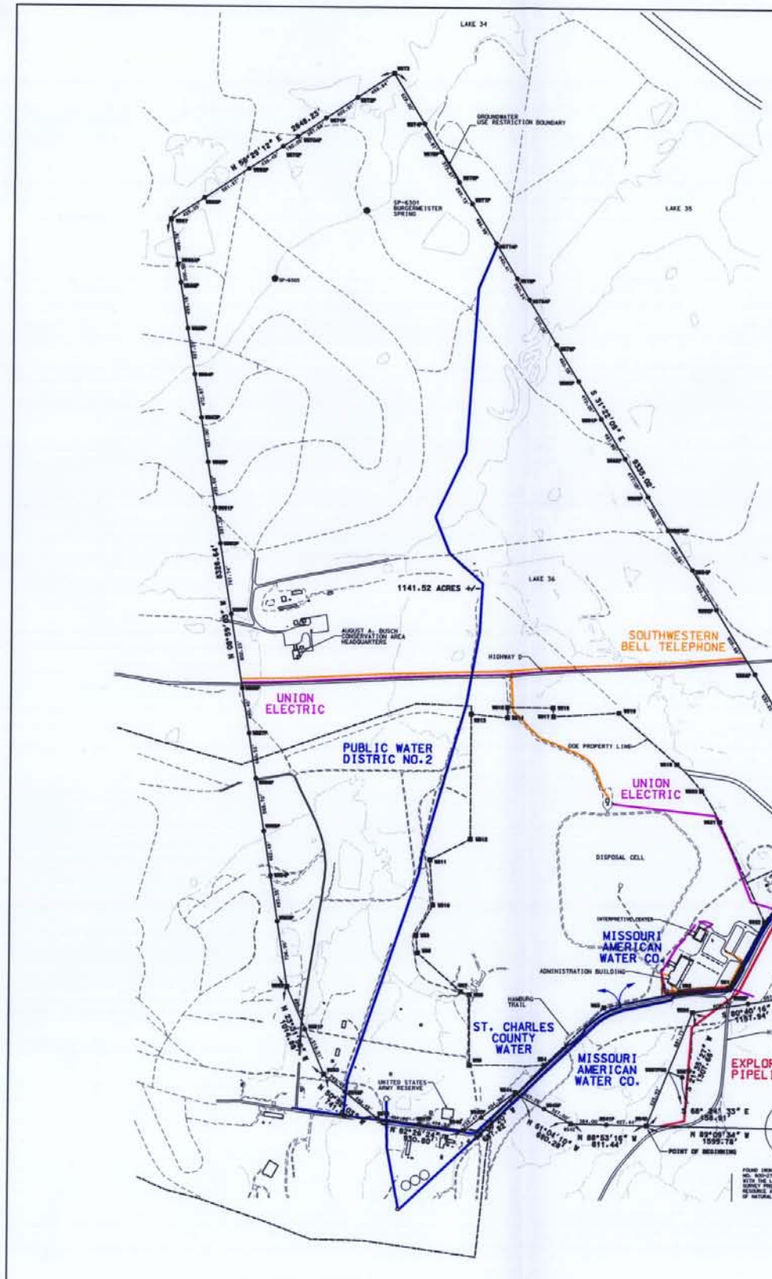
BEING IN U.S. SURVEY 887, U.S. SURVEY 453 AND U.S. SURVEY 1798 OF TOWNSHIP 46 NORTH, RANGE 2 EAST AND TOWNSHIP 46 NORTH, RANGE 3 EAST, SECTIONS 25 AND 36, TOWNSHIP 46 NORTH, RANGE 2 EAST, SECTIONS 19, 30, 31 AND 32 TOWNSHIP 46 NORTH, RANGE 3 EAST OF ST. CHARLES COUNTY, MISSOURI AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS;

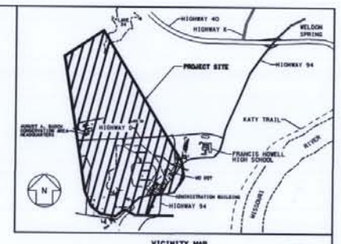
BEGINNING AT A CONCRETE MONUMENT WITH A BRASS DISK MARKED WS40, MISSOURI STATE PLANE COORDINATES (NAD83, ADJUSTMENT OF 1993) NORTH 1,040,576.88 AND EAST 755,355.94, THENCE, THE FOLLOWING COURSES AND DISTANCES:

NORTH 88°53'16" WEST 427.44 FEET TO WS41P,
NORTH 88°53'16" WEST 384.00 FEET TO WS42,
NORTH 61°04'10" WEST 327.00 FEET TO WS43P,
NORTH 61°04'10" WEST 363.28 FEET TO WS44,
NORTH 47°19'10" EAST 427.22 FEET TO WS4,
NORTH 45°55'46" EAST 894.25 FEET TO WS3,
NORTH 77°59'16" EAST 839.83 FEET TO WS2,
NORTH 84°59'43" EAST 511.53 FEET TO WS1,
NORTH 28°17'16" EAST 801.90 FEET TO WS22 WHICH IS ON THE WEST RIGHT-OF-WAY LINE OF MISSOURI STATE ROUTE 94, THENCE, IN A NORTHEASTERLY DIRECTION ALONG SAID RIGHT-OF-WAY TO A POINT, THENCE,
SOUTH 65°09'37" WEST 612.41 FEET TO A POINT,THENCE,
NORTH 24°50'33" WEST 708.57 FEET TO WS21, THENCE, ALONG A CURVE HAVING A RADIUS OF 1,862.61 FEET WITH A CHORD BEARING AND DISTANCE OF NORTH 36°47'33" WEST, 771.35 FEET FOR AN ARC DISTANCE OF 776.97 FEET TO WS19, THENCE,
NORTH 48°44'32" WEST 828.97 FEET TO WS18,
SOUTH 86°28'56" WEST 705.14 FEET TO WS17,
NORTH 00°00'02" WEST 93.62 FEET TO WS16,
SOUTH 89°54'31" WEST 499.21 FEET TO WS15,
SOUTH 00°05'38" EAST 109.85 FEET TO WS14,
NORTH 81°55'03" WEST 389.64 FEET TO WS13,
NORTH 00°15'05" WEST 84.30 FEET TO A FENCE CORNER,
NORTH 87°57'05" WEST 585.24 FEET TO A FENCE CORNER,
SOUTH 70°23'55" WEST 1,854.01 FEET TO POINT IN A FENCE LINE,
NORTH 08°59'03" WEST 295.59 FEET TO WS57P,
NORTH 08°59'03" WEST 490.40 FEET TO WS58P,
NORTH 08°59'03" WEST 802.23 FEET TO WS59P,
NORTH 08°59'03" WEST 767.74 FEET TO WS60P,
NORTH 08°59'03" WEST 387.24 FEET TO WS61P,
NORTH 08°59'03" WEST 499.50 FEET TO WS62P,
NORTH 08°59'03" WEST 481.00 FEET TO WS63P,
NORTH 08°59'03" WEST 472.87 FEET TO WS64P,
NORTH 08°59'03" WEST 497.29 FEET TO WS65P,
NORTH 08°59'03" WEST 499.16 FEET TO WS66P,
NORTH 08°59'03" WEST 200.50 FEET TO WS66AP,
NORTH 08°59'03" WEST 488.76 FEET TO WS67,
NORTH 56°29'12" EAST 425.25 FEET TO WS68P,
NORTH 56°29'12" EAST 561.97 FEET TO WS69P,
NORTH 56°29'12" EAST 436.49 FEET TO WS70P,

NORTH 56°29'12" EAST 190.09 FEET TO WS70AP,
NORTH 56°29'12" EAST 361.68 FEET TO WS71P,
NORTH 56°29'12" EAST 403.91 FEET TO WS72P,
NORTH 56°29'12" EAST 468.84 FEET TO WS73,
SOUTH 31°22'09" EAST 628.00 FEET TO WS74P,
SOUTH 31°22'09" EAST 350.87 FEET TO WS75P,
SOUTH 31°22'09" EAST 373.67 FEET TO WS76P,
SOUTH 31°22'09" EAST 269.73 FEET TO WS77P,
SOUTH 31°22'09" EAST 496.98 FEET TO WS77AP,
SOUTH 31°22'09" EAST 440.41 FEET TO WS78P,
SOUTH 31°22'09" EAST 260.24 FEET TO WS78AP,
SOUTH 31°22'09" EAST 570.08 FEET TO WS79P,
SOUTH 31°22'09" EAST 460.05 FEET TO WS80P,
SOUTH 31°22'09" EAST 470.05 FEET TO WS81P,
SOUTH 31°22'09" EAST 497.80 FEET TO WS82P,
SOUTH 31°22'09" EAST 477.05 FEET TO WS83P,
SOUTH 31°22'09" EAST 420.10 FEET TO WS83AP,
SOUTH 31°22'09" EAST 499.55 FEET TO WS84P,
SOUTH 31°22'09" EAST 499.36 FEET TO WS85P,
SOUTH 31°22'09" EAST 805.66 FEET TO WS86P,
SOUTH 31°22'09" EAST 632.22 FEET TO WS87P,
SOUTH 31°22'09" EAST 482.82 FEET TO WS88P,
SOUTH 31°22'09" EAST 470.53 FEET TO WS89P,
SOUTH 31°22'09" EAST 229.85 FEET TO WS90,
SOUTH 09°57'24" EAST 456.66 FEET TO WS91P,
SOUTH 09°57'24" EAST 495.04 FEET TO WS92,
SOUTH 32°40'53" WEST 625.07 FEET TO WS93P,
SOUTH 32°40'53" WEST 497.15 FEET TO WS94,
SOUTH 80°40'16" WEST 557.94 FEET TO WS95P,
SOUTH 80°40'16" WEST 600.00 FEET TO WS96,
SOUTH 21°35'27" WEST 681.73 FEET TO A POINT FROM WHICH BEARS A SET REBAR WITH AN ALUMINUM CAP (WS97P), SOUTH 68°24'33" EAST, A DISTANCE OF 158.91 FEET, THENCE, LEAVING SAID POINT, SOUTH 21°35'27" WEST 625.93 FEET BACK TO THE "POINT OF BEGINNING", AND CONTAINING 734.23 ACRES MOR OR LESS.

A TRACT OF LAND BEING IN PART OF U.S. SURVEY 887, U.S. SURVEY 457, AND U.S. SURVEY 1798 OF TOWNSHIP 46 NORTH, RANGE 2 EAST AND TOWNSHIP 46 NORTH, RANGE 3 EAST, SECTIONS 25 AND 36 OF TOWNSHIP 46 NORTH, RANGE 2 EAST, SECTIONS 19, 30, 31, AND 32 OF TOWNSHIP 46 NORTH, RANGE 3 EAST OF ST. CHARLES COUNTY, MISSOURI.





VICINITY MAP
(NOT TO SCALE)

MONUMENT	NORTHING	EASTING	DESCRIPTION
WS40	1040576.86	755359.94	SET CONCRETE MONUMENT WITH ALUMINUM CAP
WS41P	1040595.18	754828.58	SET ⅝ REBAR WITH ALUMINUM CAP
WS42	1040592.63	754544.65	SET CONCRETE MONUMENT WITH ALUMINUM CAP
WS43P	1040750.82	754258.46	SET ⅝ REBAR WITH ALUMINUM CAP
WS44	1040926.55	753940.51	SET CONCRETE MONUMENT WITH ALUMINUM CAP
WS45P	1040653.15	753577.62	SET ⅝ REBAR WITH ALUMINUM CAP
WS46	1040512.67	753391.16	SET CONCRETE MONUMENT WITH ALUMINUM CAP
WS47P	1040575.68	752916.38	SET ⅝ REBAR WITH ALUMINUM CAP
WS48	1040635.13	752468.44	SET CONCRETE MONUMENT WITH ALUMINUM CAP
WS49P	1040918.18	752120.55	SET ⅝ REBAR WITH ALUMINUM CAP
WS50	1041103.40	751892.90	SET CONCRETE MONUMENT WITH ALUMINUM CAP
WS51P	1041579.70	751685.47	SET ⅝ REBAR WITH ALUMINUM CAP
WS52	1042033.87	751487.69	SET CONCRETE MONUMENT WITH ALUMINUM CAP
WS53P	1042732.09	751377.30	SET ⅝ REBAR WITH ALUMINUM CAP
WS54P	1043219.39	751300.26	SET ⅝ REBAR WITH ALUMINUM CAP
WS55P	1043695.94	751224.91	SET ⅝ REBAR WITH ALUMINUM CAP
WS56P	1044257.67	751136.10	SET ⅝ REBAR WITH ALUMINUM CAP
WS57P	1044742.17	751059.50	SET ⅝ REBAR WITH ALUMINUM CAP
WS58P	1045226.58	750982.92	SET ⅝ REBAR WITH ALUMINUM CAP
WS59P	1046018.94	750857.65	SET ⅝ REBAR WITH ALUMINUM CAP
WS60P	1046777.26	750737.76	SET ⅝ REBAR WITH ALUMINUM CAP
WS61P	1047159.76	750677.28	SET ⅝ REBAR WITH ALUMINUM CAP
WS62P	1047653.13	750599.28	SET ⅝ REBAR WITH ALUMINUM CAP
WS63P	1048128.23	750524.17	SET ⅝ REBAR WITH ALUMINUM CAP
WS64P	1048595.30	750450.33	SET ⅝ REBAR WITH ALUMINUM CAP
WS65P	1049086.49	750372.67	SET ⅝ REBAR WITH ALUMINUM CAP
WS66P	1049579.53	750294.72	SET ⅝ REBAR WITH ALUMINUM CAP
WS66AP	1049777.57	750263.41	SET ⅝ REBAR WITH ALUMINUM CAP
WS67	1050260.33	750187.08	SET CONCRETE MONUMENT WITH ALUMINUM CAP
WS68P	1050495.13	750941.64	SET ⅝ REBAR WITH ALUMINUM CAP
WS69P	1050805.41	751010.19	SET ⅝ REBAR WITH ALUMINUM CAP
WS70P	1051046.41	751374.12	SET ⅝ REBAR WITH ALUMINUM CAP
WS70AP	1051151.36	751532.61	SET ⅝ REBAR WITH ALUMINUM CAP
WS71P	1051351.06	751834.16	SET ⅝ REBAR WITH ALUMINUM CAP
WS72P	1051574.07	752170.92	SET ⅝ REBAR WITH ALUMINUM CAP
WS73	1051832.93	752561.82	SET CONCRETE MONUMENT WITH ALUMINUM CAP
WS74P	1051296.73	752888.72	SET ⅝ REBAR WITH ALUMINUM CAP
WS75P	1050997.15	753071.37	SET ⅝ REBAR WITH ALUMINUM CAP
WS76P	1050678.08	753265.88	SET ⅝ REBAR WITH ALUMINUM CAP
WS77P	1050447.79	753406.29	SET ⅝ REBAR WITH ALUMINUM CAP
WS77AP	1050023.46	753664.99	SET ⅝ REBAR WITH ALUMINUM CAP
WS78P	1049647.42	753894.25	SET ⅝ REBAR WITH ALUMINUM CAP
WS78AP	1049425.22	754029.71	SET ⅝ REBAR WITH ALUMINUM CAP
WS79P	1048838.47	754326.47	SET ⅝ REBAR WITH ALUMINUM CAP
WS80P	1048545.66	754565.95	SET ⅝ REBAR WITH ALUMINUM CAP
WS81P	1048144.32	754810.63	SET ⅝ REBAR WITH ALUMINUM CAP
WS82P	1047715.28	755069.76	SET ⅝ REBAR WITH ALUMINUM CAP
WS83P	1047311.96	755318.09	SET ⅝ REBAR WITH ALUMINUM CAP
WS83AP	1046953.27	755536.77	SET ⅝ REBAR WITH ALUMINUM CAP
WS84P	1046526.73	755786.81	SET ⅝ REBAR WITH ALUMINUM CAP
WS85P	1046100.37	756056.79	SET ⅝ REBAR WITH ALUMINUM CAP
WS86AP	1045412.47	756476.14	SET ⅝ REBAR WITH ALUMINUM CAP
WS87P	1044872.66	756805.24	SET ⅝ REBAR WITH ALUMINUM CAP
WS88P	1044460.42	757056.57	SET ⅝ REBAR WITH ALUMINUM CAP
WS89P	1044056.67	757301.50	SET ⅝ REBAR WITH ALUMINUM CAP
WS90	1043862.41	757431.15	SET CONCRETE MONUMENT WITH ALUMINUM CAP
WS91P	1043412.82	757500.11	SET ⅝ REBAR WITH ALUMINUM CAP
WS92	1042925.04	757505.71	SET CONCRETE MONUMENT WITH ALUMINUM CAP
WS93P	1042398.93	757248.18	SET ⅝ REBAR WITH ALUMINUM CAP
WS94	1041980.48	756975.75	SET CONCRETE MONUMENT WITH ALUMINUM CAP
WS95P	1041880.05	756425.19	SET ⅝ REBAR WITH ALUMINUM CAP
WS96	1041782.78	755837.13	SET CONCRETE MONUMENT WITH ALUMINUM CAP
WS97PNS	1041158.90	755586.21	POINT NOT SET
WS97P	1041100.42	755734.09	REFERENCE POINT- SET ⅝ REBAR WITH ALUMINUM CAP

LEGEND

- SET CONCRETE MONUMENT WITH ALUMINUM CAP
- SET ⅝ REBAR WITH ALUMINUM CAP
- SET HUB

GENERAL NOTES:

1. HORIZONTAL DATUM IS BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83). ADJUSTMENT OF 1993. COORDINATES SHOWN ARE MISSOURI STATE PLANE EAST ZONE AND ARE EXPRESSED IN U.S. SURVEY FEET. UNLESS OTHERWISE NOTED.

2. BEARINGS SHOWN ARE BASED ON THE MISSOURI STATE PLANE COORDINATE SYSTEM.

3. DISTANCES SHOWN, AT THE REQUEST OF THE CLIENT, ARE GRID DISTANCES. THE GRID FACTOR FOR THIS PROJECT IS 0.999905366.

4. EXISTING HORIZONTAL CONTROL STATIONS USED:

STATION	NORTHING	EASTING
SC-11	1049946.54Ft.	760277.60Ft.
SC-13	1051084.09Ft.	751476.84Ft.
SC-14	1037838.36Ft.	753637.86Ft.

WE, HANSON PROFESSIONAL SERVICES INC., HAVE, AT THE REQUEST OF THE UNITED STATES DEPARTMENT OF ENERGY, DURING THE MONTH OF FEBRUARY, 2004, PERFORMED SURVEY FOR GROUNDWATER USE RESTRICTION AREA IN PART OF U.S. SURVEY 887 AND U.S. SURVEY 1798 OF TOWNSHIP 46 NORTH, RANGE 2 EAST AND TOWNSHIP 46 NORTH, RANGE 3 EAST, SECTIONS 25 AND 36, TOWNSHIP 46 NORTH, RANGE 2 EAST, SECTIONS 19, 30, 31, AND 32, TOWNSHIP 46 NORTH, RANGE 3 EAST, OF ST. CHARLES COUNTY, MISSOURI. ALTHOUGH THIS SURVEY WAS NOT A PROPERTY BOUNDARY SURVEY, IT WAS PERFORMED IN ACCORDANCE WITH THE CURRENT MISSOURI MINIMUM STANDARDS FOR PROPERTY BOUNDARY SURVEYS.

DEPT. OF ENERGY
WELDONSPRING SITE
REMEDIAL ACTION PROJECT, MO
SURVEY FOR GROUNDWATER
RESTRICTION AREA

EXHIBIT "A"

DRAWN: SP | CHECKED: RLH | DATE: 5/17/04 | JOB NO.: E/WP/001/0404