

US Army Corps
of Engineers

Kansas Citys Levees
Kansas and Missouri Rivers
Feasibility Report

Appendix D
Hazardous and Toxic Waste

Kansas Citys Levees

HTRW Investigation
Kansas and Missouri Rivers
Reaches in the Vicinity of Kansas City

August 2006

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LIST OF ACRONYMS

AIRS - Aerometric Information Retrieval System
AST – Aboveground Storage Tank
BPU – Board of Public Utilities
BNSF – Burlington Northern Santa Fe
BTEX – Benzene, Toluene, Ethylbenzene, Xylene
CALM – Cleanup Levels for Missouri
CCC –Conservation Chemical Company
CID – Central Industrial District
CMS – Corrective Measures Study
DRO – Diesel Range Organics
DSF – Diesel Shop Facility
EPA – Environmental Protection Agency
ERIIS - Environmental Risk Information and Imaging Services
GRO – Gasoline Range Organics
HTRW – Hazardous, Toxic, and Radioactive Waste
ID – inner diameter
K.C. – Kansas City
KCD – Kansas City District
KDHE – Kansas Department of Health and the Environment
LNAPL – Light Non Aqueous Phase Liquid
LUST –Leaky Underground Storage Tank
MCL – Maximum Contaminant Limit
MDNR - Missouri Department of Natural Resources
NKC - North Kansas City
NPDES – National Pollutant Discharge Elimination System
PAH – polyaromatic hydrocarbons
PID - Photoionizer detector
PVC – polyvinyl chloride
RCRA – Resource Conservation Recovery Act
RFI – RCRA Field Investigation
ROD – Record of Decision
ROW – Right of Way
SCAPS - Site Characterization and Analysis Penetrometer System
SVOC – semivolatile organic compounds
SWMU – Solid Waste Management Units
THAN - Thompson-Hayward Chemical Company
TPH – total petroleum hydrocarbons
TRIS –Toxic Release Inventory System
USACE – United States Army Corps of Engineers
UST - Underground Storage Tank
VOC - volatile organic compounds

1.0 INTRODUCTION

The Kansas City District is performing a Hazardous, Toxic, and Radiological Waste (HTRW) site assessment as part of the Feasibility Study for the Kansas City Levees Project. The K.C. Levees Project includes seven existing levees in the Kansas City area. A map of the K.C. Levee Units is shown in Figure 1.0. The levee system has been divided into two phases for the Feasibility Report and are as follows:

Phase I

- Argentine Levee Unit
- Fairfax-Jersey Creek Levee Unit
- North Kansas City Levee Unit
- East Bottoms Levee Unit

Phase II

- Armourdale Levee Unit
- Central Industrial District (CID) Levee Unit

This HTRW site assessment will only address the levee units in Phase I. Most of the areas adjacent to the existing levee units are industrialized and potentially have hazardous waste in the soil or groundwater. The primary purpose of this assessment is to identify any hazardous and toxic waste areas of concern and to determine how these areas will impact the proposed Feasibility Study alternatives. The intent is to identify these areas of concern early so they can be avoided or addressed during the study process.

2.0 PREVIOUS STUDIES

A Reconnaissance Report - HTRW Assessment and HTRW Site Follow-up Investigation were performed on both the Phase I and II K.C. levee units prior to the Feasibility Study.

2.1 Reconnaissance Report - HTRW Assessment

The Reconnaissance Report for the Flood Reduction Study was completed in August of 1999. The HTRW Assessment can be found in Appendix I of the report. During the reconnaissance phase, a preliminary HTRW Assessment was performed to identify any hazardous and toxic waste sites that could directly impact construction. The preliminary HTRW Assessment included a database search and site visits. The database search was performed by Environmental Risk Information and Imaging Services (ERIIS). It identified all industries whose addresses fell within 500 feet of the levee units that were listed in either the federal or state databases. Based on the database search and the site visits, the Reconnaissance Report – HTRW Assessment identified the following sites or areas of concern, which needed further investigations:

- Turner Outfall Station – Argentine Levee
- APAC (formerly Wilkerson-Maxwell) – Argentine Levee
- Harcros Chemical Corporation – Argentine Levee

- Armour Swift-Eckrich Inc. – Argentine Levee
- Sinclair Petroleum – Argentine Levee
- Board of Public Utilities (BPU) Quindaro Power Plant – Fairfax Jersey Creek Levee
- River Front Park – East Bottoms Levee
- Conservation Chemical Company – East Bottoms Levee
- Hawthorne Power Plant – East Bottoms Levee
- Bayer Chemical Company – East Bottoms Levee

2.2 HTRW Follow-up Investigation Report

In November 1999, Hydrogeologic, Inc. was tasked to perform a follow-up investigation of the areas of concern identified in the Reconnaissance Report – HTRW Assessment. The Follow-up Investigation consisted of the following: 1) performing additional database searches, 2) reviewing aerial photographs, 3) reviewing Sanborn Fire Insurance Maps, 4) reviewing site documents from Environmental Protection Agency (EPA), the Kansas Department of Health and the Environment (KDHE), and Missouri Department of Natural Resources (MDNR) files and 5) conducting personal interviews. The database searches, which were performed by VISTA Information Solutions, Inc, included the area within a 1- mile radius of each area of concern identified during the Reconnaissance Report. The Follow-up Investigation Report summarizes the investigations and findings for each area of concern, as identified in the Reconnaissance Report.

3.0 HTRW SITE ASSESSMENT

The HTRW Site Assessment performed as part of the Feasibility Study evaluates the HTRW areas of concern with respect to the proposed Feasibility Study alternatives. This assessment identifies the nature and extent of contamination, which could directly impact the proposed Feasibility Study alternatives. The assessment includes a document search, a site evaluation, and a field investigation for select areas.

In order to identify all the HTRW areas of concerns, the following activities were performed as part of the document search and site evaluation:

- Reviewed the Reconnaissance Report – HTRW Assessment dated August 1999 and the corresponding database search dated January 22, 1999.
- Reviewed the HTRW Follow-up Investigation dated November 1999 and the corresponding database search dated September 1999.
- Reviewed information obtained from an EPA and KDHE website database searches.
- Reviewed documents obtained from EPA – Region VII files and conducted personal interviews with EPA representatives concerning Harcros Chemical, Inc. and Sinclair Oil.

- Reviewed documents obtained from KDHE files and conducted personal interviews with the KDHE representatives concerning Burlington Northern Santa Fe Railroad (BNSF) and Fairbanks Morse Pump Corporation.
- Reviewed documents and information obtained from BNSF Railroad and met with BNSF Railroad representatives.
- Reviewed information provided by Board of Public Utilities (BPU) for the Quindaro Power Plant and met with BPU representatives.
- Reviewed documents obtained from Bayer Corporation and met with Bayer representatives.
- Met with MDNR to discuss the Feasibility Study alternatives with respect to the Bayer Corporation.
- Conducted telephone interviews with representatives from Harcros Chemical, Inc., Sinclair Oil, BNSF Railroad, and Bayer Corporation.
- Reviewed the following aerial photograph:
 - 1993 Flood photos for Argentine, NKC, and East Bottoms Levees
 - Harlem section of NKC Levee - 1958, 1965, 1976 and 1986
 - Argentine Levee - 1951, 1954, 1970, and 1983
- Reviewed Corps of Engineer correspondence files for each of the Phase I levee units. The files included correspondence from adjacent landowners on work performed within 500 feet of the levee centerline.
- Performed site visits to the following locations:
 - Argentine Levee
 - Burlington Northern Santa Fe Railroad property
 - BPU Property on the the Fairfax-Jersey Creek Levee
 - Harlem Section of the North Kansas City (NKC) Levee
 - Bayer Corporation Property on the East Bottoms Levee

4.0 SITE EVALUATIONS

Site evaluations have been performed on all properties adjacent to the levee units to determine if there are HTRW concerns which could directly impact the proposed Feasibility Study alternatives. The following section summarizes the evaluation for each property and determines if additional field investigation is necessary.

4.1 Argentine Unit

The Argentine Levee Unit is being reevaluated as part of the Feasibility Study for overtopping and underseepage concerns based on observation made during the 1993 flood. Three alternatives with

differing levels of protection are currently being evaluated for the entire levee unit. These cases are the nominal 500-year, 500-year + 3 feet, and 500-year + 5 feet. Each case includes a combination of alternatives such as levee raises, I-walls, stability berms, underseepage berms, collector drains, and relief wells for the various reaches along the levee. A detailed evaluation and footprint maps for each case are provided in other sections of the Feasibility Study Report. Generally as the level of protection increases, so does the amount of land required. Depending on the alternative, property outside the existing Kaw Valley Drainage District right-of-way could be affected. Within most of the Kaw Valley right-of-way, no contamination is expected to be encountered. The exception is the landside levee near the Harcos Chemical facility, which is discussed in more detail in Section 4.1.11.

For the HTRW Site Assessment, the case with the largest footprint along the toe of the levee was utilized for each levee section. For the majority of the Argentine Levee, the 500-year + 5 feet case was used. However, for the reaches between stationing 0+00 to 30+00 and 60+00 to 118+00, the nominal 500-year case was used. Between these stations, the proposed changes require a larger footprint than the other alternatives. These reaches do not extend beyond the existing right-of-way. Therefore, the alternative would have no impacts to the adjacent properties. For the remainder of the levee, there are many areas where the alternative extends outside the existing right-of-way and impact properties in close proximity to the levee. The areas adjacent to the Argentine Levee are highly industrialized. There are many sites, which have soil or groundwater contamination that could directly impact the Feasibility Study alternatives. Figure 2.0 shows the overall levee unit with the adjacent properties identified. The specific alternatives proposed for the 500-year +5 feet case are provided on the footprint maps on Figures 3.0, 4.0, 5.0, 6.0, and 7.0. The initial HTRW assessment was conducted in April and May of 2005 and all figures included with this HTRW Investigation Appendix reflect alternatives that were being considered during the initial 2005 assessment. When alternatives were modified, the recommendations of this HTRW Investigation Appendix were reevaluated to ensure the recommendations were consistent with the modified alternatives. The figures depicting the final preferred alternative can be found in the main Feasibility Report.

4.1.1 Burlington Northern Santa Fe Railroad Property

Owner: BNSF Railroad Company
Address: 2201 Argentine Blvd.
Kansas City, KS 66106
Stationing: 0+00 to 30+00
Figure No.: 3.0

The alternative for the section that has the largest footprint would be the nominal 500-year. It involves a levee raise, which is located within the existing Kaw Valley right-of-way (ROW). Since the Feasibility Study alternative does not extend outside the existing ROW, no further investigation is necessary for the BNSF property.

4.1.2 KC Brick Company (formerly Boral Brick)

Owner: Schnegelberger Properties

Address: 5717 Kansas Ave.
Kansas City, KS 66106

Stationing: 30+00 to 35+00
Figure No.: 3.0

The alternative with the most impact for this section is a levee raise with a stability berm for the 500-year + 5 case. The stability berm would extend approximately 50 feet beyond the existing ROW. This site, which was formerly known as Boral Brick Co. was not identified as an area of concern in the Reconnaissance Report. However, the Reconnaissance Report and the Follow-up Investigation database searches indicated there was a Leaky Underground Storage Tank (LUST) and an Underground Storage Tank (UST) located on the property. The LUST was remediated in 1994 and is considered closed by KDHE. The 2000-gallon gasoline UST was also removed. During the site visit, multiple piles of bricks were noted adjacent to the levee. But, there were no visible signs of a UST on the property. The aerial photographs of this area show the site was covered with sand after the 1951 flood. The site was developed in 1954 and the same structures that are present today appear in the 1954, 1970 and 1983 photos. Since the only indication of possible contamination was the LUST and this has been remediated, no further investigation is required.

4.1.3 Kaw Valley Materials

Owner: P & D Development, BGK Development
Address: 5640 – 5624 Kansas Ave.
Kansas City, KS 66106

Stationing: 35+00 to 60+00
Figure No.: 3.0

The alternative with the most impact for this section is a levee raise with a stability berm and a buried collector system between station 34+00 to 40+00 under the 500-year + 5 case. The berm and collector system would extend approximately 80 feet beyond the existing ROW. During the site visits, the property at 35+00 to near 45+00 appears to be vacant. The rest of the property is currently used as storages for landscaping supplies and mulch. From previous research during the Reconnaissance Report and the Follow-up Investigation, there was no evidence of hazardous waste issues during the site's current and past operations. In the 1954 aerial photos, the southeast portion of this property was occupied with what appeared to be a lumberyard. However, the remainder of the property was vacant or farmland with the exception of a few isolated buildings located near the levee. In the 1970 and 1983 photos, the entire property is occupied by a concrete pipe company. Since a buried collector system is proposed for the vacant section of the property, it is recommended that additional investigation be performed in this area to ensure the excavated material is uncontaminated.

4.1.4 Turner Outfall Station

Owner: Kaw Valley Drainage District

Address: 100 55th St.
Kansas City, KS 66106

Stationing: 60+40
Figure No.: 3.0

The alternative with the most impact for this location involves a levee raise and stability berm for the 500-year + 5 case. The Reconnaissance Report listed this site as an area of concern. Follow-up Investigation findings indicate that there was a diesel fuel LUST prior to 1987, and the soil was contaminated with petroleum hydrocarbons. In 1997, the contaminated soil was excavated and removed, and the site was backfilled and closed. Three monitoring wells were installed and sampled for one year, but no contamination was detected in the groundwater. KDHE then approved the abandonment of the wells. Aerial photos from 1954 show the pump station structure as it is today. Since there is no longer contamination present and wells have been abandoned, no additional field investigation is required.

4.1.5 Railroad Property

Owner: Atchison
Address: none given

Stationing: 60+00 to 73+00
Figure No.: 4.0

The alternative with the most impact involves a levee raise with a stability berm for the nominal 500-year case. The site was not identified as an area of concern in the Reconnaissance Report and therefore was not specifically addressed in the Follow-up Investigation. This area was included in the database searches for both previous investigations. However, this site was not listed in any of the EPA or KDHE databases on their website. During the site visits, there were no railroad cars parked on any of the tracks. There were several piles of railroad ties located at the north end of the property. Aerial photographs show that the tracks were present in 1983. The tracks did not exist in earlier photos. Since only a small portion of the alternative extends beyond the existing ROW and there is no evidence of any contamination at the site, no additional investigation will be performed.

4.1.6 Vacant Lot

Owner: Arnott
Address: none given

Stationing: 73+00 to 75+00
Figure No.: 4.0

The alternative with the most impact for this stretch included a levee raise with stability berm under the nominal 500-year case. The site is not identified as an area of concern in the Reconnaissance Report and was not listed in any of the database searches. A site visit did not highlight any major concerns for this portion of the levee. A petroleum pipeline does run under the levee in this section.

The aerial photos revealed that the site has always been vacant, with the exception of a railroad spur that first appeared in the 1970 photo. All vegetation had been cleared from the property in the 1983 photo, but the vegetation has since returned. Since only a small portion of the berm extends beyond of the ROW and there is no evidence of prior contamination at the site, no further investigation is required.

4.1.7 Ashland Chemical

Owner: Ashland Chemical
Address: 5420 Speaker Rd.
Kansas City, KS 66106

Stationing: 75+00 to 82+00
Figure No.: 4.0

The alternative with the most impact involves a levee raise for the nominal 500-year case. The alternative does not extend past the existing ROW. Ashland Chemical is not identified as an area of concern in the Reconnaissance Report. However, it is identified in the Follow-up Investigation database search as a permitted RCRA facility currently undergoing corrective action. According to the database search, a RCRA Facility Assessment and a RCRA Facility Investigations Work Plan have been complete. The site has 29 active above ground storage tanks and three above ground storage tanks, which have been removed. The database search also lists numerous RCRA violations between 1988 and 1994. According to letters sent to the USACE Geotechnical Branch from Kaw Valley Drainage District from April 1990 to September 1992, 7 monitoring wells were installed on either side of the levee near station 80+00. Based on a brief telephone interview with the EPA RCRA Project Manager for Ashland Chemical, the site has known groundwater contamination and is currently being remediated utilizing an air sparging system. Access to EPA files for this site was not obtained because all follow up telephone calls to the EPA representative were unsuccessful. Therefore, the locations of the groundwater plumes are not shown on the Figures. During a site visit, the groundwater monitoring wells were noted. From aerial photos, Ashland Chemical was built at its current location sometime between 1954 and 1970. In the 1954 photo, the land was agricultural. Tanks are visible in the 1970 photo with more tanks added by 1983. Although groundwater contamination exists at this site, the levee alternative is confined to the existing ROW and involves only surface work. Therefore, no additional investigation is required.

4.1.8 Trailer Storage Area

Owner: Frank S. C. Perry
Address: 5380 Speaker Rd.
Kansas City, KS 66106

Stationing: 82+00 to 87+00
Figure No.: 4.0

The alternative with the most impact is a levee raise for the nominal 500-year case that remains within the existing ROW. There was no mention of any contamination in either the Reconnaissance

Report and Follow-up Investigation for this property. A review of aerial photos shows that the site was vacant and covered with vegetation through 1983. By 1993, there were semi-truck trailers stored on the property. During the site visit, there was no evidence of tanks or prior contamination. Since the alternative for this stretch of levee is confined to the existing ROW, no additional investigation is required for the property.

4.1.9 Pro-Electric

Owner: T.O.A.N. Inc
Address: 5320 Speaker Rd.
Kansas City, KS 66106

Stationing: 87+00 to 89+00
Figure No.: 4.0

The alternative with the most impact for the levee adjacent to Pro-Electric is a levee raise for the nominal 500-year case. All work would be performed within the existing ROW. Pro-Electric is not listed in either the Reconnaissance Report or the Follow-up Investigation database searches. According to the aerial photos, there were no buildings noted on the property until 1983. The same structures that were noted in the 1983 photo are present today. Currently, the site is used by an electrical contractor as an office and storage yard. During a site visit, spools of electrical wire were observed along the levee toe. There was no evidence of past contamination noted at the site. Since the alternative for this reach does not extend beyond the existing ROW, no further investigation is required.

4.1.10 Alternative Transport

Owner: Vernon E. Schroeder
Address: 5254 Speaker Rd.
Kansas City, KS 66106

Stationing: 89+00 to 91+00
Figure No.: 4.0

The alternative with the most impact for this reach is a levee raise for the nominal 500-year case that lies within the existing ROW. The property is not listed in either the Reconnaissance Report or the Follow-up Investigation. The current structure on the property did not appear on the aerial photos until 1983. The property is currently used by Alternative Transport, a trucking company. The site visits did not reveal any signs of contamination on the property. Because the alternative does not extend beyond the existing ROW, no further investigation is warranted.

4.1.11 Harcros Chemicals, Inc.

Owner: Harcros Chemicals, Inc.
Address: 5218 - 5110 Speaker Rd.
Kansas City, KS 66106

Stationing: 91+00 to 118+00
Figure No.: 4.0 and 8.0

The alternative with the most impact for this section is a levee raise for the nominal 500-year case. All proposed levee modifications would be performed within the existing Kaw Valley ROW. Harcros Chemicals is an industrial chemical manufacturing and warehouse facility that has manufactured a wide variety of chemicals including, herbicides, pesticides, and vitamins. It also stores industrial chemicals and supplies, package acids, and blend feed. It began operations in 1960 and was previously owned by the Thompson-Hayward Chemical Company (THAN). Harcros Chemicals is listed as an area of concern in the Reconnaissance Report and was investigated further in the Follow-Up Investigation. During the site visit for the Reconnaissance Report, monitoring wells were noted on either side of the levee. However, this site was not listed in the Reconnaissance Report database search. The Follow-Up Investigation identified Harcros Chemicals as a permitted RCRA facility currently undergoing corrective action. It is also listed as a large quantity hazardous waste generator, which has been sited for numerous RCRA violations under both Harcros and THAN. The database search listed several spills, which had been remediated and 7 USTs, which had been listed as removed or temporary-out-of-service. KDHE's LUST database lists 5 tanks that have required remediation and are closed, which is the same tanks listed in the database search by Hydrogeologic. Two are still considered active for clean up, including Tank #4. The diesel tank was found leaking in 1999.

Numerous investigations have been performed at this site since the early 1980's. These include a RCRA Facility Assessment, a RCRA Facility Investigation (RFI) and a Corrective Measures Study (CMS). Based on the information presented in these documents, there is known soil and groundwater contamination, which could potentially impact the proposed levee modifications in this area.

The groundwater contamination identified at this site is shown on Figure 8.0. It includes multiple plumes, some of which have migrated under the levee and into the northern foreshore area, also owned by Harcros. VOC's, primarily chlorinated solvents, are the constituents of concern in the groundwater. The groundwater plume locations were obtained from Harcros RCRA Corrective Measures Study by URS, dated August 27, 2004. Harcros currently has a groundwater extraction and treatment system in operation. This system, installed in 2002, extracts contaminated water from the riverward side of the levee and pumps it for treatment to the landward side. The piping for this system was constructed through the levee, as approved by the USACE Geotechnical Branch. As of June 2004, over 50 million gallons of water had been treated. A second extraction well is to be installed to capture the southern-most plume.

There are nine Solid Waste Management Units (SWMU) identified for this site (see Figure 8.0). SWMUs H and I are located north of the levee in the foreshores area. SWMU H was historically used for the storage of empty sulfuric acid drums. According to the CMS, this area had been remediated in 1984 under the oversight KDHE. SWMU I was a ponding area that had historically received non-contact cooling water from permitted NPDES outfalls. The site was regraded in 1997 and water no longer discharges to the ponding area. During the RFI, soil samples were collected in SWMUs H and I. Concentrations below regulatory action levels of pesticides, herbicides, SVOCs,

dioxins, and VOCs were found in these areas. No additional corrective measures are proposed for these areas.

In the RFI and CMS, the northwestern portion of the facility is identified as a Restricted Zone. This zone is where herbicide manufacturing occurred and resulted in the presence of dioxins. SWMUs A, B, E, F, and G are all located within the Restricted Zone. The Restricted Zone designation generally prohibits any excavation or soil disturbance without KDHE's approval. SWMU's C, E, and G are also located within close proximity to the rail spur and the levee toe (see Figure 8.0). The contaminants identified in these SWMUs are pesticides, herbicides, dioxins, SVOCs, and VOCs. The RFI maps indicate that low levels of these contaminants are present at or near the toe of the levee. Trichlorophenol, a compound associated with dioxin production, and silvex, a pesticide, were two main chemicals found in the soil from a depth of 0 to 10 feet. Additional pesticides, herbicides, and VOCs were present from 0 to 10 feet. The recommended remedial alternative presented in the CMS is capping the contaminated areas to prevent further exposure. The proposed capping does not extend beyond the railroad spur onto the levee toe.

Aerial photographs in 1970 and 1983 show the facility as it existed and a network of roads on the property north of the facility on the riverward side of the levee. A railroad spur is located adjacent to the landward side of the levee.

The foreshore area just north of the levee was originally considered as a potential borrow area, because of its close proximity to the levee. During the site evaluation process, it was recommended that this area be avoided and other borrow sources be investigated. The reasons for this recommendation are 1) extensive soil testing would be required because the property is owned by Harcos Chemical, a RCRA permitted facility currently undergoing soil and groundwater remediation 2) there are two SWMUs which have been identified in this area and 3) there is the potential for the borrow area activities to have an adverse impact on the ongoing groundwater cleanup.

The alternatives for this reach are confined to the crest of the levee. While the levee modifications will not impact the toe, construction activity within the ROW should be confined to the crest and riverward side of the levee to avoid contact with the potentially contaminated soil at the landward side toe.

Since an alternate borrow source has been located and the proposed levee modifications in this reach would not impact the toe of the levee, no additional investigation is recommended for this area.

4.1.12 U.S. Postal Service

Owner: United States Postal Service
Address: 4900 Speaker Rd.
Kansas City, KS 66106

Stationing: 118+00 to 131+00
Figure No.: 4.0

The alternative with the most impact for this section of levee is levee raise and a stability berm for the 500-year + 5 case. Approximately 80 feet of the stability berm lies outside of the existing ROW. The U.S. Postal Service (USPS) property is a bulk mail distribution center on Speaker Road. The Reconnaissance Report did not list this property as an area of concern. However, in the Follow-Up Investigation database search, two leaking underground storage tanks (LUSTs) were present on the site, in November 1990 and February 1998. Both have been fully remediated and are considered closed by KDHE, as listed in the KDHE LUST database.

From a review of aerial photos, the site was primarily agricultural through the 1970 photo. In the 1983 photo, the distribution center appears to be present and rows of large trucks are parked in the parking lot near the levee toe. During the site visits, an aboveground storage tank was noted near the rear of the USPS building. Though the property will be impacted by the alternative, there is no evidence of contamination associated with this site. Therefore, no further investigation is warranted for this property.

4.1.13 ConAgra formerly Armour Swift-Eckrich

Owner: Beatrice Meats
Address: 4612 Speaker Rd.
Kansas City, KS 66106

Stationing: 131+00 to 145+00
Figure No.: 4.0

For this section of the levee, the alternative with the most impact involves a levee raise and stability berm for the 500-year + 5 case. The alternative does impact the property outside of the Kaw Valley Right-of-Way. The stability berm extends outside the existing ROW from 80 feet at station 131+00 to 40 feet at station 145+00. The ConAgra site is a meatpacking facility. The Reconnaissance Report identified this site as an area of concern because structures resembling monitoring wells were observed during the site visit. In the Follow-Up Investigation, these structures were found to be piezometers installed to monitor the dewatering of the area behind the levee during heavy rain and flood events. The Follow-Up Investigation database search indicates there is a 100,000- gallon aboveground storage tank (AST) located on site. No records were found that indicated there was any soil or groundwater contamination at this site.

During the site visit, large debris piles of asphalt and other demolition debris were noted along the northeast edge of the parking lot near the toe of the levee just outside of the Kaw Valley ROW. A study of the aerial photos indicates the property was agricultural in 1954 and a sand and gravel quarry in 1970. ConAgra's current facility is shown in the 1983 aerial photo. Although no records were found to indicate any subsurface contamination on the property, the asphalt and demolition debris will need to be removed if the selected alternative extends beyond the existing right-of-way at that location. No additional investigation is recommended for this property.

4.1.14 APAC aka Wilkerson-Maxwell

Owner: Arnold Knight & APAC-Kansas Inc.
Address: 4318 Speaker Rd.
Kansas City, KS 66106

Stationing: 145+00 to 157+00
Figure No.: 4.0 and 5.0

The alternative with the most impact considered for this section of levee includes a levee raise and stability berm for the 500-year + 5 case. The stability berm extends approximately 60 feet outside the existing Kaw Valley ROW. The APAC property is located on both sides of I-635 and would be impacted by construction of the berm. The site is currently being used as a maintenance facility and a storage yard for trailers and other equipment. On the west side of the interstate, the back portion of the property along the toe of the levee is overgrown with vegetation. This property is actually privately held, but appears to be rented to APAC. The property was discussed in the Reconnaissance Report as an area of concern for the follow-up investigation. Both database searches listed APAC as a small quantity hazardous waste generator with one active diesel AST and 4 USTs, which were removed, as of 1988. The Follow-Up Investigation also mentions an additional transportable AST, which is located on site. There were no leaks reported for any of the tanks that were present at the site.

In the 1954 photos, the property along the toe of the levee was agricultural with a few buildings present near Speaker Road on the eastern parcel. In the 1970 aerial photo, the western parcel of property appears to be agricultural or vacant, while the eastern half was used for equipment and material storage. The current structures were also present on the eastern parcel. In the 1983 photo, the interstate had just been constructed, as the embankment appears to have little vegetation growing. The property on both sides of the interstate appears to be a storage yard for construction equipment and materials. During the site visits, both the eastern and western properties were fenced with prominently displayed APAC signs. The eastern property appears to be mainly equipment storage with trailers and cranes near the levee. The western property along the toe of the levee was so overgrown and it was difficult to determine what was on the site. Although there is no indication of contamination at this site, it is recommended that additional investigations be performed in the western portion of the property based on the overgrown nature of the site.

4.1.15 Wilcox Truck Line

Owner: Wilcox Truck Line
Address: 4318 Speaker Rd.
Kansas City, KS 66106

Stationing: 157+00 to 158+00
Figure No.: 5.0

The alternative with the most impact for this reach is a levee raise and stability berm, which extends 60 feet beyond the existing ROW for the 500-year + 5 case. This property was not identified in either the Reconnaissance Report or the Follow-Up Investigation database searches. In the 1954 photo, the current building near Speaker Road was present, with the back part of the property

vacant. It may have been an old farmhouse. The 1970 photo shows an additional structure that was built behind the original building, but by 1983, it was gone. Aerial photos from 1983 show the property near the levee to be vacant and cleared of all vegetation. Only the original structure near Speaker Road is present. Site visits revealed that the front half is a storage lot for tanker trailers and back is vacant. There is no evidence of contamination concerns associated with this property. Therefore, no additional investigation is needed for this site.

4.1.16 E&M Transwood Truck and Trailer Repair

Owner: Thompson Bros. Inc.
Address: 4200 Speaker Rd.
Kansas City, KS 66106

Stationing: 158+00 to 165+00
Figure No.: 5.0

The alternative with the most impact for this section of the levee is a levee raise with stability and underseepage berms for the 500-year + 5 case. From station 158+00 to 161+00, the stability berm extends 60 feet from the existing ROW. The underseepage berm begins at station 161+00 and continues past the property line. It extends approximately 260 feet beyond the existing ROW at its farthest point. The property is currently used as a truck and trailer repair station.

This site was not identified as an area of concern in the Reconnaissance Report. However, the Reconnaissance Report and the Follow-Up Investigation database searches listed the property under the name of Thompson Brothers as a small quantity generator. The database searches also indicated there were two LUSTs and three USTs located at the site. The two LUSTs were remediated and closed in 1993. Two of the USTs have also been removed, but one 12,000-gallon diesel tank remains on site. During the site visit, a 4-bay garage or vehicle repair shop was noted within the proposed alternative footprint. There was also a gas or diesel pump station located on north side of the building. Aerial photos show that there was a sand and gravel dredging operation on this property in 1954. By 1970, the property was completely vacant and trees were growing on site. Aerials photos from 1983 show the current building present and a truck service station in operation.

Since the LUSTs and UST have been removed and the known contamination has been remediated, this site will not be investigated at this time. However, if the selected alternative includes the underseepage berm, which impacts the majority of the property, the existing garage or truck repair station and the UST would need to be removed. Any contaminated soil encountered during the UST removal and building demolition would have to be remediated prior to any levee modifications. If the selected remedy includes an underseepage berm, additional investigation is recommended during the Design phase.

4.1.17 Roadway Express

Owner: Roadway Express
Address: 323 39th and 233 42nd Street (2 parcels)

Kansas City, KS 66106
Stationing: 165+00 to 185+00
Figure No.: 5.0

The alternative with the most impact for this station of the levee includes the 500-year + 5 levee raise, a continuation of the underseepage berm, a stability berm, and a buried collector system. The underseepage berm, which is located between stations 179+50 to 183+00 extends between 200 and 260 feet outside the existing Kaw Valley ROW. Around station 170+00, the stability berm extends approximately 100 feet past the existing ROW. The buried collector is located between stations 179+50 to 183+00 and extends 80 feet from the existing ROW. Roadway Express is a major trucking transport company and maintains a terminal on the property. A large number of semi-trailers are located on the site.

The property was not listed in the Reconnaissance Report as an area of concern, but it did appear in the Follow-Up Investigation database search. It lists numerous spills at this site between 1987 and 1997. The database search identified one LUST, which was closed in February 1996. It also indicated there are 5 active UST containing diesel fuel on site. According to the KDHE website database there was also one additional LUST that was removed and closed in November 2000. From the aerial photos, the site was agricultural until the 1983 photo. Roadway occupied the property with one major building. Current aerial photos show that the operation has expanded. A water retention pond has also been constructed on the eastern side of the site. It contains only surface drainage from rain events and poses no known threat. During the site visit, the location of the active USTs was not easily seen from the levee.

Since all the contamination associated with the LUSTs and any of the noted spills has been removed, no additional investigations are recommended at this time. However, there are existing USTs that may be located within the footprint of the selected alternative and will have to be removed and any contaminated soils remediated prior to the levee modification. Additional investigation is recommended during the Design Phase.

4.1.18 Overnite Transportation Company

Owner: Overnite Transportation Company
Address: 441 - 535 36th Street
Kansas City, KS 66106

Stationing: 185+00 to 210+00
Figure No.: 5.0

For this reach of levee, the alternative with the most impact case was used. It consists of the 500-year + 5 levee raise and stability berm that runs the entire length of the property and a filter blanket located between stations 202+00 and 207+00. The footprint of the alternative only extends outside the existing ROW at the extreme western and eastern section of the property, extending 40 feet. The original alternative for this reach included a buried collector system, which was replaced by a filter blanket (Figure 5.0). However, during the site evaluation process, existing groundwater contamination plumes from Sinclair Oil and Fairbanks Morse Pump Corporation were identified.

The locations of the existing plumes are shown on Figure 5.0 and 9.0. In order to avoid the possibility of adversely impacting the existing groundwater contamination plumes and the current groundwater cleanup actions, a filter blanket was recommended as a more feasible option for this area.

Overnite Trucking operates a service center off Kansas Avenue. The Reconnaissance Report did not list this site as an area of concern, but it was identified in the Follow-Up Investigation database search. The company is listed as a large quantity hazardous waste generator. It indicates that there are 6 active USTs on site. One LUST was also reported in August of 1992 in the Follow-Up Investigation. The remediation status was placed on hold in 1999, but the site is no longer listed in the KDHE Leaking Underground Storage Tank Database. There have been numerous spills that occurred at the site between 1992 and 1997, which are reported to have flowed into the storm sewer and into the Kansas River. During the site visits, the locations of the USTs were not readily identified from the levee. These tanks would not be impacted by the levee modifications, since most of the work lies within the existing Kaw Valley ROW. Therefore, no additional investigations are necessary with regards to the USTs.

The aerial photos indicate the land currently owned by Overnite Trucking was widely used for agriculture in 1954. In the 1970 photo, the property was vacant with heavy vegetation. However, the eastern portion of the property appeared to be less vegetated. There were also trails and dumping noted on this part of the property. In the 1983 photo, the land where the Overnite Trucking facility sits on the western part of the site is being prepared for construction and the entire site is cleared. The current facility exists in the 1993 photo. The filter blanket berm is planned for the vacant portion of Overnite's property, which is on the eastern side of the property. Additional investigation is recommended for this portion of the property because of a possible dumping area was noted in the 1970 aerial photo.

4.1.19 Sinclair Oil

Owner: Sinclair Oil
Address: 3401 Fairbanks Avenue
Kansas City, KS 66106

Stationing: 200+00 to 225+00
Figure No.: Figure 6.0 and 9.0

This property is located outside the footprint of the levee modification alternatives. However, groundwater contamination from this site could have a major impact on the alternatives for this reach. The proposed alternative for this reach included a buried collector system at the location of the filter blanket. However, during the site evaluation process, existing groundwater contamination plumes from Sinclair Oil and Fairbanks Morse Pump Corporation were identified. The locations of the existing plumes are shown on Figure 6.0 and 9.0. In order to avoid the possibility of adversely impacting the existing groundwater contamination plumes and the current groundwater cleanup actions, a filter blanket was recommended as a more feasible option for this area.

The Sinclair Oil Corporation site is a former refinery and currently operates as a petroleum storage facility. It occupies 150-acre site and has been in existence since 1911. The Reconnaissance Report includes this site as an area of concern, because groundwater monitoring wells located along the toe of the levee were noticed during the site visit. In the Follow-Up Investigation, the site was listed as a RCRA permitted facility undergoing corrective action. Multiple investigations have been performed at the site since 1986. There are currently 17 ASTs located on site. The database search indicated there are two active USTs on site and 3 USTs, which have been removed. The database search also reported a LUST, which was remediated and closed in 1989.

In 1989, Sinclair agreed to install a groundwater monitoring network and to perform quarterly monitoring. There are currently 6 of Sinclair Oil’s monitoring wells located within the footprint of the levee alternatives 500+3 and 500+5. Figure 9.0 shows the extent of the groundwater contamination plumes and the well locations. The well and plume locations were obtained from the Site Wide Groundwater Monitoring Report dated June 2004. Monitoring wells MW-9, ERM-10, and ERM-11 are located on Kaw Valley Drainage District and Overnite Trucking property. Monitoring wells ERM-12, ERM-13, and ERM14 are located on Kaw Valley Drainage District and private owners. All six of these wells could be impacted by the levee raise and stability berm.

The most recent sampling has detected VOCs, halogenated VOCs, SVOCs, pesticides, and herbicides in the groundwater. LNAPL was found in wells near the Sinclair property southernmost boundary. Benzene concentrations were found in monitoring wells ERM-10, ERM-11, and ERM-14. MW-3S also showed benzene contamination of 1.7 mg/L. This well, while still on Sinclair property, is close to the street across from the levee. Sampling events for the first quarter of 2002 and the 2nd through 4th quarters of 2003 showed the concentrations were fluctuating. VOCs were also detected above the MCLs for drinking water standards in the groundwater wells near the Kansas River. Arsenic was found slightly above the MCL for drinking water standards in one well during the 4th quarter of 2003.

From boring logs for the temporary piezometers installed in August of 2003, petroleum was noted at various depths. They were drilled near the edge of the plumes to get a better idea of the extent of the contamination. These piezometers can be seen on Figure 9.0. The following table presents a summary of the boring logs.

Table 4.1.19 : Petroleum in Sinclair Temporary Piezometers

Boring Numbers	Soil Description	Depths (ft. bgs)
TPZ-1	Grayish-color soil; slight odor becomes stronger with depth and below water table	Gray soil & odor - 11.5 Water surface - 34
TPZ-2	Color change to gray; Slight odor	Gray soil & odor - 23 to 32.5 Water surface – 39
TPZ-3	Grayish-color soil; stained; petroleum odor; black staining	Gray soil & odor - 23.5 Black staining – 26.5 to 26.7 Water surface – 40
TPZ-4	Black cinders; Light-gray soil; odor	Cinders – 4 to 4.5 Gray soil & odor - 25

		Water surface - 34
TPZ-5	No petroleum contamination noted.	Water surface – 42
TPZ-6	Cinders; Grayish-color soil; odor	Cinders – 2 to 5 Gray soil & odor – 33.8 Water surface - 34

TPZ-3 lies within the high concentration part of the plume.

Based on telephone interviews with Paul Conrad, Environmental Site Manager for Sinclair Oil, and with the EPA RCRA Project Manager, Sinclair is currently planning to install a groundwater containment system to intercept the plumes.

As previously indicated, the original levee alternative for this area included a buried collector system. However the buried collector system alternative was abandoned because of the potential to intercept the contaminated groundwater plumes and adversely impact the current groundwater cleanup. The new alternative, which consists of stability berms or filter blankets was selected as a more feasible option for this area.

Since this property is located outside the limits of the footprint for the preferred alternative of the stability berms or filter blankets and the extent of groundwater contamination is known, there is no need to perform any additional investigation at this time.

4.1.20 Auto Salvage Yards

Owner: Numerous ownership
Address: 26th – 24th Streets
Kansas City, KS 66106

Stationing: 220+00 to 245+00
Figure No.: 6.0

The alternative considered for this site involves a levee raise and stability berm for the 500-year + 5 case. The footprint of the alternative only extends outside the existing ROW at the north and south ends of the levee at this site. At the north end of the property the alternative extends approximately 50 feet beyond the existing ROW. The auto salvage yards were not identified as an area of concern in the Reconnaissance Report. They were also not listed in the Follow-Up Investigation database searches, so not much is known about the site's history. Aerial photographs show the auto salvage yards have been at their current location since 1970. In the 1970 photo, they appear to have extended to the northwest near the current levee access road. In 1983, the salvage material near the levee access road had been removed, but remained around a service building just to the south.

During the site visit, the building located at the north end of the site appeared to be abandoned and the auto salvage had been removed. The building had 2 bay doors and resembled a service station or auto repair shop. There was no evidence of a gasoline pump island. However, there was a concrete and gravel pad surrounding the building. Based on the selected alternative, the building

may need to be demolished and any contamination encountered would have to be remediated prior to levee modifications. Since little is known about this site, additional investigation is recommended.

4.1.21 Fairbanks Morse Pump Corporation

Owner: Fairbanks Morse
Address: 3601 Fairbanks Avenue
Kansas City, KS 66106

Stationing: 200+00 to 205+00
Figure No.: 6.0 and 9.0

This property, like Sinclair Oil, has groundwater contamination that could have an impact on the alternative chosen for stationing 200+00 to 205+00. The original alternative for this reach included a buried collector system between stations 202+00 and 207+00. However, during the site evaluation process, existing groundwater contamination plumes from Sinclair Oil and Fairbanks Morse were identified. The locations of the existing plumes are shown on Figures 6.0 and 9.0. In order to avoid the possibility of adversely impacting the existing groundwater contamination plumes and the current groundwater cleanup actions, a filter blanket was recommended as a more feasible option for this area.

Fairbanks Morse manufactures pumps and small motors for public works and industrial installations. There is no mention of this property in the Reconnaissance Report. However, the Follow-Up Investigation database search listed numerous HTW issues with Fairbanks Morse. The site is currently regulated under KDHE's Voluntary Clean Up Program. It is also listed as a RCRA small quantity hazardous waste generator and has been the site for a number RCRA violations. The database indicates there is one active above ground storage tank (AST), which holds 5500 gallons of diesel fuel and one 800-gallon UST which has been removed. In November 1994, a leaky underground storage tank was discovered. The KDHE LUST database currently lists the remediation status as "monitoring".

An Environmental Assessment, a Facility Investigation, a Preliminary Investigation, and a Voluntary Cleanup Investigation have been completed for this site. Based on these investigations, numerous groundwater contamination plumes have been identified. The plumes are primarily chlorinated VOCs and petroleum related VOCs. The plume locations are shown on Figure 9.0. These plume locations were taken from "Addendum 4 Voluntary Cleanup Investigation Report" dated December 2002. The plumes have migrated off-site to the northwest toward the Kansas River. Many monitoring wells and groundwater probes have been installed on Fairbanks Morse property as well as one probe near Kansas Avenue on Overnite Transportation's property. The contamination from Fairbanks Morse was also found in Sinclair well MW-9, which lies just on the Kaw Valley ROW. The approximate limits of the plume extend from inside Fairbanks' property to 40 feet inside the Kaw Valley ROW. Since this site is outside the alternative footprint and the alternative no longer includes a buried collector system, no additional investigation is necessary for this property.

4.1.22 Burlington Northern Santa Fe Railroad – Diesel Shop Facility

Owner: BNSF Railroad
Address: 720 S. 38th St.
Kansas City, KS 66106

Stationing: 245+00 to 285+00
Figure No.: Figures 7.0 and 10.0

For this stretch of levee, there are also a few alternatives required to achieve the stability needed and correct underseepage for the 500-year + 5 case. In addition to a levee raise from 7 to 9 feet, alternatives include an I-wall, a buried collector system between stationing 276+80 to 289+00, and relief wells between 253+92 to 276+80. The Burlington Northern Santa Fe (BNSF) Railroad operates the Diesel Shop Facility (DSF) for refueling and repairs on locomotives in the rail yard. They have owned the site since the 1870s. They are currently in the investigation stage for the Voluntary Cleanup program. In the Reconnaissance Report, the railroad was not listed as an area of concern, but was noted in the database summary. It is listed as a RCRA Large Quantity Generator and cited for numerous violations since 1985 until the time of the report. The property was also listed in the Follow-Up Investigation database search. It is listed for a diesel fuel spill in June of 1997, in which the affected soil was removed. At least one AST is located on the site for diesel fuel storage.

Aerial photos show that the site has added some structures over the years, but has seen little change. A site visit was conducted on September 17, 2004 with the Burlington Northern Santa Fe Railroad (BNSF) to discuss their environmental issues. Their representatives and members of the Corps project team walked the levee to look at potential problem areas. From walking the levee, it became clear that safety constraints and available right-of-way property would prevent some alternatives from being feasible.

The railroad's environmental contractor, RETEC, provided boring logs from environmental investigations in 1995. These revealed past operations on the site had contaminated the groundwater. Soil borings and surface soils showed the soils had been impacted with petroleum hydrocarbons. Monitoring wells have been installed since 1994 (see Figures 7.0 and 10.0). Soil borings were drilled in 1995 to depths between 33 to 45 feet. Diesel free product was encountered in wells MW95-10, MW95-12, and boring B95-28 at depths of 29.9 feet, 29 feet, and 27 feet, respectively. Other wells and borings within 400 feet of the levee centerline showed evidence of diesel or other hydrocarbon contamination based on PID readings taken on vapors coming off the samples. Analyses results from these samples showed contamination with arsenic, barium, lead, benzene, and petroleum hydrocarbons in the form of diesel fuel and bunker oil, which was used in engines prior to the 1940s. Bunker oil had a very thick viscosity. In B95-4 and MW95-12, boring logs noted the presence of a "hydrocarbon sludge" or a "pudding-like" staining that could be bunker oil in the subsurface. Table 3.1.22.1 indicates the other forms of hydrocarbon contamination in the wells and borings, as well as the depths where the contamination was found. Light Non-Aqueous Phase Liquid (LNAPL) is being recovered from the site at wells MW95-3R and MW95-10R using a system or two sumps, a belt skimmer, and passive recovery methods.

Table 3.1.22.1: Hydrocarbon Contamination in Wells and Borings

Well or Boring Numbers	Hydrocarbon contamination	Depths (ft. bgs)
B95-5	Odor and heavily stained	0.5
B95-4	Hydrocarbon sludge	9
B95-30	Diesel odor and sheen	30
B95-29	Diesel odor; heavy sheen, greasy; moderate odor	1; 4; 9
B95-28	Diesel saturated soil; strong odor and soil staining increasing with depth; free product	1; 2; 27
B95-31	Hydrocarbon staining	4.4
B95-34	Weathered diesel staining	0– 5.2
B95-26	Staining and strong odor	1.0
MW95-3	Staining; diesel odor; oil saturated with diesel; diesel odor	9; 26.5; 34; 39
MW95-10	Diesel odor	15
MW95-9	Staining; odor and staining; odor	1.5; 14; 33
MW95-12	Heavy staining, strong odor, and free phase; heavy staining with pudding-like product, heavy sheen, and strong odor; strong diesel odor and free phase product evident	1.0; 19; 29
MW95-8	Staining	1-3

Trash and debris was found in borings near the levee and within the utility uplift areas of concern. The borings, drilled in 1995, contained waste such as, wood, roofing tile, bricks, concrete, coal or coke slag, glass, paper, and straw. Other materials were not readily identifiable and labeled as debris. The following table lists the borings and depths where the waste and debris was encountered.

Table 3.1.22.2: Debris Locations and Depths

Boring or Monitoring Well Number	Depth (ft.)
B95-5	4' – 22.1'
B95-3	3.9' – 7.6'
MW95-10	11' – 14.5'
B95-29	4' – 7.8'
MW95-9	9' – 12.8'
MW95-12	9' – 10.5'

B95-26	5' – 12.8'
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In 2002, the area around a 9' x 9' stormwater culvert, which runs under the levee to the Kansas River, was extensively investigated. Thirty-six direct-push samples were taken around the DSF area and 3 pothole borings were placed next to the box. The samples were analyzed for BTEX, TPH as both Gasoline Ranged Organics (GRO) and Diesel Ranged Organics (DRO), and an additional 20% were samples for PAHs. Groundwater monitoring wells were also installed under Stage II of the investigation and soils also analyzed. During Stage III, groundwater samples were taken and tested for BTEX, TPH-DRO, SVOCs, and Dissolved and Total Metals, as well as arsenic. The borings and contaminants above KDHE RSK levels for soil or water protection pathway and groundwater above MCLs for drinking water standards are presented in the table below. The KDHE RSK levels are for 20,000 mg/kg TPH-DRO, 450 mg/kg for TPH-GRO, and 0.01 mg/kg for benzene. All boring and well locations can be found in Figure 10.0.

Table 3.1.22.3: RETEC 2002 – 2003 Investigation Results

Soil		
	Boring (depth in ft.)	Contaminant with Concentration (mg/kg)
Stage I	B02-7 (8-12)	TPH-DRO – 22,900
	B02-17 (36-40)	Benzene – 0.425
	B02-24 (36-40)	TPH-DRO – 31,500
	B02-26 (24-28, 36-40)	Benzene – 0.1, 0.11
	B02-28 (36-40)	Benzene – 0.71
	B02-31 (40-44)	TPH-GRO – 1350
	B02-32 (40-44)	TPH-GRO – 575
	B02-33 (40-44)	TPH-GRO – 706
Stage II	B02-35 (32-36)	Benzene – 0.23
	MW02-5 (40-42)	TPH-DRO – 32,000
	MW02-7 (39-40)	Benzene – 1.1
Water		
	Wells	Contaminant (mg/L)
Stage III	MW94-1	Barium – 3.6, Lead – 0.081, Arsenic – 1.1
	MW95-9	TPH-DRO – 1.1, Lead – 0.041
	MW02-7	TPH-DRO – 12
	MW02-9	TPH-DRO – 2.2, Benzene – 0.25

Metals found in the groundwater monitoring wells MW94-1 and MW95-9 were found to be slightly over the MCLs for drinking water standards. Barium, lead and arsenic have MCLs for drinking water standards of 2 mg/L, 0.015 mg/L, and 0.05 mg/L, respectively. Levels in MW94-1 are as

follows: barium – 3.6 mg/L, lead – 0.081 mg/L, arsenic – 1.1 mg/L. Arsenic in MW95-9 was found to be at 0.041 mg/L.

LNAPL was found in the following wells: MW95-4, MW95-3, MW95-18, MW95-12, MW95-1, MW95-13, MW95-15, MW02-1, MW02-3, MW02-4, MW02-5, MW02-6, and MW02-8. With the exception of MW95-18 and MW95-12, all other wells were located adjacent to or near the culvert.

A RETEC investigation is planned for fall of 2004 to determine the southern extent of the contamination. Due to previous soil and groundwater investigations conducted by RETEC and BNSF, there are no further plans for the Corps to perform an investigation in the railroad area. In past alternatives, a buried collector system was planned for stationing between 260+00 to 275+00. It was recommended that a different alternative be found to prevent migration of contamination into the buried collector system. The systems further downstream should not be impacted by the contamination in the groundwater. The relief well alternative should also be avoided if possible, as the wells will be fully penetrating to rock and could also be impacted by groundwater plumes. The wells will only flow during flooding events, but may potentially bring contaminated water onto the ground surface. Per conversations with KDHE, during flood events, the wells could be discharged to the Kansas River without a NPDES permit. However, any discharge on the landward side would require an agreement with the BNSF.

4.2 Fairfax-Jersey Creek Levee Unit

The Fairfax-Jersey Creek Levee Unit is being reevaluated as part of the Feasibility Study based on observation made during the 1993 flood event. The only area of weakness for the levee unit was the existing floodwall located between Stations 287+85 and 302+32. Several floodwall modification alternatives are being considered for this area. All the alternatives would involve excavation of the soil below or landward of the existing floodwall. The potential impacted area is shown on the footprint map on Figure 11.0. The property adjacent to the existing floodwall is owned by Board of Public Utilities.

4.2.1 BPU Quindaro Power Plant

Stationing: 285+00 to 305+00

Figure No.: Figure 11.0

The BPU Quindaro Power Plant is located on the Fairfax-Jersey Creek Levee on the south side of the Missouri River in Kansas City, Kansas. It was identified in the Reconnaissance Report as an area of concern, due to a reported LUST. The Follow-Up Investigation discussed several spills from diesel fuel, oil, and LUSTs, resulting in both soil and groundwater contamination. Two LUSTs were removed in 1989 and 1993. The sites were considered closed by KDHE. Numerous spills reached the Missouri River downstream of the current floodwall within the confines of the sewer system in 1990, 1992, 1997, and 1998. The chemicals involved were diesel fuel and oil. The BPU facility is a small quantity generator as well with violations cited in 1987 and 1994. The contamination for all these occurrences happened in the storm water system or near the turbine areas further on-site. KDHE listed several spills that occurred due to the day-to-day site activities. Numerous spills in the pumps, lines, and other systems have occurred in the transformer and turbine

area. Monitoring wells on site are found near the combustion turbines and are sampled by KDHE. All these spills were remediated and considered closed by KDHE. During a meeting with BPU employees and the environmental scientist, Sarah Steineger, she supplied the facility's BPU Spill Prevention Plan, which listed past incidents over the last 7 years. These spills included some mentioned above, but none of these spills were located near the levee footprint.

The Williams Company has three petroleum pipelines immediately east and on the riverward site of the existing floodwall. No contamination has been reported, but it should be noted in the design process and avoided during construction operations at the floodwall.

A site visit was made on June 17, 2004 to assess any contamination issues and structural issues pertaining to the construction of a floodwall. There are no known plumes or contamination of soils adjacent to the floodwall and right-of-way. Therefore no further investigation is needed at this stage.

4.3.2 Fairfax-Jersey Creek Floodwall Area

This section of the project is in an area adjacent to the Kansas River and near the Kansas and Missouri River confluence. The planned alternative involves a retaining wall built to a depth below the river water surface that will prevent scour beneath it. There are no known HTRW issues at this time. In both the Reconnaissance Report and Follow-up Report, no properties with any HTRW problems were within the proposed footprint for construction. The site does lie beneath the overpass for I-70. A set of railroad tracks is also higher up on the riverbank. Any contamination present would have resulted from dumping against city ordinances.

4.3 North Kansas City Unit

The North Kansas City Levee Unit is being reevaluated as part of the Feasibility Study based on observation made during the 1993 flood event. Only two areas of concern for the project were identified along the North Kansas City Unit during this reevaluation process. They are the Harlem Section of the levee located between Stations 210+00 and 240+00 and the area adjacent to National Starch located between Stations 250+00 and 280+00.

4.3.1 Harlem

Stationing: 210+00 to 240+00
Figure No.: Figure 12.0

The recommended alternative for the Harlem Section is a buried collector system, which would be located along the landward toe of the levee within the existing North Kansas City Drainage District ROW. The footprint of the buried collector system alternative and the Harlem area are shown on Figure 12.0. The Harlem area is an older neighborhood located on the north side of the Missouri River between the Heart of America Bridge and the Broadway Bridge. There were no properties within the Harlem section identified in the Reconnaissance Report or the Follow-Up Investigation database searches. None of these properties were listed in EPA or MDNR website databases. A

site visit was performed on September 1, 2004 to assess the recent operations at the various properties. Currently, the following properties are located adjacent to the levee toe from west to east: a former Holiday Inn, which now leases apartments, an abandoned car lot or possible an abandoned gas station, Jones Iron and Metal, Southwest Mill Works, Harlem Baptist Church, a landscaping company, a couple of residences, and an auto body shop. There was nothing noted on any of these properties during the site visit which could impact the buried collector system alternative.

Research was performed at the Kansas City Public Library. Sanborn maps could not be found for this stretch of the levee. A few newspaper articles did provide some information on the unincorporated area. Harlem began its decline in 1911 with the construction of the A.S.B. Railroad Bridge into downtown. During the flood of 1951, many residences and businesses were inundated with floodwaters when the agricultural levee was overtopped. For the construction of the new levee, these properties were bought out. According to the Kansas City Star, the last and only gas station closed in 1972. The specific location of this gas station was not found.

Aerials from 1958, 1965, 1976 and 1986 were reviewed for any areas that could impact the buried collector system alternative for that stretch of the levee. In the Harlem Area, lots that were vacant in 1958 had been developed by 1965. The Holiday Inn was constructed between 1965 and 1976. Across the street, the vacant lot became a parking lot. Since the Holiday Inn construction, the properties continued their economic decline. No areas of concern were ascertained from the photographs.

Since there is no evidence of contamination on any of the properties adjacent to the levee and the buried collector system will be located within the existing ROW, no additional investigation is necessary.

4.3.2 National Starch

The proposal for the alternative for this section of the North Kansas City Levee involves relief wells at the toe to prevent underseepage problems. There is little room for any berms. A buried collector system will not handle the quantities of water predicted to flow beneath the levee during a flood event. National Starch & Chemical owns property for the full length of the levee footprint. Neither the Reconnaissance Report nor the Follow-up Report lists the site for HTRW concerns. A search of the MDNR website showed that they have a NPDES permit for discharging into the Missouri River. Discharge includes wet corn milling, condensations flows, non-contact cooling water, and stormwater runoff and has a flow of 8 million gallons/day. From the EPA website, National Starch was listed in the Toxic Release Inventory System (TRIS), Aerometric Information Retrieval System (AIRS), and UST databases. National Starch has had a past air release of propylene oxide from one of its stacks. It is listed in AIRS and is allowed through a permit to release 100 tons/year of cornstarch. National Starch is also considered a Large Quantity Generator.

The property has one 30,000 UST that is currently in use. A past geotechnical investigation around the site noted a petroleum odor in boring B-6 from a depth of 9' to 25.5'. This was found in a containment area a few hundred feet from the levee, but no tank is present at the site. None of the borings closer to the river showed any type of contamination, which indicates there is not a plume

reaching the river. No HTRW issues exist for this site; therefore no additional investigation is recommended.

4.4 East Bottoms Unit

The East Bottoms Levee Unit is being reevaluated as part of the Feasibility Study based on observation made during the 1993 flood event. The section of the levee near the confluence of the Missouri River and the Blue River was identified as an area of concern with respect to underseepage. The recommended alternative for this area is a series of relief wells located along the landward toe of the levee between stations 405+00 and 423+00. The proposed relief wells would augment the existing buried collector system located between stations 405+00 and 420+00. Figure 13.0 shows the proposed alternative footprint and the adjacent property, Bayer Chemical Corporation.

4.4.1 Conservation Chemical Company

The Conservation Chemical Company (CCC) site is located on a 6-acre tract of land on the riverward side of the East Bottoms Levee in Kansas City, Missouri between Stations 360+00 and 367+00. It is found on Figure 13.0 just to the northwest of the Bayer Crop Science Facility. This property was identified in the Reconnaissance Report as an area of concern and it was discussed in the Follow-Up Investigation. The facility operated as a chemical storage and disposal facility from 1960 to 1980. During its operation, at least 300,000 tons of chemicals were handled at the site. Most of the chemicals were disposed of on-site, often in unlined lagoons. Due to these operations, there is both soil and groundwater contamination at the site, and 25 contaminants of concern have been identified, including metals, cyanide, phenolic compounds, VOCs, and halogenated VOCs. The CCC site is a NPL site, which is currently under remediation. The EPA issued an ROD on the site in 1987, and in 1989, remediation activities began. A permeable cap was constructed over the contaminated soil, and a pump and treat system was installed for the groundwater. The groundwater extraction will carry on as mandated for 30 years, and groundwater monitoring also continues.

Since this site is located outside the footprint of the recommended alternative, it will have no impact on the proposed relief well alternative. The site and its plume are located north of the East Bottoms Levee. It is also downgradient of the project site with groundwater migration toward the Missouri River. Therefore, no additional investigations are required for this site.

4.4.2 Bayer Crop Science

Stationing: 400+00 to 425+00
Figure No.: Figure 13.0

The Bayer Crop Science facility (Bayer) is located on the south bank of the Missouri River near the confluence of the Blue River in Kansas City, Missouri. The recommended alternative for this reach is a series of relief wells, which will augment the existing buried collector system. The

proposed relief wells will be located on the landward toe of the Blue River levee between stations 400+00 and 423+00. (Reference Figure 13.0)

Bayer is an agricultural chemical manufacturing facility, which primarily manufactures insecticides, herbicides, and fungicides. Bayer has owned and operated the facility adjacent to the levee since 1956 under various subsidiary names (ChemAgro, Mobay Chemical Corporation, Miles, Inc., and Bayer Corporation).

The Bayer site is identified in the Reconnaissance Report as an area of concern. However, it was not listed in the Reconnaissance Report database search. The Follow-up Investigation identified Bayer as a permitted RCRA facility currently undergoing corrective action. The database search also listed numerous RCRA violations.

Since late 1980, numerous investigations have been conducted at the site. These include a RCRA Facility Assessment, a RCRA Facility Investigation (RFI) and a Corrective Measures Study (CMS) Work Plan. Based on the information presented in these documents, there is known soil and groundwater contamination present at the site.

There are 3 Solid Waste Management Units (SWMU) and 3 Areas of Concern (AOC) identified at the facility (reference Figure 13.0). The SWMUs are former land disposal units, which have been capped with soil. The contaminants found in the soil at the SWMUs are primarily VOC, SVOCs and pesticides. AOC-1 is located in the southern portion of the drainage ditch. Relatively low levels of SVOCs and pesticides were detected in the shallow soil along the bottom of the ditch. AOC-3 and AOC-4 are potentially impacted by historical releases of wastewater. Sampling results from these areas were not available. Since the CMS has not been developed, there is no recommended corrective action planned for the soils at this time.

There are two known groundwater plumes at the facility. Both of these plumes are associated with the former land disposal units. The primary constituents detected in the groundwater are VOCs, SVOCs and pesticides. The plumes identified on Figure 13.0 represent the total VOCs. The locations of the plumes were obtained from RFI Report dated January 2000. The VOCs found include benzene, toluene, xylenes, and chlorinated solvents. There are a total of 30 groundwater monitoring wells and 3 extraction wells at the Bayer site. As an interim measure for groundwater containment, Bayer pumps from the two plume areas to recover impacted groundwater and impede migration of contaminated groundwater. The extracted groundwater is treated at the on-site wastewater treatment facility and discharged to the Missouri River through an underground piping and permitted NPDES outfall. The final corrective measures for the groundwater cleanup have not been developed.

During the site evaluation and alternative development process, numerous meetings and discussions were held with Bayer and the City of Kansas City in order to develop a levee alternative that satisfied the underseepage concerns and minimized the impacts to Bayer's interim measures and any future corrective actions. The existing groundwater plumes are located near the levee at stations 370+00 and 380+00 along the Missouri River. The groundwater flow direction at the site under normal conditions is primarily east to southeast towards the Missouri River. The location of the proposed relief wells is a considerable distance west of the known plumes within the Bayer

facility and are also located up and side gradient from the plumes. Therefore, the proposed the relief wells should have no impact on the existing groundwater plumes under transient or flowing conditions.

On August 19, 2004, a meeting was held with MDNR, Bayer and the City of Kansas City. The MDNR representatives were Richard Nussbaum, Corrective Action Unit Leader, and Pat Quinn, Bayer Facility PM in the Corrective Action Unit. MDNR recommended sampling and testing the groundwater in the area of the proposed relief wells to ensure the groundwater was not contaminated.

Although the groundwater is not thought to be contaminated in the area of the proposed relief wells, groundwater sampling and testing has been performed based on MDNR's recommendations. The results of sampling are presented in section 7.0. Based on the results, no further investigation is required.

4.4.3 Hawthorn Generating Station

The Hawthorn Generating Station is located adjacent to the East Bottoms Levee between stations 355+00 and 365+00 in Kansas City, Missouri. This property was listed as an area of concern in the Reconnaissance Report. It was reviewed in the Follow-Up Report. The Hawthorn Generating Station site is a coal power plant owned by KCP&L Company. In 1999, an explosion rocked the plant that destroyed the top six stories of the boiler unit. Debris was scattered throughout the Hawthorn property and the adjacent Bayer property. Cleanup of the debris was completed and considered to be satisfactory, and no soil, surface water, or groundwater contamination was found as a result of the explosion. Since the Hawthorne site is located outside the footprint of the recommended alternative it is not expected to impact the levee modifications. Therefore, no additional investigations are required.

4.6 Other Areas – Borrow sites

The proposed borrow site is located adjacent to the Kansas River just southwest of the Argentine Levee near Holiday Drive (see Figure 14.0). The 10-acre property is currently owned by Water District No.1 of Johnson County (Water One). The land appears to be largely agriculture, with the exception of an old farmhouse. The Water One water treatment facility is located at the southern most end and there are numerous water wells located near the river. Water One utilizes a small portion of the property to create monofills in 5-acre increments to stockpile lime products. Once the monofills are completed, a 10-foot thick cap is constructed over the monofills. These monofills extend to 20 feet in depth. There are no known issues associated with the monofills that would impact the use of the surrounding material as borrow. During a site visit on October 28, 2004, the Water One engineers stated that a Phase I Environmental Assessment was performed on the farmstead area in 1998. Some cleanup was done to remove old pesticides. They are also in the planning to remove trash, foundations, farm equipment, and trailers from the farmstead.

There is no known contamination within the proposed borrow site. However, it is recommended that chemical sampling and testing be performed to verify the borrow source is not contaminated.

5.0 FIELD INVESTIGATION RATIONALE

The intent of this planned field investigation was to characterize any potential contamination that may exist at different locations at the borrow area, the Argentine Levee Unit, and the Confluence of the Missouri River and the Blue River near the Bayer facility. Samples were taken for both soil and groundwater. During the development of this plan, assumptions were made in order to characterize the material with a reasonable number of samples. Each site identified in the site evaluation process as needing additional field investigation was considered separately because of the different site histories. Samples from borings were used to verify that the excavated material would not be considered a hazardous waste and to characterize the material for disposal or for use as fill material during construction.

Engineering judgment was used to determine the specific number and location of samples based on site size, site history, visual observations during the field reconnaissance and aerial photos, previous geotechnical and analytical investigations, and the proposed levee alignment. Samples were taken in areas where past land use increased the potential for contamination, but little current site investigation was available.

5.1 Field Investigation Areas

Sampling was planned for the 7 preceding sites. However, access agreements could only be obtained for 3 of the 7 sites. After considering available options, the field investigation was limited to two sites, Bayer and the borrow area.

5.1.1 Borrow Area

The borrow area has mainly been used for agricultural purposes. Borings in the borrow area were taken to ensure that the fill material is not contaminated and can be used for the construction of the levee raise and berms. Three parcel areas were investigated for potential contamination. HTRW borings were drilled adjacent to the geotechnical borings, when present (Figure 15.0). HTRW borings were pushed adjacent to these with an additional two offset a distance to the south. Four HTRW borings were offset around one geotechnical boring in the eastern parcel. Borings were pushed to a depth of 4 feet with an earthprobe rig. Four aliquots were taken from four borings at each area to make up the composite sample for that area, resulting in a total of three composite samples tested. Aliquots were taken from 0 to 4 feet. Composite samples will be tested for total metals, SVOCs, pesticides, and herbicides. A discrete grab sample were taken at the bottom of the boring and analyzed for VOCs. Results of the analysis are presented in section 7.1.

5.1.2 Bayer Area

In the project area, next to the Bayer facility and the Blue River relief wells are planned in this project area. To ensure that the groundwater in this area was not contaminated, groundwater samples were taken at the riverward levee toe. Two locations were chosen (Figure 13.0), where three temporary wells were pushed to various depths at each location. The SCAPS rig performed this work. These wells were screened at the following depths: 20 feet, bottom of well, and a

midpoint in between the two. Once groundwater samples were taken, the wells were pulled and grouted. Analytes tested in the groundwater include: VOCs, SVOCs, pesticides, organopesticides, herbicides, and total metals. The results of the analysis are presented in section 7.2

5.2 Planned Investigations for Future Consideration

An HTRW investigation was planned for the following properties along the Argentine Levee: Kaw Valley Materials, APAC (Arnott Property), Overnite Transportation, and the Junkyard. These borings were chosen to determine if the soil would be clean for these properties that were within the 500 +5 levee raise footprint. Little information was present concerning these sites, but contamination concerns were present. During the process of obtaining access agreements, only Overnite Transportation would allow access onto the property. Access agreements could not be obtained for the private landowners. For two of the properties, the landowners could not be found or ever responded to the phone and letter requests for access. Since there were no agreements for the majority of the properties, the investigation did not proceed. These areas should be more fully investigated during the Design stage to ensure that the surface and subsurface soil is clean in the levee footprint.

5.2.1 Kaw Valley Materials

This property is currently vacant. It is located where surrounding properties have had past LUST issues near station 36+00. Since a buried collector system will be located in this area for the 500+5 alternative, it was recommended that a boring be placed in this area. A boring (Figure 3.0) should be drilled to 8 feet and be sampled for Volatiles (VOCs) and RCRA metals. Grab samples for VOCs should be collected at the location with the highest PID reading or at 2 and 6 feet. Composite samples should be collected from 0 to 4 feet and 4 to 8 feet interval and tested for RCRA metals.

5.2.2 APAC

The property is surrounded by a chain link fence and assumed to be a storage lot. Past aerial photos have indicated machinery and other items were kept there. Currently, the lot is so overgrown from the levee toe that little can be told about the property. One boring (Figure 4.0) should be located outside the Kaw Valley right-of-way near station 148+00 to ensure a clean site for the 500 + 5 levee raise alternative. The boring should be drilled to 4 feet and composite soil samples will be collected from 0 to 4 feet and analyzed for RCRA metals. Grab samples should be taken at the highest PID reading or at 2 feet and analyzed for VOCs.

5.2.3 Overnite Trucking

The property is currently vacant. At this location, the site appeared to be used for either storage or dumping in 1970 based on the aerial photos. An extensive berm will be placed at this location outside of the Kaw Valley right-of-way; therefore a boring should be taken to ensure a clean site. A boring (Figure 5.0) should be drilled to 4 feet in depth near station 207+00. As with the above APAC property, a composite sample should be collected from 0 to 4 feet interval and tested for

RCRA metals. Grab samples should be taken at the highest PID reading or 2 feet below ground surface and tested for VOCs.

5.2.4 Auto Salvage Yard near abandoned building

This property is just north of the large auto salvage yard. The abandoned building has the appearance of an auto body shop or gas station. Therefore, there may have contaminated the subsurface soils. This section of the levee is slated for a levee raise with stability berm for the 500 + 5 alternative and will extend outside the Kaw Valley Right of Way. One boring (Figure 6.0) should be placed to 8 feet to intercept any underground storage tank contamination that may exist. The sampling should be split into two intervals. Grab samples should be collected at the highest PID reading or at 2 feet and 6 feet and tested for VOCs. Composite samples should be collected from 0 to 4 feet and 4 to 8 feet to be analyzed for RCRA total metals.

5.2.5 Auto Salvage Yard

Near the downstream section of the auto salvage yard property, another boring will be taken. The auto salvage yard has the potential for contamination from leakage from old vehicles' gas tanks, batteries, or engines. The boring is located near station 245+00 and is just outside of the Kaw Valley Right of Way. A boring (Figure 6.0) should be taken to 4 feet below ground surface. As with the APAC property, the length of the boring should be taken for composite samples. A composite sample should be collected from 0 to 4 feet and analyzed for RCRA total metals. A grab sample should be collected from the location of the highest PID reading or at 2 feet and analyzed for VOCs.

6.0 FIELD INVESTIGATION PROCEDURES

6.1 Groundwater Samples

Groundwater samples were collected from 2 locations along riverward toe of the levee utilizing $\frac{3}{4}$ -inch temporary wells installed using the KCD Site Characterization and Analysis Penetrometer System (SCAPS) drilling rig. Three temporary wells were installed through the drilling rods at each location, and 5-foot screens placed at the top of bedrock or refusal, just below the water table, and at a location midway between the top and bottom interval. The deepest point was installed first, and the static water level used to determine the static groundwater level, thus the upper sampling interval.

Well points consisted of $\frac{3}{4}$ inch inside diameter (ID) schedule 40 poly-vinyl chloride (PVC) riser and screen. A sacrificial drive point and screen was placed into the leading push rod. An annular seal consisting of a foam insert and a pre-packed bentonite sleeve was placed above the screen and this assembly inserted into the three lead push rods. The three lead push rods were wider than the remaining rods to accommodate this assembly. Push rods were added as the push was made to the determined depth or refusal. PVC riser was fed through the push rods and threaded onto the pre-packed annular seal until the PVC riser was at the surface. The push rods were then be retracted and the PVC cut off and capped close to the ground surface. A temporary well point consisting of

3/4-inch ID screen and riser, a bentonite and foam seal, and an aluminum drive point was left in place.

Samples were grabbed immediately after well installation using a weighted bailer, and the temporary wells was then removed and the borings grouted shut.

6.2 Subsurface Samples

Subsurface samples were collected by advancing a 4-foot Macrocore[™] or similar type sampler that utilized an acetate liner to retrieve sample material using a direct push-drilling apparatus. Intact soil samples were recovered continuously, at intervals of four-feet, from the ground surface to terminal depths and samples were collected at the intervals specified in Table 1. Analytes were specified in Table 1 for each sampling location. Borings were logged in accordance with KCD requirements. Encountering groundwater was not anticipated. Completed borings were grouted shut and cutting spread evenly on the ground. Soil samples were collected using the following procedure:

1. Open the sampling device. For the Macrocore[™] or similar type sampler, the liner was to be cut longitudinally from the top to the bottom of the liner, or the sample was extruded onto clean plastic.
2. Obtained PID readings along the length of the soil sample to identify possible zones of volatile organic contamination.
3. For VOCs sample, immediately transferred the interval with the highest PID reading into sample containers. No PID readings were observed the VOC samples were taken from the center of the core, except in the borrow area where it was taken from the lower end of the core. Place the sample on ice in a cooler.
4. For all other analyses, the sample was homogenized in order to create a representative sample volume. Homogenization was accomplished by filling a decontaminated stainless steel bowl with the sample and mixing it with a stainless steel spoon, or by hand, wearing clean gloves. It was thoroughly mixed by stirring the soil material in a circular fashion and occasionally turning the material over.
5. Transferred the soil into the appropriate sample containers. Placed the sample on ice in a cooler.

6.3 Equipment Decontamination

Equipment requiring cleaning and decontamination consisted of the drill rig, associated direct push sampling equipment, SCAPS drilling rods and sample collection utensils. A temporary decontamination station was established, as necessary, to accommodate the casing or other large items of equipment. Direct push sampling equipment and sample collection utensils were to be decontaminated at individual boring locations. Prior to mobilizing to the project, all equipment including was thoroughly cleaned by washing with high pressure hot water and laboratory grade

detergent. Special attention was given to the rear deck, control area, rear undercarriage, and drilling tools to assure that oil, grease and fuels were removed and components thoroughly cleaned. Subsequent moves of equipment from one sampling location to another were required a similar cleaning only of the rear deck, control area, rear undercarriage and sampling tools. The Macrocoretm drive-shoe was cleaned and decontaminated at the beginning of each sampling interval by washing with a high pressure solution of hot water. All decontamination liquids, except any from the premobilization wash were discharged on-site.

6.4 Disposal of Investigation Derived Wastes

Investigation derived wastes consisted of decontamination liquids and disposable protective clothing. Protective clothing was to be collected in 1.5 mil garbage bags and the bags labeled with dates of collection, descriptions of contents and boring numbers with which they are associated. Garbage bags were closed and stored on site in steel drums. Garbage bags contained materials associated with only a single boring; however, drums may contain closed garbage bags from multiple borings. All drums were to be labeled with site name, boring number, description of contents and dates of collection. On-site drum storage was to be temporary, pending results of chemical analyses. Material associated with uncontaminated borings was removed for disposal at a sanitary landfill. Materials associated with contaminated borings were to be retained for disposal after consultation with Missouri environmental regulatory authorities. Decontamination liquids were to be segregated as practicable, by boring and/or by site and stored in steel drums pending results of soil sample chemical analyses. Liquids associated with all borings were to be retained for chemical analysis. Samples were to be collected and analyzed for contaminants identified in associated borings. Ultimate disposal was to be dependent upon contaminants and concentrations and determined in consultation with Missouri environmental regulation authorities.

7.0 FIELD INVESTIGATION RESULTS

7.1 Argentine Levee Unit

An HTRW investigation was planned for the following properties along the Argentine Levee: Kaw Valley Materials, APAC (Arnott Property), Overnite Transportation, and the Junkyard. These borings were chosen to determine if the soil would be clean for these properties that were within the 500 +5 levee raise footprint. Little information was present concerning these sites, but contamination concerns were present. During the process of obtaining access agreements, only Overnite Transportation would allow access onto the property. Access agreements could not be obtained for the private landowners. For two of the properties, the landowners could not be found or ever responded to the phone and letter requests for access. Since there were no agreements for the majority of the properties, the investigation did not proceed. These areas should be more fully investigated during the Design stage to ensure that the surface and subsurface soil is clean in the levee footprint.

7.2 Borrow Area

On January 24, 2005 a site investigation was performed to sample the soil being considered for borrow material. A sample, composited from four borings, was collected from 0 to 4 feet below

ground surface. These samples were tested for metals, pesticides, herbicides, and SVOCs. This was repeated for the two remaining tracts for a total of 3 composite samples collected for the borrow area. In addition, three grab samples were collected and analyzed for VOCs. A grab sample was taken from the bottom of the first boring after PID equipment did not detect any higher volatile readings along the boring column. Table 7.1 shows the results of the testing.

The results were preliminarily screened against the State of Kansas RSK levels for soil for a residential contact scenario. These levels are presented as guidance only for deciding if the soil can be used for borrow material. All chemicals were found to be below these screening levels and therefore, are suitable for borrow material.

7.3 Bayer Science

A groundwater investigation was performed from January 25 to 26th, 2005. The investigation used the SCAPS drill rig to install temporary wells at three screened locations – just below the groundwater surface, at the bedrock contact, and at an intermediate level between the two at three locations. The groundwater surface ranged from 25.5 feet at BAY-405 to 27.5 feet at BAY-415. Depth to bedrock (refusal) ranged from 56 feet to 57.5 feet. The soil type in the borings was predominantly silty sand. Immediately upon installation of each temporary well, samples were grabbed using a bailer. Because no development was conducted, samples were highly turbid. Samples were analyzed for VOCs, SVOCs, metals, pesticides, herbicides, and organophosphate pesticides. Both filtered and unfiltered metals samples were collected. Filtered samples are more representative of actual water quality than turbid samples. Non-filtered turbid samples tend to reflect increased metals concentrations due to sediment from the soil surrounding the well. The metals samples were filtered in the laboratory. These analytes are the same that Bayer collected for past groundwater sampling events. Sample results are shown in Table 7.2.

Only metals were found to be above the MCLs for drinking water standards at the Bayer site, which are not currently contaminants of concern at the Bayer facility. For temporary well BAY-405-1, the shallow screen depth, multiple metals were detected above CALM screening levels for unfiltered samples. In BAY-405-2 in a non-filtered sample, only manganese (1.24 mg/L) was found at levels higher than the MCL for drinking water standards. In BAY-405-3, only manganese (0.486 mg/L) was present. In BAY-405 filtered samples, which are more indicative of the concentrations in water, only manganese (0.298 mg/L to 1.1 mg/L) was above a secondary MCL for drinking water standards. For the unfiltered samples taken at BAY-415, all three screened intervals detected 7 to 8 metals above the MCLs for drinking water standards (see table 7.2). In the filtered samples, only manganese (1.08 mg/L, 0.603 mg/L) was above the secondary MCL. It should be noted that a secondary MCL is not a health-based standard, but is a voluntary guideline established for aesthetic considerations such as taste or odor. For example, high manganese tends to stain fixtures black and have a bitter taste. All concentrations for both BAY-405 and BAY-415 are shown in Table 7.2.

Past groundwater sampling investigations performed by Bayer also found elevated levels of metals with respect to the MCL for drinking water standards. Therefore our results appear to be consistent with past sampling events. Metals are not identified as Contaminants of Concern for the Bayer site. No other contaminants were present in the groundwater above the MCLs for drinking water standards for the sampled locations.

No additional sampling is planned. Results indicate the relief wells would not impact the existing groundwater plumes under flowing conditions. Low levels of contaminants in the groundwater also indicate water discharged from the relief wells during flood conditions does not constitute a significant environmental risk.

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TABLES

Table 7.1: KC Levee Borrow Area Soil Results

KC Levee Project Borrow Area 12-04 Data Table										
QUEUE	NAME	KCL-Borrow-1			KCL-Borrow-2			KCL-Borrow-3		
METALS	Aluminum	2820	mg/kg		3680	mg/kg		4290	mg/kg	
METALS	Arsenic	4.84	mg/kg		3.65	mg/kg		3.31	mg/kg	
METALS	Barium	77.4	mg/kg		95.7	mg/kg		105	mg/kg	
METALS	Beryllium				0.291	mg/kg	J	0.357	mg/kg	J
METALS	Cadmium	0.299	mg/kg	J	0.525	mg/kg	J	0.462	mg/kg	J
METALS	Calcium	2640	mg/kg		4040	mg/kg		4390	mg/kg	
METALS	Chromium	4.25	mg/kg		5.75	mg/kg		6.39	mg/kg	
METALS	Cobalt	3.46	mg/kg		4.47	mg/kg		4.79	mg/kg	
METALS	Copper	6.43	mg/kg		7.5	mg/kg		8.97	mg/kg	
METALS	Iron	4840	mg/kg		6330	mg/kg		7240	mg/kg	
METALS	Lead	10.7	mg/kg		11.7	mg/kg		11	mg/kg	
METALS	Magnesium	1080	mg/kg		1420	mg/kg		1540	mg/kg	
METALS	Manganese	175	mg/kg		222	mg/kg		313	mg/kg	
METALS	Nickel	6.58	mg/kg		9.05	mg/kg		10.4	mg/kg	
METALS	Potassium	767	mg/kg		996	mg/kg		904	mg/kg	
METALS	Sodium	34	mg/kg		37.5	mg/kg		31.3	mg/kg	
METALS	Thallium							0.247	mg/kg	J
METALS	Vanadium	10.2	mg/kg		13.3	mg/kg		13.9	mg/kg	
METALS	Zinc	24.3	mg/kg		32.2	mg/kg		32.1	mg/kg	
PESTICIDE	4,4'-DDE	2.92	µg/kg	J				3.04	µg/kg	J
PESTICIDE	4,4'-DDT	1.18	µg/kg	J				1.26	µg/kg	J
SVOC	Di-n-butylphthalate				48.6	µg/kg	J			
VOC	1,1-Dichloroethene	10	µg/kg	J						

Notes:

J - estimated concentration quantity

None of the results were above Kansas RSK values.

Table 7.2: Bayer Crop Science Groundwater Results

NAME	CALM/MDL	BAY-405-1			BAY-405-1F			BAY-405-2			BAY-405-2F			BAY-405-3			BAY-405-3F			BAY-415-1			BAY-415-1-F			BAY-415-2			BAY-415-2-F			BAY-415-3			BAY-415-3-F		
Aluminum		108	mg/l		<0.1	mg/l	U	3.12	mg/l		<0.1	mg/l	U	1.12	mg/l		<0.1	mg/l	U	145	mg/l		<0.1	mg/l	U	171	mg/l		<0.1	mg/l	U	81	mg/l		<0.1	mg/l	U
Antimony	6	<0.333	µg/l	U	<0.221	µg/l	U	<0.443	µg/l	U	<0.206	µg/l	U	<0.249	µg/l	U	<0.0996	µg/l	U	<0.279	µg/l	U	<0.184	µg/l	U	<0.353	µg/l	U	<0.222	µg/l	U	0.763	µg/l	U	<0.312	µg/l	U
Arsenic	50	201	µg/l		18.6	µg/l		25.6	µg/l		2.58	µg/l	J	<0.0786	µg/l	U	142	µg/l		32.4	µg/l		134	µg/l		4.32	µg/l		159	µg/l		2.07	µg/l				
Barium	2	4.85	mg/l		0.36	mg/l		0.754	mg/l		0.458	mg/l		0.208	mg/l		0.104	mg/l		11.4	mg/l		0.449	mg/l		7.5	mg/l		0.592	mg/l		2.22	mg/l		0.156	mg/l	
Beryllium	0.004	<0.00423	mg/l	U	<0.005	mg/l	U	<0.005	mg/l	U	<0.005	mg/l	U	<0.005	mg/l	U	<0.005	mg/l	J	0.00552	mg/l	J	<0.005	mg/l	U	<0.00809	mg/l	U	<0.005	mg/l	U	<0.00489	mg/l	U	<0.005	mg/l	U
Cadmium	0.005	0.00813	mg/l	J	<0.00035	mg/l	U	<0.00182	mg/l	U	<0.00104	mg/l	U	<0.00312	mg/l	U	<0.00073	mg/l	U	0.00833	mg/l	J	<0.00045	mg/l	U	0.0162	mg/l	J	<0.00084	mg/l	U	0.00618	mg/l	J	<0.0014	mg/l	U
Calcium		473	mg/l		168	mg/l		167	mg/l		147	mg/l		108	mg/l		104	mg/l		715	mg/l		128	mg/l		1470	mg/l		139	mg/l		434	mg/l		110	mg/l	
Chromium	0.1	0.392	mg/l		<0.00016	mg/l	U	0.019	mg/l	J	<0.00475	mg/l	U	0.0566	mg/l		<0.00244	mg/l	U	0.461	mg/l		0.00032	mg/l	U	0.393	mg/l		<0.00247	mg/l	U	0.366	mg/l		<0.00302	mg/l	U
Cobalt		0.18	mg/l		<0.01	mg/l	U	0.0122	mg/l	J	<0.00468	mg/l	U	<0.00265	mg/l	U	<0.00049	mg/l	U	0.254	mg/l		<0.0004	mg/l	U	0.262	mg/l		<0.00188	mg/l	U	0.097	mg/l		<0.00271	mg/l	U
Copper	1.3	0.251	mg/l		<0.01	mg/l	U	0.0164	mg/l	J	<0.00362	mg/l	U	<0.00899	mg/l	U	<0.00024	mg/l	U	0.192	mg/l		<0.01	mg/l	U	0.269	mg/l		<0.00156	mg/l	U	0.172	mg/l		<0.00121	mg/l	U
Iron		319	mg/l		2.07	mg/l		24.8	mg/l		<0.0447	mg/l	U	16.3	mg/l		<0.0375	mg/l	U	441	mg/l		7.3	mg/l		417	mg/l		1.54	mg/l		296	mg/l		0.22	mg/l	
Lead	15	218	µg/l		<0.153	µg/l	U	13.1	µg/l	U	<0.102	µg/l	U	3.08	µg/l	U	<0.0281	µg/l	U	264	µg/l		<0.0175	µg/l	U	252	µg/l		<0.187	µg/l	U	166	µg/l		<0.00426	µg/l	U
Magnesium		143	mg/l		54.2	mg/l		46.3	mg/l		43.2	mg/l		29.7	mg/l		28.9	mg/l		197	mg/l		31.6	mg/l		202	mg/l		39.8	mg/l		78.4	mg/l		29.2	mg/l	
Manganese	0.05	7.05	mg/l		1.1	mg/l		1.24	mg/l		1.04	mg/l		0.486	mg/l		0.298	mg/l		10	mg/l		0.873	mg/l		15.6	mg/l		1.08	mg/l		4.78	mg/l		0.603	mg/l	
Mercury	2	0.335	µg/l	J	<0.0131	µg/l	U	<0.0564	µg/l	U	<0.00927	µg/l	U	<0.0237	µg/l	U	<0.0108	µg/l	U	<0.204	µg/l	U	<0.0155	µg/l	U	0.323	µg/l	J	<0.0111	µg/l	U	<0.125	µg/l	U	<0.00866	µg/l	U
Nickel	0.1	0.443	mg/l		<0.0027	mg/l	U	0.0202	mg/l	J	<0.00417	mg/l	U	<0.0136	mg/l	U	<0.00521	mg/l	U	0.606	mg/l		<0.00742	mg/l	U	0.621	mg/l		0.00087	mg/l	U	0.293	mg/l		<0.00498	mg/l	U
Potassium		29	mg/l		11.5	mg/l		12.7	mg/l		11.2	mg/l		11.7	mg/l		12.4	mg/l		33.2	mg/l		12.2	mg/l		53.7	mg/l		16.3	mg/l		28.2	mg/l		17.9	mg/l	
Selenium	50	4.55	µg/l		<0.719	µg/l	U	1.67	µg/l	J	1.06	µg/l	J	2.91	µg/l		2.84	µg/l		4.55	µg/l		1.58	µg/l	J	5.08	µg/l		1.59	µg/l	J	4.43	µg/l		1.8	µg/l	J
Silver	0.1	<0.00673	mg/l	U	<0.00073	mg/l	U	<0.00408	mg/l	U	<0.00129	mg/l	U	<0.0021	mg/l	U	<0.01	mg/l	U	<0.00435	mg/l	U	<0.00485	mg/l	U	<0.00237	mg/l	U	<0.00065	mg/l	U	<0.00564	mg/l	U	<0.00199	mg/l	U
Sodium		27.4	mg/l		20.1	mg/l		27.5	mg/l		25.7	mg/l		58.8	mg/l		60.2	mg/l		24.9	mg/l		17	mg/l		53.2	mg/l		36.2	mg/l		47.2	mg/l		52.5	mg/l	
Thallium	2	1.29	µg/l		<0.5	µg/l	U	<0.191	µg/l	U	<0.5	µg/l	U	<0.0239	µg/l	U	<0.5	µg/l	U	0.894	µg/l	J	<0.5	µg/l	U	2.13	µg/l		<0.5	µg/l	U	2.24	µg/l		<0.5	µg/l	U
Vanadium	0.11	0.336	mg/l		<0.007	mg/l	U	0.0173	mg/l	J	<0.00049	mg/l	U	<0.00173	mg/l	U	<0.007	mg/l	U	0.449	mg/l		<0.007	mg/l	U	0.513	mg/l		<0.007	mg/l	U	0.291	mg/l		<0.007	mg/l	U
Zinc	5	1.07	mg/l		<0.02	mg/l	U	0.0311	mg/l	J	<0.02	mg/l	U	0.0269	mg/l	J	<0.02	mg/l	U	1.51	mg/l		<0.02	mg/l	U	1.31	mg/l		<0.02	mg/l	U	0.592	mg/l		<0.00094	mg/l	U

Notes:

U - no detection at the given quantitation limit

J - estimated quantity

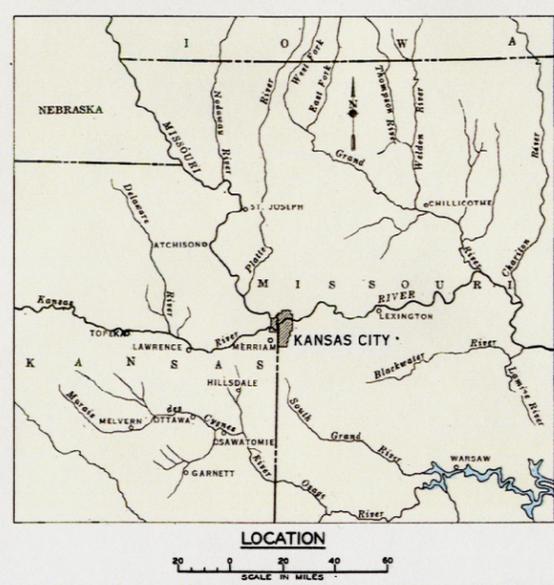
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CALM - Cleanup Levels for Missouri

Above CALM levels

FIGURES

The initial HTRW assessment was conducted in April and May of 2005 and all figures included with this HTRW Investigation Appendix reflect alternatives that were being considered during the initial 2005 assessment. When alternatives were modified, the recommendations of this HTRW Investigation Appendix were reevaluated to ensure the recommendations were consistent with the modified alternatives. The figures depicting the final preferred alternative can be found in the main Feasibility Report.



1994 PROJECT MAPS
KANSAS CITY
 MISSOURI AND KANSAS
 FLOOD CONTROL PROJECT

In 1 sheet Sheet: No. 1 Scale: as shown
 U.S. ARMY ENGINEER DISTRICT KANSAS CITY, MO.
 KANSAS CITY 30 SEPTEMBER 1994
 FILE NO. R.F.-91-45

Figure 1.0

**Kansas City,
Missouri and Kansas
Flood Damage
Reduction Project**

Feasibility Study

29 APR 2005

**Argentine Unit
Property Boundaries**

**Proposed Area
Footprint Mapping**

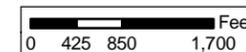
500yr + 5 case

DRAFT

**NOTE: Utility easements
are not shown.**

- Key**
- Kaw Valley Right of Way
 - Real Estate easement
 - 373.6 River Mile Markers
 - Uplift Concern Areas Within 300' of levee C/L
 - Property Tracts
 - Utility Crossings
 - Levee Features**
 - Closure Structure
 - Pump Plant
 - Levee/Floodwall**
 - Floodwall
 - Levee
 - Potentially Affected Areas**
 - Buried collector
 - Floodwall Raise
 - Levee raise
 - Soils replacement
 - I-walls
 - Relief wells

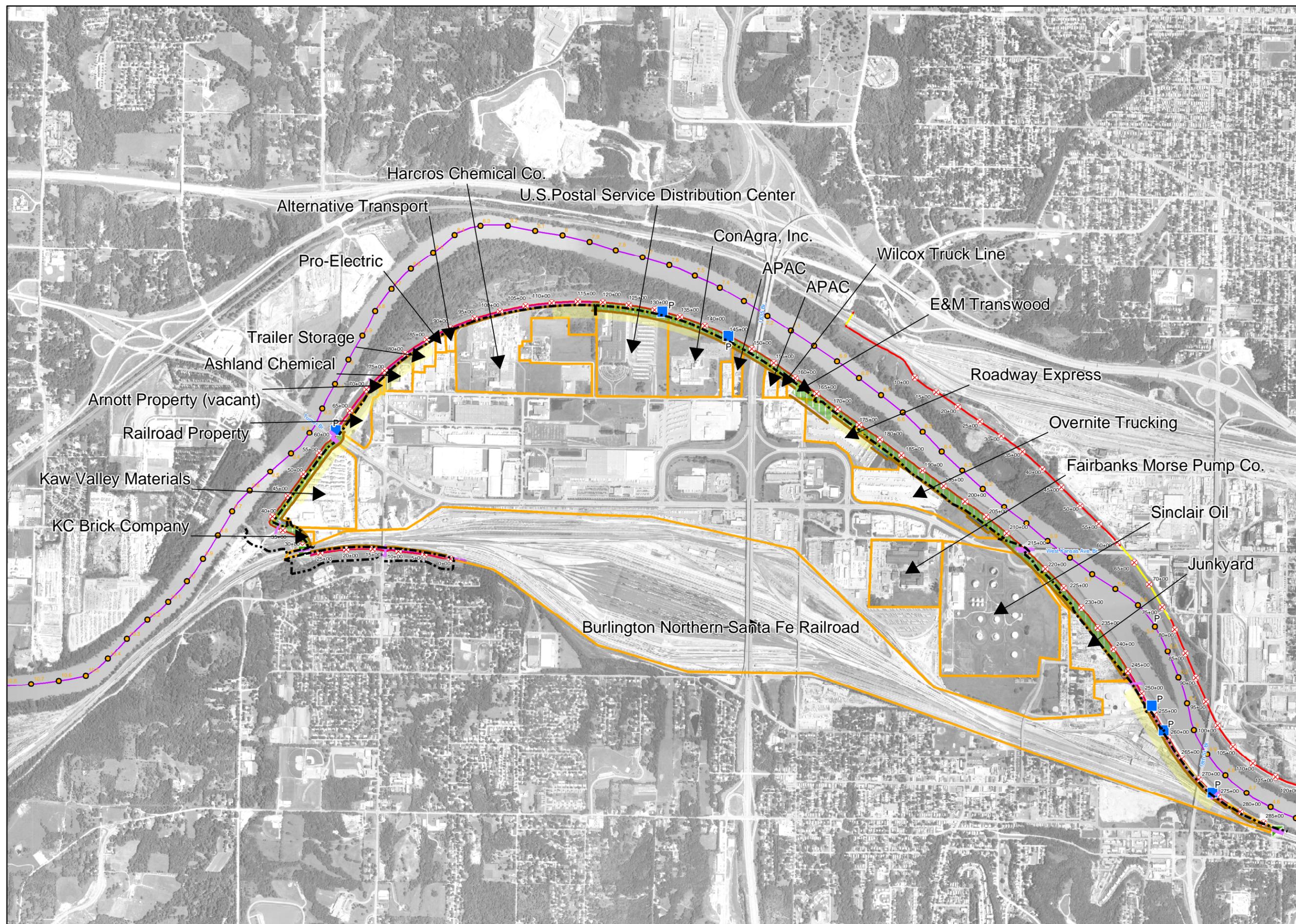
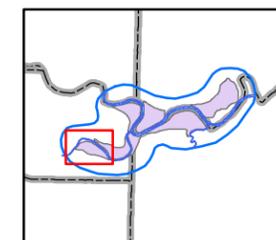
1 inch equals 1,700 feet



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Projection: UTM Zone 15, Feet
Datum: NAD 83
Photography Date: 2001 Digital Ortho Photography
Created by: U.S. Army Corps of Engineers
Kansas City District, GDS Team
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Figure 2.0



**Kansas City,
Missouri and Kansas
Flood Damage
Reduction Project**

Feasibility Study

3 MAY 05

**Proposed Area
Footprint Mapping**

500yr + 5 case

**Argentine Unit
0+00 to 60+00**

Photography Date: 2001

DRAFT

**NOTE: Utility easements
are not shown.**

- Key**
- Existing Right of Way
 - - - - - Temporary Easement Requirement
 - 373.6 River Mile Markers
 - Utility uplift concern areas within 300' of levee centerline
 - Utility Crossings
 - Existing Levee Features**
 - a Closure Structure
 - P Pump Plant
 - Existing Levee/Floodwall**
 - Floodwall
 - Levee
 - Potentially Affected Areas**
 - Buried collector
 - Floodwall raise
 - Levee raise
 - Soils replacement
 - I-walls
 - Relief wells
 - Relief Wells Points

1 inch equals 400 feet

0 100 200 400 Feet

Figure 3.0

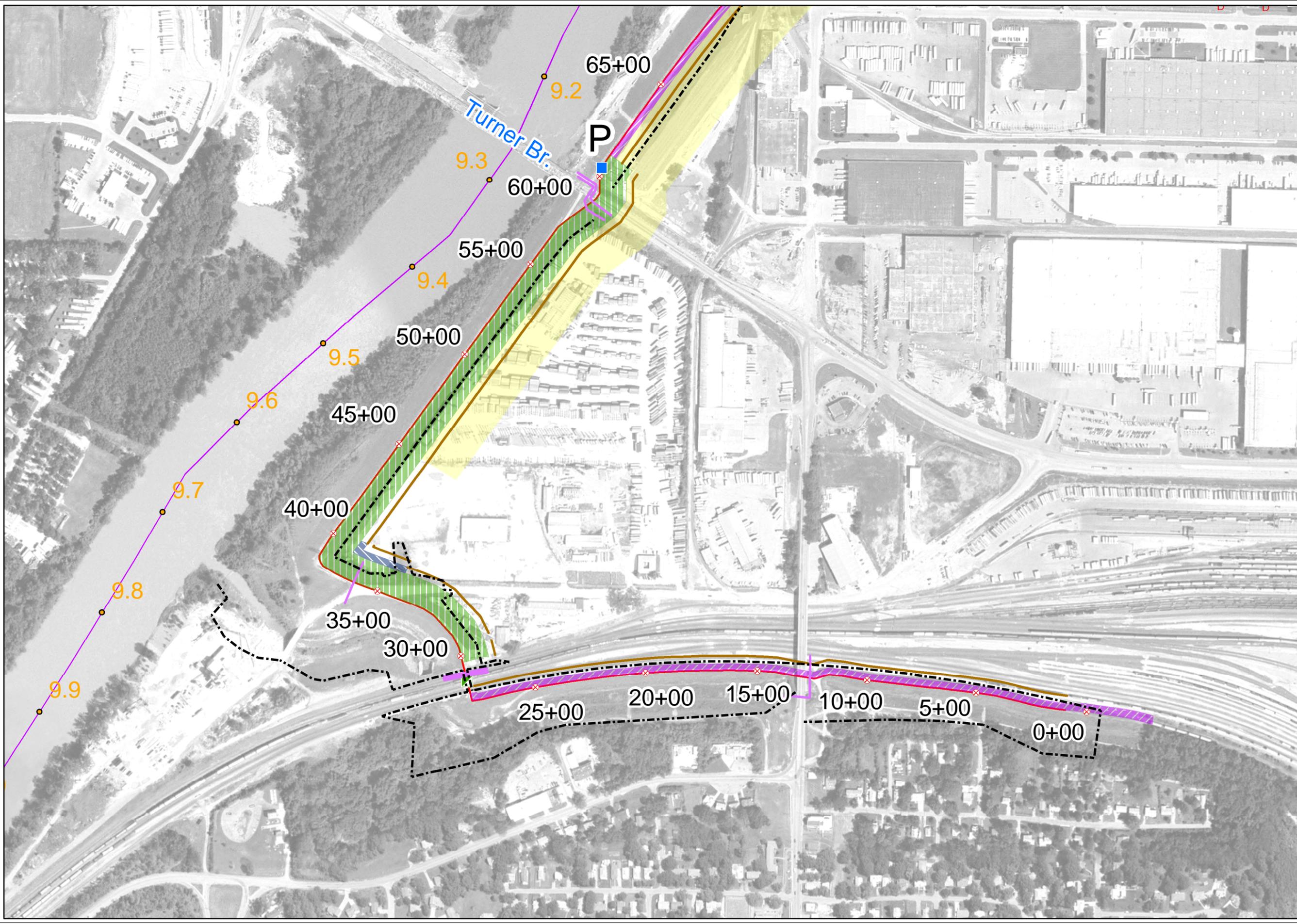
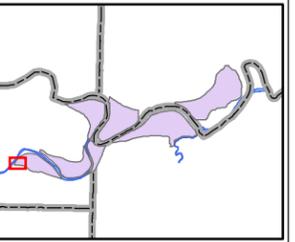
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Projection: UTM Zone 15, Feet
Datum: NAD 83

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**Kansas City,
Missouri and Kansas
Flood Damage
Reduction Project**

Feasibility Study

04 MAY 05

**Proposed Area
Footprint Mapping**

500yr + 5 case

**Argentine Unit
60+00 to 150+00**

Photography Date: 2001

DRAFT

**NOTE: Utility easements
are not shown.**

Key

- Existing Right of Way
- Temporary Easement Requirement
- 373.6 River Mile Markers
- Utility uplift concern areas within 300' of levee centerline
- Utility Crossings

Existing Levee Features

- a Closure Structure
- " P Pump Plant

Existing Levee/Floodwall

- Floodwall
- Levee

Potentially Affected Areas

- Buried collector
- Floodwall raise
- Levee raise
- Soils replacement
- I-walls
- Relief wells
- Relief Wells Points

1 inch equals 600 feet

0 150 300 600 Feet

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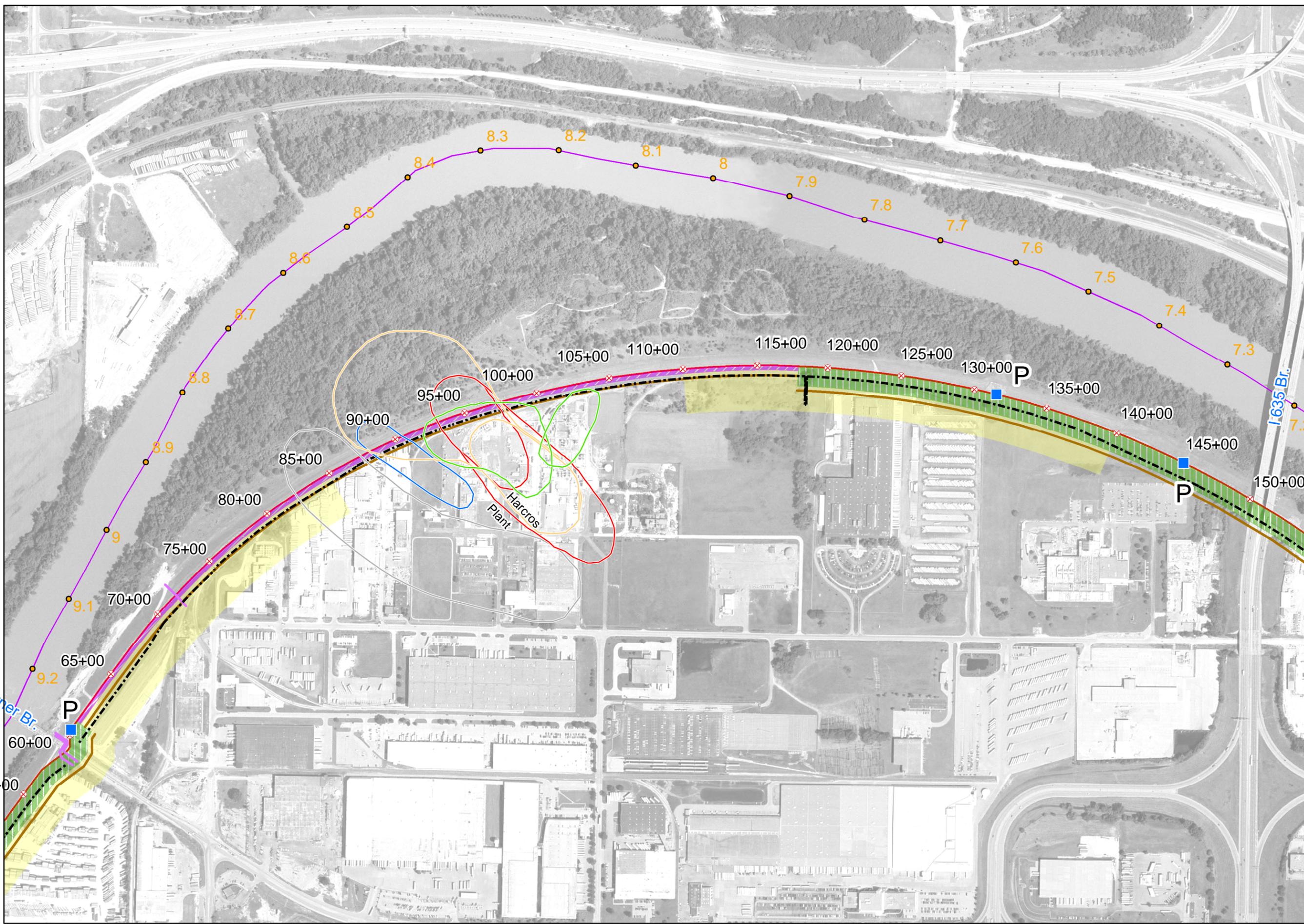
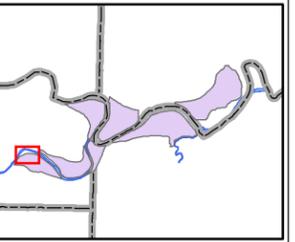
Figure 4.0

Projection: UTM Zone 15, Feet
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3

**Kansas City,
Missouri and Kansas
Flood Damage
Reduction Project**

Feasibility Study

04 MAY 05

**Proposed Area
Footprint Mapping**

500yr + 5 case

**Argentine Unit
150+00 to 215+00**

Photography Date: 2001

DRAFT

**NOTE: Utility easements
are not shown.**

- Key**
- Existing Right of Way
 - Temporary Easement Requirement
 - 373.6 River Mile Markers
 - Utility uplift concern areas within 300' of levee centerline
 - Utility Crossings
 - Existing Levee Features
 - a Closure Structure
 - " P Pump Plant
 - Existing Levee/Floodwall
 - Floodwall
 - Levee
 - Potentially Affected Areas
 - Buried collector
 - Floodwall raise
 - Levee raise
 - Soils replacement
 - I-walls
 - Relief wells
 - Relief Wells Points

1 inch equals 400 feet

0 100 200 400 Feet

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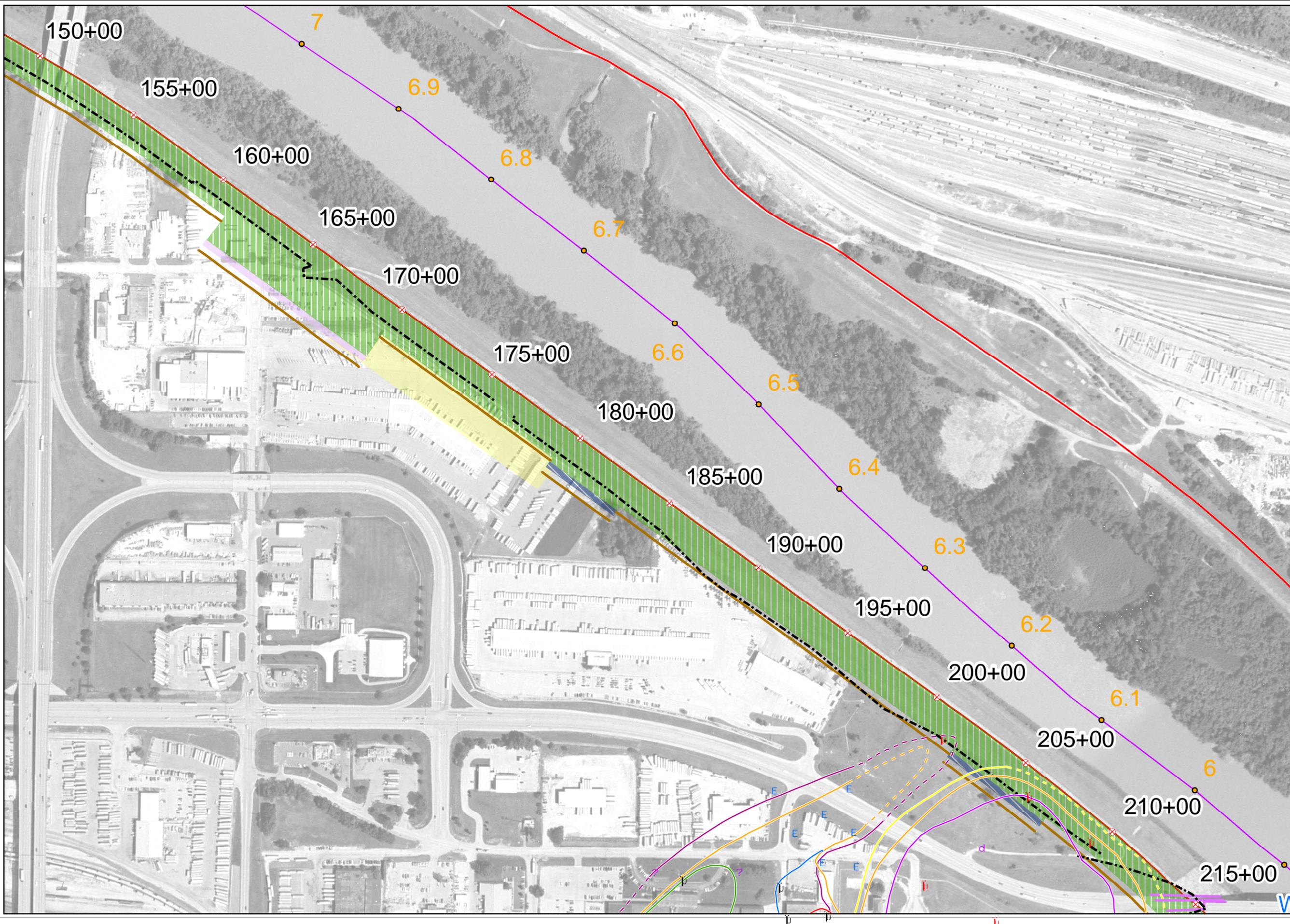
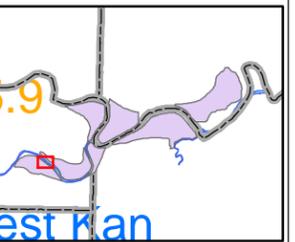
Figure 5.0

Projection: UTM Zone 15, Feet
Datum: NAD 83

Created by: U.S. Army Corps of Engineers
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**Kansas City,
Missouri and Kansas
Flood Damage
Reduction Project**

Feasibility Study

04 MAY 05

**Proposed Area
Footprint Mapping**

500yr + 5 case

**Argentine Unit
215+00 to 255+00**

Photography Date: 2001

DRAFT

**NOTE: Utility easements
are not shown.**

- Key**
- Existing Right of Way
 - Temporary Easement Requirement
 - 373.6 River Mile Markers
 - Utility uplift concern areas within 300' of levee centerline
 - Utility Crossings
 - Existing Levee Features**
 - a Closure Structure
 - P Pump Plant
 - Existing Levee/Floodwall**
 - Floodwall
 - Levee
 - Potentially Affected Areas**
 - Buried collector
 - Floodwall raise
 - Levee raise
 - Soils replacement
 - I-walls
 - Relief wells
 - o Relief Wells Points

1 inch equals 400 feet

0 100 200 400 Feet

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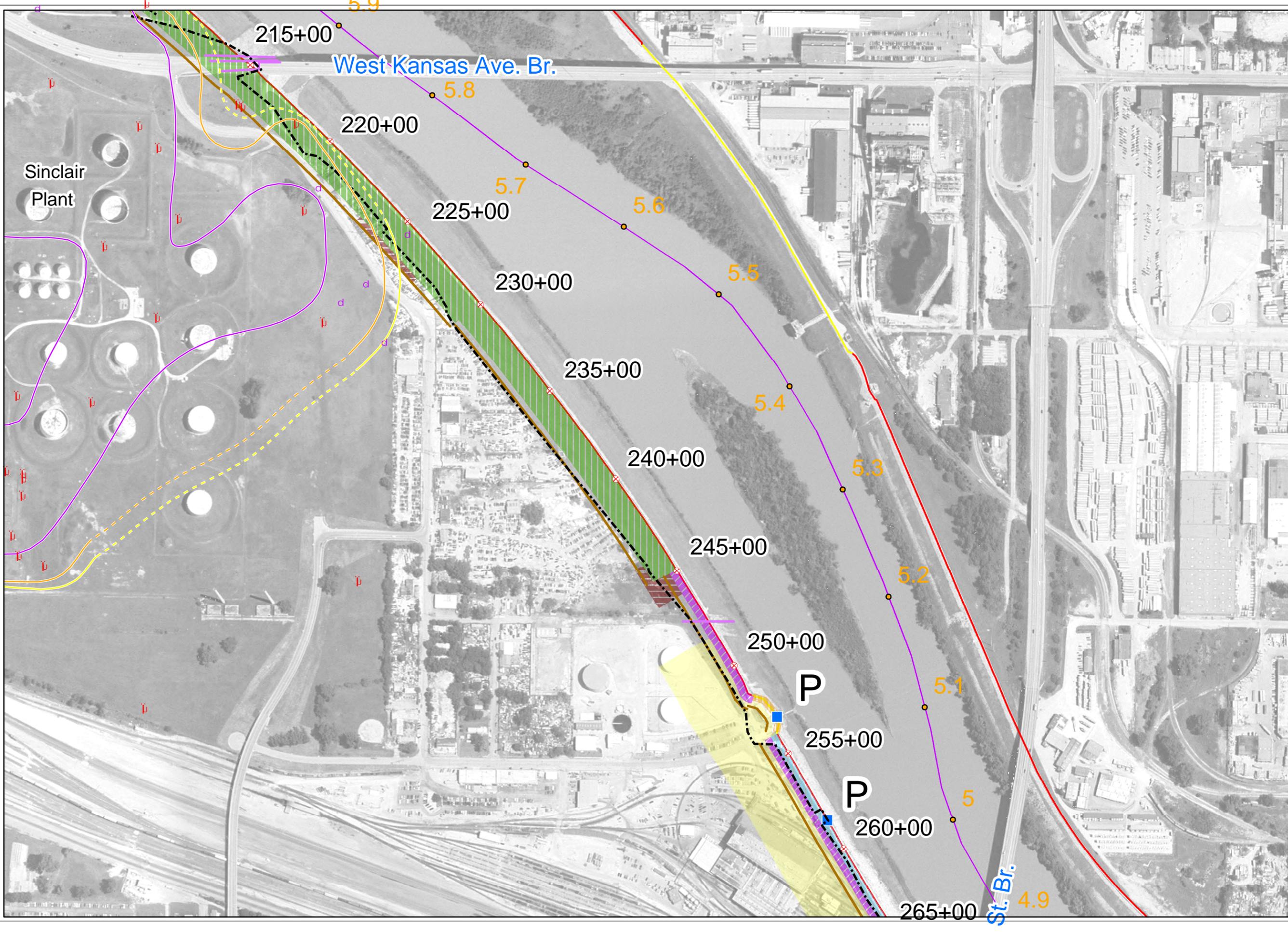
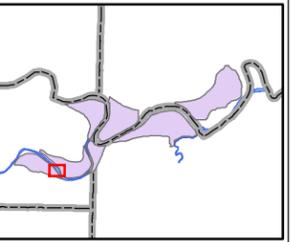
Figure 6.0

Projection: UTM Zone 15, Feet
Datum: NAD 83

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**Kansas City,
Missouri and Kansas
Flood Damage
Reduction Project**

Feasibility Study

04 MAY 05

**Proposed Area
Footprint Mapping**

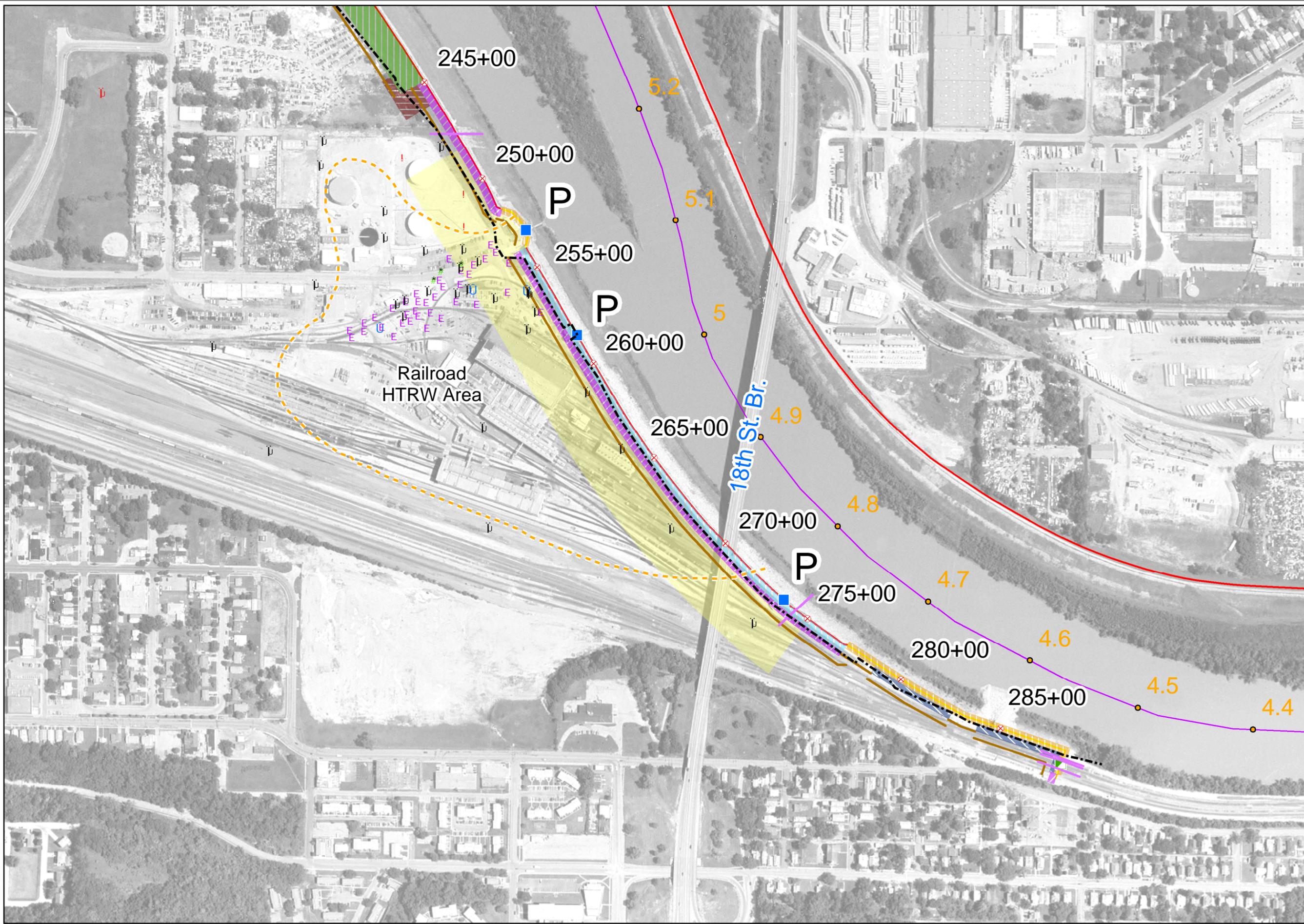
500yr + 5 case

**Argentine Unit
250+00 to 285+00**

Photography Date: 2001

DRAFT

**NOTE: Utility easements
are not shown.**



Key

- Existing Right of Way
- Temporary Easement Requirement
- 373.6 River Mile Markers
- Utility uplift concern areas within 300' of levee centerline
- Utility Crossings

Existing Levee Features

- a Closure Structure
- P Pump Plant

Existing Levee/Floodwall

- Floodwall
- Levee

Potentially Affected Areas

- Buried collector
- Floodwall raise
- Levee raise
- Soils replacement
- I-walls
- Relief wells
- Relief Wells Points

1 inch equals 400 feet

0 100 200 400 Feet

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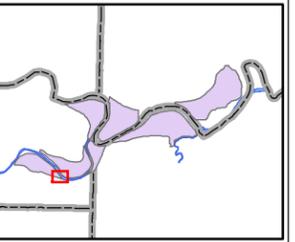
Figure 7.0

Projection: UTM Zone 15, Feet
Datum: NAD 83

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**Kansas City,
Missouri and Kansas
Flood Damage
Reduction Project**

Feasibility Study

27 APR 05

**Proposed Area
Footprint Mapping**

500yr + 5 case

**Argentine Unit
Harcros Chemical**

Photography Date: 2001

DRAFT

**NOTE: Utility easements
are not shown.**

Key	
	Existing Right of Way
	Temporary Easement Requirement
	River Mile Markers
	Utility uplift concern areas within 300' of levee centerline
	Utility Crossings
Existing Levee Features	
	Closure Structure
	Pump Plant
Existing Levee/Floodwall	
	Floodwall
	Levee
Potentially Affected Areas	
	Buried collector
	Floodwall raise
	Levee raise
	Soils replacement
	I-walls
	Relief wells
	Relief Wells Points
	SWMUs
	Property Tracts
Harcros Plumes	
	Formulating Plant Plume
	Mid-Area Plumes
	Mid-Area 4
	Restricted Area Plumes
	Southern Plume
	Restricted Area Plumes

1 inch equals 300 feet



Figure 8.0

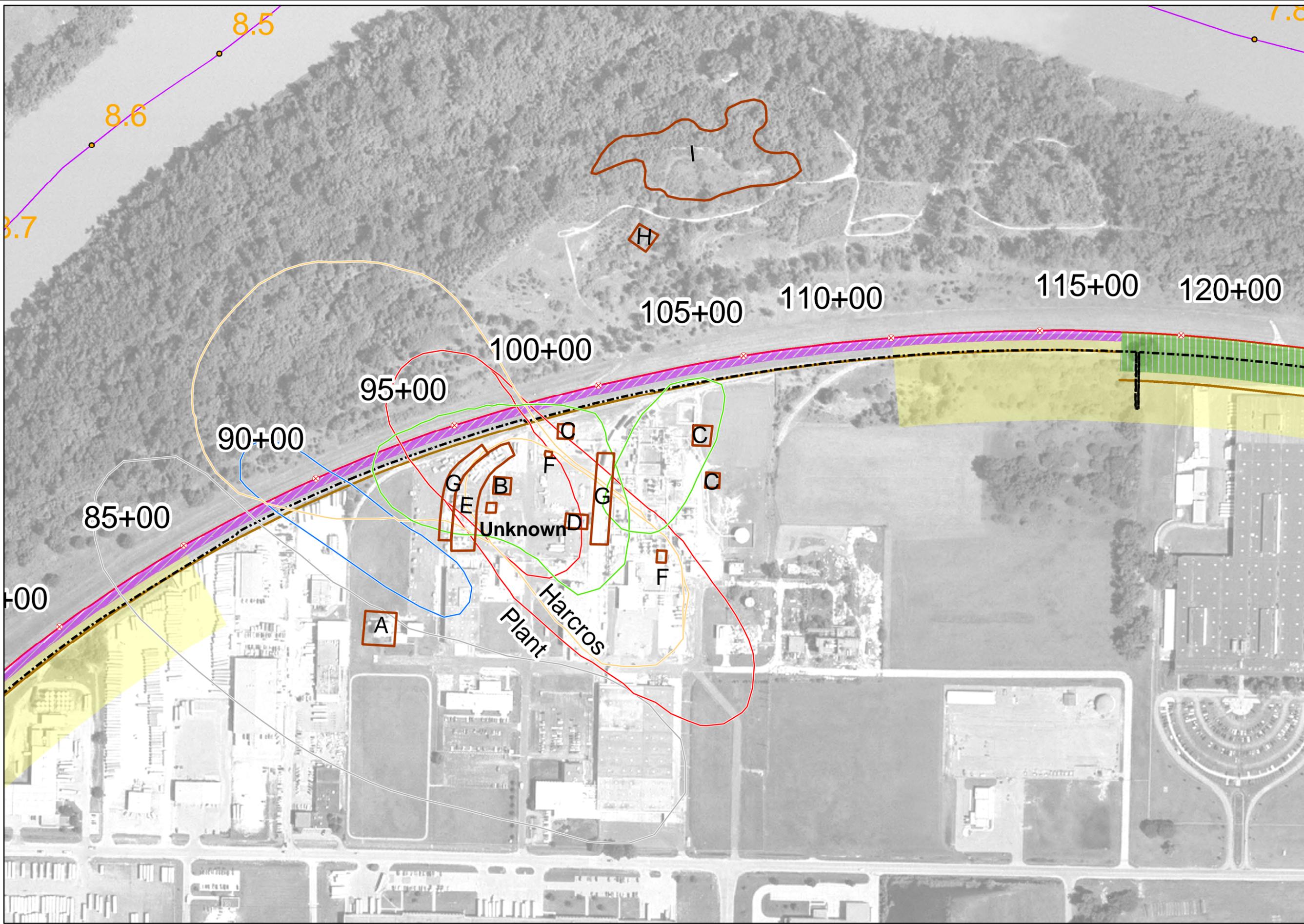
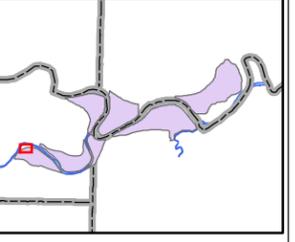
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Projection: UTM Zone 15, Feet
Datum: NAD 83

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**Kansas City,
Missouri and Kansas
Flood Damage
Reduction Project**

**Feasibility Study
27 APR 05**

**Proposed Area
Footprint Mapping**

500yr + 5 case

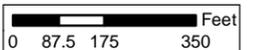
**Argentine Unit
Fairbanks & Sinclair**

DRAFT

Key

- Property Tracts
- Kaw Valley Right of Way
- Real Estate easement
- River Mile Markers
- 373.6
- Utility uplift concern areas within 300' of levee centerline
- Utility Crossings
- Levee Features**
- Closure Structure
- Pump Plant
- Levee/Floodwall**
- Floodwall
- Levee
- Potentially Affected Areas**
- Buried collector
- Floodwall raise
- Levee raise
- Soils replacement
- I-walls
- Relief wells
- Sinclair HTRW**
- Sinclair Temporary Piezometer
- Sinclair Monitoring Well
- Benzene > 0.005 mg/L
- Benzene > 0.005 mg/L, Inferred
- Benzene > 0.010 mg/L
- Benzene > 0.010 mg/L, Inferred
- Benzene > 1.0 mg/L
- Fairbanks HTRW**
- ARCO/Sinclair Well
- Groundwater Probe
- Monitoring Well
- Production Well
- Recovery Well 1995, 2002
- DCE Plume
- DCE Plume, Inferred
- PCE Plume
- Petrol VOC Plume
- Petrol VOC Plume, Inferred
- TCE Plume
- TCE Plume, Inferred
- VC Plume

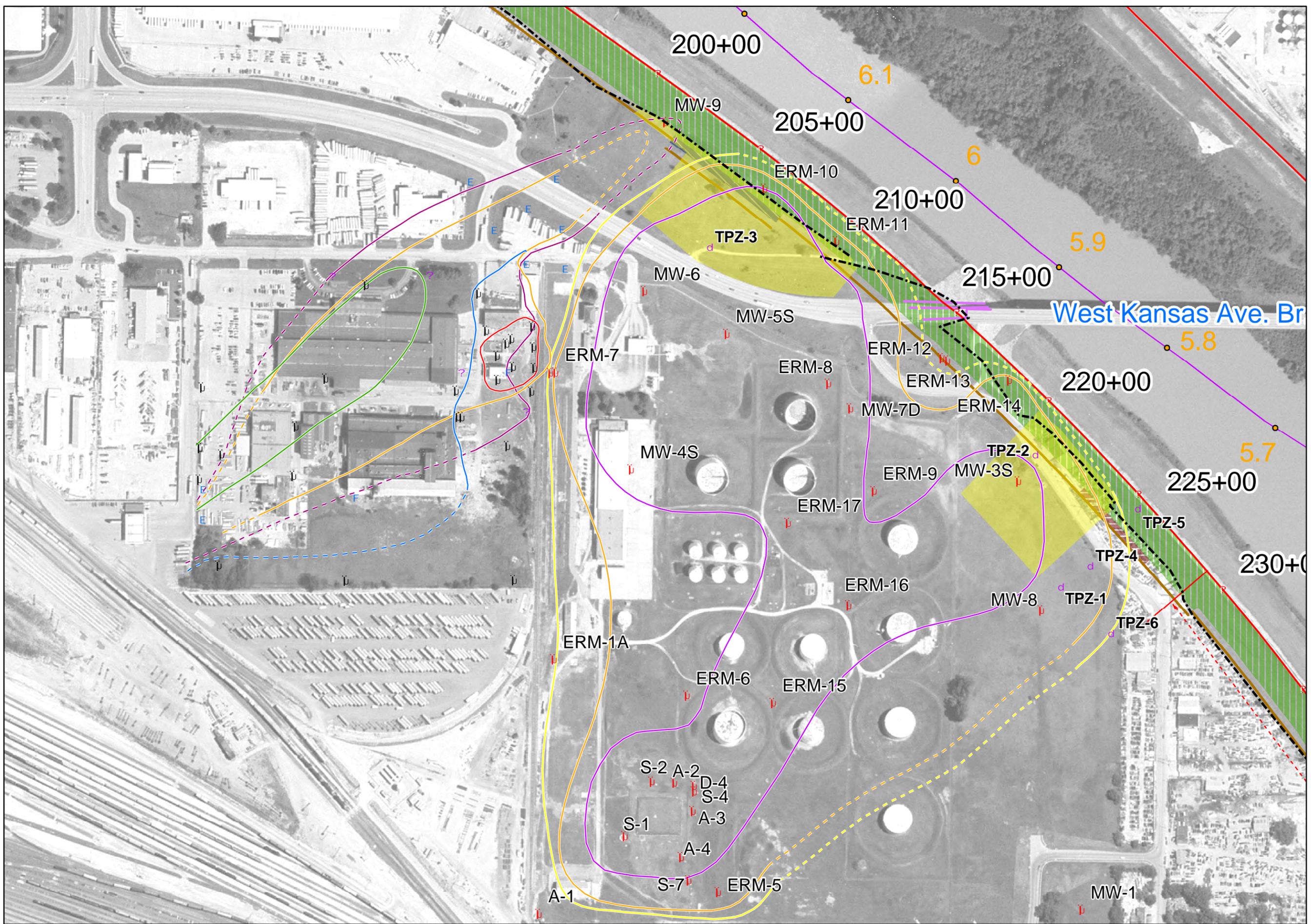
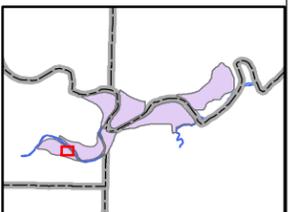
1 inch equals 350 feet



Path: K:\projects\civ\kc_krecon\arogis\maps\HTRWFairbanks_Sinclair.mxd

Projection: UTM Zone 15, Feet
Datum: NAD 83
Photography Date: 2001 Digital Ortho Photography
Created by: U.S. Army Corps of Engineers
Kansas City District, GDS Team
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Figure 9.0



**Kansas City,
Missouri and Kansas
Flood Damage
Reduction Project**

Feasibility Study

28 APR 05

Argentine Unit
BNSF Railroad Diesel Shop Facility

**Proposed Area
Footprint Mapping**

500yr + 5 case

DRAFT

**NOTE: Utility easements
are not shown.**

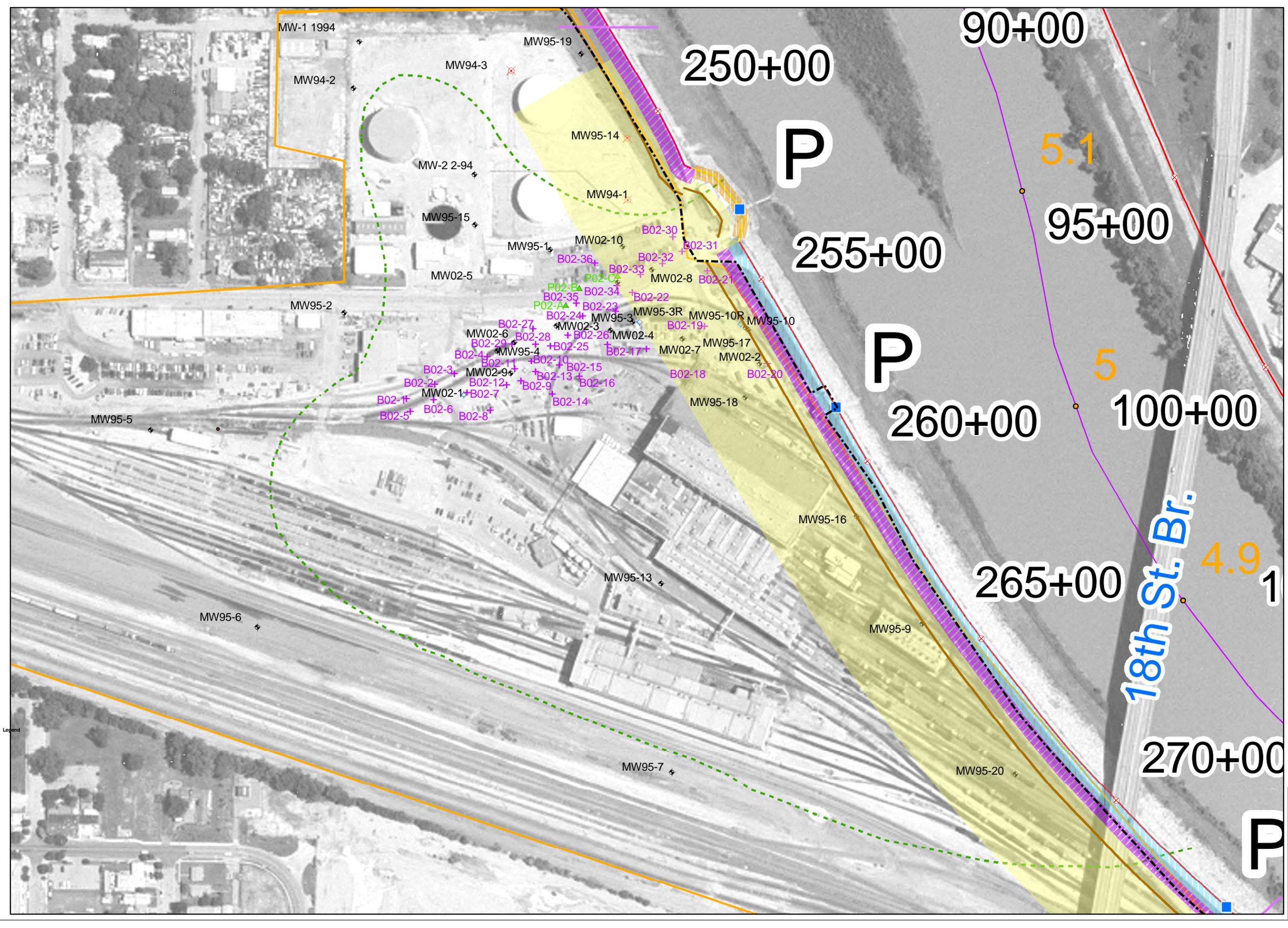
- Key**
- Property Tracts
 - Approximate Railroad Plume
 - Kaw Valley Right of Way
 - Real Estate easement
 - 373.6 River Mile Markers
 - Uplift Concern Areas Within 300' of levee C/L
 - Utility Crossings
- Levee Features**
- Closure Structure
 - Pump Plant
- Levee/Floodwall**
- Floodwall
 - Levee
- Potentially Affected Areas**
- Buried collector
 - Floodwall Raise
 - Levee raise
 - Soils replacement
 - I-walls
 - Relief wells
- BNSF Railroad Wells and Borings**
- Abandoned Well, 2004
 - Monitoring Well 2002
 - Recovery Well 1995, 2002
 - Potholing Borings 2002
 - Push-Probe Soil Boring

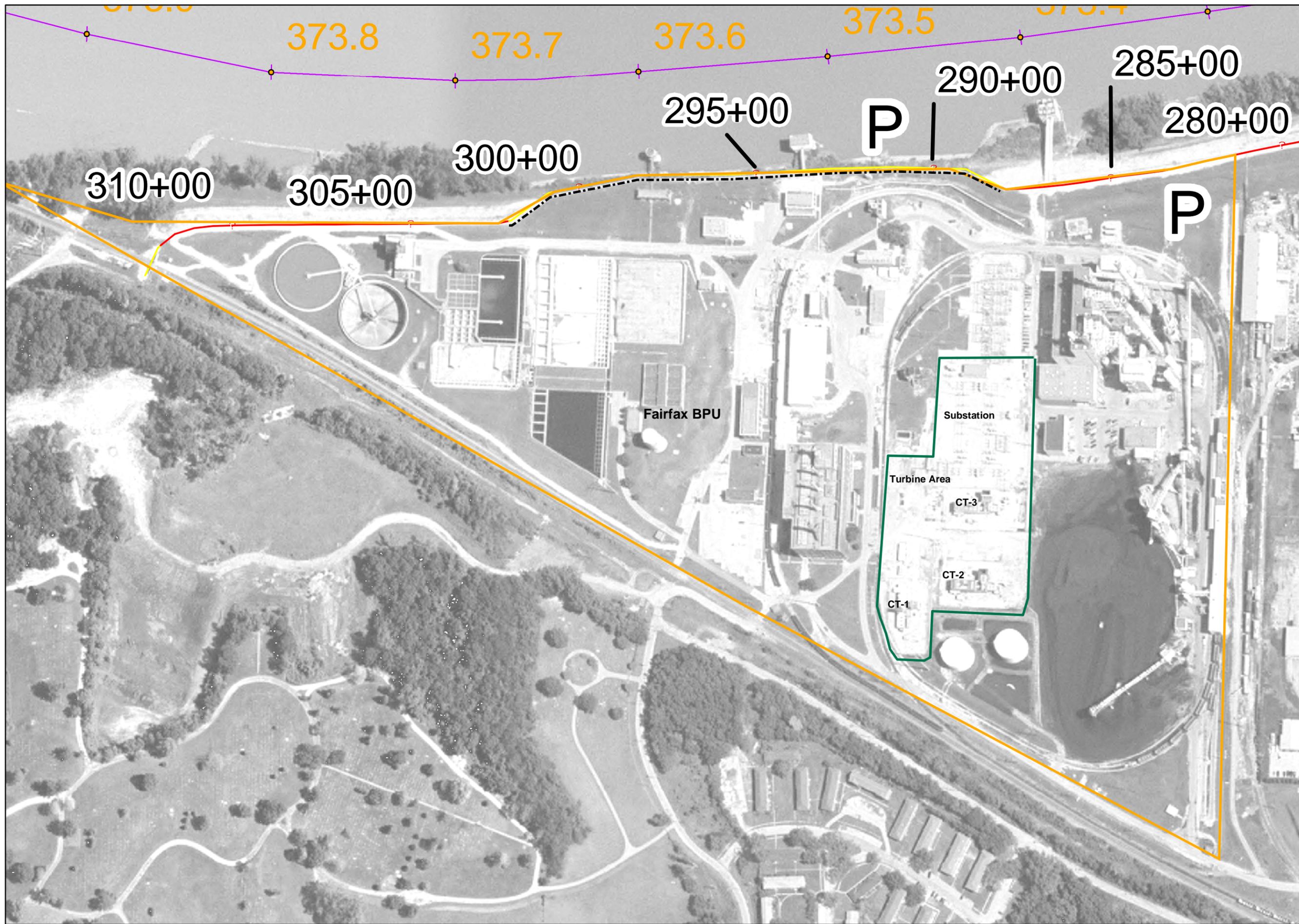
1 inch equals 200 feet

Path: K:\projects\kicv\kcrecon\arcgismaps\HTRWRRailroadDSF.mxd

Projection: UTM Zone 15. Feet
Datum: NAD 83
Photography Date: 2001 Digital Ortho Photography
Created by: U.S. Army Corps of Engineers
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Figure 10.0





**Kansas City,
Missouri and Kansas
Flood Damage
Reduction Project**

Feasibility Study

29 APR 2005

**Proposed Area
Footprint Mapping**

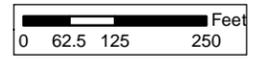
Fairfax BPU Area

DRAFT

**NOTE: Utility easements
are not shown.**

- Key**
- Kaw Valley Right of Way
 - Real Estate easement
 - 373.6 River Mile Markers
 - Uplift Concern Areas Within 300' of levee C/L
 - Utility Crossings
 - Turbine Area
 - Property Tracts
 - Project Area
- Levee Features**
- Closure Structure
 - Pump Plant
- Levee/Floodwall**
- Floodwall
 - Levee
- Potentially Affected Areas**
- Buried collector
 - Floodwall Raise
 - Levee raise
 - Soils replacement
 - I-walls
 - Relief wells

1 inch equals 250 feet



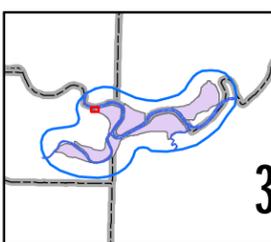
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Projection: UTM Zone 15, Feet
Datum: NAD 83
Photography Date: 2001 Digital Ortho Photography
Created by: U.S. Army Corps of Engineers
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Figure 11.0



3

3

Harlem Area

Proposed Area
Footprint Mapping

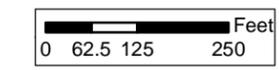
DRAFT

NOTE: Utility easements
are not shown.

Key

	North Kansas City Right of Way
	Real Estate easement
	River Mile Markers
	Uplift Concern Areas Within 300' of levee C/L
	Utility Crossings
	Harlem Power Poles
Levee Features	
	Closure Structure
	Pump Plant
Levee/Floodwall	
	Floodwall
	Levee
	Buried collector

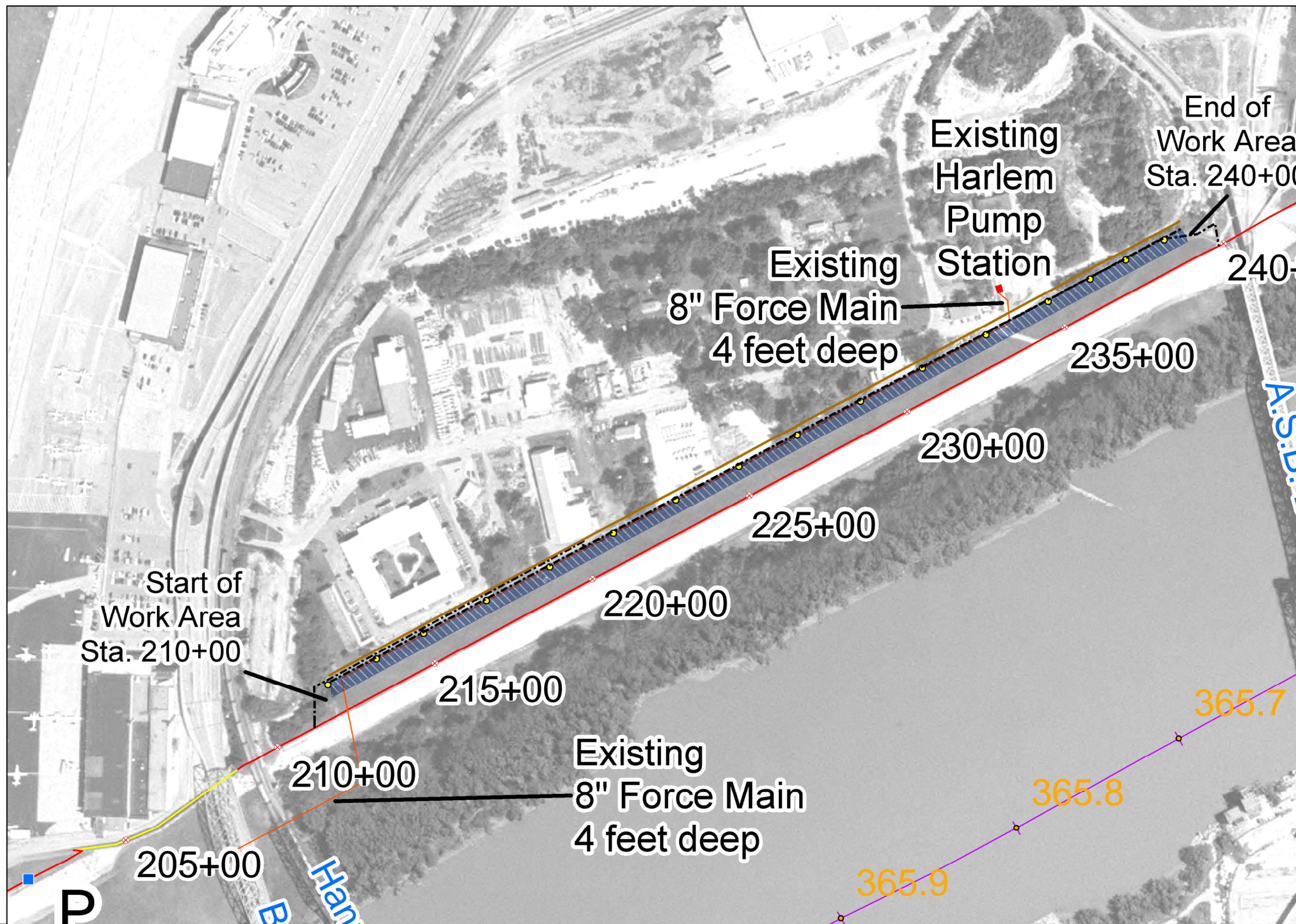
1 inch equals 250 feet



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Projection: UTM Zone 15, Feet
Datum: NAD 83
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Figure 12.0



P

B
Harlem

A.S.D.P.

3

**Kansas City,
Missouri and Kansas
Flood Damage
Reduction Project**

**Feasibility Study
28 APR 05**

**Missouri and Blue
Rivers' Confluence**

**Proposed Area
Footprint Mapping**

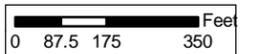
DRAFT

**NOTE: Utility easements
are not shown.**

Key

- A Boring Locations
- Bayer Buried Collector
- 373.6 River Mile Markers
- Uplift Concern Areas Within 300' of levee C/L
- Utility Crossings
- Property Tracts
- Levee Features**
 - a Closure Structure
 - ⊞ Pump Plant
- Levee/Floodwall**
 - Floodwall
 - Levee
 - ReliefWells
 - SWMU AOC Areas
- Bayer Total VOC Plume**
 - 100 ug/L
 - 1,000 ug/L
 - 10,000 ug/L
 - 100,000 ug/L

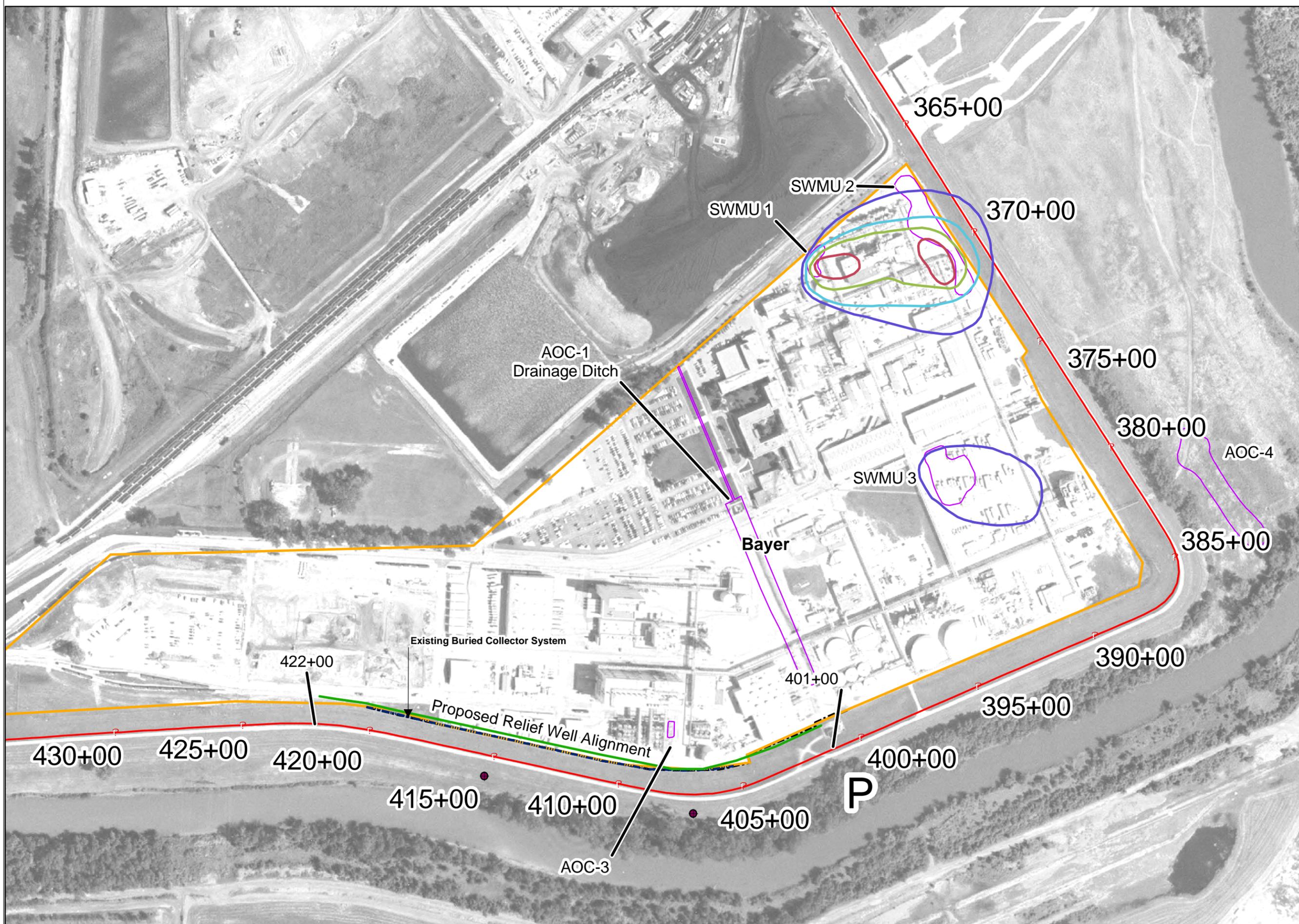
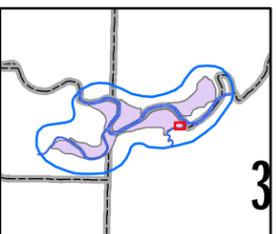
1 inch equals 350 feet



Path: K:\projects\civ\kcc_kcrecon\larcgismaps\HTRW\Bayer.mxd

Projection: UTM Zone 15, Feet
Datum: NAD 83
Photography Date: 2001 Digital Ortho Photography
Created by: U.S. Army Corps of Engineers
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Figure 13.0



**Kansas City,
Missouri and Kansas
Flood Damage
Reduction Project**

**Feasibility Study
3 MAY 05**

Borrow Area

**Proposed Area
Footprint Mapping**

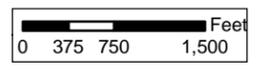
500yr + 5 case

DRAFT

**NOTE: Utility easements
are not shown.**

- Key**
-  Borrow site
 -  Boring Locations
 -  Kaw Valley Right of Way
 -  Real Estate easement
 -  373.6 River Mile Markers
 -  Uplift Concern Areas Within 300' of levee C/L
 -  Utility Crossings
 - Levee Features**
 -  Closure Structure
 -  Pump Plant
 - Levee/Floodwall**
 -  Floodwall
 -  Levee
 - Potentially Affected Areas**
 -  Buried collector
 -  Floodwall Raise
 -  Levee raise
 -  Soils replacement
 -  I-walls
 -  Relief wells

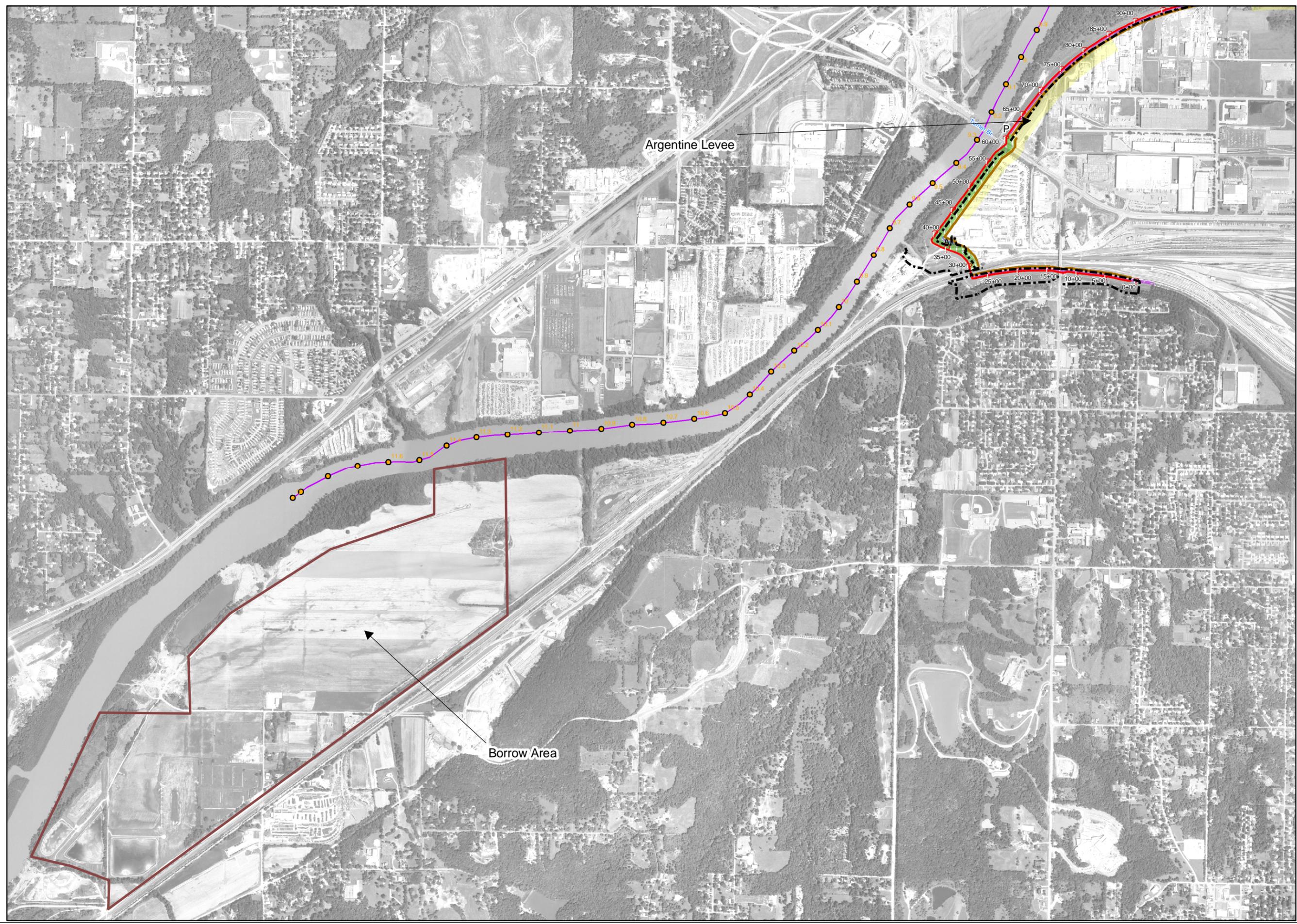
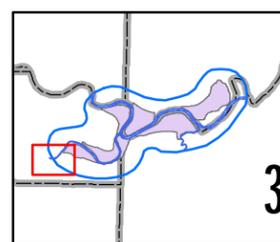
1 inch equals 1,500 feet



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Figure 14.0

Projection: UTM Zone 15, Feet
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601 East 12th, Room 612, Kansas City, Missouri, 64106



Argentine Levee

Borrow Area