



US Army Corps
of Engineers®

Prepared by:
NWK District
NWD Division

Kansas Citys, Missouri and Kansas Flood Risk Management Argentine, Armourdale, and Central Industrial Unit (CID) Levee Improvements Implementation Phase (Levee Systems 3605000092, 3605000040, and 3605000127)

Review Plan

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MSC Approval Date: (27 Mar 2019)

Last Revision Date: (01 Oct 2019)



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, NORTHWESTERN DIVISION
PO BOX 2870
PORTLAND OR 97208-2870

CENWD-RBT

MEMORANDUM FOR Commander, Kansas City District (CENWK-ED Bitner)

SUBJECT: Review Plan Approval for Kansas Cities, KS and MO, Flood Risk Management Supplemental Projects

1. References:

a. Kansas Cities, KS and MO, Flood Risk Management Supplemental Projects Review Plan.

b. EC 1165-2-217 Civil Works Review, 20 Feb 2018.

2. Reference 1.a. above has been prepared in accordance with reference 1.b. above.

3. The Kansas Cities, KS and MO, Flood Risk Management Supplemental Projects Review Plan will cover several separate projects that are geographically connected and work together as a flood risk management system. The Review Plan describes the separate reviews required for each project phase and location. The Review Plan has been coordinated with the Northwestern Division Business Technical Division and the Risk Management Center which is the Review Management Organization for the project. The Review Plan includes District Quality Control and Agency Technical Review and IEPR.

4. I hereby approve the Review Plan, which is subject to change as circumstances require, consistent with the Project Delivery Business Process. Subsequent revisions to this Review Plan will require written approval from this office.

5. For further information, please contact Mark Brodesser, P.E. at (503) 808-4052 or via email at Mark.W.Brodesser@usace.army.mil.

Encl

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V.1463958340
ERIC V. HANSEN, SES
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DEPARTMENT OF THE ARMY
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CENWK-ED

15 March 2019

MEMORANDUM THRU Northwestern Division, Regional Business Directorate
(CENWD-RBT/Mark Brodesser), 1125 SW Couch Street, Suite 500, Portland, OR
97209

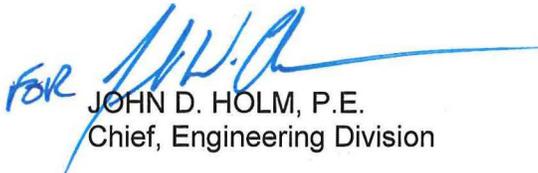
FOR Director, Northwestern Division, Regional Business Directorate (CENWD-RBT/Mr.
Hansen) 1125 SW Couch Street, Suite 500, Portland, OR 97209

SUBJECT: Kansas City's, KS and MO, Flood Risk Management, Review Plan Submittal
(P2# 354370/354362)

1. Enclosed for Major Subordinate Command approval is the Review Plan for the
Kansas City Levees, Flood Risk Management Project. The Review Plan was prepared
in accordance with EC 1165-2-217.

2. Please contact Mr. Chance Bitner, Technical Lead, at (816) 389-3482 or email at
chance.j.bitner@usace.army.mil with any questions or requests for additional
information.

Encl

FOR 
JOHN D. HOLM, P.E.
Chief, Engineering Division

CF:
CENWD-RBT (Berre)
CENWD-PDD (Weber)
CENWK-ED (Bitner)

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Section 1

Introduction

1.1 Purpose

This Review Plan (RP) for the Kansas City Levees Project located in Kansas City, Kansas and Kansas City, Missouri (P2 #354370,354362), will help ensure a quality-engineering project is developed by the Corps of Engineers in accordance with EC 1165-2-217, "Review Policy for Civil Works". As part of the Project Management Plan this RP establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products and lays out a value added process and describes the scope of review for the current phase of work. The EC outlines five general levels of review: District Quality Control/Quality Assurance (DQC), Agency Technical Review (ATR), Biddability, Constructability, Operability, and Sustainability (BOCES) Review, Independent External Peer Review (IEPR), and Policy and Legal Compliance Review. This RP will be provided to Project Delivery Team (PDT), DQC, ATR, BCOES, and IEPR Teams. The technical review efforts addressed in this RP, DQC and ATR, are to augment and complement the policy review processes. The District Chief of Engineering has assessed that the life safety risk of this project is significant; therefore a Type II IEPR/Safety Assurance Review (SAR) will be required, see Paragraph 5.1.

This Review Plan covers improvements for three levee systems currently broken into six construction contracts that will be designed in four primary efforts, one by USACE, two primarily by A-E with USACE support, and one design-build contract utilizing primarily A-E resources.

1.2 References

- EC 1165-2-217, Review Policy For Civil Works, 20 February 2018
- ER 1110-1-12, Quality Management, 31 Mar 2011
- ER 415-1-11, Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) Reviews, 1 January, 2013
- EM 1110-2-1913 Design, Construction, and Evaluation of Levees, 30 April 2000
- Project Management Plan (PMP) for study
- NWK BQP 7.3.01 Product Development Process, In-House
- NWK BQP 7.3.02 Product Development Process, Contract
- Kansas City Levees, Kansas and Missouri Interim Feasibility Report and Environmental Impact Statement with Appendices, August 2006
- Kansas City Levees, Kansas and Missouri Final Feasibility Report, March 2014

1.3 Review Management Organization

The USACE Risk Management Center (RMC) is the Review Management Organization (RMO) for this project. Contents of this Review Plan are coordinated with the RMC and the Northwestern Division (NWD), the Major Subordinate Command (MSC). The RMO, in cooperation with the vertical team, will determine/select/approve the ATR team members. NWK will assist the RMC with management of the ATR and IEPR reviews and development of the ATR and IEPR “charges”. This RP will be updated for additional project phases and for the construction phase.

Section 2

Project Description

2.1 Project Description

The Kansas Citys system consists of seven levee units located near the confluence of the Kansas River with the Missouri River in the metropolitan area of Kansas City, Missouri, and Kansas City, Kansas. Levee units include Birmingham, East Bottoms, North Kansas City, and a majority of Fairfax Jersey Creek on the Missouri River, Argentine and Armourdale on the Kansas River, and the Central Industrial District (CID) along both rivers. The system consists of 52 miles of levee and floodwall, pump stations, closures and appurtenances protecting a 32 square mile area and over \$22 Billion investment in the Kansas City metropolitan area. The project area is at risk from flooding caused by large scale, long-duration atmospheric phenomena, where either stream, the upper Missouri River or Kansas River, is capable of producing damaging floods almost entirely on their own or working in combination. Major floods in the Kansas River and lower Missouri basins are typically caused by 2-4 days of high intensity storms fueled by a combination of moisture from the Gulf of Mexico and stationary fronts, following prolonged periods of rainfall which saturate soils and bring streams to bankfull stage across the Midwestern region.

2.1.1 Original Levees and Federal Involvement

The first levees were constructed by local interests prior to 1915 following the great flood of 1903, which devastated the region with estimated flows of 337,000 cubic feet per second (cfs) on the Kansas River and 548,000 cfs on the Missouri River below the confluence. The record flood occurred in 1844 prior to most of the development at a Missouri River flow of 625,000 cfs, but still destroyed several buildings within the project area. Other than a large upper Missouri River flood in 1881, and a large Kansas River flow in 1858 similar in magnitude to 1908, no major floods, especially on the Kansas River, occurred between 1844 and 1903. The Federal Government became involved with Kansas Citys flood risk reduction in the 1930’s, where a Works Progress Administration (WPA) project between 1936 and 1938 raised the Kansas River levees 5.5 feet and constructed floodwalls. Further federal involvement was authorized in the 1936 Flood Control Act, as amended in the 1944 Flood Control Act. The U.S. Army Corps of Engineers was authorized to upgrade the levees to pass a project design storm of 170,000 cfs on the Kansas River occurring with 500,000 cfs on the Missouri River below the confluence, working in conjunction with upstream reservoirs.

2.1.2 Existing Levees Design

Similar to 1844, the great flood of 1951 flood was primarily a Kansas River event. The 1951 flood overwhelmed portions of the project; some still under or about to start construction, and prior to completion of most of the upstream federal reservoirs, at a flow of 510,000 cfs on the Kansas River and 573,000 cfs on the Missouri River below the confluence. The Argentine, Armourdale and CID Units overtopped by over 5 feet, and portions of Fairfax flooded due to a ruptured pipe and failed flood fight efforts on its short Kansas River tieback. The WPA floodwalls were destroyed in some locations. New authorization from the 1962 Flood Control Act commonly known as the “62 Mod” was aimed at correcting problems identified as a result of the 1951 flood, including improvements throughout the system, and raises to the three Kansas River levee systems up to 6 feet to pass a flow of 390,000 cfs on the Kansas River with 610,000 cfs on the Missouri River below the confluence. This design flow was based on a transposition of the 1951 flood routed through existing and proposed federal dams, three of which were not built. With dams actually constructed, USACE concluded in 1977 that the design storm would produce 432,600 cfs on the Kansas River, with 652,600 cfs on the Missouri River below the confluence, and that the project could pass this flow within its authorized freeboard. Upstream federal dams completed between 1940 and 1980 have reduced the flood risk to Kansas City, primarily by the construction of 6 USACE mainstem Missouri River Dams and the 7 most downstream of 18 USACE and US Bureau of Reclamation Kansas River Basin Dams. However, the residual drainage areas below these dams are approximately 9,730- and 154,000-square miles on the Kansas and Missouri Rivers at Kansas City, respectively. Additionally, large releases from upstream dams during prolonged wet periods or extreme storms are possible. The combined drainage area of the most downstream Federal dams compares to 84% of the total drainage area of the 60,580 square mile Kansas River Basin and 68% of the 484,100 square mile Missouri River Basin at Kansas City, Missouri.

2.1.3 Proposed Levee Improvements

The 1993 flood was primarily a Missouri River event, peaking at 170,000 cfs on the Kansas River and 541,000 cfs on the Missouri River below the confluence. While none of the Kansas Citys units were overtopped, the water rose to higher-than-expected levels at some locations, raising the question of whether the Kansas Citys system provided its authorized level of protection. A reconnaissance study followed, and showed likely Federal interest. A feasibility study was completed in two phases in 2006 and 2014, which identified a levee improvement plan consisting of structural levee, floodwall, and pump station improvements, underseepage improvements, and Kansas River levee raises of approximately 4 feet. The Phase 1 study was completed in August 2006 in the Interim Feasibility Report and Environmental Impact Statement, Review of Completed Project, Kansas Citys Levees, Missouri and Kansas, covering the Fairfax Jersey Creek, North Kansas City, East Bottoms and Argentine Levee Units. Proposed levee improvements for Armourdale and CID are outlined in the Phase 2, Kansas Citys, Missouri and Kansas, Flood Risk Management Feasibility Study, dated May 2014. A map showing the Federal Levee Units in the Kansas City Metropolitan Area is provided in Figure 1. Phase 1 construction at Fairfax Jersey Creek, North Kansas City and East Bottoms was completed prior to 2018, whereas no recommended improvements were identified for Birmingham. Funding to complete the remaining \$453,000,000 of Kansas Citys construction consisting of the Argentine Unit improvements from Phase 1 and all of the Armourdale / CID Phase 2 work was provided in the Bipartisan Budget Act of 2018, dated 8 Aug 2018 (Public Law 115-123). On 17 Jan, 2019, the Assistant Secretary of the Army (Civil Works) communicated the policy determination that “Phase 1 and Phase 2 projects shall be treated as one ongoing construction project for the purpose of implementing Public Law 115-123.”

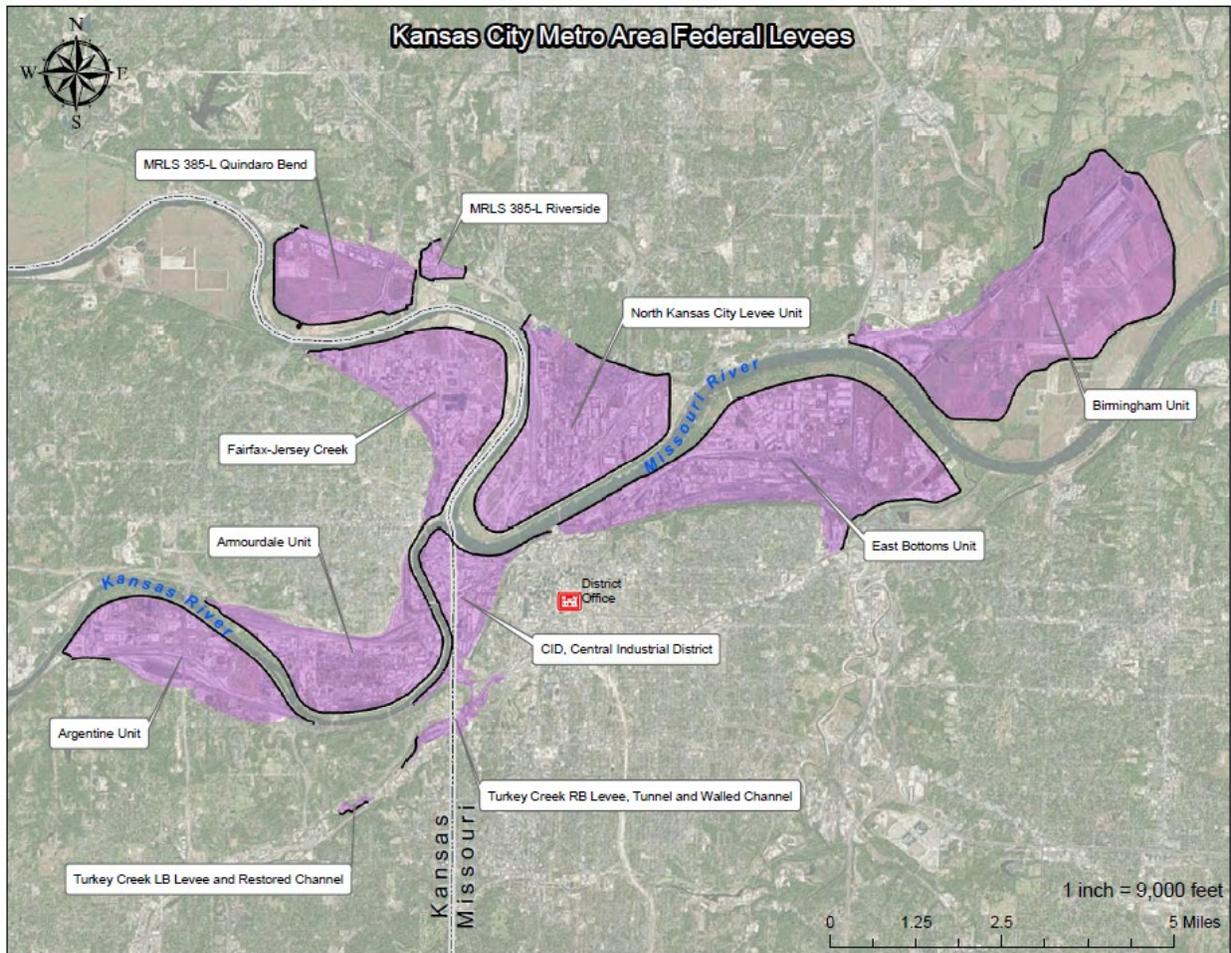


FIGURE 1 – FEDERAL LEVEES IN THE KANSAS CITY METROPOLITAN AREA

The remaining work is currently anticipated to occur through approximately six separate construction contracts, at least two designated as unrestricted and up to four broken out for small business, with the design work grouped into four efforts. The design work breakdown includes one USACE design-bid-build (D/B/B) for the Argentine Levee raise, one design-build (D/B) effort for the Argentine Pump Station, and two A-E D/B/B for structural pump station repairs and levee raise and underseepage improvements for Armourdale and CID. While different groupings or possible different separation of construction contracts may be considered, such as possibly combining underseepage or pump station modification contracts, the four primary design efforts are anticipated to remain for the duration of the project. Table 1 presents the anticipated contract acquisition strategy for the construction contracts and general scopes of work listed by the four major design efforts. Map books depicting the modifications for each levee unit from the Feasibility Reports are provided in Attachment 5. Additional details for the features of each levee unit are provided in the following subsections.

TABLE 1: DESIGN AND CONSTRUCTION CONTRACT ACQUISITION STRATEGY

Design	Construction Contract Description	Owner (see Section 2.2)	Levee Station	Construction Acquisition Strategy	Award Date	Cost
1: D/B	#1: Argentine Pump Station – AE D/B Contract	KVDD: Turner, Argentine Main	60+40, 253+14	Unrestricted	9/25/19	\$33.3 M
		UG: Strong Ave.	273+41			
2: D/B/B	#2a: Argentine Levee Raise / Underseepage Improvements, USACE Design	KVDD	00+00 to 289+40	Unrestricted	FY21Q2	\$150 to \$350M
3: USACE AE D/B/B	#2b: Armourdale / CID Levee Raise*	KVDD, KCMO	Armourdale: -4+44 (0+05UE) to 325+64; CID: 19+73-169+00			
	#3: Armourdale Underseepage Improvements	KVDD	295+00-313+00; 190+00-255+00; 62+00 to 82+00	Small Business	FY21Q1	\$5 to \$10M
	#4: CID Underseepage Improvements	KVDD	107+00-135+00	Small Business	FY21Q1	\$5 to \$10M
4: AE D/B/B	#5: Armourdale Pump Station Modification Contract	UG: Osage, 12 th St., Mill St., 5 th St, Shawnee, National Beef, Central Ave.	76+83, 129+20, 156+75, 185+70, 230+77, 295+52, 299+52	Small Business	FY20Q4	\$5 to \$15M
		KVDD: KC Southern	276+79			
	#6: CID KS/MO Pump Station Modification Contract	UG: New Central, Ohio Ave	58+12 (KS), 83+52 (MO)	Small Business	FY20Q4	\$5 to \$15M
		KVDD: Mistletoe, Stock Yard #3, Stockyards #1	37+06, 74+21, 98+05 (all KS)			
KCMO: Kemper, Broadway, Santa Fe	106+49 (KS), 24+77 (MO), 52+85 (MO)					

*Includes foundation repairs to the CID MO segment of CID and some underseepage controls

2.1.3.1 Description of Argentine Unit Improvements

The Argentine Levee Unit is located in the City of Kansas City, Kansas, on the right bank of the Kansas River between river miles 4.6 to 10. The primary components of the Argentine Unit are earthen levee, floodwalls, stop-log and sandbag gap closures, pumping plants, and drainage structures. The overall Argentine Unit is approximately 5.5 miles long, the floodwalls, in two sections, total 1,338 feet long at a height of approximately 16 feet. The recommended plan for reducing the flood risk within the Argentine Levee Unit includes resolving uplift concerns at the Turner Pump Station, replacing the Strong Avenue and Argentine pump stations, increasing the height of approximately 25,850 linear feet of levee and floodwall by approximately 4 feet, constructing levee and a new drainage structure near station 25+00 to

tie into the bluffs, addressing underseepage concerns along the line of protection, replacing two stop-log closure structures, improving up to 14 existing drainage structures, relocating 14 utility crossings. The feasibility study also identified constructing an approximately 0.21-acre emergent wetland as mitigation in the event that farmed wetlands would be impacted at the proposed borrow site. Underseepage measures include the installation of approximately 45 relief wells, including up to 5 for the Turner Pump Station, seepage berms, and collector systems in a few isolated areas.

The Argentine Levee Unit improvements are currently divided into two design and construction efforts, a design-build RFP for the three pump stations and in-house USACE design/bid/build for the levee and floodwall raise and associated improvements. All of the recommended pump station modifications derive from strength and flotation (uplift) issues, as further verified and refined during pre-construction engineering and design phase, which affect levee reliability or are related to the adaptation of the existing pump stations to a higher raised levee. The original Strong and Argentine Main Pump Stations are believed to have been built in 1916 and before 1920, respectively. The Turner Pump Station was designed and constructed as part of the initial Federal project in the late 1940's and early 1950's. The Turner Avenue pump station is proposed for modification (strength and uplift), whereas the other two stations are proposed for replacement. Replacements involve the design of new pump stations, temporary flood protection measures during construction, installing and connecting the new system, and demolition or abandonment of existing features no longer needed. Improvements at Turner involve 5 relief wells, a collector system, raising a gatewell, and structural analysis for the design and construction to increase the strength for the raised condition. Construction of the Turner Relief wells, which are a requirement of the proposed raise, will be constructed with the Argentine levee raise project.

2.1.3.2 Description of Armourdale and Central Industrial District (CID) Levee Unit Improvements

The Armourdale Unit is located in Wyandotte County Kansas, along the left bank of the Kansas River from mile 7 to mile 0.3. The primary components of the unit consist of earthen levees, floodwalls, riprap and toe protection on riverward slopes of levees, toe drains along the concrete floodwalls, sandbag gaps, stoplog gaps, drainage structures, relief wells and pumping plants. The floodwalls, in two reaches, vary from 11 to 17 feet high and total approximately 6,200 feet. The levees, in three reaches, vary from 4 to 17 feet high and total about 5.3 miles. Existing underseepage control features include approximately 13,400 linear feet (LF) of riverside impervious fill cutoffs, 1,550 LF of landward underseepage berm, and 39 relief wells with collector systems in several reaches.

Although the CID Unit is one continuous levee unit, it crosses the Kansas and Missouri State Line and is subsequently operated and managed as two separate and distinct sections: the CID-Kansas section, and the CID-Missouri section. The CID-Kansas Section (CID-KS), is located in Wyandotte County, Kansas, and extends along the right bank of the Kansas River from mile 3.4 to the mouth, then downstream along the right bank of the Missouri River to the State Line. The unit consists of two levee reaches, three floodwall reaches, riprap and levee toe protection, a surfaced levee crown and ramps, a stoplog gap, a sandbag gap, eight pumping stations, drainage structures, and relief wells. The levees total approximately 1.7 miles long and the floodwalls about 7,900 feet. The levee section varies from zero to 14.5 feet high. Existing underseepage control features in CID-KS includes a buried collector system, approximately 1,800 LF of area fill, and 19 relief wells with collector system. The CID-Missouri section (CID-MO) is located in Kansas City, Jackson County, Missouri. This section extends along the right bank of the Missouri River (river mile 365.7) to the Kansas-Missouri state line (river mile 367.2). The CID-MO section consists of levee, floodwalls, a levee drainage system and pumping plants, sandbag and stoplog gaps, toe and bank protection, and slope protection on the riverward slope. The floodwalls total 1.5 miles and the levee is about 430 feet.

Based on the Feasibility Report, the proposed levee improvements consist of the major features for Armourdale and CID as summarized in Table 2 (Table 4-7 from the Feasibility Study). As shown in Table 1, the improvements for the Armourdale and CID Levee Units are currently proposed to be broken into

five construction contracts managed with two primary design efforts. The largest design effort is for approximately 8.4 miles of Armourdale and CID levee and floodwall raises of approximately 4-feet, which will have a mixed AE and USACE design team. The construction of the Armourdale and CID levee raises is proposed to be combined with the Argentine Unit Raises in one large construction contract. As part of the levee raise, the Feasibility Study identified approximately 60 gatewells that require modification on Armourdale and CID. Associated seepage improvements, primarily proposed for approximately 131 relief wells, will be conducted with an in-house USACE design with AE support that will be part of the overall levee raise design, but will be broken into two separate construction contracts, one for each levee unit. A proposed 2,000-foot slurry wall for Armourdale will also be refined by USACE and evaluated against other measures, such as an additional 25 relief wells or berms. Many underseepage features, such as berms, some relief wells, and cutoffs will need to be constructed with the levee raises for efficiency to reduce impacts of working in active rail yards to one contractor, or to prevent two contractors from running major construction equipment in the same area. Therefore, additional modification to the breakdown of work between underseepage contracts could occur to include possibly combining the underseepage efforts into one construction project, depending on the final size of the work after design is completed. Lastly, pump station improvements (Table 1) will be designed by a small business AE and broken into two construction contracts, one for each levee unit.

TABLE 2: PROPOSED IMPROVEMENTS FOR ARMOURDALE AND CID

<i>Overtopping/Structural Measures</i>	CID	Armourdale	Total
Levee Raise (LF)	6,495	13,223	19,718
Floodwall Modification(LF)	4,649	4,208	8,857
Floodwall Replacement (LF)	152	2,105	2,257
New Floodwall (LF)	600	5,392	5,992
New T-Wall on Levee (LF)	-	7,715	7,715
<i>Closure Structure Measures</i>			
New Sandbag Closure	2	3	5
Convert Sandbag to Stop log	1	2	3
Replace Stop log Closure	1	2	3
New Stop log Closure	2	-	2
<i>Underseepage Control Measures</i>			
New Relief Wells	57	74	131
Area Fill (LF)	3,448	-	3,448
Slurry Cutoff Wall (LF)	-	2,000	2,000
<i>Drainage Control Measures</i>			
Pump Station Removal	2	2	4
Pump Station Modification	5	7	12

2.2 Project Sponsor

The Project is supported by multiple non-federal local sponsors. While USACE and the sponsors routinely share information, no in-kind services from the sponsors are included with this project. Any products and analyses provided by non-Federal sponsors are subject to DQC, ATR, policy and legal compliance, BCOES, and SAR reviews. The Kaw Valley Drainage District (KVDD) of Wyandotte County is the local sponsor for Argentine, Armourdale and CID KS units. While not a formal sponsor, the Unified Government of Wyandotte County and Kansas City, Kansas (UG) owns and operates several Argentine,

Armourdale and CID KS pump stations. The City of Kansas City, MO is the local sponsor for the CID MO unit, and also owns several outfall structures along CID KS. Figure 2 presents a map showing the project sponsors for the different Kansas City levee units. While previous construction efforts have been cost-shared, the remaining work is federally funded.

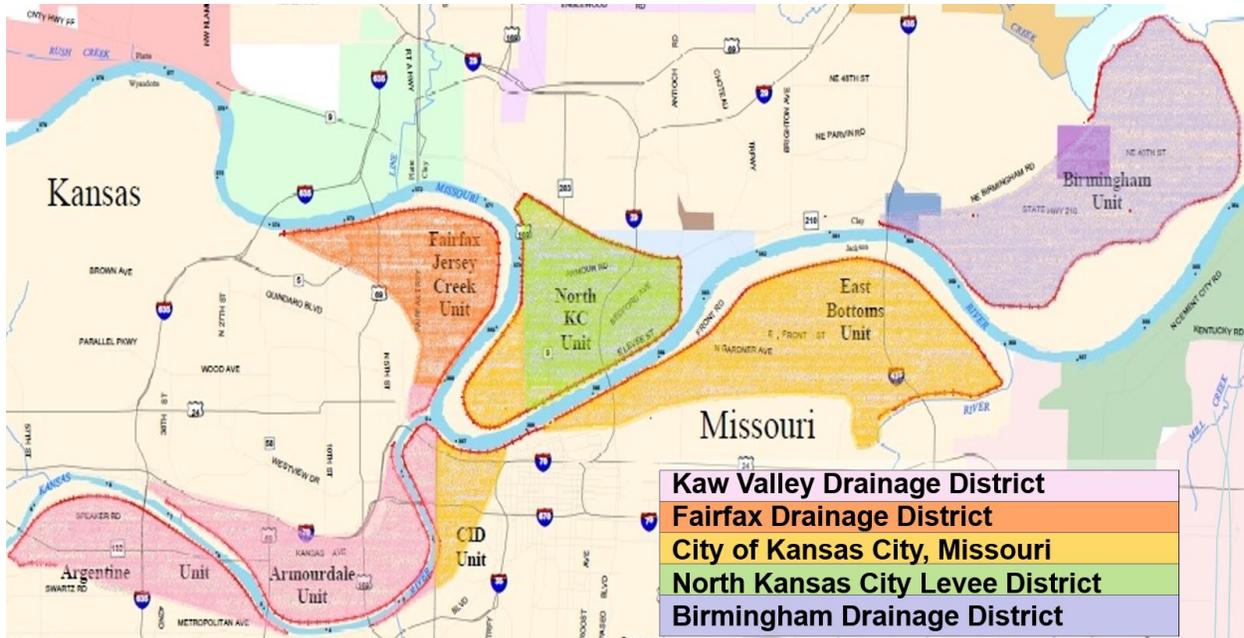


FIGURE 2 – KANSAS CITYS PROJECT SPONSORS

Section 3

District Quality Control

3.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, etc.), as well as any Design-Build RFPs shall undergo DQC in accordance EC 1165-2-217. The District shall perform these minimum required reviews in accordance with ER 1110-1-12, EC 1165-2-217, and Kansas City District's Quality Management System Manual, <https://apps.usace.army.mil/sites/QMS-R/NWDQMS/KCDistQMS/QMS%20Documents/Forms/QMSPublished.aspx>. The Kansas City District (NWK) quality manual addresses in-house designs and designs by A-E resources. The District's quality manual requires a Quality Management Plan (QMP) for all in-house USACE design and construction contracts in accordance with Business Quality Procedure (BQP) 7.3.01. As outlined in the District's BQP 7.3.02, and in accordance with ER 1110-1-12, a separate Contractor Quality Control Plan (QCP) will be submitted for each A-E design, including any design-build RFP's, which becomes an attachment to the District's Quality Assurance Plan (QAP). For mixed USACE and A-E design efforts, a QMP will be made by USACE, and the A-E firm will submit a separate QCP indicating how they will perform peer reviews of A-E products, and interdisciplinary reviews of full team products. DQC reviews will be led by the Kansas City District, with team members being from the USACE enterprise.

USACE will conduct design-build reviews similarly to design-bid-build reviews for designs conducted by A-E resources. The intent of the District is to structure the RFP's to not allow fast-tracking of construction where the full design has not yet been completed and undergone necessary DQC, ATR, or SAR reviews for non-separable elements that could cause undue risk, such as lowering a floodwall prior to finishing the design. However, the possibility of "fast-tracking" design for some D-B components may increase the number of reviews, for example if the A-E decides to submit one pump station design at a time, versus all three for Argentine at once. The District also recognizes that design comments from any phase of DQC, ATR, or SAR that result in major changes to the project could result in contract modifications to the D-B project, and will continue to factor these possible costs into the Project's cost-risk analysis throughout the design process.

See Attachment 1 for the DQC team roster and disciplines.

3.2 Documentation

The Kansas City District will conduct DQC reviews and documentation of DQC in compliance with EC 1165-2-217, and NWK BQP's 7.3.01 and 7.3.02. All work products and reports, evaluations, and assessments shall undergo necessary and appropriate DQC. Documentation of peer review comments shall be conducted using DrChecksSM, through peer reviewer initials on calculations and graphics, or other approved format that is shared with the DQC lead and other reviewers. DQC consists of peer reviews, interdisciplinary reviews, in-progress reviews, quality assurance reviews, construction review of design-build products, and chiefs' reviews. Section and Branch Chiefs assume overall responsibility to ensure adequate DQC is performed on products produced within their organizations, or by comparable AE resources, either by themselves or other qualified senior-level engineers. Additionally, the Project, including design, construction and OMRR&R aspects, will be coordinated with the NWK Levee Safety Program, documenting any significant comments in DrChecksSM. A separate BCOES review will be performed as part of the DQC review of any completed Design-Build RFP or Design-Bid-Build package

prior to it being released to industry. For all design packages, BCOES review will be conducted at the 95% submittal and prior to advertisement, at minimum, as described in Section 6. Additionally, a BCOES-like review will be conducted of D/B packages prior to clearing the design for construction.

3.2.1 Non-Federal Sponsor Review

In accordance with the Project Partnership Agreement (PPA) with the non-Federal sponsors, the non-Federal sponsors are given the opportunity to review and comment on the design documentation report, plans, specifications, and OMRR&R roles and responsibilities at all major milestones. Comments will be completed in DrChecks. The project manager will compile all comments and responses and include them with the BCOES Certification review.

3.3 DQC Schedule and Estimated Cost

The DQC reviews will be seamless with the design process and tentatively follow the review schedule shown in Section 9. Costs vary depending on the size and complexity of the design package and number of reviewers required, ranging from approximately \$30,000 to \$50,000 per design milestone.

Section 4

Agency Technical Review

4.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) shall undergo ATR in accordance EC 1165-2-217. ATR reviews will occur seamlessly, including early involvement of the ATR team for validation of key design decisions, and at the scheduled milestones as shown in Section 9. A site visit will be scheduled for the ATR Team early in the design process and periodically during construction (i.e. mid-point and end of construction). For certain milestones, an informal review will be conducted by the ATR team to seek early feedback on proposed methodology. These reviews have been designated in Section 9.

4.2 Documentation of ATR

Documentation of ATR will occur using the requirements of EC 1165-2-217. ATR comments will be documented in the DrChecksSM model review documentation database and reviewers will use the four part comment structure. DrChecksSM is a module in the ProjNetSM suite of tools developed and operated at ERDC-CERL (www.projnet.org).

4.3 Products to Undergo ATR

See in Section 9, Review Products and Milestones, for products to undergo ATR.

4.4 Required Team Expertise and Requirements

ATR teams will be established in accordance with EC 1165-2-217. For the disciplines that play a crucial part in the project, Subject Matter Experts (SMEs) are preferred for filling the ATR team roster. Tables 3 and 4 present the disciplines required for ATR of each contract of this project. A facilitated semi-quantitative risk assessment is scheduled to be included following completion of the 35% design for each levee system for all planned components and will be incorporated into the design documentation of each levee system as discussed in Section 8. Therefore, required risk assessment expertise for the ATR is included in the Table.

TABLE 3: REQUIRED ATR REVIEWER EXPERTISE

Kansas Citys, Missouri and Kansas, Argentine, Armourdale, and CID	
ATR Team Member/Disciplines	Expertise Required
Team Lead	The ATR team lead will be a senior professional outside the home MSC with extensive experience in preparing Civil Works documents and conducting ATRs for levee safety projects. The lead has the necessary skills and experience to lead a virtual team through the ATR process. The ATR lead may also serve as a reviewer for a specific discipline, in this case: Structural Engineering, Geotechnical Engineering, etc. (as applicable). Since a SAR is required, the ATR Lead will be an engineer/geologist with a strong levee safety background.
Risk	The team member shall have experience performing consistency review on semi-quantitative risk assessments, and may be filled by one or more of the disciplines identified.
Geotechnical Engineer*	The team member(s) shall have at least 10 years' experience in the field of geotechnical engineering, analysis, design, and construction of riverine storm risk management levee systems. The geotechnical engineer(s) shall have experience in subsurface investigations, rock and soil mechanics, internal erosion (seepage and piping), slope stability evaluations, erosion protection design, and earthwork construction. The geotechnical engineer(s) shall have knowledge and experience in the forensic investigation of seepage, settlement, stability, and deformation problems associated with earthen embankment, floodwalls, flood risk management structures, and appurtenances constructed on soil foundations. The team member(s) shall be a registered Professional Engineer (PE).
Civil/Construction Engineer	The team member shall have at least 10 years' experience in civil works design/construction of levee safety projects. The team member shall be a Registered Professional engineer (PE). The civil engineer shall have experience in site work, access, grading, utilities and construction phasing.

Hydraulic Engineer*	The team member shall have a minimum of 10 years of experience in the analysis and hydraulic design of levees including the design of drainage structures. The hydraulic engineer will be knowledgeable and experienced with the routing of hydrographs through major river systems, USACE application of risk and uncertainty analyses in flood risk reduction studies, and standard USACE hydrologic and hydraulic computer software and models used in levee safety investigations (e.g. HEC-HMS, HEC-SSP, HEC-RAS).
Mechanical/Electrical Engineer	The reviewer(s) shall have a minimum of 10 years of experience in the design, layout, and construction of large flood risk management projects. Reviewer should be familiar with the design and construction/ modification of pump stations, relocation of underground electrical utilities and related systems and components.
Structural Engineer*	The team member shall have a minimum of 10 years of experience in the design, layout, and construction of large flood risk management projects. Reviewer must be familiar with the design and construction/ modification of tall (>10 feet high) pile founded flood walls, closure structures, interior drainage facilities within line of protection (pump stations and gatewells), concrete placement & H2S effects on concrete, and relocation of underground utilities (to include utility penetrations). The team member shall be a registered Professional Engineer (PE) and have a minimum of 10 years' experience in the above areas.
Climate Assessment	The team member shall be a certified ATR reviewer from the Climate Preparedness and Resilience (CPR) Community of Practice (CoP).
LSOG Representative	This reviewer will be a member of the LSOG or other senior level engineer or geologist assigned by the Risk Management Center, and will review the risk assessments during the ATR of the projects.

*Team members are preferred to be SMEs.

TABLE 4: REQUIRED ATR REVIEWER EXPERTISE BY CONTRACT

General Design or Construction Contract Package	Risk Assessment	Geotechnical	Civil	H&H	Climate Assessment	Structural	Electrical/Mechanical
General Design, Hydrologic and Hydraulic Modeling and Levee Height Report				X	X		
#1: Argentine Pump Station Design/Build Contract	X	X	X	X		X	X
#2a: Argentine Levee / Floodwall Raise, USACE Design*	X	X	X	X		X	
#2b: Armourdale/CID Levee/Floodwall Raise, A-E Design*	X	X	X	X		X	
#3: Armourdale Underseepage Improvements	X	X	X	X		X	
#4: CID Underseepage Improvements	X	X	X	X		X	
#5: Armourdale Pump Station Modification Contract	X	X	X	X		X	X
#6: CID Pump Station Modification Contract	X	X	X	X		X	X

*One construction contract is planned for Argentine, Armourdale, and CID levee raises with one set of specifications, and a set of drawings, design documentation reports, and operation and maintenance manuals for each levee system. Reviews will be combined after 65% design.

4.5 Statement of Technical Review Report

At the conclusion of each ATR effort, the ATR team will prepare a review report with a completion and certification memo. The report will be prepared in accordance with EC 1165-2-217. The report will include at a minimum the Charge to Reviewers, ATR Certification Form from EC 1165-2-217, and the DrChecksSM printout of the comments, evaluations, and backchecks. The RMC's Statement of Technical Review Report template should be used with the ATR Completion of Agency Technical Review showing David E. Carlson, P.E., Chief, Eastern Division, CEIWR-RMC-E signing for the RMO.

4.6 ATR Schedule and Estimated Cost

The preliminary ATR milestone schedule is listed in Section 9. The cost for each review milestone ATR is approximately \$30,000 to 50,000, depending on the complexity and the number of disciplines required.

Section 5

Safety Assurance Review

5.1 Decision on Safety Assurance Review

The District Chief of Engineering has made a risk-informed-decision that this project poses a significant threat to human life (public safety) and therefore a Type II Independent External Peer Review (IEPR)/Safety Assurance Review (SAR) will be performed. The Type II IEPR (SAR) is managed outside the USACE and is conducted on design and construction activities for flood risk management projects where existing and potential hazards pose a significant threat to human life. SAR panels will conduct reviews of the design and construction activities prior to initiation of physical construction and, until construction activities are completed, periodically thereafter on a regular schedule. The reviews will consider the adequacy, appropriateness, and acceptability of the design activities in assuring public health safety and welfare.

The Kansas City Flood Risk Management Project is intended to reduce the flood risk through structural improvements and raises of three existing levee systems upon completion. During the course of construction, temporary flood protection measures may be required for design and construction in some instances where floodwalls or structures are being fully replaced. All contracts have life safety or a threat to human life aspect involved. Life safety risks associated with pump stations are primarily due to structural deficiencies when loaded by the Kansas River, rather than by the performance of pumping systems to evacuate interior floodwater during high river levels.

5.2 Products to Undergo SAR

SAR will be conducted on the 95% Complete Supplemental Hydrology and Hydraulics and Levee Height Report and supporting models and calculations, all contract plans, specifications, and design documentation at a 65% design, and a review during construction. Concurrent with the 65% design, the SAR will also be charged with reviewing Design-Build RFP's (post award).

5.3 Required SAR Panel Expertise

SAR panels will be established in accordance with EC 1165-2-217. The following three disciplines will be required for SAR of this project for the products identified in Table 5, which have been combined to increase the efficiency of the reviews:

Geotechnical Engineer – The panel member shall be a licensed professional engineer from an Architect-Engineer or consulting firm, a public agency, or academia with a minimum of 15 years of experience in the field of geotechnical engineering analysis, design, and construction of flood risk reduction projects. The Geotechnical panel member should be a recognized expert in levees and channels with a minimum MS degree or higher in engineering. Geotechnical panel member shall have experience in the general field of geotechnical engineering; experience in subsurface investigations; field & laboratory testing and the determination of in-situ material properties; soil compaction and earthwork construction; soil mechanics; seepage and piping; landslide and slope stability evaluations; bearing capacity and settlement; dewatering and excavation in an active stream channels; design and

construction of foundations on alluvial soils; foundation inspection and assessment; erosion protection design; levee and stream bank protection including soil cement, grouted riprap and stone protection, sheet piling, and retaining wall design; drilling and blasting; preparing plans and specifications for USACE projects, and knowledge of USACE design and construction procedures and policies. The Geotechnical panel member shall have knowledge and experience in the forensic investigation of seepage, settlement, stability, and deformation problems associated with embankments constructed on weathered and jointed rock and alluvial soils.

Structural Engineer – The panel member shall be a licensed professional civil engineer from an Architect-Engineer or consulting firm, a public agency, or academia with 15 or more years of demonstrated experience, with a minimum MS degree or higher in engineering. The Structural panel member shall have extensive experience in the design and construction of hydraulic structures for large and complex civil works projects including drainage and closure structures. The Structural panel member should be a recognized expert in stability analysis and structural design and construction. The Structural panel member shall have familiarity with preparing plans and specifications for USACE projects, knowledge of USACE design and construction procedures and policies, and USACE levee safety assurance policy and guidance. The Structural panel member shall have experience in evaluating risk reduction measures for flood risk management projects.

Hydraulic Engineer – The panel member shall be a licensed professional engineer from an AE firm, a public agency, or academia with a minimum of 15 years of experience in the hydraulic design of large civil works flood risk reduction projects. The hydraulic engineer will be knowledgeable and experienced with the hydraulic design of levees and interior drainage structures, the routing of hydrographs through major river systems, scour and stabilization measures, USACE application of risk and uncertainty analyses in flood risk reduction studies, and standard USACE hydrologic and hydraulic computer software and models used in levee safety investigations (HEC-HMS, HEC-SSP, HEC-RAS).

TABLE 5: REQUIRED SAR REVIEWER EXPERTISE BY CONTRACT

Design/Construction Contract or Review Package	Geotechnical	Hydraulic	Structural
#1: Argentine Pump Station Design/Build Contract	X		X
#2: Argentine Levee / Floodwall Raise, Armourdale/CID Levee/Floodwall Raise, Hydrologic and Hydraulic Modeling and Levee Height Report	X	X	X
#3: Armourdale and CID Underseepage Improvements	X		X
#4: Armourdale and CID Pump Station Modifications	X		X
#5: Construction Site Visits, all features	X		X

5.4 Documentation of SAR

Documentation of SAR will be prepared in accordance with EC 1165-2-217.

5.5 Scope, Schedule, and Estimated Cost of SAR's

The SAR's will be performed in accordance with EC 1165-2-217. The estimated cost for the SAR's of this project are in the range of \$25,000 to \$100,000 per design/construction contract review. This estimate will be refined when the Scope of Work for the SAR task order is completed. The SAR reviews for this project are anticipated to occur around the 65% milestone for the design, plans, and specifications (etc.) of the design package, the mid-point of construction and the end of construction. All construction contracts will have a SAR review completed. The reviews are tentatively scheduled to occur within the timeframes included in Section 9. The intention is to use the panel member's time as best as possible and lower the cost of the SAR contract by having multiple contract/product reviews occur within a short timeframe. A compressed design schedule is currently forecasted for the Kansas City Levees Project, where individual design packages may be consolidated or grouped when provided for review. Site visits for the design phase review (65% review) shall be 1.5 days for each project area (Argentine, Armourdale, and CID) and 1 day each for the midpoint or end of construction review for each project area, covering multiple construction contracts each visit when feasible.

Section 6

Biddability, Constructability, Operability, Environmental, and Sustainability

6.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) shall undergo BCOES review in accordance ER 415-1-11 and ER 1110-1-12. BCOES reviews are done during design for a project using the design-bid-build (D-B-B) method or during development of the request for proposal (RFP) for a design-build (D-B) project. The BCOES review results are to be incorporated into the procurement documents for all construction projects. The value of BCOES reviews is based on minimizing problems during the construction phase through effective checks performed by knowledgeable, experienced personnel prior to advertising a contract. Biddability, constructability, operability, environmental, and sustainability requirements must be emphasized throughout the planning and design processes for all programs and projects, including during planning and design charrettes. This will help to ensure that the government's contract requirements are clear, executable, and readily understandable by private sector bidders or proposers. It will also help ensure that the construction may be done efficiently and in an environmentally sound manner, and that the construction activities and projects are sufficiently sustainable. Finally, effective BCOES reviews of design and contract documents will reduce risks of cost and time growth, unnecessary changes and claims, as well as support safe, efficient, sustainable operations and maintenance by the facility users and maintenance organization after construction is complete.

6.1.1 Special BCOES Considerations for Design-Build

One of the benefits of D-B construction is the ability to allow contractors to “fast-track” the design and construction. The D-B project RFP has been structured to ensure the contractor submits the proposed work breakdown of the design so that the review plan can be updated by the District to reflect the anticipated number of design submittals. The RFP requires the resolution of DQC and ATR comments prior to issuing a notice to proceed to clear a design-build submittal for construction. Additionally, the RFP has been structured to ensure no undue risk is present from the proposed construction sequencing and design schedule, and DQC, ATR, and SAR reviewers will be charged to verify this is accomplished. For example, degrading an existing levee or floodwall should not be conducted until approved temporary flood protection measures are in place and the full design of the feature in question is completed and cleared for construction. Any DQC, ATR, Sponsor, or SAR comments that could result in a contract modification will be addressed by the District in coordination with the reviewers and appropriate change management process prior to requesting a proposal from the D-B contractor to modify the project.

6.2 Documentation of BCOES

The BCOES review will be documented using procedures and checklists in NWK BQP 7.3.01 and 7.3.02 for designs at 95% completion and design-build RFP’s prior to soliciting bids on the construction projects.

Section 7

Policy and Legal Compliance Review

The Kansas City District Office of Counsel reviews all contract actions for legal sufficiency in accordance with Engineer Federal Acquisition Regulation Supplement 1.602-2 responsibilities. The subject implementation documents will be reviewed for legal sufficiency prior to advertisement.

Section 8

Risk-Informed Design

An analysis of potential failure modes during the Feasibility Study was used to determine the appropriate modifications to decrease the risk to life safety, property and the environment. Previously completed screening-level risk assessments on the existing systems (Argentine, Armourdale, and CID) were also used to help validate findings of the Feasibility Study and to inform early design efforts. Proposed measures from Feasibility and early design efforts have been used to update the screening-level risk assessments for the existing and proposed conditions to inform the design through a 35% level of detail. Following the completion of the 35% design, and prior to completion of the 65% design, a facilitated semi-quantitative risk assessment will be completed for each individual levee system. The designers will utilize risk-informed decisions in order for the resulting project to meet Tolerable Risk Guidelines (TRG), ensuring that the design reduces risk as low as reasonably possible, and comparing plausible proposed alternatives to consider risk vs cost at critical areas. Risk-informed design will be used to inform the design team where traditional design standards should be made more or less conservative. One or more risk cadre members and a member of the Levee Senior Oversight Group (LSOG) will be members of the ATR team to review the design documents and SQRA throughout the design process so that the designs

are meeting TRG. Risk assessment documents will be included as appendices in the DDR for each project area.

Section 9

Review Products and Schedules

Review schedules are broken into four groupings, a general category for all three levee systems, Argentine pump stations, Armourdale and CID pump stations, and the levee raises and underseepage improvements for Argentine, Armourdale and CID. Schedules for all projects will be updated regularly. Dates provided for O&M manual completions are approximate at this time, but are anticipated to undergo reviews and updates periodically throughout construction.

9.1 General Design Milestones

The Supplementation Hydrology, Hydraulics, and Levee Height Report is currently the only design product categorized as applying to all three levee systems. The report supplements previous analysis to consider additional studies, data, and design guidance that have become available since completion of the Hydrology and Hydraulics in the 2006 Interim Feasibility Report. Table 6 presents a summary of the project milestones for the report. Earlier reviews are categorized by the products reviewed at the time, primarily consisting of an updated hydraulic model and draft report that was completed in Jun 2018, whereas the top of levee, climate resilience, and a more complete report were provided to ATR in January 2019. Coincident frequency analysis for river stage and precipitation, and analysis of Argentine Pump Station Capacities for the D-B RFP were added in an interior drainage, general attachment and reviewed by ATR in September 2019. The KVDD received a copy of the associated model and reports at each submission to ATR and has provided comments that have been considered within the project report.

TABLE 6: SUPPLEMENTAL HYDROLOGY, HYDRAULICS, AND LEVEE HEIGHT REPORT

Project Phase/Submittal	Estimated Completion
DQC – 65% report including hydraulic model calibration	11 Dec 2017
ATR – 65% report including hydraulic model calibration	26 Jun 2018
ATR – Climate Resilience Analysis	18 Jan 2019
DQC – 95% report including top of levee design refinement	18 Jan 2019
ATR – 95% report including top of levee design refinement	15 Mar 2019, Dec 2019*
DQC – 95% interior drainage attachment, general and Argentine PS	7 Aug 2019
ATR – 95% interior drainage attachment, general and Argentine PS	27 Sep 2019
SAR – 95% report (to be provided with levee raise designs)	see Section 9.4
Product Certification (post SAR)	Jun-2020

*Updates to the report will be provided to ATR in advance of the SAR

**May be provided earlier to the SAR panel than the levee raise design and construction documents.

9.2 Argentine Pump Station Project Milestones

The Argentine Unit Pump Station review milestones are presented in Table 7. A \$33.3 million D-B contract was awarded to Michels Corporation on September 25, 2019, including approximately \$1 million of sponsor-funded betterments to pump station capacities. Michels Corporation has partnered with the A-E firm Cole & Associates to be the designer of record. Dates in the table assume that notice to proceed will occur in mid-October 2019, and will be further refined upon receipt of the contractor's proposed schedule, which may include additional break down of design deliverables, to include possibly accelerating the design of individual pump stations. A facilitated semi-quantitative risk assessment (SQRA) was conducted for the full Argentine levee system in September 2019. The draft SQRA report will be included in the levee raise 65% design documents and made available to the Argentine pump station ATR team to verify risks are adequately addressed during design. USACE will closely coordinate efforts between the levee raise and pump station design teams throughout the life of the project.

TABLE 7: ARGENTINE UNIT PUMP STATION REVIEW SCHEDULE (AE D/B - DESIGN EFFORT #1)

Project Phase/Submittal*	Estimated Completion
RFP Review – DQC, ATR (informal), BCOES	6/21/2019
35% Review – DQC, ATR	Feb-20
65% Review - DQC, ATR, SAR (review of RFP)	May-20
95% Review – DQC, ATR	Sep-20
Final Review – DQC, ATR (Cleared for Construction)	Oct-20
Volume 2, O&M Manual, Pump Stations – DQC, ATR	Nov-21

*Contractor may choose to accelerate the design of certain pump stations, will update upon receipt of a more detailed schedule from the contractor. See Section 9.4 for review of the risk assessment.

9.3 Armourdale and CID Pump Station Project Milestones

Table 8 presents the review products and milestones for the modification of 12 pump stations to address strength and uplift concerns and to abandon in place 4 additional pump stations on Armourdale and CID. Design of the modifications was initiated on September 6, 2019, with the award of a design A-E Task Order to Affinis Corporation, with major structural engineering support from their sub-consultant, HDR.

TABLE 8: ARMOURDALE AND CID PUMP STATION MODIFICATION (AE D/B/B – DESIGN #4)

Project Phase*	Estimated Completion
50% Review – DQC, ATR	Jan-20
65% Review - SAR	Feb-20
95% Review – DQC, ATR, BCOES	Apr-20
Final Review – DQC, ATR, BCOES Certification	May-20
O&M Manual – DQC	Nov-21

*One AE Task Order is planned to design two construction packages: Pump Station Modifications for Armourdale, and Pump Station Modifications for CID.

9.4 Levee Raises, Argentine, Armourdale and CID

Two individual design efforts are being combined into one large levee raise contract for Argentine, Armourdale, and CID, and up to two contracts with underseepage features, primarily relief wells, proposed to be pulled from the Armourdale and CID levee units for small business opportunities. Design documentation, drawing scales, and specifications will be closely coordinated between the in-house USACE design team on Argentine, and the integrated AE and USACE team consisting of primarily AE resources on Armourdale and CID. The Argentine USACE levee raise design initiated in October of 2018, whereas the Armourdale and CID design initiated on April 12, 2019 with the award of the first of two A-E task orders to HNTB. The work will involve three sets of the following documents, one for each levee unit: design documentation reports including a semi-quantitative risk assessment, plans, and operation and maintenance manuals (O&M manuals). One set of construction specifications will be made to cover the raises all three levee units. The underseepage contracts will involve an additional similar set of plans and specifications for each contract that would be focused on installation of relief wells and associated collection of flows in areas outside of railroad right-of-way on Armourdale and CID. Table 9 presents the early design schedule for the USACE design of the Argentine Levee Raise prior to 95%. All remaining review schedules are included in Table 10 for the levee raises of Argentine, Armourdale, and CID units, and the underseepage improvements for Armourdale and CID. To streamline the SAR review, all products to include general design reports will be assembled prior to submission to the panel for review.

TABLE 9: ARGENTINE UNIT LEVEE RAISE REVIEW SCHEDULE (USACE D/B/B – DESIGN EFFORT #2)

Project Phase	Estimated Completion
Preliminary Design – DQC	Dec-18
35% Review – DQC, ATR (site visit including pump stations)	Apr-19
65% Review (w/ risk assessment) - DQC, ATR, SAR	Feb-20

TABLE 10: LEVEE RAISES REVIEW SCHEDULE (DESIGN EFFORT #3)

Project Phase/Submittal	Estimated Completion
AE / USACE Design of Armourdale / CID	
Preliminary USACE/AE Design (Early Deliverables) – DQC	Oct-19
35% Levee Raise USACE/AE Design Review – DQC, ATR (site visit)*	Jan-20
65% Underseepage – DQC, ATR	Apr-20
65% Levee Raise with Risk Assessment – DQC, ATR	May-20
95% Review; 2 Underseepage Improvement Contracts (Armourdale, CID), USACE/AE D/B/B – DQC, ATR, BCOES	Jun-20
Final Review; 2 Underseepage Improvement Contracts (Armourdale, CID), USACE/AE D/B/B – DQC, ATR, BCOES Certification	Jul-20
Argentine (USACE Design), and Armourdale, and CID (AE / USACE Design) Levee Raises	
65% Review w/ general design, risk assessments, underseepage - SAR	Jun-20
95% Review – DQC, ATR, BCOES	Sep-20
Final Review – (D/B/B) – DQC, ATR BCOES	Jan-21
O&M Manuals – DQC	Nov-21

Section 10

Public Posting of Review Plan

As required by EC 1165-2-217, the approved RP will be posted on the District public website. Kansas City District posts review plans at <https://www.nwk.usace.army.mil/Missions/Civil-Works/Civil-Works-Programs-And-Projects/Civil-Works-Review-Plans/>. This is not a formal comment period and there is no set timeframe for the opportunity for public comment. If and when comments are received, the PDT will consider them and decide if revisions to the RP are necessary.

Section 11

Review Plan Approval and Updates

The MSC Commander, or delegated official, is responsible for approving this RP. The Commander's approval reflects vertical team input (involving the District, MSC, and RMC) as to the appropriate scope, level of review, and endorsement by the RMC. The RP is a living document and should be updated in accordance with 1165-2-217. All changes made to the approved RP will be documented in Attachment 3. Significant changes to the Review Plan (such as changes to the scope and/or level of review) will be re-endorsed by the RMC and re-approved by the MSC Commander following the process used for initially approving the plan. The latest version of the RP, along with the Commanders' approval memorandum, will be posted on the District's webpage and linked to the HQUSACE webpage. The approved RP should be provided to the RMO.

Section 12

Engineering Models

The use of certified, validated, or agency approved engineering models is required for all activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. The responsible use of well-known and proven USACE developed and commercial engineering software will continue and the professional practice of documenting the application of the software and modeling results will be followed. The selection and application of the model and the input and output data is still the responsibility of the users and is subject to DQC, ATR, BCOES, policy and legal review, and SAR (if required). Where such approvals have not been completed, appropriate independent checks of critical calculations will be performed and documented. Any engineering models, software, and tools to be used will be certified and agency approved and will be subject to the reviews described in the RP.

Section 13

Review Plan Points of Contact

TABLE 12: RP POC'S

Title	Organization	Phone
Program Manager	CENWK-PMC-J	816-389-2321
Project Manager (Armourdale / CID levee raises and underseepage)	CENWK-PMC-J	816-389-3328
Project Manager (Argentine Levee)	CENWK-PMC-J	816-389-3841
Project Manager (Arm/CID pump station modifications)	CENWK-PMC-J	816-389-2352
Review Plan Author	CENWK-ED	816-389-3482
Senior Reviewer	CEIWR-RMC	304-399-5217

ATTACHMENT 3

Review Plan Revisions

TABLE 3.1 RP REVISIONS

Revision Date	Description of Change	Page/Paragraph Number
Oct 1, 2019	Updated acquisition strategy and schedule per approved change requests. Updated team roles and project features.	<p><u>Acquisition Strategy</u>: Section 1.1, paragraph 2, Section 2.1.3, paragraph 2, Tables 1, 4, 5, and 8-10; Section 2.1.3.1 paragraph 2; Section 9, deleted Table for Armourdale pump station replacements D-B contract for Mill and 12th Street, moved and edited two levee raise tables to a new Section 9.4.</p> <p><u>Schedule</u>: updated dates in Section 9 due to 2019 flood impacts and associated change requests and updated milestones with actual dates for completed products. <u>Team roles</u>: updated tables in Section 13 and Attachment 1. Clarified ATR requirements for the LSOG member in Table 3. Updated Table 5 and text in Section 5.3 to streamline the SAR reviews from coordination w/ RMC. <u>Project features</u>: updated quantities and provided a better map of the project vicinity (replaced Figure 1).</p>

ATTACHMENT 4

Completion of Agency Technical Review

This Statement of Technical Review has been completed for the [product type & short description of item] for the Kansas Citys Levee Program. See attached summary of unresolved issues and future commitments, the Charge questions, a brief resume of ATR reviewers, and a printout of all DrCheckssm comments with resolution. The ATR was conducted as defined in the project's Review Plan to comply with the requirements of EC 1165-2-217. During the ATR, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions, methods, procedures, and material used in analyses, alternatives evaluated, the appropriateness of data used and level obtained, and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing US Army Corps of Engineers policy. The ATR also assessed the District Quality Control (DQC) documentation and made the determination that the DQC activities employed appear to be appropriate and effective. All comments resulting from the ATR have been resolved or have been elevated and are attached. All comments in DrCheckssm are closed.

Name ATR Team Leader Office Symbol/Company	Date
Name Project Manager Office Symbol	Date
David E. Carlson, P.E. Chief, Eastern Division CEIWR-RMC	Date

CERTIFICATION OF AGENCY TECHNICAL REVIEW

Significant concerns and the explanation of the resolution are as follows: *Describe the major technical concerns and their resolution and specifically list any agreed-upon deferrals to be completed in the next phase of work or state "There are no significant concerns or any unresolved comments"*. As noted above, all concerns resulting from the ATR of the project have been fully resolved or have been elevated and documented with this certification.

John Holm Chief, Engineering Division CENWK-ED	Date
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ATTACHMENT 5

Planned Improvements: Argentine, Armourdale, Central Industrial District

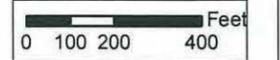
NOTES:

1. Utility easements are not shown.
2. Levee raise shown stopping at levee centerline for clarity. Raise actually involves entire levee crown width.

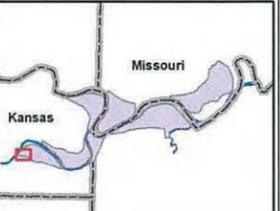
Key

- 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
 - Pump Plant
 - Existing Levee/Floodwall
 - Floodwall
 - Levee
- Potentially Affected Areas
 - Floodwall raise
 - Buried collector
 - Levee raise
 - Soils replacement, Filter blanket
 - I-walls

Photography Date: 2001



Projection: UTM Zone 15, Feet
Datum: NAD 83
Created by: U.S. Army Corps of Engineers
Kansas City District, GDS Team
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United States Army Corps of Engineers, Kansas City District,
601 East 12th, Room 812, Kansas City, Missouri, 64106



Utility Uplift Concern Area
45+00 to 85+00

Turner Station Pump Plant - no replacement
5'x8'(2) RCB deloading w/ floodwall
Relief Wells (7)

ARGENTINE

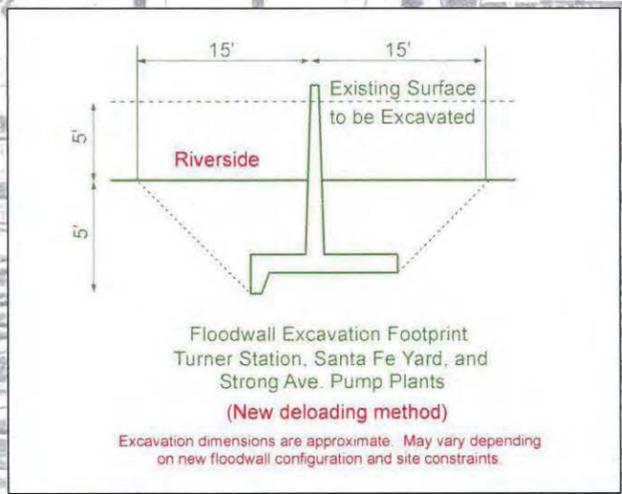
Landside levee raise & Stability berm
29+70 to 61+00

Buried collector
34+00 to 40+00

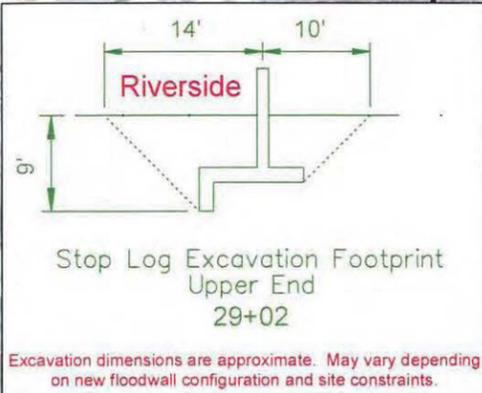
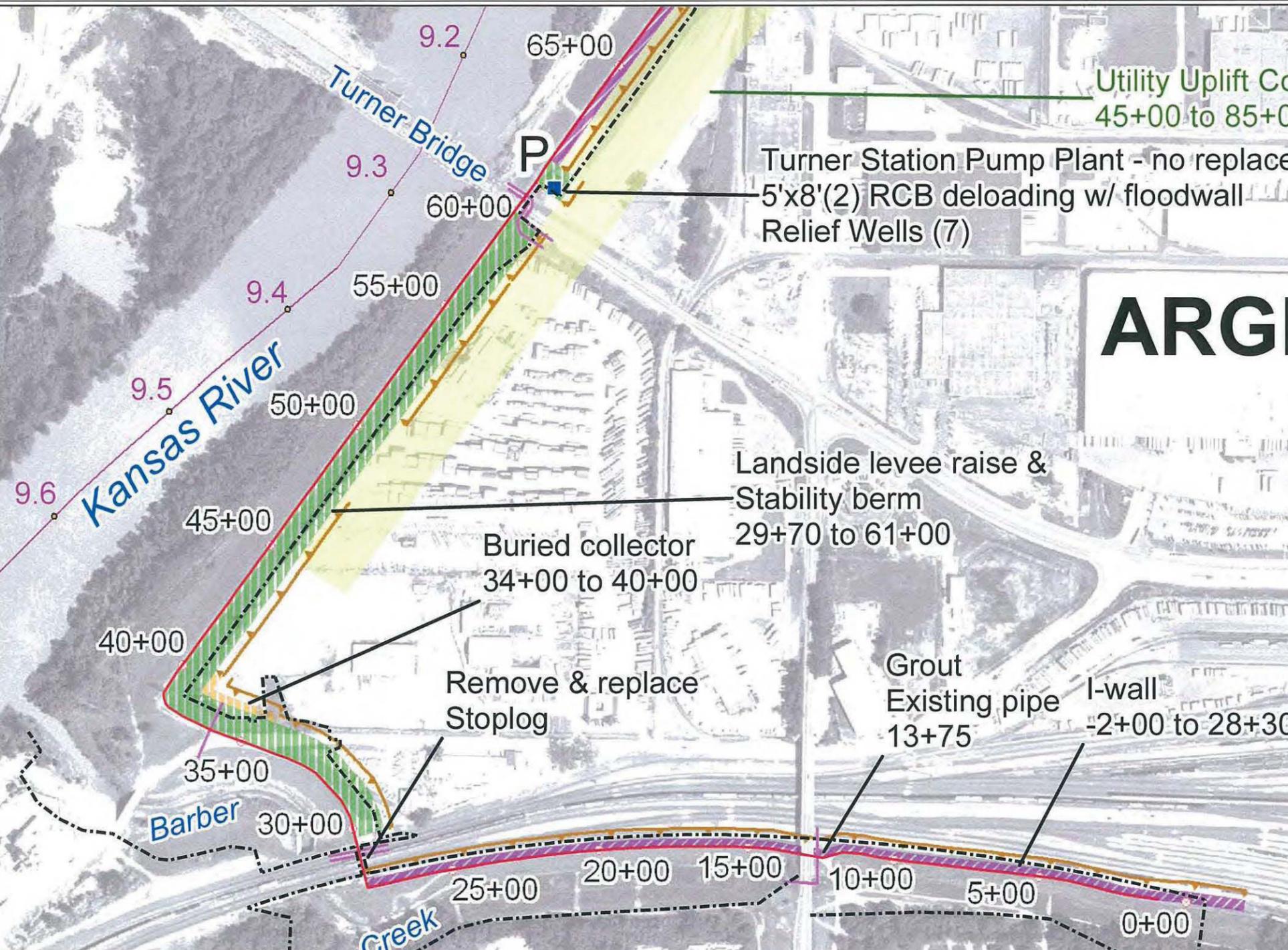
Remove & replace Stoplog

Grout Existing pipe
13+75

I-wall
-2+00 to 28+30



Nominal 500 year plus 3 feet	
Station Range Feet	Type of Levee Raise
-2+00 to 28+30	Construct I-wall on levee
28+30 to 29+70	Remove & replace stoplog
29+70 to 61+00	Landside levee raise with berm
59+50 to 61+30	Deloading, floodwall (Turner P. Plant)
61+00 to 118+00	Construct I-wall on levee
118+00 to 245+00	Landside levee raise with berm
245+00 to 251+65	Construct I-wall on levee
251+65 to 253+92	Replace floodwall with levee
257+46 to 259+26	Deloading, floodwall (Santa Fe P. Plant)
253+92 to 276+70	Construct I-wall with rockfill toe
272+51 to 274+31	Deloading, floodwall (Strong Ave. P. Plant)
276+70 to 289+09	Remove & replace floodwall
287+91 to 289+00	Remove & replace stoplog gap
289+09 to 289+40	Construct I-wall on levee



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

Feasibility Study

14 APR 06

**Recommended Plan
Footprint Mapping**

Nom500yr + 3 ft.

**Argentine Unit
60+00 to 125+00**

NOTES:

1. Utility easements are not shown.
2. Levee raise shown stopping at levee centerline for clarity. Raise actually involves entire levee crown width.

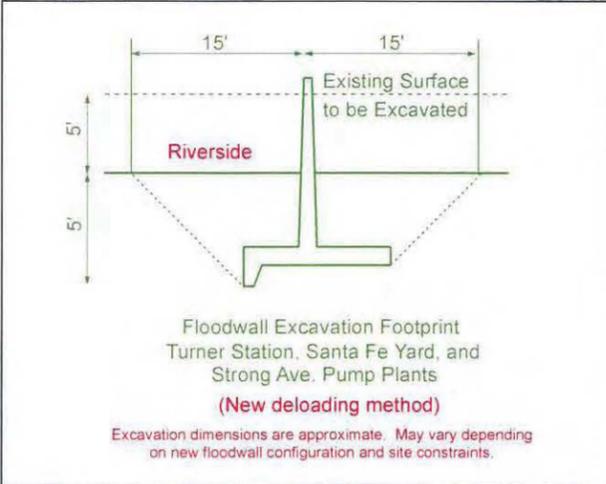
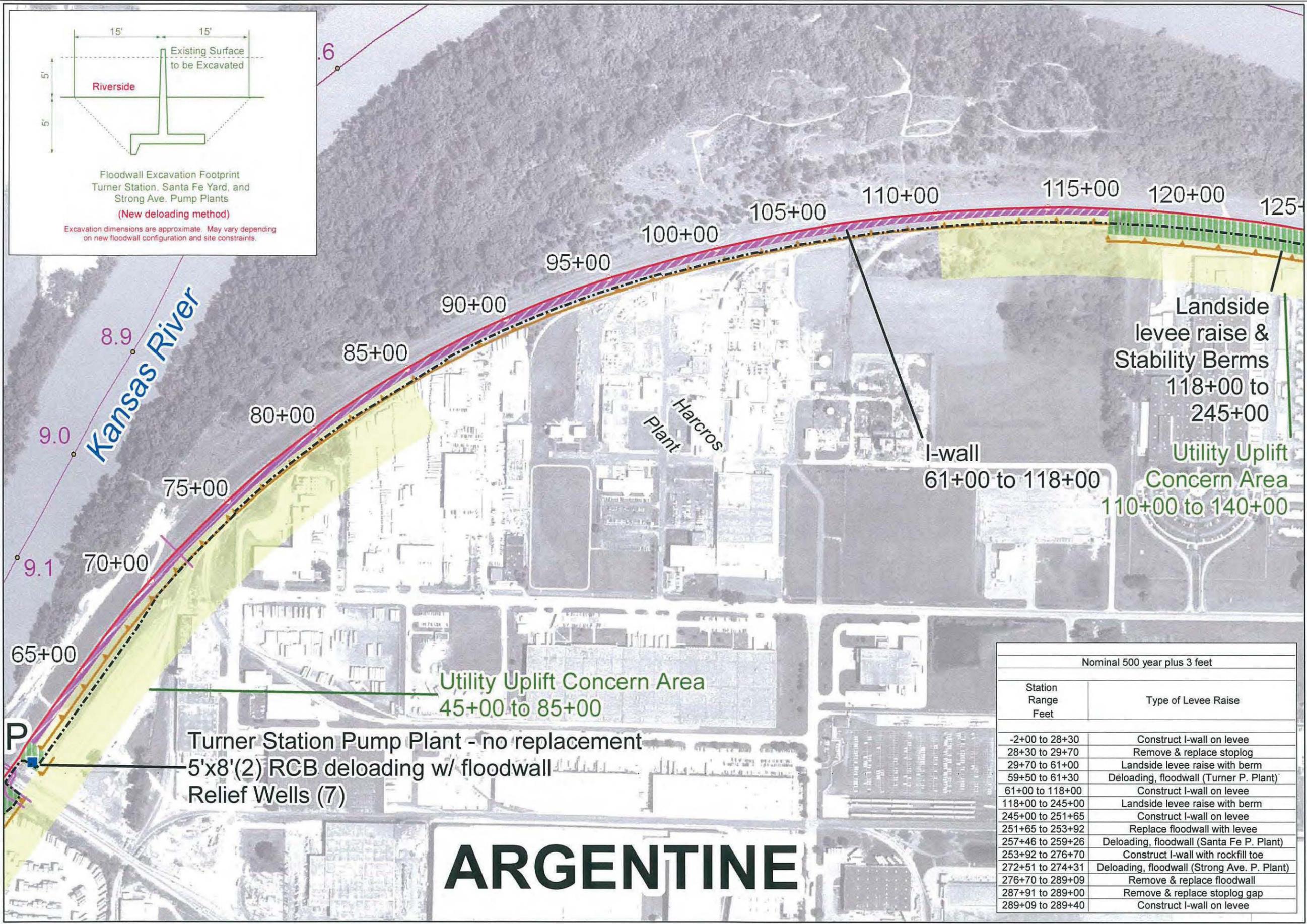
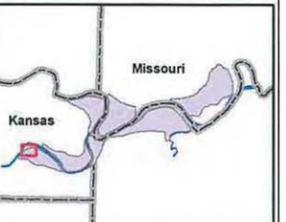
Key

- Existing Right of Way
- Temporary Easement Requirement
- River Mile Markers
- Utility Uplift concern areas within 300' of levee centerline
- Utility Crossings
- Existing Levee Features
 - Pump Plant
- Existing Levee/Floodwall
 - Floodwall
 - Levee
- Potentially Affected Areas
 - Floodwall raise
 - Buried collector
 - Levee raise
 - Soils replacement, Filter blanket
 - I-walls

Photography Date: 2001

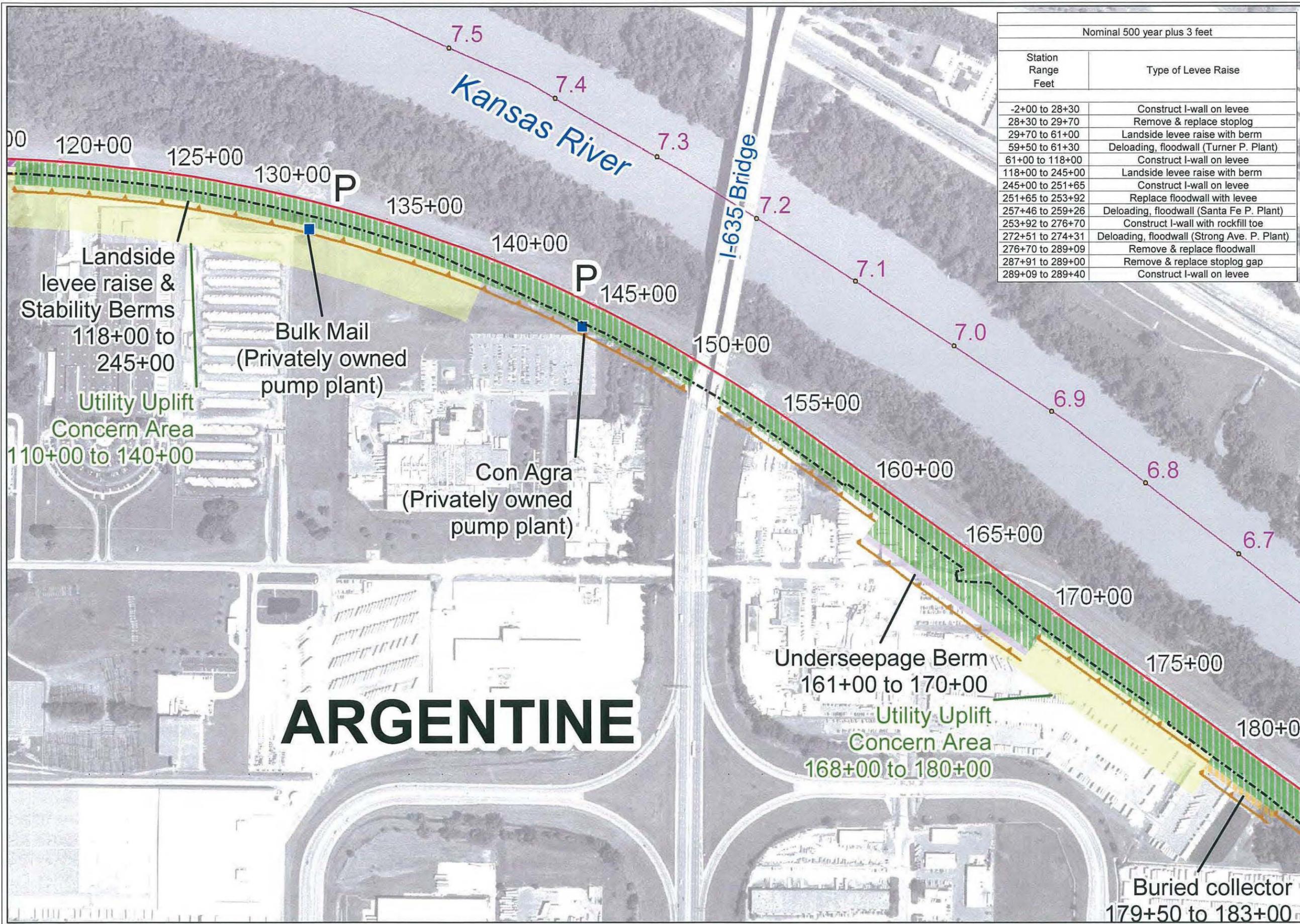


Projection: UTM Zone 15, Feet
Datum: NAD 83
Created by: U.S. Army Corps of Engineers
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Nominal 500 year plus 3 feet	
Station Range Feet	Type of Levee Raise
-2+00 to 28+30	Construct I-wall on levee
28+30 to 29+70	Remove & replace stoplog
29+70 to 61+00	Landside levee raise with berm
59+50 to 61+30	Deloading, floodwall (Turner P. Plant)
61+00 to 118+00	Construct I-wall on levee
118+00 to 245+00	Landside levee raise with berm
245+00 to 251+65	Construct I-wall on levee
251+65 to 253+92	Replace floodwall with levee
257+46 to 259+26	Deloading, floodwall (Santa Fe P. Plant)
253+92 to 276+70	Construct I-wall with rockfill toe
272+51 to 274+31	Deloading, floodwall (Strong Ave. P. Plant)
276+70 to 289+09	Remove & replace floodwall
287+91 to 289+00	Remove & replace stoplog gap
289+09 to 289+40	Construct I-wall on levee

ARGENTINE



Nominal 500 year plus 3 feet	
Station Range Feet	Type of Levee Raise
-2+00 to 28+30	Construct I-wall on levee
28+30 to 29+70	Remove & replace stoplog
29+70 to 61+00	Landside levee raise with berm
59+50 to 61+30	Deloading, floodwall (Turner P. Plant)
61+00 to 118+00	Construct I-wall on levee
118+00 to 245+00	Landside levee raise with berm
245+00 to 251+65	Construct I-wall on levee
251+65 to 253+92	Replace floodwall with levee
257+46 to 259+26	Deloading, floodwall (Santa Fe P. Plant)
253+92 to 276+70	Construct I-wall with rockfill toe
272+51 to 274+31	Deloading, floodwall (Strong Ave. P. Plant)
276+70 to 289+09	Remove & replace floodwall
287+91 to 289+00	Remove & replace stoplog gap
289+09 to 289+40	Construct I-wall on levee

Kansas City, Missouri and Kansas Flood Damage Reduction Project
Feasibility Study
14 APR 06

Recommended Plan Footprint Mapping
Nom500yr + 3 ft.

Argentine Unit 120+00 to 180+00

- NOTES:**
- Utility easements are not shown.
 - Levee raise shown stopping at levee centerline for clarity. Raise actually involves entire levee crown width.

Key

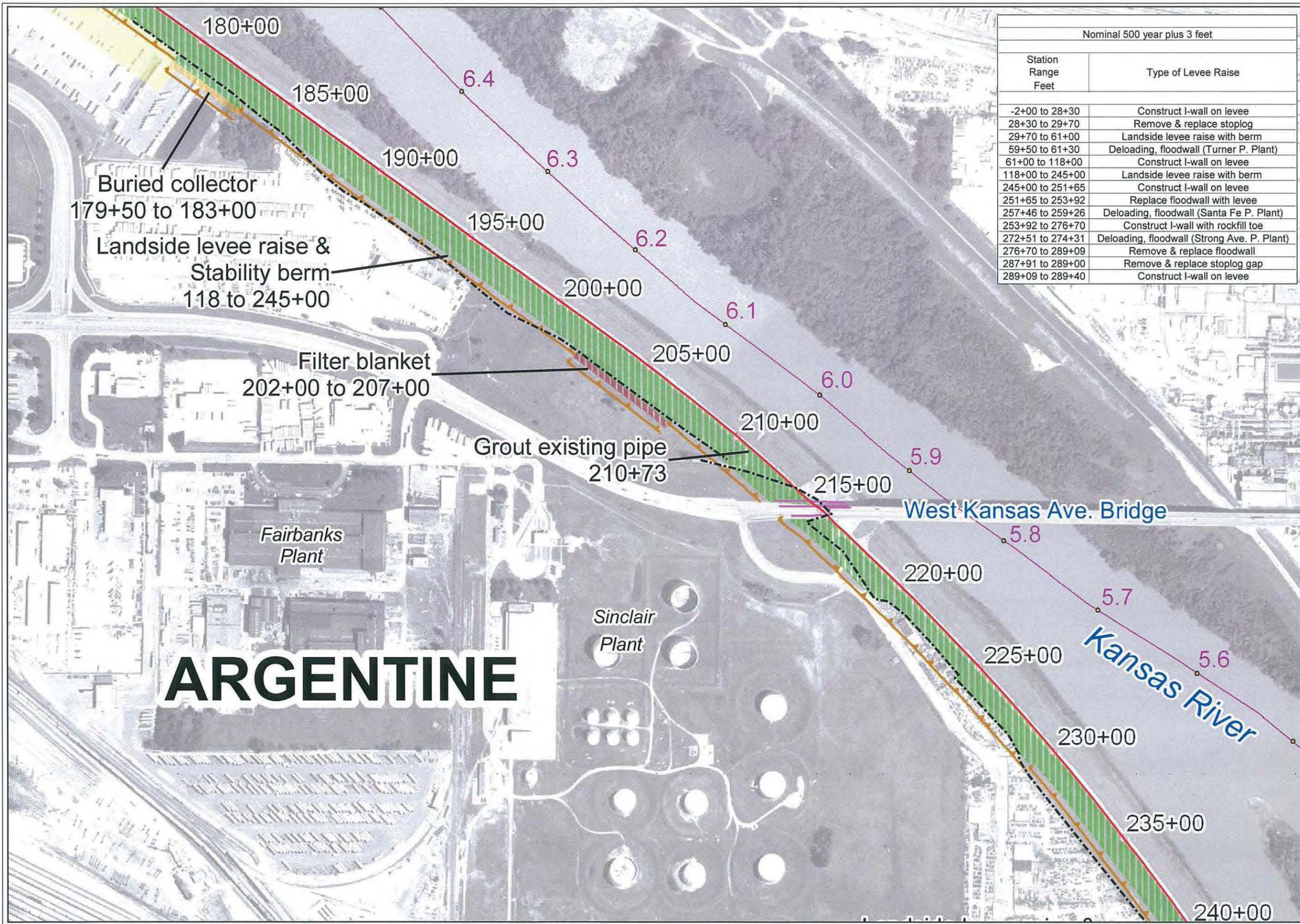
- Existing Right of Way
- Temporary Easement Requirement
- River Mile Markers
- Utility uplift concern areas within 300' of levee centerline
- Utility Crossings
- Existing Levee/Floodwall Features**
- Pump Plant
- Existing Levee/Floodwall**
- Floodwall
- Levee
- Potentially Affected Areas**
- Floodwall raise
- Buried collector
- Levee raise
- Soils replacement, Filter blanket
- I-walls

Photography Date: 2001

Projection: UTM Zone 15, Feet
 Datum: NAD 83
 Created by: U.S. Army Corps of Engineers
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 United States Army Corps of Engineers, Kansas City District,
 601 East 12th, Room 812, Kansas City, Missouri, 64106



ARGENTINE



ARGENTINE

Nominal 500 year plus 3 feet	
Station Range Feet	Type of Levee Raise
-2+00 to 28+30	Construct I-wall on levee
28+30 to 29+70	Remove & replace stoplog
29+70 to 61+00	Landside levee raise with berm
59+50 to 61+30	Deloading, floodwall (Turner P. Plant)
61+00 to 118+00	Construct I-wall on levee
118+00 to 245+00	Landside levee raise with berm
245+00 to 251+65	Construct I-wall on levee
251+65 to 253+92	Replace floodwall with levee
257+46 to 259+26	Deloading, floodwall (Santa Fe P. Plant)
253+92 to 276+70	Construct I-wall with rockfill toe
272+51 to 274+31	Deloading, floodwall (Strong Ave. P. Plant)
276+70 to 289+09	Remove & replace floodwall
287+91 to 289+00	Remove & replace stoplog gap
289+09 to 289+40	Construct I-wall on levee

Kansas City, Missouri and Kansas Flood Damage Reduction Project
Feasibility Study
14 APR 06

Recommended Plan Footprint Mapping
Nom500yr + 3 ft.

Argentine Unit
180+00 to 240+00

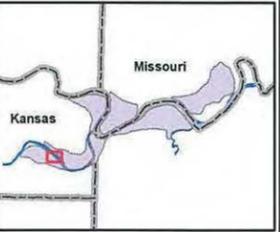
- NOTES:**
1. Utility easements are not shown.
 2. Levee raise shown stopping at levee centerline for clarity. Raise actually involves entire levee crown width.

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
 - Pump Plant
 - Existing Levee/Floodwall
 - Floodwall
 - Levee
- Potentially Affected Areas
 - Floodwall raise
 - Buried collector
 - Levee raise
 - Soils replacement, Filter blanket
 - I-walls

Photography Date: 2001

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ARGENTINE

Landside levee raise & Stability berm
118 to 245+00

Filter blanket
244+00 to 246+00

I-wall
245+00 to 251+65

Replace floodwall with levee
251+65 to 253+92

Remove and replace Argentine Pump Plant
9.5'x9' RCB

Santa Fe Yards Pump Plant
4'x5' RCB deloading with floodwall

I-wall with Rock fill toe
253+92 to 276+70

Utility Uplift Concern Area
248+00 to 275+00

Strengthen Strong Ave. Pump Plant
7'x7' RCB Strengthen box and Deloading with floodwall

Remove & replace floodwall
276+70 to 289+09

Buried collector
278+00 to 289+09

Remove & replace Stoplog

I-wall
289+09 to 289+40

Nominal 500 year plus 3 feet	
Station Range Feet	Type of Levee Raise
-2+00 to 28+30	Construct I-wall on levee
28+30 to 29+70	Remove & replace stoplog
29+70 to 61+00	Landside levee raise with berm
59+50 to 61+30	Deloading, floodwall (Turner P. Plant)
61+00 to 118+00	Construct I-wall on levee
118+00 to 245+00	Landside levee raise with berm
245+00 to 251+65	Construct I-wall on levee
251+65 to 253+92	Replace floodwall with levee
257+46 to 259+26	Deloading, floodwall (Santa Fe P. Plant)
253+92 to 276+70	Construct I-wall with rockfill toe
272+51 to 274+31	Deloading, floodwall (Strong Ave. P. Plant)
276+70 to 289+09	Remove & replace floodwall
287+91 to 289+00	Remove & replace stoplog gap
289+09 to 289+40	Construct I-wall on levee

Kansas City, Missouri and Kansas Flood Damage Reduction Project

Feasibility Study

14 APR 06

Recommended Plan Footprint Mapping

Nom500yr + 3 ft.

Argentine Unit
240+00 to 289+00 (termination)

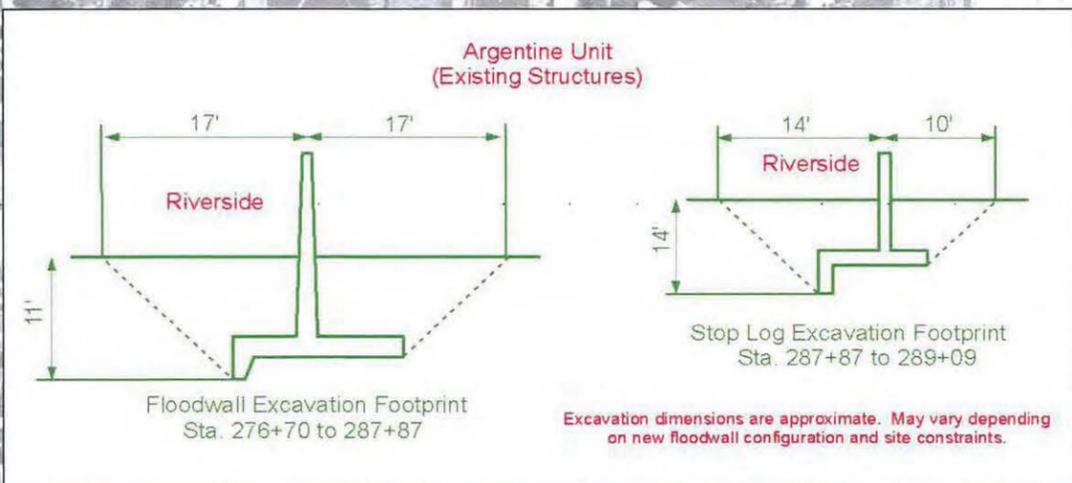
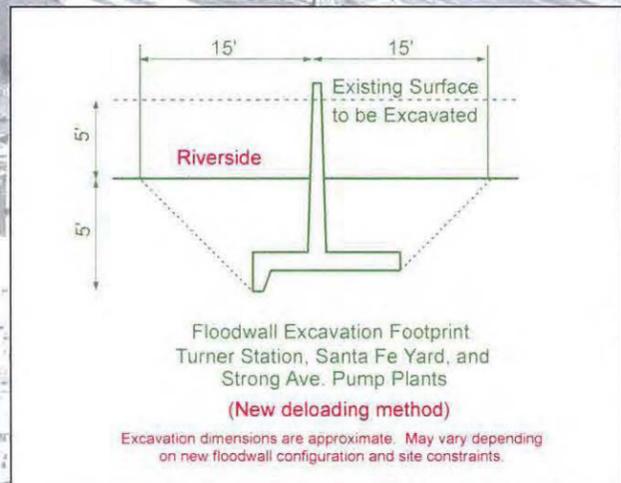
- NOTES:
- Utility easements are not shown.
 - Levee raise shown stopping at levee centerline for clarity. Raise actually involves entire levee crown width.

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
 - Pump Plant
 - Existing Levee/Floodwall
 - Floodwall
 - Levee
- Potentially Affected Areas
 - Floodwall raise
 - Buried collector
 - Levee raise
 - Soils replacement, Filter blanket
 - I-walls

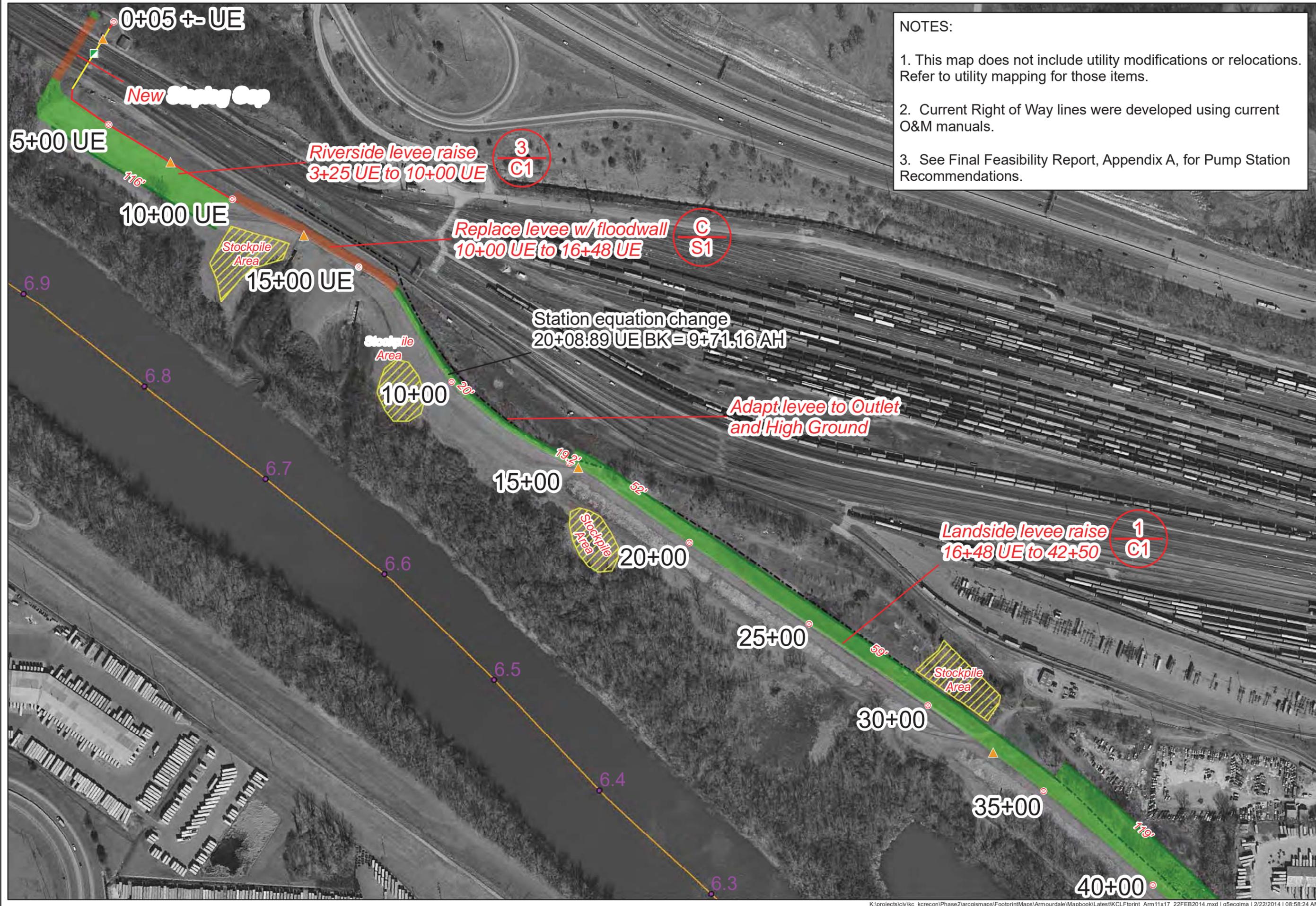
Photography Date: 2001

Projection: UTM Zone 15, Feet
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NOTES:

1. This map does not include utility modifications or relocations. Refer to utility mapping for those items.
2. Current Right of Way lines were developed using current O&M manuals.
3. See Final Feasibility Report, Appendix A, for Pump Station Recommendations.



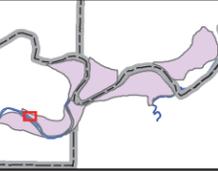
KEY

Existing Levee Features	
	Closure Structure
	Gatewell
	Abandoned Relief Well
	Active Relief Well
	Station Tick Marks
	Floodwall
	Levee
	Existing Right of Way
	Railroad
	Pump Plant
Proposed Features	
	Levee_raise
	Twall
	Floodwall
	Closure Structure
	Ponding Area
	Temporary Stockpile Area
	Distance (ft.) toe will be from existing top of levee centerline



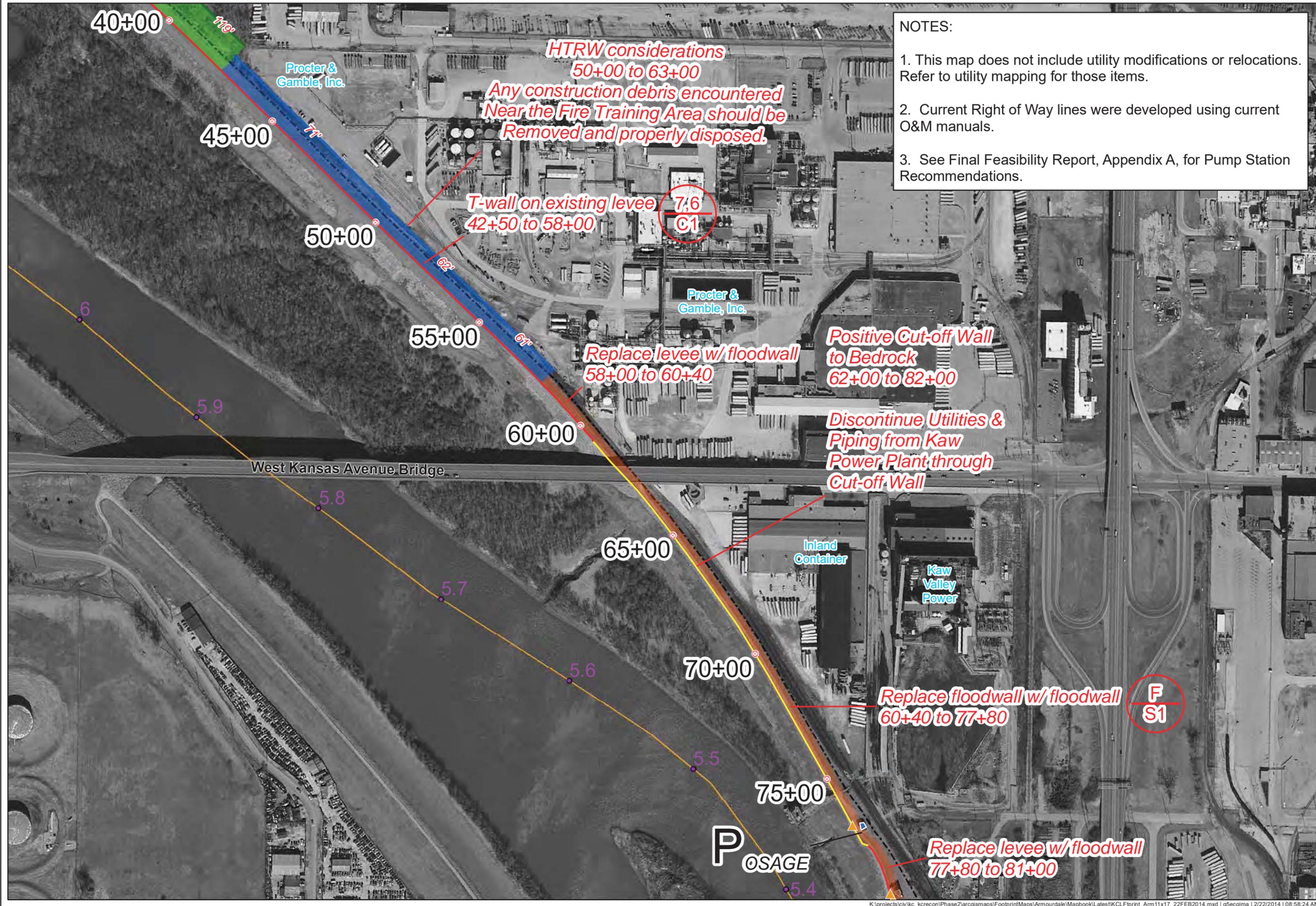
Photography Date: 2006

Projection: UTM Zone 15, Feet
Datum: NAD 83
Created by:
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Kansas City District, GDS Team
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Kansas City District,
601 East 12th, Room 812,
Kansas City, Missouri, 64106



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HTRW considerations

50+00 to 63+00
Any construction debris encountered
Near the Fire Training Area should be
Removed and properly disposed.

T-wall on existing levee
42+50 to 58+00

7,6
C1

Replace levee w/ floodwall
58+00 to 60+40

Positive Cut-off Wall
to Bedrock
62+00 to 82+00

Discontinue Utilities &
Piping from Kaw
Power Plant through
Cut-off Wall

Replace floodwall w/ floodwall
60+40 to 77+80

F
S1

Replace levee w/ floodwall
77+80 to 81+00

KEY

- Existing Levee Features**
- Closure Structure
 - Gatewell
 - Abandoned Relief Well
 - Active Relief Well
 - Station Tick Marks
 - Floodwall
 - Levee
 - Existing Right of Way
 - Railroad
 - Pump Plant
- Proposed Features**
- Levee_raise
 - Twall
 - Floodwall
 - Closure Structure
 - Ponding Area
 - Temporary Stockpile Area
 - Distance (ft.) toe will be from existing top of levee centerline



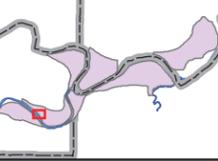
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Datum: NAD 83

Created by:
U.S. Army Corps of Engineers
Kansas City District, GDS Team

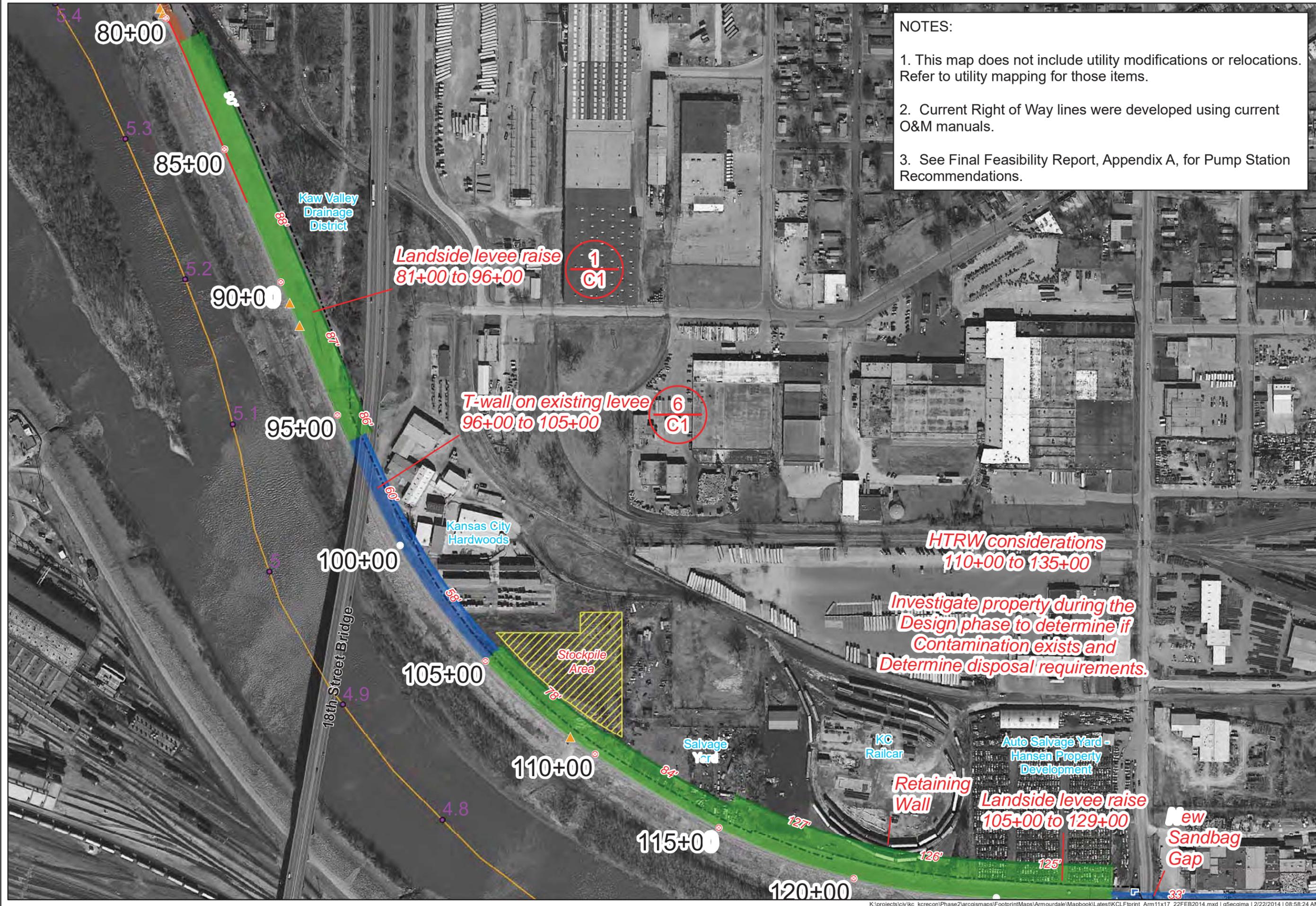
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3. See Final Feasibility Report, Appendix A, for Pump Station Recommendations.



KEY

Existing Levee Features	
	Closure Structure
	Gatewell
	Abandoned Relief Well
	Active Relief Well
	Station Tick Marks
	Floodwall
	Levee
	Existing Right of Way
	Railroad
	Pump Plant
Proposed Features	
	Levee_raise
	Twall
	Floodwall
	Closure Structure
	Ponding Area
	Temporary Stockpile Area
	Distance (ft.) toe will be from existing top of levee centerline
	Distance (ft.) toe will be from existing top of levee centerline



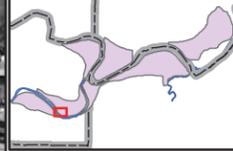
Photography Date: 2006

Projection: UTM Zone 15, Feet
Datum: NAD 83

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U.S. Army Corps of Engineers
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Kansas City, Missouri, 64106



NOTES:

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2. Current Right of Way lines were developed using current O&M manuals.
3. See Final Feasibility Report, Appendix A, for Pump Station Recommendations.

KEY

	Existing Levee Features
	Closure Structure
	Gatewell
	Abandoned Relief Well
	Active Relief Well
	Station Tick Marks
	Floodwall
	Levee
	Existing Right of Way
	Railroad
	Pump Plant
Proposed Features	
	Levee_raise
	T-wall
	Floodwall
	Closure Structure
	Ponding Area
	Temporary Stockpile Area
	Distance (ft.) toe will be from existing top of levee centerline

N

US Army Corps of Engineers
Kansas City District

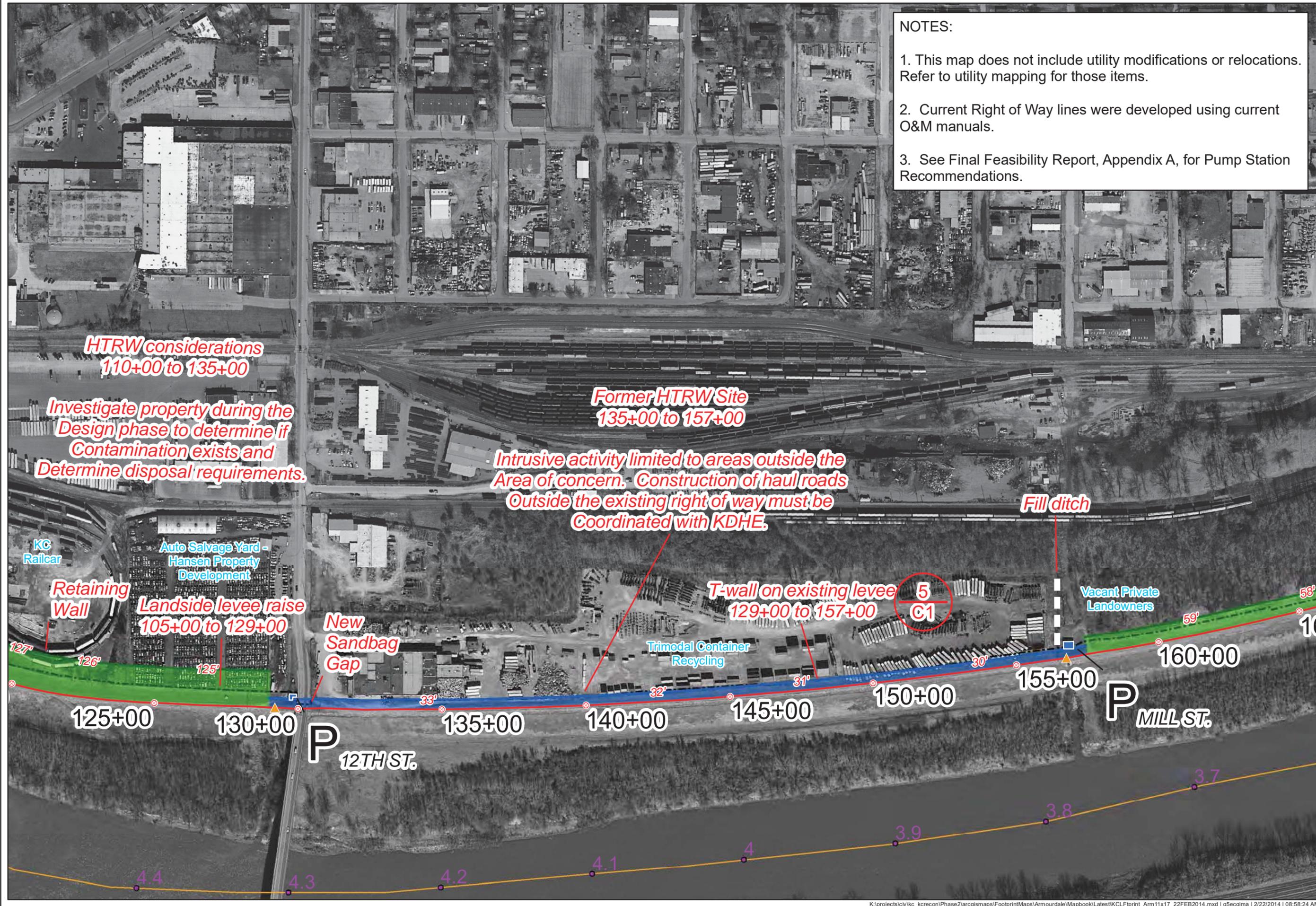
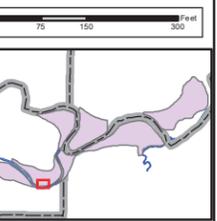
Photography Date: 2006

Projection: UTM Zone 15, Feet
Datum: NAD 83

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U.S. Army Corps of Engineers
Kansas City District, GDS Team

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Kansas City District,
601 East 12th, Room 812,
Kansas City, Missouri, 64106



NOTES:

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Kansas City,
Missouri and Kansas

Flood Risk
Management Project

Feasibility Study

Armourdale Levee Unit:
N500 + 3 ft.
February 2014

Recommended Plan
165 + 00 to 225 + 00

KEY

Existing Levee Features

- Closure Structure
- Gatewell
- Abandoned Relief Well
- Active Relief Well
- Station Tick Marks
- Floodwall
- Levee
- Existing Right of Way
- Railroad
- Pump Plant

Proposed Features

- Levee_raise
- T-wall
- Floodwall
- Closure Structure
- Ponding Area
- Temporary Stockpile Area
- Distance (ft.) toe will be from existing top of levee centerline



Photography Date: 2006

Projection: UTM Zone 15, Feet
Datum: NAD 83

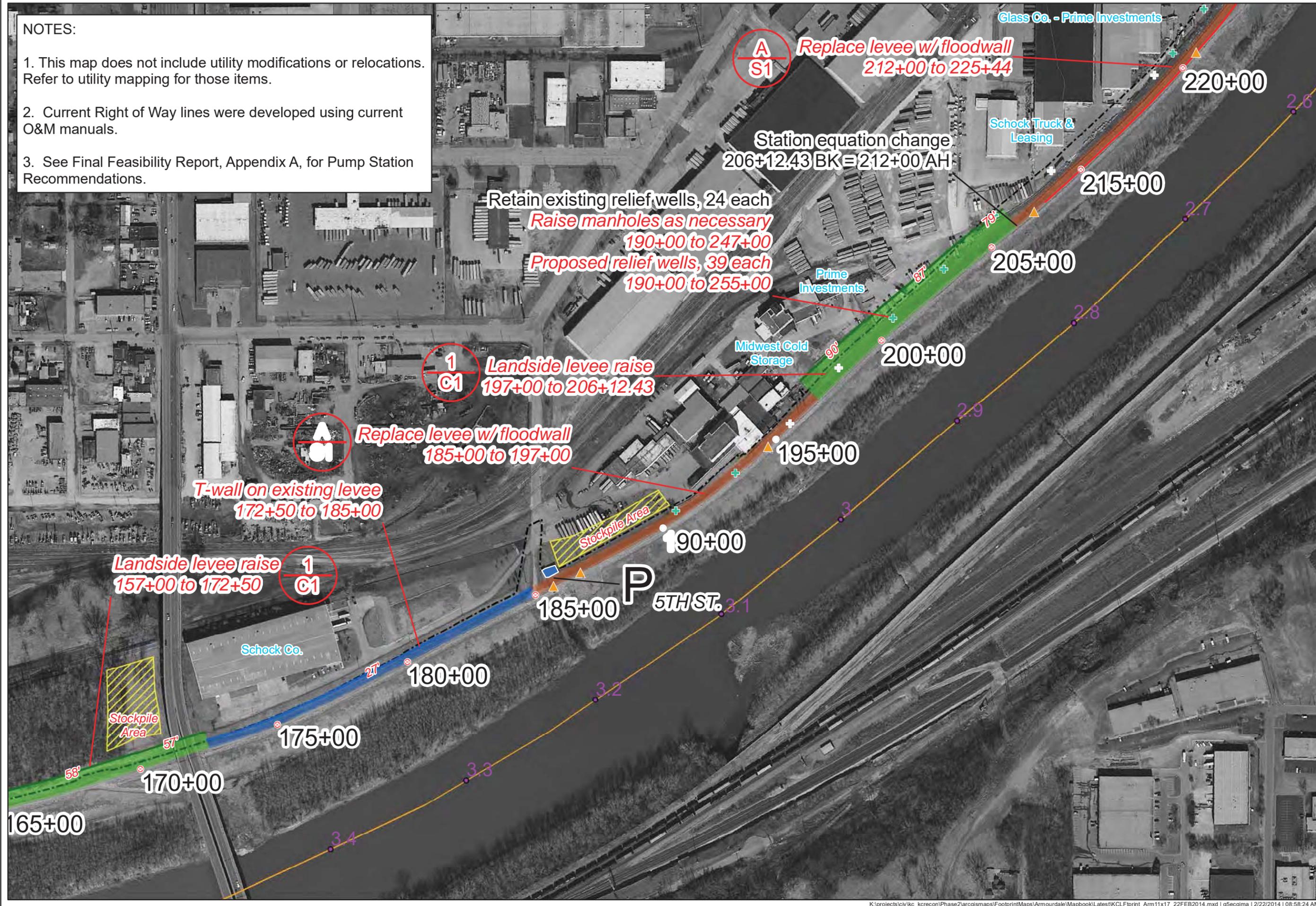
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U. S. Army Corps of Engineers,
Kansas City District,
601 East 12th, Room 812,
Kansas City, Missouri, 64106

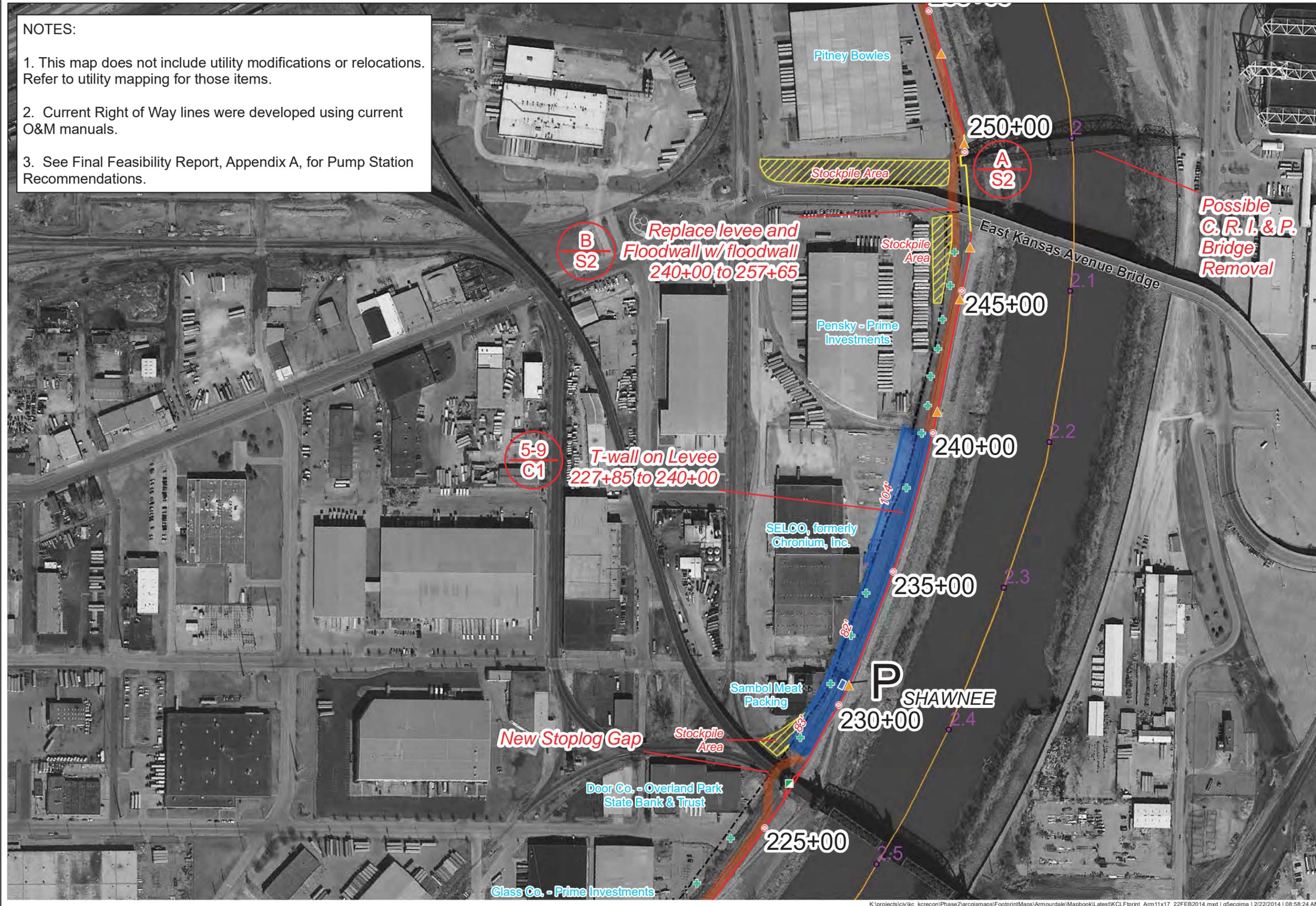


Sheet A5:
165 + 00 to 225 + 00



NOTES:

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2. Current Right of Way lines were developed using current O&M manuals.
3. See Final Feasibility Report, Appendix A, for Pump Station Recommendations.



KEY

Existing Levee Features	
	Closure Structure
	Gatewell
	Abandoned Relief Well
	Active Relief Well
	Station Tick Marks
	Floodwall
	Levee
	Existing Right of Way
	Railroad
	Pump Plant
Proposed Features	
	Levee_raise
	T-wall
	Floodwall
	Closure Structure
	Ponding Area
	Temporary Stockpile Area
	Distance (ft.) toe will be from existing top of levee centerline



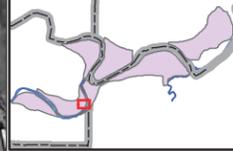
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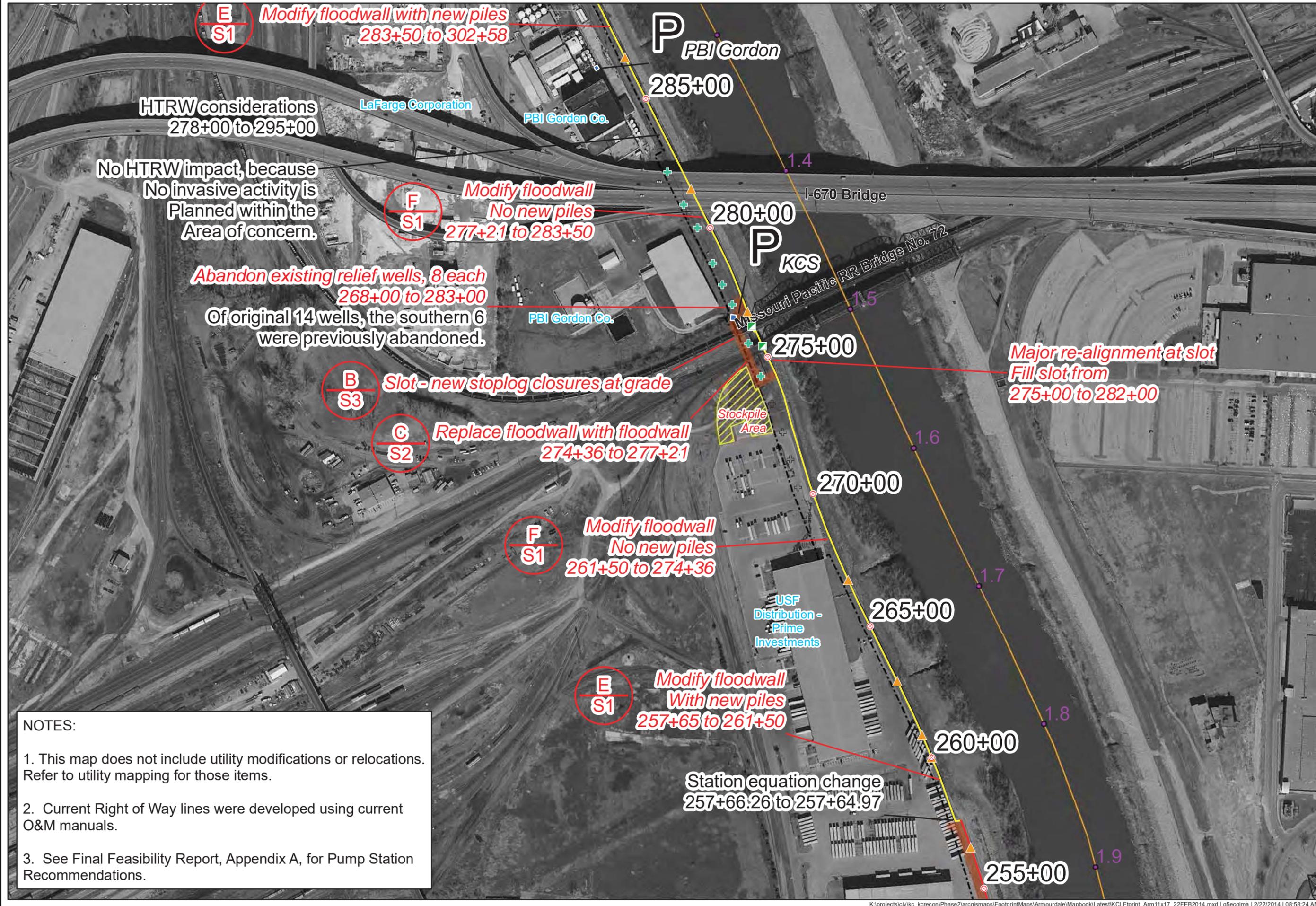
Projection: UTM Zone 15, Feet
Datum: NAD 83

Created by:
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Kansas City, Missouri, 64106





HTRW considerations
278+00 to 295+00

No HTRW impact, because
No invasive activity is
Planned within the
Area of concern.

Abandon existing relief wells, 8 each
268+00 to 283+00
Of original 14 wells, the southern 6
were previously abandoned.

B/S3 Slot - new stoplog closures at grade

C/S2 Replace floodwall with floodwall
274+36 to 277+21

F/S1 Modify floodwall
No new piles
261+50 to 274+36

E/S1 Modify floodwall
With new piles
257+65 to 261+50

Major re-alignment at slot
Fill slot from
275+00 to 282+00

Station equation change
257+66.26 to 257+64.97

- NOTES:
1. This map does not include utility modifications or relocations. Refer to utility mapping for those items.
 2. Current Right of Way lines were developed using current O&M manuals.
 3. See Final Feasibility Report, Appendix A, for Pump Station Recommendations.

KEY

Existing Levee Features	
	Closure Structure
	Gatewell
	Abandoned Relief Well
	Active Relief Well
	Station Tick Marks
	Floodwall
	Levee
	Existing Right of Way
	Railroad
	Pump Plant
Proposed Features	
	Levee_raise
	Twall
	Floodwall
	Closure Structure
	Ponding Area
	Temporary Stockpile Area
	Distance (ft.) toe will be from existing top of levee centerline



Photography Date: 2006

Projection: UTM Zone 15, Feet
Datum: NAD 83

Created by:
U.S. Army Corps of Engineers
Kansas City District, GDS Team

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3. See Final Feasibility Report, Appendix A, for Pump Station Recommendations.

KEY

Existing Levee Features

- Closure Structure
- Gatewell
- Abandoned Relief Well
- Active Relief Well
- Station Tick Marks
- Floodwall
- Levee
- Existing Right of Way
- Railroad
- Pump Plant

Proposed Features

- Levee_raise
- Twall
- Floodwall
- Closure Structure
- Ponding Area
- Temporary Stockpile Area
- Distance (ft.) toe will be from existing top of levee centerline



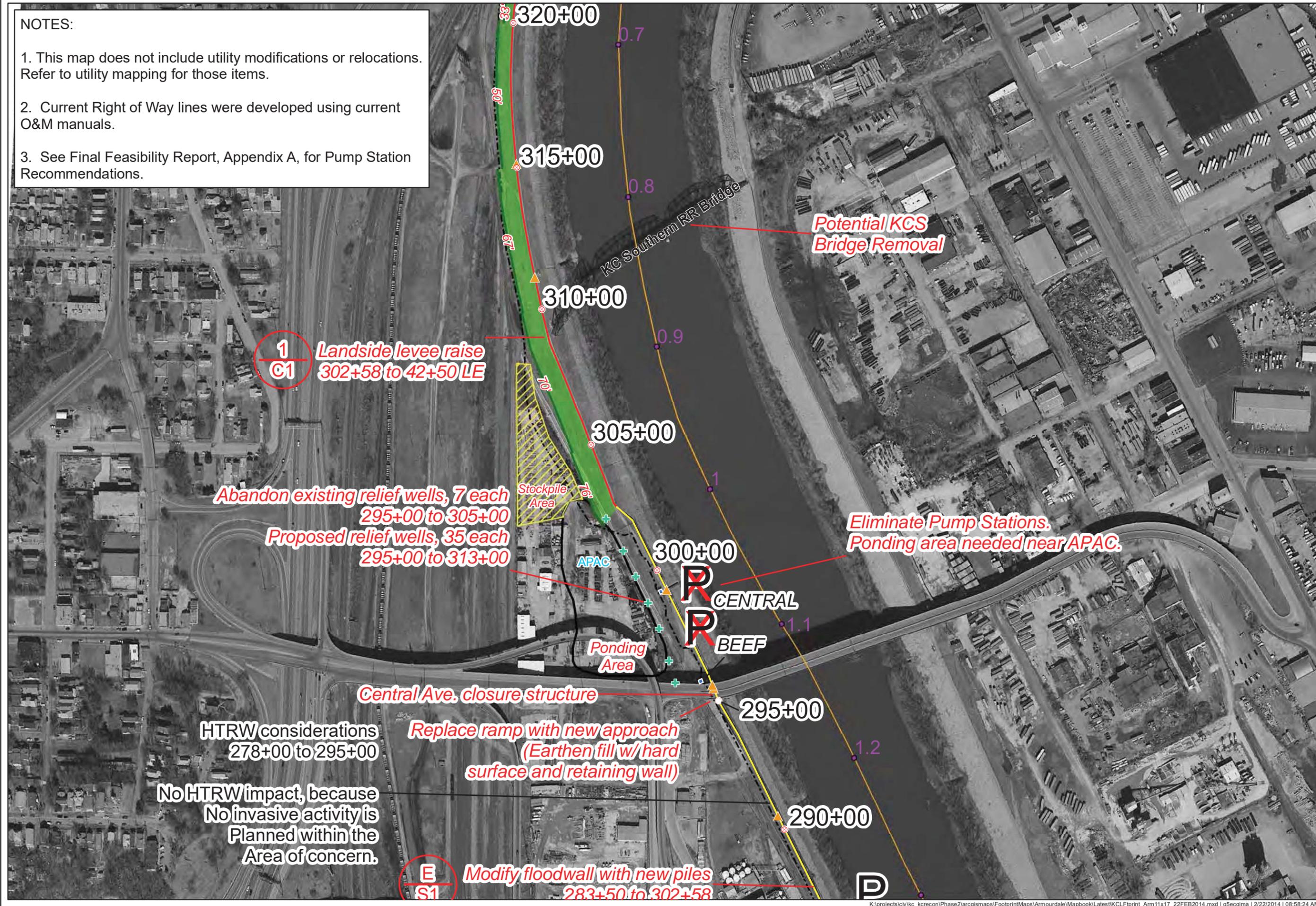
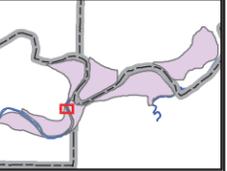
Photography Date: 2006

Projection: UTM Zone 15, Feet
Datum: NAD 83

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NOTES:

1. This map does not include utility modifications or relocations. Refer to utility mapping for those items.
2. Current Right of Way lines were developed using current O&M manuals.
3. See Final Feasibility Report, Appendix A, for Pump Station Recommendations.

Kansas City,
Missouri and Kansas

Flood Risk
Management Project

Feasibility Study

Armourdale Levee Unit:
N500 + 3 ft.
February 2014

Recommended Plan
315 + 00 to END

KEY

	Existing Levee Features
	Closure Structure
	Gatewell
	Abandoned Relief Well
	Active Relief Well
	Station Tick Marks
	Floodwall
	Levee
	Existing Right of Way
	Railroad
	Pump Plant
Proposed Features	
	Levee_raise
	Twall
	Floodwall
	Closure Structure
	Ponding Area
	Temporary Stockpile Area
	Distance (ft.) toe will be from existing top of levee centerline
	Distance (ft.) toe will be from existing top of levee centerline



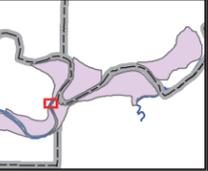
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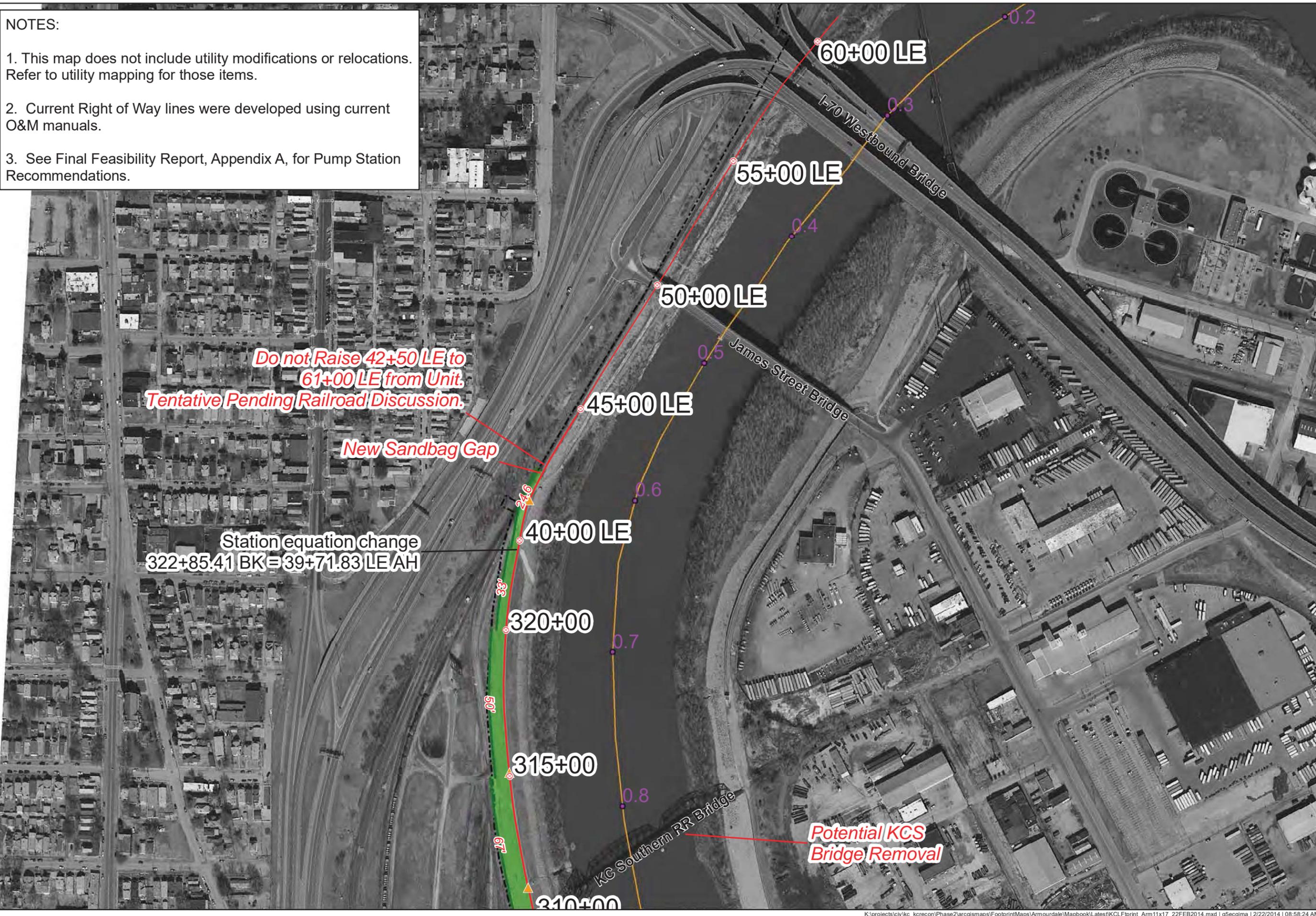
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Sheet A9:
315 + 00 to END



Recommended Plan

CID (Kansas) Unit
February 2014

Black text indicates
existing features
Red text indicates new or
modified features

KEY

- Existing Levee Features**
- Closure Structure
 - Gatewell
 - Active Relief Well
 - Abandoned Relief Well
 - Station Tick Marks
 - Buildings
 - Floodwall
 - Levee
 - Retaining wall
 - Existing Right of Way
 - Railroad
- Proposed Features**
- Closure Structure
 - Relief Well
 - Floodwall
 - Road
 - Area Fill
 - Staging/Stockpile Area
 - Levee raise



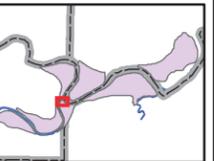
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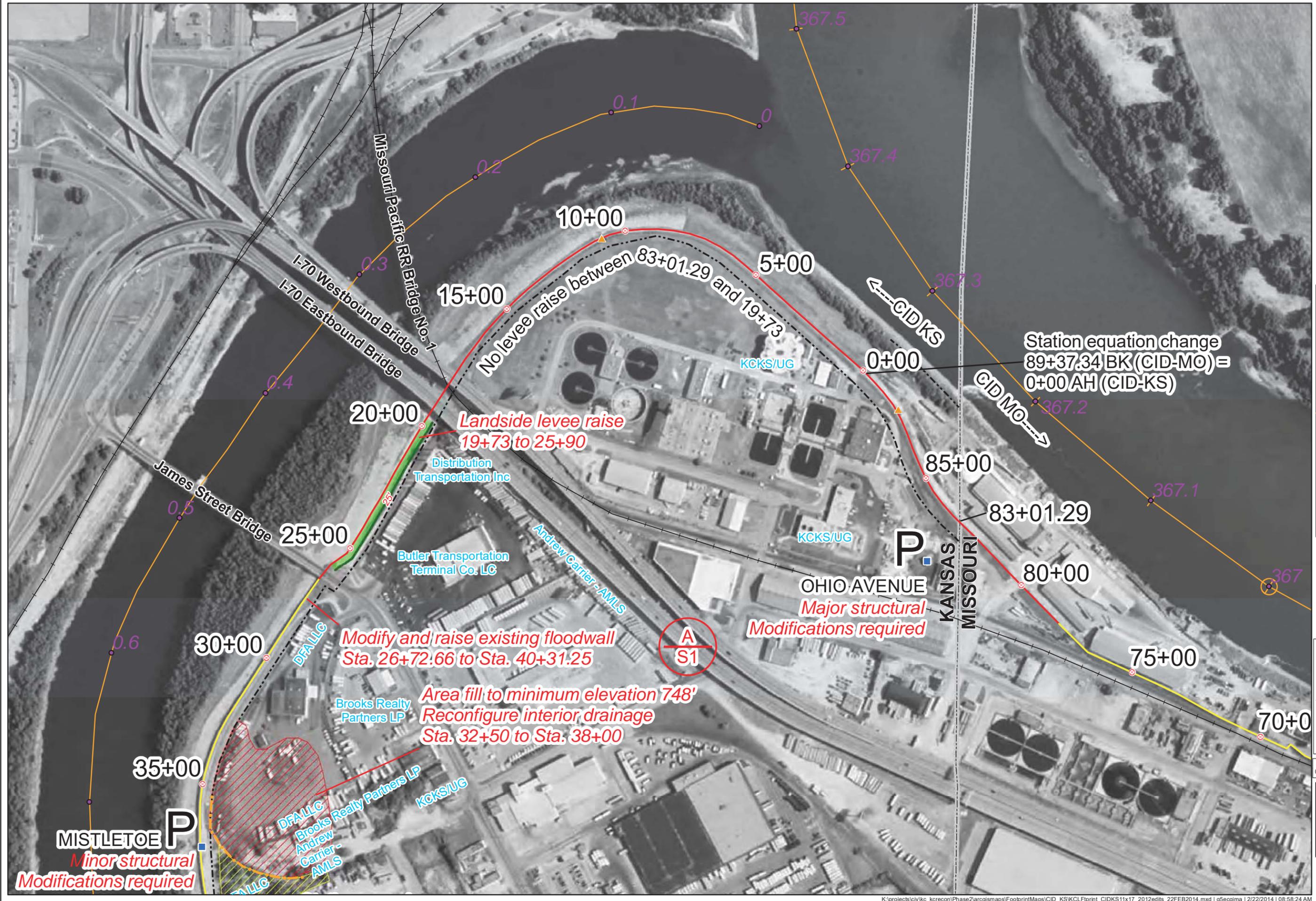
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Sheet A1:
0 + 00 to 37 + 00



KEY

Existing Levee Features

- Closure Structure
- Gatewell
- Active Relief Well
- Abandoned Relief Well
- Station Tick Marks
- Buildings
- Floodwall
- Levee
- Retaining wall
- Existing Right of Way
- Railroad

Proposed Features

- Closure Structure
- Relief Well
- Floodwall
- Road
- Area Fill
- Staging/Stockpile Area
- Levee raise



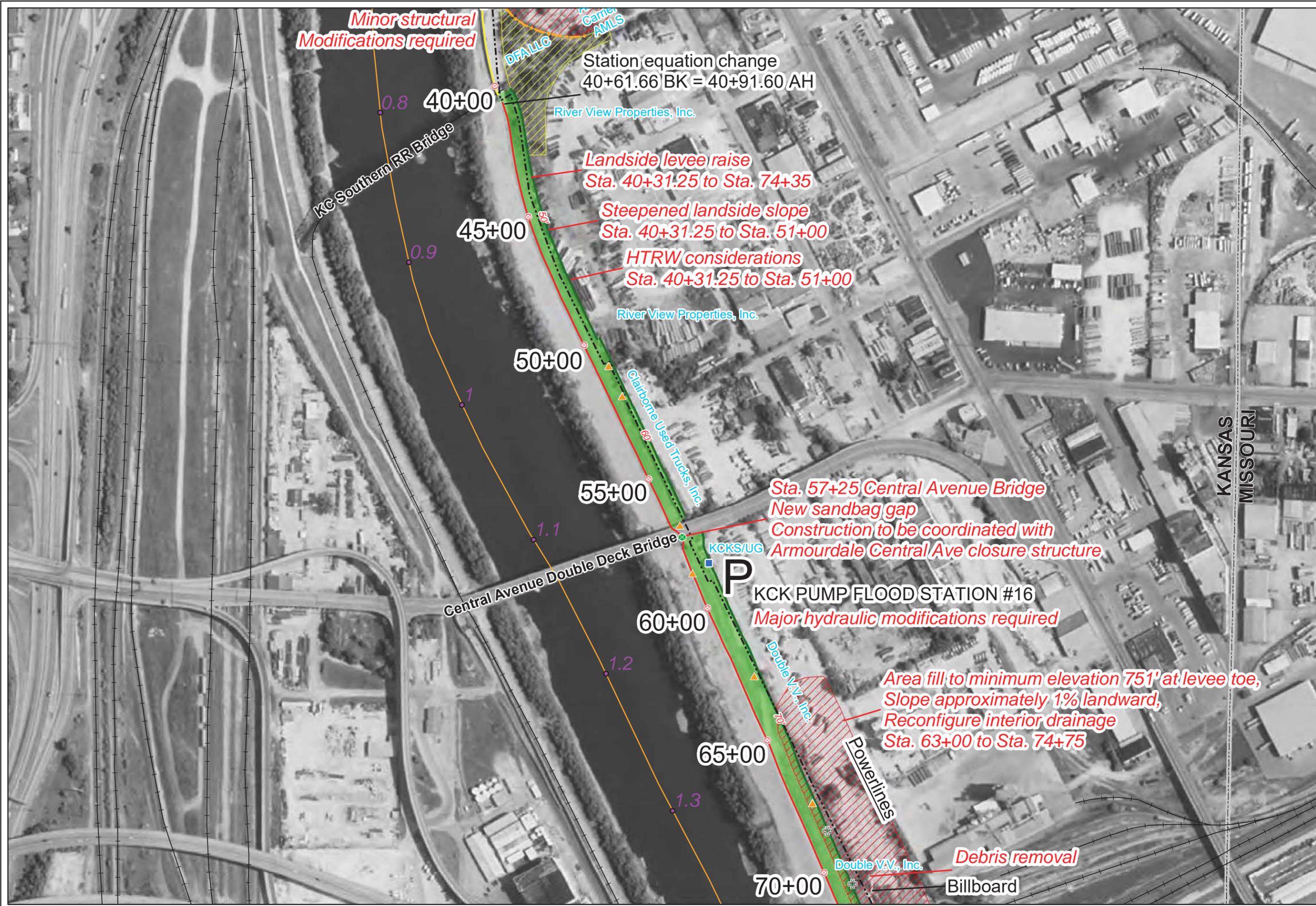
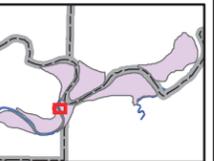
Photography Date: 2006

Projection: UTM Zone 15, Feet
Datum: NAD 83

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KEY

- Existing Levee Features**
- Closure Structure
 - Gatewell
 - Active Relief Well
 - Abandoned Relief Well
 - Station Tick Marks
 - Buildings
 - Floodwall
 - Levee
 - Retaining wall
 - Existing Right of Way
 - Railroad
- Proposed Features**
- Closure Structure
 - Relief Well
 - Floodwall
 - Road
 - Area Fill
 - Staging/Stockpile Area
 - Levee raise



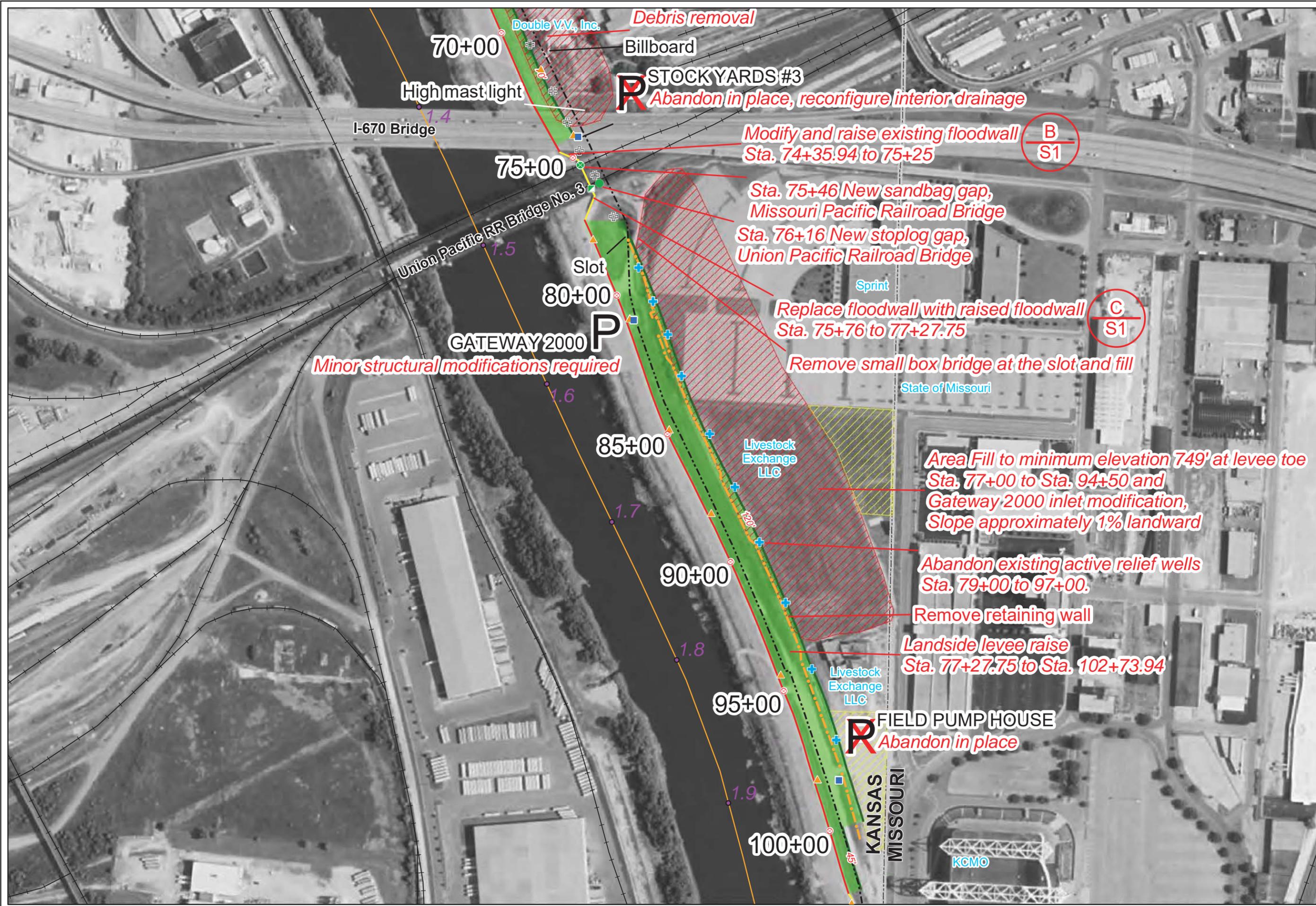
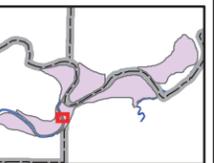
Photography Date: 2006

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KEY

- Existing Levee Features**
- Closure Structure
 - Gatewell
 - Active Relief Well
 - Abandoned Relief Well
 - Station Tick Marks
 - Buildings
 - Floodwall
 - Levee
 - Retaining wall
 - Existing Right of Way
 - Railroad
- Proposed Features**
- Closure Structure
 - Relief Well
 - Floodwall
 - Road
 - Area Fill
 - Staging/Stockpile Area
 - Levee raise



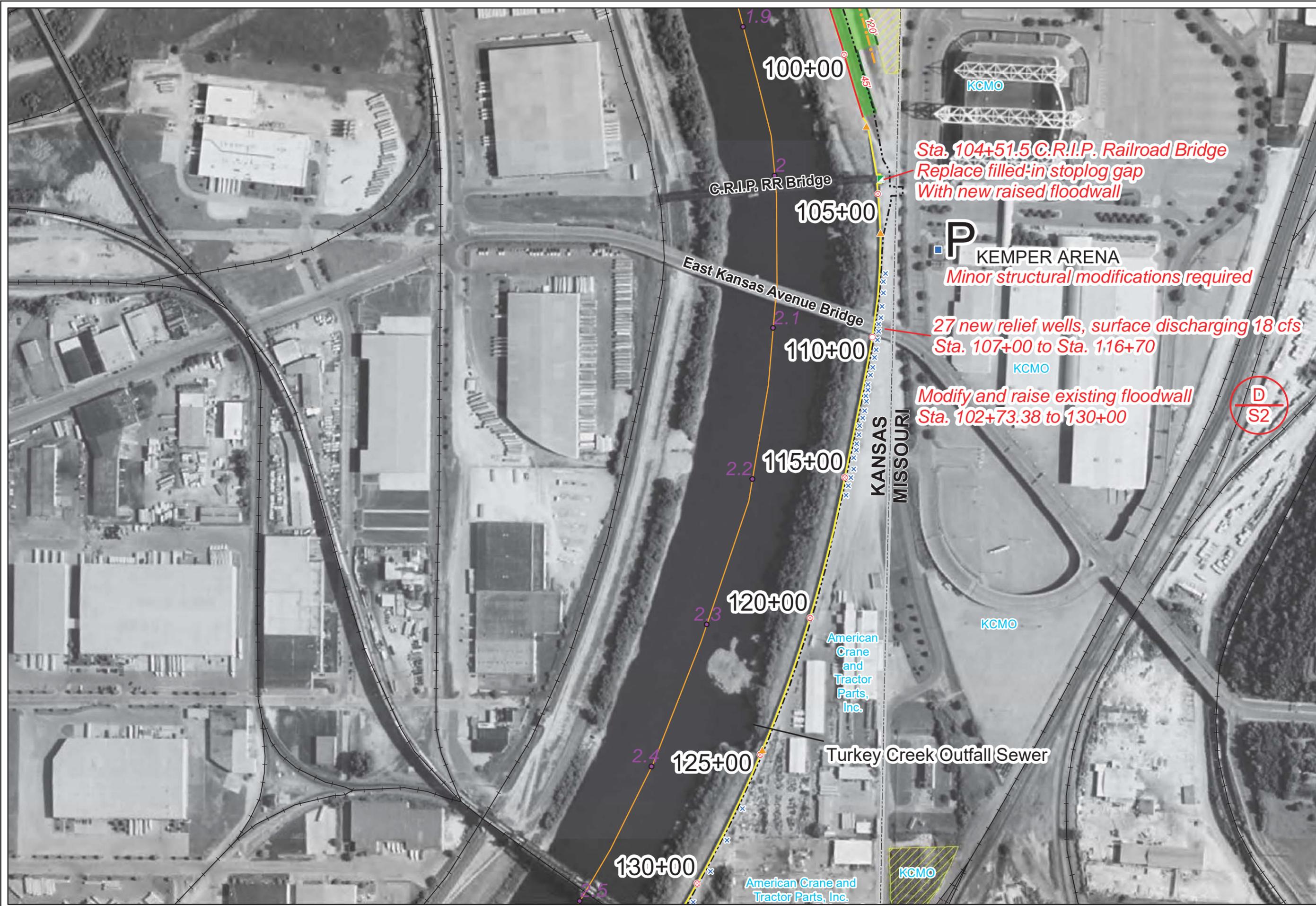
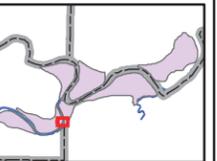
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Sta. 104+51.5 C.R.I.P. Railroad Bridge
Replace filled-in stoplog gap
With new raised floodwall

P KEMPER ARENA
Minor structural modifications required

27 new relief wells, surface discharging 18 cfs
Sta. 107+00 to Sta. 116+70

Modify and raise existing floodwall
Sta. 102+73.38 to 130+00

D
S2

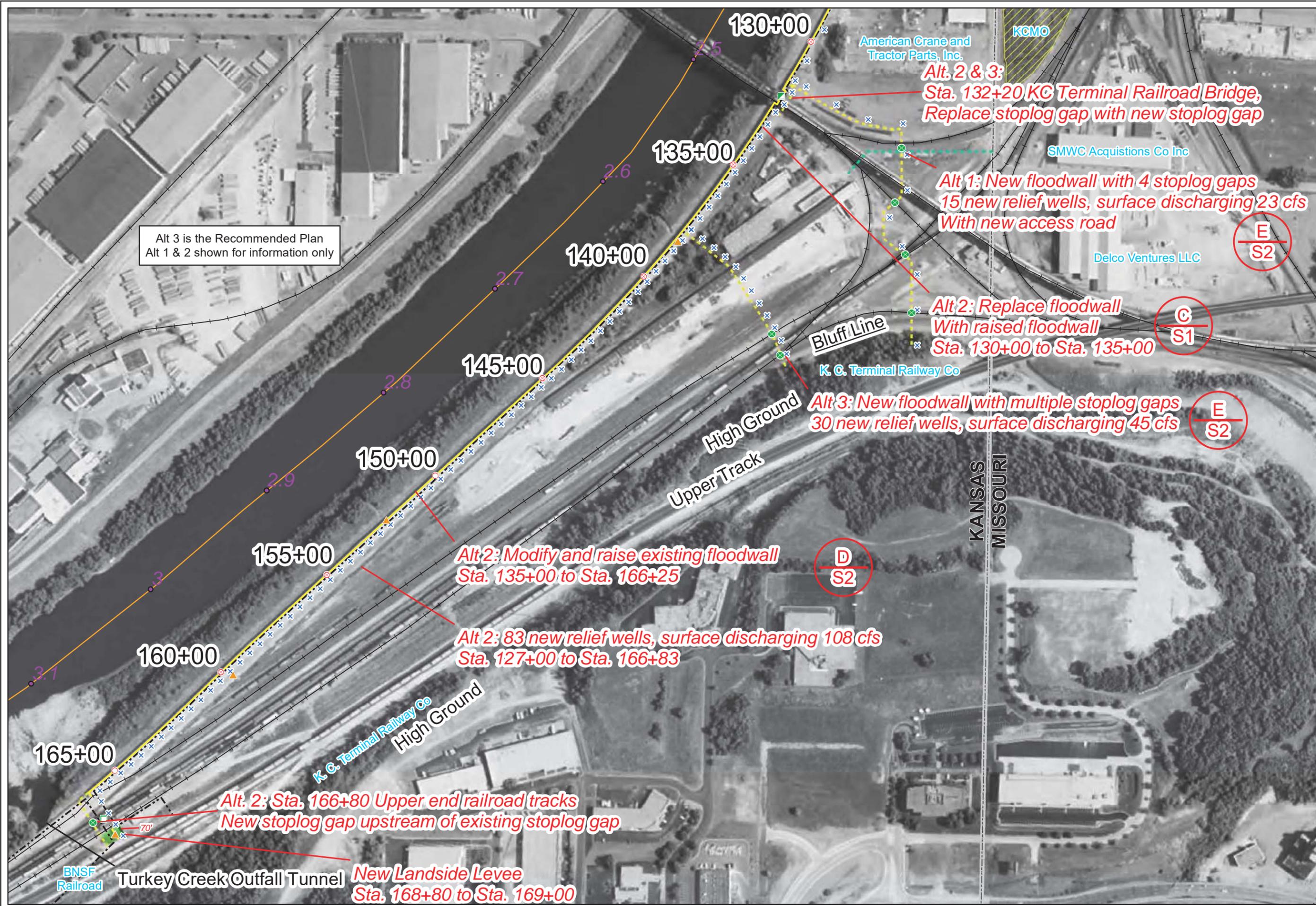
KANSAS
MISSOURI

American Crane
and
Tractor
Parts,
Inc.

Turkey Creek Outfall Sewer

American Crane
and
Tractor
Parts,
Inc.

Alt 3 is the Recommended Plan
Alt 1 & 2 shown for information only



Alt. 2 & 3:
Sta. 132+20 KC Terminal Railroad Bridge,
Replace stoplog gap with new stoplog gap

Alt 1: New floodwall with 4 stoplog gaps
15 new relief wells, surface discharging 23 cfs
With new access road

Alt 2: Replace floodwall
With raised floodwall
Sta. 130+00 to Sta. 135+00

Alt 3: New floodwall with multiple stoplog gaps
30 new relief wells, surface discharging 45 cfs

Alt 2: Modify and raise existing floodwall
Sta. 135+00 to Sta. 166+25

Alt 2: 83 new relief wells, surface discharging 108 cfs
Sta. 127+00 to Sta. 166+83

Alt. 2: Sta. 166+80 Upper end railroad tracks
New stoplog gap upstream of existing stoplog gap

New Landside Levee
Sta. 168+80 to Sta. 169+00

KEY

Existing Levee Features

- Closure Structure
- Gatewell
- Active Relief Well
- Abandoned Relief Well
- Station Tick Marks
- Buildings
- Floodwall
- Levee
- Retaining wall
- Existing Right of Way
- Railroad

Proposed Features

- Closure Structure
- Relief Well
- Floodwall
- Road
- Area Fill
- Staging/Stockpile Area
- Levee raise



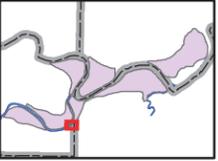
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KEY

Existing Levee Features

- Closure Structure
- Gatewell
- Active Relief Well
- Abandoned Relief Well
- Station Tick Marks
- Pump Plant
- Utility Crossings
- Floodwall
- Levee
- Retaining wall
- Existing Right of Way
- Railroad



Photography Date: 2006

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