CHAPTER A-1
GENERAL

A-1.1 INTRODUCTION

The focus of engineering effort during the feasibility study is on establishing project elements and features, developing design assumptions, technically evaluating alternatives, and collecting and assessing data. The engineering aspects of the study have been developed to the level of detail sufficient enough to prepare a baseline cost estimate, general project schedule, and allow for more detailed design of the selected plan following receipt of funds. The results of engineering investigations, studies, and designs are presented in this engineering appendix to the feasibility report.

A-1.2 NOTES REGARDING APPENDIX FORMAT

To date the development of the Engineering Appendix documentation has progressed on two parallel paths, one for each unit: Armourdale and Central Industrial Unit. Thus, each unit resulted its own set of Engineering Appendix chapters.

Please note the following:

- The same numbering system was used when establishing each Unit's appendix, i.e. each Unit has a separate Chapter A-4 – Geotechnical, Chapter A-5 Civil Analysis, etc.

- The overall method of chapter numbering was originally based on the Engineering Appendix for the Interim (Phase 1) Report. However, some chapters from the previous report appendix did not apply to Phase 2 efforts and those chapter numbers were skipped.

- For several disciplines, the CID Unit documents are split into two chapters to discuss the features of the Kansas and Missouri reaches separately.

Additional efforts regarding formatting and organization may occur in the future to better align the chapter numbering and eliminate any confusion. This work will not affect the technical content of these Appendices.

A-1.3 BACKGROUND

The existing Kansas Citys Flood Risk Management Project provides local flood risk management for the metropolitan areas of Kansas City, Missouri and Kansas City, Kansas. The Kansas Citys project is a unit of the Missouri River basin comprehensive plan authorized by the 1936, 1944, 1946, and 1954 Flood Control Acts. A modification to raise some of the levee units (Argentine, Armourdale, Central Industrial District-Kansas, and Central Industrial District-Missouri) was authorized by public law in October, 1962. The design of the Kansas Citys project was predicated on the operation

of the Kansas River Basin system of flood control lakes. Most of the lakes in that system are in place and operating, but two of the smaller lakes in the system (Grove and Onaga) were not economically feasible and have been deauthorized.

The study area consists of seven official levee units along reaches of the Kansas and Missouri Rivers. The Interim (Phase 1) Feasibility Report published in 2006 addressed recommendations for modifications five of these units. The remaining two units, Armourdale and Central Industrial District (CID), are addressed in this Final (Phase 2) Feasibility Report.

The Armourdale and CID units work in concert with the Argentine Unit to create a three-unit system along the lower 10 miles of the Kansas River. The units were designed and constructed in conjunction with each other, but are independently operated to some extent. The total protected area is characterized by dense industrial and commercial development. Some limited residential habitation is also present. Communities (or portions thereof) within the study area include Kansas City, Missouri, and Kansas City, Kansas.

The U.S. Army Corps of Engineers Kansas City District, along with the local project sponsors, are conducting a feasibility study of the existing flood protection project within the Kansas City metropolitan area. The study is authorized under Section 216 of the 1970 Flood Control Act (review of completed civil works). The entire metropolitan system of levee units withstood the Missouri River Flood of 1993, but some elements of the system were seriously challenged as the flood crest neared overtopping at some locations. This experience raised a concern that the levees may provide less than the level of protection for which they were designed.

The purpose of the feasibility study is twofold. First, it serves to update and verify data on the reliability of the existing project (Kansas Citys, Missouri and Kansas, Local Flood Protection Project). Secondly, it provides a means to develop alternative plans (to include a review of the “no Federal action” alternative) with a final recommended plan for authorization and implementation. Any recommended plan for increasing the reliability of the system must be technically viable, economically feasible, and environmentally acceptable.

A-1.4 GENERAL DESCRIPTION OF LEVEE UNITS

A-1.4.1. Armourdale Unit

The Armourdale Unit is located along the left bank of the Kansas River from mile 6.4 to mile 0.3, near the confluence of the Kansas and Missouri River. The Kaw Valley Drainage District of Wyandotte County, Kansas, furnished the required assurances of local cooperation by resolution dated June 15, 1938. The original levees and floodwalls were constructed under the jurisdiction of the Kaw Valley Drainage District. The levee is separated into three sections totaling about 5.8 miles in length. The uppermost levee section originally was a tieback from high ground on the left bank of Mattoon Creek to

the Union Pacific Railroad tracks. The levee was extended west past Mattoon Creek approximately 1500 feet since its original design. From the Union Pacific Railroad tracks, the levee extends from the railroad embankment near the mouth of Mattoon Creek downstream along the left bank of the Kansas River to the floodwall. The second portion is a floodwall that begins north of the Chicago, Rock Island and Pacific Railroad Bridge and extends downstream to connect with the third levee section. The third levee section ties back into high ground at the embankment of the Lewis and Clark Viaduct.

Construction of the Federal project began in May, 1949 and was completed in February, 1951. More recent improvements, separately authorized as the 1962 Modification, were completed in April, 1976.

The flood protection unit consists of levees, stability berms, retaining walls, floodwalls, underseepage control including 45 relief wells, 2 sandbag gaps and 2 stoplog gaps, 10 pump plants, and 36 drainage structures. The levees stretch about 5.8 miles through the Armourdale Unit and the floodwalls total approximately 6,600 feet.

A-1.4.2. Central Industrial District – Kansas Unit

The Central Industrial District – Kansas flood protection unit is located in Wyandotte County, Kansas, and extends from the Kansas/Missouri state line along the right bank of the Missouri River to the mouth of the Kansas River. It then continues upstream along the right bank of the Kansas River to mile 3.4. The Kaw Valley Drainage District is the local agency responsible for operation and maintenance. The original unit was constructed by the Kaw Valley Drainage District prior to May, 1948, when initial improvements began. The bulk of the improvements were completed by November, 1955. The most recent improvements were completed in December, 1979.
The unit consists of a system of levees and floodwalls, underseepage control including 17 relief wells, a stoplog gap, a sandbag gap, 10 pump plants, and 23 drainage structures. The levee is approximately 1.8 miles long and the floodwalls total about 7,900 feet.

A-1.4.3. Central Industrial District – Missouri Unit

The Central Industrial District – Missouri flood protection unit is located in Kansas City, Missouri within Jackson County. The unit extends along the right bank of the Missouri River, upstream from the Grand Avenue Viaduct (river mile 365.7), to the Kansas/Missouri state line (river mile 367.2). The City Council passed four resolutions between 1941 and 1947 to provide the required assurances of local cooperation. The initial construction began in March, 1946 and was completed in September, 1947. Significant improvements and repair of 1951 flood damage followed the initial construction and were completed in November, 1955.

The unit consists of a system of levees, floodwalls, underseepage control, 1 sandbag and 7 stoplog gaps, 7 pump plants, and 5 conduits. The levees total about 430 feet in length and the floodwalls are about 1.45 miles long.

A-1.5 SPONSORS AND OWNERSHIP

Discussions with local sponsors have provided much of the information used in the Kansas Citys Flood Risk Management Feasibility Study. The local sponsors are listed below:

Unit	Sponsor
Armourdale	Kaw Valley Drainage District
Central Industrial District – Kansas	Kaw Valley Drainage District
Central Industrial District – Missouri	City of Kansas City, Missouri

A-1.6 PROJECT DESCRIPTION

A Corps of Engineers (COE) reconnaissance level report was completed in August, 1999. The effort included compiling a list of existing features and indicating the impact to those features due to a 1.5 foot and 3.0 foot levee raise for all units. The report indicated that raising the level of protection provided by the Kansas Citys system may be technically and economically feasible without unacceptable environmental or social impacts.

The Reconnaissance Report identified a Federal interest in further investigation of the drainage structures. That recommendation led to the current Feasibility Study. An early effort under feasibility was development of the Inventory of Drainage Features Report submitted to the COE and performed by HNTB Corporation in June, 2001. This inventory was published in the Engineering Appendix of the Interim Feasibility Report. The general purpose was to obtain original drainage designs of interior structures and to compare those designs with current conditions for each unit. More specifically, the tasks included the compilation of an inventory for each levee unit's drainage system capacity criteria and assumptions, along with the recording of flood protection penetration information for stormwater conduits.

The Inventory of Drainage Features Report was incorporated into work on existing conditions analysis of each unit in the protection system. Additionally, information was gathered (where available) from the original design documents, Operation and Maintenance (O&M) manuals, and associated studies. The Corps utilized current hydrology/hydraulics models, and geotechnical/structural risk and uncertainty (R&U) study methods to develop the engineering portions of the existing conditions (baseline) analysis of the existing project. Much of this analysis was based on data and observations from recent high water events (since the original project design), especially those in 1993 and 1995. This new engineering analysis, along with the economic (HEC-FDA) analysis, established a complete R&U approach to estimating existing conditions flood damages. The engineering and economic evaluations taken together with a summary baseline environmental review and an HTRW review of the study area formed the full picture of existing conditions. A review of existing conditions results by the study team provided guidance during the scoping and development of future conditions (with and without project) work.

In order to obtain a clearer overview of the areas of interest for Phase 2, please refer to Maps section of this report. The footprint mapping details the location of proposed modifications and identifies some of the concerns and key issues. Additionally, Report Exhibits #6 and #7 present summary matrices detailing the recommended work at each location of the unit. Plate A-1.9 shows the segment breakdown for the Argentine Unit matrix's organization. As subsequent chapters provide discussion of these areas of interest, these Maps and Exhibits will be valuable visual and summary references.