OFFICE OF THE SPECIAL INSPECTOR GENERAL FOR IRAQ RECONSTRUCTION

AL FATAH PIPE RIVER CROSSING
AL FATAH, IRAQ

SIGIR PA-05-010
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Special Inspector General for Iraq Reconstruction

SIGIR PA-05-010 **March 7, 2006**

Al Fatah Pipe River Crossing in Al Fatah, Iraq

Synopsis

Introduction. The report was previously provided on a limited distribution basis only in Iraq to representatives of the Gulf Region Division of the U.S. Army Corps of Engineers and the Project and Contracting Office. In accordance with the revised policy of the Office of the Special Inspector General for Iraq Reconstruction, all project assessment reports are being issued publicly.

This project assessment was initiated as part of our continuing assessments of selected sector reconstruction activities for electricity, oil, and public works and water. The overall objectives were to determine whether selected sector reconstruction contractors complied with the terms of their contracts or task orders and to evaluate the effectiveness of the monitoring and controls exercised by administrative quality assurance and contract officers. This project assessment was conducted in accordance with the Quality Standards for Inspections issued by the President's Council on Integrity and Efficiency. The Special Inspector for Iraq Reconstruction (SIGIR) assessment team included an engineer and an auditor.

Project Assessment Objectives. The objective of this project assessment was to provide real-time relief and reconstruction project information to interested parties in order to enable appropriate action, when warranted. Specifically, we determined whether:

1. Project results will be consistent with original objectives;
2. Project components were adequately designed prior to construction or installation;
3. Construction or rehabilitation met the standards of the design;
4. Contractor's Quality Control plan and the U.S. Government's Quality Assurance program were adequate; and
5. Project sustainability and operational effectiveness were addressed.

Conclusions. The assessment determined that:

1. The completed project should meet and be consistent with original task order objectives if current construction methods are continued. Specifically, installation of the nine large diameter pipelines across/under the river is a key element of the overall objective to repair and continue the operations of the Iraq oil infrastructure following the destruction of crude oil pipelines that crossed the Tigris River at Al Fatah[1] during hostilities in 2003. As a result, the installation of the nine large diameter pipelines across/under the Tigris River should effectively repair and re-establish operations of the Iraq oil infrastructure at Al Fatah.

2. The design package was completed and approved prior to construction and appeared specific enough to construct the project. For example, engineering and

[1]Due to the various spellings for cities in Iraq, and in an effort to achieve standardization in SIGIR reports, Al Fathah and Al Fatha, as noted in project documentation will henceforth be referred to as Al Fatah.

design investigations conducted prior to construction established that a trenching or dragline method could be utilized to effectively and efficiently install a pipeline below the river. In addition, engineering planning indicated that concrete coated pipe could be utilized for the crossing to ensure appropriate weighting. As a result, installation of the nine large diameter pipelines across/under the Tigris River should effectively connect the existing pipelines on both banks of the Tigris River.

3. The construction of the pipeline should meet the standards of the design. We observed that Quality Management personnel and supervisors were engaged daily in construction activities to ensure construction quality. As a result, construction conformity should adhere to contract specifications and the project should effectively link the existing pipelines. Therefore, the pipeline operations at Al Fatah of the Iraq oil infrastructure that were destroyed during 2003 hostilities will be re-established.

4. Overall, the contractor's quality control plan and the U.S. Government's quality assurance program were adequate. For example, procedures in place ensured that potential construction deficiencies were detected, evaluated, and properly corrected, when necessary. In addition, the contractor's daily quality control reports and the U.S. Government's Quality Assurance Representative's reports were sufficiently complete, accurate, and timely. As a result, Quality Management documentation was accurate and timely when compared to the project's observed completion percentage and conformity to construction requirements.

5. Sustainability and operational effectiveness were adequately addressed in the contract's Scope of Work. The U.S. Government does not plan to maintain or operate the pipeline after commissioning; future pipeline operations will be turned over to the Iraqi Ministry of Oil and the Northern Oil Company. As built drawings of the pipeline and manifold system, a recommended list of spare parts, and standard operating procedures will be provided to the Iraqi Ministry of Oil and the Northern Oil Company upon completion.

   Operational effectiveness has been and is being addressed with proper planning and design, quality supervision/oversight, and quality construction. If current practices continue, the pipeline should be fully functional and effectively link the pipelines on both sides of the Tigris River at Al Fatah.

Recommendations and Management Comments. We discussed the results of our assessment with the appropriate Project and Contracting Office and U. S. Army Corps of Engineers officials, who concurred with our conclusions. This report does not contain any negative findings. Therefore, management comments were not required.

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Introduction

Objective of the Project Assessment

The objective of this project assessment was to provide real-time relief and reconstruction project information to interested parties in order to enable appropriate action, when warranted. Specifically, we determined whether:

1. Project results will be consistent with original objectives;
2. Project components were adequately designed prior to construction or installation;
3. Construction or rehabilitation met the standards of the design;
4. Contractor's quality control plan and the U.S. Government's quality assurance program were adequate; and
5. Sustainability and operational effectiveness were addressed.

Pre-Site Assessment Background

Contract, Task Order, and Costs

The Al Fatah Pipe River Crossing project will be completed under Contract W9126G-04-D-0002. Contract W9126G-04-D-0002 is an indefinite delivery indefinite quantity, cost reimbursable award fee contract for the repair and continuity of operations of the Iraqi oil infrastructure. The estimated Not to Exceed amount is $800 million for the life of the contract with a guaranteed minimum of $500,000. The contract was issued by the Project and Contracting Office (PCO) to Parsons Iraq Joint Venture (PIJV).

Task Order (TO) 0014, dated 19 November 2004, was issued to PIJV, with a Not to Exceed amount of $3,000,000, which included costs associated with completing the Al Fatah Pipeline River Crossing project and the Kirkuk Irrigation Canal Crossing #1 project. The initial TO's Scope of Work (SOW) was undefined and was intended to be accomplished in three phases. The first phase was to perform survey and investigative work so that a project plan and an initial cost estimate could be developed. The second phase was intended to produce the basic engineering design and the last phase was the detailed design, construction, and commissioning of the projects.

The modifications to the Task Order were:

- Modification 01, dated 5 January 2005, increased funding to $7,500,000.
- Modification 02, dated 25 January 2005, increased total funding to $10,250,000.
- Modification 03, dated 22 February 2005, increased funding to $11,450,000 and added the six horizontal directional drilling (HDD) pipeline tie-ins, the Riyadh Canal Crossing #2, and the Zegeton Canal Crossing #3 projects.
- Modification 04, dated 2 March 2005, reflected administrative changes to the contract. No additional funding was added at that time.

- Modification 05, dated 9 March 2005, definitized Contract Line Item Number (CLIN) 0002, and increased funding by $987,890, which raised total funding to $12,437,890 from $11,450,000.
- Modification 06, dated 9 June 2005, definitized CLINs 0001, 0003, 0004, 0005, 0006, and 0007, and increased funding by $45,717,035, which raised the total to $58,154,925 from $12,437,890. The definitized cost of CLIN 0001, the Al Fatah Pipe River Crossing project, including base fee and award fee was $29,715,425.
- Modification 07, dated 12 July 2005, definitized CLIN 0003, and increased funding by $4,056,757, which raised the total to $62,211,682 from $58,154,925.
- Modification 08, dated 12 July 2005, corrected information relating to CLIN 0004 on modification 07. No additional funding was added at that time

TO 0014 projects were intended to complete all remaining sections of the new 40-inch crude oil pipeline from the Kirkuk oil fields to the Iraq-to-Turkey Pipeline (ITP). This assessment specifically addresses project identification number 18183, which is the Al Fatah Pipe River Crossing project, budgeted at $29,715,425. PIJV contracted with A&L Underground to perform the work required at the Tigris River crossing.

Project Objective

The general objective of TO 0014 was installation of all remaining sections of the new 40-inch crude oil pipeline from the Kirkuk oil fields to the ITP. The completion of the 50 kilometers of pipeline and Tigris River crossing was considered essential for the increased production and transport of crude oil from the Kirkuk oil fields. The Kirkuk oil fields provide all crude oil for the Baiji Refinery, 40 to 45 percent of the crude oil for the Daura Refinery, and the export of crude oil through the ITP. This was a critical project, with potential revenue of up to $7 million per day in crude oil export. The specific objective of the Al Fatah pipe river crossing project was the installation of nine large diameter pipelines across the Tigris River at Al Fatah, near the city of Baiji, Iraq.

Description of facility (preconstruction)

Observations by the Assessment team and geological studies disclosed that the project is located approximately 250 kilometers north-north-west of Baghdad, Iraq, at an existing significant crossing point of the Tigris River. The location and the geologic break (left lateral fault) in the mountain ridge line made this is an obvious location for crossing the Tigris River and traversing the mountain range. The Tigris River cuts through the mountain range at this location due to the fault. This location is critical since it is the most convenient route to connect the Kirkuk oil and natural gas fields to the population centers and the ITP. Due to the geology and location at the Tigris River, this area has many old oil and natural gas pipelines that are not identified on any known drawings.

The Project Scope and Status Report (PSSR) stated that in a previous project Kellogg, Brown, and Root (KBR) installed six small pipelines under the Tigris River using Horizontal Directional Drilling (HDD). These six small pipelines are part of the

fifteen pipelines that will carry crude oil, natural gas, and refined products across the Tigris River to the main distribution system. The unused pipe that was purchased by KBR was left on-site and has a Fusion Bonded Epoxy coating. Four of the nine pipelines have been welded; therefore, the concrete coating application method will need to be identified and verified to be applicable to the welded strings of pipe.

Scope of Work

The PSSR stated that the Al Fatah River Crossing and Tie-In projects will provide for the engineering design and installation and/or tie-in of 15 pipelines across the Tigris River at Al Fatah. Nine of the large diameter pipelines need to be installed across the river, and the large diameter pipelines will be buried in the Tigris River bed. Six smaller pipelines, previously installed by KBR using HDD are part of the fifteen pipes that will carry crude oil, natural gas, and refined products across the Tigris River to the main distribution system.

Phases I and II of the SOW contained the following major tasks (the assessment team reviewed the significant Phase II SOW tasks bolded below):

Phase I SOW

- Preliminary hydrographic and geotechnical survey of the river and surrounding area for route selection
- Engineering, design, and installation of nine pipelines across the Tigris River including:
  - 14-inch liquid/liquefied petroleum gas or sour gas
  - 20-inch, 30-inch, 32-inch and 40-inch crude oil pipelines
  - 8-inch, 12-inch, 16-inch and 20-inch spare pipelines
- Installation of an oil manifold on the east and west bank of the river
- Engineering, design, and tie-in of the five oil and gas pipelines to existing pipelines on the east and west bank of the river

Phase II SOW

- Pipeline engineering and design
- Survey, design, and field verification of area, including land and river and development of detailed alignment sheets and tie-in locations
- Installation of an oil manifold on the east and west bank of the river
- River crossing of nine pipelines
  - fabrication of pipelines
  - dredging pipeline corridor in river bed
  - excavation of pipeline corridor (trench)
  - installation of pipeline in trench
  - installation of pipelines in riverbed
- Tie-in of five of the nine pipelines to manifolds and/or existing pipelines
- Fabrication and installation of two crude oil manifolds

- Tie-in of six existing HDD lines to manifold and existing pipelines

Current Project Design and Specifications

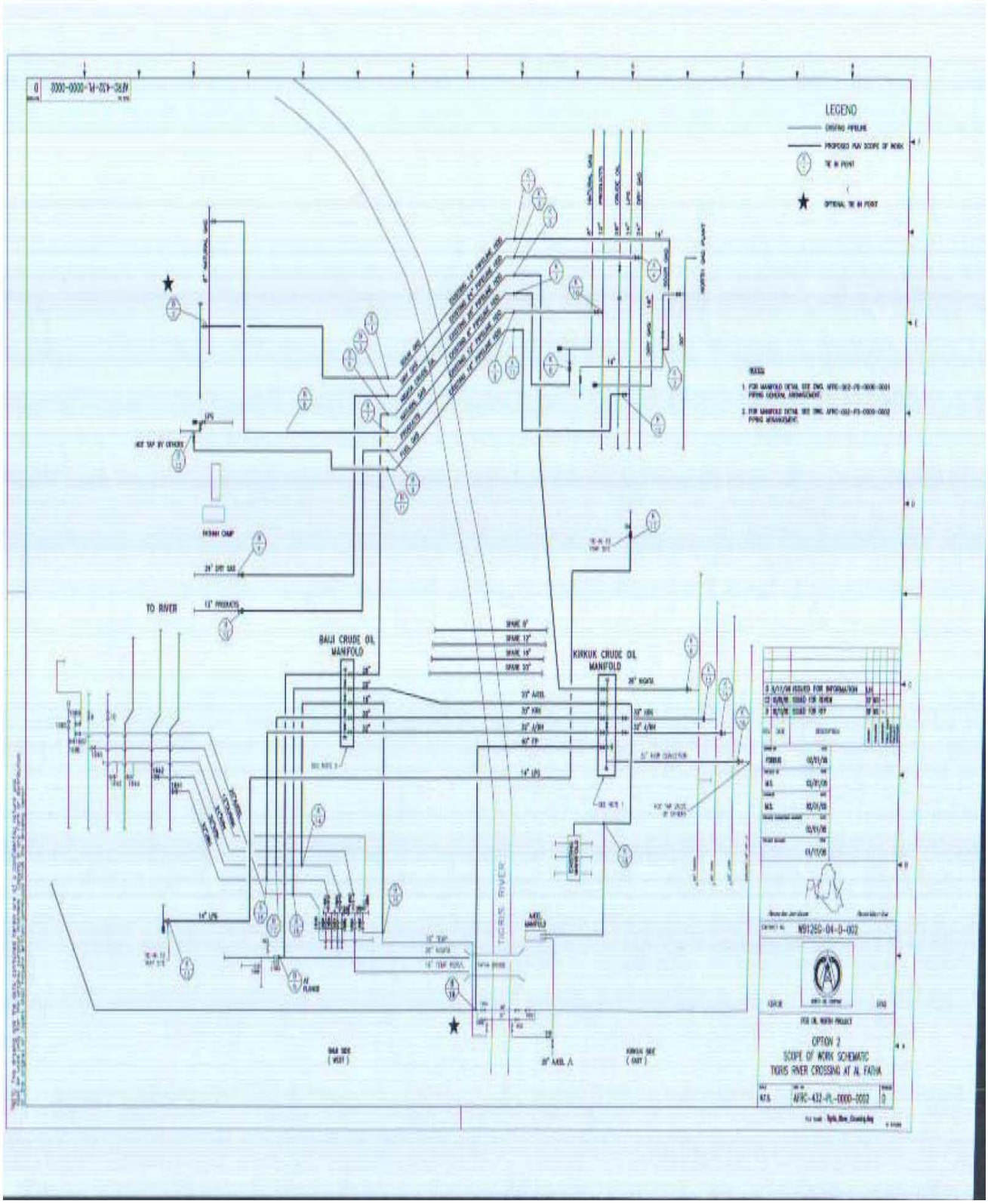
The contract required the submission and approval of Phase I, Phase II, and Phase III design and specifications. Phase I was to perform survey and investigation work so that a project plan and an initial cost estimate could be developed, Phase II was intended to produce the basic engineering design, and Phase III was the detailed design, construction, and commissioning of the projects.

Following is a list of the appropriate specifications that will be utilized during installation and construction of the pipelines.

- General Pipeline Construction Specification (GEN-SPC-PL-0000-0002) included in Appendix H, Phase II PSSR
- General Pipeline Welding, Testing and Inspection Specification (GEN-SPC-PL-0000-0005) included in Appendix I, Phase II PSSR
- General Pipeline Specification for Concrete Coating of Line Pipe (GEN-SPC-PL-0000-0003) included in Appendix J, Phase II PSSR
- General Pipeline Specification for Cathodic Protection of Pipe (GEN-SPC-PL-0000-0004) included in Appendix K, Phase II PSSR

The assessment team reviewed the Phase II PSSR design and specifications. The investigations specify that trenching or dragline can be utilized for installation of the pipelines. The design and calculations included the typical trench cross sections for the onshore and submerged pipelines and the construction limitations that should be used to avoid overstressing the pipelines. Preliminary engineering calculations are included in Appendix G of the PSSR. The pipeline river crossing design also included the tie-in design both upstream and downstream of the manifolds. The general design for this has been completed and drawings are included in Appendix F of the PSSR. Preliminary engineering indicates that concrete coated pipe will be utilized for the crossing. Pipeline specifications have been developed and issued as part of the design package. The design drawings and specification appear to be complete and consistent with the requirements of the contract.

Figure 1 is a schematic diagram obtained from the PSSR showing the river crossing option selected for this project.



October 19, 2005.max

Figure 1. A Schematic Diagram of the River Crossing Option Selected for this Project.

Reported Project Work Completed, In Progress, and Pending

We determined the project's status prior to the site visit through discussions with the U.S. Army Corps of Engineers (USACE) area engineer and design engineer and the PIJV Project Engineer and Quality Manager, and a review of the PCO contract file. No significant field tasks of the Al Fatah River Crossing project were reported to be 100 percent complete prior to the site visit.

Project site work reported completed:

Significant field work had been accomplished prior to the site visit, although not 100 percent complete and is addressed in the next section, "Work in Progress."

Project site work reported to be in progress:

- Fabrication of pipelines
- Dredging pipeline corridor in riverbed
- Excavation of pipeline corridor (trenches)
- Installation of pipeline in trenches

Project site work reported pending:

- Installation of pipelines in riverbed

Site Assessment

Our assessment team performed an on-site assessment of the Al Fatah Pipe River Crossing project from 26 September 2005 to 29 September 2005. During the time on-site, the assessment team reviewed selected project documentation provided by various government and contractor personnel. The assessment team discussed the project status and processes used to manage construction and ensure quality control (QC) with the USACE Project Engineer and Quality Assurance Representative (QAR). The assessment team observed the project's progress performed by contractor personnel. The assessment covered work completed, work underway, and work pending. At the time of the site assessment, the river site survey and investigation work had been completed and the location for the pipeline project had been selected.

Work completed:
Significant field work had been accomplished prior to the site visit and is addressed in the next section.

Work in progress:
Fabrication of pipelines

The PSSR required the fabrication of nine pipelines for placement in the riverbed. During the site assessment, the SIGIR team verified that nine pipelines have been

strung on the east side of the Tigris River. In addition, the welding was complete on the nine pipelines to be installed in the Tigris River. The 40 inch pipeline was placed on rollers in preparation for the first pull across the Tigris River. Site photo 1 shows a 40-inch pipeline on rollers. The welded pipeline strings shown are 1241 feet in length. The work observed was consistent with the requirements of the PSSR.

Site Photo 1: 40-Inch Pipeline on Rollers

Design specifications required 100 percent radiograph (X-ray) examination of welds and exterior treatment with field coat epoxy to inhibit corrosion. All nine pipelines that will be placed in the river crossing trench will require concrete encapsulation to increase the density of the pipeline so that the pipeline remains submerged in the trench particularly when empty of oil. Site photo 2 shows pipes staged on the east bank of the Tigris River. Site photo 3 shows a section of pipe encapsulated in concrete. The site assessment verified that radiograph examination of the pipeline, application of field coat epoxy, and concrete encapsulation of the pipe was ongoing. The work observed was consistent with requirements of the design specifications.

Site Photo 2: Pipes Staged on Tigris River East Bank

Site Photo 3: Section of Pipe Encapsulated in Concrete

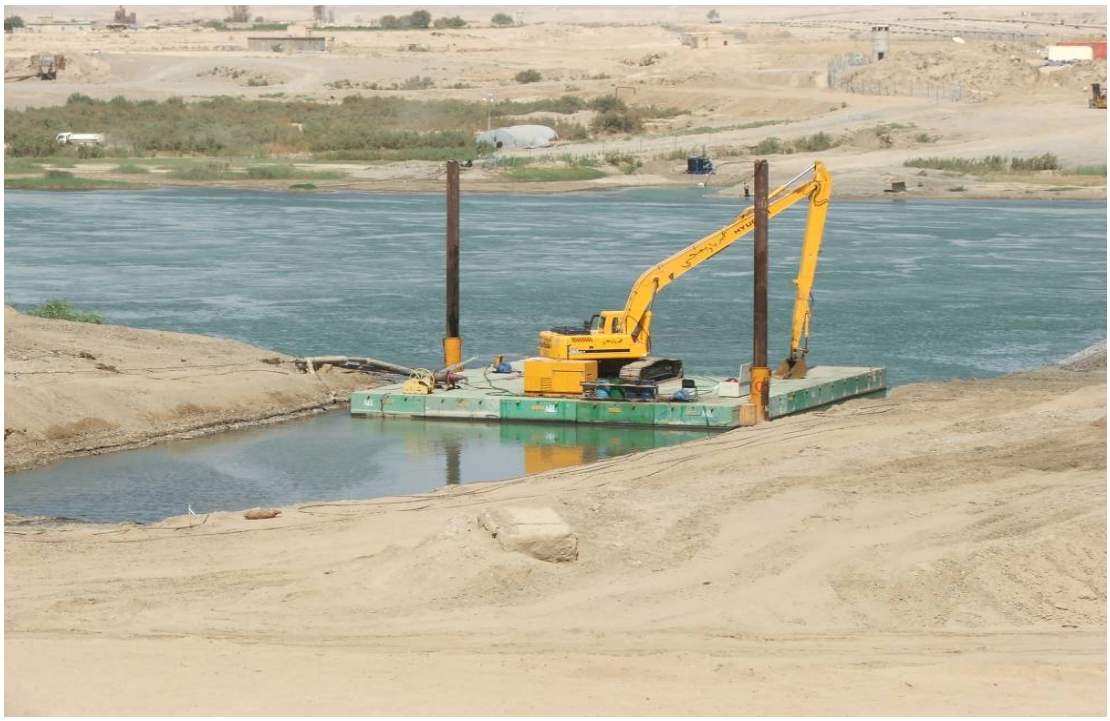
Dredging pipeline corridor in riverbed

The PSSR required the dredging of a trench over 100 meters in length, 9 meters wide, and 2 meters deep across the bed of the Tigris River to place the pipelines. A design modification changed the trench depth to include pulling the pipelines into a trench deep enough to provide a minimum of one meter of rock cover above pipelines and level with the river bed. Approximately 85 meters of dredging was through loose gravel and small diameter rock and 20 meters was through large rock or bedrock.

The dredging of the small diameter gravel and rock was reported to be complete. The gravel and small rock in the Tigris River were removed by dredging. Dredging equipment, a dredging barge, and spoil piles were observed on site, indicating dredging operations were performed, but measurements of the underwater excavation were not verified. Site Photo 4 shows river rock and gravel dredged from the riverbed. Site Photo 5 shows an excavator for dredging on the Tigris River.

Approximately 20 meters of the river crossing corridor is large rock or bedrock, which required fracturing and excavation. Mechanical fracturing with the extended reach excavator shown in Site Photo 5 is planned with equipment now on site. The alternate plan is the use of explosives to fracture the bedrock for removal. At the time of the site visit, this work had not begun, and therefore was not observed during the site visit.

Site Photo 4: River Rock and Gravel Dredged from River Bed



Site Photo 5: Excavator for Dredging on Tigris River

Excavation of pipeline corridor (trenches)

The PSSR required excavation of pipeline corridors on both the western side and eastern side of the Tigris River. The western side required excavation from the west bank of the Tigris River to the new manifold system, the new manifold system to existing pipelines, and the west bank of Tigris River to the ITP. During our site visit, we verified that excavation work on the western side of the river was ongoing, with a significant section nearly complete (Tigris River to new manifold and Tigris River to ITP). The length of the pipeline corridor excavations was not measured, although the excavations appeared to be consistent with design requirements.

The eastern side required excavation from the east bank of the Tigris River to the new manifold system and from the new manifold system to the existing pipelines. Excavation work on the eastern side was planned after the pipeline was pulled across the river and operating equipment was removed. Excavation for the area of the manifold system was in progress at the time of our site visit.

Installation of pipeline in trenches

The PSSR required installation of pipelines on the both the western side and eastern side of the Tigris River (see figure 1). The western side required pipelines from the west bank of the Tigris River to the new manifold system (three pipelines), new manifold system to existing pipelines (five pipelines), and the west bank of the Tigris River to the ITP (one pipeline). During our site visit, we verified that pipeline installation from the western bank of the Tigris River to the new manifold system

location was on-going. All three pipelines were being constructed concurrently. We did not observe the installation of pipelines between the new manifold system and existing pipelines. A single pipeline was being installed between the west bank of the Tigris River and the ITP. Installation of this pipeline appeared to be almost complete. For more details regarding the quality of the pipeline construction, see the Project Quality Management section of this report, page 13. Installation of the pipelines appeared to be consistent with design specifications.

The eastern side required pipelines from the east bank of the Tigris River to the new manifold system (4 pipelines), and from the new manifold system to the existing pipelines (4 pipelines). Pipeline installation on the eastern side of the Tigris River was planned after the pipeline was pulled across the river and equipment was removed. During the site visit, we observed no pipeline installation on the eastern side of the Tigris River.

Work pending:

Installation of pipelines in river bed

The Construction Methodology Report requires the nine concrete-encased pipelines be pulled into the river crossing trench in the Tigris River using an onsite winch from the opposite shoreline. The pipelines will then be covered with river rock to assist in stabilizing the pipeline and to minimize the scouring affects of the river. After the nine pipelines have been placed in the trench beneath the Tigris River, the pipelines will be hydrotested to ensure the integrity of the pipe. A pig[2] with a 93 percent sizing plate will be run or pushed through the pipeline sections to assure roundness of the pipe and that no intrusions exist inside of the pipeline. After the final hydrotest is performed to detect leaks, the pipeline will be drained and pigs will be used for cleaning and drying. The installation of the pipeline across the river had not been started; therefore, it was not observed during the site visit.

[2] Pipeline pigging was developed in the 1950s in the United States to clear debris from crude oil pipelines. It is now used around the world in all types of pipelines, but it is most commonly used in the oil, gas and petrochemical industries. A pig acts like a free moving piston inside the pipeline, sealing against the inside wall of the pipeline. Pigs can perform a number of tasks including cleaning debris from the line, the removal of residual product and gauging the internal bore of the pipeline. For an illustration of a 20-inch pig, see Site Photo 6. The pigging of a pipeline will increase the lifetime and throughput of a pipeline. For an illustration of a pipe ready for pigging, see Site Photo 7.

Site Photo 6: 20-Inch Pig

Site Photo 7: Pipe Ready for Pigging

Project Quality Management

The Contractor's Quality Control (CQC) plan and the U.S. Government's Quality Assurance (QA) plan were adequate and sufficiently detailed. For example, key procedures to detect, evaluate, correct, and track deficiencies were in place and effective. In addition, the contractor's daily quality control (QC) reports and the Government Quality Assurance Representatives (QAR) reports were sufficiently complete, accurate, and timely. Most important, overall implementation of the CQC and QA plans was effective. For example, testing construction conformity, on-site testing of welder applicants, on-site presence of supervisors and QC/QA personnel, and contractor/government teamwork resulted in an effective Quality Management program.

- **Construction Conformity:** USACE Project Engineer advised that all welds are radiographed (X-rayed) to ensure adequate pipe strength and seal, as required in the contract. The assessment team observed radiography testing and analysis on site. As a result, injury risk to personnel working around the pipe following commissioning will be decreased, while product loss via leaking will be avoided. The radiography process produces a filmstrip unique to each weld. For an illustration of a radiography test in progress on a 40-inch pipe weld, see Site Photo 8. Accordingly, each filmstrip is retained and logged by weld number to track deficiencies and corrections. To ensure effective monitoring of welder performance, each weld is marked with a number unique to the welder that performed the work. For an illustration of a pipe treated with an epoxy protective sealer following the completion of an electronic Holiday Test (porosity detection) that showed where the factory protective covering was thin or damaged, see Site Photo 9. For an illustration of how spots needing protective epoxy treatment are prepared and cleaned with a sand blaster, see Site Photo 10. Such processes ensure proper construction and long term serviceability.

Site Photo 8: Radiography (x-ray) Test In Progress on 40-inch Pipe Weld

Site Photo 9: Corrosion Control Epoxy Following Holiday Test

Site Photo 10: Sand Blasting to Prep Pipe for Protective Epoxy Coating

- **Welder Testing:** The USACE Project Engineer and the contractor's QC Inspector advised that all welder applicants are field tested to determine whether they possess the skills required. The assessment team observed such a test while on site. For an illustration of an Iraqi welder applicant nearly finished with a welding test, see Site Photo 11. Welds must pass visual, radiographic, and strength tests before a welder can be hired by the contractor. Standards are strict and retesting is not allowed. For an illustration of a weld test that passed visual inspection by the contractor's welding supervisor and was subsequently cut/prepared for destructive testing, see Site Photo 12.

Site Photo 11: Iraqi Welder Applicant Demonstrated Skills

Site Photo 12: Test Section Cut for Destructive Test

- **Supervisor Field Presence**: During the site visit, the assessment team observed that the line level construction supervisors were on-site 100 percent of the time, and QC and QA personnel were on site frequently enough to

effectively perform their duties. The assessment team observed the USACE Project Engineer, QAR, QC, and subcontractor quality manager on site during the site assessment. In addition, the contractor and government personnel shared a local communications (walky-talky) net. Accordingly, events that needed the attention of a supervisor or the Quality Management team were known to all.

In Site Photo 13, one of the contractor's foremen oversees the changing of the steel winch cable from 1.5 inches to 2 inches to ensure enough cable strength to pull pipes across the river.

Site Photo 13: Field Supervisor Oversees Winch Cable Change-Out

- **Teamwork:** During the site visit, the SIGIR team observed that key contractor and government managers conduct an end of business day meeting to discuss the day's accomplishments and problems. For an illustration of a contractor and government managers conducting an end of day meeting, see Site Photo 14. Present at the meeting were the senior on-site manager for both the contractor and subcontractor; subcontractor's construction superintendents and welding supervisor; prime contractor's logistics, security, and safety managers; and the U.S. Government's Resident Engineer, and at least one of the two Construction Representatives. Each meeting observed included a report of the number of welds completed, tested, and accepted. The Quality Management program was more effective because of the nightly meetings.

Site Photo 14: Contractor and Government Managers Conduct End of Day Meeting

Project Sustainability and Operational Effectiveness

Sustainability

A review of the contract file and specification submittals and discussions with PIJV Corporation project managers disclosed that the U.S. Government does not plan to maintain or operate the pipelines and manifolds after commissioning. The pipelines and manifolds will be turned over to the Iraqi Ministry of Oil and the Northern Oil Company after commissioning. As-built drawings of the pipeline and manifold system, a recommended list of spare parts and standard operating procedures will be provided to the Ministry of Oil and the Northern Oil Company upon completion.

Operational Effectiveness

Pipelines are a reliable and cost effective method for transporting large volumes of fuels to consumers. Alternatives include truck, rail, or marine tankers. On a comparative cost basis, pipelines are very efficient. Three separate Iraq Relief and Reconstruction Fund projects are underway to construct canal crossings between the Tigris River Projects and the Kirkuk oil fields and to connect those crossings to the 40-inch crude oil pipeline installed in a previous project. This complete pipeline is anticipated to provide a new, reliable crude oil pipeline system from the Kirkuk oil fields to the ITP so that these valuable natural resources may be refined into products needed domestically or for sale internationally to provide revenue for the Iraqi government.

Operational effectiveness was addressed in the design and management of this project. The contract and specifications are specific on quality requirements that must be met. Quality management is apparent in the workmanship of this project. If current practices continue, the final pipeline should be fully functional and meet the objective of this project.

Conclusions

Based on the fieldwork performed during this assessment, we reached the following conclusions for assessment objectives 1, 2, 3, 4, and 5. Appendix A provides details pertaining to Scope and Methodology.

1. Determine whether project results will be consistent with original objectives.

   The completed project should meet and be consistent with original task order objectives if current construction practices are continued. The installation of the nine large diameter pipelines across/under the river is a key element of an overall objective to repair and continue the operations of the Iraq oil infrastructure following the destruction of crude oil pipelines that crossed the Tigris River at Al Fatah during hostilities in 2003. This should occur because the project was adequately planned and designed. As a result, installation of the nine large diameter pipelines across/under the Tigris River should effectively re-establish operations of the Iraq oil infrastructure at Al Fatah.

2. Determine whether project components were adequately designed prior to construction or installation.

   The design package was completed and approved prior to construction and appears specific enough to construct the project. For example, engineering and design investigations conducted prior to construction established that a trenching or dragline method could be utilized to effectively and efficiently install the nine pipelines below the river. In addition, engineering planning indicated that concrete coated pipe could be utilized for the crossing to ensure appropriate weighting. This occurred because the project was effectively planned and designed in accordance with contract's SOW requirements. As a result, installation of the nine large diameter pipelines across/under the Tigris River should effectively connect the existing pipelines on both banks.

3. Determine whether construction or rehabilitation met the standards of the design.

   The construction and installation of the pipelines below the Tigris River should meet the standards of the design because the Quality Management practices and line-level construction supervision were determined to be effective. During the site visit, the assessment team observed that the Quality Management personnel and supervisors were engaged daily in construction activities to ensure construction quality. If this continues, construction conformity should adhere to contract specifications and the project should effectively link the existing pipelines.

4. Determine whether the Contractor's Quality Control plan and the Government quality assurance program were adequate.

   Overall, the CQC plan and the U.S. Government's QA program were adequate. For example, procedures in-place ensured that potential construction deficiencies were detected, evaluated, and properly corrected, when necessary. In addition, the contractor's daily QC reports and the Government's QAR's reports were sufficiently complete, accurate, and timely. This occurred because the U.S. Government and the contractor adequately planned and implemented an effective Quality Management program. Key to the program's effectiveness was the CQC plan that adequately addressed critical QC elements, such as construction conformity testing, deficiency detection and correction, staffing, and definable features of work. As a result, Quality Management documentation was accurate and timely when compared to the project's observed percentage complete and conformity to construction requirements.

5. Determine if project sustainability and operational effectiveness were addressed.

   Sustainability and operational effectiveness were adequately addressed in this project. Specifically, the U.S. Government does not plan to maintain or operate the pipeline after commissioning. Pipeline operations will be turned over to the Iraqi Ministry of Oil and the Northern Oil Company after commissioning. As-built drawings of the pipeline and manifold system, a recommended list of spare parts and standard operating procedures will be provided to the Ministry of Oil and the Northern Oil Company upon completion.

   Operational effectiveness has been, and is being, addressed with proper planning and design, quality supervision/oversight, and quality construction. If current practices continue, the pipeline should be fully functional and effectively link the pipelines on both sides of the Tigris River at Al Fatah.

Management Comments

We discussed the results of our assessment with the appropriate PCO and USACE officials who concurred with our conclusions. This report does not contain any negative findings. Therefore, management comments were not required.

Appendix A. Scope and Methodology

We performed this project assessment from September through October 2005, in accordance with the Quality Standards for Inspections issued by the President's Council on Integrity and Efficiency. The assessment team included an engineer and an auditor.

In performing this Project Assessment we:

- Reviewed contract documentation, including the Independent Government Estimate, Scope of Work, Contract, and contract modifications;
- Reviewed the design package (drawings and specifications), Quality Assurance Plan, Quality Control Plan, contractor's daily QC reports, and QAR reports;
- Interviewed the U.S. Army Corps of Engineers' Area Engineer, Project Engineer, and Quality Assurance Representative, and the contractor's Project Manager, Quality Control Manager and other operational personnel on-site; and
- Conducted an on-site assessment of the Al Fatah River Pipe Crossing and documented results.

Appendix B. Acronyms

CLIN	Contract Line Item Number
CQC	Contractor Quality Control
HDD	Horizontal Directional Drilling
ITP	Iraq-to-Turkey Pipeline
KBR	Kellogg, Brown, and Root
PCO	Project and Contracting Office
PIJV	Parsons Iraq Joint Venture
PSSR	Project Scope and Status Report
QA	Quality Assurance
QAR	Quality Assurance Representative
QC	Quality Control
SIGIR	Special Inspector for Iraq Reconstruction
SOW	Scope of Work
TO	Task Order
USACE	U.S. Army Corps of Engineers

Appendix C. Project Assessment Team Members

The Office of the Assistant Inspector General for Inspections, Office of the Special Inspector General for Iraq Reconstruction, prepared this report. The principal staff members who contributed to the report were:

Randall Nida

Lloyd Wilson