CALL NO. 300

CONTRACT ID. 151221

JEFFERSON COUNTY

FED/STATE PROJECT NUMBER FD04 056 1001 000-001

DESCRIPTION GRADE LANE (CR 1001G)

WORK TYPE JPC PAVEMENT WITH GRADE & DRAIN

PRIMARY COMPLETION DATE 6/15/2016

LETTING DATE: May 29,2015

Sealed Bids will be received electronically through the Bid Express bidding service until 10:00 AM EASTERN DAYLIGHT TIME May 29,2015. Bids will be publicly announced at 10:00 AM EASTERN DAYLIGHT TIME.

PLANS AVAILABLE FOR THIS PROJECT.

REQUIRED BID PROPOSAL GUARANTY: Not less than 5% of the total bid.

TABLE OF CONTENTS

PART I

SCOPE OF WORK

ADMINISTRATIVE DISTRICT - 05

CONTRACT ID - 151221

FD04 056 1001 000-001

COUNTY - JEFFERSON

PCN - DE06510011521
FD04 056 1001 000-001

GRADE LANE (CR 1001G) (MP 0.200) RECONSTRUCT GRADE LANE (CR 1001G) IN LOUISVILLE BETWEEN I-65 SB RAMPS AND GRADE LANE CONNECTOR (MP 0.600), A DISTANCE OF 0.40 MILES.JPC PAVEMENT WITH GRADE & DRAIN SYP NO. 05-00482.00.

GEOGRAPHIC COORDINATES LATITUDE 38:10:39.00 LONGITUDE 85:43:15.00

COMPLETION DATE(S):

COMPLETED BY 06/15/2016 APPLIES TO ENTIRE CONTRACT

CONTRACT NOTES

PROPOSAL ADDENDA

All addenda to this proposal must be applied when calculating bid and certified in the bid packet submitted to the Kentucky Department of Highways. Failure to use the correct and most recent addenda may result in the bid being rejected.

BID SUBMITTAL

Bidder must use the Department's Expedite Bidding Program available on the Internet web site of the Department of Highways, Division of Construction Procurement. (www.transportation.ky.gov/construction-procurement)

The Bidder must download the bid file located on the Bid Express website (www.bidx.com) to prepare a bid packet for submission to the Department. The bidder must submit electronically using Bid Express.

JOINT VENTURE BIDDING

Joint venture bidding is permissible. All companies in the joint venture must be prequalified in one of the work types in the Qualifications for Bidders for the project. The bidders must get a vendor ID for the joint venture from the Division of Construction Procurement and register the joint venture as a bidder on the project. Also, the joint venture must obtain a digital ID from Bid Express to submit a bid. A joint bid bond of 5% may be submitted for both companies or each company may submit a separate bond of 5%.

UNDERGROUND FACILITY DAMAGE PROTECTION

The contractor is advised that the Underground Facility Damage Protection Act of 1994, became law January 1, 1995. It is the contractor's responsibility to determine the impact of the act regarding this project, and take all steps necessary to be in compliance with the provision of the act.

SPECIAL NOTE FOR COMPOSITE OFFSET BLOCKS

Contrary to the Standard Drawings (2012 edition) the Cabinet will allow 6" composite offset blocks in lieu of wooden offset blocks, except as specified on proprietary end treatments and crash cushions. The composite blocks shall be selected from the Cabinet's List of Approved Materials.

REGISTRATION WITH THE SECRETARY OF STATE BY A FOREIGN ENTITY

Pursuant to KRS 176.085(1)(b), an agency, department, office, or political subdivision of the Commonwealth of Kentucky shall not award a state contract to a person that is a foreign entity required by KRS 14A.9-010 to obtain a certificate of authority to transact business in the Commonwealth ("certificate") from the Secretary of State under KRS 14A.9-030 unless the person produces the certificate within fourteen (14) days of the bid or proposal opening. If the foreign entity is not required to obtain a certificate as provided in KRS 14A.9-010, the foreign entity should identify the applicable exception. Foreign entity is defined within KRS 14A.1-070.

For all foreign entities required to obtain a certificate of authority to transact business in the Commonwealth, if a copy of the certificate is not received by the contracting agency within the time frame identified above, the foreign entity's solicitation response shall be deemed non-responsive or the awarded contract shall be cancelled.

Businesses can register with the Secretary of State at https://secure.kentucky.gov/sos/ftbr/welcome.aspx .

SPECIAL NOTE FOR PROJECT QUESTIONS DURING ADVERTISEMENT

Questions about projects during the advertisement should be submitted in writing to the Division of Construction Procurement. This may be done by fax (502) 564-7299 or email to kytc.projectquestions@ky.gov. The Department will attempt to answer all submitted questions. The Department reserves the right not to answer if the question is not pertinent or does not aid in clarifying the project intent.

The deadline for posting answers will be 3:00 pm Eastern Daylight Time, the day preceding the Letting. Questions may be submitted until this deadline with the understanding that the later a question is submitted, the less likely an answer will be able to be provided.

The questions and answers will be posted for each Letting under the heading "Questions & Answers" on the Construction Procurement website (www.transportation.ky.gov/contract). The answers provided shall be considered part of this Special Note and, in case of a discrepancy, will govern over all other bidding documents.

HARDWOOD REMOVAL RESTRICTIONS

The US Department of Agriculture has imposed a quarantine in Kentucky and several surrounding states, to prevent the spread of an invasive insect, the emerald ash borer.

Hardwood cut in conjunction with the project may not be removed from the state. Chipping or burning on site is the preferred method of disposal.

INSTRUCTIONS FOR EXCESS MATERIAL SITES AND BORROW SITES

Identification of excess material sites and borrow sites shall be the responsibility of the Contractor. The Contractor shall be responsible for compliance with all applicable state and federal laws and may wish to consult with the US Fish and Wildlife Service to seek protection under Section 10 of the Endangered Species Act for these activities.

ACCESS TO RECORDS

The contractor, as defined in KRS 45A.030 (9) agrees that the contracting agency, the Finance and Administration Cabinet, the Auditor of Public Accounts, and the Legislative Research Commission, or their duly authorized representatives, shall have access to any books, documents, papers, records, or other evidence, which are directly pertinent to this contract for the purpose of financial audit or program review. Records and other prequalification information confidentially disclosed as part of the bid process shall not be deemed as directly pertinent to the contract and shall be exempt from disclosure as provided in KRS 61.878(1)(c). The contractor also recognizes that any books, documents, papers, records, or other evidence, received during a financial audit or program review shall be subject to the Kentucky Open Records Act, KRS 61.870 to 61.884.

In the event of a dispute between the contractor and the contracting agency, Attorney General, or the Auditor of Public Accounts over documents that are eligible for production and review, the Finance and Administration Cabinet shall review the dispute and issue a determination, in accordance with Secretary's Order 11-004. (See attachment)

10/29/12

Commonwealth of Kentucky
Finance and Administration Cabinet
OFFICE OF THE SECRETARY
Room 383, Capitol Annex
702 Capital Avenue
Frankfort, KY 40601-3462
(502) 564-4240
Fax (502) 564-6785

Steven L. Beshear
Governor

Lori H. Flanery
Secretary

SECRETARY'S ORDER 11-004

FINANCE AND ADMINISTRATION CABINET

Vendor Document Disclosure

WHEREAS, in order to promote accountability and transparency in governmental operations, the Finance and Administration Cabinet believes that a mechanism should be created which would provide for review and assistance to an Executive Branch agency if said agency cannot obtain access to documents that it deems necessary to conduct a review of the records of a private vendor that holds a contract to provide goods and/or services to the Commonwealth; and

WHEREAS, in order to promote accountability and transparency in governmental operations, the Finance and Administration Cabinet believes that a mechanism should be created which would provide for review and assistance to an Executive Branch agency if said agency cannot obtain access to documents that it deems necessary during the course of an audit, investigation or any other inquiry by an Executive Branch agency that involves the review of documents; and

WHEREAS, KRS 42.014 and KRS 12.270 authorizes the Secretary of the Finance and Administration Cabinet to establish the internal organization and assignment of functions which are not established by statute relating to the Finance and Administration Cabinet; further, KRS Chapter 45A.050 and 45A.230 authorizes the Secretary of the Finance and Administration Cabinet to procure, manage and control all supplies and services that are procured by the Commonwealth and to intervene in controversies among vendors and state agencies; and

NOW, THEREFORE, pursuant to the authority vested in me by KRS 42.014, KRS 12.270, KRS 45A.050, and 45A.230, I, Lori H. Flanery, Secretary of the Finance and Administration Cabinet, do hereby order and direct the following:

I. Upon the request of an Executive Branch agency, the Finance and Administration Cabinet ("FAC") shall formally review any dispute arising where the agency has requested documents from a private vendor that holds a state contract and the vendor has refused access to said documents under a claim that said documents are not directly pertinent or relevant to the agency's inquiry upon which the document request was predicated.

II. Upon the request of an Executive Branch agency, the FAC shall formally review any situation where the agency has requested documents that the agency deems necessary to

conduct audits, investigations or any other formal inquiry where a dispute has arisen as to what documents are necessary to conclude the inquiry.

III. Upon receipt of a request by a state agency pursuant to Sections I & II, the FAC shall consider the request from the Executive Branch agency and the position of the vendor or party opposing the disclosure of the documents, applying any and all relevant law to the facts and circumstances of the matter in controversy. After FAC's review is complete, FAC shall issue a Determination which sets out FAC's position as to what documents and/or records, if any, should be disclosed to the requesting agency. The Determination shall be issued within 30 days of receipt of the request from the agency. This time period may be extended for good cause.

IV. If the Determination concludes that documents are being wrongfully withheld by the private vendor or other party opposing the disclosure from the state agency, the private vendor shall immediately comply with the FAC's Determination. Should the private vendor or other party refuse to comply with FAC's Determination, then the FAC, in concert with the requesting agency, shall effectuate any and all options that it possesses to obtain the documents in question, including, but not limited to, jointly initiating an action in the appropriate court for relief.

V. Any provisions of any prior Order that conflicts with the provisions of this Order shall be deemed null and void.

SPECIAL NOTE FOR RECIPROCAL PREFERENCE

Reciprocal preference to be given by public agencies to resident bidders

By reference, KRS 45A.490 to 45A.494 are incorporated herein and in compliance regarding the bidders residency. Bidders who want to claim resident bidder status should complete the Affidavit for Claiming Resident Bidder Status along with their bid in the Expedite Bidding Program. Submittal of the Affidavit should be done along with the bid in Bid Express.

DGA BASE

Unless otherwise noted, the Department estimates the rate of application for DGA Base to be 115 lbs/sy per inch of depth.

DGA BASE FOR SHOULDERS

Unless otherwise noted, the Department estimates the rate of application for DGA Base for Shoulders to be 115 lbs/sy per inch of depth. The Department will not measure necessary grading and/or shaping of existing shoulders prior to placing of DGA Base, but shall be incidental to the Contract unit price per ton for DGA Base.

Accept payment at the Contract unit price per ton as full compensation for all labor, materials, equipment, and incidentals for grading and/or shaping of existing shoulders and furnishing, placing, and compacting the DGA Base.

FUEL AND ASPHALT PAY ADJUSTMENT

The Department has included the Contract items Asphalt Adjustment and Fuel Adjustment for possible future payments at an established Contract unit price of $1.00. The Department will calculate actual adjustment quantities after work is completed. If existing Contract amount is insufficient to pay all items on the contract with the adjustments, the Department will establish additional monies with a change order.

Special Note for Construction Activities Near Louisville Water Company (LWC)
60" Water Transmission Line

The Contractor is to be advised that construction activities will occur in the vicinity of a 60" water transmission line owned and operated by the Louisville Water Company (LWC). Extensive testing has been performed on the structural integrity of the transmission line, including acoustic leak detection, electromagnetic inspection and a high definition video inspection. The testing reports are available as part of the proposal. Furthermore, Quality Level "A" Subsurface Utility Location is provided in the plan set.

The Contractor is advised that any damage to the 60" water transmission line during construction shall be the sole responsibility of the Contractor. This includes, but is not limited to, all costs associated with repairing damage to the newly constructed facilities should excavation under the newly constructed roadway, drainage system, etc. be required to access the damage transmission line. This also includes any costs related to adjoining facilities, including but not limited to, the KY Air National Guard property, public fire station, existing Grade Lane, I-65, etc.

The Contractor should be properly bonded to cover potential repairs to the 60" transmission line, should damage occur due to construction activities. Furthermore, at the expense of the Cabinet and before the project is finaled, LWC shall contract with Pure Technologies to conduct the same testing on the 60" transmission line once work is complete and contract with Simpson, Gumpertz and Heger (SGH) to prepare a new risk of failure analysis should testing reveal any damaged areas. Any new damage to the 60" water transmission line, detected in the post-construction testing, shall be the responsibility of the Contractor to repair.

For information on testing and repair to the 60" transmission line, contact:

Eric Walls, PE
Louisville Water Company
550 South Third St.
Louisville, KY 40202
Office: (502) 569-3600 x2167
Mobile: (502) 333-4858

6 February 2015

Mr. John Rundy
Pure Technologies U.S.
3322 Route 22 West
Bldg. 9, Suite 902
Branchburg, NJ 08876

Project 140606.01 – Construction Mitigation Risk of 60 in. Diameter Prestressed Concrete Cylinder Pipe (PCCP), Louisville Water Company, Louisville, KY

Subject – Structural Evaluation of Existing Louisville Water Company 60 in. PCCP Transmission Main for Construction Live Loads for LWC Contract No. P1452-AS-03, Change Order No. 1 – Grade Lane Relocation

Dear Mr. Rundy:

During the relocation and construction of Grade Lane in Louisville, Kentucky, a portion of the 60 in. diameter prestressed concrete cylinder pipe (PCCP) water main will be subjected to construction loads. Affected areas of the existing pipeline are between approximately Station 30+00 and Station 50+00 as shown on the Louisville Water Company (LWC) Condition 2014 PCCP drawings.

The purpose of our work is to evaluate the existing water main based on available pipeline design and condition assessment data and to make recommendations as to the maximum allowable construction loads and vibrations that can be applied to the existing pipelines. The scope of our work includes structural evaluation of the portions of the existing PCCP lines that are in the vicinity of the proposed construction Change Order No. 1.

BACKGROUND

Based on the pipeline drawings and laying schedules provided by LWC, construction on Grade Lane in Louisville, Kentucky will relocate Grade Lane to run adjacent to the on-ramp to Interstate 65 South (I-65S). This will involve construction of an approach to the National Guard, the exit ramp of I-65S, and the entrance ramp of I-65S. An existing 60 in. diameter PCCP water main exists in the vicinity of the new construction. The approximate location of the construction and existing PCCP line are shown in Figure 1.

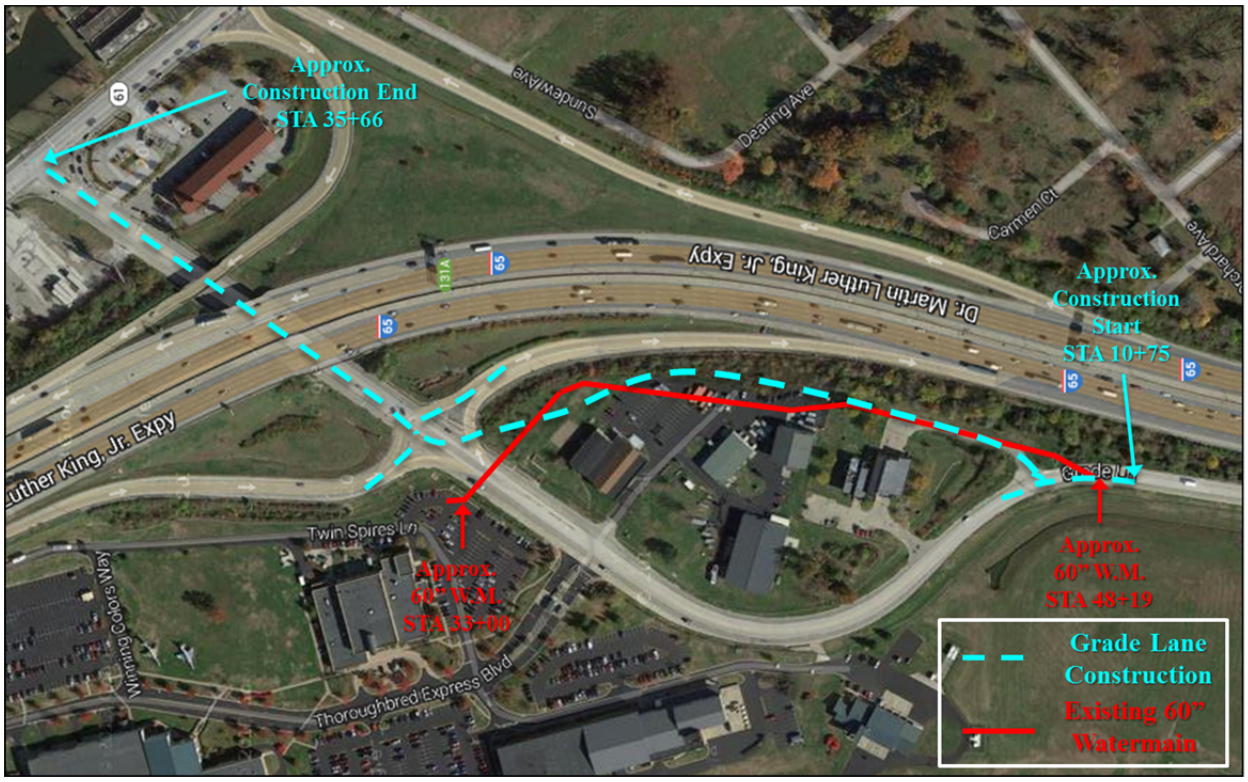

Figure 1 – Area of construction and existing water main

Construction will occur approximately between Station 30+00 and Station 50+00 of the water main. The 60 in. diameter pipeline was built in 1993 using PCCP, embedded cylinder type (ECP) manufactured by Price Brothers. According to the pipeline documents, all pipe between these stations is MK151-125 psi with 16 gage thick steel cylinder.

Geotechnical reports were not provided, but as-built drawings show that this portion of the pipeline is installed in rock, shale, and limestone. The ground water levels are not shown in the water main drawings.

EM inspection performed in August 2014 identified no distressed pipes in the pipeline.

REFERENCES

We reviewed the following documents provided by Pure Technologies:

- Construction Drawings:
  - Project Drawings for Condition 2014- P.C.C.P. Grade Lane 60" & Preston Hwy. 24"-DRAFT. Louisville Water Company, May 2014.
  - Commonwealth of Kentucky Department of Highways Plans of Proposed Project Jefferson County Grade Lane at I-65, URS, 11 December 2013.

- Design Data Sheet: Lay Schedule for Louisville Kentucky Standiford Field 60" PCCP Transmission Main Drawing No. 123.92-1C, Price Brothers Company, 28 March 1992.

- As-built Drawings: Standiford Field 60-inch Concrete Transmission Main, Phase I, Louisville Water Company, August 1993.

- As-built Laying Schedule: Louisville Kentucky Project No. 90-601A Alternate Bid Route, Price Brothers, 23 July 1992.

LOADS ON PIPE

PCCP is currently designed for combined loads following the procedures specified in AWWA C304. The existing pipeline was designed in accordance with the applicable AWWA C304-92 standards at the time of design. Design loads applied to the PCCP consist of the maximum internal working and working-plus-transient pressures, pipe and fluid weights, earth load, live load, and prestressing force.

Maximum Working and Transient Pressures

- **Working Pressure:** LWC provided pressure monitoring data from two locations on the 60 in. diameter pipeline. Based on the pipe elevations taken from the profile drawings for each monitoring location and the measured pressures, we constructed a hydraulic grade line to calculate pressures along each pipeline. The LWC drawings do not show any pumping stations between the two sites or along the remainder of the pipeline within the scope of this analysis; therefore, we extrapolated the HGL beyond the two monitoring sites. The measured working pressures are less than the design working pressure for the entire 60 in. diameter pipeline within the scope of this analysis as shown in Figure 2. We do not know if the measured pressures are the highest pressures that the pipeline experiences throughout the year. For our analysis we conservatively consider a working pressure equal to the pipe design working of 125 psi.

- **Working-Plus-Transient Pressure:** Transient pressures are caused by changes in pipeline flow velocity as a result of opening and closing of valves or starting and stopping of pumps. We were not provided with a hydraulic transient analysis and we do not know the modes of valve operation or if there are any surge protection mechanisms installed in the lines. Therefore, we use the surge pressure of 50 psi specified on the pipe design data sheet for analysis. We note this is consistent with the recommendations of AWWA C304 of a transient pressure equal to 40% of the design working pressure. The actual maximum pressure may be different from those used in this analysis, depending on the actual system operation.

Gravity and Prestressing Loads

- **Pipe Weight:** Pipe weight is calculated based on pipe geometry and constituent material unit weights given in AWWA C304 Standard for Design of PCCP. The pipe weight is assumed to be supported on a 15° bedding with Olander distribution.

- **Fluid Weight:** Fluid weight is calculated based on the pipe geometry and the weight of water (62.4 lbs/ft^3). The fluid weight is assumed to be supported on an Olander distribution with 90° bedding angle.

- **Earth Load:** Based on the MK151-125 pipe design sheet, design earth cover is 10 ft of soil with a unit weight of 140 pcf. For analysis we assume an Olander pressure distribution with a 90 degree bedding angle. Pipe installation details show trench widths ranging from 9 ft wide to 12 ft wide, so we conservatively assumed an embankment installation for our calculation of earth loads on the pipe. Based on review of the Condition 2014 PCCP drawings provided by LWC, soil cover heights over the pipe range from 3 ft to 10 ft. The Grade Lane construction drawings by URS show two locations where soil cover over the pipe is less than 3 ft. The cross section drawings of Grade Lane indicate 0.7 ft cover at Grade Lane Station 18+80 and 1.8 ft cover at Grade Lane Station 20+75. Actual soil cover over the pipe should be field verified. We recommend a minimum of 3 ft of soil over any pipe section subjected to construction live loads. Therefore, we checked the pipe for a range of cover heights between 3 ft and 10 ft.

- **Live Loads:** According to the MK151 design sheets, the pipe was designed for aircraft live load. The loading configuration for the aircraft live load is not defined. The subject pipes are located near highways and not at an airport so we assumed an AASHTO HS-20 truck live load for our capacity checks. Live load is calculated for a given soil-cover depth. The load is distributed through the depth of soil above the pipe, and the load is applied using the same pressure distributions as the earth load. We also calculated the allowable surcharge pressure at the top of the pipe. This allowable pressure can be used to compute the allowable surface pressure once the footprint of construction equipment at the surface is determined.

- **Prestressing Force:** Prestressing force is computed by UDP following AWWA C304 procedure based on prestressing wire area and residual stresses after elastic deformation, concrete creep and shrinkage, and wire relaxation losses, computed using the computer program UDP. The prestressing force is applied as a radial pressure to the exterior of the pipe.

Construction Loads

- **Transient and Sustained Vehicle Loads:** Since we do not know the vehicles that will be present during construction, we calculate allowable construction vehicle loads. See the section titled “Allowable Construction Loads” for the methodology and details for analysis.

- **Blast:** Upon review of the construction drawings and cross sections, no blasting will occur during the Grade Lane Relocation construction. Where rock exists, it is at or below the top of pipe elevation while the road construction will occur above the top of pipe elevation. Since blasting may be required for other aspects of the construction project and construction equipment may induce vibrations on the pipeline, we calculate the peak particle velocity (PPV) expected to damage to the PCCP.

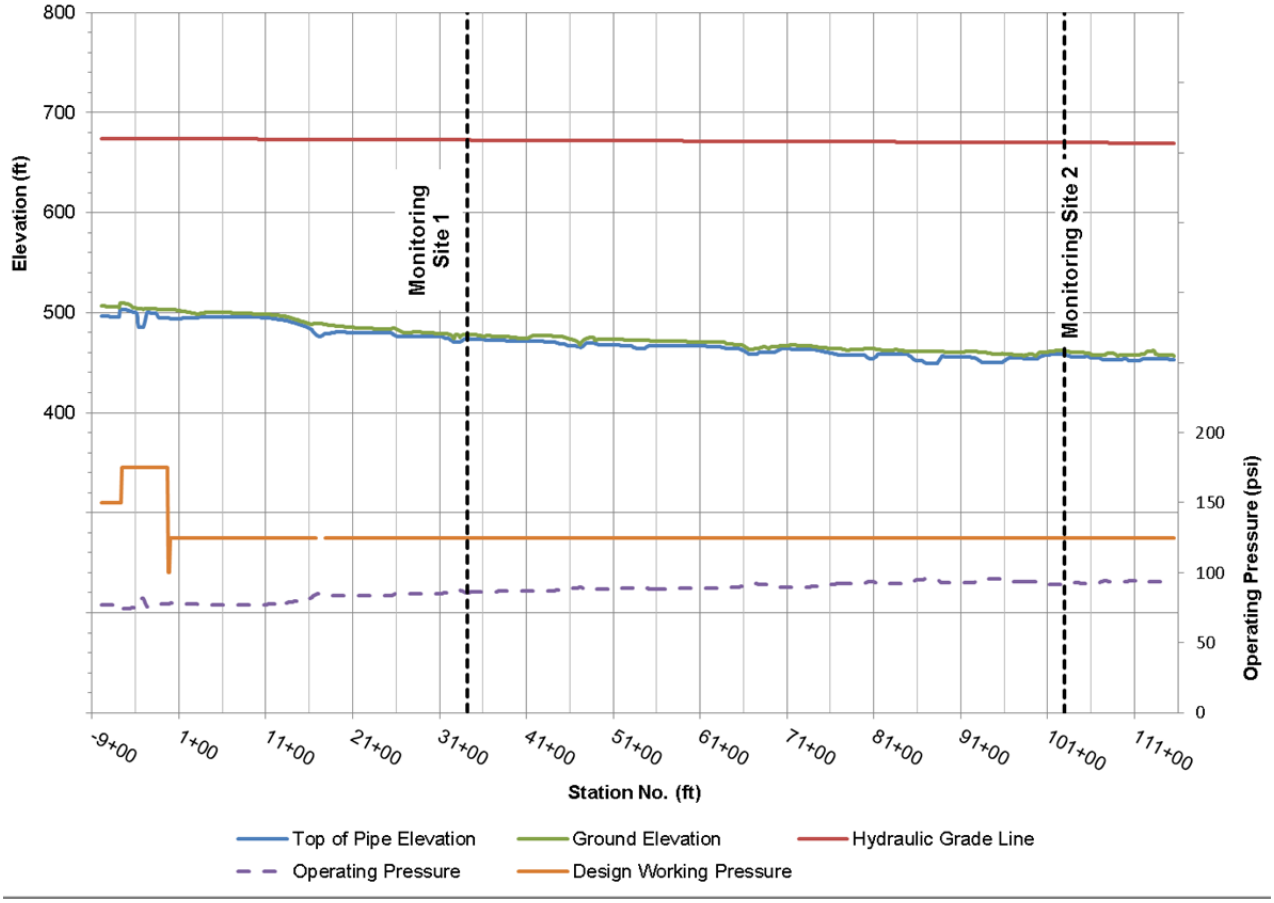

Figure 2 – Hydraulic grade line and operating pressures determined from results of LWC pressure monitoring of the 60 in. ECP.

PIPE DESIGN EVALUATION

The current PCCP analysis and design procedure uses a limit states approach in accordance with AWWA C304 based on meeting certain serviceability, damage, and strength limit states. This procedure is implemented in the computer program UDP that was developed by SGH for the American Concrete Pressure Pipe Association for the analysis and design of PCCP. We used the UDP program to perform a structural evaluation of the portion of the water main that is near construction in accordance with AWWA C304.

We evaluated the pipe design using the design properties (Table 1) subjected to the original design pressures and soil cover heights. The purpose of this analysis was to evaluate the capacity of the pipe based on the specified design and to compare the capacity to the design loads to identify the excess capacity, if any, inherent in the design. We generated the limit state curves for the pipe design and checked the adequacy of the pipe for all cover heights between 3 ft and 10 ft to identify the construction load capacity of the existing pipe for a range of soil cover heights.

Table 1 –Pipe Design Properties

		Nominal Design Value
Inner Diameter (in.)	D_i	60
Core Thickness, including cylinder (in.)	h_c	4.5
Mortar Thickness Over Wire (in.)	h_m	0.75
Steel Cylinder Thickness (in.)	t_y	0.0598
Prestress Wire Diameter (in.)	t_w	0.192
Prestress Wire Area per Foot (in^2/ft)	A_s	0.45
Prestress Wire Class		III
Concrete Core Strength (psi)	f_{pc}	4,500
Mortar Strength (psi)	f_{pm}	5,500

ALLOWABLE CONSTRUCTION LOADS

In the absence of specific construction loads for evaluation (e.g., particular equipment, trucks, cranes, etc.), we have quantified the available capacity of the pipe to resist temporary construction loads in terms of an allowable surcharge pressure at the crown of the pipe. The allowable sustained and transient surcharge pressures at the top of the pipe are summarized in Table 2 for various soil cover heights along the pipeline.

Table 2– Allowable Sustained and Transient Pressures at Top of Pipe

Pipe Class	Allowable Earth plus Sustained Load at Working Pressure (lbf/ft)	Allowable Earth plus Transient Load at Working Pressure (lbf/ft)	Existing Soil Cover Height (ft)	Calculated Earth Load on Pipe (lbf/ft)	Allowable Sustained Pressure at Top of Pipe (psf)	Allowable Transient Pressure at Top of Pipe (psf)
MK151-125psi	12,288	26,250	3	2,737	1,626	4,002
			4	3,773	1,449	3,826
			5	4,878	1,261	3,638
			6	6,056	1,061	3,437
			7	7,312	847	3,223
			8	8,652	619	2,995
			9	10,082	375	2,752
			10	11,606	116	2,493

Construction loads should be evaluated for comparison to the allowable pressure by computing the total load applied at the surface divided by a distribution area at the elevation of the pipe crown. The distribution area is defined as the contact area at the surface increased in all directions by a distance equal to the height of soil cover times a live load distribution factor of 1.15. If two loads interact, then the combined loads should be divided by the area bounded by the perimeter of the overlapping areas.

Sustained loads are assumed to be semi-permanent such as material stockpiles maintained for days or weeks. Transient loads are dynamic loads not remaining in one place for long periods such as passing trucks and operating construction equipment. Equipment or trucks parked on top of the pipeline should be considered sustained loads.

Transient construction loads (live loads) should include a dynamic load allowance. We recommend a value in accordance with the AASHTO LRFD Bridge Design Specifications Section 3.6.2.2:

$$IM=33*(1-0.125D_E) >= 1.0\%$$

where:

IM = dynamic load allowance percent
D_E = minimum depth of earth cover over the pipe, ft

In addition to the dynamic load allowance, a separate dynamic load factor should be included for operation (beyond simply traversing) of construction equipment over the pipeline. This factor accounts for the variability of load application and pressure distribution during equipment operation, e.g., non-uniform pressure distribution beneath excavator tracks during excavation. Load factors vary depending on the type of equipment and specific construction activity and therefore should be evaluated on a case-by-case basis.

Load Distribution Example: Truck loading

Wheel load is applied over the tire contact area. The wheel load dimension parallel to the direction of travel is assumed to be 10 in. and the width perpendicular to travel is assumed to be 20 in.

The wheel load is spread through soil from the contact area assuming distribution given by AASHTO at a rate of 1.15:1 ft of depth. Pressure from two or more wheels may overlap with depth, if it does, then the pressure intensity is calculated as the sum of the wheel loads divided by the area created by the outer perimeter of their influence areas as shown in Figure 3.

The resulting pressure is multiplied by the dynamic load allowance. This pressure is compared to the allowable values shown in Table 2.

For other construction vehicles, the load and contact area is in accordance with manufacturer's literature for the specific construction equipment.

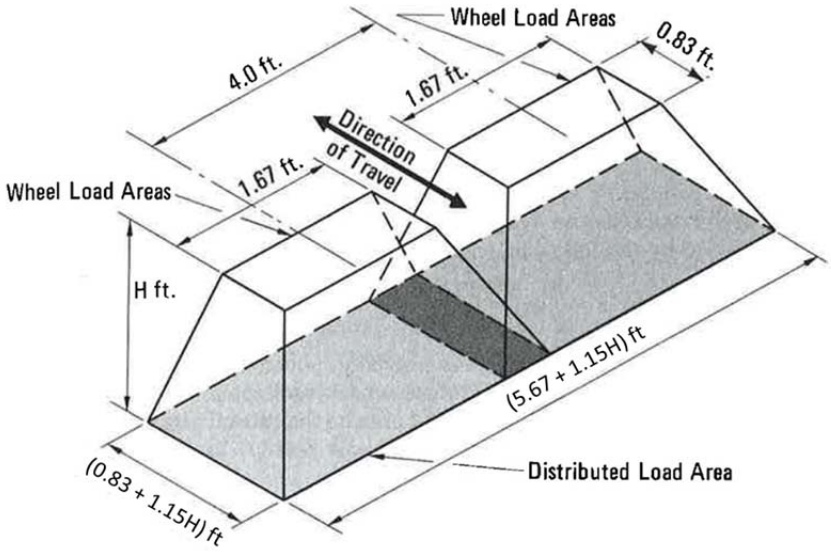

Figure 3 – Distributed load area of two HS20 trucks passing (adapted from Concrete Pipe Handbook Figure 4.27)

Determination of PPV Causing Damage to PCCP from impact/blasting loads

Delamination, longitudinal cracking, and circumferential cracking were investigated as the three possible damage modes of PCCP subjected to blast effects (Ojdrovic et al., 2003). Cracking is a precursor to other damage to the pipe, such as failure of the liner or the wall and buckling or rupture of the pipe.

Three types of seismic waves, primary/compressive wave, shear wave, and Rayleigh wave, were considered in this investigation. The most severe strain from the three wave types is conservatively chosen for this analysis.

The solutions for PPV causing pipe damage are sensitive to the stiffness or shear wave velocity of the limestone. The stiffness of limestone varies greatly and is difficult to accurately estimate without proper measurement. The shear wave velocity of the limestone at the site has not been measured. Therefore, the results for three shear wave velocities ranging from 1,000 ft/sec to 5,000 ft/sec were investigated. These shear wave velocities are characteristic of soft to medium-hard rocks (International Building Code, 2009, Table 1613.5.2).

Similarly, the solutions for PPV causing delamination are sensitive to the shear stiffness of the backfill material. Therefore, assuming a soft soil backfill with a shear wave velocity less than 600 ft/sec (International Building Code, 2009, Table 1613.5.2), a dynamic shear stiffness value of the fill, equal to 10,000 psi and 24,000 psi was used to provide a range of maximum PPV values that cause damage to the pipe.

The three damage modes investigated are:

1. Delamination: a reflected tensile stress wave within the pipe wall created by the resultant of the seismic waves may cause the mortar coating to delaminate from the concrete core of the pipe. A compressive stress wave travels through the bedrock and

backfill, and radially through the pipe wall, water (in the pipe), radially through the other pipe wall, and back into fill. As a compressive wave passes from a stiffer media into a softer media (for example, from the pipe wall to water and from pipe wall to the backfill), a tensile stress wave is reflected into the stiffer media. Formulas for the reflection/transmission of P-waves for a one-dimensional medium bar are used to calculate stress wave magnitudes. The PPV that causes the coating to delaminate is based on the calculated radial stress in the pipe and the radial tensile strength of the mortar coating.

In a study of mortar coating delamination in PCCP (Zarghamee et al., 1993a and 1993b), we measured the radial tensile strength of mortar coating on PCCP with an embedded cylinder. We established a lower bound of 177 psi (average 314 psi). We used a radial tensile strength of 100 psi for blast loading analysis of the pipeline; i.e., the coating is assumed to delaminate if the tensile stress exceeds 100 psi.

2. Pipe ovaling: as a seismic wave propagates, the soil surrounding the pipe is compressed. The compressed soil causes the pipe to oval perpendicular to the direction of the seismic wave, resulting in tensile stresses in concrete core and coating, and consequently cracking, if stresses are high enough. The pipe wall has existing stresses and strains consistent with the combined effects of earth load, pipe and fluid weights, and internal operating pressure. The criteria for cracking are the strain limit states specified in American Water Works Association (AWWA) C304 Standard for Design of Prestressed Concrete Cylinder Pipe. The change in diameter of the pipe is assumed to be equivalent to the contraction experienced by the bedrock underlying the pipe.

3. Circumferential cracking: a compressive wave traveling longitudinally along the pipe is assumed to be reflected at an air or water gap in the concrete, resulting in a tension wave with a magnitude equal to the compression wave. Wave-induced strains are superimposed on the strains due to thermal differential, shrinkage, Poisson's ratio of pressure effect, and circumferential strains due to ovaling from gravity effects. The criterion for cracking of the coating is the AWWA C304 strain limits. The PPV that causes the concrete to form visible cracks in the coating is calculated.

The results of our calculations show that for a pipe in good condition circumferential cracking is the most likely mode of damage to the pipe occurring at PPV of about 8 ips assuming shrinkage up to about 300 microstrains (Figure 3). Coating delamination occurs at a PPV of 8 ips, and cracking of the pipe liner or coating by ovaling occurs at much higher PPVs. We have assumed a coefficient of thermal expansion of $\alpha = 6x10^{-6}$ per °F and a temperature differential between operation and installation $\Delta T = 40^{o}F$. The PPV causing the pipe to sustain circumferential cracking is sensitive to the shrinkage strain in the pipe wall. Longitudinal shrinkage strains are small. The sensitivity of PPV to the existing longitudinal strains in the pipe wall, as shown in Figure 3, indicates that for shrinkage of up to about 300 microstrains, PPV that causes circumferential cracking is greater than 8 in./sec.

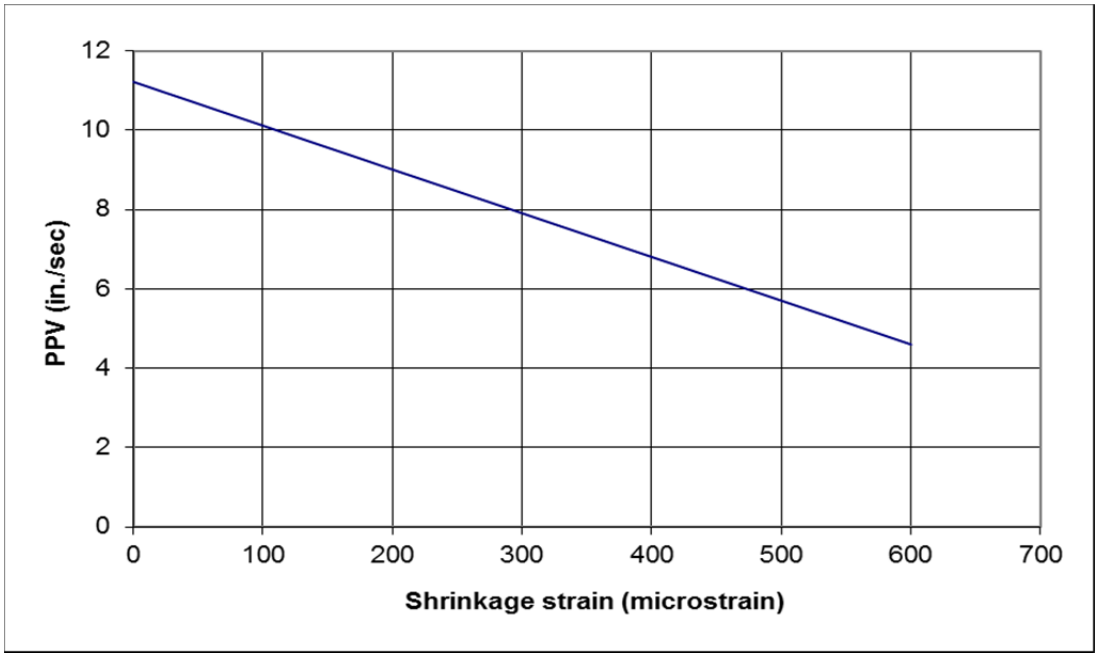

Figure 3 – Sensitivity of PPV causing circumferential cracking to shrinkage strain

Rucker and Dowding (1998), calculated axial pipe stresses in a concrete pipe from estimated vibratory ground strains and determined that concrete tensile strength is exceeded at PPV of about 10 in./sec. This estimate is close to PPV of 8 in./sec calculated above.

Considering large variability in vibration response and uncertainties in the response of the mortar coated pipe to the underground blasting, we recommend using a factor of safety of 3 on the allowable peak particle velocity for a pipe in good condition. The recommended allowable PPV is 2.7 in./sec. For a degraded pipe, allowable PPV may be much smaller than 2.7 in./sec.

Determination of PPV Causing Damage to PCCP from Construction Vibrations

The Swiss standard SN 640 312a Vibration Impacts on Structures provides guidelines for limiting criteria intended to preclude damage to structures due to vibrations. Guideline values are based on the vibration sensitivity of the structure, the frequency of vibration exposure, and the threshold frequency of the vibrations. and

Structure sensitivity to vibration

A buried pipeline could be classified as being very slightly sensitive to highly sensitive to vibrations according to SN 640 312a, depending on the pipe material and installation conditions. The descriptions of sensitivity classes as they relate to buried pipelines and utilites are provided below.

- Underground tunnels, caverns, and shafts in rock or well-consolidated soil are classified as “very slightly sensitive to vibration.”

- Utilities (gas, water, drainage, cables) laid below ground are classified as “slightly sensitive to vibration.”
- Cast iron pipes are classified as “normally sensitive to vibration.”
- Old cast iron pipes are classified as “highly sensitive to vibration.”

Based on these descriptions, the PCCP line is classified as slightly sensitive to vibrations.

Frequency of Impacts

Descriptions of frequency of impacts and vibration sources within each frequency class are provided below.

- Occasional: impacts like blasting with the number of events considerably less than 1,000.
- Frequent: impacts like frequent blasting, impact and vibration rammers, compaction machines and occasional use of demolition hammers.
- Continuous: impacts like traffic, permanently installed machines, and frequent use of demolition hammers with the number of events considerably greater than 100,000 events.

Based on these descriptions, construction activity could results in vibrations in any of the frequency classes, but will typically consist of occasional and frequent impacts.

Frequency Range of the Vibration

SN 640 312a identifies the following three frequency ranges in the lower frequency ranges where structures are most susceptible to damage:

1. 8 to 30 Hz
2. 30 to 60 Hz
3. 60 to 150 HZ

Vibration Guideline Values

For the 60 in. PCCP, the suggested limiting criteria are:

Vibration Limiting Criteria, in/ sec.				
Structure: slightly sensitive	Frequency of Vibration Occurrence	Predominant frequency content of vibration excitation		
		< 30 Hz	30-60 Hz	> 60Hz
	Occasional	1.2	1.6	2.4
	Frequent	0.5	0.6	1.0
	Continuous	0.2	0.3	0.5

Note that the values tabulated above may be multiplied by 1.5 for structures classified as “very slightly sensitive to vibration”.

The intent of the Swiss criteria is to set limiting guide values below which even light damage is improbable, and states that sporadic values exceeding the design guidelines by 30% only minimally increase the likelihood of any damage. Based on the conservative basis of the published Swiss criteria, our assessment of the limiting criteria for impacts and our experience we believe a limiting criteria for the construction vibration measured at the surface of 0.7 in./sec for reciprocating loads such as vibratory compaction equipment and 1.0 for general construction activity is acceptable for sound pipe with no distress.

CONCLUSIONS AND RECOMMENDATIONS

Based on our review of the LWC and URS drawings in the specified areas and our analysis of the 60 in. PCCP design we conclude the following:

- The pipe has additional capacity available to support construction loads. The magnitude of the allowable loads is a function of the construction load footprint, the actual soil cover over the pipe and the anticipated duration of the load.

- Surcharge pressures at the top of the pipe due to construction sustained and transient live loads should be maintained below the pressures provided in Table 2 above for different soil covers. A dynamic load allowance should be considered for all live loads.

- Our analysis for allowable construction loads is based on the design capacity of the pipe at the existing soil cover. There should be a minimum of 3 ft of earth cover over the pipe before any construction live load is applied. Soil cover over the pipeline should be field verified prior to applying any construction loads. If soil cover cannot be field verified then allowable loads should be limited to the minimum calculated value assuming the existing soil cover is as shown on the original design drawings.

- A limiting criteria for PPV due to construction vibration measured at the pipeline of 0.7 in./sec for reciprocating equipment such as vibratory compactors, and 1.0 in/sec for general construction activity is acceptable for sound pipe with no distress. These are general limits that may be refined by detailed evaluation of specific equipment that the contractor proposes to use for the project.

Based on our review and analysis we recommend the following:

- Maintain pressures at the top of the pipeline resulting from construction live loads over the pipeline below the pressures given in Table 2 for the actual soil cover heights.

- Prior to application of any construction load on the pipeline, verify the actual field conditions and perform additional analysis at specific areas as needed to demonstrate that the installed pipe has the additional capacity to support construction loads.

- Verify actual and maximum expected working pressures in the pipeline and check if they affect the results and conclusions presented in this letter.

- Maintain a minimum of 3 ft of earth cover over the pipe prior to subjecting the pipe to any surcharge loads.

- Limit the PPV measured at the pipeline to 0.7 in./sec for reciprocating equipment such as vibratory compactors, and 1.0 in/sec for general construction activity. A detailed evaluation may be performed for the specific construction equipment to be used on site.

References

International Society of Explosives Engineers (ISEE), "ISEE Blaster's Handbook, 18th Edition," International Society of Explosives Engineers, Cleveland, OH, 2011, pp 561-630.

SN 640 312a, Swiss Standard on Vibration Impacts on Structures, 1992.

Ojdrovic, R.P., Rose, B., and Zarghamee, M.S., "Analysis of Blast Effects on PCCP Pipelines," *Proceedings of ASCE International Conference on Pipeline Engineering and Construction,* Baltimore, MD, 13-16 July 2003, pp. 1201-1209.

Rucker, M.L., and Dowding, C.H. (1998). "Blasting near segmented pipelines: Damage potential assessment." *Geotechnical Earthquake Engineering and Soil Dynamics III,* Vol. 2, Proceedings of a specialty conference, American Society of Civil Engineers, 1518-1529.

Zarghamee, M.S., Ojdrovic, R.P., and Dana, W.R., "Preventing Coating Delamination in Prestressed Concrete Pipe," *Pipeline Infrastructure II: Proceedings of the International Conference,* San Antonio, TX, 16-17 Aug. 1993, pp. 574-594.

Zarghamee, M.S., Ojdrovic, R.P., and Dana, W.R., "Coating Delamination by Radial Tension in Prestressed Concrete Pipe. Part I – Experiments," *Journal of Structural Engineering*, 119, 1993, pp. 2701-2719.

Zarghamee, M.S., Ojdrovic, R.P., and Dana, W.R., "Coating Delamination by Radial Tension in Prestressed Concrete Pipe. Part II – Analysis," *Journal of Structural Engineering*, 119, 1993, pp. 2720-2732.

Sincerely yours,

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Senior Principal

Peter D. Nardini
Senior Staff II – Structures

DRAFT SmartBall® Inspection Report

for the

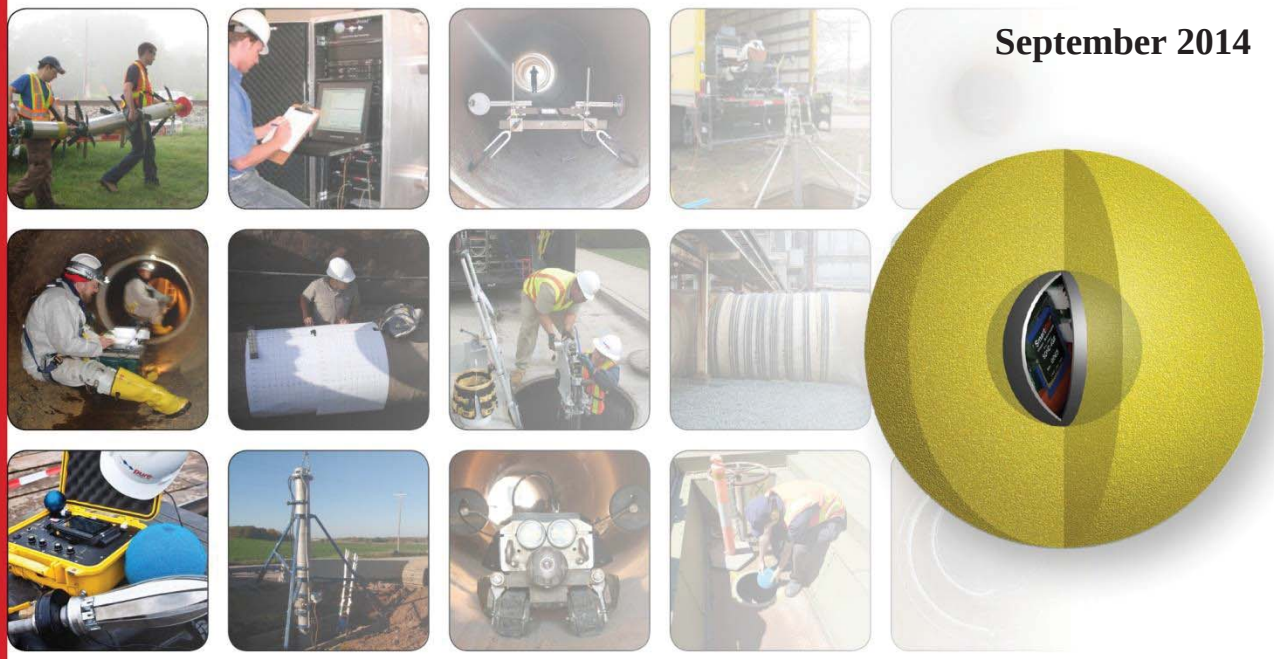
Grade Lane 60-Inch PCCP and Preston Highway 24-Inch Phase 2 PCCP Water Mains

Prepared for:

Louisville Water Company
550 South Third Street, Louisville, KY 40202

Prepared by:

Pure Technologies U.S. Inc.



September 2014

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SMARTBALL® REPORT

SmartBall® Inspection Report

Grade Lane 60-Inch PCCP and Preston Highway 24-Inch Phase 2 PCCP Water Mains

Prepared for:
Louisville Water Company

Prepared by:
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September 2014

Quality Assurance and Quality Control Statement

By my signature, I attest that this report has been prepared and reviewed in accordance with the Pure Technologies U.S. Inc. Quality Assurance and Quality Control procedures:

Project Manager	Date
Primary Data Analyst	Date
Regional Manager	Date

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Table of Contents

1. Executive Summary

The Louisville Water Company retained the services of Pure Technologies U.S. Inc. (Pure Technologies) to perform SmartBall® leak and gas pocket detection surveys of the Grade Lane 60-inch PCCP Water Main (Grade Lane) and the Preston Highway 24-Inch Phase 2 PCCP Water Main (Preston Highway). The Preston Highway inspection took place on Monday July 21, 2014 and the Grade Lane inspection was performed on Tuesday July 22, 2014.

1.1 Preston Highway Inspection Summary

The Preston Highway potable water pipeline comprises 24-inch prestressed concrete cylinder pipe (PCCP) and transfers water from North to South along Preston Highway. The inspection proceeded from Southern High School (Station 208+10) to the intersection of Antle Drive and North Preston Highway (Station 359+56). Acoustic and sensor data was collected and recorded as the tool traversed the pipeline. This data was evaluated to identify acoustic anomalies associated with leaks and pockets of trapped gas.

During the inspection of the Preston Highway Water Main, the SmartBall tool detected one (1) anomaly characteristic of a leak and zero (0) acoustic anomalies characteristic of pockets of trapped gas. The results of the inspection are summarized in Table 1.1 and Table 1.2.

Table 1.1

Pipeline Details – Preston Highway	
Total Length of Pipeline Inspected:	15,267 feet
Pipe Material:	PCCP
Diameter of Pipe:	24 inches
Product:	Water

Table 1.2

Inspection Results – Preston Highway	
Acoustic Anomalies Characteristic of Leaks:	1
Acoustic Anomalies Characteristic of Pockets of Trapped Gas:	0
Duration of the Inspection:	2 hours, 1 minutes
Average SmartBall Tool Velocity:	2.1 feet per second

1.2 Grade Lane Inspection Summary

The Grade Lane potable water pipeline comprises 60-inch PCCP and transfers water from North to South, along the Kentucky Air National Guard Base and the Louisville Regional Airport. The tool was inserted into the pipeline in the parking lot of Vision Airlines (Station 1+40) and was extracted at the intersection of Beanblossom Road and Grade Lane (115+75). Acoustic and sensor data was collected and recorded as the SmartBall tool traversed the pipeline. The data was evaluated to identify acoustic anomalies associated with leaks and pockets of trapped gas.

During the inspection of the Grade Lane Water Main, the SmartBall tool detected zero (0) anomalies characteristic of leaks and zero (0) acoustic anomalies characteristic of pockets of trapped gas. The results of the inspection are summarized in Table 1.3 and Table 1.4.

Table 1.3

Pipeline Details – Grade Lane	
Total Length of Pipeline Inspected:	11,435 feet
Pipe Material:	PCCP
Diameter of Pipe:	60 inches
Product:	Water

Table 1.4

Inspection Results – Grade Lane	
Acoustic Anomalies Characteristic of Leaks:	0
Acoustic Anomalies Characteristic of Pockets of Trapped Gas:	0
Duration of the Inspection:	2 hours, 34 minutes
Average SmartBall Tool Velocity:	1.2 feet per second

2. Introduction and Background

Louisville Water Company retained the services of Pure Technologies to perform a SmartBall inspection of the 24-inch Preston Highway Water Main and the 60-inch Grade Lane Water Main in July 2014.

Pure Technologies inspected the two (2) pipelines as a part of a larger condition assessment plan implemented by Louisville Water Company. The condition assessment plan for these two pipelines includes the SmartBall inspection as well as an electromagnetic inspection using the free-swimming PipeDiver® tool.

2.1 Description of Preston Highway

The Preston Highway Water Main comprises 24-inch PCCP and transfers water from North to South along Preston Highway. The inspection proceeded from Southern High School (Station 208+10) to the intersection of Antle Drive and North Preston Highway (Station 359+56), covering approximately 15,267 feet.

The approximate location of the Preston Highway Water Main, including the tracking locations as well as the location of the detected leak, is shown in Figure 2.1.

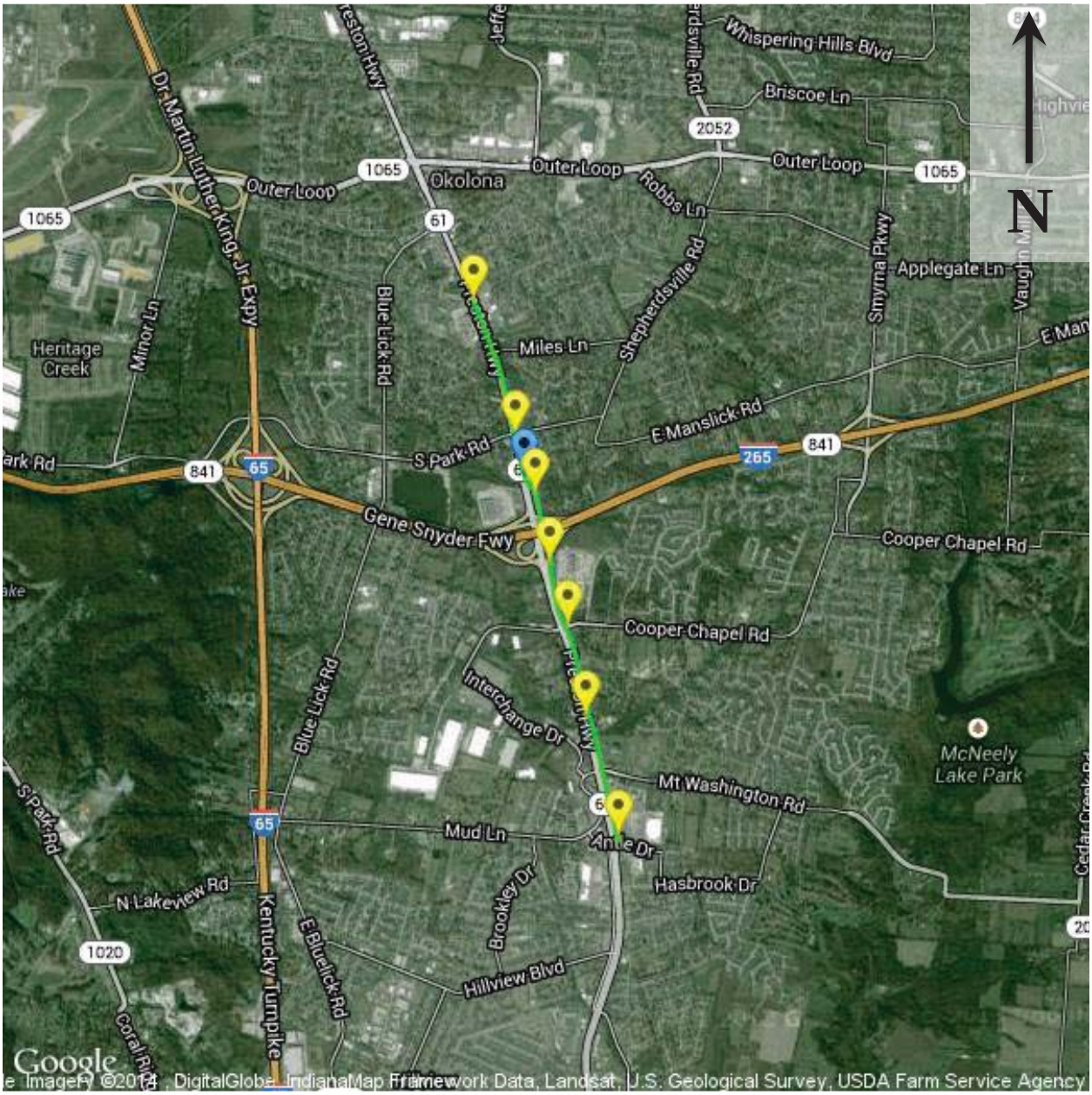


Figure 2.1 – General layout of the Preston Highway Water Main Inspection

Approximate sensor locations:

Approximate leak locations:

2.2 Description of Grade Lane

The Grade Lane Water Main comprises 60-inch PCCP and transfers water from North to South, primarily along the Dr. Martin Luther King Jr. Expressway. The tool was inserted into the pipeline in the parking lot of Vision Airlines (Station 1+40) and was extracted at the intersection of Beanblossom Road and Grade Lane (Station 115+75), covering approximately 11,435 feet. The Grade Lane Water Main is located along the East side of the Kentucky Air National Guard Base and the Louisville Regional Airport.

The approximate location of the Grade Lane Water Main, including the tracking locations, is shown in Figure 2.2.

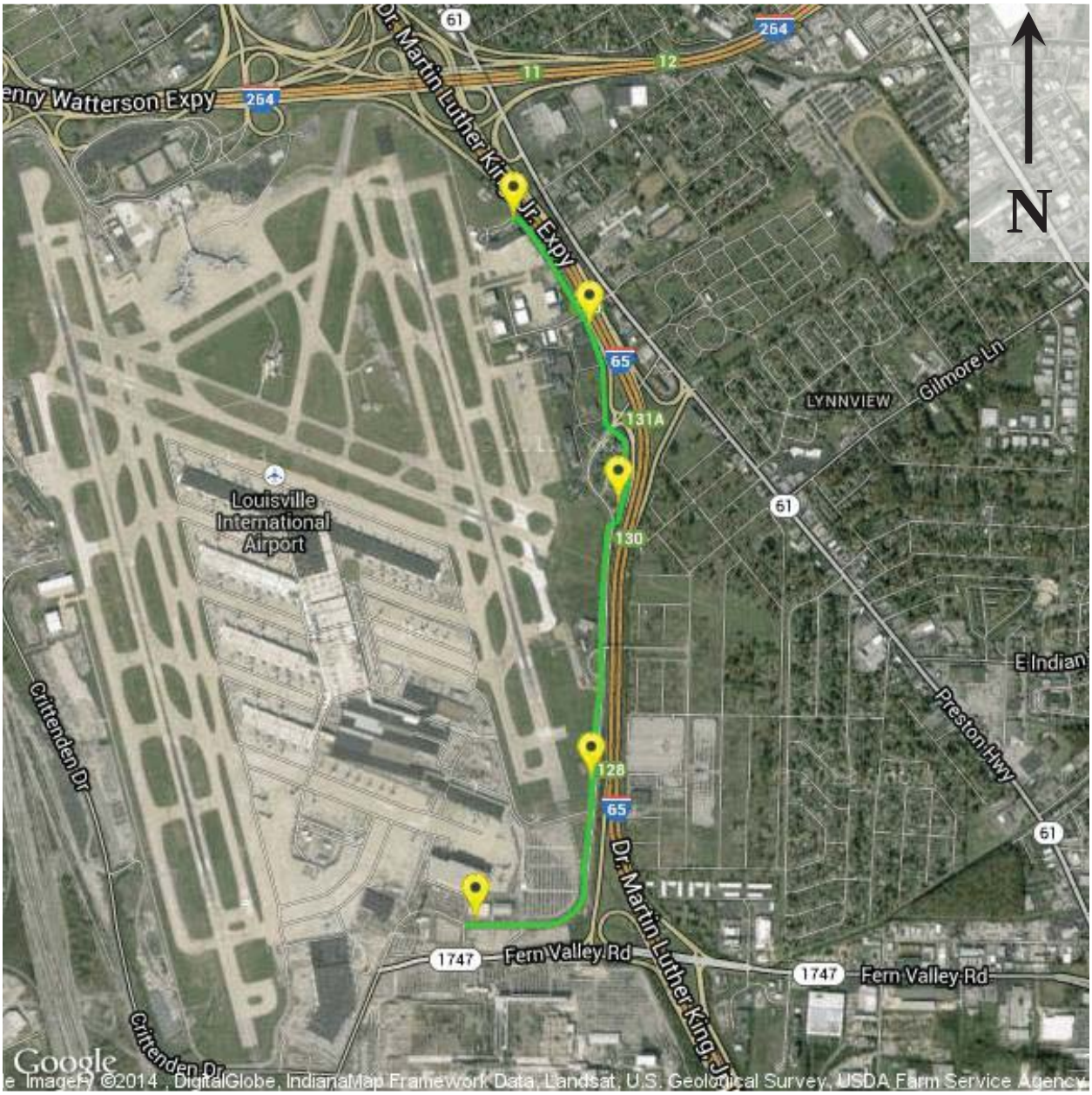


Figure 2.2 – General layout of the Grade Lane Water Main Inspection

Approximate sensor locations:

3. Description of the SmartBall Technology

3.1 Overview

Pure Technologies' SmartBall leak and gas pocket detection system is a free-swimming, acoustic-based technology that detects anomalous acoustic activity associated with leaks or gas pockets in pressurized pipelines. The SmartBall tool comprises a water-tight aluminum alloy core that contains a power source, electronic components, and instrumentation, including an acoustic sensor, tri-axial accelerometer, tri-axial magnetometer, GPS synchronized ultrasonic transmitter, and temperature sensor. The aluminum core is encapsulated by a protective outer foam shell. The compressible outer foam shell provides a larger surface area so that the device is propelled by the hydraulic flow of the water. The foam shell also dampens the low frequency ambient noise that is typically present in a pipeline. The SmartBall assembly is deployed into the flow of a pipeline, traverses the pipeline, and is captured and extracted at a point downstream. During the inspection, the location of the SmartBall tool is tracked at known points along the pipeline to correlate the inspection data with inspected distance.

Figure 3.1 – SmartBall core and foam shell with a SmartBall Receiver (SBR)

3.2 Identifying Leaks and Air Pockets

3.2.1 Acoustic Anomalies Representing Leaks

Leaks occurring in pressurized pipelines produce sounds at certain frequencies. The SmartBall leak and gas pocket inspection technology continuously records acoustic data as it traverses pipelines along the invert. After the inspection is completed, the data collected is analyzed to identify the frequencies consistent with leaks.

As the SmartBall device moves toward a leak, the amplitude of the sound wave increases, peaking at the location of the leak and then diminishing as the tool moves away. The increase and decrease in amplitude of the data is critical for precisely locating leaks. Figure 3.2 depicts the audio data of a leak when viewed in the leak and gas pocket detection analysis software.

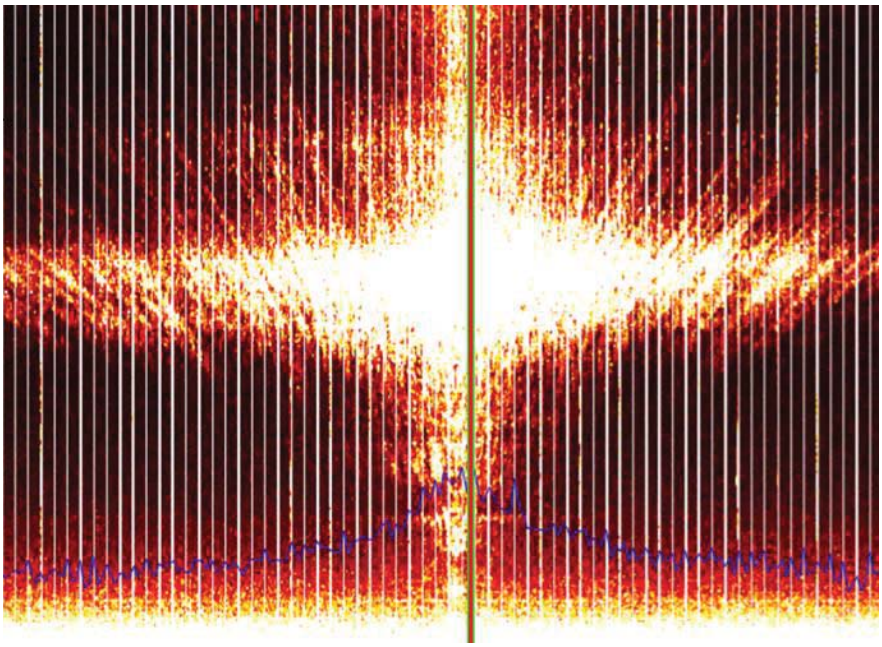


Figure 3.2 – Detected Leak, as shown in the Analysis Software

Pure Technologies has invested heavily in identifying the acoustic characteristics of leaks in pressurized pipelines. The characteristics typical of leaks include:

- The range of frequencies present increases as the tool approaches the leak
- The frequencies that appear first will intensify as the SmartBall tool approaches the leak
- The frequencies that appear to indicate a leak are consistent as the SmartBall tool approaches the leak

Pure Technologies reports leaks as being small, medium, or large. Small leaks are estimated to be less than 2 gallons per minute (GPM). Medium leaks are estimated to be in the range of 2 to 10 GPM, and large leaks are estimated to be greater than 10 GPM.

3.1.2 Acoustic Anomalies Representing Gas Pockets

Gas trapped inside a pipeline also has a distinct acoustic signature that is readily identified by the SmartBall analysis software and trained technicians. Pure Technologies classifies trapped gas inside a pipeline in three (3) ways:

1. Entrained Gas: This classification of trapped gas is characterized by small, moving bubbles of gas within the pipeline. Entrained gas is typically not static in a force main and frequently migrates with the flow. These moving bubbles have three main causes. They can be introduced at the pumping station as a result of air becoming entrained in the liquid due to pump cavitation. They can be created at a hydraulic jump at the end of a fully developed gas pocket where small pockets of gas diffuse into the liquid phase and are carried downstream with the flow. Finally, entrained air may be created by column separation, during which a vacuum is created and air is introduced into the pipeline through a leaking joint or crack.

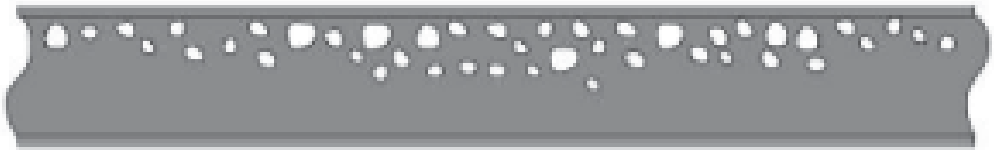


Figure 3.3 – Entrained Gas [Pothoff, 2011]

2. Gas Slugs or Developing Gas Pockets: This classification is characterized as small pockets of trapped gas that often develop as a result of an amalgamation of bubbles. Gas slugs can also be introduced at air/vacuum release valves (ARVs). If gas slugs are at localized high points, they are likely static; if not, they are likely migrating towards a high point.

Figure 3.4 – Gas Slugs [Pothoff, 2011]

3. Fully Developed Gas Pockets: Fully developed gas pockets are usually located at localized high points. These develop as a result of slugs that have accumulated to the magnitude that they extend into the downward slope of the pipeline. A fully developed gas pocket typically has a hydraulic jump prior to the pipe returning to a full flow, creating an area of turbulent flow and gas dissolution into the liquid phase. Due to the turbulent nature of the hydraulic jump and frequent wet/dry cycles at these locations from changes in flow conditions, these areas are at a higher risk of failure.

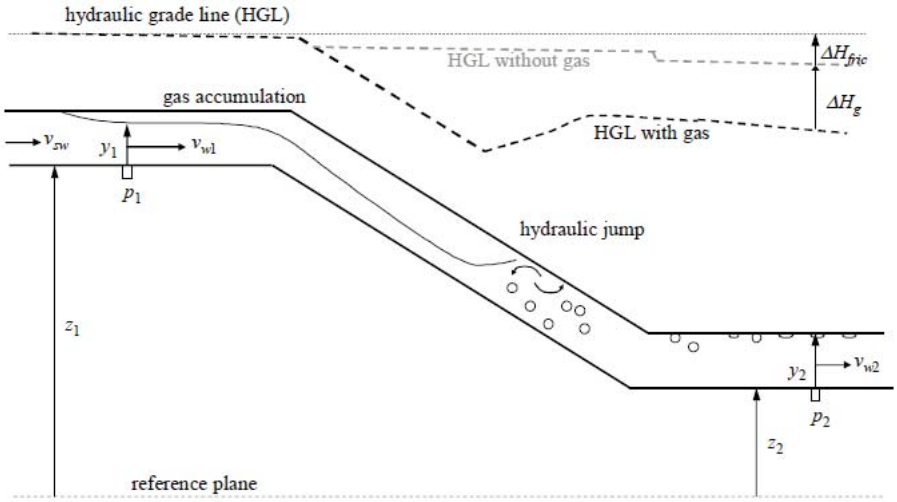


Figure 3.5 – Diagram of a Fully Developed Gas Pocket [Pothoff, 2011]

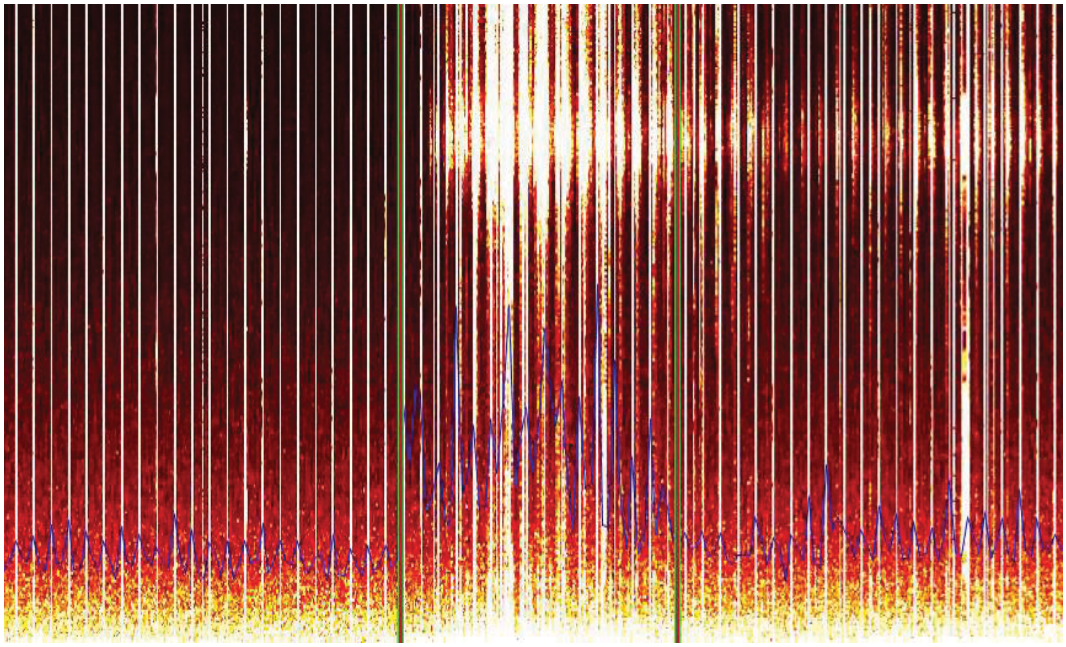


Figure 3.6 – Detected Gas Pocket, as shown in the Analysis Software

3.3 SmartBall® Tracking

The on-board accelerometer records the rotation of the SmartBall tool and this data can be translated to a rate of rotation. From there, a velocity profile for the device as it travels the entire length of the pipeline can be formulated. This data is aligned with the acoustic recordings to give a precise location for any recorded anomaly. To correlate the accelerometer data to an absolute position and time, a reference point is required. Tracking the position of the SmartBall tool via SmartBall Receivers (SBRs) provides a time and position that can be stamped on the velocity

profile, resulting in a position versus time relationship for the entire inspection length. This relationship is used to report the location of detected leaks and gas pockets.

An SBR comprises a surface mounted sensor (SMS), GPS receiver, and a processing computer. Both the SmartBall tool and the SBR are synchronized to GPS time. The SMS is attached to the pipeline at planned locations and is connected to the processing computer via a coaxial cable. The computer and SMS combination detects ultrasonic pulses emitted from the SmartBall tool. The SBRs determine the time it takes for the pulse to travel from the SmartBall tool to the SBR, and using this data, can calculate the location of the SmartBall tool at any given time.

Figure 3.7 – SMS Adhered to Flange

This locational data is combined with the data extracted from the SmartBall tool. This combination of information allows Pure Technologies' data analysts to identify the locations of leaks and gas pockets. Figure 3.7 shows an SMS, which is typically mounted to the pipeline itself or to a pipeline appurtenance. A complete overview of a typical SmartBall inspection overview is shown in Figure 3.8.

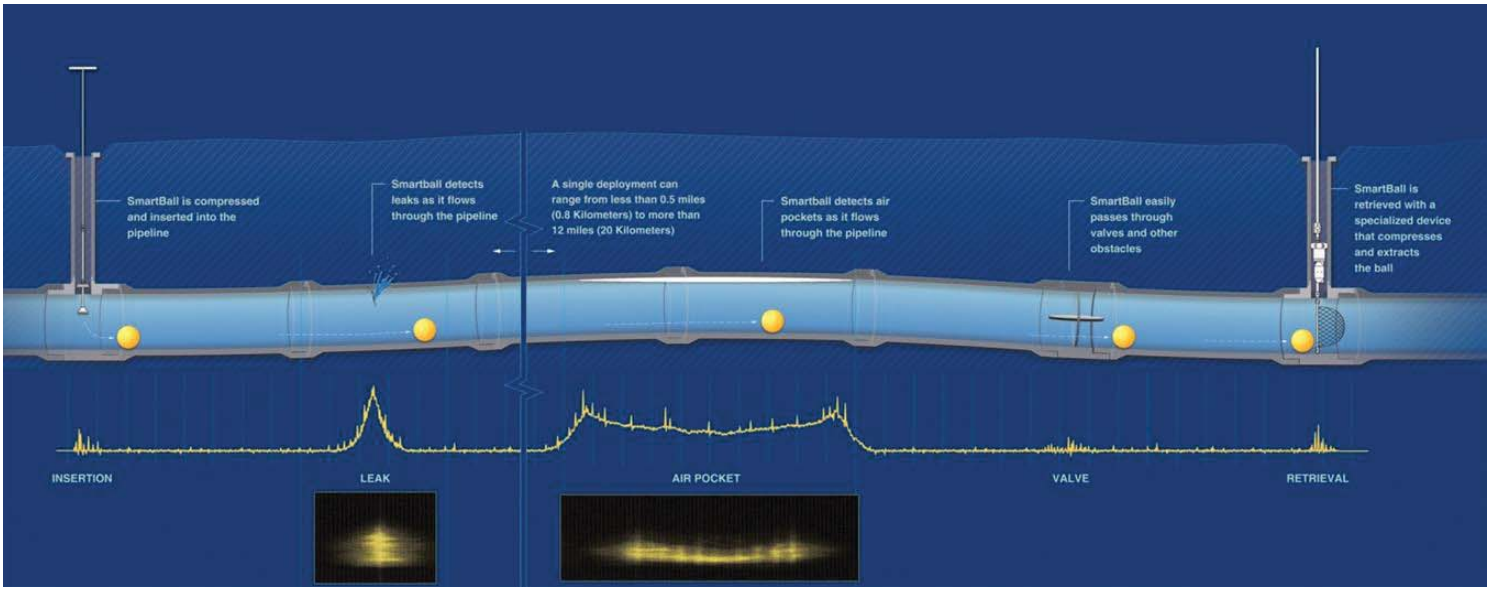


Figure 3.8 – Overview of a SmartBall® Inspection

3.4 Advantages and Limitations of the SmartBall Technology

The SmartBall® technology acquires high quality acoustic data that is evaluated to identify leaks and pockets of trapped gas. While other leak detection techniques such as noise loggers and correlators may identify a single leak or gas pocket between each sensor, they cannot accurately locate the limits of the anomaly nor identify multiple anomalies. The SmartBall tool travels directly past each acoustic anomaly of interest. As such, significant advantages are recognized:

- Medium and Large Diameter Pipelines: SmartBall technology has successfully inspected and detected leaks on a wide range of medium and large diameter pipelines (greater than 12 inches and over 96 inches in diameter). Many conventional leak detection technologies (e.g., correlators) have limitations that preclude their use on medium and large diameter pipelines.

- Pipe Material: The SmartBall tool's leak detection ability is not affected by pipe material. Because the tool passes each acoustic event, the pipe wall is not relied on to transmit the sound waves through the line to a sensor located far away from the actual event of interest. This greatly increases the SmartBall tool's sensitivity and ability to distinguish between separate acoustic events.

- Sensitivity: The sensitivity of all leak detection technologies is a function of several variables and as a result, no resolute thresholds can be established. However, the acoustic sensor inside the SmartBall tool always passes within one (1) pipe diameter of an acoustic anomaly; therefore, it can be used to identify very small leaks due to the proximity of the SmartBall tool to the leak. It should be noted that the SmartBall technology cannot differentiate between a true leak, a simulated leak, and the potential noise of a pressure reducing valve. As such, the acoustic anomalies corresponding to features in a pipeline should be investigated further in the field.

- Length of Survey: SmartBall technology has the ability to record acoustic data for over 12 hours. Depending on flow rates, the tool can handle long inspection lengths during a single deployment. The longest single recording within a water pipeline under a single deployment had the SmartBall tool record acoustic data and inspect a length of pipeline exceeding 30 miles.

All non-destructive testing technologies have unique capabilities and limitations that affect the accuracy and efficacy of the technology. The SmartBall tool has the following limitations:

- Minimum Pressure: The acoustic activity associated with a leak is derived from the pressure differential across the pipe wall. With little to no pressure differential, the SmartBall tool will not detect leaks as there will be no associated acoustic activity. Pure Technologies recommends a minimum pressure of 15 pounds per square inch (psi) for leak detection inspections; however, under ideal conditions, leaks have been detected in

pipelines with pressures as low as 5 psi. There is no minimum pressure recommendation for the detection of areas of trapped gas.

- Ambient Noise: The SmartBall technology detects and reports anomalies that have acoustic characteristics similar to leaks on pressurized pipelines. However, other forms of ambient noise may also be identified during the data analysis. For medium and large leaks, very little can match the acoustic characteristics; therefore, Pure Technologies reports these leaks with a higher level of certainty. For small leaks, there may be other forms of ambient noise that mimic the acoustic signature. Pure Technologies has invested significant resources into characterizing acoustic anomalies and consequently believes that the leaks described in this report are true leaks, unless otherwise noted. However, unknown pressure reducing valves, cracked valves in close proximity to the pipeline, interconnected pipelines that have not been completely isolated, and leaks in pipelines immediately adjacent to the subject pipeline do contain a similar acoustic signature to small leaks and could be reported as leaks in this report. Cars, pumps, boat traffic, and other forms of common ambient noise would not be reported as leaks as they contain different acoustic signatures.

- Reported Locations: Reported locations contained in this report are believed to be accurate to within approximately 6 feet. This estimation is based on project experience and the limitations of the technologies used to calculate location. There are also several other factors that would decrease the accuracy of locating leaks and gas pockets: adjacent SBRs that are more than 3,300 feet apart, the location of the SBRs are unknown**,** or the provided drawings and dimensions are incorrect.

4. SmartBall Inspection Details

4.1 Planning Document

Prior to the execution of the project, Pure Technologies reviewed the pipeline drawings and performed a site visit to determine suitability for inspection. A planning document, describing the upcoming SmartBall inspections was prepared and submitted to Louisville Water Company in July of 2014.

4.2 SmartBall Insertions

During the inspection of Preston Highway, the SmartBall tool was inserted at the valve in front of Southern High School (Station 208+10). The insertion claw was used to keep the foam and SmartBall core contained as the tool was inserted through the valve and then released into the flow. Figure 4.1 shows the insertion stack assembly for Preston Highway.

Figure 4.1 – Insertion Site for Preston Highway

During the Grade Lane Inspection, the tool was inserted at the valve in the parking lot of Vision Airlines (Station 1+40). Again, the insertion claw was used to keep the foam and SmartBall core contained as the tool was inserted through the valve and then released into the flow. Figure 4.2 shows the insertion stack assembly for Grade Lane.

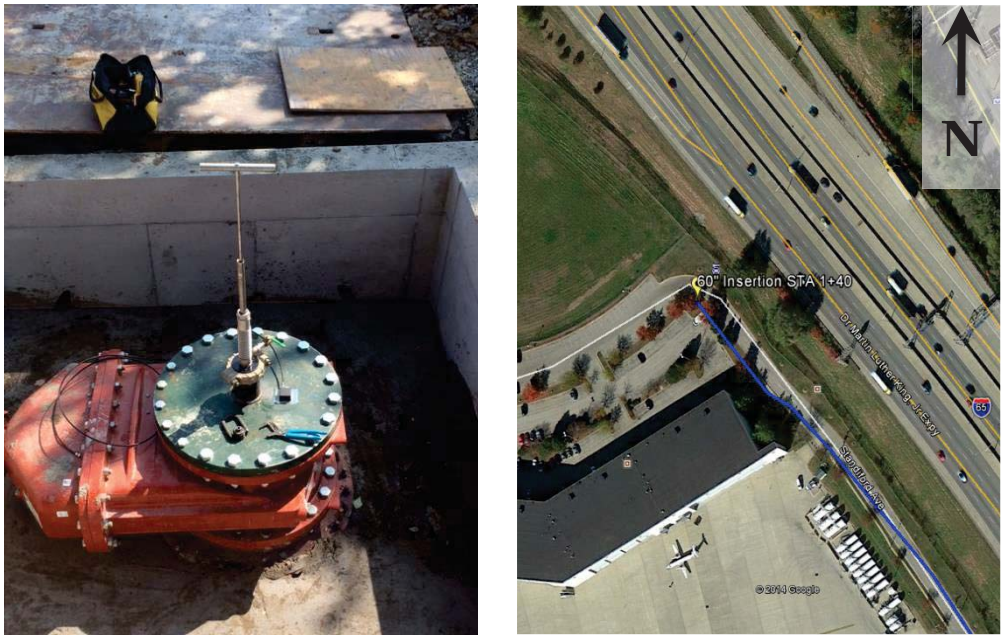


Figure 4.2 – Insertion Site for Grade Lane

The insertion claw protects the SmartBall tool from becoming stuck or damaged by any buildup or debris at the insertion valve and riser. Figure 4.3 and Figure 4.4 show actual and schematic images of the insertion claw.

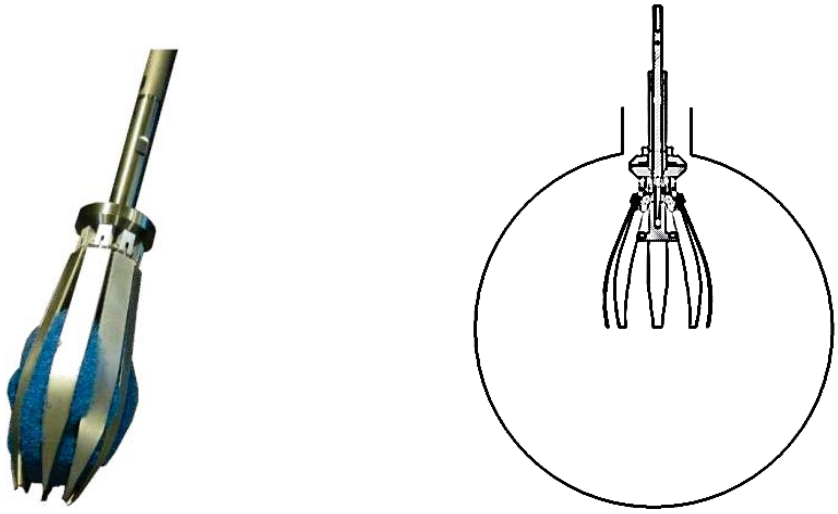


Figure 4.3 and Figure 4.4 – Insertion Claw

4.3 SmartBall Extractions

For both the Preston Highway and Grade Lane inspections, an extraction net was inserted and verified to be correctly deployed with a pressure proof camera before the SmartBall tool was released at the insertion site.

The Preston Highway inspection ended at the intersection of Antle Drive and North Preston Highway and the tool was extracted through the valve at Station 359+56. The Grade Lane inspection was completed at the intersection of Beanblossom Road and Grade Lane and the tool was removed via the valve at Station 115+75. Figure 4.5 shows the extraction stack assembly for Preston Highway and Figure 4.6 shows the extraction stack assembly for Grade Lane.

Figure 4.5 – Extraction Site on Preston Highway

Figure 4.6 – Extraction Site on Grade Lane

The extraction net is inserted into the pipeline flow at the start of the inspection and is left in place while the tool traverses the pipeline. Figure 4.7 and Figure 4.8 show drawings of deployed extraction nets.

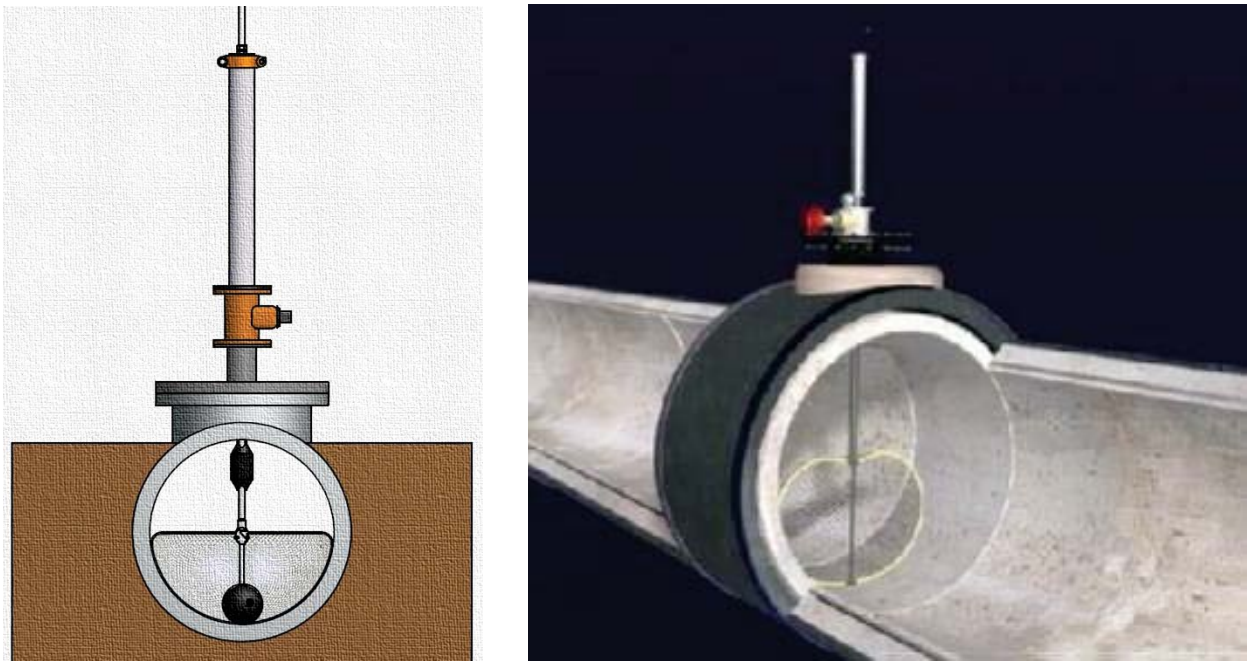


Figure 4.7 and Figure 4.8 – Deployed Extraction Net

5. Preston Highway Inspection Results

5.1 SBR Locations

Seven (7) surface mounted acoustic sensors were placed along the Preston Highway Water Main to track the progress of the SmartBall tool as it traversed the pipeline. The SBRs were connected to the sensors on the pipeline at the locations indicated in Table 5.1. These locations are further detailed in Appendix A. The times at which the SmartBall tool passed the SBR locations are also summarized in Table 5.1.

Table 5.1 – SmartBall Receiver Locations for Preston Highway

Distance from Insertion (feet)	Passage Time (hh:mm:ss)	Location Description	SBR No.	Approximate GPS Location
0	12:41:12 PM	16-inch Tap	SBR #1	38.1278, -85.6810
3,976	1:25:16 PM	ARV	SBR #2	38.1176, -85.6770
5,668	1:36:25 PM	Butterfly valve	SBR #3	38.1133, -85.6751
7,596	1:49:51 PM	Butterfly valve	SBR #4	38.1082, -85.6738
9,384	2:01:51 PM	Butterfly valve	SBR #5	38.1035, -85.6721
12,046	2:20:16 PM	Butterfly valve	SBR #6	38.0968, -85.6704
15,267	2:42:46 PM	16-inch Tap	SBR #7	38.0878, -85.6673

5.2 Tracking the Position of the SmartBall Tool

Individual SBRs were used to track the SmartBall tool's progress. The distance between and the location of these SBRs were chosen based on the information and drawings provided by Louisville Water Company. The details of the SBRs that acquired data for this inspection are shown in Appendix A.

Figure 5.1 shows a plot of the distance traveled by the SmartBall tool versus time. The slope of the blue line is the instantaneous velocity of the SmartBall tool, which was then calculated and plotted, as shown in Figure 5.2.

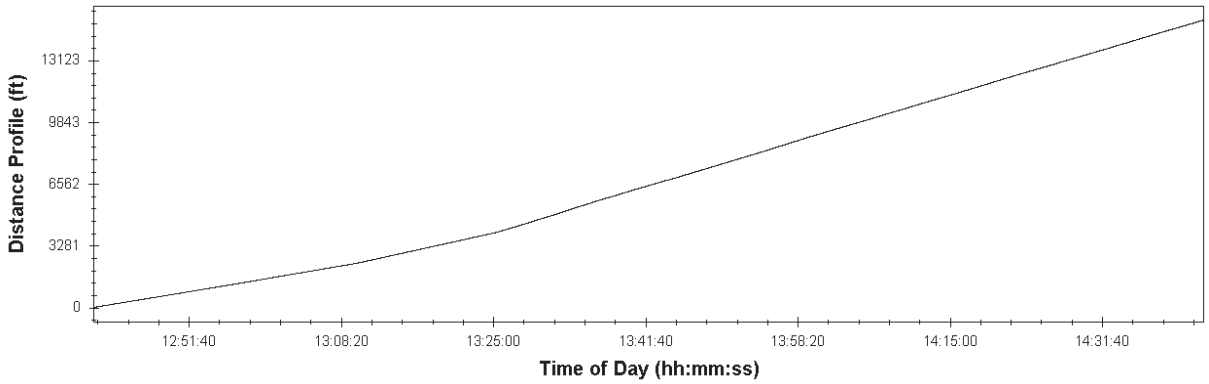


Figure 5.1 – Position Profile of the SmartBall Tool versus Time of Day for the July 21, 2014 Inspection of Preston Highway

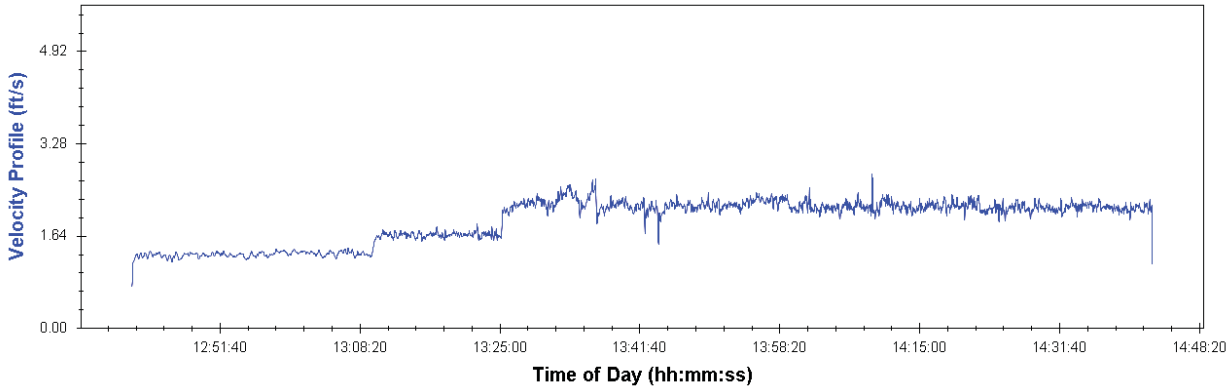


Figure 5.2 – Velocity Profile of the SmartBall Tool versus Time of Day for the July 21, 2014 Inspection of Preston Highway

Figure 5.3 shows data collected by the SBRs, indicating the relative distance of the SmartBall tool from the SBR. Data obtained from each SBR is represented by a different color.

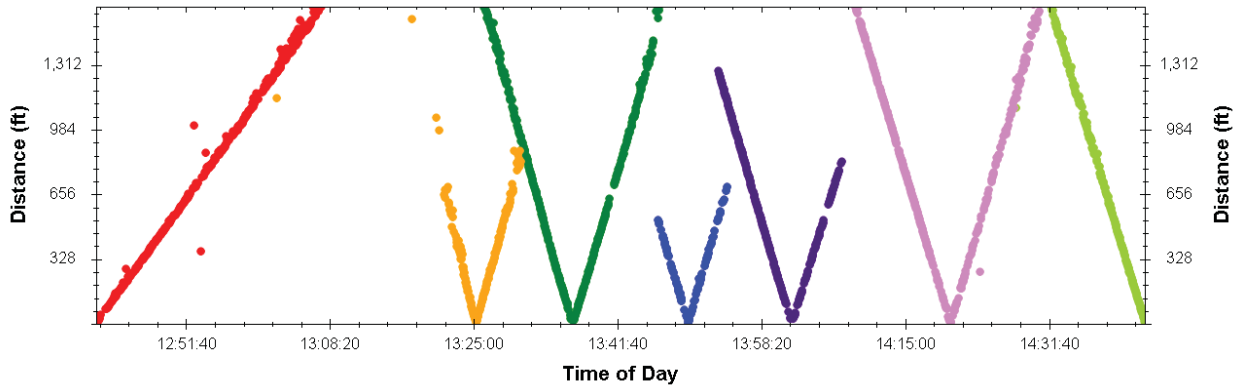


Figure 5.3 – SBR positional data for the July 21, 2014 inspection of Preston Highway

5.3 Summary of Leaks

The acoustic data recorded by the SmartBall tool was analyzed and cross-referenced with the position data from each SBR to determine a location of recorded acoustic anomalies. A summary of the leaks identified during the SmartBall inspection are provided below.

Figure 5.4 shows the acoustic profile of the inspection, as detected by the SmartBall technology, with respect to the position of the tool in the pipeline. The magnitude of identified leaks is estimated by examining the value of the leak indicator signal.

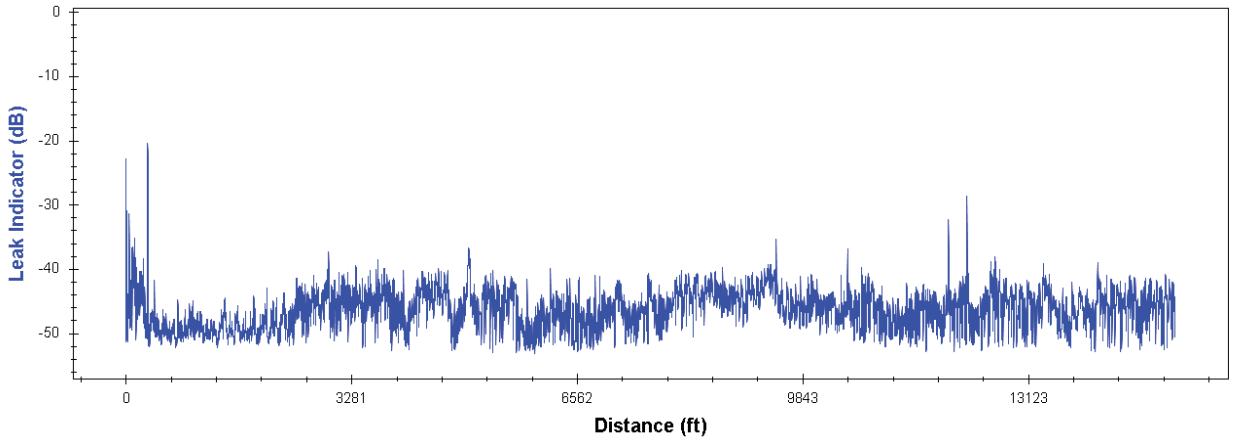


Figure 5.4 – Acoustic summary of the SmartBall Inspection versus Distance Travelled for the July 21, 2014 inspection of Preston Highway

This summary contains anomalous spikes in the data. These may have been created by ambient noise around the pipeline caused by external sources such as pumps or nearby traffic. These sources of ambient noise are easily distinguishable from leaks or other points of interest with further analysis by trained personnel and analysis of the frequencies involved. Ambient noise is generally at a much lower frequency than the frequencies generated by a leak or gas pocket.

Table 5.2 summarizes all sites of interest detected during the SmartBall inspection of the Preston Highway Water Main.

Table 5.2 – Sites of Interest

Distance from Insertion (feet)	Time Since Launch	Description	GPS Location*
4,997	00:50:58	Leak (Small)	38.1148, -85.6762

** GPS locations are approximate*

5.4 Sites of Interest – Details

Details on the detected acoustic anomaly of interest are provided below.

Site of Interest #1 - Leak	
Distance to Nearest Sensor:	671.3 feet before SBR 3
Distance from Insertion Point:	4,996.7 feet
Time Since Insertion:	00:50:58
Time of SmartBall Pass (GMT-5:00):	01:32:11 PM
Approximate Location:	38.1148, -85.6762 [I]
Acoustic Intensity:	-37.3 dB [II]
Estimated Size:	Small

[I] Based on data obtained through Google Earth
[II] Used by Pure Technologies to determine approximate leak size

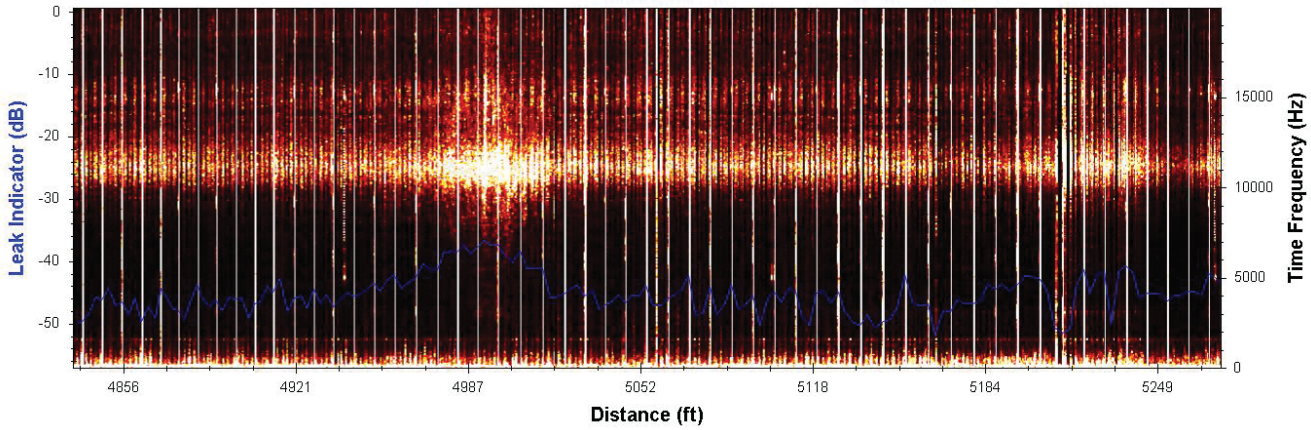


Figure 5.5 – Acoustic Intensity of the Anomaly

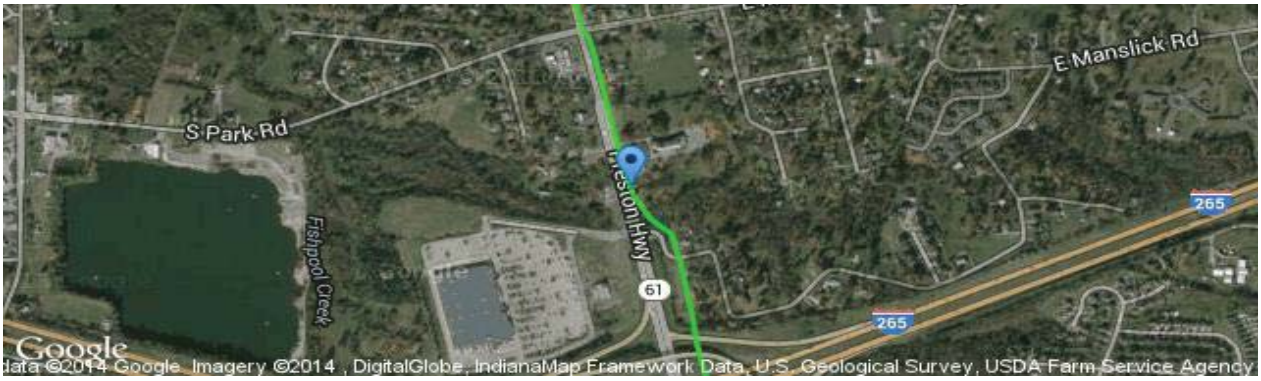


Figure 5.6 – Approximate Location of the Acoustic Anomaly

6. Grade Lane Inspection Results

6.1 SBR Locations

Five (5) surface mounted acoustic sensors were placed along the line to track the progress of the SmartBall tool as it traversed the pipeline. The SBRs were connected to the sensors on the pipeline at the locations indicated in Table 6.1, and are detailed in Appendix B. The times at which the SmartBall tool passed the SBR locations are also summarized in Table 6.1.

Table 6.1 – SmartBall Receiver Locations for Grade Lane

Distance from Insertion (feet)	Passage Time (hh:mm:ss)	Location Description	SBR No.	Approximate GPS Location
0	11:50:27 AM	24-inch Tap	SBR #1	38.1851, -85.7256
1,806	12:22:43 PM	ARV	SBR #2	38.1811, -85.7219
4,408	1:07:43 PM	ARV	SBR #3	38.1746, -85.7205
8,073	1:50:11 PM	ARV	SBR #4	38.1643, -85.7219
11,435	2:24:59 PM	24-inch Tap	SBR #5	38.1590, -85.7274

6.2 Tracking the Position of the SmartBall Tool

Individual SBRs were used to track the SmartBall tool's progress. The distance between and the location of these SBRs were based on the information and drawings provided by Louisville Water Company. The details of the SBRs that acquired data for this inspection are shown in Appendix B.

Figure 6.1 shows a plot of the distance traveled by the SmartBall tool versus time. The slope of the line is the instantaneous velocity of the SmartBall tool, which was then calculated and plotted, as shown in Figure 6.2.

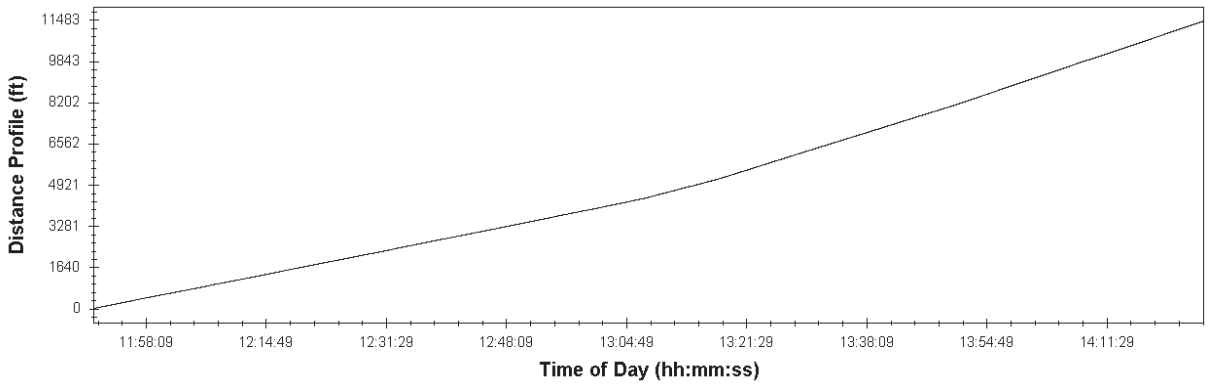


Figure 6.1 – Position Profile of the SmartBall Tool versus Time of Day for the July 22, 2014 Inspection of Grade Lane

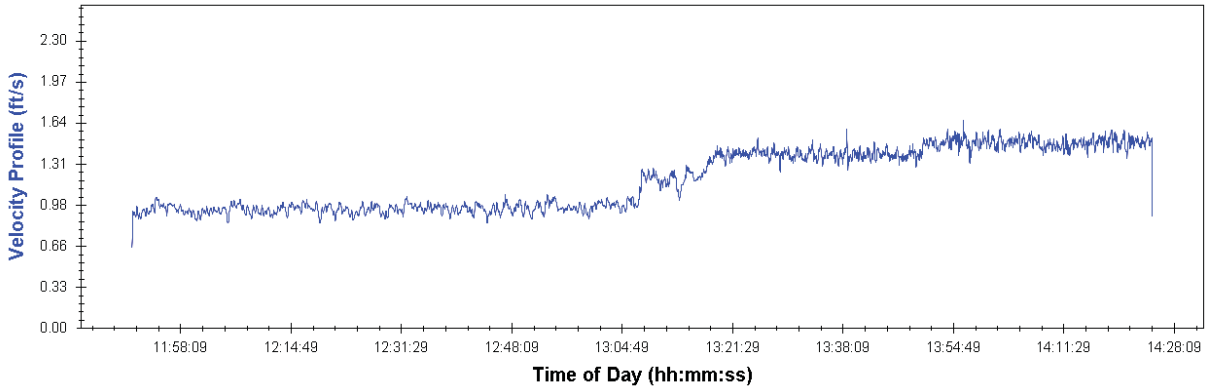


Figure 6.2 – Velocity Profile of the SmartBall Tool versus. Time of Day for the July 22, 2014 Inspection of Grade Lane

Figure 6.3 shows data collected by the SBRs, indicating the relative distance of the SmartBall tool from the SBR. Data obtained from each SBR is represented by a different color.

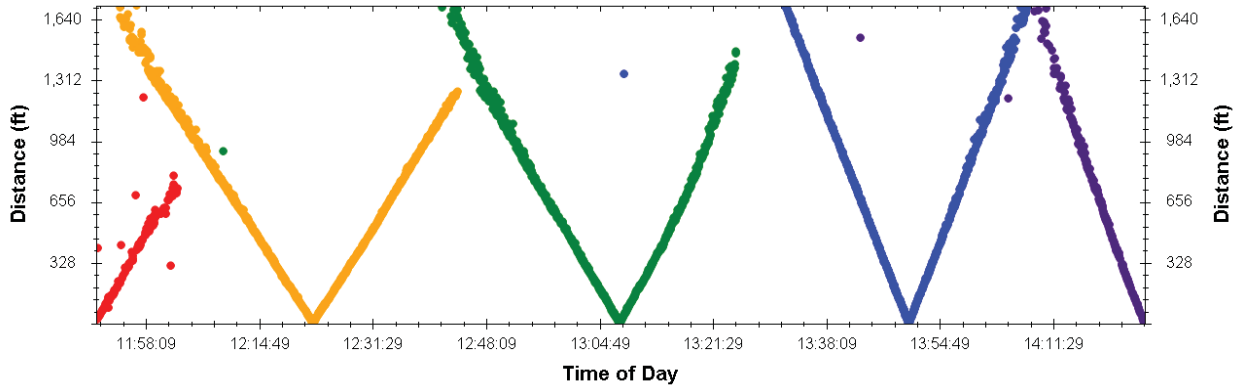


Figure 6.3 – SBR positional data for the July 22, 2014 Inspection of Grade Lane

6.3 Summary of Leaks

There were no acoustic anomalies resembling leaks detected in the Grade Lane Water Main by the SmartBall tool. The data was internally peer reviewed to verify that no acoustic anomalies were detected and that the data was accurately classified. This indicates that, under the operating conditions at the time of the inspection, there were no leaks present within the detection limits of the SmartBall technology.

Figure 6.4 shows the acoustic profile of the inspection, as detected by the SmartBall technology, with respect to the position of the tool in the pipeline. The magnitude of identified leaks is estimated by examining the value of the leak indicator signal. Due to insufficient flows in the pipeline, the flow rate was increased after approximately 5,000 feet to optimize data collection quality, which resulted in an increase of the ambient noise in the pipeline. There were no critical findings during the SmartBall inspection of the Grade Lane Water Main.

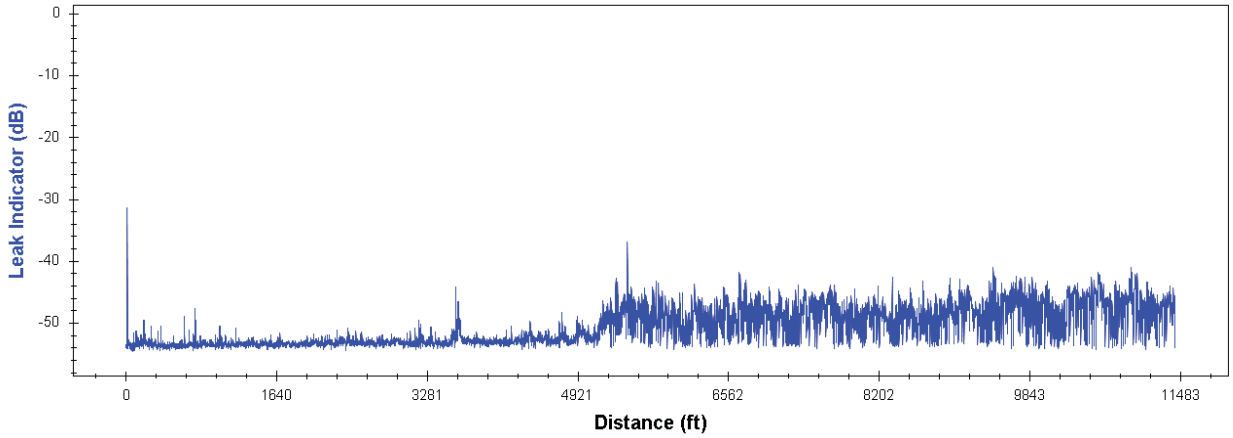


Figure 6.4 – Acoustic summary of the SmartBall inspection versus Distance Travelled for the July 22, 2014 of Grade Lane

This summary contains anomalous spikes in the data. These may have been created by ambient noise around the pipeline caused by external sources such as pumps or nearby traffic. These sources of ambient noise are easily distinguishable from leaks or other points of interest with further analysis by trained personnel and analysis of the frequencies involved. Ambient noise is generally at a much lower frequency than the frequencies generated by a leak or gas pocket.

6. 4 Sites of Interest – Details

There were no sites of interest detected during the inspection of the 60-inch Grade Lane Water Main on July 22, 2014.

7. Inspection Conclusions

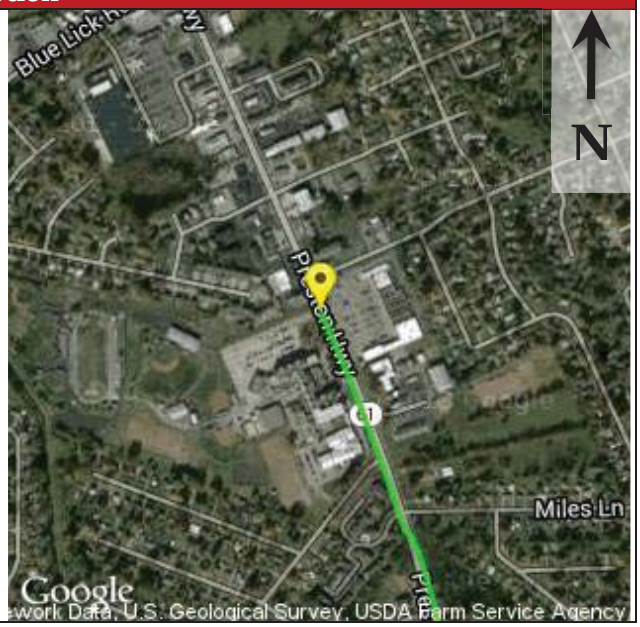
7.1 Preston Highway

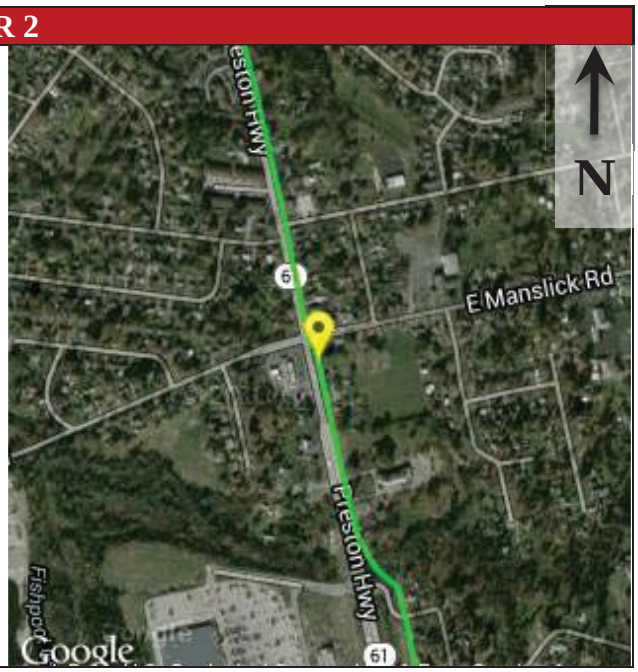
The SmartBall tool was deployed into the 24-inch Preston Highway Water Main on Monday July 21, 2014. The SmartBall tool was launched into the pipeline at Station 208+10 through a 16-inch tap and was extracted at Station 359+56 through another 16-inch tap. During the course of the inspection, the SmartBall tool recorded data for 15,267 feet of the Preston Highway Water Main. After analysis of the inspection data, one (1) leak was notes. This leak was categorized by Pure Technologies as a small leak, which is estimated to be less than 2 gallons per minute. This leak was located approximately 4,997 feet from the insertion point at Station 208+10 and 671 feet upstream of SBR 3.

7.2 Grade Lane

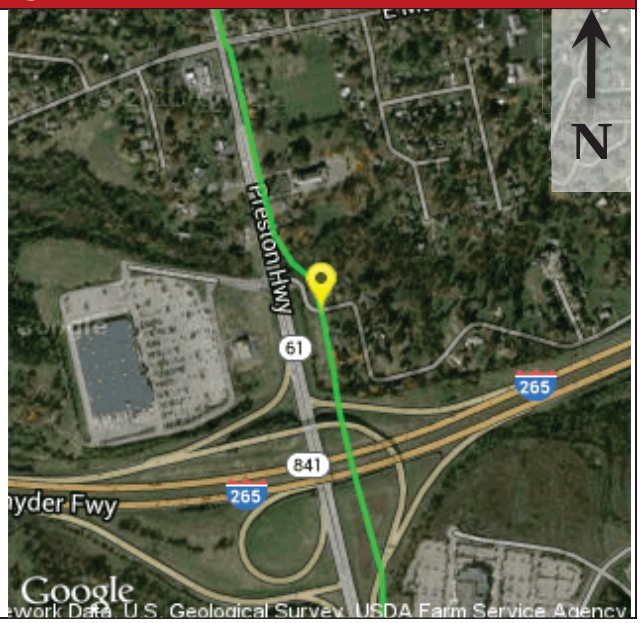
The SmartBall tool was deployed into the 60-inch Grade Lane Water Main on Tuesday July 22, 2014. The SmartBall tool was launched into the pipeline at Station 1+40 through a 24-inch tap and was extracted at Station 115+75 through a 24-inch tap. During the course of the inspection, the SmartBall tool recorded data on 11,435 feet of the Grade Lane Water Main. After analysis of the inspection data, no leaks or pockets of trapped gas were detected in the pipeline.

APPENDIX A
Preston Highway 24-Inch Phase 2: SBR Tracking Points

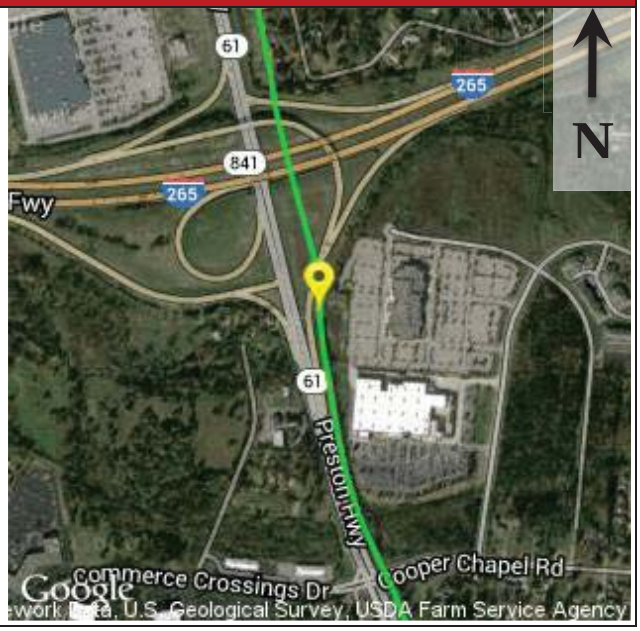
Insertion		
Distance from Launch	0 feet	
Time of Departure (GMT-5:00)	12:41:12 PM	
Latitude	38.1278	
Longitude	-85.6810	
Station	208+10	
Cross Street	Preston Highway and Southern High school	

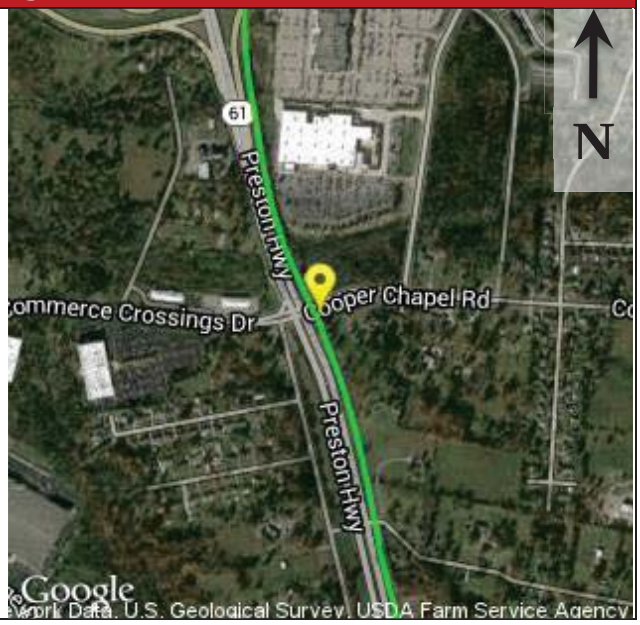
SBR 2		
Distance from Launch	3,976 feet	
Time of Tool Pass (GMT-5:00)	1:25:16 PM	
Latitude	38.1176	
Longitude	-85.6770	
Station	247+63	
Cross Street	Approximately 100 feet South of the intersection of East Manslick Road and Preston Highway	

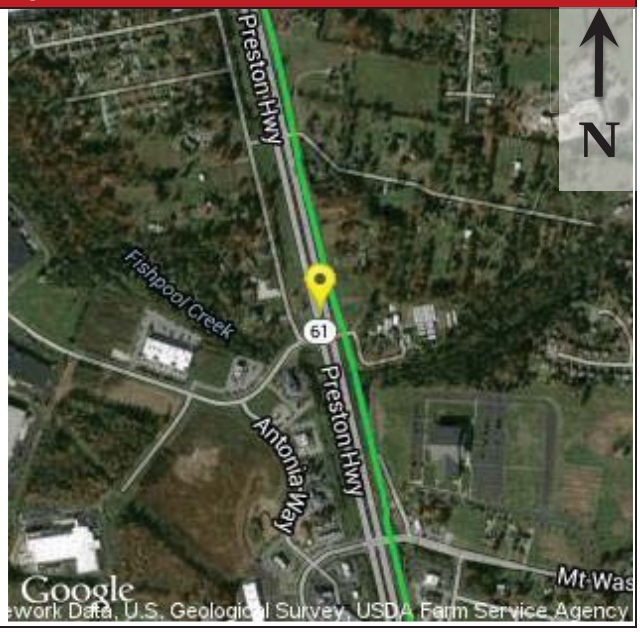
SBR 3	
Distance from Launch	5,668 feet
Time of Tool Pass (GMT-5:00)	1:36:25 PM
Latitude	38.1133
Longitude	-85.6751
Station	263+95
Cross Street	Approximately 4606 Glen Rose Road



SBR 4	
Distance from Launch	7,596 feet
Time of Tool Pass (GMT-5:00)	1:49:51 PM
Latitude	38.1082
Longitude	-85.6738
Station	283+23
Cross Street	Just off Interstate Ramp for 265 East



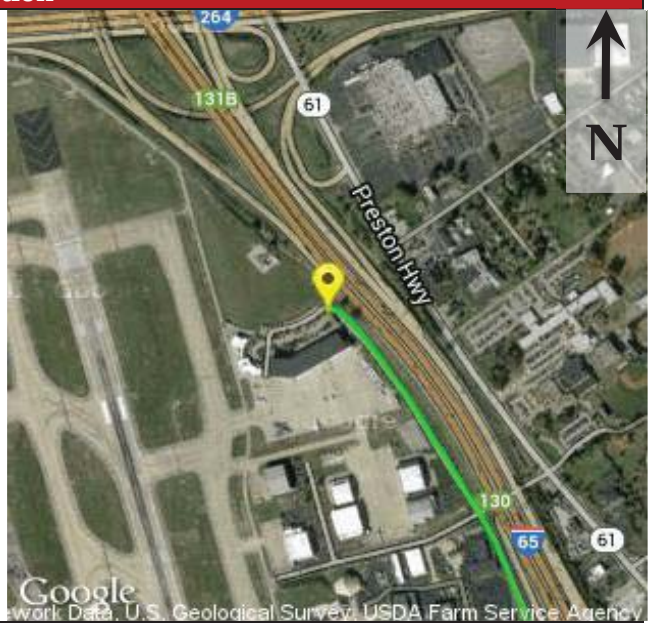
SBR 5		
Distance from Launch	9,384 feet	
Time of Tool Pass (GMT-5:00)	2:01:51 PM	
Latitude	38.1035	
Longitude	-85.6721	
Station	300+63	
Cross Street	Intersection of Preston Highway and Cooper Chapel Road	

SBR 6		
Distance from Launch	12,046 feet	
Time of Tool Pass (GMT-5:00)	2:20:16 PM	
Latitude	38.0968	
Longitude	-85.6704	
Station	327+25	
Cross Street	Intersection of Preston Highway and Interchange Drive	

Extraction	
Distance from Launch	15,267 feet
Time of Arrival (GMT-5:00)	2:42:46 PM
Latitude	38.0878
Longitude	-85.6673
Station	359+56
Cross Street	Intersection of Antle Drive and Preston Highway

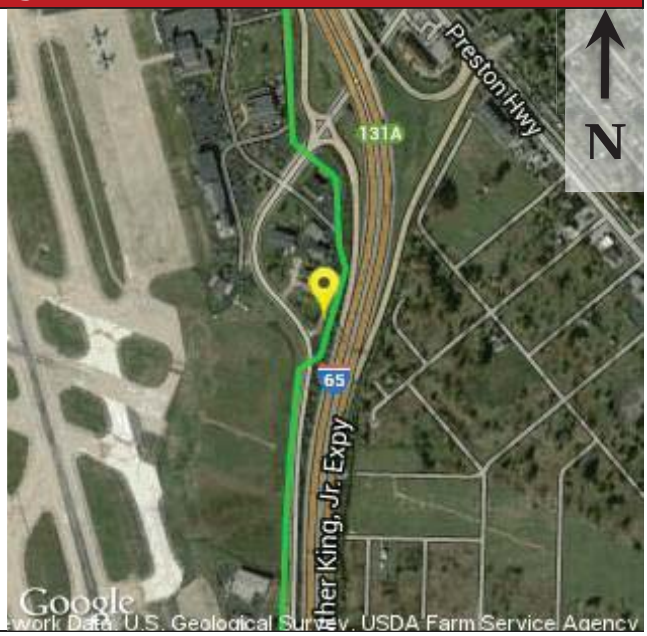
Note that distances for the items in the tables above were identified from the plans and details provided to Pure Technologies by Louisville Water Company

APPENDIX B
Grade Lane 60-Inch:
SBR Tracking Points

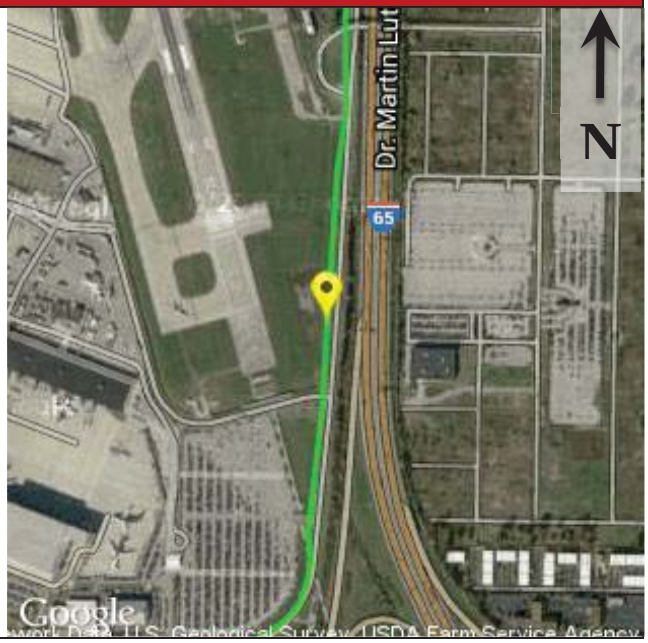
Insertion		
Distance from Launch	0 feet	
Time of Departure (GMT-5:00)	11:50:27 AM	
Latitude	38.1851	
Longitude	-85.7256	
Station	1+40	
Cross Street	Parking lot of Vision Airlines	

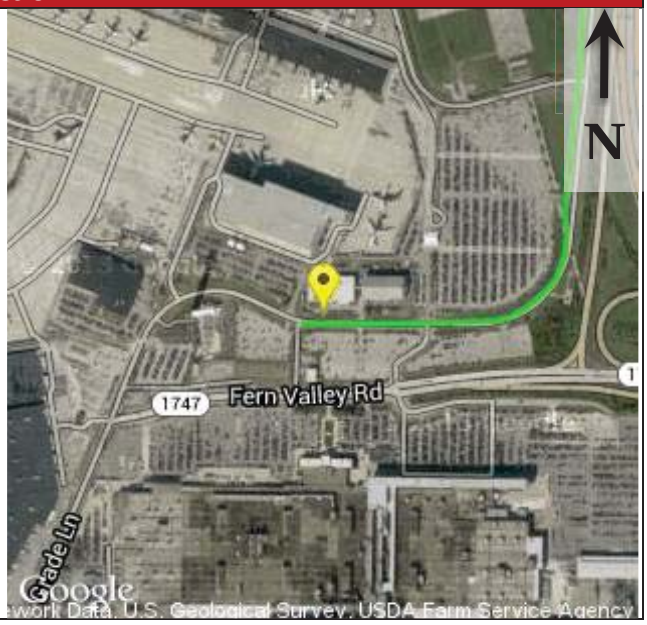
SBR 2		
Distance from Launch	1,806 feet	
Time of Tool Pass (GMT-5:00)	12:22:43 PM	
Latitude	38.1811	
Longitude	-85.7219	
Station	19+46	
Cross Street	Intersection of Standiford Avenue and Standiford Lane	

SBR 3	
Distance from Launch	4,408 feet
Time of Tool Pass (GMT-5:00)	1:07:43 PM
Latitude	38.1746
Longitude	-85.7205
Station	45+48
Cross Street	Access Road off Grade Lane next to Fire Department



SBR 4	
Distance from Launch	8,073 feet
Time of Tool Pass (GMT-5:00)	1:50:11 PM
Latitude	38.1643
Longitude	-85.7219
Station	82+13
Cross Street	Approximately 240 feet North of the intersection of Grade Lane and Midfield Access Road



Extraction		
Distance from Launch	11,435 feet	
Time of Arrival (GMT-5:00)	2:24:59 PM	
Latitude	38.1590	
Longitude	-85.7274	
Station	115+75	
Cross Street	Intersection of Grade Lane and Beanblossom Road	

Note that distances for the items in the tables above were identified from the plans and details provided to Pure Technologies by Louisville Water Company

Electromagnetic Inspection of the Grade Lane 60-Inch PCCP Water Main

Draft Inspection Report

Prepared for

Louisville Water Company

By

Pure Technologies U.S. Inc.

September 30, 2014

KY0004

ELECTROMAGNETICS

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www.puretechltd.com

Electromagnetic Inspection of the Grade Lane 60-Inch PCCP Water Main

Prepared for

Louisville Water Company

By

Pure Technologies U.S. Inc.

September 30, 2014

Quality Assurance and Quality Control Statement

By my signature I attest that this report has been prepared and reviewed in accordance with Pure Technologies' Quality Assurance and Quality Control procedures:

John Rundy	September 30, 2014
Project Manager	Date

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1. Executive Summary

1.1 Inspection Summary

On July 29, 2014 and August 20, 2014, Pure Technologies U.S. Inc. (Pure Technologies) conducted a non-destructive evaluation of the prestressed concrete cylinder pipe (PCCP) sections in the Grade Lane 60-Inch PCCP Water Main using its proprietary Electromagnetic Inspection Technology. The purpose of the inspection is to locate and identify pipes that have broken prestressing wire wraps. The electromagnetic inspection scope is highlighted in *Table 1.*

Table 1

Scope of the Electromagnetic Inspection		
Pipeline	**Start Station**	**End Station**
Grade Lane 60-Inch PCCP Water Main	~43+26	~115+65

'~' indicates approximated station number based on plan and profile drawings. Pipe laying schedules were not available.

The inspection covered a cumulative distance of 2.26 miles and spanned a total of 641 pipes. Analysis of the data obtained during the inspection determined that no pipes in the Grade Lane 60-Inch PCCP Water Main displayed electromagnetic anomalies consistent with prestressing wire damage. A summary of the results is presented in *Table 3* and a complete discussion is provided in *Section 3.3.*

2. Project Background

The inspected portion of the Grade Lane PCCP Water Main is composed of 60-inch single wrap embedded cylinder pipe (ECP) without shorting straps. The pipes were manufactured by Price Brothers Company in the 1980s and the Grade Lane 60-Inch PCCP Water Main is owned and operated by the Louisville Water Company.

A map of the inspected section of the Grade Lane 60-Inch PCCP Water Main is shown below (*Figure 2.1*). This map shows the approximate geographical location of the pipeline.

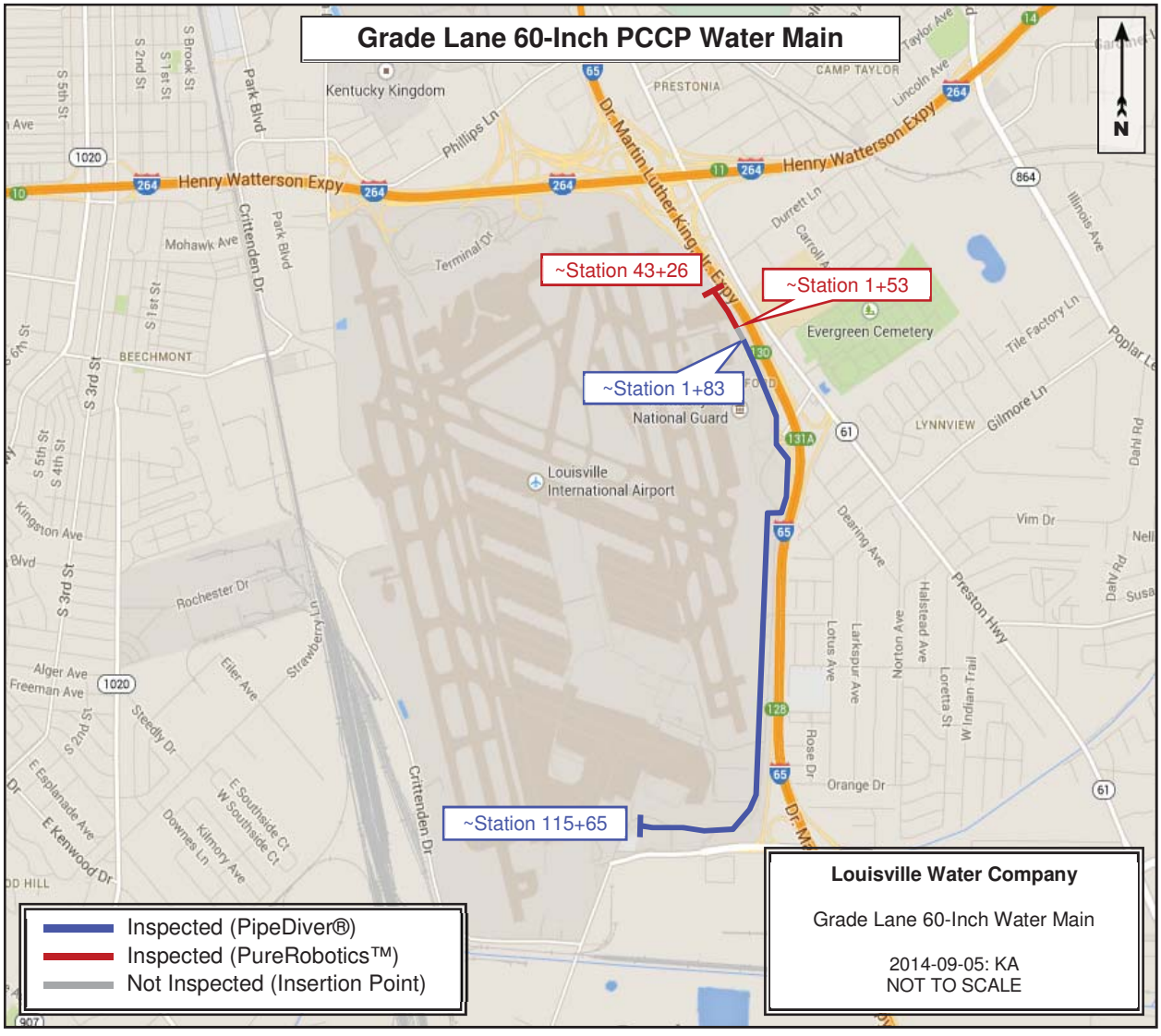

Figure 2.1: Inspection limits

3. Inspection Results

3.1 Introduction

Electromagnetic data was collected on July 29, 2014 and August 20, 2014 for the Grade Lane 60-Inch PCCP Water Main. The inspected section spanned an overall distance of 2.26 miles.[1] The section from Station 1+53 to Station 1+83 was not inspected due to the insertion technique of the inspection tools. Below are Pure Technologies' resources used to perform the inspection, as well as the inspection schedule *(Table 2)*.

Table 2

Inspection Summary				
On-Site Staff	V. Bernal, E. Biedenbach, D. Maznichenko, E. Munoz, A. Ostovitz, J. Purkiss, J. Putnam, A. Proffitt, J. Rundy, E. Vidal			
Analysts	J.Suryadi, O. Ojala, K. Abhari			
Project Manager	J. Rundy			
Date	**Tool**	**Start Station**	**End Station**	**Distance**
August 20, 2014	PureRobotics™	~43+26	~1+53	0.10 miles
July 29, 2014	PipeDiver®	~1+83	~115+65	2.16 miles
Total Distance				**2.26 miles**

'~' indicates approximated station number based on plan and profile drawings. Pipe laying schedules were not available.

A summary of the total number of pipes that had electromagnetic signatures consistent with broken prestressing wire wraps is shown below *(Table 3)*.

Table 3

Summary of Inspected Pipes			
Pipeline	**Number of Inspected Pipes**	**Pipes with Broken Wire Wraps**	
		#	**%**
Grade Lane 60-Inch PCCP Water Main	641	0	0.00

[1] All reported mileage is based on estimated pipe laying lengths, and accounts for station equations and unavailability of pipe laying schedules.

3.2 Comparison and Correlation to the Pipe Laying Schedule

Louisville Water Company provided Pure Technologies with the plan and profile drawings for the inspected portions of the Grade Lane 60-Inch PCCP Water Main. The stationing used in this report was estimated from the plan and profile drawings. Pipe laying lengths were estimated based on the electromagnetic data and the plan and profile drawings. Pipe laying schedules were not available for the entire length of the inspection.

For clarity in reporting, Pure Technologies created a Pipe List. The Pipe List is attached to this report as a spreadsheet and includes information that can be used to locate specific pipes.

3.3 Electromagnetic Inspection Results

Of the 641 pipes inspected in the Grade Lane 60-Inch PCCP Water Main, no pipes had electromagnetic anomalies consistent with broken prestressing wire wraps.

4. Conclusions

Pure Technologies' evaluation of the Grade Lane 60-Inch PCCP Water Main concluded that:

- Of the 641 pipes inspected, no pipes had broken prestressing wire wraps.

APPENDIX 1
Glossary & Abbreviations

AV:	Air Valve
BO:	Blowoff
EL:	Elbow
EM:	Electromagnetic
OL:	Outlet
MH:	Manhole
PCP:	Prestressed Concrete Pipe
PCCP:	Prestressed Concrete Cylinder Pipe
SP:	Short Pipe Length
STA:	Station Number
STD:	Standard Pipe Length
TO:	Turn Out
VS:	Vent Structure
PW:	Pumping Well

Amplitude: A component of the data signal produced during pipeline inspection, amplitude is an indication of signal strength.

Anomalous Pipe: A pipe that produces a data signal that cannot be interpreted as distressed or distress-free due to some irregularity. This irregularity may be due to unexplained signal influence during the inspection process or due to the properties of the pipe itself.

Calibration: A controlled inspection of a pipe similar to the in situ pipe that is performed to determine the expected signal response. The data signal recorded while inspecting the in situ pipes is then compared to this signal to estimate number of broken wire wraps. Calibration typically requires the destructive testing of a removed pipe.

Distressed Pipe: A pipe that exhibits electromagnetic anomalies consistent with broken wire wraps. The amount of distress can be estimated by comparing the distress signal with the signal obtained during the calibration process.

Distressed Region: A section of pipe that exhibits electromagnetic anomalies consistent with broken wire wraps. There may be one or more regions of distress in any distressed pipe.

Downstream: In the direction of water flow.

Feature: Fixtures in the pipeline that affect the inspection (e.g., Manholes, Air Valves, Tees, Elbows).

Feature Pipe: Pipes with features that may be used to locate distressed pipes. The feature pipes cannot be analyzed for distress at or near the feature due to the signal distortion caused by the presence of the feature.

Joint: An area of the pipeline where two pipe ends are fixed together. Typically, pipe ends are joined spigot to bell; however, special pipes are available that join two bells ends or two spigot ends.

Phase: A component of the data signal produced during pipeline inspection, phase is a representation of the signal's travel time.

Rank: Listing of pipes with respect to the total number of broken wire wraps in the pipe (descending order).

Pipe: Single section of pipe, from bell end to spigot end.

Upstream: Against the direction of water flow.

APPENDIX 2
Electromagnetic Inspection Technology

Primary Focus of Electromagnetic Inspection

Assessing the condition of a PCCP transmission main is a challenging task that is best performed using a combination of non-destructive testing technology, internal visual inspection and sounding (in embedded cylinder pipe), engineering science, and experiential judgment. The primary goal of an inspection is to provide an understanding of the condition of the structural component that provides the pipe's strength—the prestressing wire. An electromagnetic inspection provides a non-destructive method of evaluating the baseline condition of the prestressing wire. Electromagnetic inspections ascertain a magnetic signature for each pipe to identify anomalies that are produced by zones of broken wire wraps. Various characteristics associated with an anomaly (length, magnitude, phase shift, etc.) are evaluated to provide an estimate of the number of broken wire wraps. This inspection method is able to quantify the amount of wire wrap damage and is the best method of determining the baseline condition of a pipeline.

Background and Theory of Electromagnetic Inspection

For many years, it has been possible to exploit the concept of eddy currents to measure structural properties in metals. The application of a time-varying magnetic field to metal structures can create internal electric currents as free electrons are driven by the field along discontinuities in the metal itself. Many applications of this phenomenon have been developed to detect damaged sections in steel and iron pipelines.

For PCCP, a different mechanism exists that can be used to determine the structural condition of the pipe. Eddy currents that are generated in a wire wrap can flow along the length of the wire wrap, generating a solenoidal field (see *Figure A2.1*). If the current is interrupted by a break in the prestressing wire, the field will be affected.

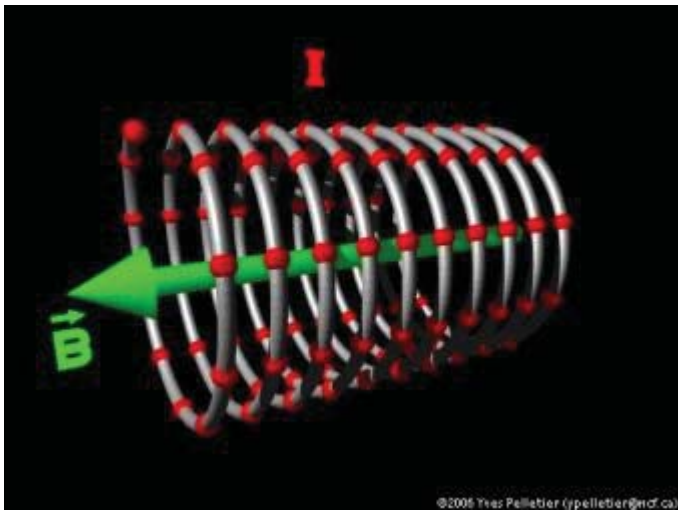

Figure A2.1 Electric currents induced by time-varying magnetic field

The electromagnetic system used by Pure Technologies generates eddy currents in the wire wrap and detects where the field is altered by the presence of breaks in the prestressing wire.

To create an electric current in the prestressing wire, the Pure Technologies electromagnetic system generates a magnetic field inside a PCCP. A signal generator outputs a low frequency alternating electric current (typically less than 100 Hz) into a coil of wire (known as an exciter coil) positioned near the inner surface of the pipe. The magnetic field generated by this coil extends through the concrete core, steel cylinder, and finally into the prestressing wire wraps. As the coil travels along the length of the pipe, the field moves as well, creating a localized magnetic field that then generates eddy currents in the wire. As long as there are no breaks in the prestressing wire, the current will flow uniformly along the wire; however, where a broken wire wrap exists, a discontinuity in the current forms. As the magnetic field passes over the section of the broken wire, currents are generated that form opposing magnetic field lines.

Detectors are placed on the opposite side of the pipe from the exciter coil to record the variations in the magnetic field that are created when broken wire wraps interrupt the current flow. Analyzing and interpreting the response of the magnetic field allows for estimates of the number of broken wire wraps and the approximate location of the broken wraps along the length of the pipe.

Analysis Considerations

Electromagnetic inspections detect electromagnetic anomalies, or differences, in the expected induced field of a PCCP. Anomalies that are consistent with broken wire wraps are of particular importance; however, the induced field of interest is small and other interference can mask or distort the size and shape of the electromagnetic signal, affecting the ability to detect and quantify broken wire wraps. The accuracy of the broken wire wrap detection and quantification process on any given pipe depends on a number of factors including, but not necessarily limited to:

- Accuracy and completeness of the information supplied by the client
- Type and configuration of pipe being inspected
- Availability of relevant calibration information
- Type, complexity, location, and number of distressed regions on a given pipe
- Inspection conditions observed in the pipe during the data collection period

Accuracy and completeness of the information supplied by the client. The inspection system is sensitive to all magnetic properties of a pipe, including cylinder thickness and composition, wire spacing and diameter, and the number of wire wraps. Pure Technologies uses the information provided by the client to perform the analysis. Drawings that indicate the exact location of pipe features and varying pressure classes are used to correlate the inspection data. Drawings that indicate how each class of pipe is constructed (cylinder thickness, wire diameter and spacing, shorting strap or non-shorting strap, etc.) are used to identify and quantify regions of distress. Discrepancies in the drawings and the data may affect the accuracy of the analysis.

Unknown or sealed appurtenances along the pipeline. Although most appurtenances exhibit a signal that is different and distinguishable from broken wire wraps, in some cases, the signals are similar and an appurtenance could be misinterpreted as broken wire wraps if it is not listed on the drawings and not visible during the inspection.

Existence of ferromagnetic (steel) materials near the pipeline. When extra steel is located in close proximity to the pipeline, it can cause a signal distortion that may mask broken wire wraps or could cause anomalies that may be misinterpreted as broken wire wraps.

Previously repaired pipes. There are a variety of methods used to repair distressed PCCP. Some of these methods allow electromagnetic inspections to be conducted on the repaired pipe while others do not. Internal carbon fiber repairs do not appear to distort the electromagnetic signal and to date, successful repeat inspections have been performed on these repaired pipes and updated quantities of broken wire wraps have been provided for them. Conversely, external tendon repairs, internal or external steel bands, steel slip lining, and internal joint seals can all affect the electromagnetic signal. Consequently, analysis cannot be provided for these types of repaired pipes.

Changes in wire diameter and wire pitch. Broken wire wraps are estimated by measuring the physical length of an anomaly and entering it into a mathematical model known as a calibration curve. Calibration curves are based on either field testing of a similar pipe or mathematical

modeling based on an extensive database of calibration test data and finite element analysis. In the case of mathematical modeling, the wire diameter and pitch information are critical factors in the calculations. If this information is not correct, the quantity of broken wire wraps will likely be incorrectly estimated. Typically, it is unknown if there are any pipes affected by this issue, as only excavation and forensic analysis can reveal variations in wire properties.

Changing distance of the wire wrap and steel cylinder. If, during manufacturing of the pipe, there is variation in the distance of the prestressing wire and the steel cylinder, the resultant signal during an electromagnetic inspection may vary, possibly mimicking broken wire wraps. Typically, it is unknown if there are any pipes affected by this issue as only excavation and forensic analysis can reveal manufacturing defects.

Discontinuities or variations such as abnormal welding in liner construction. These discontinuities can mask actual damage or mimic damage where none exists. This situation could cause over or under estimation of the number of broken wire wraps.

Proximity to power lines. In some cases, power lines can cause distortion in the signal due to the stray magnetic fields. This can limit the effectiveness of the analysis if the distortion is too severe. This interference is rare but is noted for completeness of this document.

Motion. Impacts, uneven pipe floor, excessive debris, and vibration all produce distortion which can cause overestimation of broken wire wraps or may mask actual damage. The inspection crew takes every effort to move the tool smoothly to ensure optimum data quality. Detailed field notes document excessive cart motion for analysis consideration, reducing the possibility of misinterpretation due to excessive motion. In addition, a sensitive accelerometer is integrated into the design of the cart, which allows analysts to determine where there was excessive cart motion and identify anomalous signals due to motion.

Type and Configuration of Pipe Being Inspected

The sensitivity to broken wire wraps is affected by the type of pipe being inspected. The following information on detection limits is based on previous calibration testing performed by Pure Technologies.

Embedded Cylinder Pipe without shorting straps (ECP-NSS).

Tests have shown that the EM system is sensitive to as few as one single break in the middle of the pipe. In some tests this level of detection has also been found for a single broken wire wrap at either the bell or spigot end; however, other tests have found the limit of detection to vary from 10 to 30 broken wire wraps at the pipe end. These differences in detection limits at the end of the pipe may be related to differences in the fabrication or installation of the bell and spigot rings of different manufacturers or installation contractors, or differences in how the prestressing wires are anchored at the end of the pipe (some prestressing wires are in electrical contact with the steel cylinder while others are only embedded in the concrete). The minimum separation of break regions in order to see that the regions are separate has been seen to vary from 20 to 50 continuous unbroken wires wraps within the break regions.

In ECP-NSS it can be difficult to quantify broken wire wraps because there can be a wide variation in background signals, break signals, and signal responses to the same number of breaks within the same pipe class. This means that it becomes more difficult to select a relevant background signal or a relevant calibration curve. ECP-NSS normally exhibits a very strong signal response to a single broken wire wrap but the size of the signal rises comparatively slowly to pipes with shorting straps as the number of breaks increases, making it difficult to quantify larger regions. Additionally, there is a wide variation of calibration curves for ECP-NSS, so if the wrong calibration curve is selected for a non-shorting strap pipe, the potential impact on the accuracy of the analysis results is probably much greater. Due to these inherent issues with this pipe type, it is recommended to perform verification tests prior to making rehabilitation decisions on ECP-NSS.

Feature Pipes. The electromagnetic technology is able to detect distressed regions in some feature pipes; however, due to the impact of the feature on the signal, results are presented with less certainty for regions of the pipe near fittings, manholes, blowoff valves, or other features.

Details of Estimates of Broken Wire Wraps

Break Position. The data signal for a distressed region will vary along the length of a given pipe. Small numbers of broken wire wraps in the middle of a pipe are easier to detect and measure than distress at the joint. Low to moderate quantities of broken wire wraps within approximately 18 inches of the joint may be difficult to identify and quantify due to the increased presence of steel at the joint and the distress signal may be overcome by the much larger effect of the joint steel. Small quantities of broken wire wraps near the joint may not be detected and the accuracy of those that are detected may be less than those closer to the center of the pipe. Additionally, broken wraps are more difficult to detect and quantify at the bell end of the pipe than at the spigot end of the pipe, due to the fact that a portion of the bell section will overlap the spigot end. The number of broken wire wraps required for the signal to be detectable and quantifiable depends on the pipe type (ECP, LCP, or NCP), joint configuration, proximity of the center of the break region to the joint, and whether it is the bell or spigot end. Because of this, the estimated number of broken wire wraps near the center of a pipe will be provided with greater confidence than broken wraps near the joints, especially near the bell end.

End Effects. End effects refer to changes in the data signal near the end of a pipe (bell or spigot) that are due to a variety of installation methods of the pipe joint itself. End effects do not refer to distress at the joint. Beveled spigots, pulled joints, mitered joints, butt straps, closure pieces, steel fittings, etc., will all affect the data signal at the end of a pipe in some way. Research in this specific area has provided methods for analysts to determine if the signal is due to an end effect, or true end distress. The differences are subtle and examination of client records can provide the additional information necessary to conclude whether a particular data signal represents end effects or end distress. In the case where both end effects and end distress exist, quantification is more challenging.

Non-contiguous Broken Wire Wraps. This occurs when broken wire wraps are scattered amongst non-broken wire wraps. Non-contiguous broken wire wraps are often the result of

hydrogen embrittlement as opposed to corrosion, which to results in a continuous region of broken wraps as the corrosion typically starts at a point and grows with time.

During the inspection, a broad magnetic field is projected onto the prestressing wire (several inches wide); therefore, it is difficult to analyze individual prestressing wire wraps. When broken wraps are separated by non-broken wraps, the non-broken wraps can be masked by the distress signals and may appear broken depending on the distance from the broken and non-broken prestressing wire wraps. The distance from the broken wire wraps required for the non-broken wraps to be distinguishable depends on the pipe properties and the total number of broken wire wraps. Non-contiguous broken wire wraps may lead to an anomaly that is larger than the actual associated prestressing wire damage.

The estimated number of broken wire wraps in any report normally assumes a region of consecutive broken wire wraps exist for each break region. This assumption is the only assumption that can be made without additional information, which may be obtained from field verification. It is possible that some or all of the break regions on any distressed pipe will contain intermittent or scattered broken wire wraps instead of consecutive broken wrap. In this case, the estimated number of broken wire wraps may be overestimated.

Background Signal Variations. The electromagnetic data signal is sensitive not only to physical differences in pipeline properties (wire diameter and spacing, cylinder thickness, etc.), but it is also sensitive to any magnetic differences in the steel components of the pipe. Pipe manufacturers may use different material suppliers for the various components of the pipes within a pipeline. Even though two pipes are manufactured exactly the same physically, if the steel for the cylinder and the prestressing wire come from different suppliers, they will likely have slightly different magnetic properties, which will result in variations in the background signals.

Much like the human being fingerprint, every pipe in a pipeline, no matter how alike they are supposed to be, will exhibit a slightly different background signal. Since distress is quantified by measuring the distressed pipe signal relative to a background signal, any variations in background signals can affect the accuracy of the distress measurement and ultimately the estimate of the number of broken wire wraps.

Number of Break Regions. Results are predicted with greater accuracy for pipes containing single distressed regions than for pipes containing multiple distress regions. As the number of distress regions per pipe increases, or as these regions become closer together, the complexity of the interpretation increases. In some cases, distress regions can interact with each other from an electromagnetic standpoint to create signals of varying complexity. In cases where the distress signal spans a wide region, a specific break position may not be provided. Instead the length of the damage zone will be shown and an approximate range of suspected broken wire wraps will be given.

Significantly distressed pipes (where most or all of the wire wraps are broken along the entire length of a pipe) are sometimes difficult to distinguish from pipes that just have different properties than the pipes around them. Determining if the signal change is due to changing pipe

properties or significant distress is partially dependent on the accuracy and completeness of the information made available by the client, but there are also specific checks in the analysis methodology that are applied to make this distinction.

Other Factors

There are often overlaps amongst the key issues listed above and there may or may not be other factors related to these issues that decrease the level of confidence in the results presented in the report. Wide variations in manufacturing processes may not impact the structural performance of the pipe but can significantly affect the electromagnetic properties. The list of factors includes ones that are known, unknown, controllable, and uncontrollable. Some can be confirmed during excavation or inspection and some can be eliminated by studying construction records, although errors in these records are common. In all cases, every effort is made to consider the various factors during analysis; however, it should be noted that the results provide an estimate of the broken wire wraps in a pipe section based on all the information available and assuming that the signal changes are caused by discontinuity in the prestressing wire.

APPENDIX 3
Pipe List

KY0004

Louisville Water Company
Grade Lane 60-Inch PCCP Water Main

Electromagnetic Inspection Results
Pipe Sections that Exhibit Electromagnetic Anomalies Consistent with Broken Wire Wraps

Pure Reference Number	Contract Number	Low Station	Pipe Length (feet)	Reported Class	Break Region Location (feet from Low Station)	Number of Broken Wire Wraps by Region	Total Number of Broken Wire Wraps	Layout	Comments
1	#344 & #345	43+26	14	175psi					Pipe laying schedules not available.
2	#344 & #345	43+40	4	175psi					Pipe laying schedules not available.
3	#344 & #345	43+44	16	175psi					Pipe laying schedules not available.
4	#344 & #345	43+60	16	175psi					Pipe laying schedules not available.
5	#344 & #345	43+76	16	175psi					Pipe laying schedules not available.
6	#344 & #345	43+92	9	175psi					Pipe laying schedules not available.
7	#344 & #345	44+01	4	175psi					Pipe laying schedules not available.
8	#344 & #345	44+05	16	175psi					Pipe laying schedules not available.
9	#344 & #345	44+21	14	175psi					Pipe laying schedules not available.
10	#344 & #345	44+35	2	175psi					Pipe laying schedules not available.
11	#344 & #345	44+37	16	175psi				MH	Pipe laying schedules not available. 16"x18" MH @ Station 44+53.
12	#344 & #345	44+53	16	175psi					Pipe laying schedules not available.
13	#344 & #345	44+69	16	175psi					Pipe laying schedules not available.
14	#344 & #345	44+85	16	175psi					Pipe laying schedules not available.
15	#344 & #345	45+01	16	175psi					Pipe laying schedules not available.
16	#344 & #345	45+17	16	175psi					Pipe laying schedules not available.
17	#344 & #345	45+33	4	175psi					Pipe laying schedules not available.
18	#344 & #345	45+37	16	175psi					Pipe laying schedules not available.
19	#344 & #345	45+53	1	175psi					Pipe laying schedules not available.
20	#344 & #345	45+54	16	175psi					Pipe laying schedules not available.
21	#344 & #345	45+70	3	175psi					Pipe laying schedules not available.
22	#344 & #345	45+73	2	175psi					Pipe laying schedules not available.
23	#344 & #345	45+75	16	175psi					Pipe laying schedules not available.
24	#344 & #345	45+91	16	175psi					Pipe laying schedules not available.
25	#344 & #345	46+07	16	175psi					Pipe laying schedules not available.
26	#344 & #345	46+23	16	175psi					Pipe laying schedules not available.
27	#344 & #345	46+39	16	175psi					Pipe laying schedules not available.
28	#344 & #345	46+55	16	175psi					Pipe laying schedules not available.
29	#344 & #345	46+71	6	175psi					Pipe laying schedules not available.
30	#344 & #345	46+77	16	SP-12-175psi					Pipe laying schedules not available. Plan and Profile: 12" Blind OL. Equation: 46+89.87BK (Job #344 & #345) = 377+38.90AH (Job #55).
31	#55	377+42	20	SP-12-175psi					Pipe laying schedules not available. Equation: 377+38.90BK (Job #55) = 0+00AH (PRJ #90-601B).
32	90-601B	0+18	20	MK144-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 0+28.
33	90-601B	0+38	3	MK144-125psi					Pipe laying schedules not available.
34	90-601B	0+41	5	MK144-125psi					Pipe laying schedules not available.
35	90-601B	0+46	18	MK144-125psi				OL	Pipe laying schedules not available. OL in data. Not listed in Plan and Profile.
36	90-601B	0+64	4	MK144-125psi					Pipe laying schedules not available.
37	90-601B	0+68	20	MK144-125psi				OL	Pipe laying schedules not available. OL in data. Not listed in Plan and Profile.
38	90-601B	0+88	5	MK144-125psi					Pipe laying schedules not available.
39	90-601B	0+93	20	MK144-125psi				OL	Pipe laying schedules not available. OL in data. Not listed in Plan and Profile.
40	90-601B	1+13	20	MK144-125psi					Pipe laying schedules not available.
41	90-601B	1+33	20	MK144-125psi					Pipe laying schedules not available.
N/A	90-601B	N/A	N/A	N/A					Pipe laying schedules not available. Insertion point. Not inspected.
1001	90-601B	1+83	20	MK144-125psi					Pipe laying schedules not available.
1002	90-601B	2+03	20	MK144-125psi					Pipe laying schedules not available.
1003	90-601B	2+23	4	MK151-125psi					Pipe laying schedules not available.
1004	90-601A	2+27	15	MK151-125psi					Pipe laying schedules not available. Station 2+16.42: PRJ #90-601B = PRJ #90-601A.
1005	90-601A	2+42	20	MK151-125psi					Pipe laying schedules not available.
1006	90-601A	2+62	20	MK151-125psi					Pipe laying schedules not available.
1007	90-601A	2+82	20	MK151-125psi					Pipe laying schedules not available.
1008	90-601A	3+02	20	MK151-125psi					Pipe laying schedules not available.
1009	90-601A	3+22	20	MK151-125psi					Pipe laying schedules not available.
1010	90-601A	3+42	4	MK151-125psi					Pipe laying schedules not available.
1011	90-601A	3+46	20	MK151-125psi					Pipe laying schedules not available.
1012	90-601A	3+66	20	MK151-125psi					Pipe laying schedules not available.
1013	90-601A	3+86	20	MK151-125psi					Pipe laying schedules not available. Equation: 4+00.10BK=3+96.70AH.
1014	90-601A	4+04	20	MK151-125psi					Pipe laying schedules not available.
1015	90-601A	4+24	20	MK151-125psi					Pipe laying schedules not available.
1016	90-601A	4+44	20	MK151-125psi					Pipe laying schedules not available.
1017	90-601A	4+64	4	MK151-125psi					Pipe laying schedules not available.
1018	90-601A	4+68	20	MK151-125psi					Pipe laying schedules not available.
1019	90-601A	4+88	20	MK151-125psi				MH	Pipe laying schedules not available. 16"x18" Access MH @ Station 4+88.
1020	90-601A	5+08	20	MK151-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 5+08.
1021	90-601A	5+28	20	MK151-125psi					Pipe laying schedules not available.
1022	90-601A	5+48	20	MK151-125psi					Pipe laying schedules not available.
1023	90-601A	5+68	20	MK151-125psi					Pipe laying schedules not available.
1024	90-601A	5+88	20	MK151-125psi					Pipe laying schedules not available.
1025	90-601A	6+08	20	MK151-125psi					Pipe laying schedules not available.
1026	90-601A	6+28	20	MK151-125psi					Pipe laying schedules not available.
1027	90-601A	6+48	20	MK151-125psi					Pipe laying schedules not available.
1028	90-601A	6+68	20	MK151-125psi					Pipe laying schedules not available.
1029	90-601A	6+88	20	MK151-125psi					Pipe laying schedules not available.
1030	90-601A	7+08	20	MK151-125psi					Pipe laying schedules not available.
1031	90-601A	7+28	20	MK151-125psi					Pipe laying schedules not available.
1032	90-601A	7+48	20	MK151-125psi					Pipe laying schedules not available.

KY0004

Louisville Water Company
Grade Lane 60-Inch PCCP Water Main

Electromagnetic Inspection Results
Pipe Sections that Exhibit Electromagnetic Anomalies Consistent with Broken Wire Wraps

Pure Reference Number	Contract Number	Low Station	Pipe Length (feet)	Reported Class	Break Region Location (feet from Low Station)	Number of Broken Wire Wraps by Region	Total Number of Broken Wire Wraps	Layout	Comments
1033	90-601A	7+68	20	MK151-125psi					Pipe laying schedules not available.
1034	90-601A	7+88	20	MK151-125psi					Pipe laying schedules not available.
1035	90-601A	8+08	20	MK151-125psi					Pipe laying schedules not available.
1036	90-601A	8+28	20	MK151-125psi					Pipe laying schedules not available.
1037	90-601A	8+48	20	MK151-125psi					Pipe laying schedules not available.
1038	90-601A	8+68	20	MK151-125psi					Pipe laying schedules not available.
1039	90-601A	8+88	20	MK151-125psi					Pipe laying schedules not available.
1040	90-601A	9+08	20	MK151-125psi					Pipe laying schedules not available.
1041	90-601A	9+28	20	MK151-125psi					Pipe laying schedules not available.
1042	90-601A	9+48	20	MK151-125psi					Pipe laying schedules not available.
1043	90-601A	9+68	20	MK151-125psi					Pipe laying schedules not available.
1044	90-601A	9+88	20	MK151-125psi					Pipe laying schedules not available.
1045	90-601A	10+08	20	MK151-125psi					Pipe laying schedules not available.
1046	90-601A	10+28	20	MK151-125psi					Pipe laying schedules not available.
1047	90-601A	10+48	20	MK151-125psi					Pipe laying schedules not available.
1048	90-601A	10+68	20	MK151-125psi					Pipe laying schedules not available.
1049	90-601A	10+88	20	MK151-125psi					Pipe laying schedules not available.
1050	90-601A	11+08	20	MK151-125psi					Pipe laying schedules not available.
1051	90-601A	11+28	20	MK151-125psi					Pipe laying schedules not available.
1052	90-601A	11+48	20	MK151-125psi					Pipe laying schedules not available.
1053	90-601A	11+68	20	MK151-125psi					Pipe laying schedules not available.
1054	90-601A	11+88	20	MK151-125psi					Pipe laying schedules not available.
1055	90-601A	12+08	20	MK151-125psi					Pipe laying schedules not available.
1056	90-601A	12+28	20	MK151-125psi					Pipe laying schedules not available.
1057	90-601A	12+48	20	MK151-125psi					Pipe laying schedules not available.
1058	90-601A	12+68	20	MK151-125psi					Pipe laying schedules not available.
1059	90-601A	12+88	20	MK151-125psi					Pipe laying schedules not available.
1060	90-601A	13+08	20	MK151-125psi					Pipe laying schedules not available.
1061	90-601A	13+28	20	MK151-125psi					Pipe laying schedules not available.
1062	90-601A	13+48	20	MK151-125psi					Pipe laying schedules not available.
1063	90-601A	13+68	20	MK151-125psi					Pipe laying schedules not available.
1064	90-601A	13+88	20	MK151-125psi					Pipe laying schedules not available.
1065	90-601A	14+08	20	MK151-125psi					Pipe laying schedules not available.
1066	90-601A	14+28	20	MK151-125psi					Pipe laying schedules not available.
1067	90-601A	14+48	20	MK151-125psi					Pipe laying schedules not available.
1068	90-601A	14+68	20	MK151-125psi					Pipe laying schedules not available.
1069	90-601A	14+88	20	MK151-125psi					Pipe laying schedules not available.
1070	90-601A	15+08	20	MK151-125psi					Pipe laying schedules not available.
1071	90-601A	15+28	20	MK151-125psi					Pipe laying schedules not available.
1072	90-601A	15+48	20	MK151-125psi					Pipe laying schedules not available.
1073	90-601A	15+68	20	MK151-125psi					Pipe laying schedules not available.
1074	90-601A	15+88	20	MK151-125psi					Pipe laying schedules not available.
1075	90-601A	16+08	20	MK151-125psi					Pipe laying schedules not available.
1076	90-601A	16+28	20	MK151-125psi					Pipe laying schedules not available.
1077	90-601A	16+48	20	MK151-125psi					Pipe laying schedules not available.
1078	90-601A	16+68	20	MK151-125psi					Pipe laying schedules not available.
1079	90-601A	16+88	4	MK151-125psi					Pipe laying schedules not available.
1080	90-601A	16+92	20	MK176-125psi					Pipe laying schedules not available.
1081	90-601A	17+12	20	MK176-125psi					Pipe laying schedules not available.
1082	90-601A	17+32	20	MK176-125psi					Pipe laying schedules not available.
1083	90-601A	17+52	20	MK176-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 17+48.
1084	90-601A	17+72	20	MK176-125psi					Pipe laying schedules not available.
1085	90-601A	17+92	20	MK151-125psi					Pipe laying schedules not available.
1086	90-601A	18+12	20	MK151-125psi					Pipe laying schedules not available.
1087	90-601A	18+32	20	MK151-125psi					Pipe laying schedules not available.
1088	90-601A	18+52	20	MK151-125psi					Pipe laying schedules not available.
1089	90-601A	18+72	11	MK151-125psi					Pipe laying schedules not available.
1090	90-601A	18+83	20	MK151-125psi					Pipe laying schedules not available.
1091	90-601A	19+03	20	MK151-125psi					Pipe laying schedules not available.
1092	90-601A	19+23	3	MK151-125psi					Pipe laying schedules not available.
1093	90-601A	19+26	20	MK151-125psi					Pipe laying schedules not available.
1094	90-601A	19+46	20	MK151-125psi				MH	Pipe laying schedules not available. 16"x18" Access MH @ Station 19+46.
1095	90-601A	19+66	20	MK151-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 19+66.
1096	90-601A	19+86	20	MK151-125psi					Pipe laying schedules not available.
1097	90-601A	20+06	20	MK151-125psi					Pipe laying schedules not available.
1098	90-601A	20+26	20	MK151-125psi					Pipe laying schedules not available.
1099	90-601A	20+46	20	MK151-125psi					Pipe laying schedules not available.
1100	90-601A	20+66	20	MK151-125psi					Pipe laying schedules not available.
1101	90-601A	20+86	20	MK151-125psi					Pipe laying schedules not available.
1102	90-601A	21+06	20	MK151-125psi					Pipe laying schedules not available.
1103	90-601A	21+26	20	MK151-125psi					Pipe laying schedules not available.
1104	90-601A	21+46	20	MK151-125psi					Pipe laying schedules not available.
1105	90-601A	21+66	20	MK151-125psi					Pipe laying schedules not available.
1106	90-601A	21+86	20	MK151-125psi				OL	Pipe laying schedules not available. 2" OL @ Station 21+79.
1107	90-601A	22+06	20	MK151-125psi					Pipe laying schedules not available.
1108	90-601A	22+26	20	MK151-125psi					Pipe laying schedules not available.
1109	90-601A	22+46	20	MK151-125psi					Pipe laying schedules not available.
1110	90-601A	22+66	20	MK151-125psi					Pipe laying schedules not available.
1111	90-601A	22+86	20	MK151-125psi					Pipe laying schedules not available.
1112	90-601A	23+06	20	MK151-125psi					Pipe laying schedules not available.
1113	90-601A	23+26	20	MK151-125psi					Pipe laying schedules not available.
1114	90-601A	23+46	20	MK151-125psi					Pipe laying schedules not available.
1115	90-601A	23+66	20	MK151-125psi					Pipe laying schedules not available.

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Louisville Water Company
Grade Lane 60-Inch PCCP Water Main

Electromagnetic Inspection Results
Pipe Sections that Exhibit Electromagnetic Anomalies Consistent with Broken Wire Wraps

Pure Reference Number	Contract Number	Low Station	Pipe Length (feet)	Reported Class	Break Region Location (feet from Low Station)	Number of Broken Wire Wraps by Region	Total Number of Broken Wire Wraps	Layout	Comments
1116	90-601A	23+86	20	MK151-125psi					Pipe laying schedules not available.
1117	90-601A	24+06	20	MK151-125psi					Pipe laying schedules not available.
1118	90-601A	24+26	20	MK151-125psi					Pipe laying schedules not available.
1119	90-601A	24+46	3	MK151-125psi					Pipe laying schedules not available.
1120	90-601A	24+49	20	MK151-125psi					Pipe laying schedules not available.
1121	90-601A	24+69	20	MK151-125psi					Pipe laying schedules not available.
1122	90-601A	24+89	20	MK151-125psi					Pipe laying schedules not available.
1123	90-601A	25+09	20	MK151-125psi					Pipe laying schedules not available.
1124	90-601A	25+29	20	MK151-125psi					Pipe laying schedules not available.
1125	90-601A	25+49	20	MK151-125psi					Pipe laying schedules not available.
1126	90-601A	25+69	20	MK151-125psi					Pipe laying schedules not available.
1127	90-601A	25+89	20	MK151-125psi					Pipe laying schedules not available.
1128	90-601A	26+09	20	MK151-125psi					Pipe laying schedules not available.
1129	90-601A	26+29	20	MK151-125psi					Pipe laying schedules not available.
1130	90-601A	26+49	20	MK151-125psi					Pipe laying schedules not available.
1131	90-601A	26+69	20	MK151-125psi					Pipe laying schedules not available.
1132	90-601A	26+89	20	MK151-125psi					Pipe laying schedules not available.
1133	90-601A	27+09	20	MK151-125psi					Pipe laying schedules not available.
1134	90-601A	27+29	20	MK151-125psi					Pipe laying schedules not available.
1135	90-601A	27+49	20	MK151-125psi					Pipe laying schedules not available.
1136	90-601A	27+69	20	MK151-125psi					Pipe laying schedules not available.
1137	90-601A	27+89	20	MK151-125psi					Pipe laying schedules not available.
1138	90-601A	28+09	20	MK151-125psi					Pipe laying schedules not available.
1139	90-601A	28+29	20	MK151-125psi					Pipe laying schedules not available.
1140	90-601A	28+49	20	MK151-125psi					Pipe laying schedules not available.
1141	90-601A	28+69	20	MK151-125psi					Pipe laying schedules not available.
1142	90-601A	28+89	20	MK151-125psi					Pipe laying schedules not available.
1143	90-601A	29+09	20	MK151-125psi					Pipe laying schedules not available.
1144	90-601A	29+29	20	MK151-125psi					Pipe laying schedules not available.
1145	90-601A	29+49	20	MK151-125psi					Pipe laying schedules not available.
1146	90-601A	29+69	20	MK151-125psi					Pipe laying schedules not available.
1147	90-601A	29+89	20	MK151-125psi					Pipe laying schedules not available.
1148	90-601A	30+09	20	MK151-125psi					Pipe laying schedules not available.
1149	90-601A	30+29	20	MK151-125psi					Pipe laying schedules not available.
1150	90-601A	30+49	20	MK151-125psi					Pipe laying schedules not available.
1151	90-601A	30+69	20	MK151-125psi					Pipe laying schedules not available.
1152	90-601A	30+89	20	MK151-125psi					Pipe laying schedules not available.
1153	90-601A	31+09	20	MK151-125psi					Pipe laying schedules not available.
1154	90-601A	31+29	20	MK151-125psi					Pipe laying schedules not available.
1155	90-601A	31+49	20	MK151-125psi					Pipe laying schedules not available.
1156	90-601A	31+69	20	MK151-125psi					Pipe laying schedules not available.
1157	90-601A	31+89	20	MK151-125psi					Pipe laying schedules not available.
1158	90-601A	32+09	9	MK151-125psi					Pipe laying schedules not available.
1159	90-601A	32+18	20	MK151-125psi					Pipe laying schedules not available.
1160	90-601A	32+38	20	MK151-125psi					Pipe laying schedules not available.
1161	90-601A	32+58	20	MK151-125psi					Pipe laying schedules not available.
1162	90-601A	32+78	20	MK151-125psi					Pipe laying schedules not available.
1163	90-601A	32+98	20	MK151-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 33+01.
1164	90-601A	33+18	9	MK151-125psi					Pipe laying schedules not available.
1165	90-601A	33+27	13	MK151-125psi					Pipe laying schedules not available.
1166	90-601A	33+40	20	MK151-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 33+43.
1167	90-601A	33+60	20	MK151-125psi					Pipe laying schedules not available.
1168	90-601A	33+80	20	MK151-125psi					Pipe laying schedules not available.
1169	90-601A	34+00	20	MK151-125psi					Pipe laying schedules not available.
1170	90-601A	34+20	4	MK151-125psi					Pipe laying schedules not available.
1171	90-601A	34+24	20	MK151-125psi				MH	Pipe laying schedules not available. 16"x18" Access MH @ Station 34+23.
1172	90-601A	34+44	20	MK151-125psi					Pipe laying schedules not available.
1173	90-601A	34+64	20	MK151-125psi					Pipe laying schedules not available.
1174	90-601A	34+84	10	MK151-125psi					Pipe laying schedules not available.
1175	90-601A	34+94	20	MK151-125psi					Pipe laying schedules not available.
1176	90-601A	35+14	20	MK151-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 35+13.
1177	90-601A	35+34	20	MK151-125psi					Pipe laying schedules not available.
1178	90-601A	35+54	20	MK151-125psi					Pipe laying schedules not available.
1179	90-601A	35+74	20	MK151-125psi					Pipe laying schedules not available.
1180	90-601A	35+94	20	MK151-125psi					Pipe laying schedules not available.
1181	90-601A	36+14	4	MK151-125psi					Pipe laying schedules not available.
1182	90-601A	36+18	20	MK151-125psi					Pipe laying schedules not available.
1183	90-601A	36+38	20	MK151-125psi					Pipe laying schedules not available.
1184	90-601A	36+58	20	MK151-125psi					Pipe laying schedules not available.
1185	90-601A	36+78	3	MK151-125psi					Pipe laying schedules not available.
1186	90-601A	36+81	20	MK151-125psi					Pipe laying schedules not available.
1187	90-601A	37+01	20	MK151-125psi					Pipe laying schedules not available.
1188	90-601A	37+21	4	MK151-125psi					Pipe laying schedules not available.
1189	90-601A	37+25	20	MK151-125psi					Pipe laying schedules not available.
1190	90-601A	37+45	20	MK151-125psi					Pipe laying schedules not available.
1191	90-601A	37+65	20	MK151-125psi					Pipe laying schedules not available.
1192	90-601A	37+85	20	MK151-125psi					Pipe laying schedules not available.
1193	90-601A	38+05	20	MK151-125psi					Pipe laying schedules not available.
1194	90-601A	38+25	20	MK151-125psi					Pipe laying schedules not available.
1195	90-601A	38+45	20	MK151-125psi					Pipe laying schedules not available.
1196	90-601A	38+65	20	MK151-125psi					Pipe laying schedules not available.
1197	90-601A	38+85	20	MK151-125psi					Pipe laying schedules not available.
1198	90-601A	39+05	20	MK151-125psi					Pipe laying schedules not available.

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Louisville Water Company
Grade Lane 60-Inch PCCP Water Main

Electromagnetic Inspection Results
Pipe Sections that Exhibit Electromagnetic Anomalies Consistent with Broken Wire Wraps

Pure Reference Number	Contract Number	Low Station	Pipe Length (feet)	Reported Class	Break Region Location (feet from Low Station)	Number of Broken Wire Wraps by Region	Total Number of Broken Wire Wraps	Layout	Comments
1199	90-601A	39+25	20	MK151-125psi					Pipe laying schedules not available.
1200	90-601A	39+45	20	MK151-125psi					Pipe laying schedules not available.
1201	90-601A	39+65	20	MK151-125psi					Pipe laying schedules not available.
1202	90-601A	39+85	20	MK151-125psi					Pipe laying schedules not available.
1203	90-601A	40+05	20	MK151-125psi					Pipe laying schedules not available.
1204	90-601A	40+25	10	MK151-125psi					Pipe laying schedules not available.
1205	90-601A	40+35	20	MK151-125psi					Pipe laying schedules not available.
1206	90-601A	40+55	20	MK151-125psi					Pipe laying schedules not available.
1207	90-601A	40+75	20	MK151-125psi					Pipe laying schedules not available.
1208	90-601A	40+95	3	MK151-125psi					Pipe laying schedules not available.
1209	90-601A	40+98	20	MK151-125psi					Pipe laying schedules not available.
1210	90-601A	41+18	20	MK151-125psi					Pipe laying schedules not available.
1211	90-601A	41+38	20	MK151-125psi					Pipe laying schedules not available.
1212	90-601A	41+58	20	MK151-125psi					Pipe laying schedules not available.
1213	90-601A	41+78	20	MK151-125psi					Pipe laying schedules not available.
1214	90-601A	41+98	20	MK151-125psi					Pipe laying schedules not available.
1215	90-601A	42+18	4	MK151-125psi					Pipe laying schedules not available.
1216	90-601A	42+22	20	MK151-125psi					Pipe laying schedules not available.
1217	90-601A	42+42	20	MK151-125psi					Pipe laying schedules not available.
1218	90-601A	42+62	20	MK151-125psi					Pipe laying schedules not available.
1219	90-601A	42+82	20	MK151-125psi					Pipe laying schedules not available.
1220	90-601A	43+02	2	MK151-125psi					Pipe laying schedules not available.
1221	90-601A	43+04	20	MK151-125psi					Pipe laying schedules not available.
1222	90-601A	43+24	20	MK151-125psi					Pipe laying schedules not available.
1223	90-601A	43+44	8	MK151-125psi					Pipe laying schedules not available.
1224	90-601A	43+52	12	MK151-125psi					Pipe laying schedules not available.
1225	90-601A	43+64	20	MK151-125psi					Pipe laying schedules not available.
1226	90-601A	43+84	20	MK151-125psi					Pipe laying schedules not available.
1227	90-601A	44+04	20	MK151-125psi					Pipe laying schedules not available.
1228	90-601A	44+24	20	MK151-125psi					Pipe laying schedules not available.
1229	90-601A	44+44	20	MK151-125psi					Pipe laying schedules not available.
1230	90-601A	44+64	8	MK151-125psi					Pipe laying schedules not available.
1231	90-601A	44+72	20	MK151-125psi					Pipe laying schedules not available.
1232	90-601A	44+92	20	MK151-125psi					Pipe laying schedules not available.
1233	90-601A	45+12	20	MK151-125psi				MH	Pipe laying schedules not available. 16"x18" Access MH @ Station 45+08.
1234	90-601A	45+32	20	MK151-125psi				X	Pipe laying schedules not available. 60" BFV @ Station 45+28.
1235	90-601A	45+52	20	MK151-125psi				MH	Pipe laying schedules not available. 16"x18" Access MH @ Station 45+48.
1236	90-601A	45+72	20	MK151-125psi					Pipe laying schedules not available.
1237	90-601A	45+92	20	MK151-125psi					Pipe laying schedules not available.
1238	90-601A	46+12	20	MK151-125psi					Pipe laying schedules not available.
1239	90-601A	46+32	20	MK151-125psi					Pipe laying schedules not available.
1240	90-601A	46+52	20	MK151-125psi					Pipe laying schedules not available.
1241	90-601A	46+72	20	MK151-125psi					Pipe laying schedules not available.
1242	90-601A	46+92	20	MK151-125psi					Pipe laying schedules not available.
1243	90-601A	47+12	20	MK151-125psi					Pipe laying schedules not available.
1244	90-601A	47+32	20	MK151-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 47+23.
1245	90-601A	47+52	20	MK151-125psi					Pipe laying schedules not available.
1246	90-601A	47+72	20	MK151-125psi					Pipe laying schedules not available.
1247	90-601A	47+92	20	MK151-125psi					Pipe laying schedules not available.
1248	90-601A	48+12	20	MK151-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 48+07.
1249	90-601A	48+32	4	MK151-125psi					Pipe laying schedules not available.
1250	90-601A	48+36	20	MK151-125psi				OL	Pipe laying schedules not available. 2" OL @ Station 48+33.
1251	90-601A	48+56	20	MK151-125psi					Pipe laying schedules not available.
1252	90-601A	48+76	20	MK151-125psi					Pipe laying schedules not available.
1253	90-601A	48+96	20	MK151-125psi					Pipe laying schedules not available.
1254	90-601A	49+16	20	MK151-125psi					Pipe laying schedules not available.
1255	90-601A	49+36	20	MK151-125psi					Pipe laying schedules not available.
1256	90-601A	49+56	20	MK151-125psi					Pipe laying schedules not available.
1257	90-601A	49+76	8	MK151-125psi					Pipe laying schedules not available.
1258	90-601A	49+84	20	MK151-125psi					Pipe laying schedules not available.
1259	90-601A	50+04	20	MK151-125psi					Pipe laying schedules not available.
1260	90-601A	50+24	20	MK151-125psi					Pipe laying schedules not available.
1261	90-601A	50+44	20	MK151-125psi					Pipe laying schedules not available.
1262	90-601A	50+64	20	MK151-125psi					Pipe laying schedules not available.
1263	90-601A	50+84	20	MK151-125psi					Pipe laying schedules not available.
1264	90-601A	51+04	20	MK151-125psi					Pipe laying schedules not available.
1265	90-601A	51+24	20	MK151-125psi					Pipe laying schedules not available.
1266	90-601A	51+44	20	MK151-125psi					Pipe laying schedules not available.
1267	90-601A	51+64	20	MK151-125psi					Pipe laying schedules not available.
1268	90-601A	51+84	20	MK151-125psi					Pipe laying schedules not available.
1269	90-601A	52+04	20	MK151-125psi					Pipe laying schedules not available.
1270	90-601A	52+24	20	MK151-125psi					Pipe laying schedules not available.
1271	90-601A	52+44	20	MK151-125psi					Pipe laying schedules not available.
1272	90-601A	52+64	20	MK151-125psi					Pipe laying schedules not available.
1273	90-601A	52+84	20	MK151-125psi					Pipe laying schedules not available.
1274	90-601A	53+04	20	MK151-125psi					Pipe laying schedules not available.
1275	90-601A	53+24	12	MK151-125psi					Pipe laying schedules not available.
1276	90-601A	53+36	20	MK151-125psi					Pipe laying schedules not available.
1277	90-601A	53+56	20	MK151-125psi					Pipe laying schedules not available.
1278	90-601A	53+76	3	MK151-125psi					Pipe laying schedules not available.
1279	90-601A	53+79	20	MK151-125psi					Pipe laying schedules not available.

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Louisville Water Company
Grade Lane 60-Inch PCCP Water Main

Electromagnetic Inspection Results
Pipe Sections that Exhibit Electromagnetic Anomalies Consistent with Broken Wire Wraps

Pure Reference Number	Contract Number	Low Station	Pipe Length (feet)	Reported Class	Break Region Location (feet from Low Station)	Number of Broken Wire Wraps by Region	Total Number of Broken Wire Wraps	Layout	Comments
1280	90-601A	53+99	20	MK151-125psi					Pipe laying schedules not available.
1281	90-601A	54+19	20	MK151-125psi					Pipe laying schedules not available.
1282	90-601A	54+39	20	MK151-125psi					Pipe laying schedules not available.
1283	90-601A	54+59	20	MK151-125psi					Pipe laying schedules not available.
1284	90-601A	54+79	20	MK151-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 54+84.
1285	90-601A	54+99	20	MK151-125psi					Pipe laying schedules not available.
1286	90-601A	55+19	20	MK151-125psi					Pipe laying schedules not available.
1287	90-601A	55+39	20	MK151-125psi					Pipe laying schedules not available.
1288	90-601A	55+59	20	MK151-125psi					Pipe laying schedules not available.
1289	90-601A	55+79	20	MK151-125psi					Pipe laying schedules not available.
1290	90-601A	55+99	20	MK151-125psi					Pipe laying schedules not available.
1291	90-601A	56+19	20	MK151-125psi					Pipe laying schedules not available.
1292	90-601A	56+39	20	MK151-125psi					Pipe laying schedules not available.
1293	90-601A	56+59	20	MK151-125psi					Pipe laying schedules not available.
1294	90-601A	56+79	20	MK151-125psi					Pipe laying schedules not available.
1295	90-601A	56+99	20	MK151-125psi					Pipe laying schedules not available.
1296	90-601A	57+19	20	MK151-125psi					Pipe laying schedules not available.
1297	90-601A	57+39	20	MK151-125psi					Pipe laying schedules not available.
1298	90-601A	57+59	20	MK151-125psi					Pipe laying schedules not available.
1299	90-601A	57+79	20	MK151-125psi					Pipe laying schedules not available.
1300	90-601A	57+99	20	MK151-125psi					Pipe laying schedules not available.
1301	90-601A	58+19	20	MK151-125psi					Pipe laying schedules not available.
1302	90-601A	58+39	20	MK151-125psi					Pipe laying schedules not available.
1303	90-601A	58+59	20	MK151-125psi					Pipe laying schedules not available.
1304	90-601A	58+79	20	MK151-125psi					Pipe laying schedules not available.
1305	90-601A	58+99	20	MK151-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 58+98.
1306	90-601A	59+19	16	MK151-125psi					Pipe laying schedules not available.
1307	90-601A	59+35	4	MK151-125psi					Pipe laying schedules not available. Equation: 59+28.71BK (90-601A) = 59+28.30AH (90-601B).
1308	90-601A	59+39	20	MK144-125psi					Pipe laying schedules not available.
1309	90-601A	59+59	2	MK144-125psi					Pipe laying schedules not available.
1310	90-601A	59+61	20	MK144-125psi					Pipe laying schedules not available.
1311	90-601A	59+81	14	MK144-125psi					Pipe laying schedules not available.
1312	90-601A	59+95	4	MK144-125psi					Pipe laying schedules not available.
1313	90-601A	59+98	20	MK144-125psi					Pipe laying schedules not available.
1314	90-601A	60+18	2	MK144-125psi					Pipe laying schedules not available.
1315	90-601A	60+20	20	MK144-125psi					Pipe laying schedules not available.
1316	90-601A	60+40	20	MK144-125psi				MH	Pipe laying schedules not available. 16"x18" Access MH @ Station 60+58.
1317	90-601A	60+60	20	MK144-125psi					Pipe laying schedules not available.
1318	90-601A	60+80	20	MK144-125psi					Pipe laying schedules not available.
1319	90-601A	61+00	20	MK144-125psi					Pipe laying schedules not available.
1320	90-601A	61+20	20	MK144-125psi					Pipe laying schedules not available.
1321	90-601A	61+40	20	MK144-125psi					Pipe laying schedules not available.
1322	90-601A	61+60	20	MK144-125psi					Pipe laying schedules not available.
1323	90-601A	61+80	20	MK144-125psi					Pipe laying schedules not available.
1324	90-601A	62+00	20	MK144-125psi					Pipe laying schedules not available.
1325	90-601A	62+20	20	MK144-125psi					Pipe laying schedules not available.
1326	90-601A	62+40	20	MK144-125psi					Pipe laying schedules not available.
1327	90-601A	62+60	20	MK144-125psi					Pipe laying schedules not available.
1328	90-601A	62+80	20	MK144-125psi					Pipe laying schedules not available.
1329	90-601A	63+00	20	MK144-125psi					Pipe laying schedules not available.
1330	90-601A	63+20	20	MK144-125psi					Pipe laying schedules not available.
1331	90-601A	63+40	20	MK144-125psi					Pipe laying schedules not available.
1332	90-601A	63+60	20	MK144-125psi					Pipe laying schedules not available.
1333	90-601A	63+80	20	MK144-125psi					Pipe laying schedules not available.
1334	90-601A	64+00	20	MK144-125psi					Pipe laying schedules not available.
1335	90-601A	64+20	20	MK144-125psi					Pipe laying schedules not available.
1336	90-601A	64+40	20	MK144-125psi					Pipe laying schedules not available.
1337	90-601A	64+60	20	MK144-125psi					Pipe laying schedules not available.
1338	90-601A	64+80	20	MK144-125psi					Pipe laying schedules not available.
1339	90-601A	65+00	20	MK144-125psi					Pipe laying schedules not available.
1340	90-601A	65+20	20	MK144-125psi					Pipe laying schedules not available.
1341	90-601A	65+40	20	MK144-125psi					Pipe laying schedules not available.
1342	90-601A	65+60	20	MK144-125psi					Pipe laying schedules not available.
1343	90-601A	65+80	20	MK144-125psi					Pipe laying schedules not available.
1344	90-601A	66+00	20	MK144-125psi					Pipe laying schedules not available.
1345	90-601A	66+20	20	MK144-125psi					Pipe laying schedules not available.
1346	90-601A	66+40	20	MK144-125psi					Pipe laying schedules not available.
1347	90-601A	66+60	20	MK144-125psi					Pipe laying schedules not available.
1348	90-601A	66+80	20	MK144-125psi					Pipe laying schedules not available.
1349	90-601A	67+00	20	MK144-125psi					Pipe laying schedules not available.
1350	90-601A	67+20	20	MK144-125psi					Pipe laying schedules not available.
1351	90-601A	67+40	20	MK144-125psi					Pipe laying schedules not available.
1352	90-601A	67+60	20	MK144-125psi					Pipe laying schedules not available.
1353	90-601A	67+80	20	MK144-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 67+75.
1354	90-601A	68+00	20	MK144-125psi					Pipe laying schedules not available.
1355	90-601A	68+20	20	MK144-125psi					Pipe laying schedules not available.
1356	90-601A	68+40	20	MK144-125psi					Pipe laying schedules not available.
1357	90-601A	68+60	20	MK144-125psi					Pipe laying schedules not available.
1358	90-601A	68+80	20	MK144-125psi					Pipe laying schedules not available.
1359	90-601A	69+00	20	MK144-125psi					Pipe laying schedules not available.
1360	90-601A	69+20	20	MK144-125psi					Pipe laying schedules not available.
1361	90-601A	69+40	20	MK144-125psi					Pipe laying schedules not available.

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Louisville Water Company
Grade Lane 60-Inch PCCP Water Main

Electromagnetic Inspection Results
Pipe Sections that Exhibit Electromagnetic Anomalies Consistent with Broken Wire Wraps

Pure Reference Number	Contract Number	Low Station	Pipe Length (feet)	Reported Class	Break Region Location (feet from Low Station)	Number of Broken Wire Wraps by Region	Total Number of Broken Wire Wraps	Layout	Comments
1362	90-601A	69+60	20	MK144-125psi					Pipe laying schedules not available.
1363	90-601A	69+80	20	MK144-125psi					Pipe laying schedules not available.
1364	90-601A	70+00	20	MK144-125psi					Pipe laying schedules not available.
1365	90-601A	70+20	20	MK144-125psi					Pipe laying schedules not available.
1366	90-601A	70+40	20	MK144-125psi					Pipe laying schedules not available.
1367	90-601A	70+60	20	MK144-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 70+53.
1368	90-601A	70+80	20	MK144-125psi				MH	Pipe laying schedules not available. 16"x18" Access MH @ Station 70+73.
1369	90-601A	71+00	20	MK144-125psi					Pipe laying schedules not available.
1370	90-601A	71+20	20	MK144-125psi					Pipe laying schedules not available.
1371	90-601A	71+40	20	MK144-125psi					Pipe laying schedules not available.
1372	90-601A	71+60	20	MK144-125psi					Pipe laying schedules not available.
1373	90-601A	71+80	20	MK144-125psi					Pipe laying schedules not available.
1374	90-601A	72+00	20	MK144-125psi					Pipe laying schedules not available.
1375	90-601A	72+20	20	MK144-125psi					Pipe laying schedules not available.
1376	90-601A	72+40	20	MK144-125psi					Pipe laying schedules not available.
1377	90-601A	72+60	20	MK144-125psi					Pipe laying schedules not available.
1378	90-601A	72+80	20	MK144-125psi					Pipe laying schedules not available.
1379	90-601A	73+00	20	MK144-125psi					Pipe laying schedules not available.
1380	90-601A	73+20	20	MK144-125psi					Pipe laying schedules not available.
1381	90-601A	73+40	20	MK144-125psi					Pipe laying schedules not available.
1382	90-601A	73+60	20	MK144-125psi					Pipe laying schedules not available.
1383	90-601A	73+80	20	MK144-125psi					Pipe laying schedules not available.
1384	90-601A	74+00	20	MK144-125psi					Pipe laying schedules not available.
1385	90-601A	74+20	20	MK144-125psi					Pipe laying schedules not available.
1386	90-601A	74+40	20	MK144-125psi					Pipe laying schedules not available.
1387	90-601A	74+60	20	MK144-125psi					Pipe laying schedules not available.
1388	90-601A	74+80	20	MK144-125psi					Pipe laying schedules not available.
1389	90-601A	75+00	20	MK144-125psi					Pipe laying schedules not available.
1390	90-601A	75+20	20	MK144-125psi					Pipe laying schedules not available.
1391	90-601A	75+40	20	MK144-125psi					Pipe laying schedules not available.
1392	90-601A	75+60	3	MK144-125psi					Pipe laying schedules not available.
1393	90-601A	75+63	4	MK144-125psi					Pipe laying schedules not available.
1394	90-601A	75+67	13	MK144-125psi					Pipe laying schedules not available.
1395	90-601A	75+80	20	MK144-125psi					Pipe laying schedules not available.
1396	90-601A	76+00	20	MK144-125psi					Pipe laying schedules not available.
1397	90-601A	76+20	20	MK144-125psi					Pipe laying schedules not available.
1398	90-601A	76+40	20	MK144-125psi					Pipe laying schedules not available.
1399	90-601A	76+60	20	MK144-125psi					Pipe laying schedules not available.
1400	90-601A	76+80	20	MK144-125psi					Pipe laying schedules not available.
1401	90-601A	77+00	20	MK144-125psi					Pipe laying schedules not available.
1402	90-601A	77+20	20	MK144-125psi					Pipe laying schedules not available.
1403	90-601A	77+40	20	MK144-125psi					Pipe laying schedules not available.
1404	90-601A	77+60	20	MK144-125psi					Pipe laying schedules not available.
1405	90-601A	77+80	20	MK144-125psi					Pipe laying schedules not available.
1406	90-601A	78+00	20	MK144-125psi					Pipe laying schedules not available.
1407	90-601A	78+20	20	MK144-125psi					Pipe laying schedules not available.
1408	90-601A	78+40	20	MK144-125psi					Pipe laying schedules not available.
1409	90-601A	78+60	20	MK144-125psi					Pipe laying schedules not available.
1410	90-601A	78+80	20	MK144-125psi					Pipe laying schedules not available.
1411	90-601A	79+00	20	MK144-125psi					Pipe laying schedules not available.
1412	90-601A	79+20	20	MK144-125psi					Pipe laying schedules not available.
1413	90-601A	79+40	20	MK144-125psi					Pipe laying schedules not available.
1414	90-601A	79+60	20	MK144-125psi					Pipe laying schedules not available.
1415	90-601A	79+80	20	MK144-125psi					Pipe laying schedules not available.
1416	90-601A	80+00	20	MK144-125psi					Pipe laying schedules not available.
1417	90-601A	80+20	20	MK144-125psi					Pipe laying schedules not available.
1418	90-601A	80+40	20	MK144-125psi					Pipe laying schedules not available.
1419	90-601A	80+60	20	MK144-125psi					Pipe laying schedules not available.
1420	90-601A	80+80	20	MK144-125psi					Pipe laying schedules not available.
1421	90-601A	81+00	20	MK144-125psi					Pipe laying schedules not available.
1422	90-601A	81+20	20	MK144-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 81+14.
1423	90-601A	81+40	20	MK144-125psi					Pipe laying schedules not available.
1424	90-601A	81+60	20	MK144-125psi					Pipe laying schedules not available.
1425	90-601A	81+80	20	MK144-125psi					Pipe laying schedules not available.
1426	90-601A	82+00	20	MK144-125psi					Pipe laying schedules not available.
1427	90-601A	82+20	20	MK144-125psi				MH	Pipe laying schedules not available. 16"x18" Access MH @ Station 82+14.
1428	90-601A	82+40	20	MK144-125psi					Pipe laying schedules not available.
1429	90-601A	82+60	20	MK144-125psi					Pipe laying schedules not available.
1430	90-601A	82+80	20	MK144-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 82+74.
1431	90-601A	83+00	20	MK144-125psi					Pipe laying schedules not available.
1432	90-601A	83+20	20	MK144-125psi					Pipe laying schedules not available.
1433	90-601A	83+40	20	MK144-125psi					Pipe laying schedules not available.
1434	90-601A	83+60	20	MK144-125psi					Pipe laying schedules not available.
1435	90-601A	83+80	20	MK144-125psi					Pipe laying schedules not available.
1436	90-601A	84+00	20	MK144-125psi					Pipe laying schedules not available.
1437	90-601A	84+20	20	MK144-125psi					Pipe laying schedules not available.
1438	90-601A	84+40	20	MK144-125psi					Pipe laying schedules not available.
1439	90-601A	84+60	20	MK144-125psi					Pipe laying schedules not available.
1440	90-601A	84+80	20	MK144-125psi					Pipe laying schedules not available.
1441	90-601A	85+00	20	MK144-125psi					Pipe laying schedules not available.
1442	90-601A	85+20	20	MK144-125psi					Pipe laying schedules not available.
1443	90-601A	85+40	20	MK144-125psi					Pipe laying schedules not available.

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Louisville Water Company
Grade Lane 60-Inch PCCP Water Main

Electromagnetic Inspection Results
Pipe Sections that Exhibit Electromagnetic Anomalies Consistent with Broken Wire Wraps

Pure Reference Number	Contract Number	Low Station	Pipe Length (feet)	Reported Class	Break Region Location (feet from Low Station)	Number of Broken Wire Wraps by Region	Total Number of Broken Wire Wraps	Layout	Comments
1444	90-601A	85+60	20	MK144-125psi					Pipe laying schedules not available.
1445	90-601A	85+80	20	MK144-125psi					Pipe laying schedules not available.
1446	90-601A	86+00	20	MK144-125psi					Pipe laying schedules not available.
1447	90-601A	86+20	20	MK144-125psi					Pipe laying schedules not available.
1448	90-601A	86+40	20	MK144-125psi					Pipe laying schedules not available.
1449	90-601A	86+60	20	MK144-125psi					Pipe laying schedules not available.
1450	90-601A	86+80	20	MK144-125psi					Pipe laying schedules not available.
1451	90-601A	87+00	20	MK144-125psi					Pipe laying schedules not available.
1452	90-601A	87+20	20	MK144-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 87+19.
1453	90-601A	87+40	10	MK165-125psi					Pipe laying schedules not available.
1454	90-601A	87+50	20	MK165-125psi					Pipe laying schedules not available. 96" Steel Casing pipe from Station 87+34.
1455	90-601A	87+70	20	MK165-125psi					Pipe laying schedules not available. 96" Steel Casing pipe.
1456	90-601A	87+90	20	MK165-125psi					Pipe laying schedules not available. 96" Steel Casing pipe.
1457	90-601A	88+10	20	MK165-125psi					Pipe laying schedules not available. 96" Steel Casing pipe.
1458	90-601A	88+30	20	MK165-125psi					Pipe laying schedules not available. 96" Steel Casing pipe.
1459	90-601A	88+50	20	MK144-125psi					Pipe laying schedules not available. 96" Steel Casing pipe to Station 88+54.
1460	90-601A	88+70	10	MK144-125psi					Pipe laying schedules not available.
1461	90-601A	88+80	3	MK144-125psi					Pipe laying schedules not available.
1462	90-601A	88+83	20	MK144-125psi					Pipe laying schedules not available.
1463	90-601A	89+03	20	MK144-125psi					Pipe laying schedules not available.
1464	90-601A	89+23	4	MK144-125psi					Pipe laying schedules not available.
1465	90-601A	89+27	20	MK144-125psi				OL	Pipe laying schedules not available. 20" OL @ Station 89+19.
1466	90-601A	89+47	20	MK144-125psi					Pipe laying schedules not available.
1467	90-601A	89+67	20	MK144-125psi					Pipe laying schedules not available.
1468	90-601A	89+87	20	MK144-125psi				MH	Pipe laying schedules not available. 16"x18" Access MH @ Station 89+79.
1469	90-601A	90+07	20	MK144-125psi					Pipe laying schedules not available.
1470	90-601A	90+27	14	MK144-125psi					Pipe laying schedules not available.
1471	90-601A	90+41	20	MK144-125psi					Pipe laying schedules not available.
1472	90-601A	90+61	20	MK144-125psi					Pipe laying schedules not available.
1473	90-601A	90+81	20	MK144-125psi					Pipe laying schedules not available.
1474	90-601A	91+01	20	MK144-125psi					Pipe laying schedules not available.
1475	90-601A	91+21	20	MK144-125psi					Pipe laying schedules not available.
1476	90-601A	91+41	20	MK144-125psi					Pipe laying schedules not available.
1477	90-601A	91+61	20	MK144-125psi					Pipe laying schedules not available.
1478	90-601A	91+81	20	MK144-125psi					Pipe laying schedules not available.
1479	90-601A	92+01	20	MK144-125psi					Pipe laying schedules not available.
1480	90-601A	92+21	20	MK144-125psi					Pipe laying schedules not available.
1481	90-601A	92+41	20	MK144-125psi					Pipe laying schedules not available.
1482	90-601A	92+61	20	MK144-125psi					Pipe laying schedules not available.
1483	90-601A	92+81	20	MK144-125psi					Pipe laying schedules not available.
1484	90-601A	93+01	20	MK165-125psi					Pipe laying schedules not available.
1485	90-601A	93+21	20	MK165-125psi					Pipe laying schedules not available.
1486	90-601A	93+41	20	MK165-125psi					Pipe laying schedules not available.
1487	90-601A	93+61	20	MK165-125psi					Pipe laying schedules not available.
1488	90-601A	93+81	20	MK165-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 93+73.
1489	90-601A	94+01	20	MK165-125psi					Pipe laying schedules not available.
1490	90-601A	94+21	20	MK165-125psi					Pipe laying schedules not available.
1491	90-601A	94+41	20	MK165-125psi					Pipe laying schedules not available.
1492	90-601A	94+61	20	MK165-125psi					Pipe laying schedules not available.
1493	90-601A	94+81	20	MK165-125psi					Pipe laying schedules not available.
1494	90-601A	95+01	20	MK144-125psi					Pipe laying schedules not available.
1495	90-601A	95+21	20	MK144-125psi					Pipe laying schedules not available.
1496	90-601A	95+41	20	MK144-125psi					Pipe laying schedules not available.
1497	90-601A	95+61	20	MK144-125psi					Pipe laying schedules not available.
1498	90-601A	95+81	20	MK144-125psi					Pipe laying schedules not available.
1499	90-601A	96+01	20	MK144-125psi					Pipe laying schedules not available.
1500	90-601A	96+21	20	MK144-125psi					Pipe laying schedules not available.
1501	90-601A	96+41	20	MK144-125psi					Pipe laying schedules not available.
1502	90-601A	96+61	20	MK144-125psi					Pipe laying schedules not available.
1503	90-601A	96+81	20	MK144-125psi					Pipe laying schedules not available.
1504	90-601A	97+01	20	MK144-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 96+88. Equation: 97+03.06BK = 97+26.54AH.
1505	90-601A	97+42	20	MK144-125psi					Pipe laying schedules not available.
1506	90-601A	97+62	20	MK144-125psi					Pipe laying schedules not available.
1507	90-601A	97+82	20	MK144-125psi					Pipe laying schedules not available.
1508	90-601A	98+02	20	MK144-125psi					Pipe laying schedules not available.
1509	90-601A	98+22	20	MK144-125psi					Pipe laying schedules not available.
1510	90-601A	98+42	20	MK144-125psi					Pipe laying schedules not available.
1511	90-601A	98+62	20	MK144-125psi					Pipe laying schedules not available.
1512	90-601A	98+82	20	MK144-125psi					Pipe laying schedules not available.
1513	90-601A	99+02	20	MK144-125psi					Pipe laying schedules not available.
1514	90-601A	99+22	20	MK144-125psi					Pipe laying schedules not available.
1515	90-601A	99+42	20	MK144-125psi					Pipe laying schedules not available.
1516	90-601A	99+62	20	MK144-125psi					Pipe laying schedules not available.
1517	90-601A	99+82	20	MK144-125psi					Pipe laying schedules not available.
1518	90-601A	100+02	20	MK144-125psi					Pipe laying schedules not available.
1519	90-601A	100+22	20	MK144-125psi					Pipe laying schedules not available.

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Louisville Water Company
Grade Lane 60-Inch PCCP Water Main

Electromagnetic Inspection Results
Pipe Sections that Exhibit Electromagnetic Anomalies Consistent with Broken Wire Wraps

Pure Reference Number	Contract Number	Low Station	Pipe Length (feet)	Reported Class	Break Region Location (feet from Low Station)	Number of Broken Wire Wraps by Region	Total Number of Broken Wire Wraps	Layout	Comments
1520	90-601A	100+42	20	MK144-125psi					Pipe laying schedules not available.
1521	90-601A	100+62	20	MK144-125psi					Pipe laying schedules not available.
1522	90-601A	100+82	20	MK144-125psi					Pipe laying schedules not available.
1523	90-601A	101+02	20	MK144-125psi					Pipe laying schedules not available.
1524	90-601A	101+22	20	MK144-125psi					Pipe laying schedules not available.
1525	90-601A	101+42	20	MK144-125psi					Pipe laying schedules not available.
1526	90-601A	101+62	20	MK144-125psi					Pipe laying schedules not available.
1527	90-601A	101+82	20	MK144-125psi					Pipe laying schedules not available.
1528	90-601A	102+02	20	MK144-125psi					Pipe laying schedules not available.
1529	90-601A	102+22	20	MK144-125psi					Pipe laying schedules not available.
1530	90-601A	102+42	20	MK144-125psi					Pipe laying schedules not available.
1531	90-601A	102+62	20	MK144-125psi					Pipe laying schedules not available.
1532	90-601A	102+82	20	MK144-125psi					Pipe laying schedules not available.
1533	90-601A	103+02	20	MK144-125psi				MH	Pipe laying schedules not available. 16"x18" Access MH @ Station 102+99.
1534	90-601A	103+22	20	MK144-125psi					Pipe laying schedules not available.
1535	90-601A	103+42	20	MK144-125psi					Pipe laying schedules not available.
1536	90-601A	103+62	20	MK144-125psi					Pipe laying schedules not available.
1537	90-601A	103+82	20	MK144-125psi					Pipe laying schedules not available.
1538	90-601A	104+02	20	MK144-125psi					Pipe laying schedules not available.
1539	90-601A	104+22	20	MK144-125psi					Pipe laying schedules not available.
1540	90-601A	104+42	20	MK144-125psi					Pipe laying schedules not available.
1541	90-601A	104+62	20	MK144-125psi					Pipe laying schedules not available.
1542	90-601A	104+82	20	MK144-125psi					Pipe laying schedules not available.
1543	90-601A	105+02	20	MK144-125psi					Pipe laying schedules not available.
1544	90-601A	105+22	20	MK144-125psi					Pipe laying schedules not available.
1545	90-601A	105+42	20	MK144-125psi					Pipe laying schedules not available.
1546	90-601A	105+62	20	MK144-125psi					Pipe laying schedules not available.
1547	90-601A	105+82	20	MK144-125psi					Pipe laying schedules not available.
1548	90-601A	106+02	20	MK144-125psi					Pipe laying schedules not available.
1549	90-601A	106+22	20	MK144-125psi					Pipe laying schedules not available.
1550	90-601A	106+42	20	MK144-125psi					Pipe laying schedules not available.
1551	90-601A	106+62	20	MK144-125psi					Pipe laying schedules not available.
1552	90-601A	106+82	20	MK144-125psi					Pipe laying schedules not available.
1553	90-601A	107+02	20	MK144-125psi					Pipe laying schedules not available.
1554	90-601A	107+22	20	MK144-125psi					Pipe laying schedules not available.
1555	90-601A	107+42	20	MK144-125psi					Pipe laying schedules not available.
1556	90-601A	107+62	20	MK144-125psi					Pipe laying schedules not available.
1557	90-601A	107+82	20	MK144-125psi					Pipe laying schedules not available.
1558	90-601A	108+02	20	MK144-125psi					Pipe laying schedules not available.
1559	90-601A	108+22	20	MK144-125psi					Pipe laying schedules not available.
1560	90-601A	108+42	20	MK144-125psi					Pipe laying schedules not available.
1561	90-601A	108+62	20	MK144-125psi					Pipe laying schedules not available.
1562	90-601A	108+82	20	MK144-125psi					Pipe laying schedules not available.
1563	90-601A	109+02	20	MK144-125psi					Pipe laying schedules not available.
1564	90-601A	109+22	20	MK144-125psi					Pipe laying schedules not available.
1565	90-601A	109+42	20	MK144-125psi					Pipe laying schedules not available.
1566	90-601A	109+62	20	MK144-125psi					Pipe laying schedules not available.
1567	90-601A	109+82	20	MK144-125psi					Pipe laying schedules not available.
1568	90-601A	110+02	20	MK144-125psi					Pipe laying schedules not available.
1569	90-601A	110+22	20	MK144-125psi					Pipe laying schedules not available.
1570	90-601A	110+42	20	MK144-125psi					Pipe laying schedules not available.
1571	90-601A	110+62	20	MK144-125psi					Pipe laying schedules not available.
1572	90-601A	110+82	2	MK144-125psi					Pipe laying schedules not available.
1573	90-601A	110+84	7	MK144-125psi					Pipe laying schedules not available.
1574	90-601A	110+91	20	MK144-125psi					Pipe laying schedules not available.
1575	90-601A	111+11	20	MK144-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 111+11.
1576	90-601A	111+31	20	MK144-125psi					Pipe laying schedules not available. Equation: 111+40.80BK = 111+09.90AH.
1577	90-601A	111+21	3	MK144-125psi					Pipe laying schedules not available.
1578	90-601A	111+24	20	MK144-125psi					Pipe laying schedules not available.
1579	90-601A	111+44	20	MK144-125psi					Pipe laying schedules not available.
1580	90-601A	111+64	8	MK144-125psi					Pipe laying schedules not available.
1581	90-601A	111+72	20	MK144-125psi					Pipe laying schedules not available.
1582	90-601A	111+92	20	MK144-125psi					Pipe laying schedules not available.
1583	90-601A	112+12	20	MK144-125psi					Pipe laying schedules not available.
1584	90-601A	112+25	20	MK144-125psi				OL	Pipe laying schedules not available. 12" OL @ Station 112+25.
1585	90-601A	112+45	20	MK144-125psi				MH	Pipe laying schedules not available. 16"x18" Access MH @ Station 112+45.
1586	90-601A	112+65	20	MK144-125psi					Pipe laying schedules not available.
1587	90-601A	112+85	20	MK144-125psi					Pipe laying schedules not available.
1588	90-601A	113+05	20	MK144-125psi					Pipe laying schedules not available.
1589	90-601A	113+25	20	MK144-125psi					Pipe laying schedules not available.
1590	90-601A	113+45	20	MK144-125psi					Pipe laying schedules not available.
1591	90-601A	113+65	20	MK144-125psi					Pipe laying schedules not available.
1592	90-601A	113+85	20	MK144-125psi					Pipe laying schedules not available.
1593	90-601A	114+05	20	MK144-125psi					Pipe laying schedules not available.
1594	90-601A	114+25	20	MK144-125psi					Pipe laying schedules not available.
1595	90-601A	114+45	20	MK144-125psi					Pipe laying schedules not available.
1596	90-601A	114+65	20	MK144-125psi					Pipe laying schedules not available.
1597	90-601A	114+85	20	MK144-125psi					Pipe laying schedules not available.
1598	90-601A	115+05	20	MK144-125psi					Pipe laying schedules not available.
1599	90-601A	115+25	20	MK144-125psi					Pipe laying schedules not available.
1600	90-601A	115+45	20	MK144-125psi					Pipe laying schedules not available.

Failure Risk Analysis and Structural Evaluation of PCCP Mains Along Grade Lane and Preston Highway

Louisville Water Company
Louisville, KY
19 December 2014

SGH Project 140606

SIMPSON GUMPERTZ & HEGER
Engineering of Structures and Building Enclosures

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19 December 2014

Mr. John Rundy
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Project 140606 – Failure Risk Analysis and Structural Evaluation of PCCP Mains Along Grade Lane and Preston Highway, Louisville Water Company, Louisville, KY

Dear Mr. Rundy:

This report presents the results of our pipe failure risk analysis of the 60 in. diameter prestressed concrete cylinder pipe (PCCP) on Grade Lane and 24 in. diameter PCCP on Preston Highway in Louisville, Kentucky, and our structural evaluation to determine the maximum pressure capacity of the same 24 in. diameter PCCP. The distressed pipes were detected, and their level of distress (number and location of broken wires) were estimated, using remote electromagnetic (EM) inspection technology performed by Pure Technologies Ltd. Simpson Gumpertz & Heger Inc. developed failure risk curves and determined failure margin and repair priorities of PCCP with broken wires accounting for the uncertainties in the EM inspection results and the maximum expected working-plus-transient pressures.

Please contact us if you have any questions or comments.

Sincerely yours,

Rasko P. Ojdrovic
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1. INTRODUCTION

This report summarizes the results of our pipe failure risk analysis of the 60 in. diameter prestressed concrete cylinder pipe (PCCP) on Grade Lane and 24 in. diameter PCCP on Preston Highway in Louisville, Kentucky, and our structural evaluation to determine the maximum pressure capacity of the same 24 in. diameter PCCP. The locations of the sections of pipeline of interest are shown in Figures 1 and 2.

1.1 Background

The transmission mains under investigation are operated by Louisville Water Company (LWC). The 60 in. diameter pipeline was installed under four different contracts between 1954 and 1994: Project 344 & 345 extending from Preston Highway (Sta. 41+40) to the west side of Interstate 65 (Sta. 46+90 = Sta. 377+39), Project 55 extending about 20 ft from the west side of Interstate 65 to Sta. 377+59 = Sta. 0+00, Project 90-601B extending from the west side of Interstate 65 about 216 ft to Sta. 2+16, and Project 90-601A extending from the end of Project 90-601B (Sta. 2+16) to Sta. 59+28 where Project 90-601B resumes again and extends to Sta. 115+86. The pipeline is made of 60 in. diameter PCCP, embedded-cylinder (ECP) type, manufactured by Price Brothers. The available drawings indicate that the pipes do not have shorting straps.

The 24 in. diameter pipeline was installed under four different contracts between 1979 and 1983: Project 41.82D (80-838) extending from Okolona Terrace (Sta. 173+16) to East Manslick Road (Sta. 246+20), Project 95.79D (79-699) extending from East Manslick Road to Cooper Chapel Road (Sta. 300+91), Project 109.83D (82-896) extending from Cooper Chapel Road to Interchange Drive (Sta. 327+46), and Project 110.83D extending from Interchange Drive to Antle Drive (Sta. 360+72). The pipeline is made of 24 in. diameter PCCP, lined-cylinder (LCP) type, manufactured by Price Brothers.

LWC would like to maximize the flow capacity of the 24 in. diameter pipeline and is currently pressure-limited in the Southern High School area (south of 24 in. diameter tee connection near Sta. 208+00).

Pure Technologies U.S. Inc. (Pure) performed electromagnetic inspection of the 60 in. ECP on 29 July 2014 and 20 August 2014 and of the 24 in. LCP on 17 July 2014 and 19 August 2014.

SGH was retained by Pure to evaluate the risk of failure of all distressed pipes identified using electromagnetic inspection as having broken wires, to determine the repair priorities of distressed pipes, and to determine the maximum pressure capacity of the 24 in. diameter pipeline.

1.2 Purpose and Scope

The purpose of our work is to determine the risk of pipe rupture and the repair priority of each distressed pipe identified by EM inspection in the above-referenced pipelines, determine the maximum pressure capacity of the 24 in. diameter pipeline, and provide recommendations for repair and further inspections.

The scope of our work includes the following:

- Gather and review pipe plan and profile drawings, laying schedule, design specifications, electromagnetic inspection results, working and transient pressures, and any other available relevant data.
- Evaluate the structural adequacy of the pipeline for the applied internal pressures and earth loads.
- Develop failure risk curves for the 24 in. and 60 in. diameter PCCP presented in terms of pressures at which serviceability, damage, and strength limit states are reached for varying effective number of broken wires.
- Determine the repair priority of each distressed pipe based on the EM inspection results and uncertainty in the number of broken wires.
- Determine the maximum allowable internal pressures in the 24 in. diameter pipeline.
- Develop recommendations regarding repair and future inspection of the pipeline.

The sections of pipeline included in our scope of work include approximately 12,300 ft of 60 in. diameter ECP from the intersection of Durrett Lane and Preston Highway to the intersection of Grade Lane and Beanblossom Road and approximately 18,900 ft of 24 in. diameter LCP from the intersection of Okolona Terrace and Preston Highway to the intersection of Mud Lane/Antle Drive and Preston Highway.

1.3 Methodology

Our approach for the PCCP design classes for which pipe design data is available is to check the structural adequacy of the designs (i.e., nondistressed pipe) in accordance with the current

AWWA C304 using the UDP software, develop failure risk curves, and to determine the threshold prestress loss lengths (i.e., length of broken wire zone) required to reach serviceability, damage, and ultimate limit states. For PCCP designs that are known to be used in the pipeline based on the laying schedules but for which only partial pipe design data is available (e.g., typical cross section, core thickness), our approach is to determine the likely design properties based on the proximity of pipes to other pipe classes and the soil cover heights obtained from the drawings, and then perform structural evaluation and failure risk analysis.

The risk of failure of a pipe is determined from the effective number of broken wires, the maximum pressure (operating plus transient) in the distressed pipe, and additional loads on the pipe from soil weight, fluid weight, and pipe self-weight. The failure risk analysis is performed using risk curves that relate the pressure in the pipe to the effective number of broken wires in the pipe at serviceability, damage, and strength limit states. The effective number of broken wires is the measured number of broken wires plus allowances for the uncertainties in inspection results, likely degraded condition of unbroken wires adjacent to the broken wires, interaction of adjacent broken wire zones, and rate of progression of wire breaks over time. The risk analysis procedure (risk curves technology) is a proprietary procedure (U.S. Patent 7043373), and SGH has the sole right to the use of the risk curves technology. Each set of the risk curves is developed for a specific pipe design and cover height.

The risk curves for the 24 in. diameter LCP are developed from nonlinear finite element analysis of pipes with increasing number of broken wires. Analysis of LCP accounts for corrosion-induced thinning in the steel cylinder. The pipes are subjected to the combined effects of self-weight, fluid weight, internal pressure, and earth load. The models have been verified through hydrostatic pressure testing of new LCP with prescribed wire breaks and also by our field inspections of various LCPs with broken wires at other pipelines.[1]

[1] Ojdrovic, R.P. , P.D. Nardini, and M.S. Zarghamee, “Verification of PCCP Failure Margin and Risk Curves,” ASCE Pipelines, Seattle, Washington, July 2011.

2. DOCUMENTS REVIEWED

We reviewed the following documents:

Plan and Profiles

- "Condition 2014- P.C.C.P. Grade Lane 60" & Preston Hwy. 24", Project No. 14099" by LWC, dated May 2014.

60 in. Diameter ECP Designs and Laying Schedules

- Price Brothers Company Laying Schedule, 60" Concrete Pipe Transmission Line, Louisville Kentucky, Job No, 50.42, 25 September 1954.
- Price Brothers Co Drawings, 10.58 Louisville-60", January 1958.
- Price Brothers Company Laying Schedule, Louisville-60", Job No, 10.58, 5 May 1958.
- Price Brothers Company, Laying Schedule, Louisville, Kentucky-60" Transmission Main through Standiford Field, Job No. 19.64, 27 August 1964.
- Price Brothers, Laying Schedule, Louisville, Kentucky Standiford Field 60 in PCCP Alternate Route Transmission Main: 90-601A, Job No.123.92, 3 April 1992.
- Price Brothers, Laying Schedule, Louisville, KY Standiford Field- Phase II, 48" & 60" Pipe, Job No.326.93, 22 March 1994.

24 in. Diameter LCP Designs and Laying Schedules

- Price Brothers Laying Schedule, Louisville, KY, 24" Transmission Main Project 79-699 (95.79D), 17 September 1979.
- Price Brothers Design Sheet, Louisville, KY, 24" Transmission Main Project 79-699 (95.79D), 17 September 1979.
- Price Brothers Laying Schedule, Louisville, KY, Preston Hwy 24" Transmission Main Project #80-838 (41.82D), 24 May 1982.
- Price Brothers Design Sheet and Design Calculations, Louisville, KY, Preston Hwy 24" W.M. Project #82-896 (109.83), 3 November 1983.
- Price Brothers Design Sheet and Design Calculations, Louisville, KY, Preston Hwy 24" W.M. Project #83-485 (110.83D), 3 November 1983.

Electromagnetic Inspection Results

- "Electromagnetic Inspection of the Grade Lane 60-Inch PCCP Water Main" prepared for LWC by Pure on 30 September 2014.
- "Electromagnetic Inspection of the Preston Highway 24-Inch PCCP Water Main" prepared for LWC by Pure on 30 September 2014.

Leak Detection Results

- Pure Technologies U,C. Inc., "DRAFT SmartBall Inspection Report for the Grade Lane 60-Inch PCCP and Preston Highway 24-Inch Phase 2 PCCP Water Mains", September 2014.

Pressure Monitoring

Flow and Pressure Tabular Data from Sites 24-1, 24-2, 60-1, and 60-2, 2014.

- 24 –inch PCCP Pressure through Day 10.Pdf
- 60 –inch PCCP Pressure through Day 4.pdf

2.1 60 in. Diameter ECP

Pipe Design and System Layout

We reviewed the provided documents including the pipe design, laying schedule, and plan and profile drawings for each contract number of the 60 in. ECP. Table 1 provides a summary of the year of construction, station range, and pipe classes installed for each contract number within our scope of work.

The design sheet for class MK151 (Contract 123.92) specifies a 16 gauge cylinder, but the laying schedule shows portions of the line with 10 gauge cylinder and 3/16 in. plate. The laying schedule also shows class MK176 over a 100 ft section of pipeline from Sta. 16+83.1 to Sta. 17+82.5, but we do not have any design information for this class. The design sheet for class MK144 (Contract 326.93) specifies a 16 gauge cylinder, but the laying schedule shows portions of the line with 14 gauge,12 gauge, and 10 gauge cylinder and 3/16 in. plate.

We obtained the pipe design properties, summarized in Table 2, from pipe design sheets. The pipe classes from Contract 10.58 and 19.64 use Class I prestressing wire. The pipe classes from Contracts 123.92 and 326.93 use Class III prestressing wire.

Table 1 – Design Information for 60 in. Diameter Pipeline

Project Names/Contract No.		Year	Station Range		Pipe Class Installed	
50.42	344 and 345	1954	41+40	46+90	BWP	
10.58	150-895	1958	195+90	371+88	SP-12-150	SP-12-175
19.64	55	1964	377+39	377+59	SP-12-175	
123.92	90-601A	1992	2+26	59+29	MK151*	MK176
326.93	90-601B	1994	60+28	115+80	MK144*	MK165

**Cylinder thicknesses used are 16GA through 3/16 in. as needed for thrust restraint.*

Table 2 – 60 in. Diameter ECP Properties

Contract No.		10.58		19.64	123.92	326.93	
Pipe Class		SP-12-150	SP-12-175	SP-12-175	MK151 (16GA, 10GA, 3/16PL)	MK144 (16GA, 14GA, 12GA, 10GA, 3/16PL)	MK165
Inner Diameter (in.)	D_i	60	60	60	60	60	60
Core Thickness, including cylinder (in.)	h_c	4.5	4.5	4.5	4.5	4.5	4.5
Nominal Mortar Thickness (in.)	h_m	0.75	0.75	0.75	0.75	0.75	0.75
Steel Cylinder Thickness (in.)	t_y	0.0598	0.0598	0.0598	see note 2	see note 3	0.0598
Prestress Wire Diameter (in.)	t_w	0.192	0.207	0.192	0.192	0.192	0.192
Prestress Wire Area per Foot (in^2/ft)	A_s	0.826	0.992	0.68	0.45	0.43	0.49
Prestress Wire Class		I	I	I	III	III	III
Gross Wrapping Stress (psi)	f_{sg}	140,000	138,600	150,000	189,000	189,000	189,000
Minimum Tensile Strength of Wire (psi)	f_{su}	192,000	192,000	192,000	252000	252000	252000
Concrete Core Strength (psi)	f_{pc}	4500[1]	4500[1]	4500[1]	4500[1]	4500	4500
Mortar Strength (psi)	f_{pm}	5500[1]	5500[1]	5500[1]	5500[1]	5500[1]	5500[1]
Design Working Pressure (psi)	P_w	150	175	100	125	125	125
Design Transient Pressure (psi)	P_t	NA	NA	NA	50	50	50
Design Soil Cover Height (ft)	H	NA	NA	NA	10	10	13

[1] Typical value assumed.
[2] MK151 from Contract No. 123.92 has three classes which differ only in cylinder thickness: 16 GA=0.0598 in., 10GA=0.1345 in., and 3/16PL=0.1875 in.
[3] MK144 from Contract No. 326.93 has five classes which differ only in cylinder thickness: 16 GA=0.0598 in., 14GA=0.0747 in., 12GA=0.1046 in., 10GA=0.1345 in., and 3/16PL=0.1875 in.

Electromagnetic and Leak Detection Inspection Results

Pure conducted EM inspections on 2.26 miles of the 60 in. diameter pipeline (a total of 641 pipes) on 29 July 2014 and 20 August 2014. The scope of inspection included approximately Sta. 43+26 to Sta. 115+65. Overall, Pure surveyed 29 pipes from Contract 50.42, one SP-12-175 from Contract 10.58, one SP12-175 from Contract 19.64, and 610 pipes from Contracts 123.92 and 326.93. Pure concluded that based on the analysis of the data obtained from the EM inspection, none of the 60 in. ECP displayed EM anomalies consistent with prestressing wire damage.

Pure performed SmartBall leak and gas pocket detection surveys of the Grade Lane 60 in. diameter ECP from Sta. 1+40 to Sta. 115+75 on 22 July 2014. They inspected a total length of 11,435 ft for the 60 in. diameter ECP and detected zero anomalies characteristic leaks or pockets of trapped gas.

2.2 24 in. Diameter LCP

Pipe Design and System Layout

We reviewed the provided documents including the pipe design, laying schedule, and plan and profile drawings for each contract number of the 24 in. LCP. Table 3 provides a summary of the year of construction, station range, and pipe classes installed for each contract number.

We obtained the pipe design properties, summarized in Table 4, from pipe design sheets. All three pipe classes have similar designs. They all use the minimum wire area by AWWA C304, but MK162 uses Class 3.5 wire when MK150 and MK153 use Class III wire. Additionally, MK153 and MK162 have 18 gauge cylinders when MK150 has a 17 gauge cylinder.

Table 3 – Design Information for 24 in. Diameter Pipeline

Project Names		Year	Station Range		Pipe Class
95.79D	79-699	1979	246+20	300+91	MK162
41.82D	80-838	1982	173+16	246+20	MK153
109.83D	82-896	1983	301+18	327+46	MK150
110.83.D	83-485	1983	327+46	360+72	MK150

Table 4 – 24 in. Diameter LCP Properties

Contract No.		**82-896 and 83-485**	**80-838**	**79-699**
Pipe Class		**MK150**	**MK153**	**MK162**
Inner Diameter (in.)	D_i	24	24	24
Core Thickness, including cylinder (in.)	h_c	1.5	1.5	1.5
Nominal Mortar Thickness (in.)	h_m	5/8	5/8	5/8
Steel Cylinder Thickness (in.)	t_y	0.0538	0.0478	0.0478
Prestress Wire Diameter (in.)	t_w	0.192	0.192	0.192
Prestress Wire Area per Foot (in^2/ft)	A_s	0.23	0.23	0.23
Prestress Wire Class		III	III	3.5
Concrete Core Strength (psi)	f_{pc}	6000[1]	6000[1]	6000[1]
Mortar Strength (psi)	f_{pm}	5500[1]	5500[1]	5500[1]
Minimum Tensile Strength of Wire (psi)	f_{su}	252000	252000	267000
Design Working Pressure (psi)	P_w	107	125	150
Design Transient Pressure (psi)	P_t	43	50	60
Design Soil Cover Height (ft)	H	17	12	12

[1] Typical value assumed.

Electromagnetic Inspection and Leak Detection Results

Pure conducted EM inspections on 3.53 miles of the 60 in. ECP (a total of 985 pipes) on 17 July 2014 and 19 August 2014. The scope of the inspection included approximately Sta. 173+68 to Sta. 358+31. However, the section from approximate Sta. 207+50 to Sta. 208+50 was not inspected due to the insertion technique of the inspection tools. The results of the inspection are summarized in Table 5. They identified twelve distressed pipes (a 1.2% distress rate) and three anomalous pipes. No estimate of the number of wire breaks is given for the anomalous pipes.

Pure performed SmartBall leak and gas pocket detection surveys of the 24 in. diameter LCP from Sta. 208+10 to Sta. 359+56 on 21 July 2014 and detected one anomaly characteristic of a leak and zero anomalies characteristic of pockets of trapped gas. The acoustic leak anomaly occurred 4,996.7 ft from the insertion point, corresponding to Sta. 258+07 (GPS Location: 38.1148, -85.6762) and Pure estimates that it is a small leak. We do not know if this suspected leak has been investigated further and what the pipe condition is at that location.

Table 5 – EM Results for 24 in. LCP

Pure Reference Number	Low Station	Pipe Class	Pipe Length (ft)	Break Position (ft)	Number of Broken Wire Wraps by Region	Total Number of Broken Wire Wraps
1025	213+10	MK 153	18	13.5	5	5
2021	267+73	MK 162	20	4.5	5	5
2040	271+53	MK 162	20	16	5	5
2053	273+39	MK 162	20	3.5;11.0	5;15	20
2057	274+17	MK 162	20	11.5	15	15
2058	274+37	MK 162	20	9.5;14.0	5;20	25
2062	274+77	MK 162	20	7.5-16.5	25	25
2145	289+61	MK 162	20	3.5	5	5
2173	294+73	MK 162	20	12.5	5	5
2188	297+52	MK 162	20	10.5	5	5
3023	305+13	MK 150	20	16	5	5
3173	333+19	MK 150	20	9	15	15
1157	238+79	MK 153	20	9.5-11.5	Anomalous	
1257	257+84	MK 162	20	12.5-15.5	Anomalous	
2177	295+53	MK 162	20	0.5-20.0	Anomalous	

2.3 Hydraulic Monitoring Results

LWC provided data from pressure monitoring on the 24 in. and 60 in. pipelines (Appendix A). The pressures correspond to working pressures as the monitoring devices were not capable of capturing transient events. Two locations on the 60 in. pipeline were monitored over a four day period between 8 July 2014 and 12 July 2014 and two locations on the 24 in. pipeline were monitored over a ten day period between 24 June 2014 and 4 July 2014. The locations of each monitor and a summary of the results are shown in Table 6.

Table 6 – Summary of Pressure Monitoring Data

Pipe Diameter (in.)	Station	Nearby Landmark	Measured Working Pressure		
			Max. (psi)	Min. (psi)	Avg. (psi)
60	34+23	KY Air Guard on Grade Lane	88	77	82
60	102+98.90	UPS on Grade Lane	91	78	84
24	207+89	Preston Highway and St. Rita Drive	118	78	101
24	247+63	9207 Preston Highway	92	53	74

3. PIPE STRUCTURAL EVALUATION

We performed structural evaluation of the 60 in. diameter ECP and 24 in. diameter LCP using the computer program UDP to check if the designs meet the current design standard, AWWA C304-2007 (see Appendix B). The loads applied to the pipes consist of the internal working and working-plus-transient pressures, pipe and fluid weights, earth load, live load, and prestressing force.

3.1 Loads on Pipe

The loads applied to the PCCP consist of the maximum internal working and working-plus-transient pressures, pipe and fluid weights, earth load, live load, and prestressing force.

3.1.1 Maximum Working and Transient Pressures

Working Pressure: LWC provided pressure monitoring data from two locations on each pipeline. Based on the pipe elevations taken from the profile drawings for each monitoring location and the measured pressures, we constructed a hydraulic grade line to calculate pressures along each pipeline. The LWC drawings do not show any pumping stations between the two sites or along the remainder of the pipeline within the scope of this analysis; therefore, we extrapolated the HGL beyond the two monitoring sites. The measured working pressures slightly exceed the design working pressures (by up to 5%) between Sta. 173+16 and 199+00 for the 24 in. diameter pipeline and are otherwise less than the design working pressure as shown in Figure 3. The measured working pressures are less than the design working pressure for the entire 60 in. diameter pipeline within the scope of this analysis as shown in Figure 4. We do not know if the measured pressures are the highest pressures that the pipeline experiences throughout the year.

We considered the design working pressure for structural evaluation of each pipe class. The working pressure used for the structural evaluation of each pipe class is summarized in Table 7.

Working-Plus-Transient Pressure: No hydraulic transient analysis has been performed on these pipelines. For design of PCCP in absence of hydraulic transient analysis, AWWA C304 recommends the use of 40% of the working pressure or 40 psi, whichever is greater. For our structural evaluation, we used the transient pressure specified on the pipe design sheets when available. When the pipe design sheet did not indicate a design transient pressure, we considered a transient pressure equal to 40% of the design working pressure or 40 psi,

whichever is greater. The transient pressure used for the structural evaluation of each pipe class is summarized in Table 7.

3.1.2 Gravity Loads

Pipe Weight: Pipe weight is calculated based on pipe geometry and constituent material unit weights given in AWWA C304. The pipe weight is assumed to be supported on a 15° bedding angle with an Olander distribution.

Fluid Weight: Fluid weight is calculated based on the pipe geometry and the weight of water (62.4 pcf). The fluid weight is assumed to be supported on a 90° bedding angle with an Olander distribution**.**

Earth Load: Earth load is calculated based on the design soil cover height when available, or else based on the soil cover heights shown on the profile drawings. The soil unit weight shown on the design sheets varies from 120 pcf to 140 pcf. When the design soil unit weight is not specified in the pipe design sheet, the unit weight from the adjacent project is used. We considered trench installation conditions with 18 in. on either side of pipe for all 60 in. ECP classes based on drawings for Job 123.92 and Job 326.93. We considered trench installation conditions with 12 in. on either side of the pipe for all 24 in. diameter LCP classes based on drawings for Projects 83-485, 82-896, and 80.838. Moments and thrusts in the pipe wall due to earth load are calculated from an Olander distribution with a 90° bedding angle**.**

The soil cover height and soil unit weight used for the structural evaluation and risk analysis of each pipe class is summarized in Table 7.

Live Loads: Live load is calculated for a given soil cover height assuming an AASHTO HS20 standard truck. The load is distributed through the depth of soil above the pipe, and the load is applied with an Olander distribution within the bedding angle. Pipe design sheets for Class MK151 from Contract 123.92 specify that the pipe was designed for aircraft live loading; however we conduct the structural evaluation under the standard AASHTO HS20 live load.

3.1.3 Prestressing Force

Prestressing force is calculated following AWWA C304 procedure based on prestressing wire area and residual stresses after elastic deformation, concrete creep and shrinkage, and wire relaxation losses, computed using the UDP software. The prestressing force is applied as a

radial pressure to the exterior of the pipe where wires are not broken and omitted in the broken wire zones.

Table 7 – Pressures and Loads Used for the Analysis of Each Pipe Class

Contract No.	Pipe Class	Diameter (in)	Cylinder Thickness (in)	Design Working Pressure (psi)	Design Transient Pressure (psi)	Design Soil Cover (ft)	Design Soil Unit Weight (pcf)
10.58	SP-12-150	60	0.0598	150	60	10*	140*
10.58	SP-12-175	60	0.0598	175	70	10*	140*
19.64	SP-12-175	60	0.0598	100	40	10*	140*
123.92	MK151	60	0.0598	125	50	10	140
326.93	MK144	60	0.0598	125	50	10	140
326.93	MK165	60	0.0598	125	50	13	140
79-699	MK162	24	0.0478	150	60	12	120
80-838	MK153	24	0.0478	125	50	12	135
82-896	MK150	24	0.538	107	43	17	120
83-485	MK150	24	0.538	107	43	17	120

*Not specified on pipe design sheets, assumed values based on other 60 in. diameter pipe designs.

3.2 Pipe Design Check

3.2.1 60 in. Diameter ECP

We evaluated the structural adequacy for each 60 in. ECP class with the properties listed in Table 2 subjected to the loads specified in Table 7. The results of the structural evaluation indicate that all classes satisfy all of the limit states criteria with their nominal design steel cylinder thicknesses.

We also evaluated the pipe classes with thicker steel cylinder used for thrust restraint in a small percentage of the pipeline. Class MK151 with 10GA and 3/16 in. cylinder from Contract 123.92 and Class MK144 with 12 GA, 10 GA, and 3/16 in. cylinder from Contract 326.93 do not satisfy all limit states in the current standard under the original design loads. The actual pressures and soil cover heights appear to be lower than the design values. We evaluated the 60 in. diameter pipe designs for the maximum anticipated actual earth loads that occur within each pipe class based on the profile drawings, internal working pressures based on the calculated HGL, and a transient pressure equal to 40% of the working pressure. Under these loading conditions, all pipe designs satisfy or very nearly satisfy the limit states of AWWA C304. The lack of

distressed pipes implies that the mortar coating is likely undamaged or that the soils are not corrosive to PCCP.

3.2.2 24 in. Diameter LCP

We evaluated the structural adequacy for each 24 in. LCP class with the properties listed in Table 4 subjected to the loads specified in Table 7. The results of the structural evaluation indicate that all classes satisfy all limit states criteria.

3.3 Maximum Pressure Capacity of 24 in. LCP

We evaluated the maximum pressure capacity of the 24 in. diameter pipeline using the working and working-plus-transient envelope limit states from AWWA C304-2007. We determined the allowable working and working-plus-transient pressures considering the maximum soil cover heights for each pipe class and the maximum combined earth plus live load. Limit states curves for each pipe class are shown in Appendix C. A summary of the allowable pressures is shown in Table 8 and an example evaluation using the limit states curves in shown in Figure 5 for Class MK153.

The results indicate that the maximum allowable working pressures are controlled by Class MK153, which can be increased by about 13 psi.

Table 8 – Maximum Allowable Internal Pressures

Pipe Class		MK153	MK162	MK150
Station No.	Start	173+16	246+20	300+91
	End	246+20	300+91	360+72
Minimum Soil Cover	[ft]	2	2	1
Maximum Soil Cover	[ft]	12	18	9
Maximum Earth Load	[lbf/ft]	4,848	5,449	3,538
Maximum Combined Earth Plus Live Load	[lbf/ft]	4,997	5,528	3,765
Maximum Allowable Working Pressure	[psi]	**144**	**150**	**141**
Maximum Allowable Working-Plus-Transient Pressure	[psi]	**214**	**210**	**206**
Maximum Actual Pressure from HGL	[psi]	131	113	59
Maximum Actual Pressure from HGL plus Design Transient Pressure	[psi]	181	173	102

4. FAILURE RISK ANALYSIS AND DISTRESSED PIPE PRIORITIES

The risk of failure of PCCP is evaluated using risk curves. Risk curves define the relationship between the pressure in the pipe and the effective number of broken wires that result in different limit states. The limit states quantify the level of damage in the pipe and are used to assign repair priorities.

The risk curves are developed from nonlinear finite element analyses, calibrated by hydrostatic pressure testing of ECP and LCP with induced and actual wire breaks, and validated by field inspection of various ECPs and LCPs with broken wires at other pipelines. The results of finite element analyses were used to determine the pressures and the number of broken wires that produce different limit states in the pipe.

Once the risk curves are generated for different limit states, the number of broken wires detected by the EM inspection and the effective number of broken wires are plotted on the risk curves at working and working-plus-transient pressures to evaluate the failure risk of distressed pipes. The details of this procedure can be found in the following sections, and in US Patent No. 7043373, Zarghamee et al (2003)[2] and Erbay et al. (2007) [3].

4.1 Limit States

We considered the following limit states in developing the risk curves:

- **Serviceability Limit State Curve:** The combination of broken wires and pressure in the line causing tensile strain in the concrete core reaching the strain corresponding to the onset of visible cracking.

- **Damage Limit State Curve:** The combination of broken wires and pressure in the line causing yielding in the steel cylinder and stress increase in the prestressing wires adjacent to a BWZ that would promote wire breakage.

- **Strength Limit State Curve:** The combination of broken wires and pressure in the line causing rupture of the steel cylinder, breakage of prestressing wires, or failure of concrete core.

[2] Zarghamee, M.S., D.W. Eggers, R.P. Ojdrovic, and B. Rose, “Risk Analysis of Prestressed Concrete Cylinder Pipe with Broken Wires,” *Proceedings of ASCE Specialty Conference Pipelines 2003*, Baltimore, MD, 2003.
[3] Erbay O.O., M.S. Zarghamee, and R.P. Ojdrovic, “Failure Risk Analysis of Lined Cylinder Pipes with Broken Wires and Corroded Cylinder,” ASCE Pipeline Conference, Boston, MA, 8 to 11 Jul 2007.

4.2 Repair Priorities

The limit state curves divide the plots of pressure versus number of broken wires into different zones. Each zone is assigned an alphanumeric order, depending on the risk of pipe failure and the need for repair. A typical plot of limit state curves and repair priorities is shown in Figure 6. The repair priorities are as follows:

- **Priority 1:** The expected maximum pressure exceeds the pressure that produces the ultimate strength limit states. Priority 1 is divided into three subcategories:
  - **Priority 1A** is the state where the expected maximum pressure is more than the pressure that exceeds the ultimate strength of the pipe including soil resistance and also exceeds the tensile strength of the cylinder.
  - **Priority 1B** is the state where the expected maximum pressure is more than the pressure that exceeds the ultimate strength of the pipe without soil resistance and also exceeds the tensile strength of the cylinder.
  - **Priority 1C** is the state where the expected maximum pressure is more than the pressure that exceeds the ultimate strength of the pipe including soil resistance but not more than the pressure that exceeds the tensile strength of the cylinder.

  For Priorities 1A and 1B, failure can occur at any time. For Priority 1C, failure can occur with time if and when the steel cylinder corrodes. Repair should be performed as soon as practical and in less than 1 yr.

- **Priority 2:** The expected maximum pressure exceeds pressure that produces damage limit states. The failure occurs with time as the number of broken wires increases or when the steel cylinder corrodes. Repair should be performed within a short time period of about 3 to 5 yrs. Priority 2 is divided into two subcategories:
  - **Priority 2A** is the state where the expected maximum pressure is more than the pressure that exceeds the tensile strength of the cylinder.
  - **Priority 2B** is the state where the expected maximum pressure is less than the pressure that exceeds the tensile strength of the cylinder.

- **Priority 3:** The expected maximum pressure exceeds the pressure that produces serviceability limit states, but not the damage limit states. The failure of the pipe, if it

occurs at all, is after much longer time period than in Priority 2. The pipeline should be monitored. Priority 3 is divided into two subcategories:

- **Priority 3A** is the state where the expected maximum pressure is more than the pressure that exceeds the tensile strength of the cylinder.
- **Priority 3B** is the state where the expected maximum pressure is less than the pressure that exceeds the tensile strength of the cylinder.

- **Priority 4:** The maximum pressure is less than the pressure that produces serviceability limit states. The failure of the pipe, if it occurs at all, is after much longer time period than in Priority 3. The pipeline should be monitored. Priority 4 is divided into two subcategories:

  - **Priority 4A** is the state where the expected maximum pressure is more than the pressure that exceeds the tensile strength of the cylinder.
  - **Priority 4B** is the state where the expected maximum pressure is less than the pressure that exceeds the tensile strength of the cylinder.

4.3 Risk Curves

We performed a set of nonlinear finite element analyses (NL-FEA) to evaluate the risk of failure of the PCCP resulting from loss of prestress due to wire breaks. For each pipe design, a series of finite element analyses are performed for pipes with different numbers of broken wires, subjected to the combined effects of self-weight, earth load, and internal pressure. The results of the NL-FEA are used to determine the serviceability limit state (i.e., onset of core cracking), the damage limit state (i.e., structural cracking of core and increase in wire stress adjacent to the BWZ), and the strength limit state as a function of the number of broken wires (NBW).

Electromagnetic inspection identified twelve distressed pipes in the 24 in. diameter LCP water main. Nine of the distressed pipes are Class MK162, two are Class MK150, and one is Class MK153. Classes MK150 and MK153 are very similar in design and only differ in steel cylinder thickness (17 gage for Class MK150 and 18 gage for Class MK153). We performed NL-FEA of classes MK162 and MK150. Since class MK153 is similar to Class MK150, we evaluate the failure risk and repair priority for the distressed MK153 pipe using the risk curves developed for MK150. The steel cylinder has reduced thickness accounting for corrosion and possible perforation due to water infiltration through the cracked mortar coating. The properties of the 24 in. LCP are provided in Table 4. Non-linear material properties are included for the steel

cylinder, concrete core, and mortar (Zarghamee and Fok, 1990[4]). Example results from the NL_FEA of the 24 in. LCP MK162 are shown in Figure 7.

Since the EM inspection results from Pure show that none of the 60 in. ECP are distressed, we did not develop risk curves for the 60 in. ECP.

4.4 Effective Number of Broken Wires

The analysis of risk of pipe rupture and determination of repair priorities of different pipe designs in the pipeline is based on the number of wire breaks and the maximum pressure in the pipe. Considering the accuracy of the inspection and other uncertainties in the condition of wires and rate of wire breakage, we evaluate repair priorities using an effective number of broken wires, N_e, equal to the number of broken wires as determined from the inspection, n, plus a certain number of wires that account for the following uncertainties:

- Electromagnetic inspection error
- Degraded condition of wires adjacent to BWZ
- Increase in BWZ over time

Each source of uncertainty is discussed separately below.

Electromagnetic Inspection Error

The accuracy of electromagnetic inspection was first discussed in a PPIC report to AWWARF prepared in the late 1990s. At the time of the AWWARF research, the role of the shorting strap was not known; however, PPIC reported on two different signal distortions – one that is almost directly proportional to the number of wire breaks and the other that is not. In other words, signal distortion is large with a single wire break and changes only slightly with increasing number of wire breaks.

For ECP with shorting straps and LCP pipes, tests have shown signal distortions in the middle of the pipe proportional to the number of wire breaks; however, the accuracy of detection near pipe ends is much lower and small numbers of broken wires may go undetected near the pipe ends.

[4] M.S. Zarghamee and K.L. Fok, “Analysis of Prestressed Concrete Pipe Under Combined Loads,” Journal of Structural Engineering, Vol. 116, No. 7, July 1990, pp. 2022 – 2039.

Degraded Condition of Wires Adjacent to BWZ

Wires adjacent to a BWZ may be corroded, even though they remain electrically continuous. Based on observations on other pipelines, we recommend that a certain length, L_c, of severely corroded wires should be considered as broken and added to the length of the BWZ. For pipes with broken wires due to corrosion, we assume L_c to be a random variable with mean length $\mu_{L_c} = 1\ in.$ and standard deviation $\sigma_{L_c} = 1\ in.$ if the length of the BWZ is less than or equal to 6 in.; $\mu_{L_c} = 3\ in.$ and $\sigma_{L_c} = 3\ in.$ if the length of the BWZ is greater than or equal to 24 in. and linearly varying in between. For pipes with broken wires due to embrittlement, $L_c = 0\ in.$.

Increase in BWZs Over Time

If a pipe is not repaired immediately, the BWZs will continue to grow in the future. The rate of growth of BWZs is a function of the rate of corrosion of wire, which depends on whether the pipeline is cathodically protected, the length of the BWZ, and the time it takes to corrode the wire cross-section. The rate of growth of BWZs is directly proportional to the rate of progression of wire breaks. Since this is the first EM inspection of the pipeline, the site-specific BWZ growth rate is unknown. The BWZ growth rate will be calculated following the second EM inspection and will be used to project repair priorities of distressed pipes in the future.

Effective Number of Broken Wires

The effective number of broken wires N_e for this pipeline is calculated as follows:

$$N_e = n + E + \frac{n_w}{12} L_c + n_w + t\, L_r \qquad \textbf{Eq. 1}$$

where n = number of broken wires from electromagnetic inspections, E = random variable of error in number of broken wires from electromagnetic inspections, n_w = number of wraps per foot, L_r = annual rate of increase of BWZ length, L_c = length of severely corroded wire zone, and ℓ = contiguous length of pipe inclusive of all BWZs. Note that a capital letter depicts a random variable.

The mean effective number of broken wires μ_{N_e} and the standard deviation in the effective number of broken wires σ_{N_e} are calculated from the distribution defined in Eq. 1. Depending on the consequence of failure, an acceptable upper bound estimate of the effective number of broken wires $u(N_e)$ may be defined as the mean μ_{N_e} plus an appropriate number of standard deviations (say k) of N_e as follows:

$$u(N_e) = \mu_{N_e} + k\,\sigma_{N_e} \qquad \textbf{Eq. 2}$$

The upper bound estimate of the effective number of broken wires, appropriate for the consequence of failure of the pipeline, is used to determine the failure risk of each distressed pipe, and referred to henceforth as the effective number of broken wires.

Uncertainty in Pipes with Multiple Wire Break Zones

The uncertainty in pipes with two BWZs depends on the structural interaction of the two BWZs, the uncertainty in the number of broken wires in each zone, and the rate of progression of the number of broken wires in each zone. For pipes with multiple BWZs, interaction of two BWZs is based on the number of broken wires in the two zones n_1 and n_2, and the actual clear distance between the two zones. The minimum required clear distance is calculated by performing multiple finite element analyses for different pipe diameters, BWZ lengths, and different spacing between the two BWZs, and looking at the increased stress in the wires in the distance between the two zones.

In addition, for pipes with four or more BWZs, the BWZs are assumed to be contiguous and extend over the portion of the pipe length inclusive of all BWZs.

4.5 Failure Risk of Distressed Pipes

We determined the repair priorities of distressed pipes, based on the effective number of broken wires equal to the number of broken wires measured by EM inspection plus a certain number of wires that account for the uncertainties in the EM results and condition of the unbroken but possibly corroded wires adjacent to broken wires. Since this is the first inspection of the pipeline, the uncertainties are based on our analysis of inspection and verification data from other pipelines.

The repair priorities of the distressed pipes are presented in Table 9, and the risk curves are presented in Figures 8 and 9. Both the measured number of broken wires and the calculated effective number of broken wires at the time of inspection are plotted at both working and working-plus-transient pressures. Where there are two or more BWZs on a single pipe segment that do not combine into one effective zone, the repair priority of the pipe is the most critical repair priority of a single BWZ presented in Table 9. The highest priority pipes are summarized below.

- Pipes 2058 and 2062 are in or very near Repair Priority 1 at present based on the measured number of broken wires, considering the working pressure.

- Pipes 2053, 2057, 2058, 2062, and 3173 are in or very near Repair Priority 1 at present based on the measured number of broken wires plus measurement uncertainties, considering the working pressure. No additional pipes enter Repair Priority 1 at present when considering working-plus-transient pressures.

We also evaluated the risk of failure of the distressed pipes considering the potential increased pressures in the pipeline based on our structural evaluation discussed earlier in this report. We shifted the HGL elevation until the maximum pressure in Class MK153 reached the maximum allowable pressure of 144 psi (about 13 psi increase in pressure). The results are shown in Table 10 and indicate that the overall pipe repair priorities do not change significantly to those discussed above.

We did not calculate repair priorities for the three pipes identified as anomalous by Pure as there is significant uncertainty in the number of wire breaks, if any exist. The length of anomalous signal on these pipes is between 2 and 19.5 ft. Considering that the pipe designs contain 8 wire wraps per ft, these zones contain 16 to 156 wires. An anomalous pipe with 16 wire breaks would be similar to Pipes 2053, 2057, and 3173 with 15 wire breaks each which are in or close to Repair Priority 1 based on the estimated number of broken wires without consideration of measurement or other uncertainties at the working pressure. It is highly unlikely that a pipe contains 156 wire breaks as it would most likely have failed or leaked, but these pipes could contain wire breaks within the anomalous region. Further investigation of these pipes is needed.

5. CONCLUSIONS

We make the following conclusions based on our structural evaluation and failure risk analysis:

- No distressed pipes were identified by electromagnetic inspection in the 60 in. diameter pipeline. This is much lower than distress in similar PCCP lines that have an average distress rate of about 3.9%.

- The distress rate for the 24 in. diameter pipeline is low (about 1.2%), less than the 3.9% rate for other similar PCCP lines.

- At present, under working pressure, Pipes 2058 and 2062 are in or close to Repair Priority 1 based on the number of broken wires estimated by electromagnetic inspection.

- At present, under working-plus-transient pressure, Pipes 2053, 2057, 2058, 2062, and 3173 are in or close to Repair Priority 1 based on the number of broken wires estimated by electromagnetic inspection.

- The 24 in. diameter pipe classes satisfy all limit states criteria of the current AWWA C304 standard under the design loads.

- The 60 in. diameter pipe classes satisfy all limit states criteria of the current AWWA C304 standard under the design loads with the nominal steel cylinder thickness. Some classes do not meet all limit states when the steel cylinder thickness is increased; however, these classes do satisfy (or marginally exceed) all limit states under the actual earth loads and internal pressures.

- Structural evaluation of the 24 in. diameter pipeline indicates that the maximum allowable working pressures are controlled by Class MK153, which can be increased by about 13 psi. This increase in pressure does not significantly increase the risk of failure of the distressed pipes.

- Three pipes have anomalous EM signal. The number of wire breaks, if any, on those pipes is unknown. Further investigation of these pipes is needed in order to evaluate their risk of failure.

- One leak location was identified near Sta. 258+07 in the 24 in. diameter pipeline. Further investigation is needed to verify this leak and evaluate the condition of the pipe. No wire breaks were identified by EM at this location.

6. RECOMMENDATIONS

Based on our analysis, we recommend the following:

- Externally inspect Pipes 2058 and 2062 (and consider inspecting Pipes 2053, 2057, and 3173) as soon as practical to verify the number of broken wires, evaluate the pipe condition, and repair pipe as needed.

- Externally inspect one of the three anomalous pipes to evaluate the pipe condition and repair the pipe as needed.

- Externally inspect the pipe at the leak location identified using SmartBall, to confirm the leak, and repair the pipe as needed.

- Reevaluate the risk of failure of all distressed pipes based on the results of external inspection and considering future progression of wire breaks until the next inspection.

- Minimize transient pressure events in the pipeline to the extent possible to reduce the risk of pipe failure.

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Table 9 – Repair Priorities for Distressed 24 in. Pipes under Current Working Pressure and Design Transient Pressure

Pipe No.	Pipe Class	Station (ft)	Soil Cover (ft)	Working Pressure (psi)	Working plus Transient Pressure (psi)	Field Inspection Data		At Time of Inspection	
						Location of BWZ† (ft)	RFTC Number of Broken Wires	Repair Priority without Uncertainties	Repair Priority with Uncertainties
1025	MK153	213+10	5	113	163	13.5	5	4	2
2021	MK162	267+73	5	90	150	4.5	5	4	2
2040	MK162	271+53	5	92	152	16	5	4	2
2053	MK162	273+39	5	95	155	3.5	5	4	2
2053	MK162	273+39	5	95	155	11	15	1b	1a
2057	MK162	274+17	5	94	154	11.5	15	1b	1a
2058	MK162	274+37	5	94	154	9.5	5	4	2
2058	MK162	274+37	5	94	154	14	20	1a	1a
2062	MK162	274+77	5	88	148	7.5	25	1a	1a
2145	MK162	289+61	5	83	143	3.5	5	4	2
3023	MK150	305+13	5	81	124	16	5	4	3
3173	MK150	333+19	5	79	122	9	15	2	1a

†Distance from downstream end to center of the BWZ.

Table 10 – Repair Priorities for Distressed 24 in. Pipes under Maximum Allowable Working Pressure and Design Transient Pressure

Pipe No.	Pipe Class	Station (ft)	Soil Cover (ft)	Working Pressure (psi)	Working plus Transient Pressure (psi)	Field Inspection Data		At Time of Inspection	
						Location of BWZ† (ft)	RFTC Number of Broken Wires	Repair Priority without Uncertainties	Repair Priority with Uncertainties
1025	MK153	213+10	5	126	176	13.5	5	4	2
2021	MK162	267+73	5	103	163	4.5	5	4	2
2040	MK162	271+53	5	105	165	16	5	4	2
2053	MK162	273+39	5	108	168	3.5	5	4	2
2053	MK162	273+39	5	108	168	11	15	1a	1a
2057	MK162	274+17	5	107	167	11.5	15	1a	1a
2058	MK162	274+37	5	107	167	9.5	5	4	2
2058	MK162	274+37	5	107	167	14	20	1a	1a
2062	MK162	274+77	5	101	161	7.5	25	1a	1a
2145	MK162	289+61	5	96	156	3.5	5	4	2
3023	MK150	305+13	5	94	137	16	5	4	2
3173	MK150	333+19	5	92	135	9	15	2	1a

†Distance from downstream end to center of the BWZ.

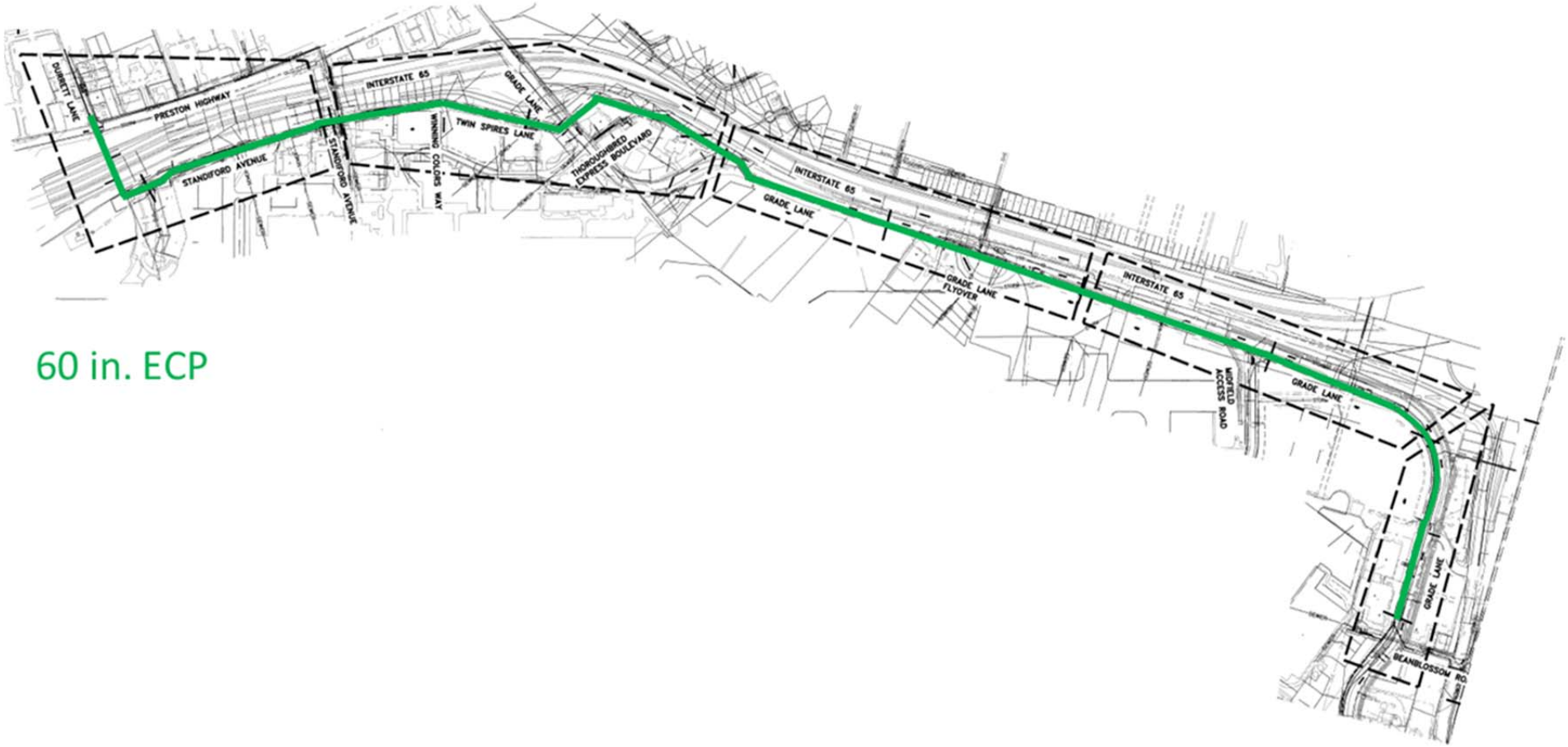


Figure 1

Overview of 60 in. ECP scope.

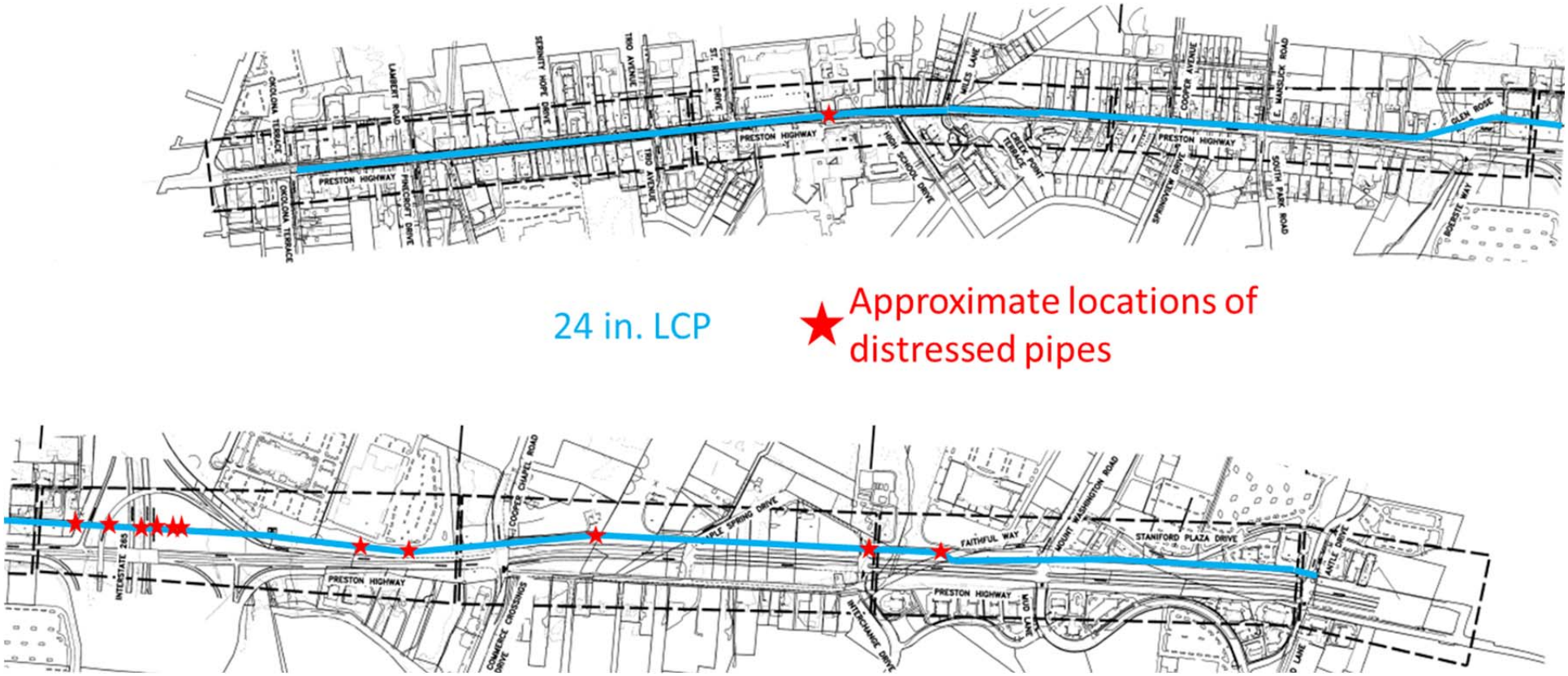


Figure 2

Overview of 24 in. LCP scope with approximate locations of distressed pipes.

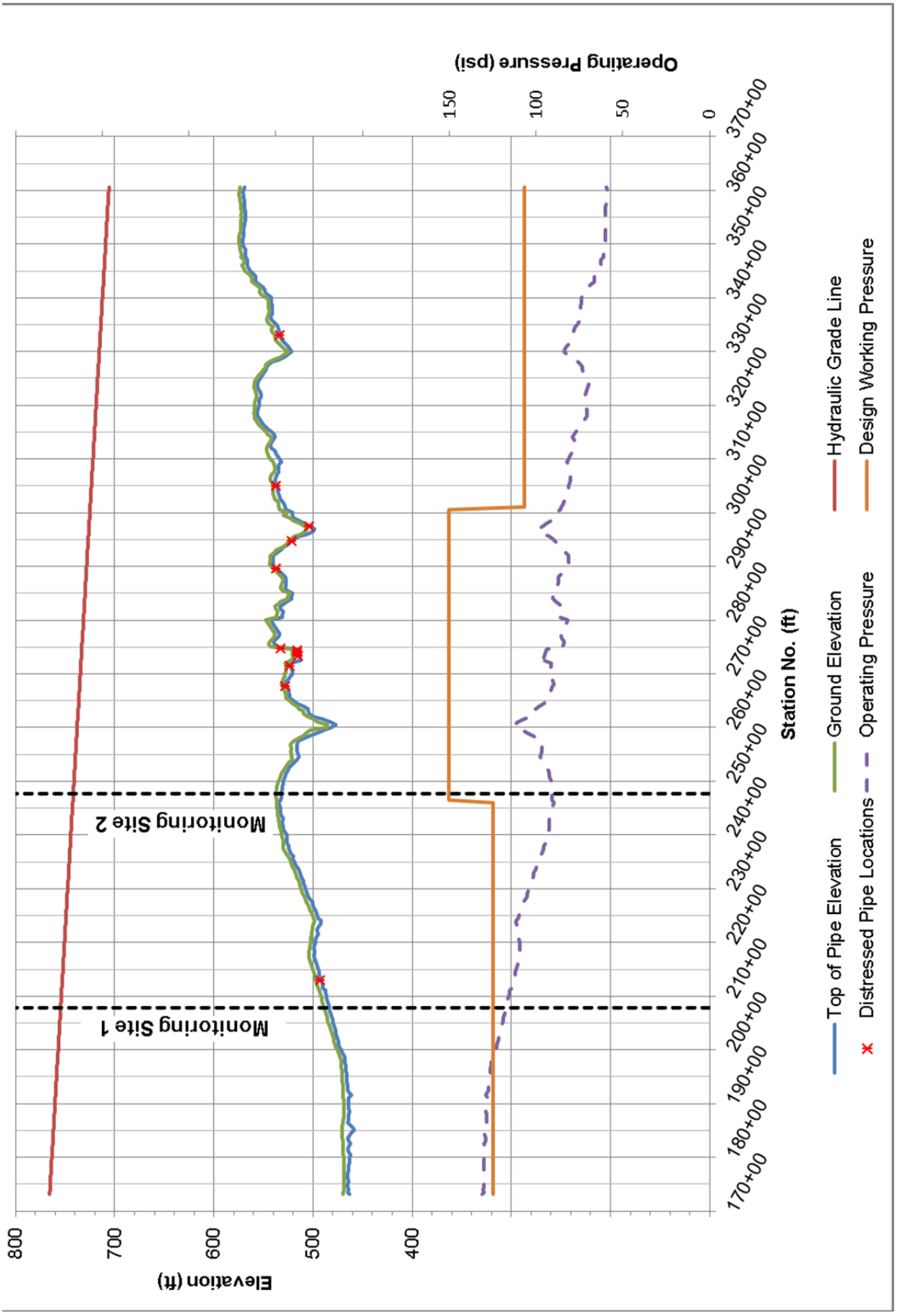


Figure 3

Hydraulic grade line and operating pressures determined from results of LWC pressure monitoring of the 24 in. LCP. Points on the plots identify the distressed 24 in. LCP locations.

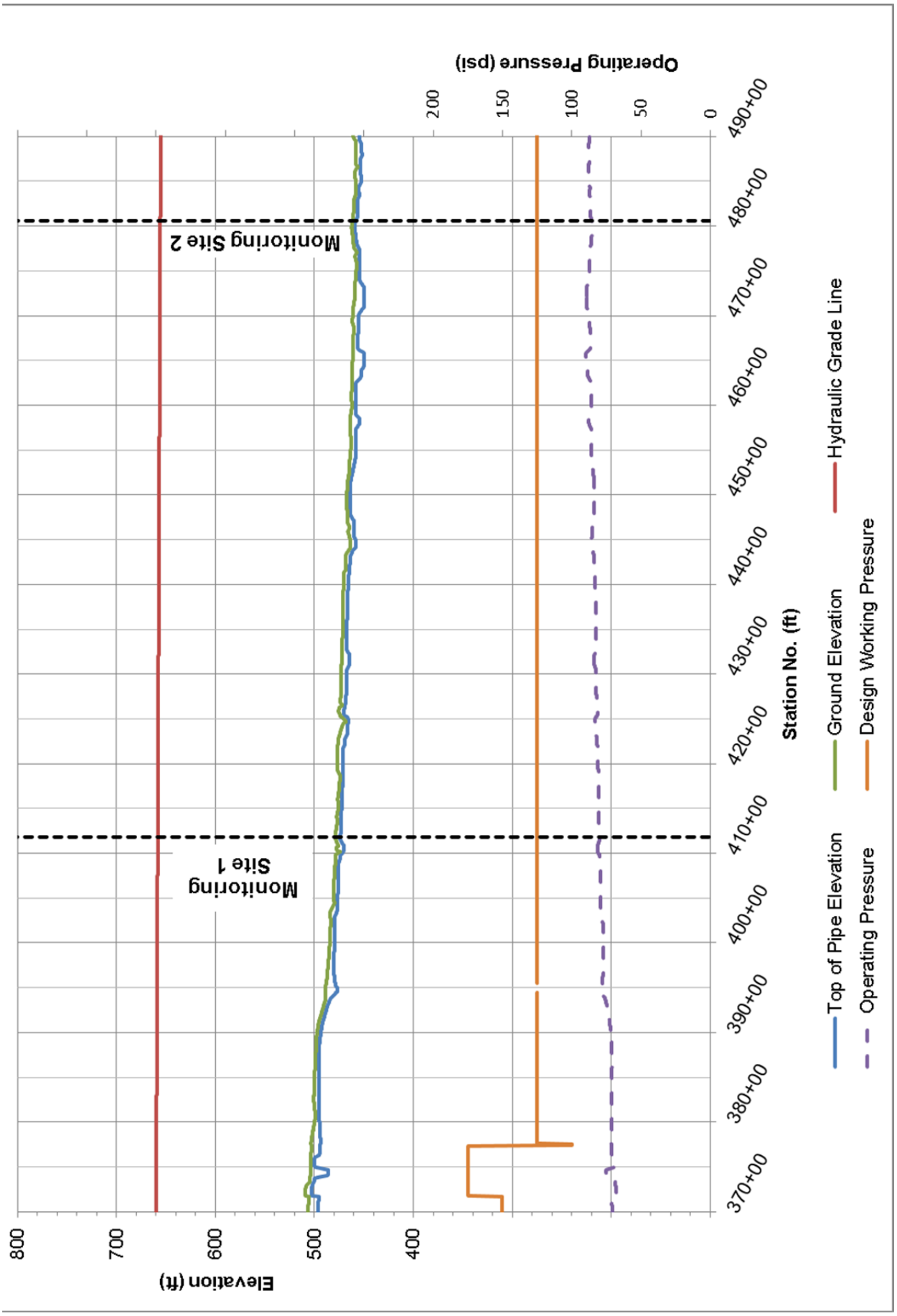


Figure 4

Hydraulic grade line and operating pressures determined from results of LWC pressure monitoring of the 60 in. ECP.

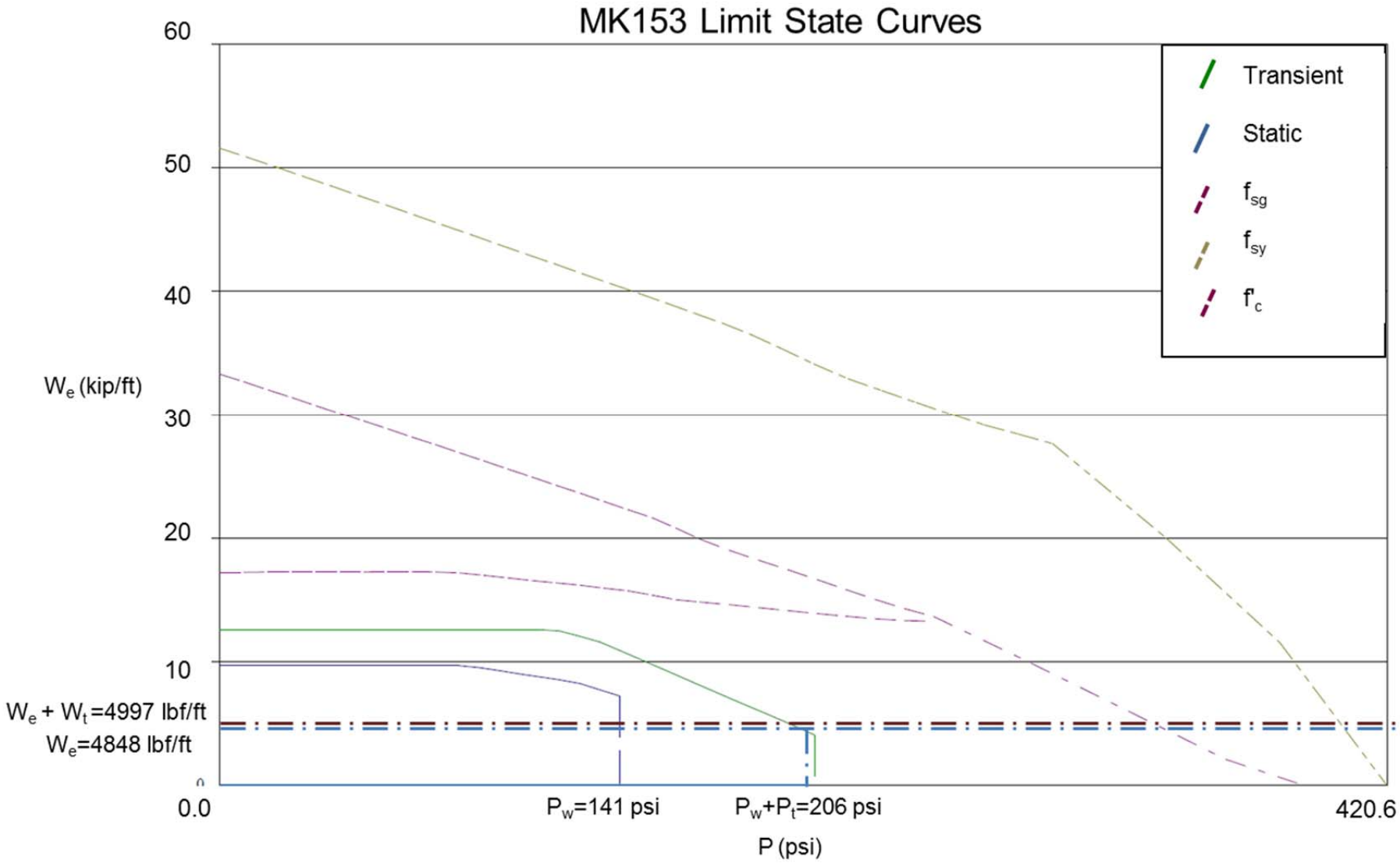


Figure 5

Limit State Curves for 24 in. LCP MK153 and calculation of allowable working and working-plus-transient pressures.

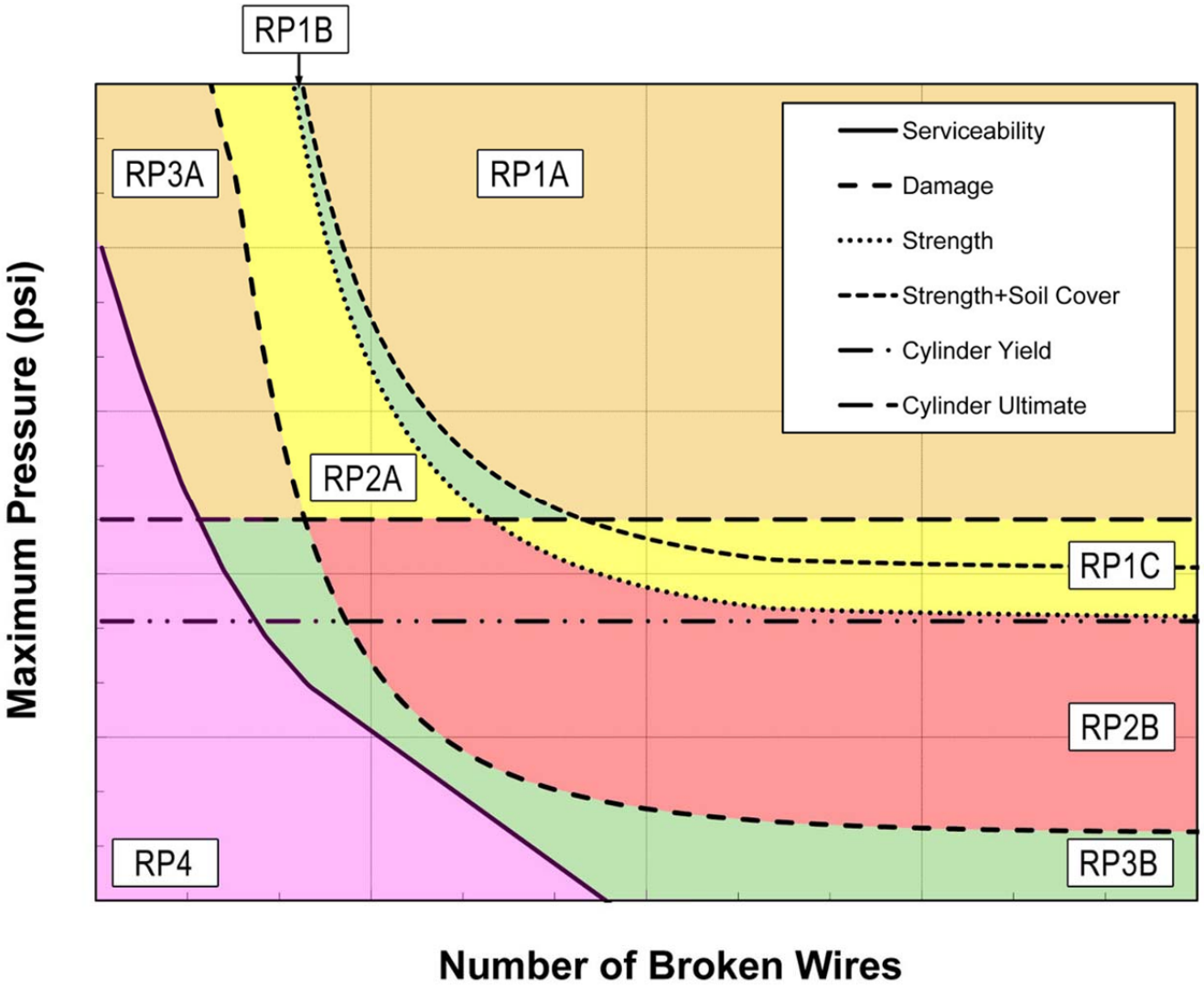
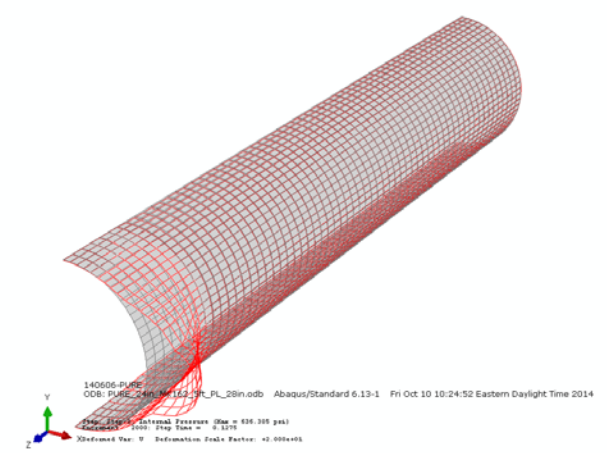
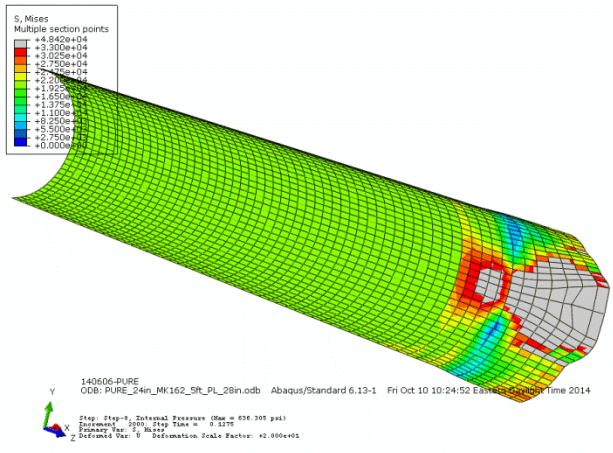


Figure 6

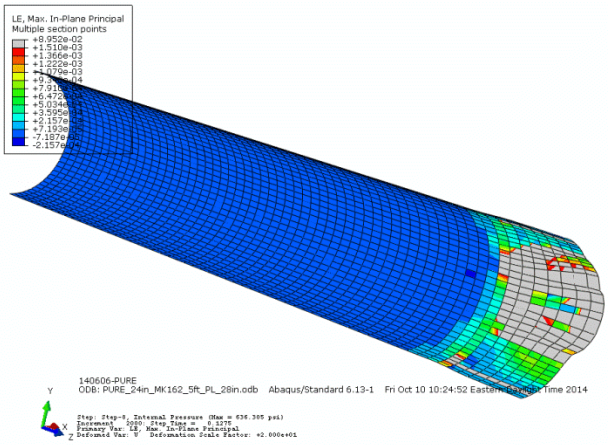
Risk curves and repair priority zones.



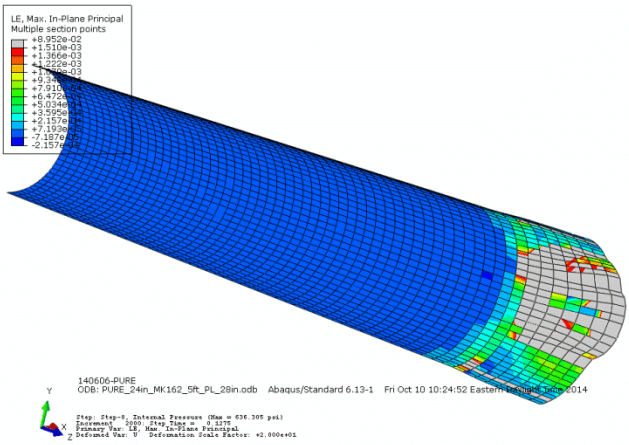
a) Deformed Shape (20x)



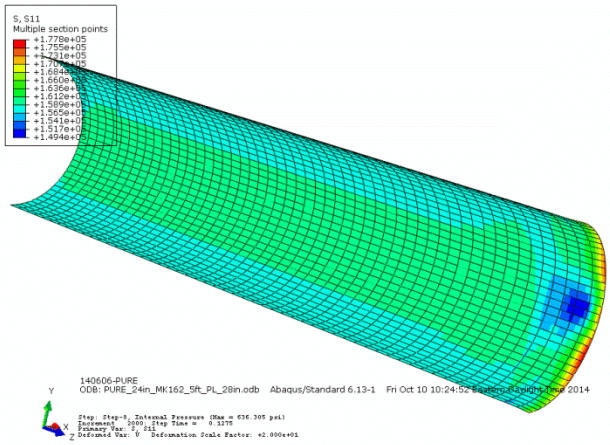
b) von Mises Stress in Steel Cylinder



c) Maximum Principal Strain in the Concrete Core



d) Maximum Principal Strain in the Concrete Core



e) Stress in Prestressing Wires

Figure 7

FEA Results at maximum pressure.

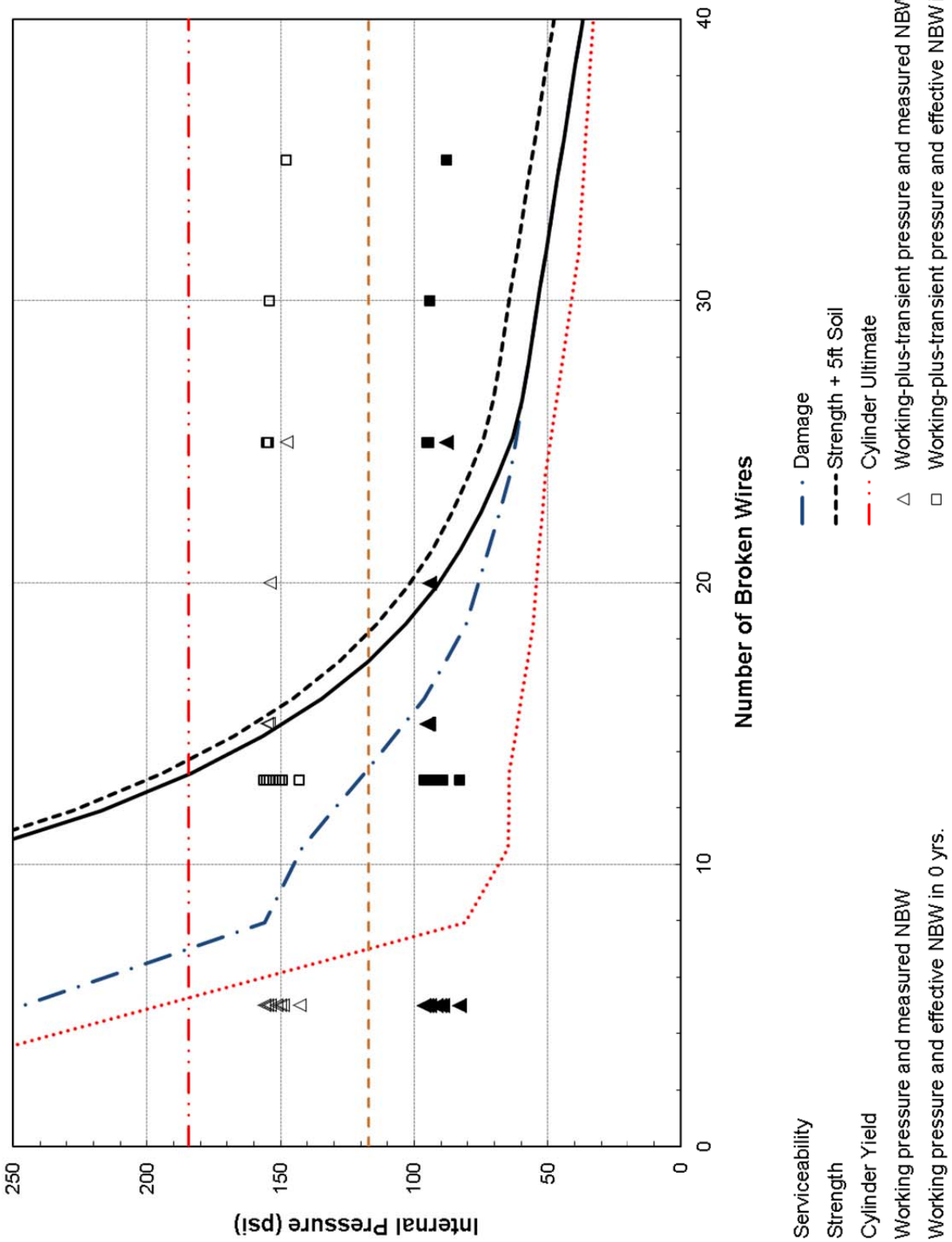


Figure 8

Failure risk curves for 24 in. diameter MK162 LCP with 5 ft soil cover.

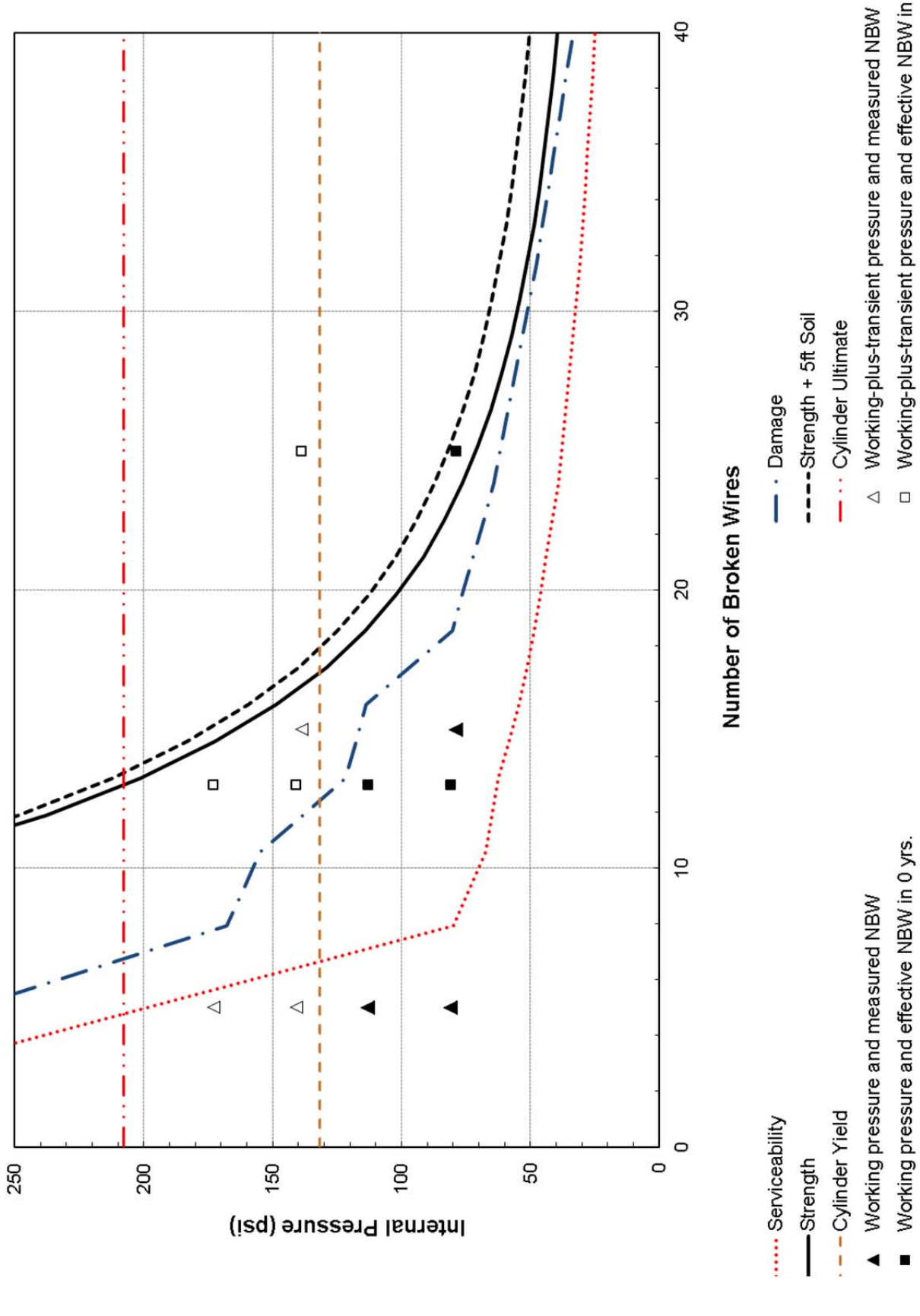


Figure 9

Failure risk curves for 24 in. diameter MK150 and MK153 LCP with 5 ft soil cover.

APPENDIX A
Pressure Monitoring Data

HYDROMAX USA
Advanced Water and Wastewater Pipeline Data Collection

July 18, 2014

Mr. Andrew Williams, P.E.
Louisville Water Company
550 South Third Street
Louisville, KY 40202

Re: Louisville Water Company Contract P1723
Louisville Water Company Project 14099
Hydromax USA Project No. 1612
Flow and Pressure for 24-inch & 60-inch Mainline Condition Assessments

Dear Mr. Williams,

Hydromax USA (HUSA) was contracted by Louisville Water Company (LWC) to install two (2) pitometer flow and static pressure recording devices and allow them to remain installed for 11 days at each of two (2) mainline sites. The sites included a 24-inch PCCP mainline on Preston Highway and a 60-inch mainline on Grade Lane. The equipment was to be operated and checked as necessary for recording capacity and battery function. Flow and pressure data was to be recorded at 1 minute intervals. This letter report and digital data file documents the work performed to complete the above scope of work.

24-Inch PCCP

On Monday, February 17, the locations of the 2 24-inch sites were visited and discussions were initiated to make them ready for flow monitoring and pressure recording. The 24-inch PCCP Mainline (24) site numbers and general locations for metering for this contract were as follows:

1. Preston Hwy at St. Rita Dr
2. 9207 Preston Hwy

Specialized recorders were installed without problems on June 23 and data recording commenced. The recorders were serviced and data was downloaded on June 24, 27, 30, and July 3. Due to the July 4 Holiday, LWC opted to pull the metering equipment on July 3 in lieu of July 7.

After data review for completeness and accuracy, the flow meters and pressure recorders were removed.

Flow statistics for the 24-inch mainline dataset are shown below.

Site #	Min Flow Range (mgd)	Max Flow Range (mgd)	Flow Direction	Comments
1	~ 1	~ 1.75 to 2	North	Unknown flow cycle cause
2	~ 2.5	~ 6 to 7	South	Unknown flow cycle cause

HYDROMAX USA
Advanced Water and Wastewater Pipeline Data Collection

Attached data files contain Excel data for the 24-inch sites. Each site file contains 1 page of site information and 1 page of site data including graphs of flow, static pressure, and center pipe flow velocity versus time. A Velocity Profile is provided for site 24-2. Flow at site 24-1 was too small to profile. Figure 1 illustrates the site information page from the site 1 flow and pressure file (Site 24-1 2014 F&P.xls). Figure 2 is a screen shot of the flow and pressure data page illustrating the data and graph layouts.

60-Inch PCCP

On Monday, February 17, the locations of the 2 60-inch sites were visited and discussions were initiated to make them ready for flow monitoring and pressure recording. The 60-inch PCCP Mainline (60) site numbers and general locations for metering for this contract were as follows:

1 Grade Ln KY Air Guard
2 Grade Ln UPS

Specialized recorders were installed without problems on July 7 and data recording commenced. The recorders were serviced and data was downloaded on July 8, 11, 14, and 18.

After data review for completeness and accuracy, the flow meters and pressure recorders were removed. Flow statistics for the 60-inch mainline dataset are shown below.

Site #	Min Flow (mgd)	Max Flow (mgd)	Average Flow (mgd)	Flow Direction
1	0	32	~20	South
2	0	30	~18	South

Attached data files contain Excel data for the 60-inch sites. Each site file contains 1 page of site information and 1 page of site data including graphs of flow, static pressure, and center pipe flow velocity versus time. Velocity Profiles were understood as not necessary for collection.

We have appreciated the opportunity to provide our services for this important project and look forward to the next opportunity to work together as you continue your distribution system optimization efforts. If you have questions or comments regarding this submittal, please feel free to call me at (502) 500-6657.

Sincerely,

Richard R. Rabold, PH

Figure 1. Site information page from Site 24-1 2014 F&P.xls

SITE 24-1		
		intentionally blank
Location:	Preston Hwy at St. Rita Dr	
Proximity Coordinates (WGS84)		
Latitude:	N38.128034176	
Longitude:	W085.681091527	
Pipe Size (in.):	24	
Pipe Material:	PCCP	

Chamber at cone in southbound lane Preston Hwy

Existing tap at Air Release Valve Location

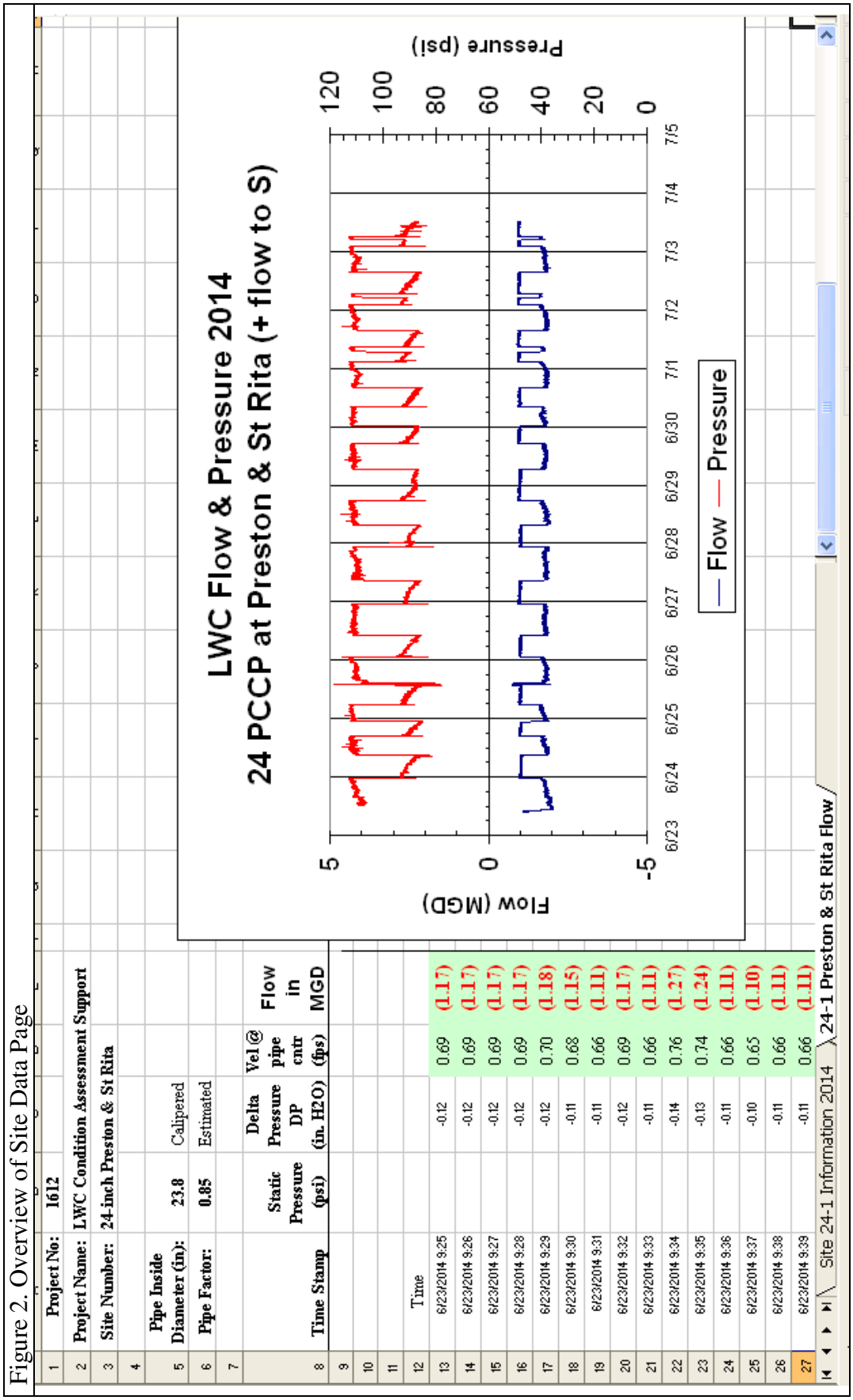
Corp stop under vault cone.

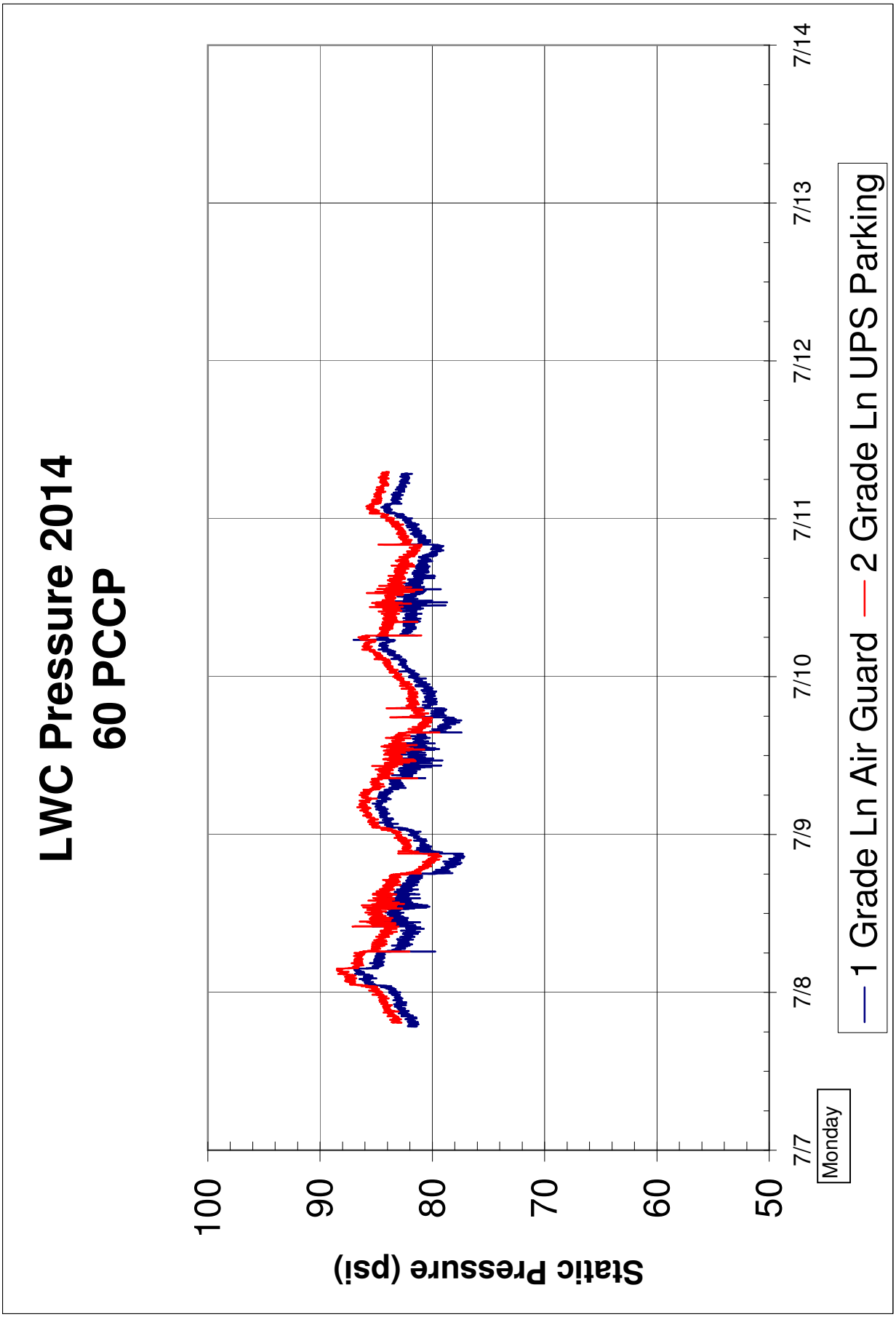
Accessed via new core hole

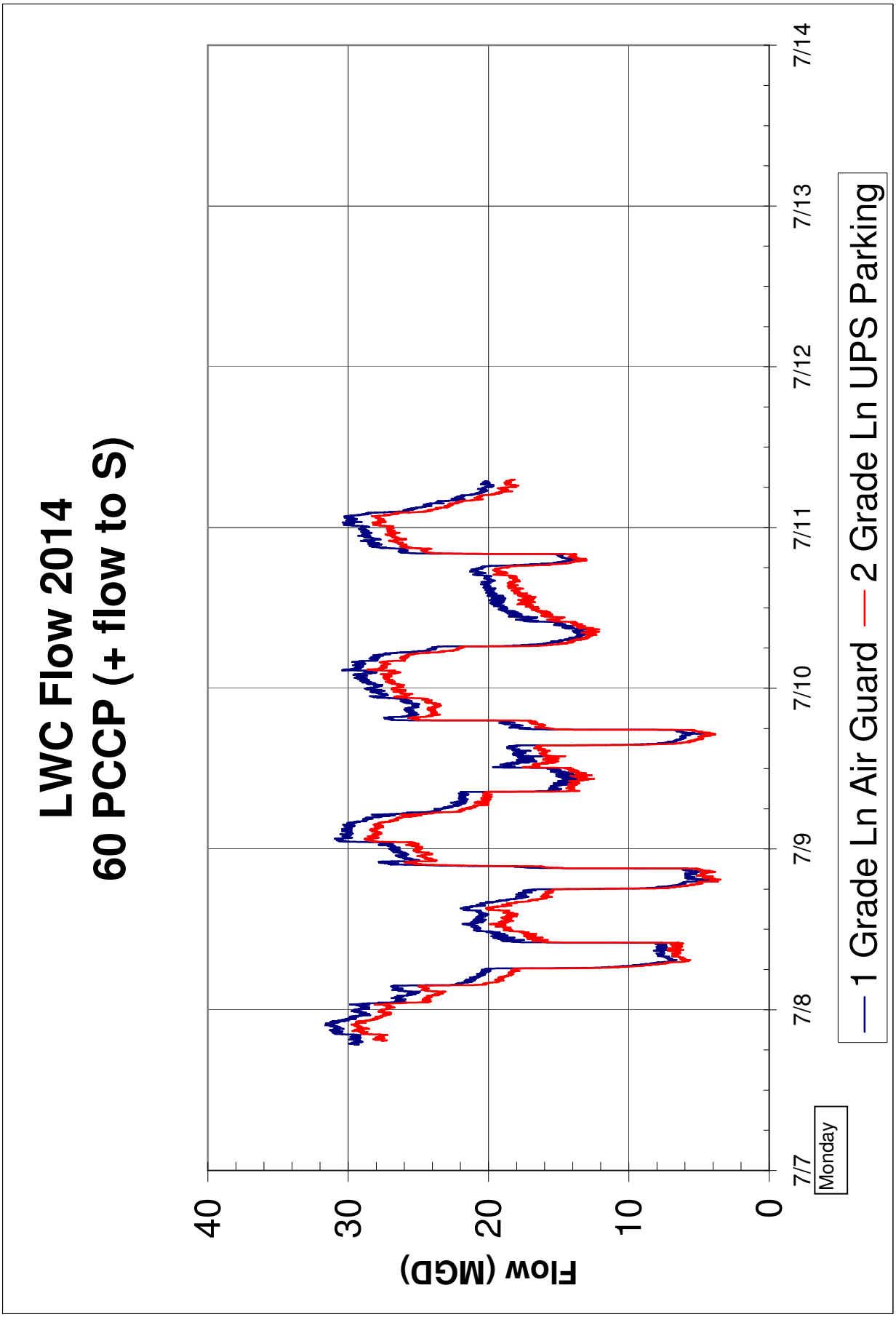
Flow and Pressure Metering at Pitot rod installation

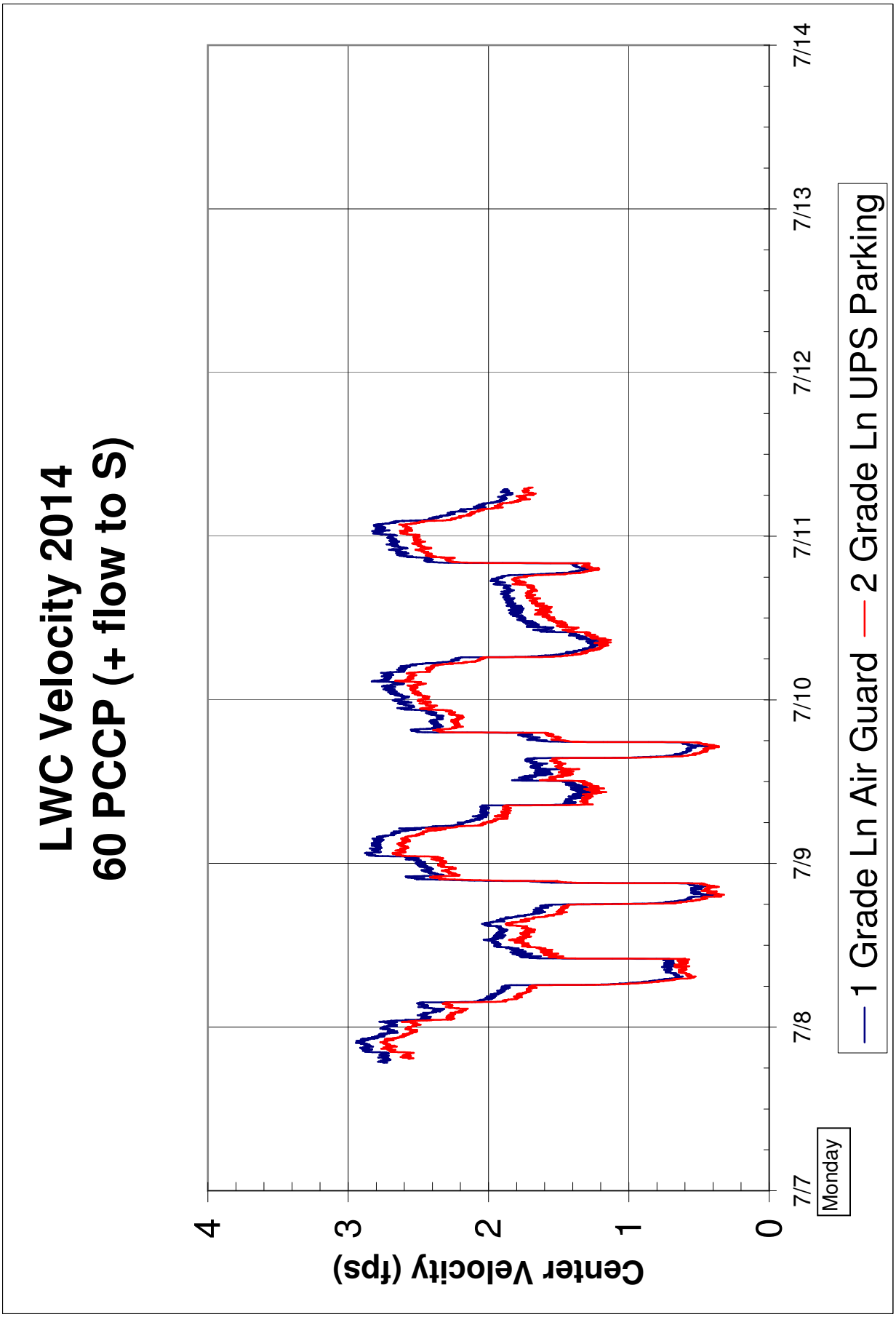
All equipment below grade, pressure recorder not shown

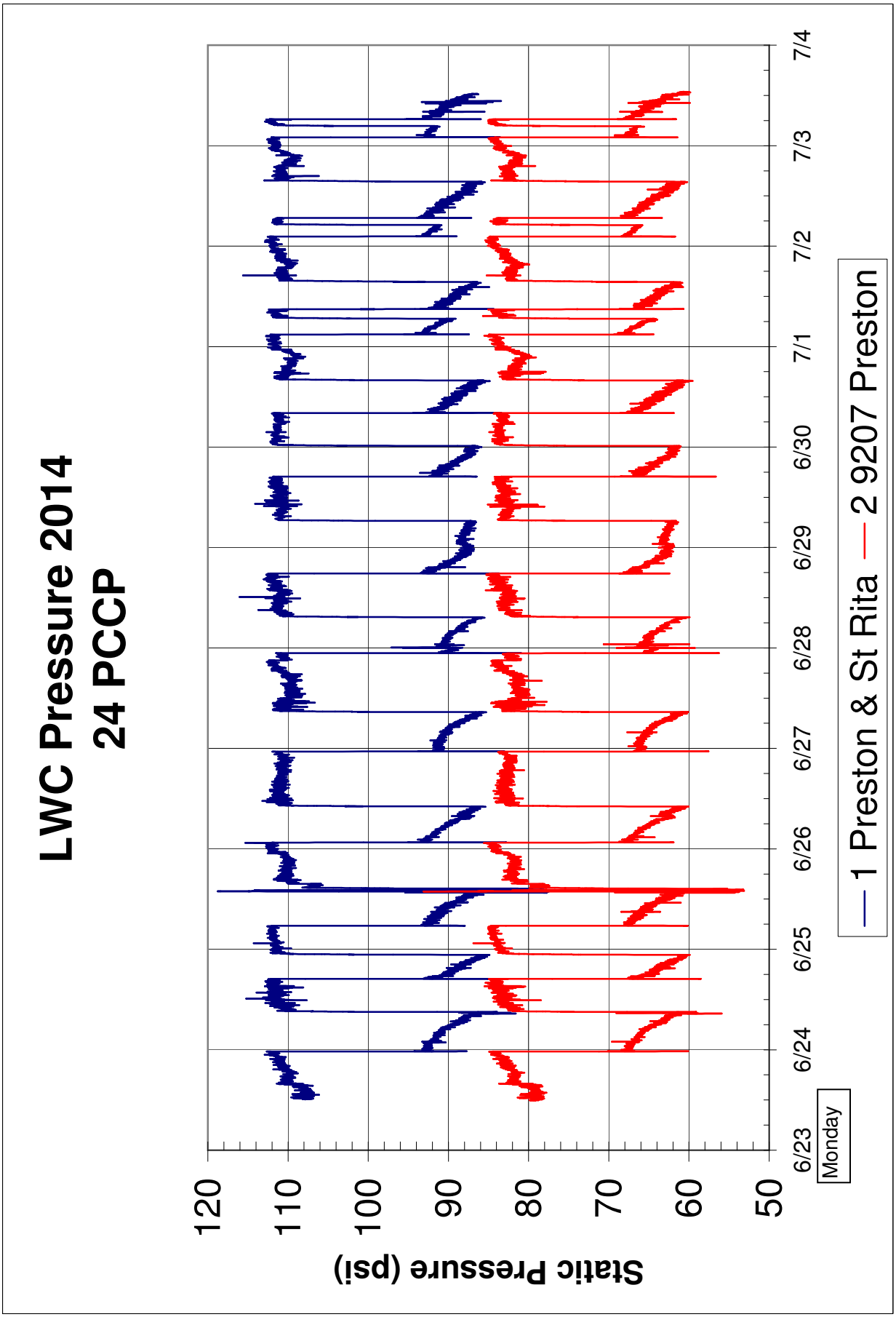
Figure 2. Overview of Site Data Page

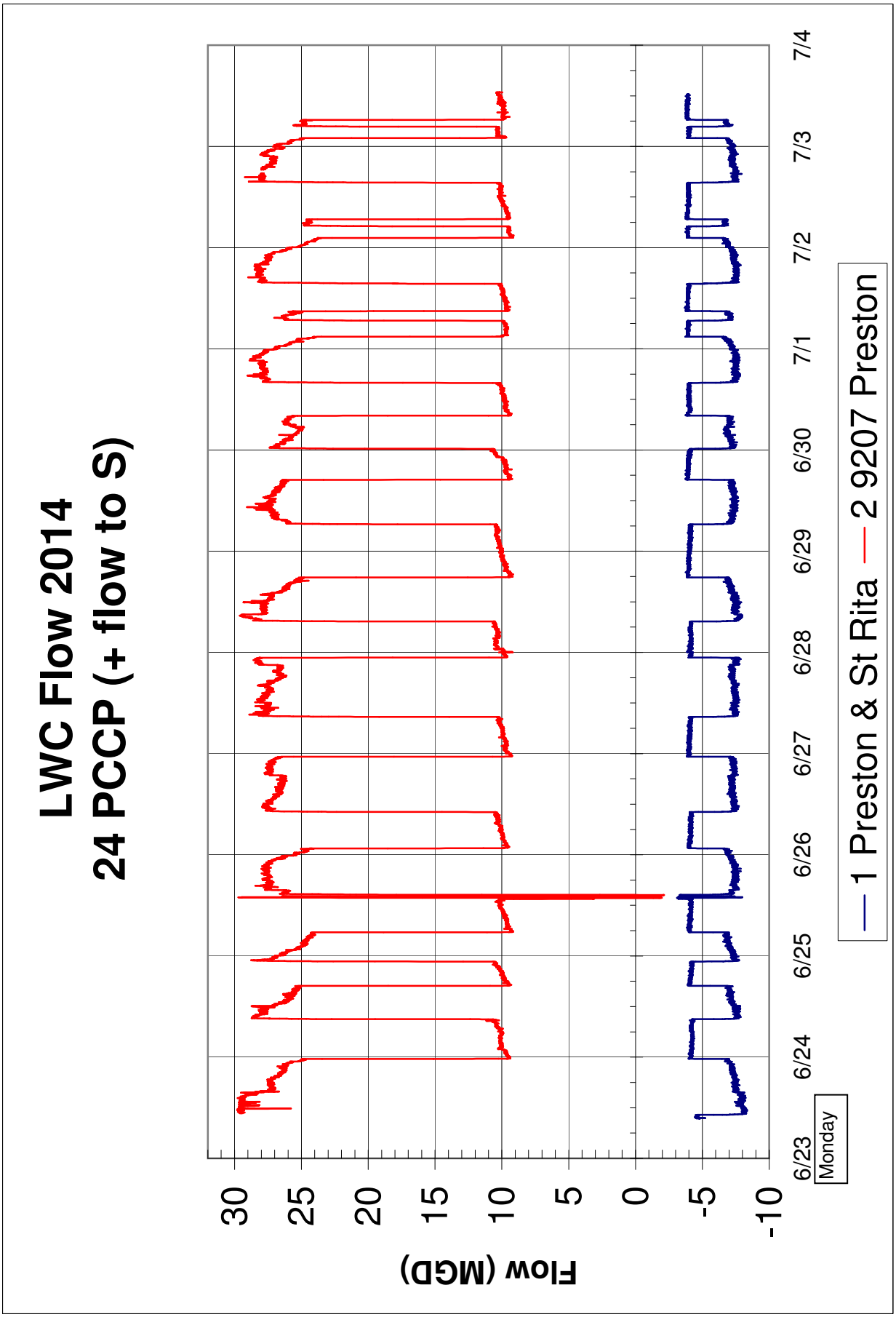


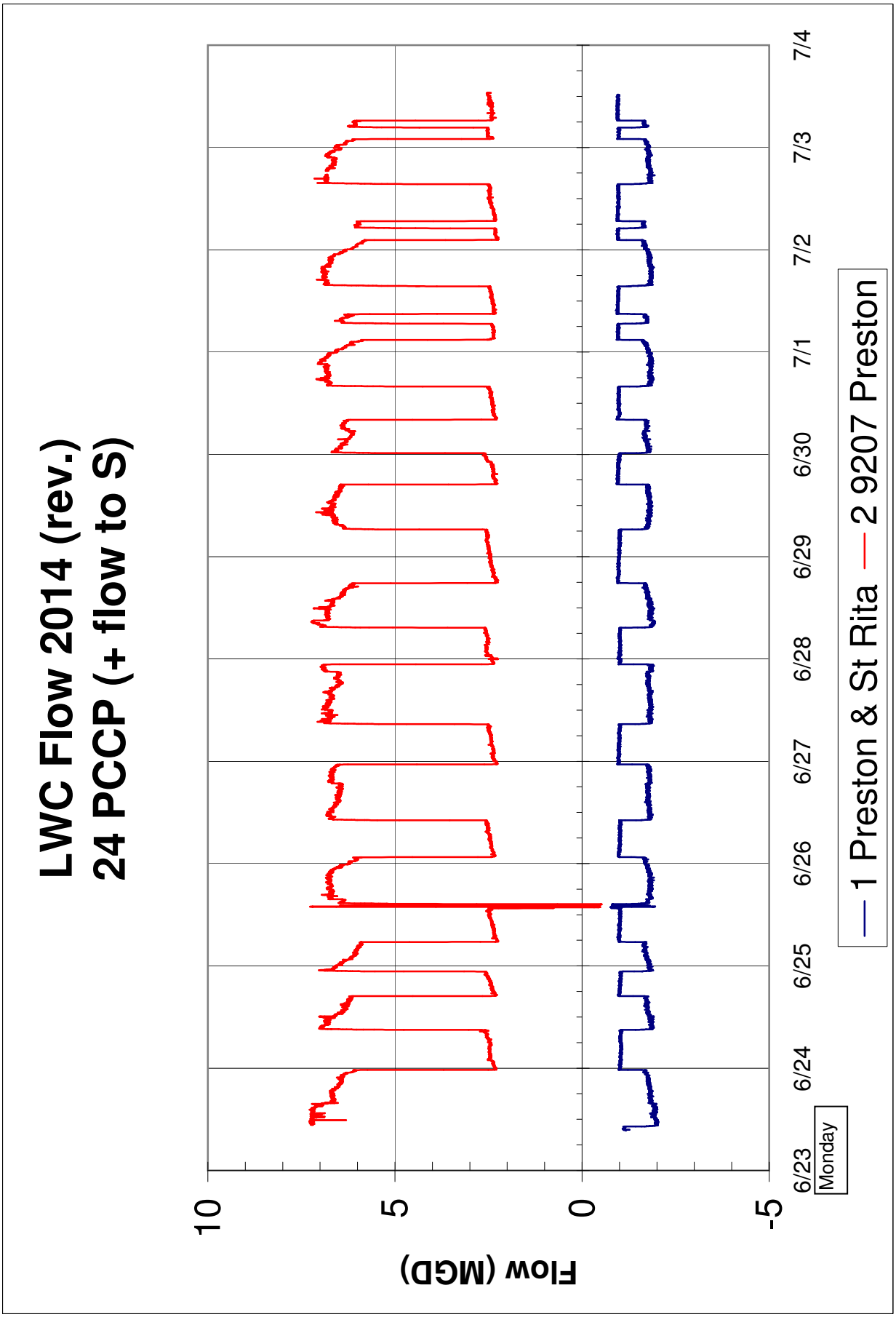

LWC Pressure 2014
60 PCCP
Static Pressure (psi)
100
90
80
70
60
50
7/7
Monday
7/8
7/9
7/10
7/11
7/12
7/13
7/14
1 Grade Ln Air Guard
2 Grade Ln UPS Parking

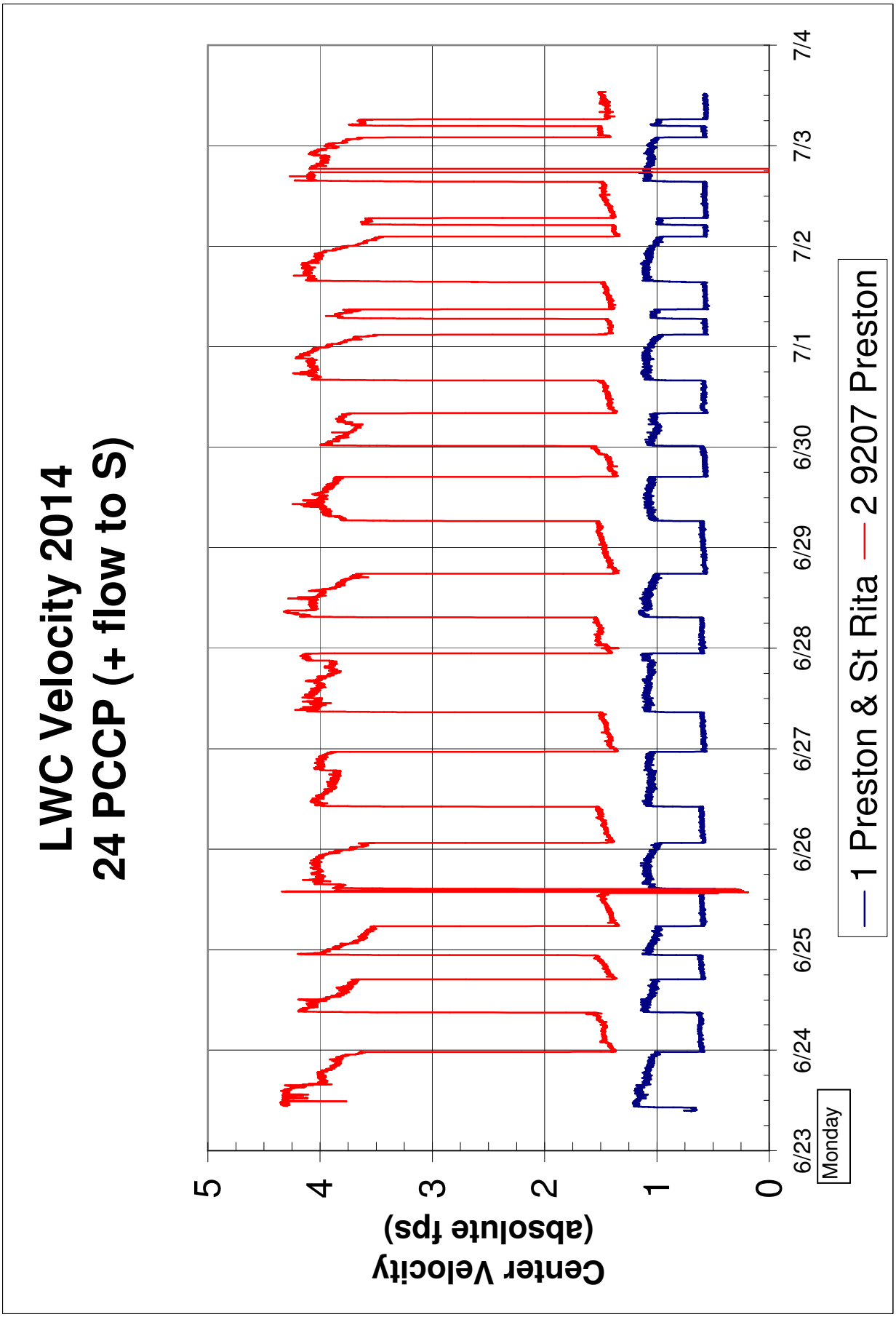

LWC Flow 2014
60 PCCP (+ flow to S)
Flow (MGD)
0
10
20
30
40
7/7
Monday
7/8
7/9
7/10
7/11
7/12
7/13
7/14
1 Grade Ln Air Guard
2 Grade Ln UPS Parking

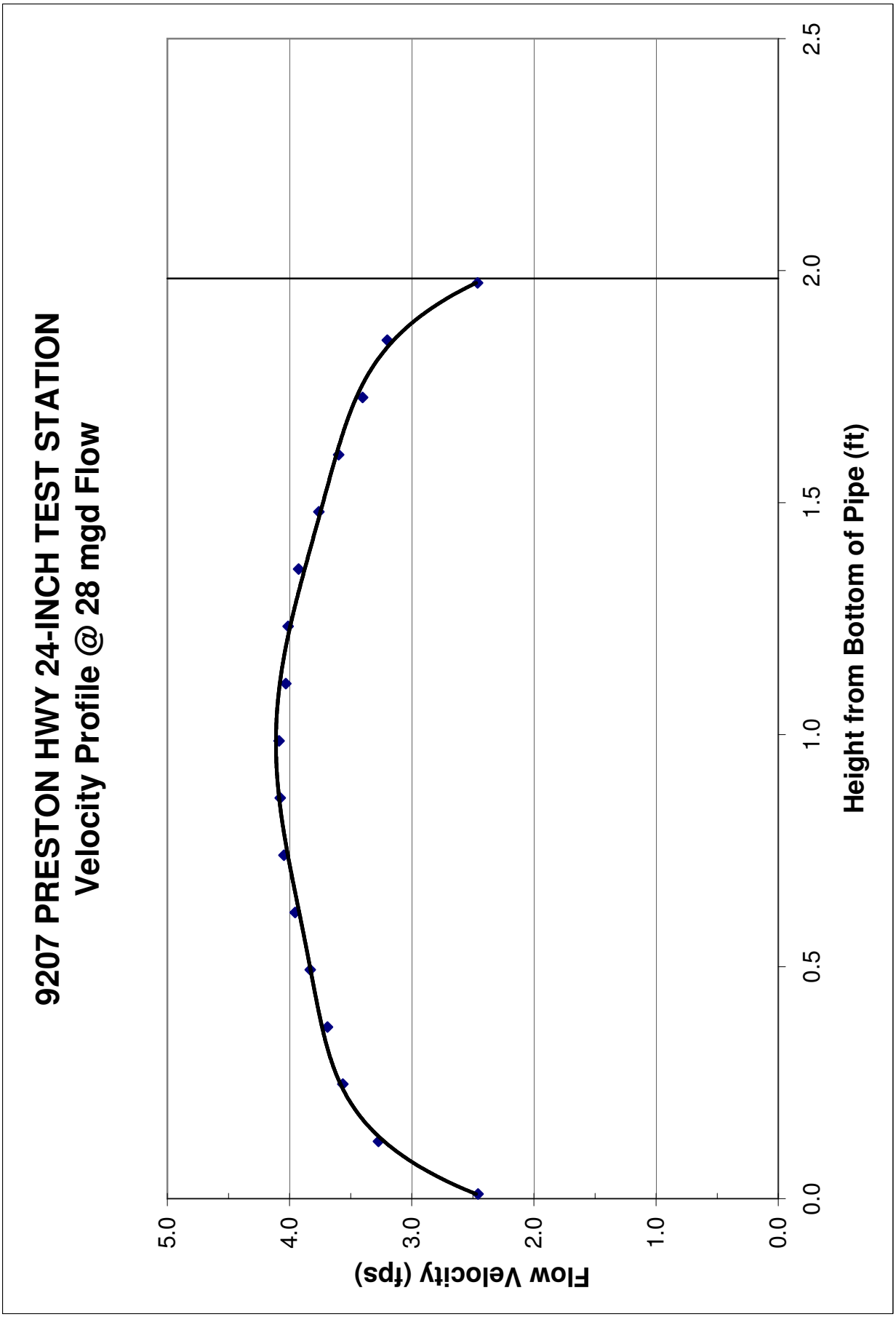

LWC Velocity 2014
60 PCCP (+ flow to S)
Center Velocity (fps)
0
1
2
3
4
7/7
Monday
7/8
7/9
7/10
7/11
7/12
7/13
7/14
1 Grade Ln Air Guard
2 Grade Ln UPS Parking


LWC Pressure 2014
24 PCCP
Static Pressure (psi)
120
110
100
90
80
70
60
50
6/23
Monday
6/24
6/25
6/26
6/27
6/28
6/29
6/30
7/1
7/2
7/3
7/4
1 Preston & St Rita
2 9207 Preston


LWC Flow 2014
24 PCCP (+ flow to S)
Flow (MGD)
30
25
20
15
10
5
0
-5
-10
6/23
Monday
6/24
6/25
6/26
6/27
6/28
6/29
6/30
7/1
7/2
7/3
7/4
1 Preston & St Rita
2 9207 Preston


LWC Flow 2014 (rev.)
24 PCCP (+ flow to S)
Flow (MGD)
10
5
0
-5
6/23
Monday
6/24
6/25
6/26
6/27
6/28
6/29
6/30
7/1
7/2
7/3
7/4
1 Preston & St Rita
2 9207 Preston


LWC Velocity 2014
24 PCCP (+ flow to S)
Center Velocity
(absolute fps)
0
1
2
3
4
5
6/23
Monday
6/24
6/25
6/26
6/27
6/28
6/29
6/30
7/1
7/2
7/3
7/4
1 Preston & St Rita
2 9207 Preston


9207 PRESTON HWY 24-INCH TEST STATION
Velocity Profile @ 28 mgd Flow
Flow Velocity (fps)
0.0
1.0
2.0
3.0
4.0
5.0
Height from Bottom of Pipe (ft)
0.0
0.5
1.0
1.5
2.0
2.5

APPENDIX B
Pipe Design Evaluation UDP Output

Company: SGH
Project: 140606.00-PURE: Design Check 24 in. LCP MK150
Designer: KAPeterson UDP SGH Propr. Ver. 1.4nc 10-22-2014
File Name: 150_5FT

DESIGN SUMMARY

GEOMETRY

Type = LCP(Core Spun) Di = 24.00 in. Dy = 27.00 in. (OD)
hc = 1.500 in. hm = 0.817 in. ty = 0.0538 in.
ds = 0.192 in. As = 0.23 in^2/ft Pipe OD = 28.63 in.

MATERIAL PROPERTIES

f'c = 6,000 psi f't = 542 psi f'ci = 4,000 psi
f'm = 5,500 psi f'tm = 519 psi fyy = 33,000 psi
ASTM A648 Wire Class III
fsg = 189,000 psi fsu = 252,000 psi
n = 7.102 n' = 7.609 Cphi = 1.00
Cs = 1.00 CE = 1.00 CR = 1.00

EXPOSURE

RH = 70 % t1 = 270 days t2 = 90 days

BEDDING: 90 deg. Olander

	Thrust			Moment		
	Earth	Pipe	Fluid	Earth	Pipe	Fluid
Side	0.5386	0.3026	-0.0617	0.0885	0.1016	0.0878
Invert	0.3255	0.1029	-0.2703	0.1247	0.2157	0.1208

LOADS: User Entered

Pw = 107 psi Pt = 43 psi Pft = 128 psi
We = 2,087 lb/ft Wt = 480 lb/ft
Wp = 205 lb/ft Wf = 196 lb/ft

INITIAL PRESTRESS

fic = 1,802 psi fiy = 14,179 psi fis = -175,749 psi
ni = 7.355 ni' = 7.869

FINAL PRESTRESS

Po = 173 psi fcr = 1,174 psi fyr = 22,247 psi
fsr = -150,922 psi R = 0.090915
phi = 1.071 s = 0.000111
nr = 6.987 nr' = 7.502

PIPE CHARACTERISTICS

P'k = 207 psi Pb = 537 psi

Design meets limit states criteria.

Company: SGH
Project: 140606.00-PURE: Design Check 24 in. LCP MK153
Designer: KAPeterson UDP SGH Propr. Ver. 1.4nc 10-22-2014
File Name: MK153

DESIGN SUMMARY

GEOMETRY

Type					
	= LCP(Core Spun)	Di	= 24.00 in.	Dy	= 27.00 in. (OD)
hc	= 1.500 in.	hm	= 0.817 in.	ty	= 0.0478 in.
ds	= 0.192 in.	As	= 0.23 in^2/ft	Pipe OD	
					= 28.63 in.

MATERIAL PROPERTIES

f'c	= 6,000 psi	f't	= 542 psi	f'ci	= 4,000 psi
f'm	= 5,500 psi	f'tm	= 519 psi	fyy	= 33,000 psi
ASTM A648 Wire Class III					
		fsg	= 189,000 psi	fsu	= 252,000 psi
n	= 7.102	n'	= 7.609	Cphi	
					= 1.00
Cs	= 1.00	CE	= 1.00	CR	= 1.00

EXPOSURE

RH	= 70 %	t1	= 270 days	t2	= 90 days

BEDDING: 90 deg. Olander

	Thrust			Moment		
	Earth	Pipe	Fluid	Earth	Pipe	Fluid
Side	0.5386	0.3026	-0.0617	0.0885	0.1016	0.0878
Invert	0.3255	0.1029	-0.2703	0.1247	0.2157	0.1208

LOADS: User Entered

Pw	= 125 psi	Pt	= 50 psi	Pft	= 150 psi
We	= 3,294 lb/ft	Wt	= 319 lb/ft		
Wp	= 204 lb/ft	Wf	= 196 lb/ft		

INITIAL PRESTRESS

fic	= 1,839 psi	fiy	= 14,475 psi	fis	= -175,472 psi
ni	= 7.355	ni'	= 7.869		

FINAL PRESTRESS

Po	= 176 psi	fcr	= 1,225 psi	fyr	= 23,038 psi
fsr	= -150,147 psi	R	= 0.091085		
phi	= 1.070	s	= 0.000111		
nr	= 6.987	nr'	= 7.502		

PIPE CHARACTERISTICS

P'k	= 210 psi	Pb	= 517 psi

Design meets limit states criteria.

Company: SGH
Project: 140606.00-PURE: Design Check 24 in. LCP MK162_267000
Designer: KAPeterson UDP SGH Propr. Ver. 1.4nc 10-23-2014
File Name: F162_5FT

DESIGN SUMMARY

GEOMETRY

Type					
	= LCP(Core Spun)	Di	= 24.00 in.	Dy	= 27.00 in. (OD)
hc	= 1.500 in.	hm	= 0.817 in.	ty	= 0.0478 in.
ds	= 0.192 in.	As	= 0.230 in^2/ft	Pipe OD	= 28.63 in.

MATERIAL PROPERTIES

f'c	= 6,000 psi	f't	= 542 psi	f'ci	= 4,000 psi
f'm	= 5,500 psi	f'tm	= 519 psi	fyy	= 33,000 psi
ASTM A648 Wire Class 3.5					
		fsg	= 200,250 psi	fsu	= 267,000 psi
n	= 7.102	n'	= 7.609	Cphi	= 1.00
Cs	= 1.00	CE	= 1.00	CR	= 1.00

EXPOSURE

RH	= 70 %	t1	= 270 days	t2	= 90 days

BEDDING: 90 deg. Olander

	Thrust			Moment		
	Earth	Pipe	Fluid	Earth	Pipe	Fluid
Side	0.5386	0.3026	-0.0617	0.0885	0.1016	0.0878
Invert	0.3255	0.1029	-0.2703	0.1247	0.2157	0.1208

LOADS: User Entered

Pw	= 150 psi	Pt	= 60 psi	Pft	= 180 psi
We	= 2,087 lb/ft	Wt	= 480 lb/ft		
Wp	= 204 lb/ft	Wf	= 196 lb/ft		

INITIAL PRESTRESS

fic	= 1,949 psi	fiy	= 15,337 psi	fis	= -185,916 psi
ni	= 7.355	ni'	= 7.869		

FINAL PRESTRESS

Po	= 188 psi	fcr	= 1,303 psi	fyr	= 24,292 psi
fsr	= -159,201 psi	R	= 0.091085		
phi	= 1.070	s	= 0.000111		
nr	= 6.987	nr'	= 7.502		

PIPE CHARACTERISTICS

P'k	= 221 psi	Pb	= 538 psi

Design meets limit states criteria.

Company: SGH
Project: 140606.00-PURE: 40 in. ECP, 10.58, SP-12-150
Designer: KAPeterson UDP SGH Propr. Ver. 1.4nc 11-07-2014
File Name: SP12150

DESIGN SUMMARY

GEOMETRY

Type	= ECP(Core Cast)	Di	= 60.00 in.	Dy	= 63.00 in. (OD)
hc	= 4.500 in.	hm	= 0.942 in.	ty	= 0.0598 in.
ds	= 0.192 in.	As	= 0.803 in^2/ft	Pipe OD	= 70.88 in.

MATERIAL PROPERTIES

f'c	= 4,500 psi	f't	= 470 psi	f'ci	= 3,136 psi
f'm	= 5,500 psi	f'tm	= 519 psi	fyy	= 33,000 psi
ASTM A648 Wire Class I		fsg	= 144,000 psi	fsu	= 192,000 psi
n	= 7.742	n'	= 8.295	Cphi	= 1.00
Cs	= 1.00	CE	= 1.00	CR	= 1.00

EXPOSURE

RH	= 70 %	t1	= 270 days	t2	= 90 days

BEDDING: 90 deg. Olander

	Thrust			Moment		
	Earth	Pipe	Fluid	Earth	Pipe	Fluid
Side	0.5386	0.3026	-0.0617	0.0885	0.1016	0.0878
Invert	0.3255	0.1029	-0.2703	0.1247	0.2157	0.1208

LOADS: User Entered

Pw	= 150 psi	Pt	= 60 psi	Pft	= 180 psi
We	= 10,587 lb/ft	Wt	= 411 lb/ft		
Wp	= 1,183 lb/ft	Wf	= 1,225 lb/ft		

INITIAL PRESTRESS

fic	= 1,725 psi	fiy	= 16,182 psi	fis	= -128,925 psi
ni	= 8.739	ni'	= 9.380		

FINAL PRESTRESS

Po	= 206 psi	fcr	= 1,200 psi	fyr	= 30,640 psi
fsr	= -106,726 psi	R	= 0.058253		
phi	= 1.357	s	= 0.000191		
nr	= 7.456	nr'	= 7.937		

PIPE CHARACTERISTICS

P'k	= 264 psi	Pb	= 493 psi

Design meets limit states criteria.

Company: SGH
Project: 140606.00-PURE: 40 in. ECP, 10.58, SP-12-175
Designer: KAPeterson UDP SGH Propr. Ver. 1.4nc 10-23-2014
File Name: SP12175

DESIGN SUMMARY

GEOMETRY

Type	= ECP(Core Cast)	Di	= 60.00 in.	Dy	= 63.00 in. (OD)
hc	= 4.500 in.	hm	= 0.942 in.	ty	= 0.0598 in.
ds	= 0.192 in.	As	= 0.955 in^2/ft	Pipe OD	= 70.88 in.

MATERIAL PROPERTIES

f'c	= 4,500 psi	f't	= 470 psi	f'ci	= 3,657 psi
f'm	= 5,500 psi	f'tm	= 519 psi	fyy	= 33,000 psi
ASTM A648 Wire Class I		fsg	= 144,000 psi	fsu	= 192,000 psi
n	= 7.742	n'	= 8.295	Cphi	= 1.00
Cs	= 1.00	CE	= 1.00	CR	= 1.00

EXPOSURE

RH	= 70 %	t1	= 270 days	t2	= 90 days

BEDDING: 90 deg. Olander

	Thrust			Moment		
	Earth	Pipe	Fluid	Earth	Pipe	Fluid
Side	0.5386	0.3026	-0.0617	0.0885	0.1016	0.0878
Invert	0.3255	0.1029	-0.2703	0.1247	0.2157	0.1208

LOADS: User Entered

Pw	= 175 psi	Pt	= 70 psi	Pft	= 210 psi
We	= 10,587 lb/ft	Wt	= 411 lb/ft		
Wp	= 1,190 lb/ft	Wf	= 1,225 lb/ft		

INITIAL PRESTRESS

fic	= 2,011 psi	fiy	= 18,867 psi	fis	= -126,423 psi
ni	= 8.739	ni'	= 9.380		

FINAL PRESTRESS

Po	= 245 psi	fcr	= 1,403 psi	fyr	= 34,853 psi
fsr	= -104,232 psi	R	= 0.048281		
phi	= 1.357	s	= 0.000191		
nr	= 7.456	nr'	= 7.937		

PIPE CHARACTERISTICS

P'k	= 304 psi	Pb	= 570 psi

Design meets limit states criteria.

Company: SGH
Project: 140606.00-PURE: 40 in. ECP, 19.64, SP-12-175
Designer: KAPeterson UDP SGH Propr. Ver. 1.4nc 10-23-2014
File Name: ESP12175

DESIGN SUMMARY

GEOMETRY

Type	= ECP(Core Cast)	Di	= 60.00 in.	Dy	= 63.00 in. (OD)
hc	= 4.500 in.	hm	= 0.942 in.	ty	= 0.0598 in.
ds	= 0.192 in.	As	= 0.708 in^2/ft	Pipe OD	= 70.88 in.

MATERIAL PROPERTIES

f'c	= 4,500 psi	f't	= 470 psi	f'ci	= 3,000 psi
f'm	= 5,500 psi	f'tm	= 519 psi	fyy	= 33,000 psi
ASTM A648 Wire Class I		fsg	= 144,000 psi	fsu	= 192,000 psi
n	= 7.742	n'	= 8.295	Cphi	= 1.00
Cs	= 1.00	CE	= 1.00	CR	= 1.00

EXPOSURE

RH	= 70 %	t1	= 270 days	t2	= 90 days

BEDDING: 90 deg. Olander

	Thrust			Moment		
	Earth	Pipe	Fluid	Earth	Pipe	Fluid
Side	0.5386	0.3026	-0.0617	0.0885	0.1016	0.0878
Invert	0.3255	0.1029	-0.2703	0.1247	0.2157	0.1208

LOADS: User Entered

Pw	= 100 psi	Pt	= 40 psi	Pft	= 120 psi
We	= 10,587 lb/ft	Wt	= 411 lb/ft		
Wp	= 1,179 lb/ft	Wf	= 1,225 lb/ft		

INITIAL PRESTRESS

fic	= 1,541 psi	fiy	= 14,452 psi	fis	= -130,536 psi
ni	= 8.739	ni'	= 9.380		

FINAL PRESTRESS

Po	= 182 psi	fcr	= 1,068 psi	fyr	= 27,915 psi
fsr	= -108,372 psi	R	= 0.064473		
phi	= 1.357	s	= 0.000191		
nr	= 7.456	nr'	= 7.937		

PIPE CHARACTERISTICS

P'k	= 239 psi	Pb	= 445 psi

Design meets limit states criteria.

Company: SGH
Project: 140606.00-PURE: Design Check of 60 in ECP MK151-16G (123.92)
UDP Version 1.8
Designer: KAPeterson AWWA C304-99 10-22-2014
File Name: PURE_60IN_ECP_12393_MK151-16GA

DESIGN SUMMARY

GEOMETRY

Type = ECP(Core Cast)	Di = 60.00 in.	Dy = 63.00 in. (OD)
hc = 4.500 in.	hm = 0.942 in.	ty = 0.0598 in.
ds = 0.192 in.	As = 0.45 in^2/ft	Pipe OD = 70.88 in.

MATERIAL PROPERTIES

f'c = 4,500 psi	f't = 470 psi	f'ci = 3,000 psi
f'm = 5,500 psi	f'tm = 519 psi	fyy = 33,000 psi
ASTM A648 Wire Class III	fsg = 189,000 psi	fsu = 252,000 psi
n = 7.742	n' = 8.295	Cphi = 1.00
Cs = 1.00	CE = 1.00	CR = 1.00

EXPOSURE

RH = 70 %	t1 = 270 days	t2 = 90 days

BEDDING: 90 deg. Olander

	Thrust			Moment		
	Earth	Pipe	Fluid	Earth	Pipe	Fluid
Side	0.5386	0.3026	-0.0617	0.0885	0.1016	0.0878
Invert	0.3255	0.1029	-0.2703	0.1247	0.2157	0.1208

LOADS: User Entered

Pw = 125 psi	Pt = 50 psi	Pft = 150 psi
We = 10,587 lb/ft	Wt = 411 lb/ft	
Wp = 1,167 lb/ft	Wf = 1,225 lb/ft	

INITIAL PRESTRESS

fic = 1,330 psi	fiy = 12,476 psi	fis = -177,377 psi
ni = 8.739	ni' = 9.380	

FINAL PRESTRESS

Po = 154 psi	fcr = 931 psi	fyr = 25,050 psi
fsr = -149,925 psi	R = 0.081441	
phi = 1.357	s = 0.000191	
nr = 7.456	nr' = 7.937	

PIPE CHARACTERISTICS

P'k = 209 psi	Pb = 385 psi

Design meets limit states criteria.

Company: SGH
Project: 140606.00-PURE: Design Check of 60 in ECP MK144-16G(326.93)
UDP Version 1.8
Designer: KAPeterson AWWA C304-99 10-22-2014
File Name: PURE_60IN_ECP_32693_MK144-16GA

DESIGN SUMMARY

GEOMETRY

Type = ECP(Core Cast)	Di = 60.00 in.	Dy = 63.00 in. (OD)
hc = 4.500 in.	hm = 0.942 in.	ty = 0.0598 in.
ds = 0.192 in.	As = 0.43 in^2/ft	Pipe OD = 70.88 in.

MATERIAL PROPERTIES

f'c = 4,500 psi	f't = 470 psi	f'ci = 3,000 psi
f'm = 5,500 psi	f'tm = 519 psi	fyy = 33,000 psi
ASTM A648 Wire Class III	fsg = 189,000 psi	fsu = 252,000 psi
n = 7.742	n' = 8.295	Cphi = 1.00
Cs = 1.00	CE = 1.00	CR = 1.00

EXPOSURE

RH = 70 %	t1 = 270 days	t2 = 90 days

BEDDING: 90 deg. Olander

	Thrust			Moment		
	Earth	Pipe	Fluid	Earth	Pipe	Fluid
Side	0.5386	0.3026	-0.0617	0.0885	0.1016	0.0878
Invert	0.3255	0.1029	-0.2703	0.1247	0.2157	0.1208

LOADS: User Entered

Pw = 125 psi	Pt = 50 psi	Pft = 150 psi
We = 10,587 lb/ft	Wt = 411 lb/ft	
Wp = 1,167 lb/ft	Wf = 1,225 lb/ft	

INITIAL PRESTRESS

fic = 1,274 psi	fiy = 11,954 psi	fis = -177,863 psi
ni = 8.739	ni' = 9.380	

FINAL PRESTRESS

Po = 146 psi	fcr = 890 psi	fyr = 24,209 psi
fsr = -150,462 psi	R = 0.082754	
phi = 1.357	s = 0.000191	
nr = 7.456	nr' = 7.937	

PIPE CHARACTERISTICS

P'k = 202 psi	Pb = 372 psi

Design meets limit states criteria.

Company: SGH
Project: 140606.00-PURE: Design Check of 60 in ECP MK165 (326.93)
UDP Version 1.8
Designer: KAPeterson AWWA C304-99 10-22-2014
File Name: PURE_60IN_ECP_32693_MK165

DESIGN SUMMARY

GEOMETRY

Type = ECP(Core Cast)	Di = 60.00 in.	Dy = 63.00 in. (OD)
hc = 4.500 in.	hm = 0.942 in.	ty = 0.0598 in.
ds = 0.192 in.	As = 0.49 in^2/ft	Pipe OD = 70.88 in.

MATERIAL PROPERTIES

f'c = 4,500 psi	f't = 470 psi	f'ci = 3,000 psi
f'm = 5,500 psi	f'tm = 519 psi	fyy = 33,000 psi
ASTM A648 Wire Class III	fsg = 189,000 psi	fsu = 252,000 psi
n = 7.742	n' = 8.295	Cphi = 1.00
Cs = 1.00	CE = 1.00	CR = 1.00

EXPOSURE

RH = 70 %	t1 = 270 days	t2 = 90 days

BEDDING: 90 deg. Olander

	Thrust			Moment		
	Earth	Pipe	Fluid	Earth	Pipe	Fluid
Side	0.5386	0.3026	-0.0617	0.0885	0.1016	0.0878
Invert	0.3255	0.1029	-0.2703	0.1247	0.2157	0.1208

LOADS: User Entered

Pw = 125 psi	Pt = 50 psi	Pft = 150 psi
We = 13,128 lb/ft	Wt = 285 lb/ft	
Wp = 1,169 lb/ft	Wf = 1,225 lb/ft	

INITIAL PRESTRESS

fic = 1,440 psi	fiy = 13,511 psi	fis = -176,413 psi
ni = 8.739	ni' = 9.380	

FINAL PRESTRESS

Po = 168 psi	fcr = 1,012 psi	fyr = 26,716 psi
fsr = -148,867 psi	R = 0.078813	
phi = 1.357	s = 0.000191	
nr = 7.456	nr' = 7.937	

PIPE CHARACTERISTICS

P'k = 223 psi	Pb = 412 psi

Design meets limit states criteria.

APPENDIX C
24 in. Diameter LCP Structural Evaluation UDP Limit States Plots

Company: SGH File Name: MK153
Project: 140606.00-PURE: Design Check 24 in. LCP MK153
Designer: KAPeterson UDP SGH Propr. Ver. 1.4nc 11-06-2014

PLOT OF LIMIT STATES CURVES

GEOMETRY

Type = LCP(Core Spun)	Di = 24.00 in.	Dy = 27.00 in. (OD)
hc = 1.500 in.	hm = 0.817 in.	ty = 0.0478 in.
ds = 0.192 in.	As = 0.23 in^2/ft	Pipe OD = 28.63 in.

MATERIAL PROPERTIES, EXPOSURE AND BEDDING

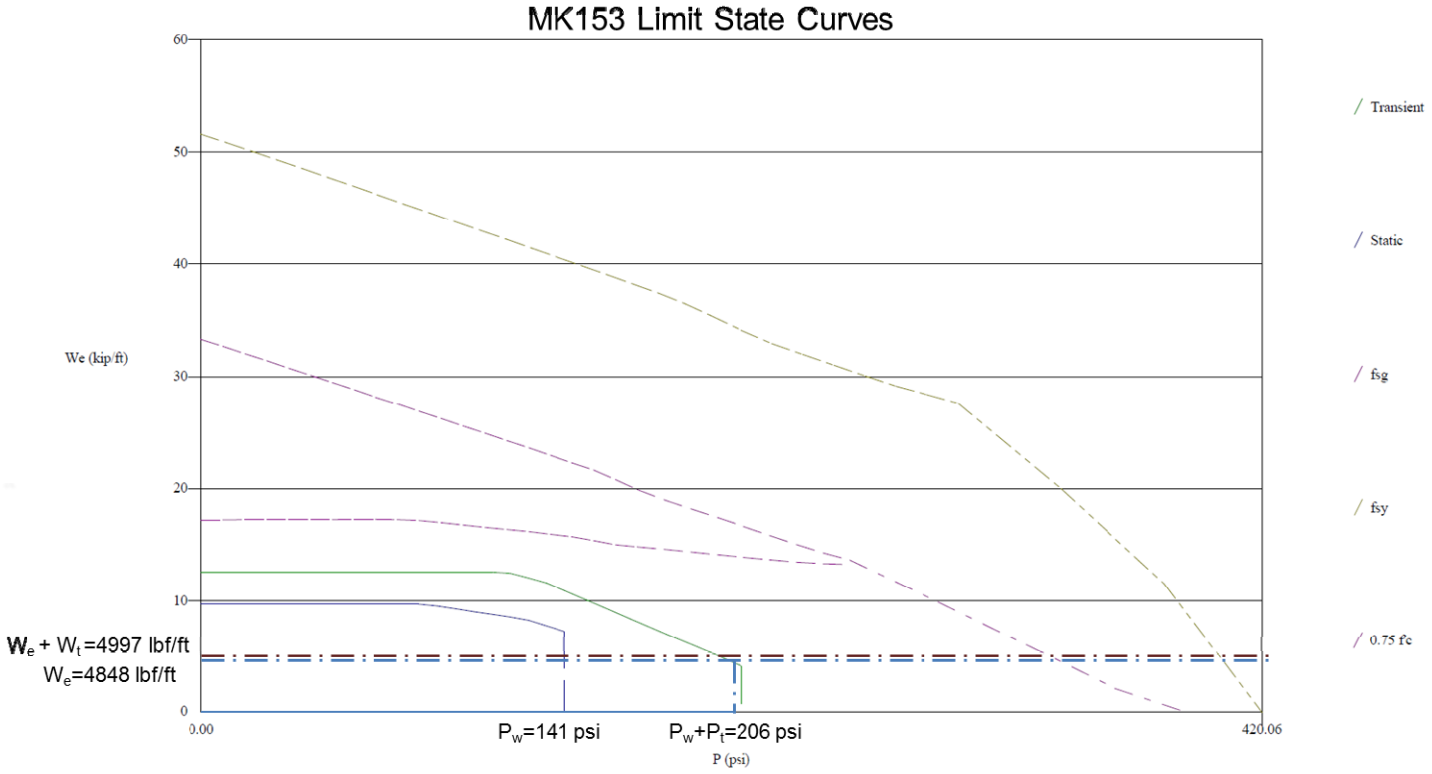
f'c = 6,000 psi	f't = 542 psi	f'ci = 4,000 psi
f'm = 5,500 psi	f'tm = 519 psi	fyy = 33,000 psi
ASTM A648 Wire Class III	fsg = 189,000 psi	fsu = 252,000 psi
n = 7.102	n' = 7.609	Cphi = 1.00
Cs = 1.00	CE = 1.00	CR = 1.00
RH = 70 %	t1 = 270 days	t2 = 90 days

Bedding: 90 deg. Olander

FINAL PRESTRESS AND PIPE CHARACTERISTICS

Po = 176 psi	fcr = 1,225 psi	fyr = 23,038 psi
fsr = -150,147 psi	R = 0.091085	rfsg = 0 psi
phi = 1.070	s = 0.000111	
nr = 6.987	nr' = 7.502	
P'k = 210 psi	Pb = 517 psi	Weult= 15,415 lb/ft

Pw = 141 psi at 4,848 lb/ft; We = 7,191 lb/ft at 131 psi
Pw + Pt = 206 psi at 4,848 lb/ft; We + Wt = 12,297 lb/ft at 131 psi
Envelope for Transient Pressure = 40 %



Company: SGH File Name: F162_5FT
Project: 140606.00-PURE: Design Check 24 in. LCP MK162
Designer: KAPeterson UDP SGH Propr. Ver. 1.4nc 11-06-2014

PLOT OF LIMIT STATES CURVES

GEOMETRY

Type = LCP(Core Spun)	Di = 24.00 in.	Dy = 27.00 in. (OD)
hc = 1.500 in.	hm = 0.817 in.	ty = 0.0478 in.
ds = 0.192 in.	As = 0.230 in^2/ft	Pipe OD = 28.63 in.

MATERIAL PROPERTIES, EXPOSURE AND BEDDING

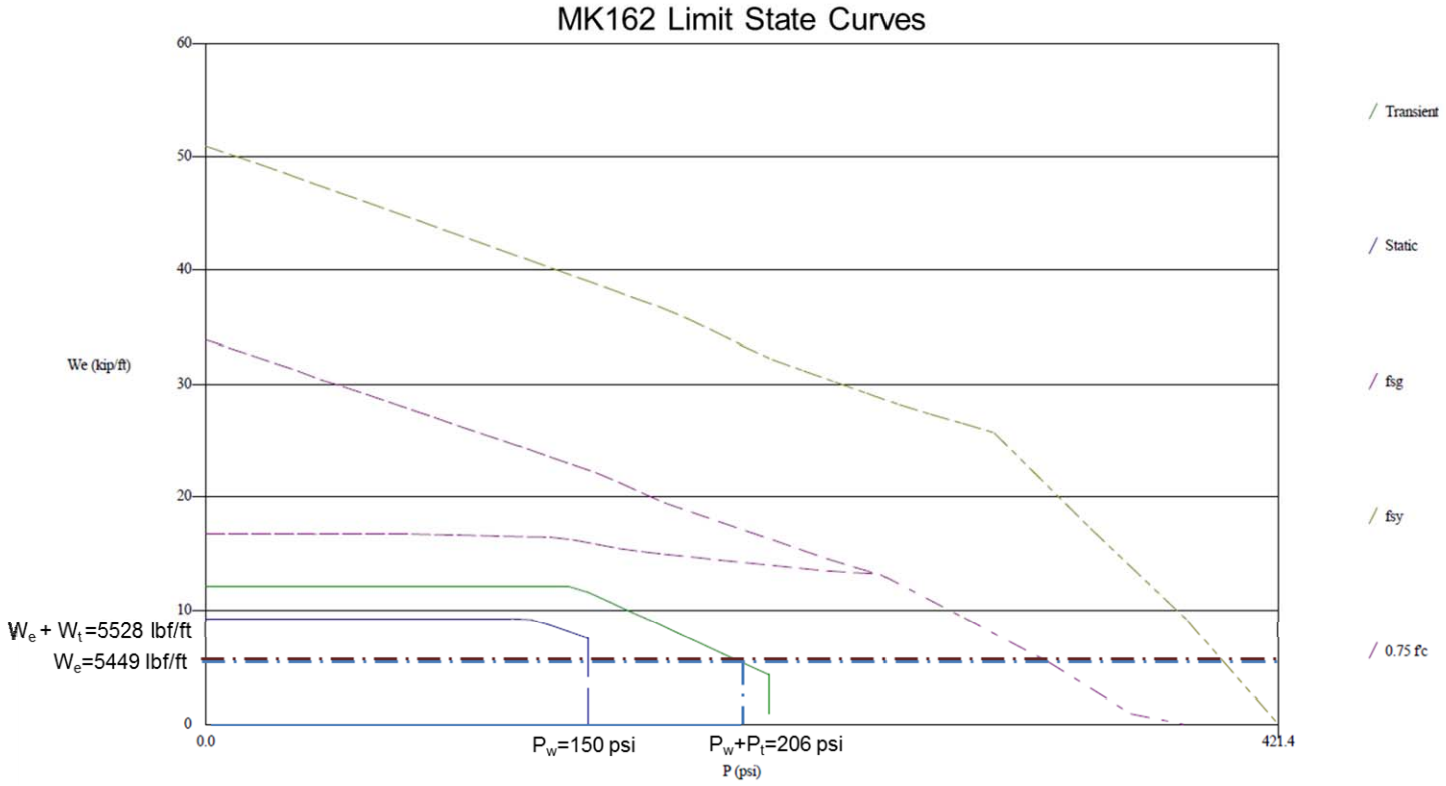
f'c = 6,000 psi	f't = 542 psi	f'ci = 4,000 psi
f'm = 5,500 psi	f'tm = 519 psi	fyy = 33,000 psi
ASTM A648 Wire Class 3.5	fsg = 200,250 psi	fsu = 267,000 psi
n = 7.102	n' = 7.609	Cphi = 1.00
Cs = 1.00	CE = 1.00	CR = 1.00
RH = 70 %	t1 = 270 days	t2 = 90 days

Bedding: 90 deg. Olander

FINAL PRESTRESS AND PIPE CHARACTERISTICS

Po = 188 psi	fcr = 1,303 psi	fyr = 24,292 psi
fsr = -159,201 psi	R = 0.091085	rfsg = 0 psi
phi = 1.070	s = 0.000111	
nr = 6.987	nr' = 7.502	
P'k = 221 psi	Pb = 538 psi	Weult= 15,525 lb/ft

Pw = 150 psi at 5,449 lb/ft; We = 9,206 lb/ft at 113 psi
Pw + Pt = 210 psi at 5,449 lb/ft; We + Wt = 12,083 lb/ft at 113 psi
Envelope for Transient Pressure = 40 %



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Company:    SGH                                          File Name: MK150
Project:    140606.00-PURE: Design Check of 24 in. LCP MK150
Designer:   KAPeterson    UDP SGH Propr. Ver. 1.4nc       11-06-2014

                    PLOT OF LIMIT STATES CURVES

                              GEOMETRY

Type = LCP(Core Spun)     Di   = 24.00 in.          Dy   = 27.00 in. (OD)
hc   = 1.500 in.          hm   = 0.787 in.         ty   = 0.0538 in.
ds   = 0.162 in.          As   = 0.23 in^2/ft   Pipe OD = 28.57 in.

              MATERIAL PROPERTIES, EXPOSURE AND BEDDING

f'c  = 6,000 psi          f't  = 542 psi           f'ci = 4,000 psi
f'm  = 5,500 psi          f'tm = 519 psi           fyy  = 33,000 psi
ASTM A648 Wire Class III  fsg  = 196,500 psi       fsu  = 262,000 psi
n    = 7.102              n'   = 7.609             Cphi = 1.00
Cs   = 1.00               CE   = 1.00              CR   = 1.00
RH   = 70  %              t1   = 270 days          t2   = 90 days
Bedding: 90 deg. Olander

              FINAL PRESTRESS AND PIPE CHARACTERISTICS

Po   = 180 psi            fcr  = 1,225 psi         fyr  = 23,055 psi
fsr  = -156,986 psi       R    = 0.090915          rfsg = 0 psi
phi  = 1.071              s    = 0.000111
nr   = 6.987              nr'  = 7.502
P'k  = 214 psi            Pb   = 551 psi           Weult= 15,260 lb/ft

Pw = 144 psi at 3,538 lb/ft; We = 9,673 lb/ft at 60 psi
Pw + Pt = 214 psi at 3,538 lb/ft; We + Wt = 12,575 lb/ft at 60 psi
Envelope for Transient Pressure = 40 %
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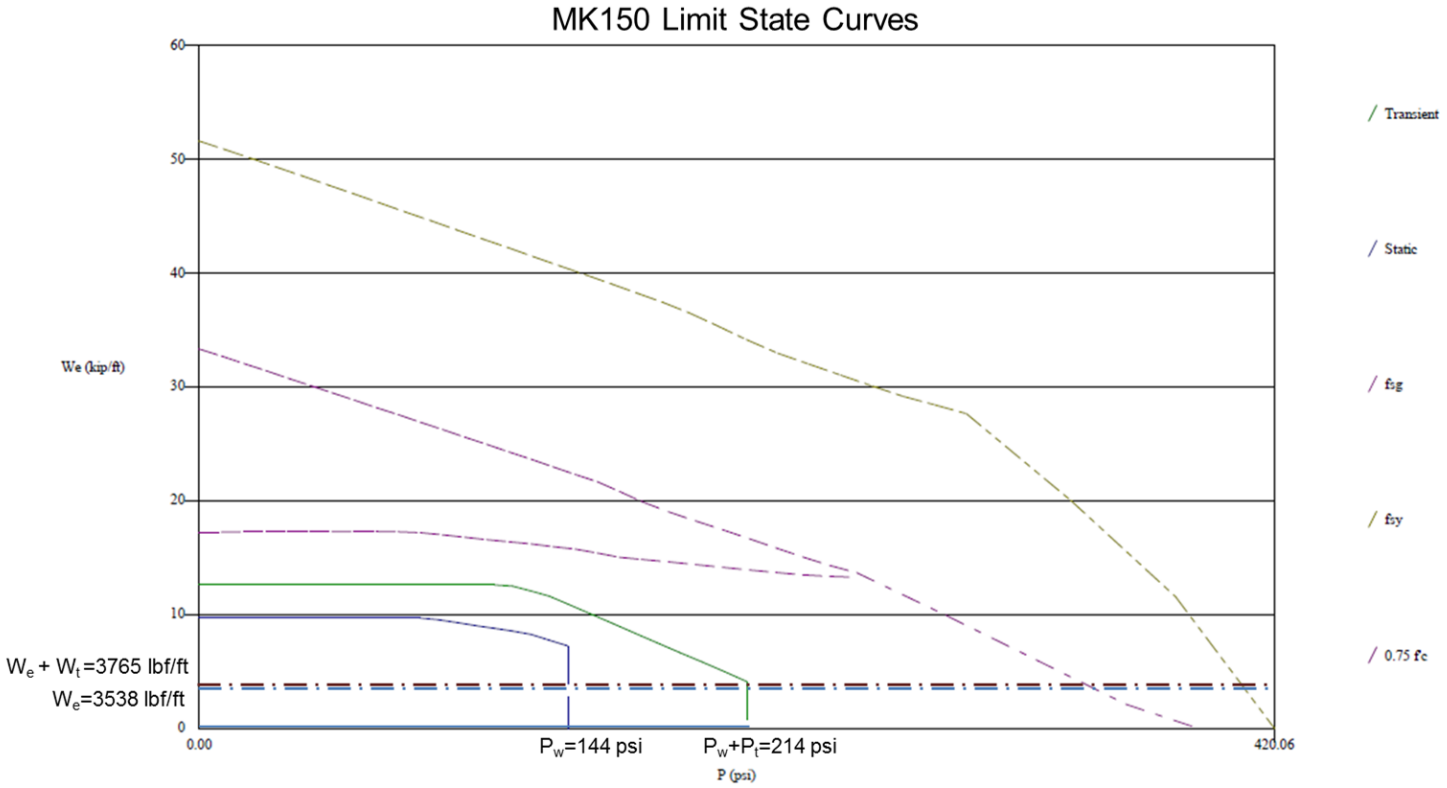


SPECIAL NOTE FOR
GUARDRAIL END TREATMENT TYPE 1

Contrary to KYTC Standard Drawing RBR-020-05 the guardrail end treatment ET-Plus manufactured by Trinity Industries will not be permitted as an option for bid item “Guardrail End Treatment Type 1”.

Right-of-Way Certification Form

Revised 2/22/11

☐ Federal Funded ☑ Original

☑ State Funded ☐ Re-Certification

This form must be completed and submitted to FHWA with the PS&E package for federal-aid funded Interstate, Appalachia, and Major projects. This form shall also be submitted to FHWA for all federal-aid projects that fall under Conditions No. 2 or 3 outlined elsewhere in this form. When Condition No. 2 or 3 apply, KYTC shall resubmit this ROW Certification prior to construction contract Award. For all other federal-aid projects, this form shall be completed and retained in the KYTC project file.

Date: APRIL 28, 2015

Project Name: Grade Lane
Letting Date: May 29, 2015
Project #: 5-482.00
County: JEFFERSON
Item #:
Federal #: N/A

Description of Project: Reconstruct Grade Lane in Louisville between I-65 SB ramps and Grade Lane connector

Projects that require NO new or additional right-of-way acquisitions and/or relocations

☑ The proposed transportation improvement will be built within the existing rights-of -way and there are no properties to be acquired, individuals, families, and businesses ("relocatees") to be relocated, or improvements to be removed as a part of this project.

Projects that require new or additional right-of-way acquisitions and/or relocations

☐ Per 23 CFR 635.309, the KYTC hereby certify that all relocatees have been relocated to decent, safe, and sanitary housing or that KYTC has made available to relocatees adequate replacement housing in accordance with the provisions of the current FHWA directive(s) covering the administration of the Highway Relocation Assistance Program and that at least one of the following three conditions has been met. (Check those that apply.)

☐ **Condition 1.** All necessary rights-of-way, including control of access rights when applicable, have been acquired including legal and physical possession. Trial or appeal of cases may be pending in court but legal possession has been obtained. There may be some improvements remaining on the right-of-way, but all occupants have vacated the lands and improvements, and KYTC has physical possession and the rights to remove, salvage, or demolish all improvements and enter on all land. Fair market value has been paid or deposited with the court.

☐ **Condition 2.** Although all necessary rights-of-way have not been fully acquired, the right to occupy and to use all rights-of-way required for the proper execution of the project has been acquired. Trial or appeal of some parcels may be pending in court and on other parcels full legal possession has not been obtained, but right of entry has been obtained, the occupants of all lands and improvements have vacated, and KYTC has physical possession and right to remove, salvage, or demolish all improvements. Fair market value has been paid or deposited with the court for most parcels. Fair market value for all pending parcels will be paid or deposited with the court prior to AWARD of construction contract. (See note 1 below.)

Note 1: The KYTC shall re-submit a right-of-way certification form for this project prior to AWARD of all Federal-Aid construction contracts. Award must not to be made until after KYTC has obtained full legal possession and fair market value for all parcels has been paid or deposited with the court and FHWA has concurred in the re-submitted right-of-way certification.

Right-of-Way Certification Form

Revised 2/22/11

☐ **Condition 3.** The acquisition or right of occupancy and use of a few remaining parcels are not complete and/or some parcels still have occupants. However, all remaining occupants have had replacement housing made available to them in accordance with 49 CFR 24.204. The KYTC is hereby requesting authorization to advertise this project for bids and to proceed with bid letting even though the necessary rights-of-way will not be fully acquired, and/or some occupants will not be relocated, and/or the fair market value will not be paid or deposited with the court for some parcels until after bid letting. KYTC will fully meet all the requirements outlined in 23 CFR 635.309(c)(3) and 49 CFR 24.102(j) and will expedite completion of all acquisitions, relocations, and full payments after bid letting and prior to AWARD of the construction contract or force account construction. A full explanation and reason for this request, including identification of each such parcel and dates on which acquisitions, payments, and relocations will be completed, is attached to this certification form for FHWA concurrence. (See note 2.)

Note 2: The KYTC may request authorization on this basis only in unique and unusual circumstances. Proceeding to bid letting shall be the exception and never become the rule. In all cases, the KYTC shall make extraordinary efforts to expedite completion of the acquisition, payment for all affected parcels, and the relocation of all relocatees prior to AWARD of all Federal-Aid construction contracts or force account construction.

Approved	Ron Geveden	Ron Gev	Right-of-Way Supervisor
	Printed Name	Signature	
Approved	Dean H Lay	Dean H Lay by [illegible]	KYTC, Director of ROW & Utilities
	Printed Name	Signature	
Approved	David Whitworth	[illegible] 4/29/15	FHWA, ROW Officer (when applicable)
	Printed Name	Signature	

Right-of-Way Certification Form

Revised 2/22/11

Date: April 28, 2015

Project Name: Grade Lane
Project #: 5-482.00
Item #:
Letting Date: May 29, 2015

County: JEFFERSON
Federal #: N/A

This project has 0 total number of parcels to be acquired, and 0 total number of individuals or families to be relocated, as well as 0 total number of businesses to be relocated.

_____ Parcels where acquired by a signed fee simple deed and fair market value has been paid

_____ Parcels have been acquired by IOJ through condemnation and fair market value has been deposited with the court

_____ Parcels have not been acquired at this time (*explain below for each parcel*)

_____ Parcels have been acquired or have a "right of entry" but fair market value has not been paid or has not been deposited with the court *(explain below for each parcel)*

_____ Relocatees have not been relocated from parcels ____, ____, ____, ____, ____, ____, and ____ *(explain below for each parcel)*

Parcel #	Name/Station	Explanation for delayed acquisition, delayed relocation, or delayed payment of fair market value	Proposed date of payment or of relocation

There are 0 billboards and/or 0 cemeteries involved on this project.

There are 0 water or monitoring wells on parcels ____, ____, ____, ____, and ____. All have been acquired and are the responsibility of the project contractor to close/cap.

Form Effective Date: April 1, 2006
Last Revised: February 22, 2011

SPECIAL NOTES FOR UTILITY CLEARANCE
IMPACT ON CONSTRUCTION

JEFFERSON COUNTY
FD04 056 1001 000-001
GRADE LANE/REALIGN GRADE LANE AT I-65
ITEM NUMBER 5-482.00

GENERAL PROJECT NOTE ON UTILITY PROTECTION

Prior to any work taking place the Contractor will notify the Engineer and Louisville Water Company 5 days in advance. Any damage to the water transmission line and any further damage caused by construction to adjacent facilities will be the responsibility of the Contractor. All other utilities identified below will not be disturbed. The Contractor is responsible for the immediate repair and replacement of any utility listed below as "DO NOT DISTURB".

NOTE: DO NOT DISTURB THE FOLLOWING UTILITIES LOCATED WITHIN THE PROJECT DISTURB LIMITS

Louisville Water Company, MSD, LG&E-gas, LG&E-electric, Time Warner, and AT&T Kentucky have facilities that require relocation. Please see the notes below pertaining to their locations.

LG&E (Gas) – has an existing 8-inch line under existing Grade Lane pavement from a point outside of project limits and within the project limits between Sta. 25+60 to Sta. 31+00 and beyond. **This line is to remain in place and not disturbed.**
An existing 4-inch has been cut and capped at Sta. 14+40 Lt. 90. From this point to the east this line has been abandoned in place.

MSD– has an existing 12-inch line running parallel to existing Grade Lane on the north side. Note-SAN MH lid labeled in the plans on the left side at approximate Sta. 52+50. **This line is to remain in place and not disturbed.**

Louisville Water Company – has an existing 12-inch main running parallel to existing Grade Lane on the north side and crosses through the intersection with Ramp C. The existing 12-inch main keeps on the north side of Grade Lane an approximate offset of 45' left. The 12-inch main crosses existing Grade Lane at Sta. 29+16 and continues under pavement of Grade Lane past the project limits. **This line is to remain in place and not disturbed.**

Louisville Water Company – has an existing 60-inch main running along proposed Grade Lane. The 60-inch main runs on the west side of proposed Grade Lane at the beginning of the project and crosses proposed Grade Lane at approximately Sta. 11+15 then runs parallel on the east side of proposed Grade Lane. The existing 60-inch main crossed to the west side of proposed Grade Lane at Sta. 17+90 and maintains on the west side of proposed Grade Lane until it crosses again at Sta. 22+20. From Sta. 22+20 to Sta. 24+00 the 60-inch main runs under the proposed Grade Lane. **This line is to remain in place and not disturbed. Use extreme caution when working near this facility.**

The Contractor is fully responsible for protection of all utilities listed above

SPECIAL NOTES FOR UTILITY CLEARANCE

IMPACT ON CONSTRUCTION

JEFFERSON COUNTY
FD04 056 1001 000-001
GRADE LANE/REALIGN GRADE LANE AT I-65
ITEM NUMBER 5-482.00

THE FOLLOWING COMPANIES ARE RELOCATING/ADJUSTING THEIR UTILITIES WITHIN THE PROJECT LIMITS AND WILL BE COMPLETE PRIOR TO CONSTRUCTION

LG&E (Electric) – has an existing overhead route that will be abandoned. Poles will be removed at approximate Sta. 17+55 34L and Sta. 19+33 29L. A proposed under route will begin at Sta. 17+50 37L from a proposed pull box and will continue parallel to the proposed Grade Lane at an approximate offset of 39L. At Sta. 19+33 29L the underground route turns west and will terminate at an existing pole at Sta. 19+75 80L. **This work is anticipated to be completed by May 30, 2015.**

Time Warner Cable – has an existing overhead route that will be abandoned. A proposed under route will begin at Sta. 17+50 37L from a proposed pull box and will continue parallel to the proposed Grade Lane at an approximate offset of 39L. At Sta. 19+33 29L the underground route turns west and will terminate at an existing pole at Sta. 19+75 80L. **This work is anticipated to be completed by June 17, 2015.**

AT&T Kentucky – has an existing overhead route that will be abandoned. A proposed under route will begin at Sta. 17+50 37L from a proposed pull box and will continue parallel to the proposed Grade Lane at an approximate offset of 39L. At Sta. 19+33 29L the underground route turns west and will terminate at an existing pole at Sta. 19+75 80L. **This work is anticipated to be completed by June 17, 2015.**

LG&E, Time Warner Cable, and AT&T KY, share some of the same pole routes. Existing poles will be removed once **all** facilities have been relocated underground.

THE FOLLOWING COMPANIES HAVE FACILITIES TO BE RELOCATED/ADJUSTED BY THE COMPANY OR THE COMPANY'S SUBCONTRACTOR AND IS TO BE COORDINATED WITH THE ROAD CONTRACT

N/A

THE FOLLOWING COMPANIES HAVE FACILITIES TO BE RELOCATED/ADJUSTED BY THE ROAD CONTRACTOR AS INCLUDED IN THIS CONTRACT

Louisville Water Company – has an existing 12" water main crossing the intersection of new Grade Lane and existing Grade Lane for approximate Sta. 12+28 43R to Sta. 13+57 80L that will be abandoned. As part of the roadway project the existing main will be replaced by the contractor as part of the roadway project as shown on the relocation plans. A proposed 12" will tie-in to the exiting 12" water main at Sta. 12+28 43R to a 45° bend and continues and crosses proposed Grade Lane at Sta. 13+00 and connects with the existing 12" water main at Sta. 13+57 80L.

SPECIAL NOTES FOR UTILITY CLEARANCE
IMPACT ON CONSTRUCTION

JEFFERSON COUNTY
FD04 056 1001 000-001
GRADE LANE/REALIGN GRADE LANE AT I-65
ITEM NUMBER 5-482.00

See the plans, specifications and special notes concerning the relocations.

SPECIAL CAUTION NOTE – PROTECTION OF UTILITIES

The contractor will be responsible for contacting all utility facility owners on the subject project to coordinate his activities. The contractor will coordinate his activities to minimize and, where possible, avoid conflicts with utility facilities. Due to the nature of the work proposed, it is unlikely to conflict with the existing utilities beyond minor facility adjustments. Where conflicts with utility facilities are unavoidable, the contractor will coordinate any necessary relocation work with the facility owner and Resident Engineer. The Kentucky Transportation Cabinet maintains the right to remove or alter portions of this contract if a utility conflict occurs.

The utility facilities as noted in the previous section(s) have been determined using data garnered by varied means and with varying degrees of accuracy: from the facility owners, a result of S.U.E., field inspections, and/or reviews of record drawings. The facilities defined may not be inclusive of all utilities in the project scope and are not Level A quality, unless specified as such. It is the contractor's responsibility to verify all utilities and their respective locations before excavating.

BEFORE YOU DIG

The contractor is instructed to call 1-800-752-6007 to reach KY 811, the one-call system for information on the location of existing underground utilities. The call is to be placed a minimum of two (2) and no more than ten (10) business days prior to excavation. The contractor should be aware that owners of underground facilities are not required to be members of the KY 811 one-call Before-U-Dig (BUD) service. The contractor must coordinate excavation with the utility owners, including those whom do not subscribe to KY 811. It may be necessary for the contractor to contact the County Court Clerk to determine what utility companies have facilities in the area.

Please Note: The information presented in this Utility Note is informational in nature and the information contained herein is not guaranteed.

SPECIAL NOTES FOR UTILITY CLEARANCE

IMPACT ON CONSTRUCTION

JEFFERSON COUNTY
FD04 056 1001 000-001
GRADE LANE/REALIGN GRADE LANE AT I-65
ITEM NUMBER 5-482.00

AREA UTILITIES CONTACT LIST

1. LG&E KU (Electric)
820 West Broadway
Louisville, KY 40202
LG&E Emergency Number (502) 589-1444
LG&E and KU Emergency Number 1-800-331-7370

Greg Geiser
work: (502) 627-3708
Greg.Geiser@LGE-KU.com

2. LG&E (Gas)
820 West Broadway
Louisville, KY 40202
Gas Emergency Number (502) 589-5511
LG&E and KU Emergency Number 1-800-331-7370

Greg Geiser
work: (502) 627-3708
Greg.Geiser@LGE-KU.com

3. Louisville Water Company
550 South Third Street
Louisville, KY 40202

Daniel Tegene, PE
(502) 569-3649
DTegene@LWCky.com

4. AT&T KY
3719 Bardstown Road - 2nd Floor
Louisville, KY 40218

Morgan Herndon
Morgan.Herndon@att.com
(502) 458-7312

5. Metropolitan Sewer District
700 West Liberty Street
Louisville, KY 40203-1911

Greg Powell
Greg.Powell@LouisvilleMSD.org

Brad Selch
Brad.Selch@louisvilleMSD.org
(502) 540-6614
Send to both contacts

SPECIAL NOTES FOR UTILITY CLEARANCE

IMPACT ON CONSTRUCTION

JEFFERSON COUNTY
FD04 056 1001 000-001
GRADE LANE/REALIGN GRADE LANE AT I-65
ITEM NUMBER 5-482.00

6. Insight Communications Company
4701 Commerce Crossings Dr.
Louisville, KY40229

Deno Barbour
Cell: (502) 664-7395
Office(502) 357-4376
Dwight.Barbour@TWCable.com

AIRPORT CONTACTS

Bruce Little (502) 375-7363 – FAA Location Manager
Jack Stauble (502) 664-9637 cell – FAA Location Technician

Chuck Hensley (502) 380-8356 EXT 356 – Construction Manager
Louisville Regional Airport Authority

Andy Hepfinger (502) 329-3706 – UPS Construction
Brian Knesco (502) 741-2922 – UPS Construction

SUPPLEMENTARY SPECIFICATIONS

Grade Lane from I-65 to Grade Lane Connector
WATER MAIN RELOCATION PROJECT
KTC ITEM NO. 5-482.00

PROJECT LIMITS

Limits of the referenced project include **Grade Lane** between **I-65** and **Grade Lane Connector**.

PROJECT SUMMARY

The referenced project consists of the supply and installation of approximately **200** linear feet of 12-inch Pressure Class 350 ductile iron water main (using traditional trench installation techniques) and the supply and installation of approximately **150** of 30-inch steel casing pipe.

SCOPE OF WORK

A. Supply and Install **200** linear feet of 12-inch Pressure Class 350 ductile iron water main along Grade Lane between I-65 and Grade Lane Connector.

B. **The contractor is bound by and shall comply with the provisions of the "Louisville Water Company Technical Specifications and Standard Drawings for Pipeline Construction" (2008 Edition) which shall govern work on this project with the following additions/exceptions:**

GENERAL REQUIREMENTS

C. All work performed for the installation and relocation of the water main and related construction must be performed by an LWC pre-qualified contractor in the following categories:

- Category 1: 4" – 16" Ductile Iron Water Main

PIPELINE MATERIALS

D. Unless otherwise approved by the LWC Project Manager, all pipe replacement work in this project scope shall be constructed with Contractor-supplied Pressure Class 350 ductile iron pipe in accordance with the plans using traditional trenching techniques. The contractor shall provide LWC with material submittals for all materials that the contractor plans to use for LWC work including but not limited to pipe, valves, fittings, casing pipe, etc. The submittals shall be reviewed and approved by the LWC Project Manager prior to installation of any material. The contractor shall provide alternate materials for any materials that the LWC

Project Manager rejects until an acceptable material is selected by the contractor as approved by the LWC Project Manager. Material submittal review takes approximately two weeks for each submittal.

TRAFFIC CONTROL

E. This project will be bid and constructed in conjunction with the Kentucky Transportation Cabinet's (KTC) Grade Lane project; therefore, no KTC permits will be required. Contractor shall obtain all permits through KTC.

F. Specific traffic control signage referencing lane blockages, detours, flaggers, etc. shall be removed from the site or covered when not in use. Signs that provide general messages such as "Construction Ahead" shall be left in place throughout the completion of this project.

G. All construction vehicles shall be legally parked. Privately owned vehicles including vehicles owned by the construction crew shall not be parked in the "No Parking" zones.

H. The Contractor shall be responsible for establishing temporary "No Parking" zones. The zones shall be confined to the immediate work area and appropriate transition zones, and shall be limited in duration to the length of time work is actually performed in that area.

VIDEO RECORDING

I. Video Recording shall be provided in DVD format.

SITE WORK

J. Field modifications to the proposed pipeline alignment may be necessary to avoid or minimize the effects of potential conflicts. To avoid potential conflicts with existing utilities located perpendicular and/or parallel to the proposed main, the Contractor should anticipate the need to use offsets, bends and fittings when installing the new main, and for large service connections.

K. Utility locations are shown on the plans from available information and are approximate. The contractor is responsible for locating all existing utilities including water line facilities prior to start of construction. The contractor is responsible for relocating any existing utility that is in conflict with the proposed construction at no additional cost to LWC.

EXCAVATION

L. Excavation on this project shall be unclassified.

M. Rock shall be removed using mechanical methods (backhoe, hoe ram, or rock trenching machine). Blasting shall not be permitted.

INSTALLATION, HANDLING AND STORAGE

N. Forklifts' forks or other material handling equipment shall not be inserted into the barrels of pipe, valves or other fittings to lift or move them or for any other construction activity.

O. Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the Project Manager.

P. Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the LWC Inspector or Project Manager.

Q. Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.

R. Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.

S. Pipe shall not be stored on-site for periods greater than 3 months or as approved by the LWC Inspector and Project Manager.

T. Pipe shall be stored and stacked per the pipe supplier's guidelines and as approved by the LWC Inspector and Project Manager.

BACKFILLING PROCEDURES AND TAMPING

AA. When under the *pavement in state right-of-way*, the final backfill material shall be selected, placed and compacted in accordance with section 7 of the LWC Technical Specifications and Standard Drawing No. 4000 – State of Kentucky Backfill and Paving Restoration.

AB. When under *pavement other than state right-of-way,* (side streets, driveways, and entrances), the final backfill material shall be selected, placed and compacted in accordance with section 7 of the LWC Technical Specifications

and Standard Drawing No. 4100 – Louisville and Jefferson County Metro Backfill and Paving Restoration.

AC. If septic system / lateral field is encountered, contractor shall put 6 inches of compacted DGA on all sides of pipe for a distance of 5 feet on each side of line encountered.

PLACING WATER MAIN IN SERVICE

AD. All new ductile iron and PVC pipe installations longer than 50 feet shall be pig cleaned. Ductile iron and PVC pipe sections shorter than 50 feet in length may require pig cleaning at the direction of the LWC Construction Inspector. LWC will supply pigs for the ductile iron pipe. Pigs shall be used one time and discarded.

AE. A chlorine injection system shall be used to fill the new main. The LWC Construction Inspector will provide the equipment needed to inject the chlorine-based solution into the main. The Contractor shall assist the LWC Construction Inspector with the connection of hoses and the operation of valves.

CUSTOMER SERVICES

AF. The renewal of 5/8" services shall include the upsizing of the service to ¾".

AG. The contractor shall review the proposed private/public service lines as shown on the plans prior to bidding. The contractor is responsible for relocating the customer's service line (the line from the main to the meter and the line from the meter to the residential structure). The new locations shall be approved by the LWC Project Manager prior to installation. The contractor is responsible for reconnecting these services at the location on the residential structure where the existing service enters the residential structure at no additional cost to the Louisville Water Company or the property owner. The contractor shall employee a licensed plumber to make all private service connection between the proposed meter box and the existing service on the residential structure. The contractor shall coordinate each relocated service with the property owner and obtain property owners approval prior to any construction outside of the right-of-way. The property shall be restored to the satisfaction of the property owner.

AH. Prior to beginning any work that requires a shut-down of the main or individual services, the Contractor shall make a thorough evaluation of each service connection and meter vault within the limits of the shut-down. Discrepancies between the field conditions and the Project Plans shall be discussed with the LWC Construction Inspector.

AI. The use of copper couplings under paved areas shall be avoided. In situations where the new main is located on the opposite side of the roadway from the

existing main or where the new main is located in the roadway and more than two feet from the existing main, “long” service transfers shall be completed by advancing a new service line from the new main to the meter vault.

AJ. The type, size and condition of the existing customer service at the property line shall be verified before completing the service reconnection. Where lead is encountered at the property line and an existing property connection is not found, the Contractor shall extend the service excavation up to three (3) feet behind the property line to remove additional lead and to search for an existing property connection. The service reconnection shall then be completed at the three-foot distance, or less, if an existing property connection is encountered.

AK. During lead service renewals, meter vault frames and covers that have the old style “1/4-Turn” or “J-Hook” locking mechanisms shall be replaced with new frames and covers. Additionally, where covers are broken or inoperable the covers and frames shall be replaced. The removed frame and cover shall be returned to LWC for proper disposal.

AL. Service discontinues are indicated at several locations on the Project Plans. Prior to discontinuing a service, the site shall be thoroughly investigated by the LWC Construction Inspector. If the service requires reconnection (transfer or renewal), the Contractor shall make the appropriate connection. The Contractor shall be compensated in accordance with the Supplementary Unit prices included in the Bidders Proposal.

Services shall be discontinued in accordance with Section 10.11 of the Technical Specifications, except that the discontinuation of services at the main will not be required for a main that is scheduled for abandonment as part of this project.

At some locations, meters and meter vaults have already been removed and/or abandoned, but the service lines and taps may still be in place and live. The Contractor shall exercise caution in the vicinity of these services to reduce the risk of “pulling” a live corporation.

AM. If temporary water lines are used for the pipe replacement operations, they shall be installed and maintained in accordance with the following specifications.

The contractor shall furnish all piping, fittings, and connections necessary to install a temporary water supply line for customers located in the ‘Lay-In-Place’ sections.

Temporary lines that cross roadways or driveways shall be buried. In the event that construction work will be done during freezing weather conditions temporary water mains shall be buried.

All temporary lines attached to fire hydrants shall be constructed to allow easy access to the hydrant should a fire emergency arise. Such connections shall be compatible with the standards of the Louisville Metro Fire Department.

The piping, fittings, and hoses used to construct the temporary system and to make connections to customer services shall be FDA or NSF approved for human consumption.

All piping and hoses shall be clean, watertight and compatible with the flow and pressure requirements of the LWC system.

The contractor shall disinfect the temporary piping and hoses prior to connection to any customer service. Similar to the acceptance of a water main, temporary water lines will require sampling and testing for chlorine, turbidity, taste, odor, and bacteria.

The contractor shall be responsible for making all connections to the distribution system and the individual customer services.

WORK SCHEDULE

AN. A 'Staging 'Plan' for how the work is to proceed is to be presented by the contractor at the Preconstruction meeting. Staging of the work should try to minimize the time between installing the new main and working on or removing the existing water main so that the time between the restorations of the two events is minimized. Work shall be performed such that tie-in and service work is completed and restoration begun before proceeding to the next area.

AO. LWC observes the following holidays; New Years Day, Martin Luther King Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving (Thursday and Friday), Christmas Eve, and Christmas Day. Work shall not be performed on any of these holidays without two weeks prior notice and approval from the Project Manager.

AP. Normal work hours shall be limited to work hours approved by KTC.

AQ. The Contractor shall anticipate the need to work after-hours and on weekends to accommodate critical customer needs, and to avoid logistical problems involving work in proximity to parking lots and in heavily traveled intersections. In addition, after-hour or weekend work may be needed to shut down transmission mains or to connect to a tank. All such work will be considered incidental to the project and no additional compensation will be provided. As with holidays and any work planned for weekends, this shall be pre-approved by the LWC Project Manager.

AR. In the case of an emergency, the Contractor shall immediately notify the LWC Construction Inspector. If the contractor can not reach the inspector, then they

shall immediately notify the Radio Room or Project Manager. Prior to the actual shut-off, an attempt shall also be made to contact each customer (door-to-door) to alert customers of the emergency situation and the need to shut-off the main.

PIPELINE CONSTRUCTION

AS. Prior to the start of any work at the site (including saw-cutting), the Contractor and LWC Construction Inspector shall review the proposed pipeline alignment with respect to the utility locations marked by BUD, trees, and other existing site improvements.

AT. Standard burial depth for new water mains is 42 inches, as measured from the top of ground to the top of the newly installed pipe. While the Contractor is expected to adhere to this standard burial depth requirement at all times, it is understood that revisions to the burial depth will be necessary when the installation of mains and large services conflict with existing utilities and other site improvements. With prior notification and approval from the LWC Project Manager, the depth of burial may be reduced to a minimum of 30 inches, or increased to a maximum of 72 inches, for short durations (10 feet or less) to avoid these conflicts. Any situation requiring a depth of burial outside these maximum and minimum limits or of a longer duration shall be approved by the LWC Chief Engineer.

AU. The type, size and condition of the existing pipe shall be verified prior to completing tie-ins. When the existing pipe is other than indicated on the Project Plans, the LWC Construction Inspector or LWC Project Manager shall be contacted immediately to assess the need for revising the tie-in location. The Contractor shall be compensated in accordance with the supplementary unit prices for any additional pipeline installed to revise the tie-in location.

AV. The Contractor is cautioned that many large trees are located within close proximity to the project alignment. Care will be required to minimize damage to trees and tree root systems. Excavations that encounter roots should be backfilled as soon as possible. Severed roots more than 2-inches in diameter shall be cut straight at an undamaged portion, maintained in a moist condition and then buried as soon as possible. Excavated soil shall not be placed within the dripline of any tree.

When installing main within the dripline of any tree with a diameter of 6 inches or larger, the root system shall be bored. The cost of the tree bore shall be considered incidental to the installation of the pipeline, and no extra compensation will be provided.

All tree root systems that require boring shall be bored a minimum of 30 feet; 15 feet either side of the tree trunk. The bore shall be located a minimum of 4 feet below the ground surface and a minimum of 5 feet from the center of the tree.

RESTORATION

AW. Unless otherwise noted on the Project Plans, surface restoration of grassy areas shall consist of seed and straw. The seed type used shall match the existing grass. Reseeded areas that are located within ditches or on other sloped ground shall be covered with erosion control netting secured with pins or stakes. As an alternative, the Contractor may utilize prefabricated matting containing mulch, seed, and fertilizer.

Areas that have landscaping shall be replaced with like materials (mulch, plants, etc.). The Contractor shall contact each customer with landscaping to be disturbed to give them the option of removing it prior to construction and replacing it. If the customer does not choose this option, the Contractor shall remove it for them or replace it with like materials following construction. The LWC general warranty period shall apply to this work.

AX. Sidewalks requiring replacement shall be constructed of Class A (3,500 psi) concrete with 6”x6”x10x10 Weld Wire Fabric (WWF) located at mid-depth (where A”xB”xCxD – A=lengthwise wire spacing, B=crosswise wire spacing C&D=size of wire(gauge)). In lieu of WWF, the Contractor may utilize a fiber-filled concrete mix. The completed sidewalk finish shall match the existing width and finish. Thickness of the sidewalk shall be 4-1/2 inches except at driveway crossings where the thickness shall be increased to 6 inches. Expansion joints shall be provided at driveway crossings and on approximate 25-foot spacing. Tooled joints shall be provided on 4-6 foot spacing. Wheelchair accessible ramps shall be provided as required by the City of Louisville Specifications.

AY. All driveways requiring replacement shall be restored in the following manner: (1) concrete driveways shall be replaced in their entirety to the nearest construction joint and (2) asphalt driveways shall be restored via a utility cut, as approved by the inspector and property owner.

POST CONSTRUCTION

AZ. All in-line and service valves installed and/or operated during the completion of this project shall be inspected after construction to verify that all valves used by the Contractor are left in the proper operating position. Unless otherwise noted, or directed, all gates shall be left open.

EROSION CONTROL MEASURES

BA. As a minimum, erosion control features shall be provided at catch basins, headwalls and in small ditches where associated construction procedures may cause the transport of sediment into the storm drainage system. When soil is disturbed within grassy areas, erosion control protection shall also be provided at

yard drains. Care will be required to minimize stockpiling or placing backfill or excavated materials on roadways.

BB. A copy of the LWC General Permit can be obtained from the Project Manager. In accordance with the General Permit, the work performed under this project is defined as a Class “C” Activity. Since the work will be completed with in the limits of a paved roadway, and no sensitive features will be impacted, an individual plan review is not necessary.

WARRANTY

BC. The Contractor warrants to the Company that materials and equipment furnished by the Contractor under the Contract will be new and of good quality unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Company, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

BD. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of the Contractor's obligation to perform the work in accordance with the Contract Documents:

1. Observations by the Project Manager;
2. Payment by the Company;
3. Issuance of a certificate of Substantial Completion;
4. Use or occupancy of any part of the Work by the Company;
5. Review of Shop Drawings or other Submittals;
6. Any inspection, test, or approval by others; or
7. Any correction of defective Work by the Company.

BE. Failure on the part of the Company to insist on strict performance by the Contractor of any provision of this Contract is not a waiver of any of the Company's rights and/or remedies, nor shall it relieve the Contractor from performing any subsequent obligations strictly in accordance with the terms of this Contract.

BF. The Company may, at its option, waive compliance with any particular Contract requirement. No waiver shall be effective unless in writing and signed by both the Company and the Contractor. Written waivers shall be limited to the specified provisions of this Contract specifically referred to herein, and shall not be

deemed a waiver of any other provision. The written waiver shall not constitute a continuing waiver unless it states otherwise.

BG. All work shall be warranted for two (2) years from the date of Final Completion unless specified otherwise. Paved surfaces and restoration of structures will be warranted for five (5) years. Contractor-furnished iron pipe materials shall be warranted for five (5) years after the iron pipeline is placed in service. Satisfactory performance of the iron water main and appurtenances, as they relate to installation, shall be warranted for two (2) years after the iron pipeline is placed in service. The Company reserves the right to require Contractor's presence at scheduled Warranty inspections held within the 12-month period following acceptance of the Project.

BH. Contractor shall assign to the Company all manufacturers' warranties. All such warranties shall be directly enforceable by the Company. Such assignment shall in no way affect the Contractor's responsibilities and duties during the warranty period.

N O T I C E

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
NATIONWIDE PERMIT AUTHORIZATION
KENTUCKY DIVISION OF WATER 401 WQC

PROJECT: Jefferson County, Item No. 5-482

The Section 404 activities for this project have been previously permitted under the authority of the Department of the Army Nationwide Permit No. 14 “Linear Transportation Crossings” as the project impacts are BELOW NOTIFICATION THRESHOLDS. Specifically all stream impacts are below 300’, less than 0.10 acres and no special aquatic sites will be impacted.

This project involves work near and/or within Jurisdictional Waters of the United States as defined by the United States Army Corps of Engineers and therefore requires a Nationwide 14 General 404 Permit. The Division of Water certified this General Permit with several conditions (See attached). One that should be brought to your attention is regarding the use of heavy equipment in the stream channel. If there is need to cross the stream channel with heavy equipment or conduct work from within the stream channel a working platform or temporary crossing is authorized. This should be constructed with clean rock and sufficient pipe to allow stream flow to continue unimpeded (see attached typical drawing).

In order for this authorization to be valid, the attached conditions must be followed. The contractor shall post a copy of this Nationwide Approval in a conspicuous location at the project site for the duration of construction and comply with the general conditions as required.

To more readily expedite construction, the contractor may elect to alter the design or perform the work in a manner different from what was originally proposed and specified. Prior to commencing such alternative work, the contractor shall obtain **written** permission from the Division of Construction and the Division of Environmental Analysis. If such changes necessitate further permitting then the contractor will be responsible for applying to the Army Corps of Engineers and the Kentucky Division of Water (KDOW). A copy of any request to the Corps of Engineers or the KDOW to alter this proposal and subsequent responses shall be forwarded to the Division of Environmental Analysis, DA Permit Coordinator, for office records and for informational purposes.

STEVEN L. BESHEAR
GOVERNOR

LEONARD K. PETERS
SECRETARY

ENERGY AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
200 FAIR OAKS LANE
FRANKFORT, KENTUCKY 40601
www.kentucky.gov

General Certification--Nationwide Permit # 14
Linear Transportation Projects

This General Certification is issued March 19, 2012, in conformity with the requirements of Section 401 of the Clean Water Act of 1977, as amended (33 U.S.C. §1341), as well as Kentucky Statute KRS 224.16-050.

For this and all nationwide permits, the definition of surface water is as per 401 KAR 10:001 Chapter 10, Section 1(80): Surface Waters means those waters having well-defined banks and beds, either constantly or intermittently flowing; lakes and impounded waters; marshes and wetlands; and any subterranean waters flowing in well-defined channels and having a demonstrable hydrologic connection with the surface. Lagoons used for waste treatment and effluent ditches that are situated on property owned, leased, or under valid easement by a permitted discharger are not considered to be surface waters of the commonwealth.

Agricultural operations, as defined by KRS 224.71-100(1) conducting activities pursuant to KRS 224.71-100 (3), (4), (5), (6), or 10 are deemed to have certification if they are implementing an Agriculture Water Quality Plan pursuant to KRS 224.71-145.

For all other operations, the Commonwealth of Kentucky hereby certifies under Section 401 of the Clean Water Act (CWA) that it has reasonable assurances that applicable water quality standards under Kentucky Administrative Regulations Title 401, Chapter 10, established pursuant to Sections 301, 302, 304, 306 and 307 of the CWA, will not be violated for the activity covered under NATIONWIDE PERMIT 14, namely Linear Transportation Projects, provided that the following conditions are met:

1. The activity will not occur within surface waters of the Commonwealth identified by the Kentucky Division of Water as Outstanding State or National Resource Water, Cold Water Aquatic Habitat, or Exceptional Waters.

2. The activity will not occur within surface waters of the Commonwealth identified as perpetually-protected (e.g. deed restriction, conservation easement) mitigation sites.

3. The activity will impact less than 1/2 acre of wetland/marsh.

4. The activity will impact less than 300 linear feet of surface waters of the Commonwealth. Stream realignment greater than 100 feet is not covered under this general water quality certification.

5. For a single and complete linear transportation project, the cumulative length of impacts less than 300 linear feet of surface waters within each Hydrologic Unit Code (HUC) 14 watershed will not exceed 500 linear feet.

6. Stream impacts covered under this General Water Quality Certification and undertaken by those persons defined as an agricultural operation under the Agricultural Water Quality Act must be completed in compliance with the Kentucky Agricultural Water Quality Plan (KWQP).

7. The Kentucky Division of Water may require submission of a formal application for an individual certification for any project if the project has been determined to likely have a significant adverse effect upon water quality or degrade the waters of the Commonwealth so that existing uses of the water body or downstream waters are precluded.

8. Activities that do not meet the conditions of this General Water Quality Certification require an Individual Section 401 Water Quality Certification.

9. Activities qualifying for coverage under this General Water Quality Certification are subject to the following conditions:

    - Erosion and sedimentation pollution control plans and Best Management Practices must be designed, installed, and maintained in effective operating condition at all times during construction activities so that violations of state water quality standards do not occur (401 KAR 10:031 Section 2 and KRS 224.70-100).
    - Sediment and erosion control measures, such as check-dams constructed of any material, silt fencing, hay bales, etc., shall not be placed within surface waters of the Commonwealth, either temporarily or permanently, without prior approval by the Kentucky Division of Water's Water Quality Certification Section. If placement of sediment and erosion control measures in surface waters is unavoidable, design and placement of temporary erosion control measures shall not be conducted in such a manner that may result in instability of streams that are adjacent to, upstream, or downstream of the structures. All sediment and erosion control devices shall be removed and the natural grade restored within the completion timeline of the activities.
    - Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
    - Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access.
    - To the maximum extent practicable, all in-stream work under this certification shall be performed under low-flow conditions.

General Certification--Nationwide Permit # 14
Linear Transportation Projects
Page 2

- Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances in which such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.
- Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If rip-rap is utilized, it should be of such weight and size that bank stress or slump conditions will not be created because of its placement.
- If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the permittee shall notify the operator when such work will be done.
- Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the KDOW shall be notified immediately by calling (800) 928-2380.

Non-compliance with the conditions of this general certification or violation of Kentucky state water quality standards may result in civil penalties.

KENTUCKY REGIONAL GENERAL CONDITIONS

These regional conditions are in addition to, but do not supersede, the requirements in the Federal Register (Volume 77 No. 34 of February 21, 2012)

Notifications for all Nationwide Permits (NWPs) shall be in accordance with General Condition No. 31.

1. For activities that would result in a loss of Outstanding State or National Resource Waters (OSNRWs), Exceptional Waters (EWs), Coldwater Aquatic Habitat Waters (CAHs) and waters with Designated Critical Habitat (DCH) under the Endangered Species Act for the NWPs listed below, a Pre-Construction Notification (PCN) will be required to the Corps. The Corps will coordinate with the appropriate resource agencies (see attached list) on these NWPs for impacts to these waters.

   NWP 3 (Maintenance)
   NWP 7 (Outfall Structures and Associated Intake Structures)
   NWP 12 (Utility Line Activities)
   NWP 14 (Linear Transportation Projects)
   NWP 29 (Residential Developments)
   NWP 39 (Commercial and Institutional Developments)
   NWP 40 (Agricultural Activities)
   NWP 41 (Reshaping Existing Drainage Ditches)
   NWP 42 (Recreational Facilities)
   NWP 43 (Stormwater Management Facilities)
   NWP 44 (Mining Activities)
   NWP 51 (Land-Based Renewable Energy Generation Facilities)
   NWP 52 (Water-Based Renewable Energy Generation Pilot Projects)

2. In addition to the notification and agency coordination requirements in the NWPs, for impacts greater than 0.25 acres in all "waters of the U.S." for the NWPs listed below, a PCN will be required to the Corps. The Corps will coordinate with the appropriate resource agencies (see attached list) on these NWPs:

   NWP 3 (Maintenance)
   NWP 7 (Outfall Structures and Associated Intake Structures)
   NWP 12 (Utility Line Activities)
   NWP 14 (Linear Transportation Projects)
   NWP 29 (Residential Developments)
   NWP 39 (Commercial and Institutional Developments)
   NWP 40 (Agricultural Activities)
   NWP 41 (Reshaping Existing Drainage Ditches)
   NWP 42 (Recreational Facilities)
   NWP 43 (Stormwater Management Facilities)
   NWP 44 (Mining Activities)
   NWP 51 (Land-Based Renewable Energy Generation Facilities)
   NWP 52 (Water-Based Renewable Energy Generation Pilot Projects)

3. For activities in all "waters of the U.S." for the NWPs listed below, a PCN will be required to the Corps. The Corps will coordinate with the appropriate resource agencies (see attached list) on these NWPs:

   NWP 21 (Surface Coal Mining Activities)
   NWP 27 (Aquatic Habitat Restoration, Establishment & Enhancement Activities)
   NWP 49 (Coal Remining Activities)
   NWP 50 (Underground Coal Mining Activities)

4. Nationwide Permit No. 14 – Linear Transportation Projects.

   (a) Activities in Section 10 navigable waters will require a PCN to the Corps.

   (b) New public road alignments or realignments are limited to a permanent loss of 500 linear feet of intermittent or perennial stream length at each crossing. Public road crossings with permanent losses greater than 500 linear feet of intermittent or perennial stream associated with new alignments or realignments will be evaluated as an individual permit i.e., a Letter of Permission or as a Standard Individual Permit.

   (c) All linear transportation project crossings resulting in the permanent loss of greater than 300 linear feet of intermittent or perennial stream will require mitigation to compensate for impacts to the "waters of the U.S." The permanent loss of "waters of the U.S." includes the linear feet of water that is permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity and not restored to pre-construction contours and elevations after construction. In addition to the notification requirements contained in NWP 14, the permittee must submit a PCN to the district engineer prior to commencing the activity for the permanent loss of greater than 300 feet of intermittent and perennial stream of all "waters of the U.S.". (See General Condition 31 and the definition of "loss of waters of the United States" in the Nationwide Permits for further information.)

Further information:
Outstanding State or National Resource Water (OSNRWs), Exceptional Waters (EWs), and Coldwater Aquatic Habitat Waters (CAHs) are waters designated by the Commonwealth of Kentucky, Natural Resources and Environmental Protection Cabinet. The list can be found at the following link: http://eppcapp.ky.gov/spwaters/
Designated Critical Habitat (DCH) under the Endangered Species Act is determined within the Commonwealth of Kentucky by the U.S. Fish and Wildlife Service. The current list of Kentucky's Threatened, Endangered, and Federal Candidate Species can be found at the following link: http://www.fws.gov/frankfort/EndangeredSpecies.html

Information on Pre-Construction Notification (PCN) can be found at NWP General Condition No. 31 (Federal Register, Volume 77, No. 34, Tuesday, February 21, 2012, pp 10286-10288).
Mitigation includes activities that avoid, minimize, and compensate for impacts.

COORDINATING RESOURCE AGENCIES

Chief, Wetlands Regulatory Section
U.S. Environmental Protection Agency
Region IV
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, Georgia 30303
Supervisor
U.S. Fish & Wildlife Service
JC Watts Federal Building, Room 265
330 West Broadway
Frankfort, Kentucky 40601
Supervisor
401 Water Quality Certification
Kentucky Division of Water
200 Fair Oaks Lane, 4th Floor
Frankfort, Kentucky 40601
Commissioner
Department of Fish and Wildlife Resources
#1 Game Farm Road
Frankfort, Kentucky 40601
Executive Director and State Historic Preservation Officer
Kentucky Heritage Council
300 Washington Street
Frankfort, Kentucky 40601

ADDITIONAL COORDINATING RESOURCE AGENCY FOR NWPS 21, 49, AND 50

Kentucky Department of Natural Resources
Division of Mine Permits
#2 Hudson Hollow
Frankfort, Kentucky 40601

US Army Corps of Engineers

Nationwide Permit
No. 14, Linear Transportation Projects

Activities required for the construction, expansion, modification, or improvement of linear transportation projects (e.g., roads, highways, railways, trails, airport runways, and taxiways) in waters of the United States.

a. For linear transportation projects in non-tidal waters, the discharge cannot cause the loss of greater than 1/2-acre of waters of the United States. For linear transportation projects in tidal waters, the discharge cannot cause the loss of greater than 1/3-acre of waters of the United States.

b. Any stream channel modification, including bank stabilization, is limited to the minimum necessary to construct or protect the linear transportation project; such modifications must be in the immediate vicinity of the project.

c. This NWP also authorizes temporary structures, fills, and work necessary to construct the linear transportation project. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

d. This NWP cannot be used to authorize non-linear features commonly associated with transportation projects, such as vehicle maintenance or storage buildings, parking lots, train stations, or aircraft hangars.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if: (1) the loss of waters of the United States exceeds
1/10-acre; or (2) there is a discharge in a special aquatic site, including wetlands. (See general condition 31.) (Sections 10 and 404)

Note: Some discharges for the construction of farm roads or forest roads, or temporary roads for moving mining equipment, may qualify for an exemption under Section 404(f) of the Clean Water Act (see 33 CFR 323.4).

Valid from March 19, 2012 through March 18, 2017

Nationwide Permit General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as applicable, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/or Coastal Zone Management Act consistency for an NWP. Every person who may wish to obtain permit authorization under one or more NWPs, or who is currently relying on an existing or prior permit authorization under one or more NWPs, has been and is on notice that all of the provisions of 33 CFR §§ 330.1 through 330.6 apply to every NWP authorization. Note especially 33 CFR § 330.5 relating to the modification, suspension, or revocation of any NWP authorization.

1. Navigation. (a) No activity may cause more than a minimal adverse effect on navigation.

(b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.

(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. Aquatic Life Movements. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species.

3. Spawning Areas. Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. Migratory Bird Breeding Areas. Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. Shellfish Beds. No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.

6. Suitable Material. No activity may use unsuitable material (e.g., trash, debris, car

bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

7. Water Supply Intakes. No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. Adverse Effects From Impoundments. If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. Management of Water Flows. To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization and storm water management activities, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

10. Fills Within 100-Year Floodplains. The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. Equipment. Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. Soil Erosion and Sediment Controls. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow.

13. Removal of Temporary Fills. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. Proper Maintenance. Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

15. Single and Complete Project. The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

16. Wild and Scenic Rivers. No activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River

designation or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service).

17. Tribal Rights. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

18. Endangered Species. (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless Section 7 consultation addressing the effects of the proposed activity has been completed.

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will review the documentation and determine whether it is sufficient to address ESA compliance for the NWP activity, or whether additional ESA consultation is necessary.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the pre-construction notification must include the name(s) of the endangered or threatened species that might be affected by the proposed work or that utilize the designated critical habitat that might be affected by the proposed work. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete pre-construction notification. In cases where the non-Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the project, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification the proposed activities will have "no effect" on listed species or critical habitat, or until Section 7 consultation has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species-specific regional endangered species conditions to the NWPs.

(e) Authorization of an activity by a NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the U.S. FWS or the NMFS, The Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word "harm" in the definition of "take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

(f) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the U.S. FWS and NMFS or their world wide web pages at http://www.fws.gov/ or http://www.fws.gov/ipac and http://www.noaa.gov/fisheries.html respectively.

19. Migratory Birds and Bald and Golden Eagles. The permittee is responsible for obtaining any "take" permits required under the U.S. Fish and Wildlife Service's regulations governing compliance with the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act. The permittee should contact the appropriate local office of the U.S. Fish and Wildlife Service to determine if such "take" permits are required for a particular activity.

20. Historic Properties. (a) In cases where the district engineer determines that the activity may affect properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(b) Federal permittees should follow their own procedures for complying with the requirements of Section 106 of the National Historic Preservation Act. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will review the documentation and determine whether it is sufficient to address section 106 compliance for the NWP activity, or whether additional section 106 consultation is necessary.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if the authorized activity may have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties may be affected by the proposed work or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of or potential for the presence of historic resources can be sought from the State Historic Preservation Officer or Tribal Historic Preservation Officer, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of Section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted and these efforts, the district engineer shall determine whether the proposed activity has the potential to cause an effect on the historic properties. Where the non-Federal applicant has identified historic properties on which the activity may have the potential to cause effects and so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects or that consultation under Section 106 of the NHPA has been completed.

(d) The district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA Section 106 consultation is required. Section 106 consultation is not required when the Corps determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR §800.3(a)). If NHPA section 106 consultation is required and will occur, the district engineer will notify the non-Federal applicant that he or she cannot begin work until Section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must

still wait for notification from the Corps.

(e) Prospective permittees should be aware that section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

21. Discovery of Previously Unknown Remains and Artifacts. If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by this permit, you must immediately notify the district engineer of what you have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

22. Designated Critical Resource Waters. Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.

(a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, and 52 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, and 38, notification is required in accordance with general condition 31, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

23. Mitigation. The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that adverse effects on the aquatic environment are minimal:

(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse effects of the proposed activity are minimal, and provides a project-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in minimal adverse effects on the aquatic environment. Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

(1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in minimal adverse effects on the aquatic environment.

(2) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, wetland restoration should be the first compensatory mitigation option considered.

(3) If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan may be used by the district engineer to make the decision on the NWP verification request, but a final mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) – (14) must be approved by the district engineer before the permittee begins work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)).

(4) If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan only needs to address the baseline conditions at the impact site and the number of credits to be provided.

(5) Compensatory mitigation requirements (e.g., resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan.

(d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation, such as stream rehabilitation, enhancement, or preservation, to ensure that the activity results in minimal adverse effects on the aquatic environment.

(e) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any project resulting in the loss of greater than 1/2-acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that a project already meeting the established acreage limits also satisfies the minimal impact requirement associated with the NWPs.

(f) Compensatory mitigation plans for projects in or near streams or other open waters will normally include a requirement for the restoration or establishment, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, riparian areas may be the only compensatory mitigation required. Riparian areas should consist

of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to establish a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or establishing a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

(g) Permittees may propose the use of mitigation banks, in-lieu fee programs, or separate permittee-responsible mitigation. For activities resulting in the loss of marine or estuarine resources, permittee-responsible compensatory mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee-responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.

(h) Where certain functions and services of waters of the United States are permanently adversely affected, such as the conversion of a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse effects of the project to the minimal level.

24. Safety of Impoundment Structures. To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

25. Water Quality. Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA Section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

26. Coastal Zone Management. In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

27. Regional and Case-By-Case Conditions. The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with

any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

28. Use of Multiple Nationwide Permits. The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the United States authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

29. Transfer of Nationwide Permit Verifications. If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:

"When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

_____
(Transferee)

_____
(Date)

30. Compliance Certification. Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include:

(a) A statement that the authorized work was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions;

(b) A statement that the implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and

(c) The signature of the permittee certifying the completion of the work and mitigation.

31. Pre-Construction Notification. (a) Timing. Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. The request must specify the information needed to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

(1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

(2) 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or in the vicinity of the project, or to notify the Corps pursuant to general condition 20 that the activity may have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or Section 106 of the National Historic Preservation (see 33 CFR 330.4(g)) has been completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) Contents of Pre-Construction Notification: The PCN must be in writing and include the following information:

(1) Name, address and telephone numbers of the prospective permittee;

(2) Location of the proposed project;

(3) A description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause, including the anticipated amount of loss of water of the United States expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. The description should be sufficiently detailed to allow the district engineer to determine that the adverse effects of the project will be minimal and to determine the need for compensatory mitigation. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the project and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative

description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);

(4) The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many waters of the United States. Furthermore, the 45 day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;

(5) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse effects are minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(6) If any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, for non-Federal applicants the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed work or utilize the designated critical habitat that may be affected by the proposed work. Federal applicants must provide documentation demonstrating compliance with the Endangered Species Act; and

(7) For an activity that may affect a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, for non-Federal applicants the PCN must state which historic property may be affected by the proposed work or include a vicinity map indicating the location of the historic property. Federal applicants must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act.

(c) Form of Pre-Construction Notification: The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is a PCN and must include all of the information required in paragraphs (b)(1) through (7) of this general condition. A letter containing the required information may also be used.

(d) Agency Coordination: (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the project's adverse environmental effects to a minimal level.

(2) For all NWP activities that require pre-construction notification and result in the loss of greater than 1/2-acre of waters of the United States, for NWP 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52 activities that require pre-construction notification and will result in the loss of greater than 300 linear feet of intermittent and ephemeral stream bed, and for all NWP 48 activities that require pre-construction notification, the district engineer will immediately provide (e.g., via e-mail, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (U.S. FWS, state natural resource or water quality agency, EPA, State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Office (THPO), and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to telephone or fax the district engineer notice that they intend to provide substantive, site-specific comments.

The comments must explain why the agency believes the adverse effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district engineer will fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure the net adverse environmental effects to the aquatic environment of the proposed activity are minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

(3) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by Section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

(4) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of pre-construction notifications to expedite agency coordination.

D. District Engineer's Decision

1. In reviewing the PCN for the proposed activity, the district engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest. For a linear project, this determination will include an evaluation of the individual crossings to determine whether they individually satisfy the terms and conditions of the NWP(s), as well as the cumulative effects caused by all of the crossings authorized by NWP. If an applicant requests a waiver of the 300 linear foot limit on impacts to intermittent or ephemeral streams or of an otherwise applicable limit, as provided for in NWPs 13, 21, 29, 36, 39, 40, 42, 43, 44, 50, 51 or 52, the district engineer will only grant the waiver upon a written determination that the NWP activity will result in minimal adverse effects. When making minimal effects determinations the district engineer will consider the direct and indirect effects caused by the NWP activity. The district engineer will also consider site specific factors, such as the environmental setting in the vicinity of the NWP activity, the type of resource that will be affected by the NWP activity, the functions provided by the aquatic resources that will be affected by the NWP activity, the degree or magnitude to which the aquatic resources perform those functions, the extent that aquatic resource functions will be lost as a result of the NWP activity (e.g., partial or complete loss), the duration of the adverse effects (temporary or permanent), the importance of the aquatic resource functions to the region (e.g., watershed or ecoregion), and mitigation required by the district engineer. If an appropriate functional assessment method is available and practicable to use, that assessment method may be used by the district engineer to assist in the minimal adverse effects determination. The district engineer may add case-specific special conditions to the NWP authorization to address site-specific environmental concerns.

2. If the proposed activity requires a PCN and will result in a loss of greater than 1/10-acre of wetlands, the prospective permittee should submit a mitigation proposal with the PCN. Applicants may also propose compensatory mitigation for projects with smaller impacts. The district engineer will consider any proposed compensatory mitigation the applicant has included in the proposal in determining whether the net adverse environmental effects to the aquatic environment of the proposed activity are minimal. The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse effects on the aquatic environment are minimal, after considering mitigation, the district engineer will notify the permittee and include any activity-specific conditions in the NWP verification the district engineer deems necessary. Conditions for compensatory mitigation requirements must comply with the appropriate provisions at 33 CFR 332.3(k). The district engineer must approve the final mitigation plan before the permittee commences work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the district engineer will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the proposed compensatory mitigation plan within 45 calendar days of receiving a complete PCN and determine whether the proposed mitigation would ensure no more than minimal adverse effects on the aquatic environment. If the net adverse effects of the project on the aquatic environment (after consideration of the compensatory mitigation proposal) are determined by the district engineer to be minimal, the district engineer will provide a timely written response to the applicant. The response will state that the project can proceed under the terms and conditions of the NWP, including any activity-specific conditions added to the NWP authorization by the district engineer.

3. If the district engineer determines that the adverse effects of the proposed work are more than minimal, then the district engineer will notify the applicant either: (a) that the project does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (b) that the project is authorized under the NWP subject to the applicant's submission of a mitigation plan that would reduce the adverse effects on the aquatic environment to the minimal level; or (c) that the project is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal adverse effects occur to the aquatic environment, the activity will be authorized within the 45-day PCN period, with activity-specific conditions that state the mitigation requirements. The authorization will include the necessary conceptual or detailed mitigation or a requirement that the applicant submit a mitigation plan that would reduce the adverse effects on the aquatic environment to the minimal level. When mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan or has determined that prior approval of a final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation.

E. Further Information

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.

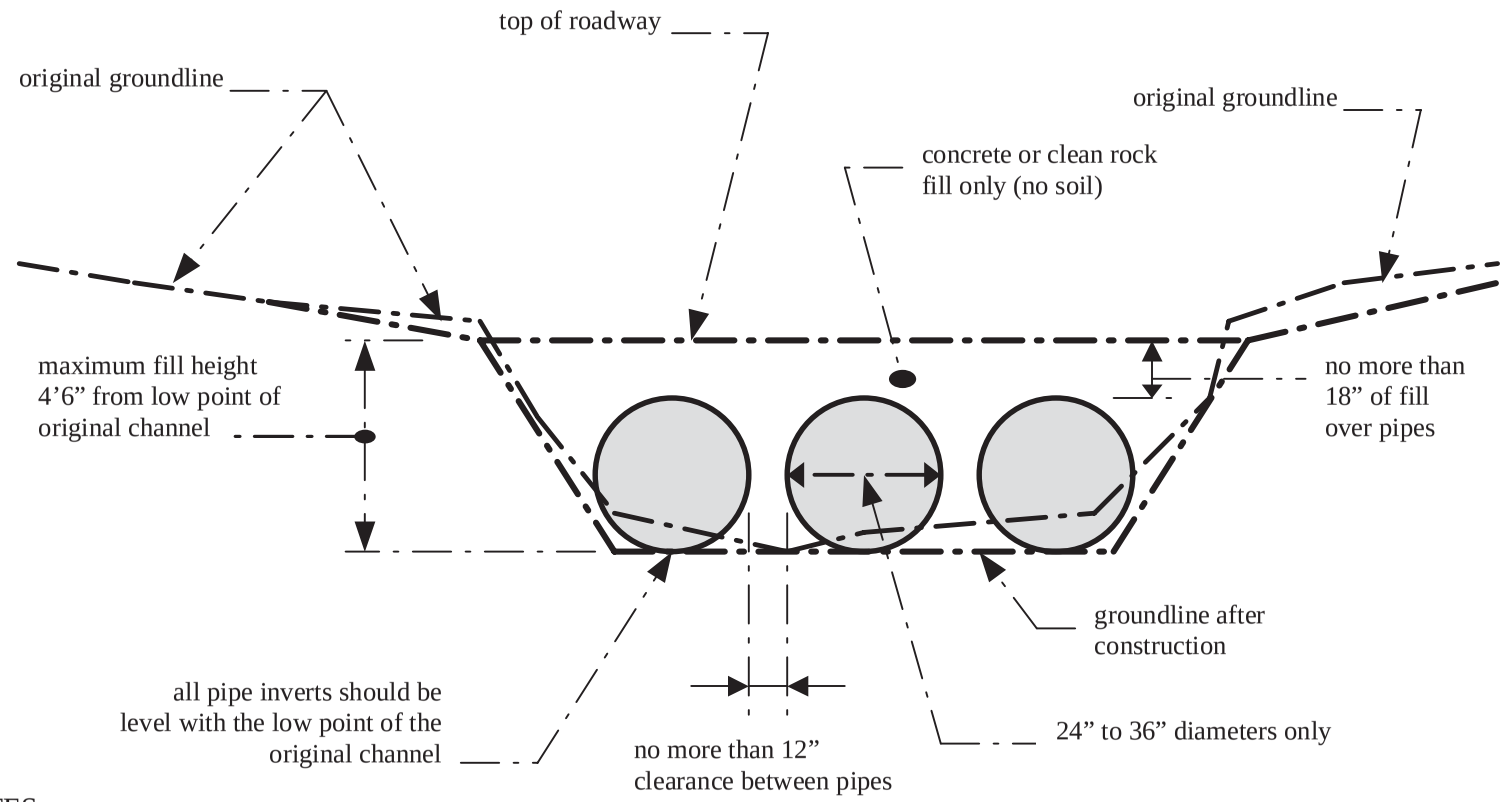
2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.

3. NWPs do not grant any property rights or exclusive privileges.

4. NWPs do not authorize any injury to the property or rights of others.

5. NWPs do not authorize interference with any existing or proposed Federal project.

ATTACHMENT 1



NOTES:

1. This is a conceptual drawing. The number and size of pipes and other details will vary depending on specific site conditions.
2. The pipes and backfill must be contained within the stream channel as shown above. During the construction of the approaches and access roadway across the floodplain, unstable and unconsolidated materials unsuitable for roadways may be excavated and replaced with riprap, crushed stone, or other stable road construction materials. This may only be done, however, with the following provisions: (1) the disposal of excess, unconsolidated materials thus excavated must be outside of the floodplain and (2) the finished surface of the completed road may be no more than three inches (3") above the pre-construction surface of the floodplain at any point beyond the top of banks.

LOW-WATER CROSSING

STANDARD DRAWING
Not to Scale

SPECIAL NOTE FOR EROSION CONTROL

I. DESCRIPTION

Perform all erosion and water pollution control work in accordance with the Department's 2008 Standard Specifications, these notes, and interim Supplemental Specifications, Special Provisions and Special Notes, and Standard and Sepia Drawings, current editions, and as directed by the Engineer. Section references are to the Standard Specifications. This work shall consist of:

(1) Developing and preparing a Best Management Practices Plan (BMP) tailored to suit the specific construction phasing for each site within the project; (2) Preparing the project site for construction, including locating, furnishing, installing, and maintaining temporary and/or permanent erosion and water pollution control measures as required by the BMP prior to beginning any earth disturbing activity on the project site; (3) Clearing and grubbing and removal of all obstructions as required for construction; (4) Removing all erosion control devices when no longer needed; (5) Restoring all disturbed areas as nearly as possible to their original condition; (6) Preparing seedbeds and permanently seeding all disturbed areas; (7) Providing a Kentucky Erosion Prevention and Sediment Control Program (KEPSC) qualified inspector; and (8) Performing any other work to prevent erosion and/or water pollution as specified by this contract, required by the BMP, or as directed by the Engineer.

II. MATERIALS

Furnish materials in accordance with these notes, the Standard Specifications and interim Supplemental Specifications, and applicable Special Provisions and Special Notes, and Standard and Sepia Drawings, current editions. Provide for all materials to be sampled and tested in accordance with the Department's Sampling Manual. Unless directed otherwise by the Engineer, make the materials available for sampling a sufficient time in advance of the use of the materials to allow for the necessary time for testing.

III. CONSTRUCTION

Be advised, these Erosion Control Plan Notes do not constitute a BMP plan for the project. Jointly with the Engineer, prepare a site specific BMP plan for each drainage area within the project in accordance with Section 213 and the supplemental specifications. Provide a unique BMP at each project site using good engineering practices taking into account existing site conditions, the type of work to be performed, and the construction phasing, methods and techniques to be utilized to complete the work. Be responsible for all erosion prevention, sediment control, and water pollution prevention measures required by the BMP for each site. Represent and warrant compliance with the Clean Water Act (33 USC Section 1251 et seq.), the 404 Permit, the 401 Water Quality

Certification, and applicable state and local government agency laws, regulations, rules, specifications, and permits. Contrary to Section 105.05, in case of discrepancy between theses notes, the Standard Specifications, interim Supplemental Specifications, Special and Special Notes, Standard and Sepia Drawings, and such state and local government agency requirements, adhere to the most restrictive requirement.

Conduct operations in such a manner as to minimize the amount of disturbed ground during each phase of the construction and limit the haul roads to the minimum required to perform the work.. Preserve existing vegetation not required to be removed by the work or the contract. Seed and/or mulch disturbed areas at the earliest opportunity. Use silt fence, silt traps, temporary ditches, brush barriers, erosion control blankets, sodding, channel lining, and other erosion control measures in a timely manner as required by the BMP and as directed or approved by the Engineer. Prevent sediment laden water from leaving the project, entering an existing drainage structure, or entering a steam.

Provide for erosion control measures to be in place and functioning prior to any earth disturbance within a drainage area. Compute the volume and size of silt control devices necessary to control sediment during each phase of construction. Remove sediment from silt traps before they become a maximum of ½ full. Maintain silt fence by removing accumulated trappings and/or replacing the geotextile fabric when it becomes clogged, damaged, or deteriorated, or when directed by the Engineer. Properly dispose of all materials trapped by erosion control devices at approved sites off the right of way obtained by the Contractor at no additional cost to the Department (See Special Note for Waste and Borrow).

As work progresses, add or remove erosion control measures as required by the BMP applicable to the Contractor’s project phasing and construction methods and techniques. Update the volume calculations and modify the BMP as necessary throughout the duration of the project. Ensure that an updated BMP is kept on site and available for public inspection throughout the life of the project.

After all construction is complete, restore all disturbed areas in accordance with Section 212. completely remove all temporary erosion control devices not required as part of the permanent erosion control from the construction site. Prior to removal, obtain the Engineer’s concurrence of items to be removed. Grade the remaining exposed earth (both on and off the Right of-Way) as nearly as possible to its original condition, or as directed by the Engineer. Prepare the seed bed areas and sow all exposed earthen areas with the applicable seed mixture(s) according to Section 212.03.03.

IV. MEASUREMENT

Erosion Control Blanket. If required by the BMP, the Department will measure Erosion Control Blanket according to Section 212.04.07.

Sodding. If required by the BMP, the Department will measure Sodding according to Section 212.04.08.

Channel Lining. If required by the BMP, the Department will measure Channel Lining according to Sections 703.04.04-703.04.07.

Erosion Control. Contrary to Sections 212.04 and 213.04, other than Erosion Control Blankets, Sodding, and Channel Lining, the Department will measure Erosion Control as one lump sum. The Department will not measure developing, updating, and maintaining a BMP plan for each site; providing a KEPSC qualified inspector; locating, furnishing, installing, inspecting, maintaining, and removing erosion and water pollution control items; Roadway Excavation, Borrow Excavation, Embankment In Place, Topsoil Furnished and Placed, and Spreading Stockpiled Topsoil; Topdressing Fertilizer, Temporary and Permanent Seeding and Protection, Special Seeding Crown Vetch, and Temporary Mulch; Sedimentation Basin and Clean Sedimentation Basin, Silt Trap Type "A" and Clean Silt Trap Type "A"; Silt Trap Type "B" and Clean Silt Trap Type "B"; Silt Trap Type "C" and Clean Silt Trap Type "C"; Temporary Silt Fence and Clean Temporary Silt Fence; Plants, Vines, Shrubs, and Trees; Gabion and Dumped Stone Deflectors and Riffle Structures; Boulders; and Temporary Ditches and clean Temporary Ditches; and all other erosion and water pollution control items required by the BMP or the Engineer, but shall be incidental to Erosion Control.

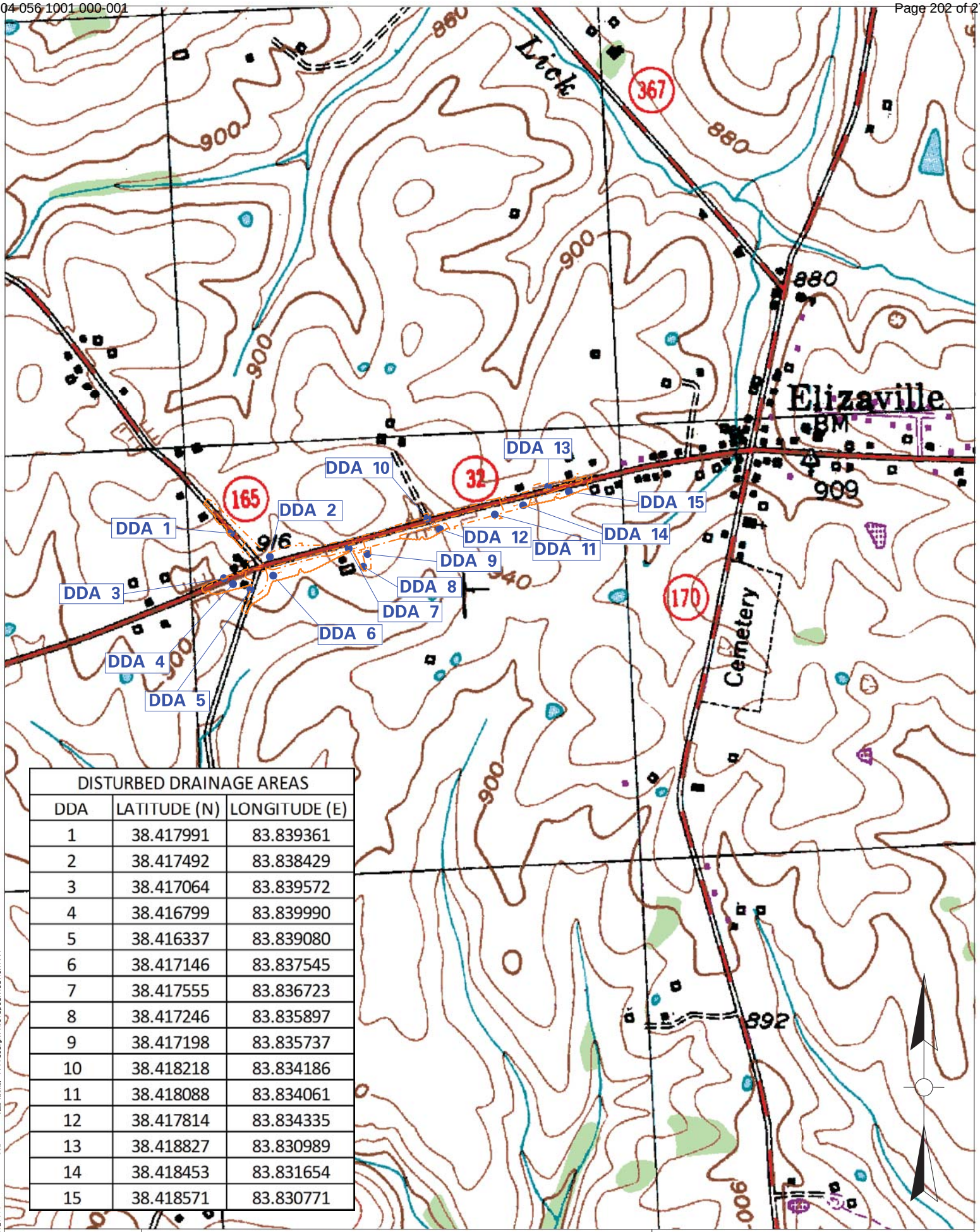
V. Basis of Payment

Erosion Control Blanket. If not listed as a bid item, but required by the BMP, the Department will pay for Erosion Control Blankets as Extra Work according to Sections 104.03 and 109.04.

Sodding. If not listed as a bid item, but required by the BMP, the Department will pay for Sodding as Extra Work according to Sections 104.03 and 109.04.

Channel Lining. If not listed as a bid item, but required by the BMP, the Department will pay for Channel Lining as Extra Work according to Sections 104.03 and 109.04.

Erosion Control. Contrary to Sections 212.05 and 213.05, other than Erosion Control Blanket, Sodding, and Channel Lining, payment at the Contract lump sum price for Erosion Control, shall be full compensation for all materials, equipment, labor and incidentals necessary to complete the erosion and water pollution control work as specified in these notes, Sections 212 and 213, the Supplemental Specifications, applicable Special Provisions and Special Notes, and Standard and Sepia Drawings, including but not limited to developing, updating, and maintaining a BMP plan for each site; providing a KEPSC qualified inspector; locating, furnishing, installing, inspecting, maintaining, and removing erosion and water pollution control items; Roadway Excavation, Borrow Excavation, Embankment In Place, Topsoil Furnished and Placed, and Spreading Stockpiled Topsoil; Topdressing Fertilizer, Temporary and Permanent Seeding and Protection, Special Seeding Crown Vetch, and Temporary Mulch; Sedimentation Basin and Clean Sedimentation Basin, Silt Trap Type “A” and Clean Silt Trap Type “A”; Silt Trap Type “B” and Clean Silt Trap Type “B”; Silt Trap Type “C” and Clean Silt Trap Type “C”; Temporary Silt Fence and Clean Temporary Silt Fence; Plants, Vines, Shrubs, and Trees; Gabion and Dumped Stone Deflectors and Riffle Structures; Boulders; and Temporary Ditches and clean Temporary Ditches; and all other erosion and water pollution control items required by the BMP or the Engineer



DISTURBED DRAINAGE AREAS		
DDA	LATITUDE (N)	LONGITUDE (E)
1	38.417991	83.839361
2	38.417492	83.838429
3	38.417064	83.839572
4	38.416799	83.839990
5	38.416337	83.839080
6	38.417146	83.837545
7	38.417555	83.836723
8	38.417246	83.835897
9	38.417198	83.835737
10	38.418218	83.834186
11	38.418088	83.834061
12	38.417814	83.834335
13	38.418827	83.830989
14	38.418453	83.831654
15	38.418571	83.830771

DATE: $$$$DATE$$$$ USER: $$$$USER$$$$ FILE NAME: $$$$designs\files\specification$$$$

Kentucky Transportation	SITE: KY 32		STREAM: MUD LICK		
	COUNTY: FLEMING	STATE: KENTUCKY	NEAR: ELIZAVILLE	ITEM: 9-8702	SHEET: 1 OF 1

MEMORANDUM

TO: All Prequalified Contractors

FROM: Bob Lewis, PE
Acting Director
Division of Construction Procurement

DATE: April 27, 2015

SUBJECT: Mandatory Pre-Bid Conference
Jefferson County
Contract ID
Relocation of Grade Lane (CS1001G) Between I65 Southbound Ramps and Grade Lane Connector
Item No. 05-0482.00

The Department of Highways will conduct a Mandatory Pre-Bid Conference for the subject project. The Pre-Bid Conference is scheduled for May 14th, 2015 at 10:00 AM local time at the KYTC District 5 Office Building – Main Conference Room, 8310 Westport Rd., Louisville, KY 40242.

Any prime contractor that is interested in bidding on the subject project or being part of a joint venture must be represented at the Pre-Bid Meeting by at least one person of sufficient authority to bind the company. No individual can represent more than one company. At the conference, a roster will be taken of the representatives present. Only companies represented at the meeting will be eligible to have their bids opened at the date of the letting.

The purpose of the meeting is to familiarize all prospective bidders with the contract requirements.

Department of Highways officials and the Design Consultant will be present at the meeting to answer questions concerning the project.

If you have any questions, please contact this office at 502-564-3500.

DCR/klm

SPECIAL NOTE FOR PRE-BID CONFERENCE
Jefferson County
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PART II

SPECIFICATIONS AND STANDARD DRAWINGS

SPECIFICATIONS REFERENCE

Any reference in the plans or proposal to previous editions of the *Standard Specifications for Road and Bridge Construction* and *Standard Drawings* are superseded by *Standard Specifications for Road and Bridge Construction, Edition of 2012* and *Standard Drawings, Edition of 2012 with the 2012 Revision.*

Supplemental Specifications to the
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Subsection:	102.15 Process Agent.
Revision:	Replace the 1st paragraph with the following: Every corporation doing business with the Department shall submit evidence of compliance with KRS Sections 14A.4-010, 271B.11-010, 271B.11-070, 271B.11-080, 271B.5-010 and 271B.16-220, and file with the Department the name and address of the process agent upon whom process may be served.
Subsection:	105.13 Claims Resolution Process.
Revision:	Delete all references to TC 63-34 and TC 63-44 from the subsection as these forms are no longer available through the forms library and are forms generated within the AASHTO SiteManager software.
Subsection:	108.03 Preconstruction Conference.
Revision:	Replace 8) Staking with the following: 8) Staking (designated by a Professional Engineer or Land Surveyor licensed in the Commonwealth of Kentucky.
Subsection:	109.07.02 Fuel.
Revision:	Revise item Crushed Aggregate Used for Embankment Stabilization to the following: Crushed Aggregate Used for Stabilization of Unsuitable Materials Used for Embankment Stabilization
	Delete the following item from the table. ~~Crushed Sandstone Base (Cement Treated)~~
Subsection:	110.02 Demobilization.
Revision:	Replace the first part of the first sentence of the second paragraph with the following: Perform all work and operations necessary to accomplish final clean-up as specified in the first paragraph of Subsection 105.12;
Subsection:	112.03.12 Project Traffic Coordinator (PTC).
Revision:	Replace the last paragraph of this subsection with the following: Ensure the designated PTC has sufficient skill and experience to properly perform the task assigned and has successfully completed the qualification courses.
Subsection:	112.04.18 Diversions (By-Pass Detours).
Revision:	Insert the following sentence after the 2nd sentence of this subsection. The Department will not measure temporary drainage structures for payment when the contract documents provide the required drainage opening that must be maintained with the diversion. The temporary drainage structures shall be incidental to the construction of the diversion. If the contract documents fail to provide the required drainage opening needed for the diversion, the cost of the temporary drainage structure will be handled as extra work in accordance with section 109.04.
Subsection:	201.03.01 Contractor Staking.
Revision:	Replace the first paragraph with the following: Perform all necessary surveying under the general supervision of a Professional Engineer or Land Surveyor licensed in the Commonwealth of Kentucky.

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Subsection:	201.04.01 Contractor Staking.
Revision:	Replace the last sentence of the paragraph with the following: Complete the general layout of the project under the supervision of a Professional Engineer or Land Surveyor licensed in the Commonwealth of Kentucky.
Subsection:	206.04.01 Embankment-in-Place.
Revision:	Replace the fourth paragraph with the following: The Department will not measure **suitable** excavation included in the original plans that is disposed of for payment and will consider it incidental to Embankment-in-Place.
Subsection:	208.02.01 Cement.
Revision:	Replace paragraph with the following: Select Type I or Type II cement conforming to Section 801. Use the same type cement throughout the work.
Subsection:	208.03.06 Curing and Protection.
Revision:	Replace the fourth paragraph with the following: Do not allow traffic or equipment on the finished surface until the stabilized subgrade has cured for a total of 7-days with an ambient air temperature above 40 degrees Fahrenheit. A curing day consists of a continuous 24-hour period in which the ambient air temperature does not fall below 40 degrees Fahrenheit. Curing days will not be calculated consecutively, but must total seven (7) , 24-hour days with the ambient air temperature remaining at or above 40 degrees Fahrenheit before traffic or equipment will be allowed to traverse the stabilized subgrade. The Department may allow a shortened curing period when the Contractor requests. The Contractor shall give the Department at least 3 day notice of the request for a shortened curing period. The Department will require a minimum of 3 curing days after final compaction. The Contractor shall furnish cores to the treated depth of the roadbed at 500 feet intervals for each lane when a shortened curing time is requested. The Department will test cores using an unconfined compression test. Roadbed cores must achieve a minimum strength requirement of 80 psi.
Subsection:	208.03.06 Curing and Protection.
Revision:	Replace paragraph eight with the following: At no expense to the Department, repair any damage to the subgrade caused by freezing.
Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	A) Seed Mixtures for Permanent Seeding.
Revision:	Revise **Seed Mix Type I** to the mixture shown below: 50% Kentucky 31 Tall Fescue (Festuca arundinacea) 35% Hard Fescue (Festuca (Festuca longifolia) 10% Ryegrass, Perennial (Lolium perenne) 5% White Dutch Clover (Trifolium repens)
Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	A) Seed Mixtures for Permanent Seeding.
Number:	2)
Revision:	Replace the paragraph with the following: Permanent Seeding on Slopes Greater than 3:1 in Highway Districts 4, 5, 6, and 7. Apply seed mix Type II at a minimum application rate of 100 pounds per acre. If adjacent to a golf course replace the crown vetch with Kentucky 31 Tall Fescue.

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Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	A) Seed Mixtures for Permanent Seeding.
Number:	3)
Revision:	Replace the paragraph with the following: Permanent Seeding on Slopes Greater than 3:1 in Highway Districts 1, 2, 3, 8, 9, 10, 11, and 12. Apply seed mix Type III at a minimum application rate of 100 pounds per acre. If adjacent to crop land or golf course, replace the Sericea Lespedeza with Kentucky 31 Fescue.
Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	B) Procedures for Permanent Seeding.
Revision:	Delete the first sentence of the section.
Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	B) Procedures for Permanent Seeding.
Revision:	Replace the second and third sentence of the section with the following: Prepare a seedbed and apply an initial fertilizer that contains a minimum of 100 pounds of nitrogen, 100 pounds of phosphate, and 100 pounds of potash per acre. Apply agricultural limestone to the seedbed when the Engineer determines it is needed. When required, place agricultural limestone at a rate of 3 tons per acre.
Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	D) Top Dressing.
Revision:	Change the title of part to D) Fertilizer.
Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	D) Fertilizer.
Revision:	Replace the first paragraph with the following: Apply fertilizer at the beginning of the seeding operation and after vegetation is established. Use fertilizer delivered to the project in bags or bulk. Apply initial fertilizer to all areas prior to the seeding or sodding operation at the application rate specified in 212.03.03 B). Apply 20-10-10 fertilizer to the areas after vegetation has been established at a rate of 11.5 pounds per 1,000 square feet. Obtain approval from the Engineer prior to the 2nd fertilizer application. Reapply fertilizer to any area that has a streaked appearance. The reapplication shall be at no additional cost to the Department. Re-establish any vegetation severely damaged or destroyed because of an excessive application of fertilizer at no cost to the Department.
Subsection:	212.03.03 Permanent Seeding and Protection.
Part:	D) Fertilizer.
Revision:	Delete the second paragraph.
Subsection:	212.04.04 Agricultural Limestone.
Revision:	Replace the entire section with the following: The Department will measure the quantity of agricultural limestone in tons.
Subsection:	212.04.05 Fertilizer.
Revision:	Replace the entire section with the following: The Department will measure fertilizer used in the seeding or sodding operations for payment. The Department will measure the quantity by tons.

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Subsection:	212.05 PAYMENT.
Revision:	Delete the following item code:
	Code Pay Item Pay Unit
	05966 Topdressing Fertilizer Ton
Subsection:	212.05 PAYMENT.
Revision:	Add the following pay items:
	Code Pay Item Pay Unit
	05963 Initial Fertilizer Ton
	05964 20-10-10 Fertilizer Ton
	05992 Agricultural Limestone Ton
Subsection:	213.03.02 Progress Requirements.
Revision:	Replace the last sentence of the third paragraph with the following:
	Additionally, the Department will apply a penalty equal to the liquidated damages when all aspects of the work are not coordinated in an acceptable manner within 7 calendar days after written notification.
Subsection:	213.03.05 Temporary Control Measures.
Part:	E) Temporary Seeding and Protection.
Revision:	Delete the second sentence of the first paragraph.
Subsection:	304.02.01 Physical Properties.
Table:	Required Geogrid Properties
Revision:	Replace all references to Test Method "GRI-GG2-87" with ASTM D 7737.
Subsection:	402.03.02 Contractor Quality Control and Department Acceptance.
Part:	B) Sampling.
Revision:	Replace the second sentence with the following:
	The Department will determine when to obtain the quality control samples using the random-number feature of the mix design submittal and approval spreadsheet. The Department will randomly determine when to obtain the verification samples required in Subsections 402.03.03 and 402.03.04 using the Asphalt Mixture Sample Random Tonnage Generator.
Subsection:	402.03.02 Contractor Quality Control and Department Acceptance.
Part:	D) Testing Responsibilities.
Number:	3) VMA.
Revision:	Add the following paragraph below Number 3) VMA:
	Retain the AV/VMA specimens and one additional corresponding G_{mm} sample for 5 working days for mixture verification testing by the Department. For Specialty Mixtures, retain a mixture sample for 5 working days for mixture verification testing by the Department. When the Department's test results do not verify that the Contractor's quality control test results are within the acceptable tolerances according to Subsection 402.03.03, retain the samples and specimens from the affected sublot(s) for the duration of the project.
Subsection:	402.03.02 Contractor Quality Control and Department Acceptance.
Part:	D) Testing Responsibilities.
Number:	4) Density.
Revision:	Replace the second sentence of the Option A paragraph with the following:
	Perform coring by the end of the following work day.

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Subsection: **Part:** **Number:** **Revision:**	402.03.02 Contractor Quality Control and Department Acceptance. D) Testing Responsibilities. 5) Gradation. Delete the second paragraph.
Subsection: **Part:** **Number:** **Revision:**	402.03.02 Contractor Quality Control and Department Acceptance. H) Unsatisfactory Work. 1) Based on Lab Data. Replace the second paragraph with the following: When the Engineer determines that safety concerns or other considerations prohibit an immediate shutdown, continue work and the Department will make an evaluation of acceptability according to Subsection 402.03.05.
Subsection: **Revision:**	402.03.03 Verification. Replace the first paragraph with the following: **402.03.03 Mixture Verification.** For volumetric properties, the Department will perform a minimum of one verification test for AC, AV, and VMA according to the corresponding procedures as given in Subsection 402.03.02. The Department will randomly determine when to obtain the verification sample using the Asphalt Mixture Sample Random Tonnage Generator. For specialty mixtures, the Department will perform one AC and one gradation determination per lot according to the corresponding procedures as given in Subsection 402.03.02. However, Department personnel will not perform AC determinations according to KM 64-405. The Contractor will obtain a quality control sample at the same time the Department obtains the mixture verification sample and perform testing according to the procedures given in Subsection 402.03.02. If the Contractor's quality control sample is verified by the Department's test results within the tolerances provided below, the Contractor's sample will serve as the quality control sample for the affected sublot. The Department may perform the mixture verification test on the Contractor's equipment or on the Department's equipment.
Subsection: **Part:** **Revision:**	402.03.03 Verification. A) Evaluation of Sublot(s) Verified by Department. Replace the third sentence of the second paragraph with the following: When the paired *t* -test indicates that the Contractor's data and Department's data are possibly not from the same population, the Department will investigate the cause for the difference according to Subsection 402.03.05 and implement corrective measures as the Engineer deems appropriate.
Subsection: **Part:** **Revision:**	402.03.03 Verification. B) Evaluation of Sublots Not Verified by Department. Replace the third sentence of the first paragraph with the following: When differences between test results are not within the tolerances listed below, the Department will resolve the discrepancy according to Subsection 402.03.05.

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Subsection: **Part:** **Revision:**	402.03.03 Verification. B) Evaluation of Sublots Not Verified by Department. Replace the third sentence of the second paragraph with the following: When the *F* -test or *t* -test indicates that the Contractor's data and Department's data are possibly not from the same population, the Department will investigate the cause for the difference according to Subsection 402.03.05 and implement corrective measures as the Engineer deems appropriate.
Subsection: **Part:** **Revision:**	402.03.03 Verification. C) Test Data Patterns. Replace the second sentence with the following: When patterns indicate substantial differences between the verified and non-verified sublots, the Department will perform further comparative testing according to subsection 402.03.05.
Subsection: **Revision:**	402.03 CONSTRUCTION. Add the following subsection: **402.03.04 Testing Equipment and Technician Verification.** For mixtures with a minimum quantity of 20,000 tons and for every 20,000 tons thereafter, the Department will obtain an additional verification sample at random using the Asphalt Mixture Sample Random Tonnage Generator in order to verify the integrity of the Contractor's and Department's laboratory testing equipment and technicians. The Department will obtain a mixture sample of at least 150 lb at the asphalt mixing plant according to KM 64-425 and split it according to AASHTO R 47. The Department will retain one split portion of the sample and provide the other portion to the Contractor. At a later time convenient to both parties, the Department and Contractor will simultaneously reheat the sample to the specified compaction temperature and test the mixture for AV and VMA using separate laboratory equipment according to the corresponding procedures given in Subsection 402.03.02. The Department will evaluate the differences in test results between the two laboratories. When the difference between the results for AV or VMA is not within ± 2.0 percent, the Department will investigate and resolve the discrepancy according to Subsection 402.03.05.
Subsection: **Revision:**	402.03.04 Dispute Resolution. Change the subsection number to 402.03.05.
Subsection: **Part:** **Table:** **Revision:**	402.05 PAYMENT. Lot Pay Adjustment Schedule Compaction Option A Base and Binder Mixtures AC Replace the Deviation from JMF(%) that corresponds to a Pay Value of 0.95 to ±0.6.
Subsection: **Revision:**	403.02.10 Material Transfer Vehicle (MTV). Replace the first sentence with the following: In addition to the equipment specified above, provide a MTV with the following minimum characteristics:
Subsection: **Revision:**	412.02.09 Material Transfer Vehicle (MTV). Replace the paragraph with the following: Provide and utilize a MTV with the minimum characteristics outlined in section 403.02.10.

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Subsection:	412.03.07 Placement and Compaction.
Revision:	Replace the first paragraph with the following: Use a MTV when placing SMA mixture in the driving lanes. The MTV is not required on ramps and/or shoulders unless specified in the contract. When the Engineer determines the use of the MTV is not practical for a portion of the project, the Engineer may waive its requirement for that portion of pavement by a letter documenting the waiver.
Subsection:	412.04 MEASUREMENT.
Revision:	Add the following subsection: 412.04.03. Material Transfer Vehicle (MTV). The Department will not measure the MTV for payment and will consider its use incidental to the asphalt mixture.
Subsection:	501.03.19 Surface Tolerances and Testing Surface.
Part:	B) Ride Quality.
Revision:	Add the following to the end of the first paragraph: The Department will specify if the ride quality requirements are Category A or Category B when ride quality is specified in the Contract. Category B ride quality requirements shall apply when the Department fails to classify which ride quality requirement will apply to the Contract.
Subsection:	603.03.06 Cofferdams.
Revision:	Replace the seventh sentence of paragraph one with the following: Submit drawings that are stamped by a Professional Engineer licensed in the Commonwealth of Kentucky.
Subsection:	605.03.04 Tack Welding.
Revision:	Insert the subsection and the following: 605.03.04 Tack Welding. The Department does not allow tack welding.
Subsection:	606.03.17 Special Requirements for Latex Concrete Overlays.
Part:	A) Existing Bridges and New Structures.
Number:	1) Prewetting and Grout-Bond Coat.
Revision:	Add the following sentence to the last paragraph: Do not apply a grout-bond coat on bridge decks prepared by hydrodemolition.
Subsection:	609.03 Construction.
Revision:	Replace Subsection 609.03.01 with the following: 609.03.01 A) Swinging the Spans. Before placing concrete slabs on steel spans or precast concrete release the temporary erection supports under the bridge and swing the span free on its supports. 609.03.01 B) Lift Loops. Cut all lift loops flush with the top of the precast beam once the beam is placed in the final location and prior to placing steel reinforcement. At locations where lift loops are cut, paint the top of the beam with galvanized or epoxy paint.
Subsection:	611.03.02 Precast Unit Construction.
Revision:	Replace the first sentence of the subsection with the following: Construct units according to ASTM C1577, **replacing Table 1 (Design Requirements for Precast Concrete Box Sections Under Earth, Dead and HL-93 Live Load Conditions) with KY Table 1 (Precast Culvert KYHL-93 Design Table)**, and Section 605 with the following exceptions and additions:

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Subsection: **Number:** **Revision:**	613.03.01 Design. 2) Replace "AASHTO Standard Specifications for Highway Bridges" with "AASHTO LRFD Bridge Design Specifications"
Subsection: **Revision:**	615.06.02 Add the following sentence to the end of the subsection. The ends of units shall be normal to walls and centerline except exposed edges shall be beveled ¾ inch.
Subsection: **Revision:**	615.06.03 Placement of Reinforcement in Precast 3-Sided Units. Replace the reference of 6.6 in the section to 615.06.06.
Subsection: **Revision:**	615.06.04 Placement of Reinforcement for Precast Endwalls. Replace the reference of 6.7 in the section to 615.06.07.
Subsection: **Revision:**	615.06.06 Laps, Welds, and Spacing for Precast 3-Sided Units. Replace the subsection with the following: Tension splices in the circumferential reinforcement shall be made by lapping. Laps may not be tack welded together for assembly purposes. For smooth welded wire fabric, the overlap shall meet the requirements of AASHTO 2012 Bridge Design Guide Section 5.11.2.5.2 and AASHTO 2012 Bridge Design Guide Section 5.11.6.3. For deformed welded wire fabric, the overlap shall meet the requirements of AASHTO 2012 Bridge Design Guide Section 5.11.2.5.1 and AASHTO 2012 Bridge Design Guide Section 5.11.6.2. The overlap of welded wire fabric shall be measured between the outer most longitudinal wires of each fabric sheet. For deformed billet-steel bars, the overlap shall meet the requirements of AASHTO 2012 Bridge Design Guide Section 5.11.2.1. For splices other than tension splices, the overlap shall be a minimum of 12" for welded wire fabric or deformed billet-steel bars. The spacing center to center of the circumferential wires in a wire fabric sheet shall be no less than 2 inches and no more than 4 inches. The spacing center to center of the longitudinal wires shall not be more than 8 inches. The spacing center to center of the longitudinal distribution steel for either line of reinforcing in the top slab shall be not more than 16 inches.
Subsection: **Revision:**	615.06.07 Laps, Welds, and Spacing for Precast Endwalls. Replace the subsection with the following: Splices in the reinforcement shall be made by lapping. Laps may not be tack welded together for assembly purposes. For smooth welded wire fabric, the overlap shall meet the requirements of AASHTO 2012 Bridge Design Guide Section 5.11.2.5.2 and AASHTO 2012 Bridge Design Guide Section 5.11.6.3. For deformed welded wire fabric, the overlap shall meet the requirements of AASHTO 2012 Bridge Design Guide Section 5.11.2.5.1 and AASHTO 2012 Bridge Design Guide Section 5.11.6.2. For deformed billet-steel bars, the overlap shall meet the requirements of AASHTO 2012 Bridge Design Guide Section 5.11.2.1. The spacing center-to-center of the wire fabric sheet shall not be less than 2 inches or more than 8 inches.

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Subsection:	615.08.01 Type of Test Specimen.
Revision:	Replace the subsection with the following: Start-up slump, air content, unit weight, and temperature tests will be performed each day on the first batch of concrete. Acceptable start-up results are required for production of the first unit. After the first unit has been established, random acceptance testing is performed daily for each 50 yd^3 (or fraction thereof). In addition to the slump, air content, unit weight, and temperature tests, a minimum of one set of cylinders shall be required each time plastic property testing is performed.
Subsection:	615.08.02 Compression Testing.
Revision:	Delete the second sentence.
Subsection:	615.08.04 Acceptability of Core Tests.
Revision:	Delete the entire subsection.
Subsection:	615.12 Inspection.
Revision:	Add the following sentences to the end of the subsection: Units will arrive at jobsite with the "Kentucky Oval" stamped on the unit which is an indication of acceptable inspection at the production facility. Units shall be inspected upon arrival for any evidence of damage resulting from transport to the jobsite.
Subsection:	716.02.02 Paint.
Revision:	Replace sentence with the following: Conform to Section 821.
Subsection:	716.03 CONSTRUCTION.
Revision:	Replace bullet 5) with the following: 5) AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2013-6th Edition with current interims,
Subsection:	716.03.02 Lighting Standard Installation.
Revision:	Replace the second sentence with the following: Regardless of the station and offset noted, locate all poles/bases behind the guardrail a minimum of four feet from the front face of the guardrail to the front face of the pole base.
Subsection:	716.03.02 Lighting Standard Installation.
Part:	A) Conventional Installation.
Revision:	Replace the third sentence with the following: Orient the transformer base so the door is positioned on the side away from on-coming traffic.
Subsection:	716.03.02 Lighting Standard Installation.
Part:	A) Conventional Installation.
Number:	1) Breakaway Installation and Requirements.
Revision:	Replace the first sentence with the following: For breakaway supports, conform to Section 12 of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2013-6th Edition with current interims.
Subsection:	716.03.02 Lighting Standard Installation.
Part:	B) High Mast Installation
Revision:	Replace the first sentence with the following: Install each high mast pole as noted on plans.
Subsection:	716.03.02 Lighting Standard Installation.
Part:	B) High Mast Installation
Number:	2) Concrete Base Installation
Revision:	Modification of Chart and succeeding paragraphs within this section:

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Drilled Shaft Depth Data							
Level Ground		3:1 Ground Slope		2:1 Ground Slope		1.5:1 Ground Slope (2)	
Soil	Rock	Soil	Rock	Soil	Rock	Soil	Rock
17 ft	7 ft	19 ft	7 ft	20 ft	7 ft	(1)	7 ft

Steel Requirements			
Vertical Bars		Ties or Spiral	
Size	Total	Size	Spacing or Pitch
#10	16	#4	12 inch

(1): Shaft length is 22' for cohesive soil only. For cohesionless soil, contact geotechnical branch for design.
(2): Do not construct high mast drilled shafts on ground slopes steeper than 1.5:1 without the approval of the Division of Traffic.

If rock is encountered during drilling operations and confirmed by the engineer to be of sound quality, the shaft is only required to be further advanced into the rock by the length of rock socket shown in the table. The total length of the shaft need not be longer than that of soil alone. Both longitudinal rebar length and number of ties or spiral length shall be adjusted accordingly.

If a shorter depth is desired for the drilled shaft, the contractor shall provide, for the state's review and approval, a detailed column design with individual site specific soil and rock analysis performed and approved by a Professional Engineer licensed in the Commonwealth of Kentucky.

Spiral reinforcement may be substituted for ties. If spiral reinforcement is used, one and one-half closed coils shall be provided at the ends of each spiral unit. Subsurface conditions consisting of very soft clay or very loose saturated sand could result in soil parameters weaker than those assumed. Engineer shall consult with the geotechnical branch if such conditions are encountered.

The bottom of the drilled hole shall be firm and thoroughly cleaned so no loose or compressible materials are present at the time of the concrete placement. If the drilled hole contains standing water, the concrete shall be placed using a tremie to displace water. Continuous concrete flow will be required to insure full displacement of any water.

The reinforcement and anchor bolts shall be adequately supported in the proper positions so no movement occurs during concrete placement. Welding of anchor bolts to the reinforcing cage is unacceptable, templates shall be used. Exposed portions of the foundation shall be formed to create a smooth finished surface. All forming shall be removed upon completion of foundation construction.

Subsection: 716.03.03 Trenching.
Part: A) Trenching of Conduit for Highmast Ducted Cables.
Revision: Add the following after the first sentence: If depths greater than 24 inches are necessary, obtain the Engineer's approval and maintain the required conduit depths coming into the junction boxes. No payment for additional junction boxes for greater depths will be allowed.

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Subsection:	716.03.03 Trenching.
Part:	B) Trenching of Conduit for Non-Highmast Cables.
Revision:	Add the following after the second sentence: If depths greater than 24 inches are necessary for either situation listed previously, obtain the Engineer's approval and maintain the required conduit depths coming into the junction boxes. No payment for additional junction boxes for greater depths will be allowed.
Subsection:	716.03.10 Junction Boxes.
Revision:	Replace subsection title with the following: Electrical Junction Box.
Subsection:	716.04.07 Pole with Secondary Control Equipment.
Revision:	Replace the paragraph with the following: The Department will measure the quantity as each individual unit furnished and installed. The Department will not measure mounting the cabinet to the pole, backfilling, restoration, any necessary hardware to anchor pole, or electrical inspection fees, and will consider them incidental to this item of work. The Department will also not measure furnishing and installing electrical service conductors, specified conduits, meter base, transformer, service panel, fused cutout, fuses, lighting arrestors, photoelectrical control, circuit breaker, contactor, manual switch, ground rods, and ground wires and will consider them incidental to this item of work.
Subsection:	716.04.08 Lighting Control Equipment.
Revision:	Replace the paragraph with the following: The Department will measure the quantity as each individual unit furnished and installed. The Department will not measure constructing the concrete base, excavation, backfilling, restoration, any necessary anchors, or electrical inspection fees, and will consider them incidental to this item of work. The Department will also not measure furnishing and installing electrical service conductors, specified conduits, meter base, transformer, service panel, fused cutout, fuses, lighting arrestors, photoelectrical control, circuit breakers, contactor, manual switch, ground rods, and ground wires and will consider them incidental to this item of work.
Subsection:	716.04.09 Luminaire.
Revision:	Replace the first sentence with the following: The Department will measure the quantity as each individual unit furnished and installed.
Subsection:	716.04.10 Fused Connector Kits.
Revision:	Replace the first sentence with the following: The Department will measure the quantity as each individual unit furnished and installed.
Subsection:	716.04.13 Junction Box.
Revision:	Replace the subsection title with the following: Electrical Junction Box Type Various.
Subsection:	716.04.13 Junction Box.
Part:	A) Junction Electrical.
Revision:	Rename A) Junction Electrical to the following: A) Electrical Junction Box.
Subsection:	716.04.14 Trenching and Backfilling.
Revision:	Replace the second sentence with the following: The Department will not measure excavation, backfilling, underground utility warning tape (if required), the restoration of disturbed areas to original condition, and will consider them incidental to this item of work.

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Subsection: 716.04.18 Remove Lighting.
Revision: Replace the paragraph with the following:
The Department will measure the quantity as a lump sum for the removal of lighting equipment. The Department will not measure the disposal of all equipment and materials off the project by the contractor. The Department also will not measure the transportation of the materials and will consider them incidental to this item of work.

Subsection: 716.04.20 Bore and Jack Conduit.
Revision: Replace the paragraph with the following: The Department will measure the quantity in linear feet. This item shall include all work necessary for boring and installing conduit under an existing roadway. Construction methods shall be in accordance with Sections 706.03.02, paragraphs 1, 2, and 4.

Subsection: 716.05 PAYMENT.
Revision: Replace items 04810-04811, 20391NS835 and, 20392NS835 under Code, Pay Item, and Pay Unit with the following:

Code	Pay Item	Pay Unit
04810	Electrical Junction Box	Each
04811	Electrical Junction Box Type B	Each
20391NS835	Electrical Junction Box Type A	Each
20392NS835	Electrical Junction Box Type C	Each

Subsection: 723.02.02 Paint.
Revision: Replace sentence with the following: Conform to Section 821.

Subsection: 723.03 CONSTRUCTION.
Revision: Replace bullet 5) with the following: 5) AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2013-6th Edition with current interims,

Subsection: 723.03.02 Poles and Bases Installation.
Revision: Replace the first sentence with the following:
Regardless of the station and offset noted, locate all poles/bases behind the guardrail a minimum of four feet from the front face of the guardrail to the front face of the pole base.

Subsection: 723.03.02 Poles and Bases Installation.
Part: A) Steel Strain and Mastarm Poles Installation
Revision: Replace the second paragraph with the following: For concrete base installation, see Section 716.03.02, B), 2), Paragraphs 2-7. Drilled shaft depth shall be based on the soil conditions encountered during drilling and slope condition at the site. Refer to the design chart below:

Subsection: 723.03.02 Poles and Bases Installation.
Part: B) Pedestal or Pedestal Post Installation.
Revision: Replace the fourth sentence of the paragraph with the following: For breakaway supports, conform to Section 12 of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2013-6th Edition with current interims.

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Subsection: **Part:** **Revision:**	723.03.03 Trenching. A) Under Roadway. Add the following after the second sentence: If depths greater than 24 inches are necessary, obtain the Engineer's approval and maintain ether required conduit depths coming into the junction boxes. No payment for additional junction boxes for greater depths will be allowed.
Subsection: **Revision:**	723.03.11 Wiring Installation. Add the following sentence between the fifth and sixth sentences: Provide an extra two feet of loop wire and lead-in past the installed conduit in poles, pedestals, and junction boxes.
Subsection: **Revision:**	723.03.12 Loop Installation. Replace the fourth sentence of the 2nd paragraph with the following: Provide an extra two feet of loop wire and lead-in past the installed conduit in poles, pedestals, and junction boxes.
Subsection: **Revision:**	723.04.02 Junction Box. Replace subsection title with the following: Electrical Junction Box Type Various.
Subsection: **Revision:**	723.04.03 Trenching and Backfilling. Replace the second sentence with the following: The Department will not measure excavation, backfilling, underground utility warning tape (if required), the restoration of disturbed areas to original condition, and will consider them incidental to this item of work.
Subsection: **Revision:**	723.04.10 Signal Pedestal. Replace the second sentence with the following: The Department will not measure excavation, concrete, reinforcing steel, specified conduits, fittings, ground rod, ground wire, backfilling, restoring disturbed areas, or other necessary hardware and will consider them incidental to this item of work.
Subsection: **Revision:**	723.04.15 Loop Saw Slot and Fill. Replace the second sentence with the following: The Department will not measure sawing, cleaning and filling induction loop saw slot, loop sealant, backer rod, and grout and will consider them incidental to this item of work.
Subsection: **Revision:**	723.04.16 Pedestrian Detector. Replace the paragraph with the following: The Department will measure the quantity as each individual unit furnished, installed and connected to pole/pedestal. The Department will not measure installing R10-3e (with arrow) sign, furnishing and installing mounting hardware for sign and will consider them incidental to this item of work.
Subsection: **Revision:**	723.04.18 Signal Controller- Type 170. Replace the second sentence with the following: The Department will not measure constructing the concrete base or mounting the cabinet to the pole, connecting the signal and detectors, excavation, backfilling, restoration, any necessary pole mounting hardware, electric service, or electrical inspection fees and will consider them incidental to this item of work. The Department will also not measure furnishing and connecting the induction of loop amplifiers, pedestrian isolators, load switches, model 400 modem card; furnishing and installing electrical service conductors, specified conduits, anchors, meter base, fused cutout, fuses, ground rods, ground wires and will consider them incidental to this item of work.

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Subsection: **Revision:**	723.04.20 Install Signal Controller - Type 170. Replace the paragraph with the following: The Department will measure the quantity as each individual unit installed. The Department will not measure constructing the concrete base or mounting the cabinet to the pole, connecting the signal and detectors, and excavation, backfilling, restoration, any necessary pole mounting hardware, electric service, or electrical inspection fees and will consider them incidental to this item of work. The Department will also not measure connecting the induction loop amplifiers, pedestrian, isolators, load switches, model 400 modem card; furnishing and installing electrical service conductors, specified conduits, anchors, meter base, fused cutout, fuses, ground rods, ground wires and will consider them incidental to this item of work.
Subsection: **Revision:**	723.04.22 Remove Signal Equipment. Replace the paragraph with the following: The Department will measure the quantity as a lump sum removal of signal equipment. The Department will not measure the return of control equipment and signal heads to the Department of Highways as directed by the District Traffic Engineer. The Department also will not measure the transportation of materials of the disposal of all other equipment and materials off the project by the contractor and will consider them incidental to this item of work.
Subsection: **Revision:**	723.04.28 Install Pedestrian Detector Audible. Replace the second sentence with the following: The Department will not measure installing sign R10-3e (with arrow) and will consider it incidental to this item of work.
Subsection: **Revision:**	723.04.29 Audible Pedestrian Detector. Replace the second sentence with the following: The Department will not measure furnishing and installing the sign R10-3e (with arrow) and will consider it incidental to this item of work.
Subsection: **Revision:**	723.04.30 Bore and Jack Conduit. Replace the paragraph with the following: The Department will measure the quantity in linear feet. This item shall include all work necessary for boring and installing conduit under an existing roadway. Construction methods shall be in accordance with Sections 706.03.02, paragraphs 1, 2, and 4.
Subsection: **Revision:**	723.04.31 Install Pedestrian Detector. Replace the paragraph with the following: The Department will measure the quantity as each individual unit installed and connected to pole/pedestal. The Department will not measure installing sign R 10-3e (with arrow) and will consider it incidental to this item of work.
Subsection: **Revision:**	723.04.32 Install Mast Arm Pole. Replace the second sentence with the following: The Department will not measure arms, signal mounting brackets, anchor bolts, or any other necessary hardware and will consider them incidental to this item of work.
Subsection: **Revision:**	723.04.33 Pedestal Post. Replace the second sentence with the following: The Department will not measure excavation, concrete, reinforcing steel, anchor bolts, conduit, fittings, ground rod, ground wire, backfilling, restoration, or any other necessary hardware and will consider them incidental to this item of work.

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Subsection: 723.04.36 Traffic Signal Pole Base.
Revision: Replace the second sentence with the following: The Department will not measure excavation, reinforcing steel, anchor bolts, specified conduits, ground rods, ground wires, backfilling, or restoration and will consider them incidental to this item of work.

Subsection: 723.04.37 Install Signal Pedestal.
Revision: Replace the second sentence with the following: The Department will not measure excavation, concrete, reinforcing steel, anchor bolts, specified conduits, fittings, ground rod, ground wire, backfilling, restoration, or any other necessary hardware and will consider them incidental to this item of work.

Subsection: 723.04.38 Install Pedestal Post.
Revision: Replace the second sentence with the following: The Department will not measure excavation, concrete, reinforcing steel, anchor bolts, specified conduits, fittings, ground rod, ground wire, backfilling, restoration, or any other necessary hardware and will consider them incidental to this item of work.

Subsection: 723.05 PAYMENT.
Revision: Replace items 04810-04811, 20391NS835 and, 20392NS835 under Code, Pay Item, and Pay Unit with the following:

Code	Pay Item	Pay Unit
04810	Electrical Junction Box	Each
04811	Electrical Junction Box Type B	Each
20391NS835	Electrical Junction Box Type A	Each
20392NS835	Electrical Junction Box Type C	Each

Subsection: 804.01.02 Crushed Sand.
Revision: Delete last sentence of the section.

Subsection: 804.01.06 Slag.
Revision: Add subsection and following sentence.
Provide blast furnace slag sand where permitted. The Department will allow steel slag sand only in asphalt surface applications.

Subsection: 804.04 Asphalt Mixtures.
Revision: Replace the subsection with the following:
Provide natural, crushed, conglomerate, or blast furnace slag sand, with the addition of filler as necessary, to meet gradation requirements. The Department will allow any combination of natural, crushed, conglomerate or blast furnace slag sand when the combination is achieved using cold feeds at the plant. The Engineer may allow other fine aggregates.

Subsection: 806.03.01 General Requirements.
Revision: Replace the second sentence of the paragraph with the following:
Additionally, the material must have a minimum solubility of 99.0 percent when tested according to AASHTO T 44 and PG 76-22 must exhibit a minimum recovery of 60 percent, with a J_{NR} (nonrecoverable creep compliance) between 0.1 and 0.5, when tested according to AASHTO TP 70.

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Subsection: **Table:** **Revision:**	806.03.01 General Requirements. PG Binder Requirements and Price Adjustment Schedule Replace the Elastic Recovery, % [3] (AASHTO T301) and all corresponding values in the table with the following: Test | Specification | 100% Pay | 90% Pay | 80% Pay | 70% Pay | 50%Pay[1] MSCR recovery, % [3] (AASHTO TP 70) | 60 Min. | ≥58 | 56 | 55 | 54 | <53
Subsection: **Table:** **Superscript:** **Revision:**	806.03.01 General Requirements. PG Binder Requirements and Price Adjustment Schedule (3) Replace [3] with the following: Perform testing at 64°C.
Subsection: **Revision:**	813.04 Gray Iron Castings. Replace the reference to "AASHTO M105" with "ASTM A48".
Subsection: **Number:** **Revision:**	813.09.02 High Strength Steel Bolts, Nuts, and Washers. A) Bolts. Delete first paragraph and "Hardness Number" Table. Replace with the following: A) Bolts. Conform to ASTM A325 (AASHTO M164) or ASTM A490 (AASHTO 253) as applicable.
Subsection: **Revision:**	814.04.02 Timber Guardrail Posts. Third paragraph, replace the reference to "AWPA C14" with "AWPA U1, Section B, Paragraph 4.1".
Subsection: **Revision:**	814.04.02 Timber Guardrail Posts. Replace the first sentence of the fourth paragraph with the following: Use any of the species of wood for round or square posts covered under AWPA U1.
Subsection: **Revision:**	814.04.02 Timber Guardrail Posts. Fourth paragraph, replace the reference to "AWPA C2" with "AWPA U1, Section B, Paragraph 4.1".
Subsection: **Revision:**	814.04.02 Timber Guardrail Posts. Delete the second sentence of the fourth paragraph.
Subsection: **Revision:**	814.05.02 Composite Plastic. 1) Add the following to the beginning of the first paragraph: Select composite offset blocks conforming to this section and assure blocks are from a manufacturer included on the Department's List of Approved Materials. 2) Delete the last paragraph of the subsection.
Subsection: **Revision:**	816.07.02 Wood Posts and Braces. First paragraph, replace the reference to "AWPA C5" with "AWPA U1, Section B, Paragraph 4.1".
Subsection: **Revision:**	816.07.02 Wood Posts and Braces. Delete the second sentence of the first paragraph.
Subsection: **Revision:**	818.07 Preservative Treatment. First paragraph, replace all references to "AWPA C14" with "AWPA U1, Section A".

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Subsection: **Revision:**	834.14 Lighting Poles. Replace the first sentence with the following: Lighting pole design shall be in accordance with loading and allowable stress requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2013-6th Edition with current interims, with the exception of the following: The Cabinet will waive the requirement stated in the first sentence of Section 5.14.6.2 – Reinforced Holes and Cutouts for high mast poles (only). The minimum diameter at the base of the pole shall be 22 inches for high mast poles (only).
Subsection **Revision:**	834.14.03 High Mast Poles. Remove the second and fourth sentence from the first paragraph.
Subsection **Revision:**	834.14.03 High Mast Poles. Replace the third paragraph with the following: Provide calculations and drawings that are stamped by a Professional Engineer licensed in the Commonwealth of Kentucky.
Subsection: **Revision:**	834.14.03 High Mast Poles. Replace paragraph six with the following: Provide a pole section that conforms to ASTM A 595 grade A with a minimum yield strength of 55 KSI or ASTM A 572 with a minimum yield strength of 55 KSI. Use tubes that are round or 16 sided with a four inch corner radius, have a constant linear taper of .144 in/ft and contain only one longitudinal seam weld. Circumferential welded tube butt splices and laminated tubes are not permitted. Provide pole sections that are telescopically slip fit assembled in the field to facilitate inspection of interior surface welds and the protective coating. The minimum length of the telescopic slip splices shall be 1.5 times the inside diameter of the exposed end of the female section. Use longitudinal seam welds as commended in Section 5.15 of the AASHTO 2013 Specifications. The thickness of the transverse base shall not be less than 2 inches. Plates shall be integrally welded to the tubes with a telescopic welded joint or a full penetration groove weld with backup bar. The handhole cover shall be removable from the handhole frame. One the frame side opposite the hinge, provide a mechanism on the handhole cover/frame to place the Department's standard padlock as specified in Section 834.25. The handhole frame shall have two stainless studs installed opposite the hinge to secure the handhole cover to the frame which includes providing stainless steel wing nuts and washers. The handhole cover shall be manufactured from 0.25 inch thick galvanized steel (ASTM A 153) and have a neoprene rubber gasket that is permanently secured to the handhole frame to insure weather-tight protection. The hinge shall be manufactured from 7-guage stainless steel to provide adjustability to insure weather-tight fit for the cover. The minimum clear distance between the transverse plate and the bottom opening of the handhole shall not be less than the diameter of the bottom tube of the pole but needs to be at least 15 inches. Provide products that are hot-dip galvanized to the requirements of either ASTM A123 (fabricated products) or ASTM A 153 (hardware items).
Subsection: **Revision:**	834.16 ANCHOR BOLTS. Insert the following sentence at the beginning of the paragraph: The anchor bolt design shall follow the NCHRP Report 494 Section 2.4 and NCHRP 469 Appendix A Specifications.

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Subsection: **Revision:**	834.17.01 Conventional. Add the following sentence after the second sentence: Provide a waterproof sticker mounted on the bottom of the housing that is legible from the ground and indicates the wattage of the fixture by providing the first two numbers of the wattage.
Subsection: **Revision:**	834.21.01 Waterproof Enclosures. Replace the last five sentences in the second paragraph with the following sentences: Provide a cabinet door with a louvered air vent, filter-retaining brackets and an easy to clean metal filter. Provide a cabinet door that is keyed with a factory installed standard no. 2 corbin traffic control key. Provide a light fixture with switch and bulb. Use a 120-volt fixture and utilize a L.E.D. bulb (equivalent to 60 watts minimum). Fixture shall be situated at or near the top of the cabinet and illuminate the contents of the cabinet. Provide a 120 VAC GFI duplex receptacle in the enclosure with a separate 20 amp breaker.
Subsection: **Revision:**	835.07 Traffic Poles. Replace the first sentence of the first paragraph with the following: Pole diameter and wall thickness shall be calculated in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2013-6th Edition with current interims.
Subsection: **Revision:**	835.07 Traffic Poles. *Replace the first sentence of the fourth paragraph with the following: Ensure transverse plates have a thickness ≥ 2 inches. *Add the following sentence to the end of the fourth paragraph: The bottom pole diameter shall not be less than 16.25 inches.
Subsection: **Revision:**	835.07 Traffic Poles. Replace the third sentence of the fifth paragraph with the following: For anchor bolt design, pole forces shall be positioned in such a manner to maximize the force on any individual anchor bolt regardless of the actual anchor bolt orientation with the pole.
Subsection: **Revision:**	835.07 Traffic Poles. Replace the first and second sentence of the sixth paragraph with the following: The pole handhole shall be 25 inches by 6.5 inches. The handhole cover shall be removable from the handhole frame. On the frame side opposite the hinge, provide a mechanism on the handhole cover/frame to place the Department's standard padlock as specified in Section 834.25. The handhole frame shall have two stainless studs installed opposite the hinge to secure the handhole cover to the frame which includes providing stainless steel wing nuts and washers. The handhole cover shall be manufactured from 0.25 inch thick galvanized steel (ASTM 153) and have a neoprene rubber gasket that is permanently secured to the handhole frame to insure weather-tight protection. The hinge shall be manufactured from 7 gauge stainless steel to provide adjustability to insure a weather-tight fit for the cover. The minimum clear distance between the transverse plate and the bottom opening of the handhole shall not be less than the diameter of the bottom tube but needs to be at least 12 inches.

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Subsection:	835.07 Traffic Poles.
Revision:	*Replace the first sentence of the last paragraph with the following: Provide calculations and drawings that are stamped by a Professional Engineer licensed in the Commonwealth of Kentucky. *Replace the third sentence of the last paragraph with the following: All tables referenced in 835.07 are found in the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2013-6th Edition with current interims.
Subsection:	835.07.01 Steel Strain Poles.
Revision:	Replace the second sentence of the second paragraph with the following: The detailed analysis shall be certified by a Professional Engineer licensed in the Commonwealth of Kentucky.
Subsection:	835.07.01 Steel Strain Poles.
Revision:	Replace number 7. after the second paragraph with the following: 7. Fatigue calculations should be shown for all fatigue related connections. Provide the corresponding detail, stress category and example from table 11.9.3.1-1.
Subsection:	835.07.02 Mast Arm Poles.
Revision:	Replace the second sentence of the fourth paragraph with the following: The detailed analysis shall be certified by a Professional Engineer licensed in the Commonwealth of Kentucky.
Subsection:	835.07.02 Mast Arm Poles.
Revision:	Replace number 7) after the fourth paragraph with the following: 7) Fatigue calculations should be shown for all fatigue related connections. Provide the corresponding detail, stress category and example from table 11.9.3.1-1.
Subsection:	835.07.03 Anchor Bolts.
Revision:	Add the following to the end of the paragraph: There shall be two steel templates (one can be used for the headed part of the anchor bolt when designed in this manner) provided per pole. Templates shall be contained within a 26.5 inch diameter. All templates shall be fully galvanized (ASTM A 153).
Subsection:	835.16.05 Optical Units.
Revision:	Replace the 3rd paragraph with the following: The list of certified products can be found on the following website: http://www.intertek.com.
Subsection:	835.19.01 Pedestrian Detector Body.
Revision:	Replace the first sentence with the following: Provide a four holed pole mounted aluminum rectangular housing that is compatible with the pedestrian detector.
Subsection:	843.01.01 Geotextile Fabric.
Table:	TYPE I FABRIC GEOTEXTILES FOR SLOPE PROTECTION AND CHANNEL LINING
Revision:	Add the following to the chart:

Property	Minimum Value[(1)]	Test Method
CBR Puncture (lbs)	494	ASTM D6241
Permittivity (1/s)	0.7	ASTM D4491

Supplemental Specifications to the Standard Specifications for Road and Bridge Construction, 2012 Edition Effective with the August 22, 2014 Letting

Subsection: 843.01.01 Geotextile Fabric.
Table: TYPE II FABRIC GEOTEXTILES FOR UNDERDRAINS
Revision: Add the following to the chart:

Property	Minimum Value[1]	Test Method
CBR Puncture (lbs)	210	ASTM D6241
Permittivity (1/s)	0.5	ASTM D4491

Subsection: 843.01.01 Geotextile Fabric.
Table: TYPE III FABRIC GEOTEXTILES FOR SUBGRADE OR EMBANKMENT STABILIZATION
Revision: Add the following to the chart:

Property	Minimum Value[1]	Test Method
CBR Puncture (lbs)	370	ASTM D6241
Permittivity (1/s)	0.05	ASTM D4491

Subsection: 843.01.01 Geotextile Fabric.
Table: TYPE IV FABRIC GEOTEXTILES FOR EMBANKMENT DRAINAGE BLANKETS AND PAVEMENT EDGE DRAINS
Revision: Add the following to the chart:

Property	Minimum Value[1]	Test Method
CBR Puncture (lbs)	309	ASTM D6241
Permittivity (1/s)	0.5	ASTM D4491

Subsection: 843.01.01 Geotextile Fabric.
Table: TYPE V HIGH STRENGTH GEOTEXTILE FABRIC
Revision: Make the following changes to the chart:

Property	Minimum Value[1]	Test Method
CBR Puncture (lbs)	618	ASTM D6241
Grab Strength (lbs)	700	ASTM D4632
Apparent Opening Size	U.S. #40[3]	ASTM D4751

[3] Maximum average roll value.

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SPECIAL NOTE FOR PORTABLE CHANGEABLE MESSAGE SIGNS

This Special Note will apply when indicated on the plans or in the proposal.

1.0 DESCRIPTION. Furnish, install, operate, and maintain variable message signs at the locations shown on the plans or designated by the Engineer. Remove and retain possession of variable message signs when they are no longer needed on the project.

2.0 MATERIALS.

2.1 General. Use LED Variable Message Signs Class I, II, or III, as appropriate, from the Department's List of Approved Materials.

Unclassified signs may be submitted for approval by the Engineer. The Engineer may require a daytime and nighttime demonstration. The Engineer will make a final decision within 30 days after all required information is received.

2.2 Sign and Controls. All signs must:

1) Provide 3-line messages with each line being 8 characters long and at least 18 inches tall. Each character comprises 35 pixels.
2) Provide at least 40 preprogrammed messages available for use at any time. Provide for quick and easy change of the displayed message; editing of the message; and additions of new messages.
3) Provide a controller consisting of:
   a) Keyboard or keypad.
   b) Readout that mimics the actual sign display. (When LCD or LCD type readout is used, include backlighting and heating or otherwise arrange for viewing in cold temperatures.)
   c) Non-volatile memory or suitable memory with battery backup for storing pre-programmed messages.
   d) Logic circuitry to control the sequence of messages and flash rate.
4) Provide a serial interface that is capable of supporting complete remote control ability through land line and cellular telephone operation. Include communication software capable of immediately updating the message, providing complete sign status, and allowing message library queries and updates.
5) Allow a single person easily to raise the sign to a satisfactory height above the pavement during use, and lower the sign during travel.
6) Be Highway Orange on all exterior surfaces of the trailer, supports, and controller cabinet.
7) Provide operation in ambient temperatures from -30 to + 120 degrees Fahrenheit during snow, rain and other inclement weather.
8) Provide the driver board as part of a module. All modules are interchangeable, and have plug and socket arrangements for disconnection and reconnection. Printed circuit boards associated with driver boards have a conformable coating to protect against moisture.
9) Provide a sign case sealed against rain, snow, dust, insects, etc. The lens is UV stabilized clear plastic (polycarbonate, acrylic, or other approved material) angled to prevent glare.
10) Provide a flat black UV protected coating on the sign hardware, character PCB, and appropriate lens areas.
11) Provide a photocell control to provide automatic dimming.

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12) Allow an on-off flashing sequence at an adjustable rate.
13) Provide a sight to aim the message.
14) Provide a LED display color of approximately 590 nm amber.
15) Provide a controller that is password protected.
16) Provide a security device that prevents unauthorized individuals from accessing the controller.
17) Provide the following 3-line messages preprogrammed and available for use when the sign unit begins operation:

/KEEP/RIGHT/⇒⇒⇒/
/KEEP/LEFT/⇐⇐⇐/
/LOOSE/GRAVEL/AHEAD/
/RD WORK/NEXT/**MILES/
/TWO WAY/TRAFFIC/AHEAD/
/PAINT/CREW/AHEAD/
/REDUCE/SPEED/**MPH/
/BRIDGE/WORK/***0 FT/
/MAX/SPEED/**MPH/
/SURVEY/PARTY/AHEAD/
/MIN/SPEED/**MPH/
/ICY/BRIDGE/AHEAD/ /ONE LANE/BRIDGE/AHEAD/
/ROUGH/ROAD/AHEAD/
/MERGING/TRAFFIC/AHEAD/
/NEXT/***/MILES/
/HEAVY/TRAFFIC/AHEAD/
/SPEED/LIMIT/**MPH/
/BUMP/AHEAD/
/TWO/WAY/TRAFFIC/

*Insert numerals as directed by the Engineer.
Add other messages during the project when required by the Engineer.

2.3 Power.

1) Design solar panels to yield 10 percent or greater additional charge than sign consumption. Provide direct wiring for operation of the sign or arrow board from an external power source to provide energy backup for 21 days without sunlight and an on-board system charger with the ability to recharge completely discharged batteries in 24 hours.

3.0 CONSTRUCTION. Furnish and operate the variable message signs as designated on the plans or by the Engineer. Ensure the bottom of the message panel is a minimum of 7 feet above the roadway in urban areas and 5 feet above in rural areas when operating. Use Class I, II, or III signs on roads with a speed limit less than 55 mph. Use Class I or II signs on roads with speed limits 55 mph or greater.

Maintain the sign in proper working order, including repair of any damage done by others, until completion of the project. When the sign becomes inoperative, immediately repair or replace the sign. Repetitive problems with the same unit will be cause for rejection and replacement.

Use only project related messages and messages directed by the Engineer, unnecessary messages lessen the impact of the sign. Ensure the message is displayed in either one or 2 phases with each phase having no more than 3 lines of text. When no message is needed, but it is necessary to know if the sign is operable, flash only a pixel.

When the sign is not needed, move it outside the clear zone or where the Engineer directs. Variable Message Signs are the property of the Contractor and shall be removed from the project when no longer needed. The Department will not assume ownership of these signs.

4.0 MEASUREMENT. The final quantity of Variable Message Sign will be

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the actual number of individual signs acceptably furnished and operated during the project. The Department will not measure signs replaced due to damage or rejection.

5.0 PAYMENT. The Department will pay for the Variable Message Signs at the unit price each. The Department will not pay for signs replaced due to damage or rejection. Payment is full compensation for furnishing all materials, labor, equipment, and service necessary to, operate, move, repair, and maintain or replace the variable message signs. The Department will make payment for the completed and accepted quantities under the following:

Code	Pay Item	Pay Unit
02671	Portable Changeable Message Sign	Each

Effective June 15, 2012

11J

SPECIAL NOTE FOR FULL DEPTH CONCRETE PAVEMENT REPAIR

This Special Note applies to full depth repairs of concrete pavement. Section references herein are to the Department's 2012 Standard Specifications for Road and Bridge Construction.

1.0 DESCRIPTION. Remove and replace concrete pavement. Comply with the applicable Standard Drawings and the Standard Specifications except as specifically superseded herein.

2.0 MATERIALS AND EQUIPMENT.

2.1 JPC Pavement. Test concrete materials according to section 601.03.03. Conform to 501, 502, and 601 except that the concrete must achieve 3000 psi in accordance with Section 4.4 of this note. The Engineer may allow pavement to be opened to traffic at less than 3,000 psi subject to the deductions described in Section 4.4 of this note.

2.2 Dowel Bars and Sleeves. Conform to 811.

2.3 Tie Bars. Conform to Section 811. Use epoxy coated tie bars in longitudinal and transverse joints.

2.4 Joint Sealants. Conform to Subsection 807.03.01 or 807.03.05.

2.5 Grout Adhesives and Epoxy Resin Systems. Conform to Section 826.

2.6 Dense Graded Aggregate (DGA) and Crushed Stone Base (CSB). Conform to Section 805.

2.7 Geotextile Fabric. Conform to Section 843.

2.8 Drills. Drill holes using a gang drill, capable of drilling a minimum of four simultaneously. Misalignment of holes shall not exceed 1/4 inch in the vertical or oblique plane.

2.9 Hammers. Only use chisel point hammers weighing less than 40 pounds to remove deteriorated concrete.

3.0 CONSTRUCTION.

3.1 Removal of Existing Pavement. Remove existing pavement to the extent the Contract specifies or as the Engineer directs. The minimum length of patches measured along centerline is 3 feet on each side of an existing joint.

When working with pavements with non-skewed transverse joints, if it is necessary to remove existing pavement closer than 6 feet to a transverse joint, remove the pavement 3 feet beyond that joint .

When working with pavements with skewed transverse joints, if it is necessary to remove existing pavement closer than 3 feet to a transverse joint, remove the pavement 3 feet beyond that joint.

Details of configurations of pavement and joints for various situations are depicted in the drawings herein.

When small areas of removal and replacement are performed at bridge ends, maintain or reconstruct existing expansion joints at their existing location. When the Engineer determines extensive full width removal and replacement is required, construct new expansion joints at the locations shown on Standard Drawing No. RPN-010.

In the removal operation, make a full depth saw cut longitudinally along the centerline joint and shoulder joint and transversely along the area marked for removal. To prevent damage to the subbase, do not allow the saw to penetrate more than ½" into the subbase. The Engineer may direct or approve additional cuts within the removal area for ease of removal of the damaged slab and to prevent damage to adjacent pavement to remain in place. Do not overcut beyond the limits of the removal area. Prevent saw slurry from entering existing joints and cracks. To avoid pumping and erosion beneath the slab, do not allow traffic on sawed pavement for more than 48 hours before beginning removal procedures, unless directed by the Engineer.

Lift out the deteriorated concrete vertically with lift pins. If approved by the Engineer, use other methods that do not damage the base, shoulder, or sides of pavement that is to be left in place. If any damage does occur, repair as the Engineer directs and use an acceptable alternative method for the removal process. Do not damage the pavement base during these operations.

3.2 Pavement Replacement. Do not damage the pavement base during these operations.

3.2.1 Preparation of Base. Compact the new and existing aggregate base to the Engineer's satisfaction. The Engineer will accept compaction by either visual inspection or by nuclear gauge. When the Engineer deems it necessary to stabilize the existing base or replace unsuitable materials, excluding bridge ends, use 12 inches of geotextile fabric wrapped No. 2 aggregate topped with 4 inches of DGA or CSB. Use either Type III or Type IV geotextile fabric. Flowable fill and cement stabilization may be used as an alternative to stabilize the existing base or to replace unsuitable materials when a plan for such is presented to and approved by the Engineer. The Engineer may also direct using only DGA or CSB to correct base deficiencies. At bridge ends, treat existing base and subgrade as the Contract specifies. During compaction, wet the base as the Engineer directs. Compact areas not accessible to compaction equipment by hand tamping.

3.2.2 Underdrains. Construct, or repair damage to, pavement edge drains according to Section 704. If underdrains are placed omitting areas to be patched, construct additional lateral drains as necessary to provide outlets for the installed underdrain until performing the pavement replacement and completing the underdrain system. Provide drainage for any undercut or base repair areas.

3.2.3 Pavement Replacement. Using load transfer assemblies for dowel joints drill into the existing slab according to the details shown herein and on the Standard Drawings.

Use plain epoxy coated dowels of the size specified on the standard drawings based on the pavement thickness for contraction and expansion joints.

Drill holes for dowel bars and tie bars into the face of the existing slab, at a diameter as specified in the following. Drill the dowel bar holes and tie bar

holes to a depth equal to 1/2 the length of the bars. Anchor tie bars into the existing pavement using an epoxy resin. Anchor dowel bars into the existing pavement using either an epoxy resin or an adhesive grout. For tie bars and dowel bars where an epoxy resin is to be used drill the holes 1/8 inch larger than the bar diameter. For dowel bars where an adhesive grout product is to be used, drill holes 1/4 inch larger than the bar diameter. Use a clear or opaque grout retention disk in both grout and epoxy applications. Operate the equipment to prevent damage to the pavement being drilled. Obtain the Engineer's approval of the drilling procedure. Install load transfer assemblies according to the Standard Drawings and Standard Specifications.

When indicated herein or in the Standard Drawings, use 1 inch deformed tie bars, 18 inches long on 30-inch centers and starting and ending 20 inches inside the edges of the repair area in the longitudinal joint. Use 1 inch deformed tie bars, or plain epoxy coated dowel bars sized in accordance with the Standard Drawings, 18 inches long beginning 12 inches inside of each edge and on 12-inch centers in transverse construction joints.

Install the dowels and tie bars according to Section 511 unless contradicted here. Ensure the holes are dry and free of dust and debris. Use a nozzle to insert the grout or epoxy starting at the back of the drilled hole to allow for full coating of the dowel or tie bar. After placement, use a bond breaker on the section of the dowel bar that is protruding from the hole.

Mix, place, finish, and cure concrete according to Section 501 with the exception that the Department will allow truck mixing, 2-bag mixers, and hand finishing.

When required, use a form on the side of the slab at longitudinal joints. When the adjacent traffic lane is not closed to traffic or the drop-off is not protected, temporarily fill the space between the form and the adjacent pavement with DGA. After placing the slab, remove the DGA and form. Fill the hole with concrete and thoroughly consolidate by rodding, spading, and sufficient vibration to form a dense homogeneous mass. Use a form on the side of the slab adjacent to shoulders. Excavate and backfill as shown on Section F'-F'.

For patches less than 25 feet in length, use a bond breaker and do not install tie bars at the longitudinal joint. Bond breakers should not exceed 1/8 inch in thickness, e.g. tar paper.

When resurfacing is required, a float finish is satisfactory. Otherwise, broom finish or, when the adjacent surface has a grooved finish, texture the surface according to Subsection 501.03.13 H). Finish the surface, including joints, to meet a surface tolerance of 1/8 inch in 10 feet that will be verified by straightedge. Cure the pavement and apply curing membranes according to 501.03.15.

Keep all pavement surfaces adjacent to this operation reasonably clean of excess grout and other materials at all times. Maintain all original longitudinal joints. Place transverse joints according to the details shown herein and on the Standard Drawings.

3.3 Joint Sealing. Seal all new or partially new joints with silicone rubber sealant or hot-poured elastic joint sealant according to Subsection 501.03.18.

4.0 MEASUREMENT.

4.1 Remove JPC Pavement. The Department will measure the quantity in square yards of surface area. The Department will not measure removal of

underlying base material for payment and will consider it incidental to Remove JPC Pavement.

4.2 DGA or CSB. The Department will measure the quantity used to stabilize the existing base or to replace unsuitable material in tons. The Department will not measure removal of existing base material or underlying material for payment and will consider incidental to DGA or CSB. The quantity of DGA used for the drop-off protection shall be incidental to this work and will not be measured for payment.

4.3 JPC Pavement Non-Reinforced. The Department will measure according to 501.04.01. The Department will not measure dowels, tie bars, or joint sealing for payment and will consider it incidental to Non-Reinforced JPC Pavement.

JPC Pavement will be paid according to section 5.0 below and according to the following payment schedule based on the compressive strength. The cylinders for payment will be tested two hours prior the scheduled opening of traffic.

3000 psi and up	100% payment
2750 to 3000 psi	75% payment and approval from the Engineer to open to traffic*
2500 to 2750 psi	50% payment and approval from the Engineer to open to traffic*
2250 to 2500 psi	25% payment and approval from the Engineer to open to traffic*
Below 2250 psi	10% payment and no potential to open to traffic. Maintain traffic closure until concrete reaches a minimum of 2250 psi.

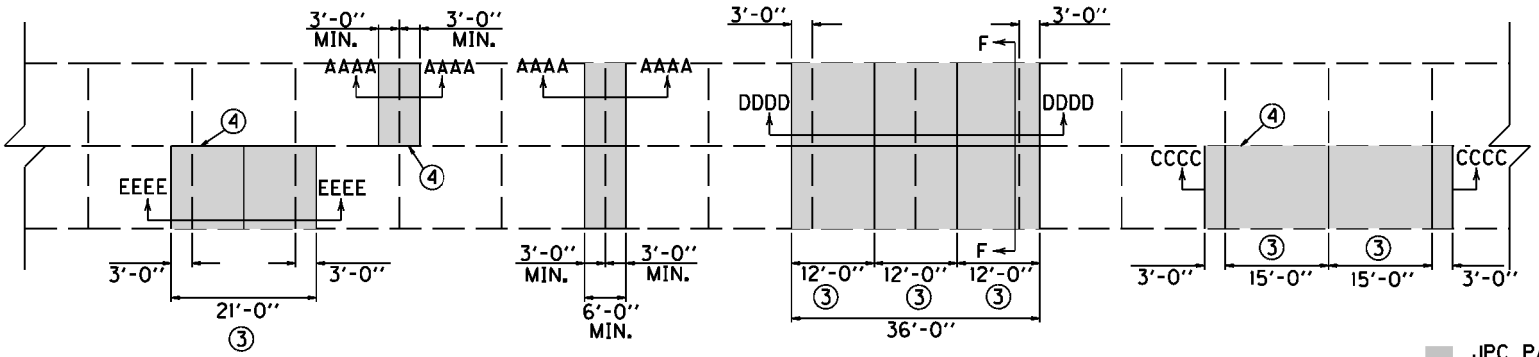
*If the Engineer approves opening to traffic, the Engineer will evaluate the concrete at 28 days (or sooner) to determine if the removal and replacement of the concrete is necessary due to pavement distress induced by the early opening (i.e. noticeable cracking). If required by the Engineer, remove and replace those slabs showing distress at no cost to the Department.

4.4 Underdrains. The Department will measure the quantity according to Subsection 704.04. The Department will not measure lateral drains for payment and will consider them incidental to the Underdrains.

5.0 PAYMENT. The Department will make payment for the completed and accepted quantities under the following:

Code	Pay Item	Pay Unit
----	Remove JPC Pavement	Square Yard
00001	DGA Base	Ton
00003	Crushed Stone Base	Ton
02069-02071, 02073, 02075, 02084, 02086, 02088	JPC Pavement Non-Reinforced, thickness	See Subsection 501.05
01000	Perforated Pipe, 4-inch	Linear Foot
02598, 02599	Fabric-Geotextile, Type	Square Yard

The Department will consider payment as full compensation for all work required in this provision.



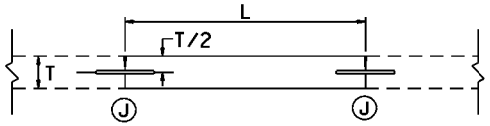
PLAN VIEW

1. SAW AT LOCATIONS "J" AND ALONG LONGITUDINAL JOINT (IF ONLY ONE LANE IS REMOVED) FULL DEPTH WITHOUT DAMAGE TO EXISTING CONCRETE. SAW RELIEF JOINTS AS THE ENGINEER DIRECTS OR APPROVES. REMOVE THE EXISTING JPC PAVEMENT TO THE LENGTH AND AT THE LOCATIONS NOTED ELSEWHERE IN THE CONTRACT. L=6 FEET MINIMUM AND LOCATIONS "J" SHALL NOT BE CLOSER THAN 6 FEET TO ANY TRANSVERSE JOINT BEYOND THE REPAIR.
2. INSTALL SMOOTH, LOAD TRANSFER DOWELS (EXCEPT USE TIE BARS FOR SECTION CCCC), 18 INCHES LONG (SEE STANDARD DRAWING NO. RPS-020 FOR DOWEL SIZE) AT LOCATIONS "J". INSTALL DOWELS (OR TIE BARS FOR SECTION CCCC) IN THE EXISTING CONCRETE USING EPOXY TYPE IV. INSTALL DOWELS (OR TIE BARS FOR SECTION CCCC) ON 12 INCH CENTERS BEGINNING 12 INCHES FROM THE EDGE OF THE SLAB.

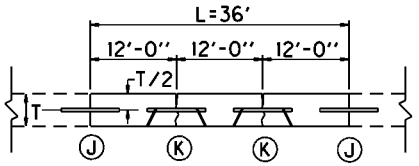
③ IF L IS GREATER THAN 20 FEET, INSTALL NEW LOAD TRANSFER ASSEMBLY(S) AND CONSTRUCT CONTRACTION JOINTS SUCH THAT THE DISTANCE BETWEEN JOINTS IN THE REPLACED SECTION IS NO LESS THAN 10 FEET OR MORE THAN 20 FEET. TRANSVERSE JOINTS SHALL BE SPACED APPROXIMATELY 15' EQUIDISTANT, BUT NOT LESS THAN 10 FEET OR NO MORE THAN 20 FEET. ADJUST JOINTS TO PROVIDE THE MINIMUM NUMBER OF JOINTS WITHOUT EXCEEDING THE 10-20 FOOT RANGE. INSTALL NEW LOAD TRANSFER ASSEMBLY(S) AND ALIGN LOAD TRANSFER ASSEMBLY(S) WITH AN EXISTING JOINT OR CRACK IN THE ADJACENT SLAB IF ONLY ONE LANE IS BEING REPLACED.

④ IF ONLY ONE LANE IS REMOVED, AND L>25', INSTALL NEW 1-INCH TIE BARS 18 INCHES LONG ON 30 INCH CENTERS IN THE LONGITUDINAL JOINT USING EPOXY TYPE IV. IF 2 OR MORE LANES ARE REMOVED, CONSTRUCT LONGITUDINAL JOINT(S) ACCORDING TO THE STANDARD DRAWING EXCEPT USE 1-INCH TIE BARS 18 INCHES LONG ON 30 INCH CENTERS. IF L≤25', DO NOT TIE THE LONGITUDINAL JOINT TO THE EXISTING LANE; USE A BOND BREAKER MATERIAL APPROVED BY THE ENGINEER THAT WILL ASSURE NO INTERACTION WITH THE ADJACENT LANE.

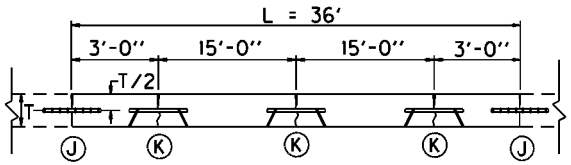
5. REPLACE WITH NON-REINFORCED JPC PAVEMENT AND INSTALL CONTRACTION JOINTS AT LOCATIONS "K" AND CONTRACTION JOINTS (OR A CONSTRUCTION JOINT FOR LOCATION CCCC) AT LOCATIONS "J". SAW AND SEAL ALL JOINTS.
6. SEE "CROSS SECTION" FOR SECTION F.



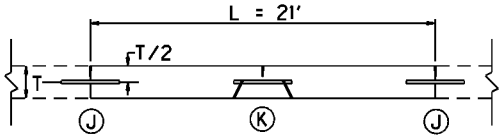
SECTION AAAA
JOINT REPLACEMENT



SECTION DDDD
FULL WIDTH REPLACEMENT
(INCLUDING JPC SHOULDERS)



SECTION CCCC
LANE REPLACEMENT WHERE ADJACENT
LANES OR JPC SHOULDERS WILL REMAIN

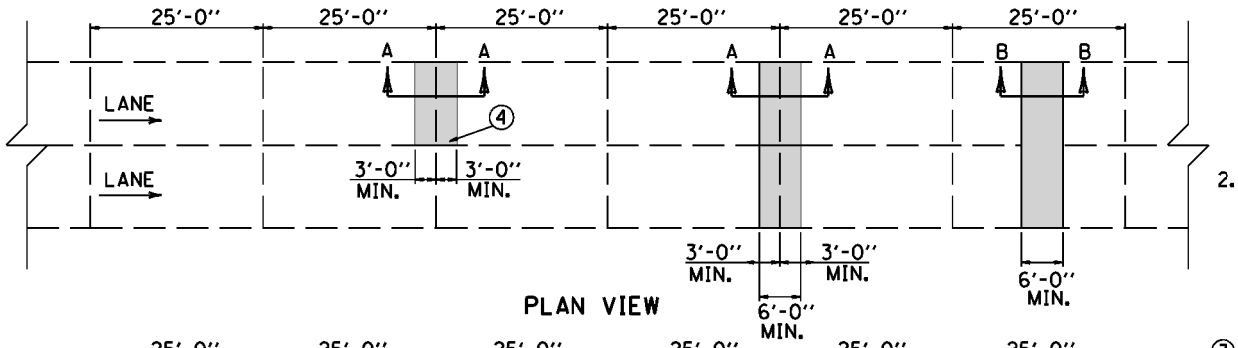


SECTION EEEE
LANE REPLACEMENT L≤25'

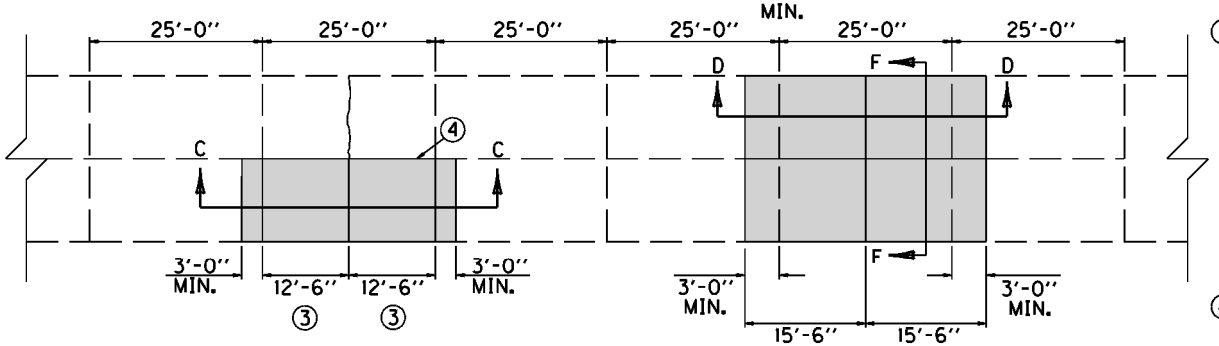
KENTUCKY DEPARTMENT OF HIGHWAYS

15' JOINT SPACING

APPROVED _____ TEBM DIVISION OF DESIGN _____ DATE

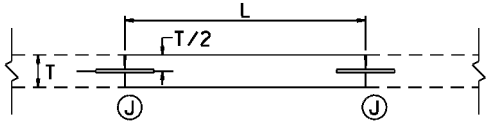


PLAN VIEW

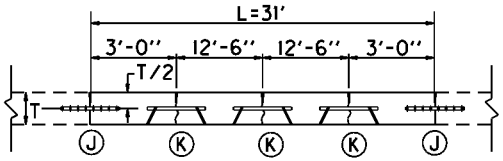


PLAN VIEW

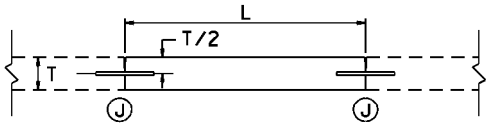
JPC PAVEMENT TO BE REMOVED



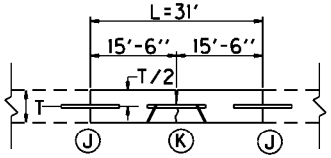
SECTION A
JOINT REPLACEMENT



SECTION C
LANE REPLACEMENT WHERE ADJACENT LANES OR JPC SHOULDERS WILL REMAIN



SECTION B
MID-SLAB REPLACEMENT



SECTION D
FULL WIDTH REPLACEMENT
(INCLUDING JPC SHOULDERS)

1. SAW AT LOCATIONS "J" AND ALONG LONGITUDINAL JOINT (IF ONLY ONE LANE IS REMOVED) FULL DEPTH WITHOUT DAMAGE TO EXISTING CONCRETE. SAW RELIEF JOINTS AS THE ENGINEER DIRECTS OR APPROVES. REMOVE THE EXISTING JPC PAVEMENT TO THE LENGTH AND AT THE LOCATIONS NOTED ELSEWHERE IN THE CONTRACT. L=6 FEET MINIMUM AND LOCATIONS "J" SHALL NOT BE CLOSER THAN 6 FEET TO ANY TRANSVERSE JOINT BEYOND THE REPAIR.
2. INSTALL SMOOTH, LOAD TRANSFER DOWELS (EXCEPT USE TIE BARS FOR SECTION C), 18 INCHES LONG (SEE STANDARD DRAWING NO. RPS-020 FOR DOWEL SIZE) AT LOCATIONS "J". INSTALL DOWELS (OR TIE BARS FOR SECTION C) IN THE EXISTING CONCRETE USING EPOXY TYPE IV. INSTALL DOWELS (OR TIE BARS FOR SECTION C) ON 12 INCH CENTERS BEGINNING 12 INCHES FROM THE EDGE OF THE SLAB.

③ IF L IS GREATER THAN 20 FEET, INSTALL NEW LOAD TRANSFER ASSEMBLY(S) AND CONSTRUCT CONTRACTION JOINTS SUCH THAT THE DISTANCE BETWEEN JOINTS IN THE REPLACED SECTION IS NO LESS THAN 10 FEET OR MORE THAN 20 FEET. TRANSVERSE JOINTS SHALL BE SPACED APPROXIMATELY 15' EQUIDISTANT, BUT NOT LESS THAN 10 FEET OR NO MORE THAN 20 FEET. ADJUST JOINTS TO PROVIDE THE MINIMUM NUMBER OF JOINTS WITHOUT EXCEEDING THE 10-20 FOOT RANGE. INSTALL NEW LOAD TRANSFER ASSEMBLY(S) AND ALIGN LOAD TRANSFER ASSEMBLY(S) WITH AN EXISTING JOINT OR CRACK IN THE ADJACENT SLAB IF ONLY ONE LANE IS BEING REPLACED.

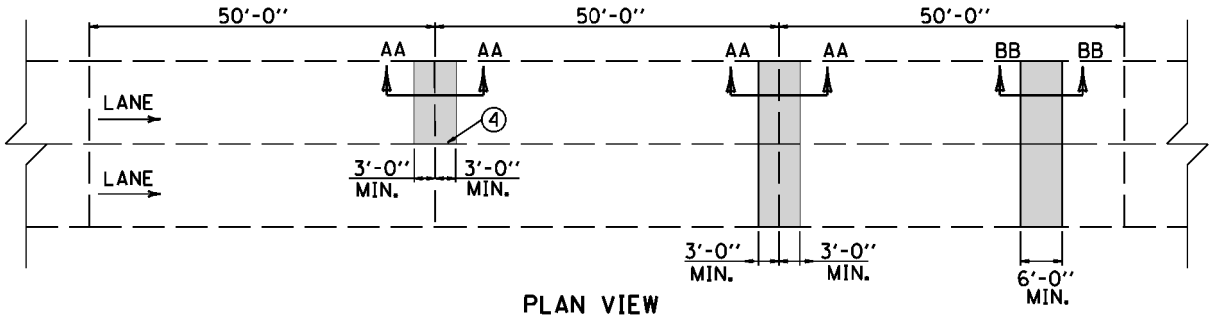
④ IF ONLY ONE LANE IS REMOVED, AND L>25', INSTALL NEW 1-INCH TIE BARS 18 INCHES LONG ON 30 INCH CENTERS IN THE LONGITUDINAL JOINT USING EPOXY TYPE IV. IF 2 OR MORE LANES ARE REMOVED, CONSTRUCT LONGITUDINAL JOINT(S) ACCORDING TO THE STANDARD DRAWING EXCEPT USE 1-INCH TIE BARS 18 INCHES LONG ON 30 INCH CENTERS. IF L≤25', DO NOT TIE THE LONGITUDINAL JOINT TO THE EXISTING LANE; USE A BOND BREAKER MATERIAL APPROVED BY THE ENGINEER THAT WILL ASSURE NO INTERACTION WITH THE ADJACENT LANE.

5. REPLACE WITH NON-REINFORCED JPC PAVEMENT AND INSTALL CONTRACTION JOINTS AT LOCATIONS "K" AND CONTRACTION JOINTS (OR A CONSTRUCTION JOINT FOR LOCATION C) AT LOCATIONS "J". SAW AND SEAL ALL JOINTS.
6. SEE "CROSS SECTION" FOR SECTION F.

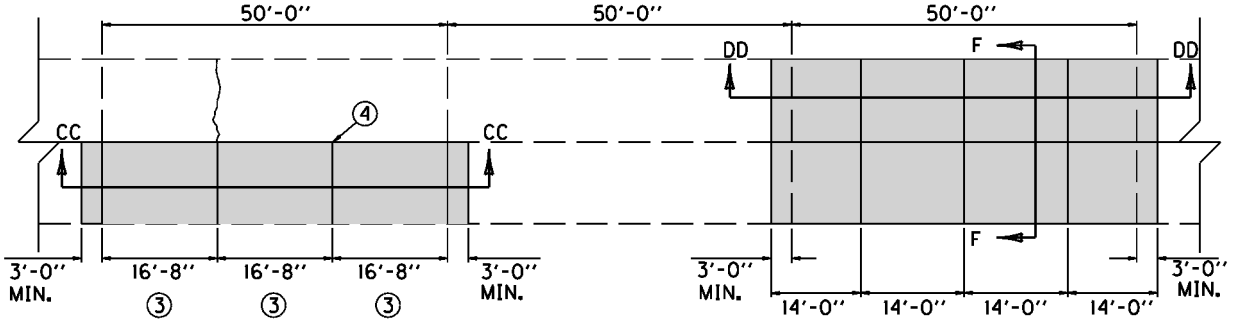
KENTUCKY DEPARTMENT OF HIGHWAYS

25' JOINT SPACING

APPROVED _____ TEBM DIVISION OF DESIGN _____ DATE

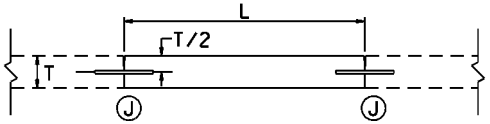


PLAN VIEW

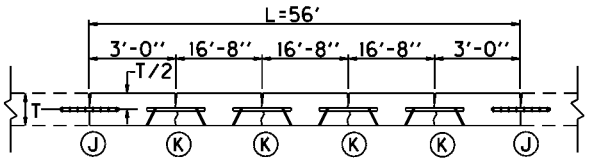


JPC PAVEMENT TO BE REMOVED

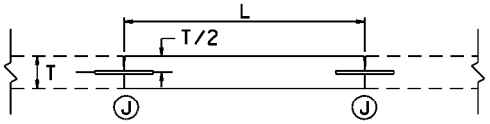
PLAN VIEW



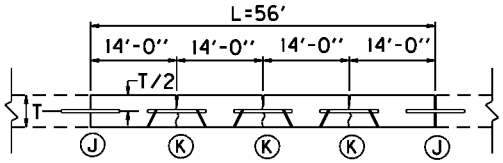
SECTION AA
JOINT REPLACEMENT



SECTION CC
LANE REPLACEMENT WHERE ADJACENT LANES OR JPC SHOULDERS WILL REMAIN



SECTION BB
MID-SLAB REPLACEMENT



SECTION DD
FULL WIDTH REPLACEMENT
(INCLUDING JPC SHOULDERS)

1. SAW AT LOCATIONS "J" AND ALONG LONGITUDINAL JOINT (IF ONLY ONE LANE IS REMOVED) FULL DEPTH WITHOUT DAMAGE TO EXISTING CONCRETE. SAW RELIEF JOINTS AS THE ENGINEER DIRECTS OR APPROVES. REMOVE THE EXISTING JPC PAVEMENT TO THE LENGTH AND AT THE LOCATIONS NOTED ELSEWHERE IN THE CONTRACT. L=6 FEET MINIMUM AND LOCATIONS "J" SHALL NOT BE CLOSER THAN 6 FEET TO ANY TRANSVERSE JOINT BEYOND THE REPAIR.
2. INSTALL SMOOTH, LOAD TRANSFER DOWELS (EXCEPT USE TIE BARS FOR SECTION CC), 18 INCHES LONG (SEE STANDARD DRAWING NO. RPS-020 FOR DOWEL SIZE) AT LOCATIONS "J". INSTALL DOWELS (OR TIE BARS FOR SECTION CC) IN THE EXISTING CONCRETE USING EPOXY TYPE IV. INSTALL DOWELS (OR TIE BARS FOR SECTION CC) ON 12 INCH CENTERS BEGINNING 12 INCHES FROM THE EDGE OF THE SLAB.

(3) IF L IS GREATER THAN 20 FEET, INSTALL NEW LOAD TRANSFER ASSEMBLY(S) AND CONSTRUCT CONTRACTION JOINTS SUCH THAT THE DISTANCE BETWEEN JOINTS IN THE REPLACED SECTION IS NO LESS THAN 10 FEET OR MORE THAN 20 FEET. TRANSVERSE JOINTS SHALL BE SPACED APPROXIMATELY 15' EQUIDISTANT, BUT NOT LESS THAN 10 FEET OR NO MORE THAN 20 FEET. ADJUST JOINTS TO PROVIDE THE MINIMUM NUMBER OF JOINTS WITHOUT EXCEEDING THE 10-20 FOOT RANGE. INSTALL NEW LOAD TRANSFER ASSEMBLY(S) AND ALIGN LOAD TRANSFER ASSEMBLY(S) WITH AN EXISTING JOINT OR CRACK IN THE ADJACENT SLAB IF ONLY ONE LANE IS BEING REPLACED.

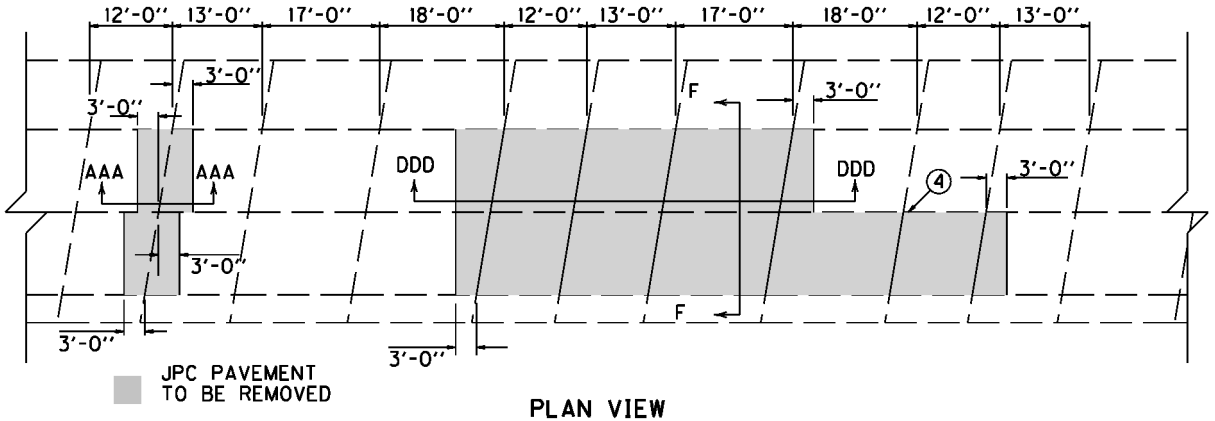
(4) IF ONLY ONE LANE IS REMOVED, AND L>25', INSTALL NEW 1-INCH TIE BARS 18 INCHES LONG ON 30 INCH CENTERS IN THE LONGITUDINAL JOINT USING EPOXY TYPE IV. IF 2 OR MORE LANES ARE REMOVED, CONSTRUCT LONGITUDINAL JOINT(S) ACCORDING TO THE STANDARD DRAWING EXCEPT USE 1-INCH TIE BARS 18 INCHES LONG ON 30 INCH CENTERS. IF L≤25', DO NOT TIE THE LONGITUDINAL JOINT TO THE EXISTING LANE; USE A BOND BREAKER MATERIAL APPROVED BY THE ENGINEER THAT WILL ASSURE NO INTERACTION WITH THE ADJACENT LANE.

5. REPLACE WITH NON-REINFORCED JPC PAVEMENT AND INSTALL CONTRACTION JOINTS AT LOCATIONS "K" AND CONTRACTION JOINTS (OR A CONSTRUCTION JOINT FOR LOCATION CC) AT LOCATIONS "J". SAW AND SEAL ALL JOINTS.
6. SEE "CROSS SECTION" FOR SECTION F.

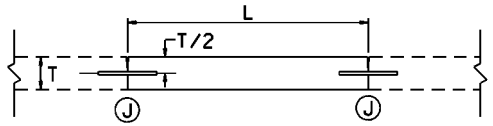
KENTUCKY DEPARTMENT OF HIGHWAYS

50' JOINT SPACING

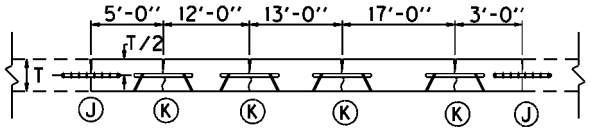
SUBMITTED _____ DATE _____
TEBM DIVISION OF DESIGN



PLAN VIEW



SECTION AAA
JOINT REPLACEMENT



SECTION DDD
LANE REPLACEMENT
(ALWAYS MATCH EXISTING JOINTS)

1. SAW AT LOCATIONS "J" AND ALONG LONGITUDINAL JOINT (IF ONLY ONE LANE IS REMOVED) FULL DEPTH WITHOUT DAMAGE TO EXISTING CONCRETE. SAW RELIEF JOINTS AS THE ENGINEER DIRECTS OR APPROVES. REMOVE THE EXISTING JPC PAVEMENT TO THE LENGTH AND AT THE LOCATIONS NOTED ELSEWHERE IN THE CONTRACT. L=6 FEET MINIMUM AND LOCATIONS "J" SHALL NOT BE CLOSER THAN 6 FEET TO ANY TRANSVERSE JOINT BEYOND THE REPAIR.
2. INSTALL SMOOTH, LOAD TRANSFER DOWELS (EXCEPT USE TIE BARS FOR SECTION DDD), 18 INCHES LONG (SEE STANDARD DRAWING NO. RPS-020 FOR DOWEL SIZE) AT LOCATIONS "J". INSTALL DOWELS (OR TIE BARS FOR SECTION DDD) IN THE EXISTING CONCRETE USING EPOXY TYPE IV. INSTALL DOWELS (OR TIE BARS FOR SECTION DDD) ON 12 INCH CENTERS BEGINNING 12 INCHES FROM THE EDGE OF THE SLAB.
3. IF L IS GREATER THAN 20 FEET, INSTALL NEW LOAD TRANSFER ASSEMBLY(S) AND MATCH EXISTING JOINTS. INSTALL NEW LOAD TRANSFER ASSEMBLY(S) AND ALIGN LOAD TRANSFER ASSEMBLY(S) WITH EXISTING JOINTS IN ADJACENT SLABS.

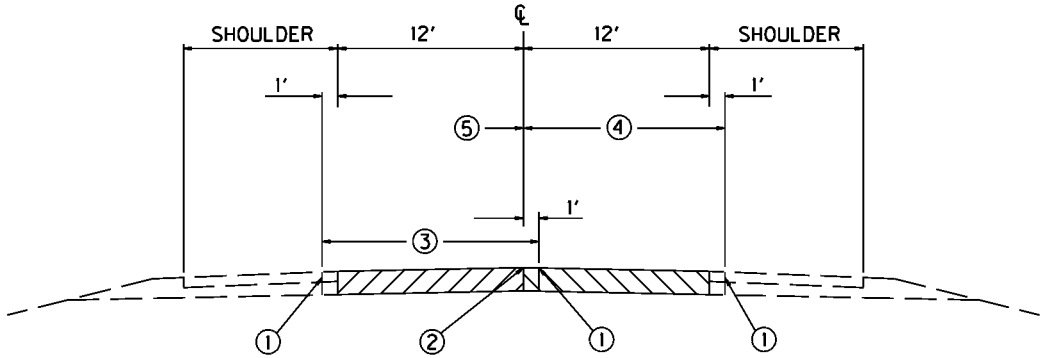
④ IF ONLY ONE LANE IS REMOVED, AND L>25', INSTALL NEW 1-INCH TIE BARS 18 INCHES LONG ON 30 INCH CENTERS IN THE LONGITUDINAL JOINT USING EPOXY TYPE IV. IF 2 OR MORE LANES ARE REMOVED, CONSTRUCT LONGITUDINAL JOINT(S) ACCORDING TO THE STANDARD DRAWING EXCEPT USE 1-INCH TIE BARS 18 INCHES LONG ON 30 INCH CENTERS. IF L≤25', DO NOT TIE THE LONGITUDINAL JOINT TO THE EXISTING LANE; USE A BOND BREAKER MATERIAL APPROVED BY THE ENGINEER THAT WILL ASSURE NO INTERACTION WITH THE ADJACENT LANE.

5. REPLACE WITH NON-REINFORCED JPC PAVEMENT AND INSTALL CONTRACTION JOINTS AT LOCATIONS "K" AND CONTRACTION JOINTS (OR A CONSTRUCTION JOINT FOR LOCATION DDD) AT LOCATIONS "J". SAW AND SEAL ALL JOINTS.
6. SEE "CROSS SECTION" FOR SECTION F.

KENTUCKY
DEPARTMENT OF HIGHWAYS

RANDOM SKEWED

APPROVED _____ DATE _____
TEBM DIVISION OF DESIGN



SECTION F

① SAW-CUT LINE. THIS ONE FOOT IS TO ALLOW FOR A FORM AND THE REMOVAL AND REPLACEMENT SHALL BE INCIDENTAL TO THE WORK, EXCEPT NEW ASPHALT MIXTURE SHALL BE PAID DIRECT ON A TONNAGE BASIS, AND NEW JPC PAVEMENT WILL BE PAID BY THE SQUARE YARD. COMPACT THE DGA BASE BY MECHANICAL TAMPERS TO THE ENGINEER'S SATISFACTION.

② EXISTING LONGITUDINAL JOINT.

③ FIRST SLAB REMOVAL LIMITS AND REPLACE 12-FOOT LANE.

④ SECOND SLAB REMOVAL LIMITS AND REPLACE 12-FOOT LANE.

⑤ THIS ONE FOOT IS TO ALLOW FOR A FORM ON THE FIRST POUR, AND A TEMPORARY PAVEMENT IS REQUIRED. THE DEPARTMENT WILL NOT REQUIRE REMOVAL OF THIS ONE FOOT IF THE GRADE OF THE EXISTING PAVEMENT IS ADEQUATE TO ENSURE THE NEW CONCRETE CAN BE PLACED AND FINISHED TO THE SATISFACTION OF THE ENGINEER. ANY TEMPORARY PAVEMENT IS INCIDENTAL TO JPC PAVEMENT.

6. THE ABOVE DRAWING DEPICTS THE ORDER OF SLAB REMOVAL WHEN BOTH ARE TO BE REMOVED AT THE SAME LOCATION. WHEN ONLY ONE SLAB OR LANE IS TO BE REMOVED, REMOVE AND REPLACE ACCORDING TO SECTION C, CC, OR CCCC. TRAFFIC CONTROL WILL SPECIFY WHICH LANE TO REMOVE FIRST.

KENTUCKY
DEPARTMENT OF HIGHWAYS

CROSS SECTION

APPROVED _____ _____
TEBM DIVISION OF DESIGN DATE

SPECIAL NOTE FOR BARCODE LABEL ON PERMANENT SIGNS

1.0 DESCRIPTION. Install barcode label on sheeting signs. Section references herein are to the Department's 2012 Standard Specifications for Road and Bridge Construction.

2.0 MATERIALS. The Department will provide the Contractor with a 2 inch x 1 inch foil barcode label for each permanent sheeting sign. A unique number will be assigned to each barcode label.

The Contractor shall contact the Operations and Pavement Management Branch in the Division of Maintenance at (502) 564-4556 to obtain the barcode labels.

3.0 CONSTRUCTION. Apply foil barcode label in the lower right quadrant of the sign back. Signs where the bottom edge is not parallel to the ground, the lowest corner of the sign shall serve as the location to place the barcode label. The barcode label shall be placed no less than one-inch and no more than three inches from any edge of the sign. The barcode must be placed so that the sign post does not cover the barcode label.

Barcodes shall be applied in an indoor setting with a minimum air temperature of 50°F or higher. Prior to application of the barcode label, the back of the sign must be clean and free of dust, oil, etc. If the sign is not clean, an alcohol swab shall be used to clean the area. The area must be allowed to dry prior to placement of the barcode label.

Data for each sign shall include the barcode number, MUTCD reference number, sheeting manufacturer, sheeting type, manufacture date, color of primary reflective surface, installation date, latitude and longitude using the North American Datum of 1983 (NAD83) or the State Plane Coordinates using an x and y ordinate of the installed location.

Data should be provided electronically on the TC 71-229 Sign Details Information and TC 71-230 Sign Assembly Information forms. The Contractor may choose to present the data in a different format provided that the information submitted to the Department is equivalent to the information required on the Department TC forms. The forms must be submitted in electronic format regardless of which type of form is used. The Department will not accept PDF or handwritten forms. These completed forms must be submitted to the Department prior to final inspection of the signs. The Department will not issue formal acceptance for the project until the TC 71-229 and TC-230 electronic forms are completed for all signs and sign assemblies on the project.

4.0 MEASUREMENT. The Department will measure all work required for the installation of the barcode label and all work associated with completion and submission of the sign inventory data (TC 71-229 and TC 71-230).

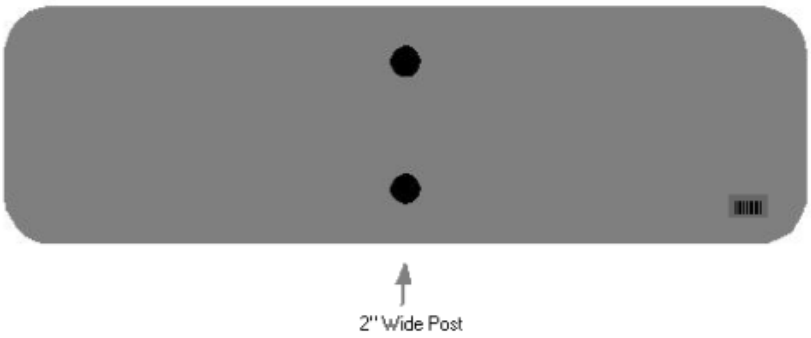
The installation of the permanent sign will be measured in accordance to Section 715.

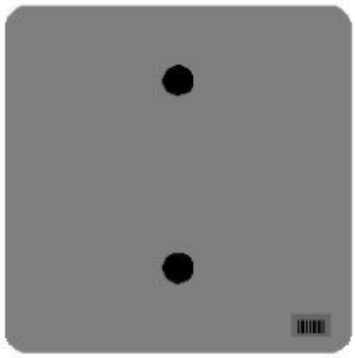
5.0 PAYMENT. The Department will make payment for the completed and accepted quantities under the following:

Code	Pay Item	Pay Unit
24631EC	Barcode Sign Inventory	Each

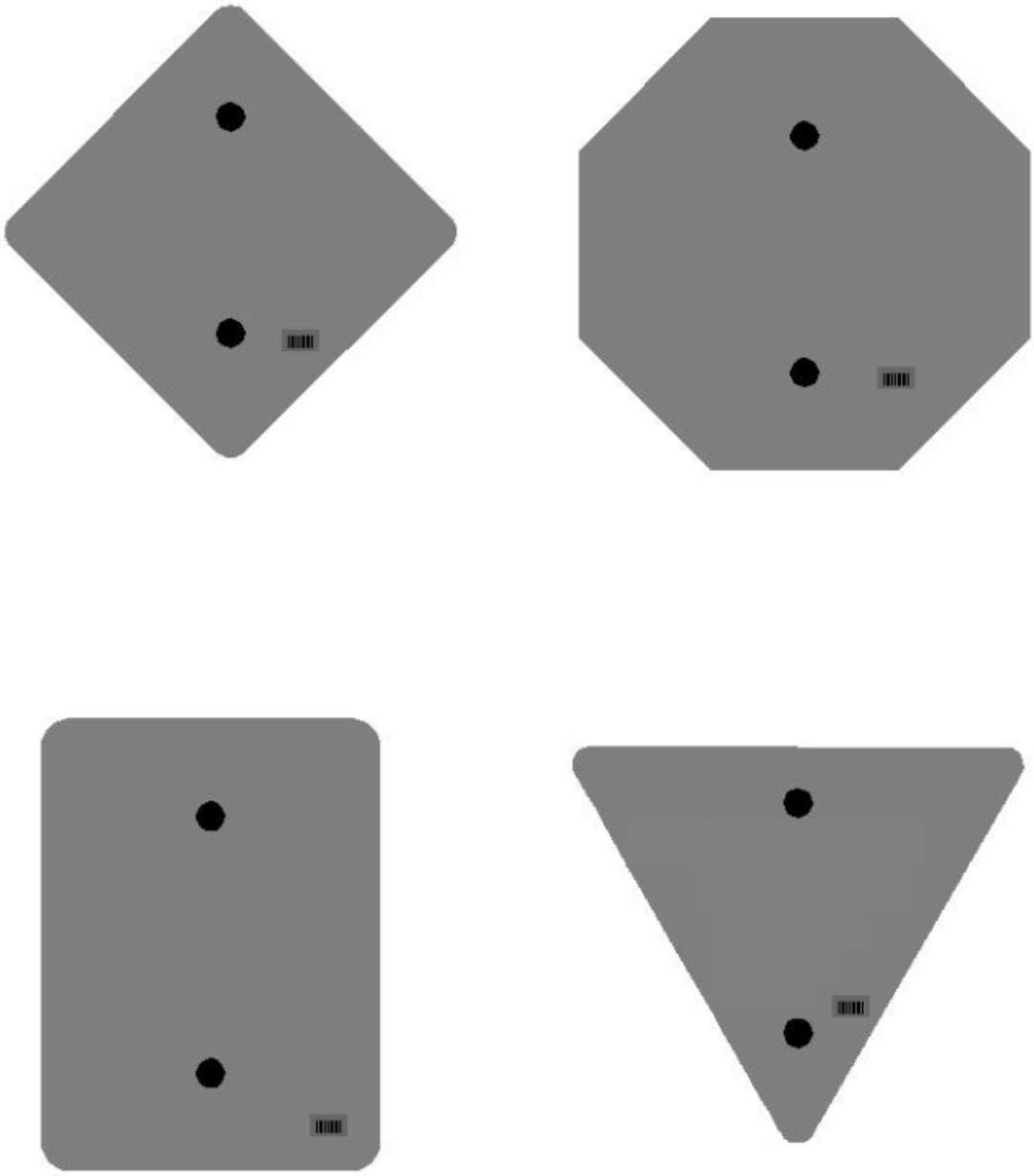
The Department will not make payment for this item until all barcodes are installed and sign inventory is complete on every permanent sign installed on the project. The Department will make payment for installation of the permanent sign in accordance to Section 715. The Department will consider payment as full compensation for all work required under this special note.

One Sign Post

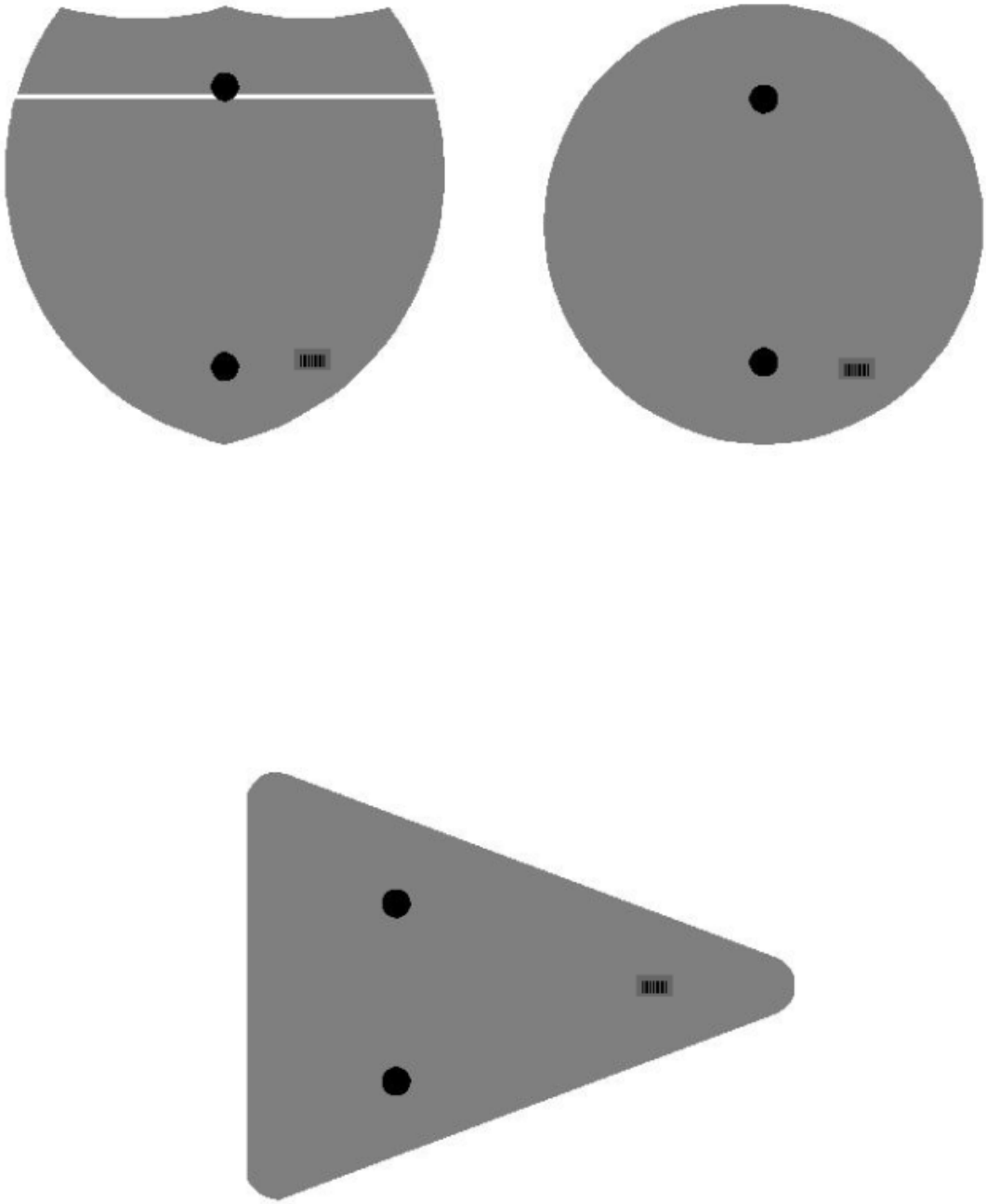




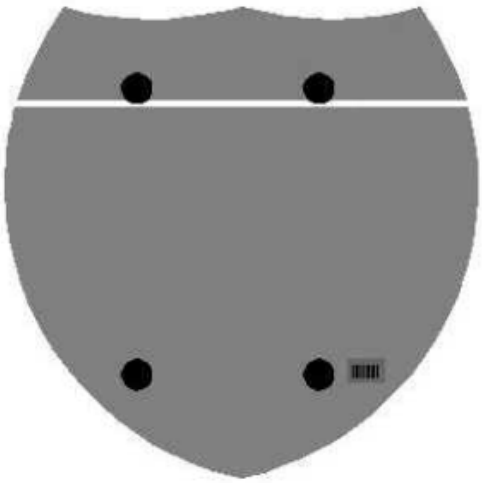
One Sign Post



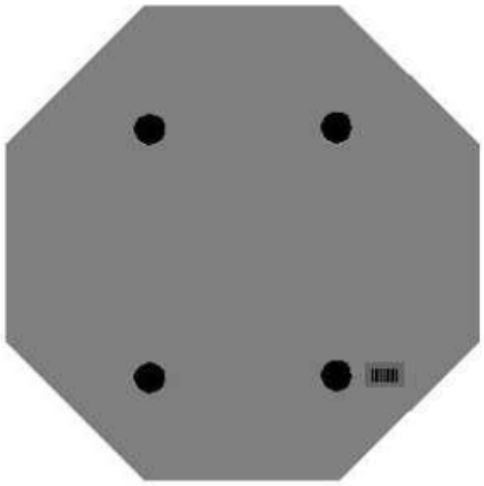
One Sign Post



Double Sign Post

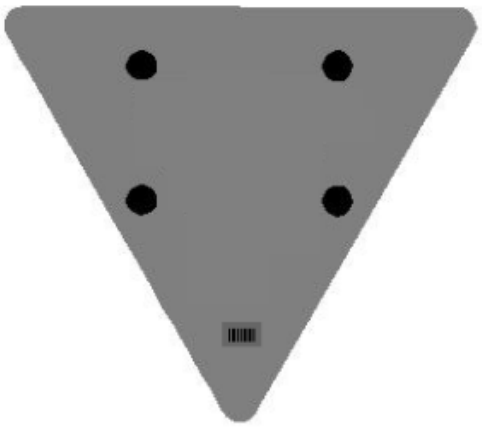


Interstate
Shield



48" Stop

2 Post Signs



PART III

EMPLOYMENT, WAGE AND RECORD REQUIREMENTS

TRANSPORTATION CABINET
DEPARTMENT OF HIGHWAYS

LABOR AND WAGE REQUIREMENTS
APPLICABLE TO OTHER THAN FEDERAL-AID SYSTEM PROJECTS

I. APPLICATION

1. These contract provisions shall apply to all work performed on the contract by the contractor with his own organization and with the assistance of workmen under his immediate superintendence and to all work performed on the contract by piecework, station work or by subcontract. The contractor's organization shall be construed to include only workmen employed and paid directly by the contractor and equipment owned or rented by him, with or without operators.

2. The contractor shall insert in each of his subcontracts all of the stipulations contained in these Required Provisions and such other stipulations as may be required.

3. A breach of any of the stipulations contained in these Required Provisions may be grounds for termination of the contract.

II. NONDISCRIMINATION OF EMPLOYEES

AN ACT OF THE KENTUCKY
GENERAL ASSEMBLY TO PREVENT
DISCRIMINATION IN EMPLOYMENT
KRS CHAPTER 344
EFFECTIVE JUNE 16, 1972

The contract on this project, in accordance with KRS Chapter 344, provides that during the performance of this contract, the contractor agrees as follows:

1. The contractor shall not fail or refuse to hire, or shall not discharge any individual, or otherwise discriminate against an individual with respect to his compensation, terms, conditions, or privileges of employment, because of such individual's race, color, religion, national origin, sex, disability or age (between forty and seventy); or limit, segregate, or classify his employees in any way which would deprive or tend to deprive an individual of employment opportunities or otherwise adversely affect his status as an employee, because of such individual's race, color, religion, national origin, sex, disability or age (between forty and seventy). The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

2. The contractor shall not print or publish or cause to be printed or published a notice or advertisement relating to employment by such an employer or membership in or any classification or referral for employment by the employment agency, indicating any preference, limitation, specification, or discrimination, based on race, color, religion, national origin, sex, disability or age (between forty and seventy), except that such notice or advertisement may indicate a preference, limitation, or specification based on religion, or national origin when religion, or national origin is a bona fide occupational qualification for employment.

3. If the contractor is in control of apprenticeship or other training or retraining, including on-the-job training programs, he shall not discriminate against an individual because of his race, color, religion, national origin, sex, disability or age (between forty and seventy), in admission to, or employment in any program established to provide apprenticeship or other training.

4. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representative of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment. The contractor will take such action with respect to any subcontract or purchase order as the administrating agency may direct as a means of enforcing such provisions, including sanctions for non-compliance.

III. PAYMENT OF PREDETERMINED MINIMUM WAGES

1. These special provisions are supplemented elsewhere in the contract by special provisions which set forth certain predetermined minimum wage rates. The contractor shall pay not less than those rates.

2. The minimum wage determination schedule shall be posted by the contractor, in a manner prescribed by the Department of Highways, at the site of the work in prominent places where it can be easily seen by the workers.

IV. STATEMENTS AND PAYROLLS

1. All contractors and subcontractors affected by the terms of KRS 337.505 to 337.550 shall keep full and accurate payroll records covering all disbursements of wages to their employees to whom they are required to pay not less than the prevailing rate of wages. Payrolls and basic records relating thereto will be maintained during the course of the work and preserved for a period of one (1) year from the date of completion of this contract.

2. The payroll records shall contain the name, address and social security number of each employee, his correct classification, rate of pay, daily and weekly number of hours worked, itemized deductions made and actual wages paid.

3. The contractor shall make his daily records available at the project site for inspection by the State Department of Highways contracting office or his authorized representative.

Periodic investigations shall be conducted as required to assure compliance with the labor provisions of the contract. Interrogation of employees and officials of the contractor shall be permitted during working hours.

Aggrieved workers, Highway Managers, Assistant District Engineers, Resident Engineers and Project Engineers shall report all complaints and violations to the Division of Contract Procurement.

The contractor shall be notified in writing of apparent violations. The contractor may correct the reported violations and notify the Department of Highways of the action taken or may request an informal hearing. The request for hearing shall be in writing within ten (10) days after receipt of the notice of the reported violation. The contractor may submit

records and information which will aid in determining the true facts relating to the reported violations.

Any person or organization aggrieved by the action taken or the findings established as a result of an informal hearing by the Division of Contract Procurement may request a formal hearing.

4. The wages of labor shall be paid in legal tender of the United States, except that this condition will be considered satisfied if payment is made by a negotiable check, on a solvent bank, which may be cashed readily by the employee in the local community for the full amount, without discount or collection charges of any kind. Where checks are used for payments, the contractor shall make all necessary arrangements for them to be cashed and shall give information regarding such arrangements.

5. No fee of any kind shall be asked or accepted by the contractor or any of his agents from any person as a condition of employment on the project.

6. No laborers shall be charged for any tools used in performing their respective duties except for reasonably avoidable loss or damage thereto.

7. Every employee on the work covered by this contract shall be permitted to lodge, board, and trade where and with whom he elects and neither the contractor nor his agents, nor his employees shall directly or indirectly require as a condition of employment that an employee shall lodge, board or trade at a particular place or with a particular person.

8. Every employee on the project covered by this contract shall be an employee of either the prime contractor or an approved subcontractor.

9. No charge shall be made for any transportation furnished by the contractor or his agents to any person employed on the work.

10. No individual shall be employed as a laborer or mechanic on this contract except on a wage basis, but this shall not be construed to prohibit the rental of teams, trucks or other equipment from individuals.

No Covered employee may be employed on the work except in accordance with the classification set forth in the schedule mentioned above; provided, however, that in the event additional classifications are required, application shall be made by the contractor to the Department of Highways and (1) the Department shall request appropriate classifications and rates from the proper agency, or (2) if there is urgent need for additional classification to avoid undue delay in the work, the contractor may employ such workmen at rates deemed comparable to rates established for similar classifications provided he has made written application through the Department of Highways, addressed to the proper agency, for the supplemental rates. The contractor shall retroactively adjust, upon receipt of the supplemental rates schedule, the wages of any employee paid less than the established rate and may adjust the wages of any employee overpaid.

11. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any laborer or mechanic in any work-week in which he is employed on such work, to work in excess of eight hours in any calendar day or in excess of forty hours in such work-week unless such laborer or mechanic receives compensation at a rate not less than one and one half times his basic rate of pay for all hours worked in excess of eight hours in any calendar day or in excess of forty hours in such work-week. A laborer, workman or mechanic and an employer may enter into a written agreement or a collective bargaining agreement to work more than eight (8) hours a calendar day but not more than ten (10) hours a calendar day for the straight time hourly rate. This agreement shall be in writing and shall be executed prior to the employee working in excess of eight (8) hours, but not more than ten (10) hours, in any one (1) calendar day.

12. Payments to the contractor may be suspended or withheld due to failure of the contractor to pay any laborer or mechanic employed or working on the site of the work, all or part of the wages required under the terms of the contract. The Department may suspend or withhold payments only after the contractor has been given written notice of the alleged violation and the contractor has failed to comply with the wage determination of the Department of Highways.

13. Contractors and subcontractors shall comply with the sections of Kentucky Revised Statutes, Chapter 337 relating to contracts for Public Works.

Revised 2-16-95

EXECUTIVE BRANCH CODE OF ETHICS

In the 1992 regular legislative session, the General Assembly passed and Governor Brereton Jones signed Senate Bill 63 (codified as KRS 11A), the Executive Branch Code of Ethics, which states, in part:

KRS 11A.040 (6) provides:

No present or former public servant shall, within six (6) months of following termination of his office or employment, accept employment, compensation or other economic benefit from any person or business that contracts or does business with the state in matters in which he was directly involved during his tenure. This provision shall not prohibit an individual from returning to the same business, firm, occupation, or profession in which he was involved prior to taking office or beginning his term of employment, provided that, for a period of six (6) months, he personally refrains from working on any matter in which he was directly involved in state government. This subsection shall not prohibit the performance of ministerial functions, including, but not limited to, filing tax returns, filing applications for permits or licenses, or filing incorporation papers.

KRS 11A.040 (8) states:

A former public servant shall not represent a person in a matter before a state agency in which the former public servant was directly involved, for a period of one (1) year after the latter of:

a) The date of leaving office or termination of employment; or
b) The date the term of office expires to which the public servant was elected.

This law is intended to promote public confidence in the integrity of state government and to declare as public policy the idea that state employees should view their work as a public trust and not as a way to obtain private benefits.

If you have worked for the executive branch of state government within the past six months, you may be subject to the law's prohibitions. The law's applicability may be different if you hold elected office or are contemplating representation of another before a state agency.

Also, if you are affiliated with a firm which does business with the state and which employs former state executive-branch employees, you should be aware that the law may apply to them.

In case of doubt, the law permits you to request an advisory opinion from the Executive Branch Ethics Commission, Room 136, Capitol Building, 700 Capitol Avenue, Frankfort, Kentucky 40601; telephone (502) 564-7954.

Kentucky Equal Employment Opportunity Act of 1978

The requirements of the Kentucky Equal Employment Opportunity Act of 1978 (KRS 45.560-45.640) shall apply to this Contract. The apparent low Bidder will be required to submit EEO forms to the Division of Construction Procurement, which will then forward to the Finance and Administration Cabinet for review and approval. No award will become effective until all forms are submitted and EEO/CC has certified compliance. The required EEO forms are as follows:

- EEO-1: Employer Information Report
- Affidavit of Intent to Comply
- Employee Data Sheet
- Subcontractor Report

These forms are available on the Finance and Administration's web page under ***Vendor Information, Standard Attachments and General Terms*** at the following address: **https://www.eProcurement.ky.gov**.

Bidders currently certified as being in compliance by the Finance and Administration Cabinet may submit a copy of their approval letter in lieu of the referenced EEO forms.

For questions or assistance please contact the Finance and Administration Cabinet by email at **finance.contractcompliance@ky.gov** or by phone at 502-564-2874.

General Decision Number: KY150100 05/01/2015 KY100

Superseded General Decision Number: KY20140100

State: Kentucky

Construction Type: Highway

Counties: Anderson, Bath, Bourbon, Boyd, Boyle, Bracken, Breckinridge, Bullitt, Carroll, Carter, Clark, Elliott, Fayette, Fleming, Franklin, Gallatin, Grant, Grayson, Greenup, Hardin, Harrison, Henry, Jefferson, Jessamine, Larue, Lewis, Madison, Marion, Mason, Meade, Mercer, Montgomery, Nelson, Nicholas, Oldham, Owen, Robertson, Rowan, Scott, Shelby, Spencer, Trimble, Washington and Woodford Counties in Kentucky.

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Executive Order (EO) 13658 establishes an hourly minimum wage of $10.10 for 2015 that applies to all contracts subject to the Davis-Bacon Act for which the solicitation is issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.10 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/02/2015
1	01/23/2015
2	01/30/2015
3	02/20/2015
4	05/01/2015

BRIN0004-003 06/01/2011

BRECKENRIDGE COUNTY

	Rates	Fringes
BRICKLAYER	$ 24.11	10.07

BRKY0001-005 06/01/2014

BULLITT, CARROLL, GRAYSON, HARDIN, HENRY, JEFFERSON, LARUE, MARION, MEADE, NELSON, OLDHAM, SHELBY, SPENCER, & TRIMBLE COUNTIES:

	Rates	Fringes

BRICKLAYER.....$ 25.37 10.50

BRKY0002-006 06/01/2011

BRACKEN, GALLATIN, GRANT, MASON & ROBERTSON COUNTIES:

	Rates	Fringes
BRICKLAYER	$ 26.57	10.26

BRKY0007-004 06/01/2014

BOYD, CARTER, ELLIOT, FLEMING, GREENUP, LEWIS & ROWAN COUNTIES:

	Rates	Fringes
BRICKLAYER	$ 30.57	17.94

BRKY0017-004 06/01/2009

ANDERSON, BATH, BOURBON, BOYLE, CLARK, FAYETTE, FRANKLIN, HARRISON, JESSAMINE, MADISON, MERCER, MONTGOMERY, NICHOLAS, OWEN, SCOTT, WASHINGTON & WOODFORD COUNTIES:

	Rates	Fringes
BRICKLAYER	$ 24.11	9.97

CARP0064-001 04/01/2014

	Rates	Fringes
CARPENTER	$ 27.50	14.96
Diver	$ 41.63	14.96
PILEDRIVERMAN	$ 27.75	14.96

ELEC0212-008 06/02/2014

BRACKEN, GALLATIN and GRANT COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 26.74	16.45

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* ELEC0212-014 12/01/2014

BRACKEN, GALLATIN & GRANT COUNTIES:

	Rates	Fringes
Sound & Communication Technician	$ 22.75	10.08

ELEC0317-012 05/28/2014

BOYD, CARTER, ELLIOT & ROWAN COUNTIES:

	Rates	Fringes

ELECTRICIAN
Cable Splicer.....$ 32.68 18.13
Electrician.....$ 32.62 21.45

ELEC0369-007 05/28/2014

ANDERSON, BATH, BOURBON, BOYLE, BRECKINRIDGE, BULLITT, CARROLL, CLARK, FAYETTE, FRAONKLIN, GRAYSON, HARDIN, HARRISON, HENRY, JEFFERSON, JESSAMINE, LARUE, MADISON, MARION, MEADE, MERCER, MONTGOMERY, NELSON, NICHOLAS, OLDHAM, OWEN, ROBERTSON, SCOTT, SHELBY, SPENCER, TRIMBLE, WASHINGTON, & WOODFORD COUNTIES:

	Rates	Fringes
ELECTRICIAN	$ 29.88	14.78

ELEC0575-002 06/02/2014

FLEMING, GREENUP, LEWIS & MASON COUNTIES:

	Rates	Fringes
ELECTRICIAN	$ 31.70	14.21

ENGI0181-018 07/01/2014

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1	$ 28.85	14.15
GROUP 2	$ 26.24	14.15
GROUP 3	$ 26.65	14.15
GROUP 4	$ 25.95	14.15

OPERATING ENGINEER CLASSIFICATIONS

GROUP 1 - A-Frame Winch Truck; Auto Patrol; Backfiller; Batcher Plant; Bituminous Paver; Bituminous Transfer Machine; Boom Cat; Bulldozer; Mechanic; Cableway; Carry-All Scoop; Carry Deck Crane; Central Compressor Plant; Cherry Picker; Clamshell; Concrete Mixer (21 cu. ft. or Over); Concrete Paver; Truck-Mounted Concrete Pump; Core Drill; Crane; Crusher Plant; Derrick; Derrick Boat; Ditching & Trenching Machine; Dragline; Dredge Operator; Dredge Engineer; Elevating Grader & Loaders; Grade-All; Gurries; Heavy Equipment Robotics Operator/Mechanic; High Lift; Hoe-Type Machine; Hoist (Two or More Drums); Hoisting Engine (Two or More Drums); Horizontal Directional Drill Operator; Hydrocrane; Hyster; KeCal Loader; LeTourneau; Locomotive; Mechanic; Mechanically Operated Laser Screed; Mechanic Welder; Mucking Machine; Motor Scraper; Orangepeel Bucket; Overhead Crane; Piledriver; Power Blade; Pumpcrete; Push Dozer; Rock Spreader, attached to equipment; Rotary Drill; Roller (Bituminous); Rough Terrain Crane; Scarifier; Scoopmobile; Shovel; Side Boom; Subgrader; Tailboom; Telescoping Type Forklift; Tow or Push Boat; Tower Crane (French, German & other types); Tractor Shovel; Truck Crane; Tunnel Mining Machines, including Moles, Shields or

similar types of Tunnel Mining Equipment

GROUP 2 - Air Compressor (Over 900 cu. ft. per min.); Bituminous Mixer; Boom Type Tamping Machine; Bull Float; Concrete Mixer (Under 21 cu. ft.); Dredge Engineer; Electric Vibrator; Compactor/Self-Propelled Compactor; Elevator (One Drum or Buck Hoist); Elevator (When used to Hoist Building Material); Finish Machine; Firemen & Hoist (One Drum); Flexplane; Forklift (Regardless of Lift Height); Form Grader; Joint Sealing Machine; Outboard Motor Boat; Power Sweeper (Riding Type); Roller (Rock); Ross Carrier; Skid Mounted or Trailer Mounted Conrete Pump; Skid Steer Machine with all Attachments; Switchman or Brakeman; Throttle Valve Person; Tractair & Road Widening Trencher; Tractor (50 H.P. or Over); Truck Crane Oiler; Tugger; Welding Machine; Well Points; & Whirley Oiler

GROUP 3 - All Off Road Material Handling Equipment, including Articulating Dump Trucks; Greaser on Grease Facilities servicing Heavy Equipment

GROUP 4 - Bituminous Distributor; Burlap & Curing Machine; Cement Gun; Concrete Saw; Conveyor; Deckhand Oiler; Grout Pump; Hydraulic Post Driver; Hydro Seeder; Mud Jack; Oiler; Paving Joint Machine; Power Form Handling Equipment; Pump; Roller (Earth); Steerman; Tamping Machine; Tractor (Under 50 H.P.); & Vibrator

CRANES - with booms 150 ft. & Over (Including JIB), and where the length of the boom in combination with the length of the piling leads equals or exceeds 150 ft. - $1.00 over Group 1 rate

EMPLOYEES ASSIGNED TO WORK BELOW GROUND LEVEL ARE TO BE PAID 10%
ABOVE BASIC WAGE RATE. THIS DOES NOT APPLY TO OPEN CUT WORK.

IRON0044-009 08/27/2014

BRACKEN, GALLATIN, GRANT, HARRISON, ROBERTSON,
BOURBON (Northern third, including Townships of Jackson, Millersburg, Ruddel Mills & Shawhan);
CARROLL (Eastern third, including the Township of Ghent);
FLEMING (Western part, excluding Townships of Beechburg, Colfax, Elizaville, Flemingsburg, Flemingsburg Junction, Foxport, Grange City, Hillsboro, Hilltop, Mount Carmel, Muses Mills, Nepton, Pecksridge, Plummers Landing, Plummers Mill, Poplar Plains, Ringos Mills, Tilton & Wallingford);
MASON (Western two-thirds, including Townships of Dover, Lewisburg, Mays Lick, Maysville, Minerva, Moranburg, Murphysville, Ripley, Sardis, Shannon, South Ripley & Washington);
NICHOLAS (Townships of Barefoot, Barterville, Carlisle, Ellisville, Headquarters, Henryville, Morningglory, Myers & Oakland Mills);
OWEN (Townships of Beechwood, Bromley, Fairbanks, Holbrook, Jonesville, Long Ridge, Lusby's Mill, New, New Columbus, New Liberty, Owenton, Poplar Grove, Rockdale, Sanders, Teresita & Wheatley);

SCOTT (Northern two-thirds, including Townships of Biddle, Davis, Delaplain, Elmville, Longlick, Muddy Ford, Oxford, Rogers Gap, Sadieville, Skinnersburg & Stonewall)

	Rates	Fringes
IRONWORKER		
Fence Erector	$ 23.09	18.85
Structural	$ 25.65	18.85

IRON0070-006 06/01/2014

ANDERSON, BOYLE, BRECKINRIDGE, BULLITT, FAYETTE, FRANKLIN, GRAYSON, HARDIN, HENRY, JEFFERSON, JESSAMINE, LARUE, MADISON, MARION, MEADE, MERCER, NELSON, OLDHAM, SHELBY, SPENCER, TRIMBLE, WASHINGTON & WOODFORD
BOURBON (Southern two-thirds, including Townships of Austerlity, Centerville, Clintonville, Elizabeth, Hutchison, Littlerock, North Middletown & Paris);
CARROLL (Western two-thirds, including Townships of Carrollton, Easterday, English, Locust, Louis, Prestonville & Worthville);
CLARK (Western two-thirds, including Townships of Becknerville, Flanagan, Ford, Pine Grove, Winchester & Wyandotte);
OWEN (Eastern eighth, including Townships of Glenmary, Gratz, Monterey, Perry Park & Tacketts Mill);
SCOTT (Southern third, including Townships of Georgetown, Great Crossing, Newtown, Stampling Ground & Woodlake);

	Rates	Fringes
IRONWORKER	$ 26.97	19.75

IRON0372-006 07/01/2014

BRACKEN, GALLATIN, GRANT, HARRISON and ROBERTSON
BOURBON (Northern third, including Townships of Jackson, Millersburg, Ruddel Mills & Shawhan);
CARROLL (Eastern third, including the Township of Ghent);
FLEMING (Western part, Excluding Townships of Beechburg, Colfax, Elizaville, Flemingsburg, Flemingsburg Junction, Foxport, Grange City, Hillsboro, Hilltop, Mount Carmel, Muses Mills, Nepton, Pecksridge, Plummers Landing, Plummers Mill, Poplar Plains,
Ringos Mills, Tilton & Wallingford);
MASON (Western two-thirds, including Townships of Dover, Lewisburg, Mays Lick, Maysville, Minerva, Moranburg, Murphysville, Ripley, Sardis, Shannon, South Ripley & Washington);
NICHOLAS (Townships of Barefoot, Barterville, Carlisle, Ellisville, Headquarters, Henryville, Morningglory, Myers & Oakland Mills);
OWEN (Townships of Beechwood, Bromley, Fairbanks, Holbrook, Jonesville, Long Ridge, Lusby's Mill, New, New Columbus, New Liberty, Owenton, Poplar Grove, Rockdale, Sanders, Teresita & Wheatley);
SCOTT (Northern two-thirds, including Townships of Biddle, Davis,Delaplain, Elmville, Longlick, Muddy Ford, Oxford, Rogers Gap, Sadieville, Skinnersburg & Stonewall) COUNTIES

	Rates	Fringes
IRONWORKER, REINFORCING	$ 26.25	18.45

IRON0769-007 06/01/2014

BATH, BOYD, CARTER, ELLIOTT, GREENUP, LEWIS, MONTGOMERY & ROWAN
CLARK (Eastern third, including townships of Bloomingdale, Hunt, Indian Fields, Kiddville, Loglick, Rightangele & Thomson);
FLEMING (Townships of Beechburg, Colfax, Elizaville, Flemingsburg, Flemingsburg Junction, Foxport, Grange City, Hillsboro, Hilltop, Mount Carmel, Muses Mills, Nepton, Pecksridge, Plummers Landing, Plummers Mill, Poplar Plains, Ringos Mills, Tilton & Wallingford);
MASON (Eastern third, including Townships of Helena, Marshall, Orangeburg, Plumville & Springdale);
NICHOLAS (Eastern eighth, including the Township of Moorefield Sprout)

	Rates	Fringes
IRONWORKER		
ZONE 1	$ 31.33	21.33
ZONE 2	$ 31.73	21.33
ZONE 3	$ 33.33	21.33

ZONE 1 - Up to 10 mile radius of Union Hall, Ashland, Ky., 1643 Greenup Ave.

ZONE 2 - 10 to 50 mile radius of Union Hall, Ashland, Ky., 1643 Greenup Ave.

ZONE 3 - 50 mile radius & over of Union Hall, Ashland, Ky., 1643 Greenup Ave.

LABO0189-003 07/01/2014

BATH, BOURBON, BOYD, BOYLE, BRACKEN, CARTER, CLARK, ELLIOTT, FAYETTE, FLEMING, FRANKLIN, GALLATIN, GRANT, GREENUP, HARRISON, JESSAMINE, LEWIS, MADISON, MASON, MERCER, MONTGOMERY, NICHOLAS, OWEN, ROBERTSON, ROWAN, SCOTT, & WOOLFORD COUNTIES

	Rates	Fringes
Laborers:		
GROUP 1	$ 21.80	11.96
GROUP 2	$ 22.05	11.96
GROUP 3	$ 22.10	11.96
GROUP 4	$ 22.70	11.96

LABORERS CLASSIFICATIONS

GROUP 1 - Aging & Curing of Concrete; Asbestos Abatement Worker; Asphalt Plant; Asphalt; Batch Truck Dump; Carpenter Tender; Cement Mason Tender; Cleaning of Machines;

Concrete; Demolition; Dredging; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Level D; Flagperson; Grade Checker; Hand Digging & Hand Back Filling; Highway Marker Placer; Landscaping, Mesh Handler & Placer; Puddler; Railroad; Rip-rap & Grouter; Right-of-Way; Sign, Guard Rail & Fence Installer; Signal Person; Sound Barrier Installer; Storm & Sanitary Sewer; Swamper; Truck Spotter & Dumper; Wrecking of Concrete Forms; General Cleanup

GROUP 2 - Batter Board Man (Sanitary & Storm Sewer); Brickmason Tender; Mortar Mixer Operator; Scaffold Builder; Burner & Welder; Bushammer; Chain Saw Operator; Concrete Saw Operator; Deckhand Scow Man; Dry Cement Handler; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Level C; Forklift Operator for Masonary; Form Setter; Green Concrete Cutting; Hand Operated Grouter & Grinder Machine Operator; Jackhammer; Pavement Breaker; Paving Joint Machine; Pipelayer; Plastic Pipe Fusion; Power Driven Georgia Buggy & Wheel Barrow; Power Post Hole Digger; Precast Manhole Setter; Walk-Behind Tamper; Walk-Behind Trencher; Sand Blaster; Concrete Chipper; Surface Grinder; Vibrator Operator; Wagon Driller

GROUP 3 - Asphalt Luteman & Raker; Gunnite Nozzleman; Gunnite Operator & Mixer; Grout Pump Operator; Side Rail Setter; Rail Paved Ditches; Screw Operator; Tunnel (Free Air); Water Blaster

GROUP 4 - Caisson Worker (Free Air); Cement Finisher; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Levels A & B; Miner & Driller (Free Air); Tunnel Blaster; & Tunnel Mucker (Free Air); Directional & Horizontal Boring; Air Track Drillers (All Types); Powdermen & Blasters; Troxler & Concrete Tester if Laborer is Utilized

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LABO0189-008 07/01/2014

ANDERSON, BULLITT, CARROLL, HARDIN, HENRY, JEFFERSON, LARUE, MARION, MEADE, NELSON, OLDHAM, SHELBY, SPENCER, TRIMBLE & WASHINGTON COUNTIES

	Rates	Fringes
Laborers:		
GROUP 1	$ 22.71	11.05
GROUP 2	$ 22.96	11.05
GROUP 3	$ 23.01	11.05
GROUP 4	$ 23.61	11.05

LABORERS CLASSIFICATIONS

GROUP 1 - Aging & Curing of Concrete; Asbestos Abatement Worker; Asphalt Plant; Asphalt; Batch Truck Dump; Carpenter Tender; Cement Mason Tender; Cleaning of Machines; Concrete; Demolition; Dredging; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Level D; Flagperson; Grade Checker; Hand Digging & Hand Back Filling; Highway Marker Placer; Landscaping, Mesh Handler & Placer; Puddler;

Railroad; Rip-rap & Grouter; Right-of-Way; Sign, Guard Rail & Fence Installer; Signal Person; Sound Barrier Installer; Storm & Sanitary Sewer; Swamper; Truck Spotter & Dumper; Wrecking of Concrete Forms; General Cleanup

GROUP 2 - Batter Board Man (Sanitary & Storm Sewer); Brickmason Tender; Mortar Mixer Operator; Scaffold Builder; Burner & Welder; Bushammer; Chain Saw Operator; Concrete Saw Operator; Deckhand Scow Man; Dry Cement Handler; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Level C; Forklift Operator for Masonary; Form Setter; Green Concrete Cutting; Hand Operated Grouter & Grinder Machine Operator; Jackhammer; Pavement Breaker; Paving Joint Machine; Pipelayer; Plastic Pipe Fusion; Power Driven Georgia Buggy & Wheel Barrow; Power Post Hole Digger; Precast Manhole Setter; Walk-Behind Tamper; Walk-Behind Trencher; Sand Blaster; Concrete Chipper; Surface Grinder; Vibrator Operator; Wagon Driller

GROUP 3 - Asphalt Luteman & Raker; Gunnite Nozzleman; Gunnite Operator & Mixer; Grout Pump Operator; Side Rail Setter; Rail Paved Ditches; Screw Operator; Tunnel (Free Air); Water Blaster

GROUP 4 - Caisson Worker (Free Air); Cement Finisher; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Levels A & B; Miner & Driller (Free Air); Tunnel Blaster; & Tunnel Mucker (Free Air); Directional & Horizontal Boring; Air Track Drillers (All Types); Powdermen & Blasters; Troxler & Concrete Tester if Laborer is Utilized

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LABO0189-009 07/01/2014

BRECKINRIDGE & GRAYSON COUNTIES

	Rates	Fringes
Laborers:		
GROUP 1	$ 22.66	11.10
GROUP 2	$ 22.91	11.10
GROUP 3	$ 22.96	11.10
GROUP 4	$ 23.56	11.10

LABORERS CLASSIFICATIONS

GROUP 1 - Aging & Curing of Concrete; Asbestos Abatement Worker; Asphalt Plant; Asphalt; Batch Truck Dump; Carpenter Tender; Cement Mason Tender; Cleaning of Machines; Concrete; Demolition; Dredging; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Level D; Flagperson; Grade Checker; Hand Digging & Hand Back Filling; Highway Marker Placer; Landscaping, Mesh Handler & Placer; Puddler; Railroad; Rip-rap & Grouter; Right-of-Way; Sign, Guard Rail & Fence Installer; Signal Person; Sound Barrier Installer; Storm & Sanitary Sewer; Swamper; Truck Spotter & Dumper; Wrecking of Concrete Forms; General Cleanup

GROUP 2 - Batter Board Man (Sanitary & Storm Sewer); Brickmason Tender; Mortar Mixer Operator; Scaffold Builder;

Burner & Welder; Bushammer; Chain Saw Operator; Concrete Saw Operator; Deckhand Scow Man; Dry Cement Handler; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Level C; Forklift Operator for Masonary; Form Setter; Green Concrete Cutting; Hand Operated Grouter & Grinder Machine Operator; Jackhammer; Pavement Breaker; Paving Joint Machine; Pipelayer; Plastic Pipe Fusion; Power Driven Georgia Buggy & Wheel Barrow; Power Post Hole Digger; Precast Manhole Setter; Walk-Behind Tamper; Walk-Behind Trencher; Sand Blaster; Concrete Chipper; Surface Grinder; Vibrator Operator; Wagon Driller

GROUP 3 - Asphalt Luteman & Raker; Gunnite Nozzleman; Gunnite Operator & Mixer; Grout Pump Operator; Side Rail Setter; Rail Paved Ditches; Screw Operator; Tunnel (Free Air); Water Blaster

GROUP 4 - Caisson Worker (Free Air); Cement Finisher; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Levels A & B; Miner & Driller (Free Air); Tunnel Blaster; & Tunnel Mucker (Free Air); Directional & Horizontal Boring; Air Track Drillers (All Types); Powdermen & Blasters; Troxler & Concrete Tester if Laborer is Utilized

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PAIN0012-005 06/11/2005

BATH, BOURBON, BOYLE, CLARK, FAYETTE, FLEMING, FRANKLIN, HARRISON, JESSAMINE, MADISON, MERCER, MONTGOMERY, NICHOLAS, ROBERTSON, SCOTT & WOODFORD COUNTIES:

	Rates	Fringes
PAINTER		
Bridge/Equipment Tender and/or Containment Builder	$ 18.90	5.90
Brush & Roller	$ 21.30	5.90
Elevated Tanks; Steeplejack Work; Bridge & Lead Abatement	$ 22.30	5.90
Sandblasting & Waterblasting	$ 22.05	5.90
Spray	$ 21.80	5.90

PAIN0012-017 05/01/2014

BRACKEN, GALLATIN, GRANT, MASON & OWEN COUNTIES:

	Rates	Fringes
PAINTER (Heavy & Highway Bridges - Guardrails - Lightpoles - Striping)		
Bridge Equipment Tender and Containment Builder	$ 20.73	8.71
Brush & Roller	$ 23.39	8.71
Elevated Tanks; Steeplejack Work; Bridge & Lead Abatement	$ 24.39	8.71

Sandblasting & Water		
Blasting	$ 24.14	8.71
Spray	$ 23.89	8.71

PAIN0118-004 06/01/2014

ANDERSON, BRECKINRIDGE, BULLITT, CARROLL, GRAYSON, HARDIN, HENRY, JEFFERSON, LARUE, MARION, MEADE, NELSON, OLDHAM, SHELBY, SPENCER, TRIMBLE & WASHINGTON COUNTIES:

	Rates	Fringes
PAINTER		
Brush & Roller	$ 18.50	11.97
Spray, Sandblast, Power Tools, Waterblast & Steam Cleaning	$ 19.50	11.97

PAIN1072-003 12/01/2014

BOYD, CARTER, ELLIOTT, GREENUP, LEWIS and ROWAN COUNTIES

	Rates	Fringes
Painters:		
Bridges; Locks; Dams; Tension Towers & Energized Substations	$ 31.83	15.30
Power Generating Facilities	$ 28.59	15.30

PLUM0248-003 06/01/2014

BOYD, CARTER, ELLIOTT, GREENUP, LEWIS & ROWAN COUNTIES:

	Rates	Fringes
Plumber and Steamfitter	$ 33.00	18.95

PLUM0392-007 06/01/2014

BRACKEN, CARROLL (Eastern Half), GALLATIN, GRANT, MASON, OWEN & ROBERTSON COUNTIES:

	Rates	Fringes
Plumbers and Pipefitters	$ 29.80	17.79

PLUM0502-003 08/01/2013

BRECKINRIDGE, BULLITT, CARROLL (Western Half), FRANKLIN (Western three-fourths), GRAYSON, HARDIN, HENRY, JEFFERSON, LARUE, MARION, MEADE, NELSON, OLDHAM, SHELBY, SPENCER, TRIMBLE & WASHINGTON COUNTIES

	Rates	Fringes
PLUMBER	$ 32.00	17.17

SUKY2010-160 10/08/2001

	Rates	Fringes
Truck drivers:		
GROUP 1	$ 16.57	7.34
GROUP 2	$ 16.68	7.34
GROUP 3	$ 16.86	7.34
GROUP 4	$ 16.96	7.34

TRUCK DRIVER CLASSIFICATIONS

GROUP 1 - Mobile Batch Truck Tender

GROUP 2 - Greaser; Tire Changer; & Mechanic Tender

GROUP 3 - Single Axle Dump; Flatbed; Semi-trailer or Pole Trailer when used to pull building materials and equipment; Tandem Axle Dump; Distributor; Mixer; & Truck Mechanic

GROUP 4 - Euclid & Other Heavy Earthmoving Equipment & Lowboy; Articulator Cat; 5-Axle Vehicle; Winch & A-Frame when used in transporting materials; Ross Carrier; Forklift when used to transport building materials; & Pavement Breaker

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of

the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination

* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

Fringe benefit amounts are applicable for all hours worked except when otherwise noted.

These rates are listed pursuant to the Kentucky Determination No. CR-14-III- HWY dated July 14, 2014.

No laborer, workman or mechanic shall be paid at a rate less than that of a Journeyman except those classified as bona fide apprentices.

Apprentices or trainees shall be permitted to work as such subject to Administrative Regulations adopted by the Commissioner of Workplace Standards. Copies of these regulations will be furnished upon request from any interested person.

Before using apprentices on the job the contractor shall present to the Contracting Officer written evidence of registration of such employees in a program of a State apprenticeship and training agency approved and recognized by the U. S. Bureau of Apprenticeship and Training. In the absence of such a State agency, the contractor shall submit evidence of approval and registration by the U. S. Bureau of Apprenticeship and Training.

The contractor shall submit to the Contracting Officer, written evidence of the established apprenticeship-journeyman ratios and wage rates in the project area, which will be the basis for establishing such ratios and rates for the project under the applicable contract provisions.

TO: EMPLOYERS/EMPLOYEES

PREVAILING WAGE SCHEDULE:

The wages indicated on this wage schedule are the least permitted to be paid for the occupations indicated. When an employee works in more than one classification, the employer must record the number of hours worked in each classification at the prescribed hourly base rate.

OVERTIME:

Overtime is to be paid after an employee works eight (8) hours a day or forty (40) hours a week, whichever gives the employee the greater wages. At least time and one-half the base rate is required for all overtime. A laborer, workman or mechanic and an employer may enter into a written agreement or a collective bargaining agreement to work more than eight (8) hours a calendar day but not more than ten (10) hours a calendar day for the straight time hourly rate. Wage violations or questions should be directed to the designated Engineer or the undersigned.

Diana Castle Radcliffe, P.E.
Director, Division of Construction Procurement
Frankfort, Kentucky 40622

PART IV

INSURANCE

INSURANCE

The Contractor shall procure and maintain the following insurance in addition to the insurance required by law:

1) Commercial General Liability-Occurrence form – not less than $2,000,000 General aggregate, $2,000,000 Products & Completed Aggregate, $1,000,000 Personal & Advertising, $1,000,000 each occurrence.

2) Automobile Liability- $1,000,000 per accident

3) Employers Liability:

   a) $100,000 Each Accident Bodily Injury
   b) $500,000 Policy limit Bodily Injury by Disease
   c) $100,000 Each Employee Bodily Injury by Disease

4) The insurance required above must be evidenced by a Certificate of Insurance and this Certificate of Insurance must contain one of the following statements:
   a) "policy contains no deductible clauses."
   b) "policy contains _____ (amount) deductible property damage clause but company will pay claim and collect the deductible from the insured."

5) KENTUCKY WORKMEN'S COMPENSATION INSURANCE. The contractor shall furnish evidence of coverage of all his employees or give evidence of self-insurance by submitting a copy of a certificate issued by the Workmen's Compensation Board.

The cost of insurance is incidental to all contract items. All subcontractors must meet the same minimum insurance requirements.

PART V

BID ITEMS

151221

PROPOSAL BID ITEMS

Report Date 5/4/15

Section: 0001 - PAVING

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0010	00001		DGA BASE	4,953.00	TON		$	
0020	00100		ASPHALT SEAL AGGREGATE	40.00	TON		$	
0030	00103		ASPHALT SEAL COAT	5.00	TON		$	
0040	02032		JPC PAVEMENT-9 IN/48	3,859.00	SQYD		$	
0050	02034		JPC PAVEMENT-11 IN/48	962.00	SQYD		$	
0060	02071		JPC PAVEMENT-11 IN	705.00	SQYD		$	
0070	02072		JPC PAVEMENT-11 IN SHLD	87.00	SQYD		$	
0080	02073		JPC PAVEMENT-9 IN	7,679.00	SQYD		$	
0090	02075		JPC PAVEMENT-6 IN	82.00	SQYD		$	
0100	02082		JPC PAVEMENT-9 IN SHLD	127.00	SQYD		$	

Section: 0002 - ROADWAY

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0110	00005		GEOGRID REINFORCEMENT FOR SUBGRADE	8,054.00	SQYD		$	
0120	00078		CRUSHED AGGREGATE SIZE NO 2	900.00	TON		$	
0130	01310		REMOVE PIPE	205.00	LF		$	
0140	01314		PLUG PIPE	4.00	EACH		$	
0150	01585		REMOVE DROP BOX INLET	2.00	EACH		$	
0160	01705		REMOVE CURB & GUTTER BOX INLET	3.00	EACH		$	
0170	01812		REMOVE CURB AND GUTTER	161.00	LF		$	
0180	01815		BARRIER CURB AND GUTTER	519.00	LF		$	
0190	01830		STANDARD INTEGRAL CURB	3,426.00	LF		$	
0200	01845		ISLAND INTEGRAL CURB	630.00	LF		$	
0210	01987		DELINEATOR FOR GUARDRAIL BI DIRECTIONAL WHITE	16.00	EACH		$	
0220	02009		REMOVE ASPHALT MEDIAN	569.00	SQYD		$	
0230	02014		BARRICADE-TYPE III	31.00	EACH		$	
0240	02058		REMOVE PCC PAVEMENT	8,013.00	SQYD		$	
0250	02091		REMOVE PAVEMENT	1,857.00	SQYD		$	
0260	02165		REMOVE PAVED DITCH	33.00	SQYD		$	
0270	02230		EMBANKMENT IN PLACE	5,318.00	CUYD		$	
0280	02242		WATER (FOR DUST CONTROL)	800.00	MGAL		$	
0290	02259		FENCE-TEMP	703.00	LF		$	
0300	02265		REMOVE FENCE	816.00	LF		$	
0310	02274		FENCE-6 FT CHAIN LINK	690.00	LF		$	
0320	02351		GUARDRAIL-STEEL W BEAM-S FACE	800.00	LF		$	
0330	02360		GUARDRAIL TERMINAL SECTION NO 1	2.00	EACH		$	
0340	02367		GUARDRAIL END TREATMENT TYPE 1	4.00	EACH		$	
0350	02381		REMOVE GUARDRAIL	561.50	LF		$	
0360	02429		RIGHT-OF-WAY MONUMENT TYPE 1	1.00	EACH		$	
0370	02432		WITNESS POST	1.00	EACH		$	
0380	02483		CHANNEL LINING CLASS II	115.00	TON		$	
0390	02545		CLEARING AND GRUBBING (APPROXIMATELY 2 ACRES)	1.00	LS		$	

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PROPOSAL BID ITEMS

Report Date 5/4/15

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0400	02562		TEMPORARY SIGNS	260.00	SQFT		$	
0410	02599		FABRIC-GEOTEXTILE TYPE IV	10,043.00	SQYD		$	
0420	02625		REMOVE HEADWALL	8.00	EACH		$	
0430	02650		MAINTAIN & CONTROL TRAFFIC	1.00	LS		$	
0440	02671		PORTABLE CHANGEABLE MESSAGE SIGN	6.00	EACH		$	
0450	02721		REMOVE CONCRETE SIDEWALK	310.00	SQYD		$	
0460	02726		STAKING	1.00	LS		$	
0470	02775		ARROW PANEL	2.00	EACH		$	
0480	05950		EROSION CONTROL BLANKET	291.00	SQYD		$	
0490	05963		INITIAL FERTILIZER	.30	TON		$	
0500	05964		20-10-10 FERTILIZER	.40	TON		$	
0510	05990		SODDING	5,374.00	SQYD		$	
0520	05992		AGRICULTURAL LIMESTONE	3.40	TON		$	
0530	06510		PAVE STRIPING-TEMP PAINT-4 IN	4,000.00	LF		$	
0540	06514		PAVE STRIPING-PERM PAINT-4 IN	9,879.00	LF		$	
0550	06515		PAVE STRIPING-PERM PAINT-6 IN	1,275.00	LF		$	
0560	06568		PAVE MARKING-THERMO STOP BAR-24IN	138.00	LF		$	
0570	06569		PAVE MARKING-THERMO CROSS-HATCH	5,159.00	SQFT		$	
0580	06572		PAVE MARKING-DOTTED LANE EXTEN	181.00	LF		$	
0590	06574		PAVE MARKING-THERMO CURV ARROW	10.00	EACH		$	
0600	06576		PAVE MARKING-THERMO ONLY	2.00	EACH		$	
0610	10020NS		FUEL ADJUSTMENT	2,000.00	DOLL	$1.00	$	$2,000.00
0620	20550ND		SAWCUT PAVEMENT	1,726.00	LF		$	
0630	21415ND		EROSION CONTROL	1.00	LS		$	
0640	22664EN		WATER BLASTING EXISTING STRIPE	1,733.00	LF		$	
0650	23839EC		REMOVE CONCRETE MEDIAN	186.00	SQYD		$	
0660	24466EN		FENCE-SPECIAL FENCE-8 FT CHAIN LINK W/ 3 STRAND BARBED WIRE	866.00	LF		$	
0670	24768EC		LANE SEPARATOR CURB	291.00	LF		$	

Section: 0003 - DRAINAGE

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0680	00460		CULVERT PIPE-12 IN	4.00	LF		$	
0690	00461		CULVERT PIPE-15 IN	4.00	LF		$	
0700	00462		CULVERT PIPE-18 IN	4.00	LF		$	
0710	00468		CULVERT PIPE-36 IN	146.00	LF		$	
0720	00499		CULVERT PIPE-48 IN EQUIV	106.00	LF		$	
0730	00520		STORM SEWER PIPE-12 IN	96.00	LF		$	
0740	00521		STORM SEWER PIPE-15 IN	473.00	LF		$	
0750	00522		STORM SEWER PIPE-18 IN	288.00	LF		$	
0760	01000		PERFORATED PIPE-4 IN	32.00	LF		$	
0770	01010		NON-PERFORATED PIPE-4 IN	4.00	LF		$	
0780	01202		PIPE CULVERT HEADWALL-15 IN	2.00	EACH		$	
0790	01204		PIPE CULVERT HEADWALL-18 IN	3.00	EACH		$	
0800	01217		PIPE CULVERT HEADWALL-48 IN EQUIV	1.00	EACH		$	
0810	01453		S & F BOX INLET-OUTLET-36 IN	1.00	EACH		$	
0820	01480		CURB BOX INLET TYPE B	12.00	EACH		$	

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PROPOSAL BID ITEMS

Report Date 5/4/15

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0830	01487		CURB BOX INLET TYPE F	4.00	EACH		$	
0840	01544		DROP BOX INLET TYPE 11	6.00	EACH		$	
0850	01650		JUNCTION BOX	2.00	EACH		$	
0860	02600		FABRIC GEOTEXTILE TY IV FOR PIPE	1,719.00	SQYD	$2.00	$	$3,438.00
0870	08100		CONCRETE-CLASS A (4.3 CU YDS FOR FOR DOUBLE 36" PIPE CULVERT HEADWALL)	29.56	CUYD		$	
0880	08150		STEEL REINFORCEMENT (FOR DOUBLE 36" PIPE CULVERT HEADWALL)	363.00	LB		$	
0890	23131ER701		PIPELINE VIDEO INSPECTION	1,121.00	LF		$	

Section: 0004 - SIGNING

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0900	06406		SBM ALUM SHEET SIGNS .080 IN	144.00	SQFT		$	
0910	06407		SBM ALUM SHEET SIGNS .125 IN	258.00	SQFT		$	
0920	06410		STEEL POST TYPE 1	399.00	LF		$	
0930	24631EC		BARCODE SIGN INVENTORY	41.00	EACH		$	

Section: 0005 - SIGNALIZATION

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0940	04792		CONDUIT-1 IN	30.00	LF		$	
0950	04793		CONDUIT-1 1/4 IN	125.00	LF		$	
0960	04795		CONDUIT-2 IN	200.00	LF		$	
0970	04811		ELECTRICAL JUNCTION BOX TYPE B	2.00	EACH		$	
0980	04820		TRENCHING AND BACKFILLING	170.00	LF		$	
0990	04844		CABLE-NO. 14/5C	1,500.00	LF		$	
1000	04850		CABLE-NO. 14/1 PAIR	1,000.00	LF		$	
1010	04885		MESSENGER-10800 LB	575.00	LF		$	
1020	04894		PREFORMED LOOP/LEAD-IN	90.00	LF		$	
1030	04931		INSTALL CONTROLLER TYPE 170	2.00	EACH		$	
1040	04932		INSTALL STEEL STRAIN POLE	7.00	EACH		$	
1050	04950		REMOVE SIGNAL EQUIPMENT	2.00	EACH		$	
1060	20094ES835		TEMP RELOCATION OF SIGNAL HEAD	4.00	EACH		$	
1070	20188NS835		INSTALL LED SIGNAL-3 SECTION	13.00	EACH		$	
1080	20453ES835		PREFORMED QUADRAPOLE LOOPS	306.00	LF		$	
1090	23157EN		TRAFFIC SIGNAL POLE BASE	31.00	CUYD		$	
1100	23982EC		INSTALL ANTENNA	2.00	EACH		$	

Section: 0006 - LIGHTING

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1110	04701		POLE 40 FT MTG HT	6.00	EACH		$	
1120	04721		BRACKET 6 FT	1.00	EACH		$	
1130	04722		BRACKET 8 FT	2.00	EACH		$	

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PROPOSAL BID ITEMS

Report Date 5/4/15

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1140	04724		BRACKET 12 FT	1.00	EACH		$	
1150	04725		BRACKET 15 FT	2.00	EACH		$	
1160	04740		POLE BASE	6.00	EACH		$	
1170	04750		TRANSFORMER BASE	6.00	EACH		$	
1180	04760		POLE W/SECONDARY CONTROL EQUIP	1.00	EACH		$	
1190	04770		HPS LUMINAIRE	6.00	EACH		$	
1200	04780		FUSED CONNECTOR KIT	18.00	EACH		$	
1210	04793		CONDUIT-1 1/4 IN	1,035.00	LF		$	
1220	04795		CONDUIT-2 IN	425.00	LF		$	
1230	04820		TRENCHING AND BACKFILLING	1,055.00	LF		$	
1240	04832		WIRE-NO. 12	990.00	LF		$	
1250	04835		WIRE-NO. 4	4,470.00	LF		$	
1260	04940		REMOVE LIGHTING	1.00	LS		$	
1270	20391NS835		ELECTRICAL JUNCTION BOX TYPE A	6.00	EACH		$	
1280	20410ED		MAINTAIN LIGHTING	1.00	LS		$	
1290	21543EN		BORE AND JACK CONDUIT	225.00	LF		$	

Section: 0007 - WATERLINE

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1300	01099		DUCTILE IRON PIPE-12 IN (12 IN PRESSURE CLASS 350 DUCTILE IRON WATER MAIN)	200.00	LF		$	
1310	03472		TIE-IN 12 IN	2.00	EACH		$	
1320	03532		GATE VALVE-12 IN 12 IN MJ GATE VALVE	2.00	EACH		$	
1330	03556		BEND 45 DEG 12 IN	4.00	EACH		$	
1340	20127EC		SOLID SLEEVE-12 IN	2.00	EACH		$	
1350	23093ND		PLUG-12 IN	2.00	EACH		$	
1360	23699EC		STEEL ENCASEMENT PIPE-30 IN	150.00	LF		$	

Section: 0008 - DEMOBILIZATION &/OR MOBILIZATION

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1370	02568		MOBILIZATION	1.00	LS		$	
1380	02569		DEMOBILIZATION	1.00	LS		$	