Appendix I
Hydrotest Plan

Contents

List of Attachments

Hydrostatic Test Plan

1.0 Introduction

This Hydrostatic Test Plan (Plan) identifies measures to be taken by Greencore and its Contractors to ensure pipeline integrity and conform to regulatory requirements. The Plan will be carried out in accordance with the following agency regulations:

- United States Department of Transportation (DOT), 49 CFR Part 195, Subpart E – Pressure Testing
- Wyoming Department of Environmental Quality (DEQ)
- Wyoming State Engineers Office
- Montana Department of Natural Resources
- Montana Department of Environmental Quality (DEQ)

Measures identified in this Plan apply to work within the project area defined as the right-of-way and other areas used during hydrostatic pressure testing of the pipeline and facilities.

Greencore and Contractor personnel are to be thoroughly familiar with this Plan and its contents prior to initiating hydro-testing operations on the project.

1.1 Purpose

The purpose of this Plan is to define the necessary measures that are to be implemented during pipeline integrity testing to ensure the safety of pipeline construction personnel and the general public. This Plan describes safety standards and practices that will be implemented during construction of the project to minimize health, safety, and environmental (particularly water quality) concerns related to hydro-testing procedures throughout the project. Permit regulations for obtaining and discharging test water are also included in Appendix A of the Plan of Development (POD).

2.0 Hydrostatic Testing Procedures

The following procedures would be implemented by the Contractor during hydrostatic testing operations. This section of the Plan describes pre-testing requirements, the typical sequence of activities associated with the hydrostatic testing operations, and notifications required by Greencore and the Contractor.

Greencore would be responsible for securing the necessary permits and approvals from the governing authorities for the use of and disposal of test water. Greencore would also comply with the rules and regulations from the agencies listed in Section 1.0. Greencore would provide Contractor with a copy of the withdrawal/discharge permits and Contractor would keep copies onsite at all times during the testing operations.

2.1 Water Discharge and Use Regulations

The discharge locations for this project have been selected to avoid direct discharge into wetland or waterways. If this becomes unavoidable, the federal Clean Water Act provides that the discharge of any pollutants from a point source into surface water of the United States must be regulated under the Wyoming Department of Environmental Quality (DEQ) Pollutant Discharge Elimination System (WYPDES) Program. Through this program, operators of a point source discharge are required to receive coverage under a WYPDES discharge permit. The permits contain limitations and conditions that will assure that the state's surface water quality standards are protected. Montana DEQ covers this discharge in the Disinfected Water General Permit. Discharge devices must be used as described in Section 2.11.

If discharge will be made into streams, ephemeral drainages, or wetlands, Greencore's Environmental Inspector (EI) will be responsible for ensuring any water sampling follows the corresponding state DEQ regulations for water quality sampling procedures. Greencore's EI will be notified at least 72 hours prior to obtaining water and/or discharging water and the Contractor will provide the EI access for sampling. If water sampling is required, sample bottles will be obtained from a certified testing laboratory. Analysis of the samples would be in accordance with permit requirements. Each bottle would be marked with:

- source of water with pipeline station number,
- date taken,
- laboratory order number, and
- name of person taking sample.

If test water is taken from a natural source (stream, river, or pond) then the appropriate permit would be obtained from the state. In Wyoming, a Temporary Water Use Permit would be obtained from the State Engineers Office and in Montana a Water Right Permit would be obtained from the Department of Natural Resources.

2.2 Water Sources

The pipeline will be constructed in two (2) phases: Phase 1 will include 114 miles (MP 65 to MP 180) to be constructed in 2011; and Phase 2 includes the remaining 118 miles to be constructed in 2012. Each phase will include two pipeline spreads. The Phase 1, 2011 construction segment will be pressure tested in four (4) segments. The Phase 2, 2012 construction will be tested in five (5) segments. Water will be obtained as close as possible to each segment. A commercial water source has been identified in Gillette, WY that would also include water hauling to the test segments. A water source has also been identified in Belle Creek, MT (pipeline terminus) and access to a natural water source (Little Powder River) has been identified at MP 126. Water sources will be further refined as the project develops.

If surface water is used at MP 126, Greencore will utilize screens on the intake hoses to prevent the entrainment of fish or other aquatic species. Common industry practice is to cover the end of the intake hose with ¼ - inch mesh hardware cloth, secured with a pipe clamp to prevent uptake of debris. Greencore would also monitor the appropriate rate of withdraw to ensure that an adequate downstream flow is maintained to support aquatic life.

2.3 Discharge Locations

Phase 1, 2011 construction will be pressure tested in four (4) pipeline segments. Phase 2, 2012 will be tested in five (5) pipeline segments. The discharge locations are listed below by mile post and year.

Year	Segment	Discharge Location
2011	1	MP 64.6 MLV 6
	2	MP 113.0
	3	MP 158.5 MLV 14
	4	MP 158.5 MLV 14
2012	1	MP 0.0 MLV 1
	2	MP 45.1 MLV 5
	3	MP 64.6 MLV 6
	4	MP 178.9 MLV 16
	5	MP 231 MLV 20

2.4 Pumps

If pumps for hydrostatic testing are to be used within 100 feet of any waterbody or wetland, secondary containment measures (such as bermed depressions lined with visquene plastic, plastic troughs, or other containment structure) would be implemented to prevent any spilled fuels or oils from reaching the waterbody or wetland.

2.5 Safety Measures

The Contractor would provide for the safety of pipeline construction personnel and the general public during hydrostatic test. The Contractor would:

- Develop a site specific test plan for each test section and address the following safety measures
- Place warning signs in or near populated areas.
- Restrict access to the area involving the hydrostatic test (i.e. test shelter, manifolds, pressure pumps, instruments, etc.) to only those personnel engaged in the testing operations.
- Prohibit major pipeline work not directly associated with the test operations around the pipeline sections being tested. While the pipeline facilities are being pressurized and during the test, personnel not required for direct operations (checking for leaks, tightening gaskets, checking valve status, operating pumps, recording data, etc.) will be restricted from the area where the pipeline is being tested.
- Provide and maintain a reliable transportation and communication system during the test operations whereby personnel directly involved in the test will be able to communicate test status or problems that develop during the test.

- Check hoses, fittings, connectors, and valves for proper pressure rating.
- Restrain and secure fill and discharge lines/hoses.

2.6 Test Sections and Pressures

Each pipeline section will be pressure tested to prove its integrity and substantiate the Maximum Operating Pressure (MOP). All pressure tests will meet the requirements of 49 CFR 195, Subpart E. Test pressure summary is included in Attachment 2.

2.7 Cleaning the Pipeline

Upon completion of the pipe lowering and backfilling operations and prior to filling the pipeline for a hydrostatic test, each section of the pipe to be tested would be cleaned.

The Contractor cleans the pipeline by air pressurized wire brush type pig(s) through the interior of the line a sufficient number of times to clean any rust, scale, slag, dirt or other debris which may be in the pipeline. Next, the pipeline would be cleaned using a compressed air-propelled reinforced poly type pig. The cleaning pig will be run through each test section until each section has been cleaned before filling the pipeline with water for testing. Greencore's Hydrotest Inspector will be present at a minimum for the first and last brush pig run to compare their respective conditions and will be present to approve the cleanliness of the line.

2.8 Filling the Pipeline

Prior to filling a test section with water, the Contractor would make a final check to verify the following:

- valve body drain plugs have been removed, carefully cleaned, taped (Teflon) and replaced;
- all mainline valve assembly cross-overs are in open position (valves are isolated) *(Do not test through mainline valves)*;
- valves have been greased, stroked, and the packing tightened; valve stops are properly set; all pipe and bolt connections are tight;
- test manifolds are properly fabricated and tested;
- pumps and compressors are in good working condition;
- instruments are ready for use (proper charts installed, clocks wound, instrument calibration records validated, etc.); and pigs are properly installed.

A pipeline pig would be placed ahead of the water to separate the remaining air in the line from the hydrostatic test water. The 2011 tests would require approximately 9 MM gallons and the 2012 tests would require approximately 9.3 MM gallons of water.

After completion of the filling operation, the pipeline water temperature and turbulence would be allowed to stabilize. The Contractor would check the pressure on each end of the test section and compare with calculated pressures to confirm the specified test pressure for the section.

2.9 Testing the Pipeline

The duration of the test will be not less than 8 hours, with the pressure maintained at or above the minimum test pressure at all points in the pipeline section. The test will be accepted upon proof of no leakage.

In the event of a leak during testing, the leak would be repaired as directed by Greencore's Hydrotest Inspector and the above test repeated until a satisfactory test is obtained on the section.

2.10 Depressurizing the Pipeline

After the test has been presented by the Contractor as a successful test and accepted by Greencore's Hydrotest Inspector, the pipeline would be depressurized as soon as practical.

2.11 Dewatering the Pipeline

Discharge points have been selected to avoid waterways and wetlands. Landowners or land management agency will also be consulted when finalizing discharge points. All discharge points would utilize discharge dispersion devices. The devices are designed to capture discharge water to limit erosion, scour, and filter contaminants. These devices are typically constructed of geotextile fabric, silt fence/filter cloth and straw bales (Attachment 2). The rate of discharge will be monitored to prevent the device from being ineffective or overwhelmed by the volume of water. Discharge lines would be sufficient in strength and would be securely supported and constrained at the discharge end to prevent whipping during the dewatering operation.

If discharging into waterways or wetlands is unavoidable, the discharge dispersion devices would still be used and all permit identified in Section 2.1 would be followed.

2.12 Drying the Pipeline

Following the dewatering of individual pipeline sections, these sections would be cleaned of loosely adhered mill scale, rust, dirt, and other debris by the use of air propelled pigs. To facilitate drying, several sections of pipeline may be welded together, cleaned, and dried in one continuous section. For the Phase 1 construction, nitrogen will also be injected into each pipeline segment and isolated to maintain pipeline dryness and ensure integrity until Phase 2 construction is completed.

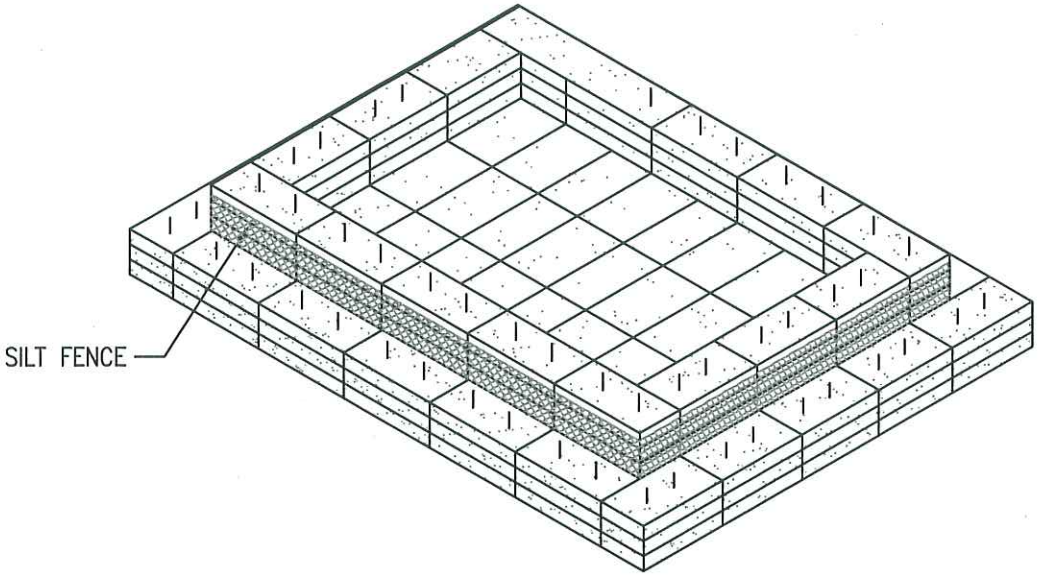
3.0 Records

In accordance with applicable regulations, the Contractor will maintain complete and comprehensive records of all hydrostatic tests and of related activities such as filling, pressuring, stabilizing, dewatering, etc. Records will be clearly identified with respect to the specific piping systems to which they apply and records will be accurately dated. In addition to the general requirements above, such forms will at a minimum include:

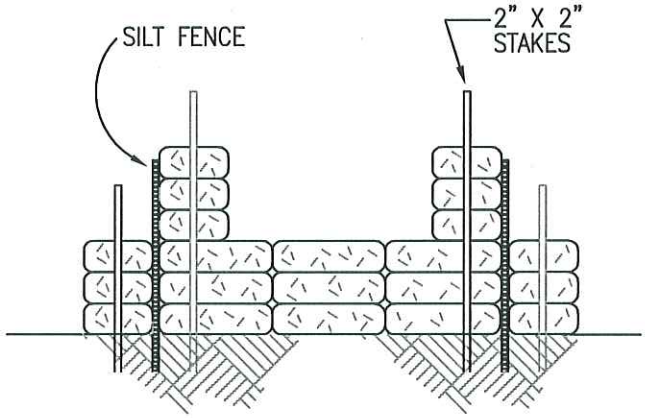
- date and time of test,
- identification of piping system,
- test medium, pressure and duration,
- automatic 24 hour pressure-time and temperature-time recording chart, including manual recording of pressure gauge readings at each additional station,
- test medium temperature at definite time intervals,

- a summary of leaks and repair methods, and
- the names and company affiliation of persons recording the test data;
- pressure and temperature recorder charts showing the date and time stop and start of recording;
- weather conditions during testing;
- elevation variations, whenever significant for the particular test (over 100' for liquids line);
- calibration certificates for dead weight gauges and records of field calibrations of pressure and temperature instruments;
- make, style number, and condition of pigs used in filling and dewatering; and
- any remarks pertinent to any phase of the test.
- Results of the hydrotest will be provided to the BLM upon request at the conclusion of the project.

Attachment 1—Discharge Dissipation Devices



PERSPECTIVE VIEW



OPTION 1

NOTES:

1. INSTALL A STRAW BALE DEWATERING STRUCTURE WHEREVER IT IS NECESSARY AND AS DIRECTED BY THE COMPANY'S INSPECTOR TO PREVENT THE FLOW OF HEAVILY SILT LADEN WATER INTO WATER BODIES OR WETLANDS.

2. DISCHARGE SITE SHALL BE WELL VEGETATED AND THE TOPOGRAPHY OF THE SITE SUCH THAT WATER WILL FLOW AWAY FROM ANY WORK AREAS. THE AREA DOWN SLOPE FROM THE DEWATERING SITE MUST BE REASONABLY PLANE OR STABILIZED BY VEGETATION OR OTHER MEANS TO ALLOW THE FILTERED WATER TO CONTINUE AS SHEET FLOW.

3. IN AREAS OF HIGHLY ERODIBLE SOILS, LINE ENTIRE STRUCTURE WITH GEOTEXTILE FILTER FABRIC, PLASTIC SHEETING, OR STRAW.

4. THE DIMENSIONS OF THE STRUCTURE SHALL BE DETERMINED IN THE FIELD BASED UPON SITE CONDITIONS.

5. DISCHARGE RATES SHALL BE SUCH THAT WATER WILL NOT OVERFLOW THE TOP OF THE STRUCTURE.

6. INSTALL A SPLASH PUP IF THE DISCHARGE VELOCITY IS EXCESSIVE. (TYP–064)

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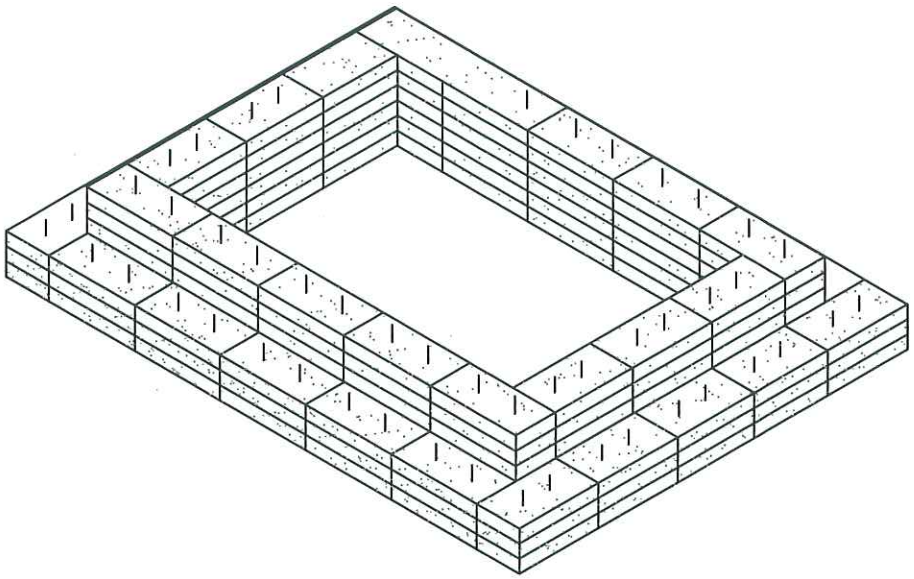
1	ISSUED FOR REVIEW	10/21/09	AWM	CAM	TW
NO.	DESCRIPTION	DATE	BY	CHK.	APPR.

DRAWN BY:
CHECKED BY:
REVIEWED BY:
APPROVED BY:
PROJECT MANAGER:
SCALE: NONE

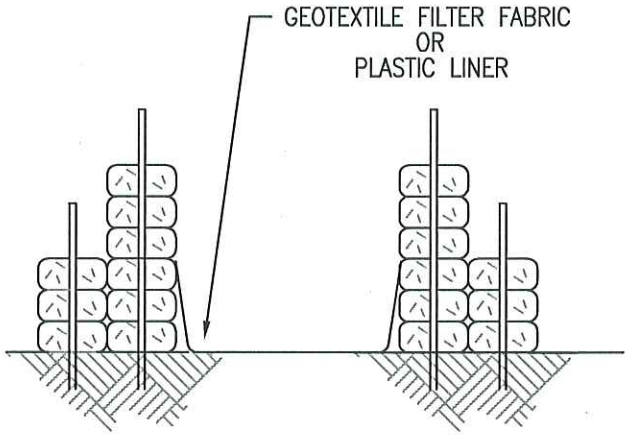
GREENCORE
CH2MHILL

TYPICAL STRAW BALE DEWATERING STRUCTURE
LARGE VOLUME - OPTION 1 (SHT. 1 OF 2)

PROJECT NUMBER	DRAWING NUMBER	REV.
2568-01	TYP-038	A



PERSPECTIVE VIEW



OPTION 2

NOTES:

1. INSTALL A STRAW BALE DEWATERING STRUCTURE WHEREVER IT IS NECESSARY AND AS DIRECTED BY THE COMPANY'S INSPECTOR TO PREVENT THE FLOW OF HEAVILY SILT LADEN WATER INTO WATER BODIES OR WETLANDS.
2. DISCHARGE SITE SHALL BE WELL VEGETATED AND THE TOPOGRAPHY OF THE SITE SUCH THAT WATER WILL FLOW AWAY FROM ANY WORK AREAS. THE AREA DOWN SLOPE FROM THE DEWATERING SITE MUST BE REASONABLY PLANE OR STABILIZED BY VEGETATION OR OTHER MEANS TO ALLOW THE FILTERED WATER TO CONTINUE AS SHEET FLOW.
3. IN AREAS OF HIGHLY ERODIBLE SOILS, LINE ENTIRE STRUCTURE WITH GEOTEXTILE FILTER FABRIC, PLASTIC SHEETING, OR STRAW.
4. THE DIMENSIONS OF THE STRUCTURE SHALL BE DETERMINED IN THE FIELD BASED UPON SITE CONDITIONS.
5. DISCHARGE RATES SHALL BE SUCH THAT WATER WILL NOT OVERFLOW THE TOP OF THE STRUCTURE.
6. INSTALL A SPLASH PUP IF THE DISCHARGE VELOCITY IS EXCESSIVE. (TYP–064)

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NO.	DESCRIPTION	DATE	BY	CHK.	APPR.	

DRAWN BY:	
CHECKED BY:	
REVIEWED BY:	
APPROVED BY:	
PROJECT MANAGER:	
SCALE: NONE	

GREENCORE

CH2MHILL

TYPICAL STRAW BALE DEWATERING STRUCTURE
LARGE VOLUME - OPTION 2 (SHT. 2 OF 2)

PROJECT NUMBER	DRAWING NUMBER	REV.
2568-01	TYP-038A	A

Attachment 2—Hydrostatic Pressure Summary

Greencore CO2 Pipeline Project — 20"

HYDROSTATIC TEST PRESSURE SUMMARY

Rev. **A** 22-Oct-10

Pipeline Design	**20" Pipeline**
MOP	2,220 psig
Pipe Diameter	20 inches
Wall Thickness (DF=0.72)	0.441 inches
Wall Thickness (DF=0.60)	0.529 inches
Grade/SMYS	70,000 psi

Pipeline Test Information

Test Pressures (FOR LIQUIDS PIPELINES)

100 % SMYS Pressure =	3,087 psig
Max. Test Press. (100% SMYS or ANSI 1500 limit)	3,087 psig
Code Min. Test Press. (1.25 x MAOP) =	2,775 psig
Min.-Max. Pressure Delta =	312 psig

Elevation/Head Considerations

Hydrostatic Press. Change =	0.433 psig/ft of elevation
Allowable Elevation Change =	720 feet/test section

Water Volume

Pipeline X-Section Area (Nominal Pipe Only)	287.06 sq. in.	1.99 sq. ft.
Pipeline Unit Volume (Nominal Pipe Only)	**14.91** gal/ft	

Greencore CO2 Pipeline Project — 20" Above Ground

HYDROSTATIC TEST PRESSURE SUMMARY

Rev. **A** 22-Oct-10

Pipeline Design	**20" Pipeline**
MOP	2,220 psig
Pipe Diameter	20 inches
Wall Thickness (DF=0.72)	0.441 inches
Wall Thickness (DF=0.60)	0.529 inches
Grade/SMYS	70,000 psi

Pipeline Test Information

Test Pressures (FOR LIQUIDS PIPELINES)

100 % SMYS Pressure =	3,703 psig
Max. Test Press. (100% SMYS or ANSI 1500 limit)	3,703 psig
Code Min. Test Press. (1.25 x MAOP) =	2,775 psig
Min.-Max. Pressure Delta =	928 psig

Elevation/Head Considerations

Hydrostatic Press. Change =	0.433	psig/ft of elevation
Allowable Elevation Change =	2,143	feet/test section

Water Volume

Pipeline X-Section Area (Nominal Pipe Only)	281.80 sq. in.	1.96 sq. ft.
Pipeline Unit Volume (Nominal Pipe Only)	**14.64** gal/ft	

Greencore Pipeline Hydrostatic Test Summary

SECTION 2012-1		
Start Milepost	0.0	
End Milepost	19.7	
Length	19.7	miles
Low Elevation	5,517	ft
High Elevation	6,161	ft
Elevation Difference	644	ft
Pressure Differential	279	psi
Water Volume	1,550,977	gallons

SECTION 2012-2		
Start Milepost	19.7	
End Milepost	45.1	
Length	25.4	miles
Low Elevation	5,629	ft
High Elevation	6,329	ft
Elevation Difference	699	ft
Pressure Differential	303	psi
Water Volume	1,999,865	gallons

SECTION 2012-3		
Start Milepost	45.1	
End Milepost	64.6	
Length	19.5	miles
Low Elevation	5,510	ft
High Elevation	5,828	ft
Elevation Difference	318	ft
Pressure Differential	138	psi
Water Volume	1,536,064	gallons

Greencore Pipeline Hydrostatic Test Summary

SECTION 2011-1		
Start Milepost	64.6	
End Milepost	83.0	
Length	18.4	miles
Low Elevation	4,910	ft
High Elevation	5,524	ft
Elevation Difference	614	ft
Pressure Differential	266	psi
Water Volume	1,448,075	gallons

SECTION 2011-2		
Start Milepost	83.0	
End Milepost	113.0	
Length	30.0	miles
Low Elevation	4,470	ft
High Elevation	5,093	ft
Elevation Difference	623	ft
Pressure Differential	270	psi
Water Volume	2,362,257	gallons

SECTION 2011-3		
Start Milepost	113.0	
End Milepost	158.5	
Length	45.5	miles
Low Elevation	4,159	ft
High Elevation	4,825	ft
Elevation Difference	665	ft
Pressure Differential	288	psi
Water Volume	3,583,651	gallons

SECTION 2011-4		
Start Milepost	158.5	
End Milepost	178.9	
Length	20.4	miles
Low Elevation	4,107	ft
High Elevation	4,754	ft
Elevation Difference	647	ft
Pressure Differential	280	psi
Water Volume	1,606,156	gallons

Greencore Pipeline Hydrostatic Test Summary

SECTION 2012-4		
Start Milepost	178.9	
End Milepost	200.4	
Length	21.5	miles
Low Elevation	3,630	ft
High Elevation	4,335	ft
Elevation Difference	706	ft
Pressure Differential	305	psi
Water Volume	1,692,653	gallons

SECTION 2012-5		
Start Milepost	200.4	
End Milepost	231.0	
Length	30.6	miles
Low Elevation	3,545	ft
High Elevation	4,104	ft
Elevation Difference	558	ft
Pressure Differential	242	psi
Water Volume	2,406,455	gallons