North Unit Irrigation District

System Improvement Plan

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NORTH UNIT IRRIGATION DISTRICT

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RENEWS 12-31-19

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Executive Summary

Farmers Conservation Alliance commissioned this System Improvement Plan with support from the Energy Trust of Oregon. The purpose of this System Improvement Plan (SIP) was to develop a well-considered evaluation of North Unit Irrigation District's (NUID) primary and secondary canal systems, a mitigation plan for the seepage losses, and consideration of resulting pressurized deliveries. System piping was the primary method proposed for such mitigation.

In December of 2016, a meeting was held with District staff to confirm the approach for this SIP. Data requests were fulfilled by the District. The District determined that a value of 7 GPM/Acre should be used for hydraulic modeling and pipe sizing purposes. Project groups created for cost estimating purposes will provide the district flexibility in implementing future projects with respect to seepage loss estimates and pump energy mitigation per project group.

The District's approximate 961 patrons are served by one primary diversion and lengthy main canal. The system runs from south to north branching into laterals and sublaterals along its path, serving the patron delivery turnouts. Irrigation water is supplied from surface water runoff collected in the Wickiup Reservoir that is discharged to the Deschutes River system and ultimately diverted into the District's main canal in Bend, Oregon. NUID also holds a water right with water supplied via the Crooked River at times of high demand. Although the District's water rights cover 58,887 acres of potentially irrigated cropland, the District's 2012 Water Management and Conservation plan indicates that the average annual irrigated acreage over the last 10 years was 52,293 acres. While the modernization strategy outlined in this SIP is designed to serve all 58,887 acres, the latter acreage of 52,293 was used when referencing historical water delivery information to determine baseline water use. The primary canal and laterals were evaluated for seepage loss using state-of-the-art measurement equipment, and it was found that approximately 205.4 CFS were being lost at the time of measurements. Of the 205.4 CFS, it was determined that approximately 174.4 CFS might be conserved if the system were completely piped (assuming peak flows of 7 GPM/Acre delivered).

The District chose to consider pressurization to patron deliveries as it rolls-out its System Improvement Plan. Fully piping the District system will accomplish moderate to full pressurization of the District resulting in an estimated reduction of 40,359 MWh in patron pumping costs each season. Due to a large amount of elevation differential in the system, 27 pressure reducing stations were found to be necessary to eliminate excess pressure. This excess pressure may be converted to electrical energy by means of hydropower turbines. A high-level hydropower generation potential analysis was completed for all pressure reducing stations in which the flow rate exceeds 10 CFS peak. Using conservative estimates, it was determined that there is a potential of 24.8 MW of hydropower generation potential within a fully piped system. It is also noted Natel hydroEngine technology may generate as much as 4.7 MW of power prior to full system piping.

A pipe manufacturer/vendor was contacted to provide budgetary pipe cost information for pipe delivered to Central Oregon. This information was used to develop reconnaissance-level cost estimates to design and construct the entire piped system to all patron and private delivery points. The cost estimates were evaluated and broken into grouped cost elements. An At-A-Glance Map (Figure 1.0.1 and Figure 1.0.2) and summary tables (Table 1.0.1 and Table 1.0.2) are provided to detail the summary of this System Improvement Plan.

Section 1

At-A-Glance System Modernization Summary

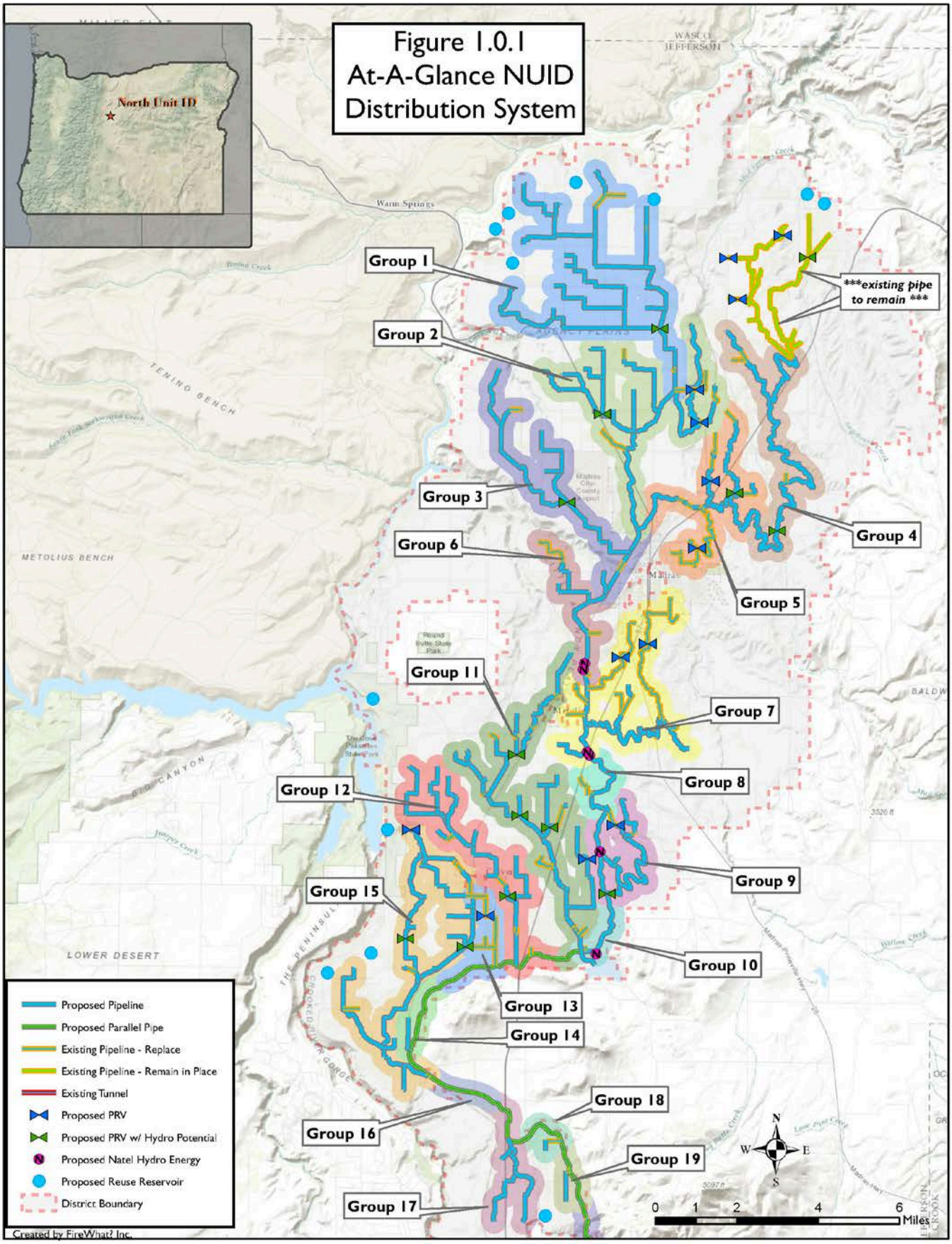


Figure 1.0.1 At-A-Glance NUID Distribution System

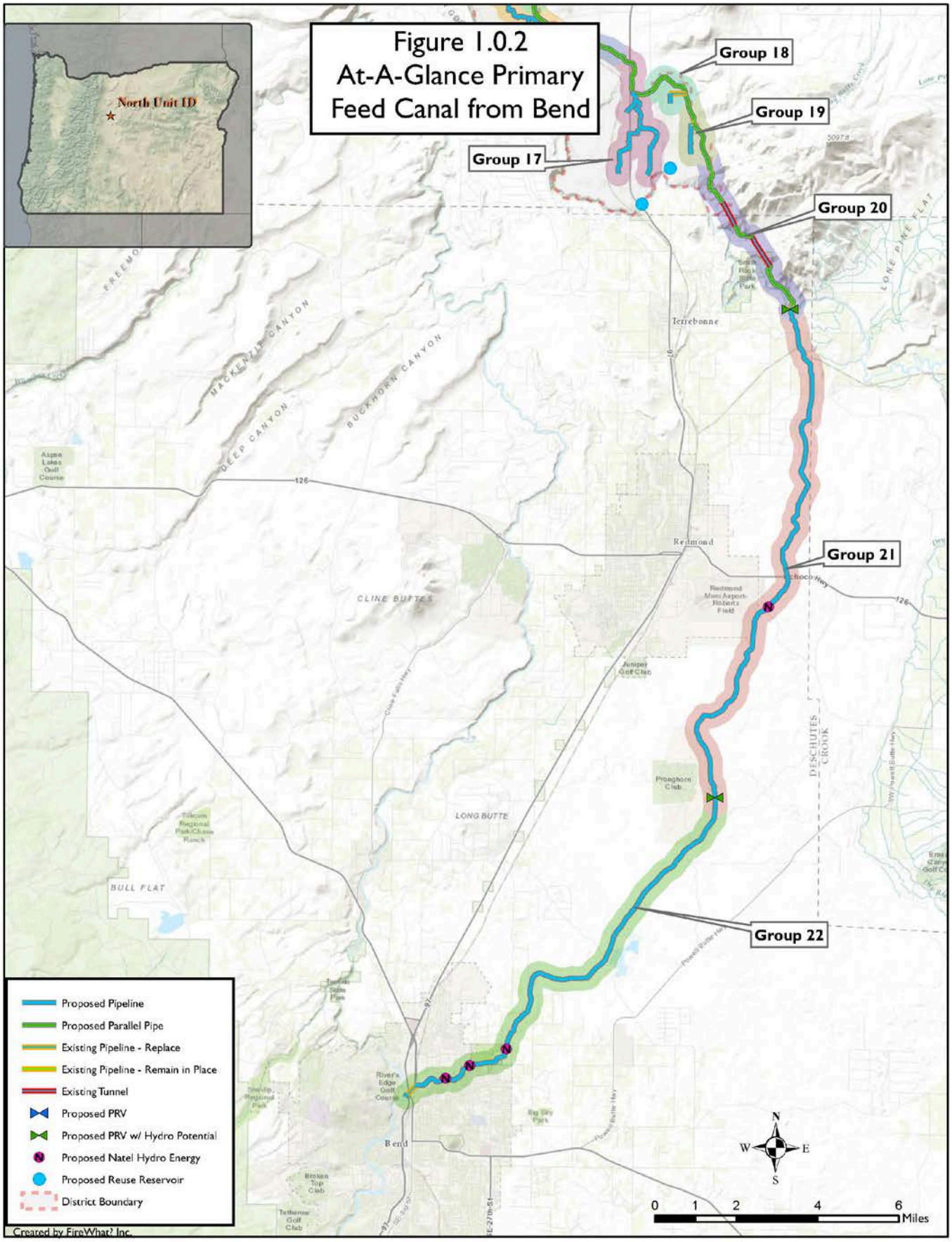


Figure 1.0.2 At-A-Glance Primary Feed Canal from Bend

Table 1.0.1 At-A-Glance NUID Distribution System

AT-A-GLANCE - NUID DISTRIBUTION SYSTEM					
PROJECT GROUP	**CANAL/LATERAL**	**EST. WATER CONSERVATION (CFS)**	**EST. ENERGY CONSERVATION (KWH/YR)**	**LENGTH PIPED (FT)**	**RECON- ESTIMATED COST**
1	Lateral 63	2.9	2,681,219	59,395	$8,020,516
1	Lateral 64	7.5	4,065,130	49,509	$11,678,392
1	Main Canal	6.1	1,240,837	27,928	$20,943,911
Project Group 1 Total		**16.6**	**7,987,186**	**136,832**	**$40,642,819**
2	Lateral P58	0.0	486,896	4,103	$359,112
2	Lateral 59	1.0	2,136,766	41,272	$4,960,017
2	Lateral 60	0.2	655,326	12,414	$1,083,714
2	Lateral 61	2.0	441,530	32,818	$2,092,602
2	Lateral PL62	0.0	266,192	6,449	$605,452
2	Main Canal	5.1	868,586	23,128	$34,057,462
Project Group 2 Total		**8.2**	**4,855,295**	**120,183**	**$43,158,359**
3	Lateral 56	0.1	345,407	2,914	$167,225
3	Lateral 57	3.7	2,141,176	57,122	$11,108,778
3	Main Canal	2.1	186,126	9,392	$28,535,796
Project Group 3 Total		**5.8**	**2,672,708**	**69,429**	**$39,811,799**
4	Lateral 58 Phase-1	6.7	1,079,687	77,781	$36,381,425
Project Group 4 Total		**6.7**	**1,079,687**	**77,781**	**$36,381,425**
5	Lateral 58 Phase-2	7.0	2,581,860	80,617	$31,862,852
Project Group 5 Total		**7.0**	**2,581,860**	**80,617**	**$31,862,852**
6	Lateral 52	0.0	52,072	590	$31,212
6	Lateral 53	0.0	200,648	1,784	$79,169
6	Lateral 55	0.6	1,051,841	16,666	$1,263,816
6	Main Canal	3.3	434,293	15,036	$45,710,340
Project Group 6 Total		**3.9**	**1,738,854**	**34,077**	**$47,084,538**
7	Lateral 50	0.3	96,180	5,080	$244,571
7	Lateral 51	1.8	428,069	40,079	$5,628,426
7	Lateral L51	0.0	26,213	3,856	$62,765
7	Lateral PL51	0.0	338,290	26,949	$1,269,152
7	Lateral PL52	0.0	293,260	14,994	$965,964
7	Main Canal	2.4	310,209	10,807	$32,853,182
Project Group 7 Total		**4.5**	**1,492,220**	**101,765**	**$41,024,060**
8	Lateral 48	0.4	10,911	3,752	$142,722
8	Main Canal	2.8	248,167	12,747	$38,726,041
Project Group 8 Total		**3.2**	**259,078**	**16,499**	**$38,868,763**
9	Lateral 45	2.6	850,148	38,486	$3,479,746
9	Main Canal	3.2	0	14,442	$43,821,816
Project Group 9 Total		**5.7**	**850,148**	**52,928**	**$47,301,562**
10	Main Canal	2.8	186,126	12,573	$35,005,569
Project Group 10 Total		**2.8**	**186,126**	**12,573**	**$35,005,569**
11	Lateral 43	13.5	5,497,521	114,290	$28,335,835
11	Main Canal	1.1	186,126	4,564	$9,627,698
Project Group 11 Total		**14.7**	**5,683,646**	**118,854**	**$37,963,533**
12	Lateral 41	4.9	3,479,129	70,485	$14,535,742
12	Lateral 42	0.1	17,189	1,029	$102,162
12	Main Canal	3.7	124,084	15,140	$31,841,418
Project Group 12 Total		**8.7**	**3,620,402**	**86,654**	**$46,479,322**

Table 1.0.1 At-A-Glance NUID Distribution System - Cont.

13	Lateral PL41	0.0	504,771	17,332	$1,224,071
13	Main Canal	4.4	372,251	17,977	$37,852,811
Project Group 13 Total		**4.4**	**877,022**	**35,309**	**$39,076,882**
14	Lateral 38	1.1	11,134	4,427	$68,840
14	Main Canal	5.5	62,042	22,266	$46,806,354
Project Group 14 Total		**6.6**	**73,176**	**26,693**	**$46,875,195**
15	Lateral 37	6.6	2,459,098	108,461	$17,704,347
15	Main Canal	2.2	62,042	8,913	$18,742,997
Project Group 15 Total		**8.8**	**2,521,140**	**117,374**	**$36,447,344**
16	Main Canal	4.2	248,167	16,919	$51,386,830
Project Group 16 Total		**4.2**	**248,167**	**16,919**	**$51,386,830**
17	Lateral 34	1.1	149,063	24,146	$1,961,375
17	Main Canal	3.5	62,042	14,283	$43,350,264
Project Group 17 Total		**4.6**	**211,105**	**38,429**	**$45,311,639**
18	Lateral 32	0.3	31,590	1,945	$63,743
18	Main Canal	4.3	62,042	17,333	$52,604,548
Project Group 18 Total		**4.6**	**93,632**	**19,277**	**$52,668,291**
19	Lateral 31	0.9	126,278	4,406	$592,752
19	Main Canal	4.2	124,084	17,080	$51,850,686
Project Group 19 Total		**5.1**	**250,362**	**21,487**	**$52,443,438**
TOTAL		**126.1**	**37,281,817**	**1,183,681**	**$809,794,219**

Notes: At the time of this report, Laterals 58-9 and 58-11 were already piped or in the construction phase of being piped and therefore not included in the construction cost estimates. It should be noted that following completion of a completely piped system, full pressurization of Laterals 58-9 and 58-11 would be realized, for an additional energy conservation of 3,077,922 kWh.

Table 1.0.2 At-A-Glance NUID Primary Feed Canal from Bend

AT-A-GLANCE - NUID PRIMARY FEED CANAL FROM BEND					
PROJECT GROUP	**CANAL/LATERAL**	**EST. WATER CONSERVATION (CFS)**	**EST. ENERGY CONSERVATION (KWH/YR)**	**LENGTH PIPED (FT)**	**RECON- ESTIMATED COST**
20	CRPS to 1st Delivery	12.4	0	42,416	$125,079,066
21	End of Lining - CRPS	35.9	0	72,840	$222,731,721
22	Headworks - End of Lining	0.0	0	63,594	$192,959,211
TOTAL		**48.3**	**0.0**	**178,849**	**$540,769,998**

Notes: It was assumed that there was no significant loss from the Headworks down the inital 11.7 miles of lined main canal.

Section 2

Project Overview and Description

2.0 Authorization

Farmers Conservation Alliance commissioned this System Improvement Plan with support from the Energy Trust of Oregon and authorized April 20, 2016 through a Consultant Services Agreement by and between the Farmers Conservation Alliance (FCA) and Black Rock Consulting (BRC).

2.1 Purpose

NUID was founded in 1916 to provide irrigation water to areas from Culver to Madras and Agency Plains areas. The District obtained water rights for natural flow diversions from the Deschutes River with a priority date of February 28, 1913. Multiple studies were completed to investigate irrigation possibilities, and it wasn't until 1938 that construction began on the Wickiup Reservoir and the NUID main canal. Due to World War II delaying completion of certain features, water was not made available to NUID until May 1946. The District was designed and constructed largely through a United States Bureau of Reclamation program. Long term contract obligations exist between North Unit Irrigation District and the Bureau of Reclamation. Operation and maintenance of District facilities was transferred to NUID on January 1, 1955.

The District currently serves approximately 961 patrons over 58,887 acres spanning northerly from the Crooked River near Smith Rock State Park to areas north of Madras, Oregon. According to the 2012 Water Management and Conservation Plan (WMCP), crop fallowing, sale of lands, and interruption of farming practice resulted in an average irrigated acreage of 52,293 acres between 2001 and 2010. For the purposes of comparing historical records of NUID's diversion rates and on-farm deliveries to actual irrigated acreage, 52,293 acres was used herein. The modernization strategy addressed in this report, however, is designed to provide irrigation water (at 7 GPM/Acre) to all of the District's 58,887 acres. Although the District supports the growth of a variety of crops, the primary crops in NUID are carrot seed, grass seed, mint, hay, wheat, irrigated pasture, and others. Irrigation techniques range from graded furrow, hand and wheel lines, center pivot, drip, and big gun type systems.

The District operates and maintains over 257 miles of main canal and laterals, including a few existing piped segments. Given the approximate 65-mile delivery system length (north to south), the District conveys water through a variety of topography and geology. The District's primary diversion canal conveys water through heavily fractured basalt resulting in a high propensity for seepage losses. Once crossing the Crooked River, the system branches into a network of earthen canals (laterals and sublaterals) that are finer grained in nature. Although seepage in the north area of the District is less pronounced than the primary diversion canal, seepage does exist. A loss assessment program was orchestrated to estimate water loss throughout the District and is discussed further in this System Improvement Plan.

The purpose of this SIP is to develop a well-considered evaluation of the District's primary and secondary canal systems, a mitigation plan for the seepage losses, and consideration of resulting pressurized deliveries. Consistent with its existing modernization program under way, system piping is to be the primary method proposed for such mitigation.

The plan will become a key element of the District's planning documents and is expected to become the basis for future phased construction of the District's conveyance system.

2.2 Scope of Services

A joint partnership between FCA and BRC was employed to provide the following services and deliverables in conjunction with this plan.

Kickoff Meeting -

Met with District staff December 1, 2016 to confirm approach to the study. FCA and BRC developed a list of questions to review with District staff. At these meetings FCA and BRC requested documents for major system elements that affected system hydraulic modeling, a copy of the District Water Conservation Plan, water diversion/water right information, and associated operational input from the District.

FCA and BRC discussed seepage loss information with the District and the concluded loss assessment program implemented by BRC within the District.

FCA and BRC inquired about energy dissipation approach preferences of the District (i.e. hydroelectric power generation and pressurized delivery preferences).

Review of Materials -

FCA and BRC reviewed materials obtained from the District following the kick-off meetings to ensure that required materials for moving the study forward were obtained or readily supplemented during the study to develop the deliverables indicated below. Data gaps that were found during the meeting process were identified and resolved with District staff.

Coordination -

FCA and BRC coordinated with NUID staff at various project milestones to confirm that the SIP continued to be developed in accordance with the direction of the District.

Seepage Loss Study -

BRC coordinated the development of seepage loss study with NUID staff. The seepage loss study identified a program of seepage loss measurements for the NUID delivery system to support loss assumptions to be used in the SIP. Results from the seepage loss study were used to assist with water conservation estimates and phasing of the modernized system implementation.

Review of Provided Flow Data -

FCA and BRC provided a thorough review of diversion data and on-farm delivery rates (per water right certificates) to ensure a clear understanding of delivery approach. BRC coordinated with the District to ensure rates used in system evaluation and modeling were as agreed by the District.

NUID SIP Base Map Development -

In conjunction with NUID staff, and direction from FCA, FireWhat developed a primary and secondary canal and lateral system base map. This map identifies the primary and secondary canal system in its existing state.

NUID SIP Proposed Map Development -

FCA and BRC (with NUID input) developed a proposed primary and secondary system piping overlay on the base map. To the extent possible, existing mapping obtained as described above was used for this purpose. This map included an aerial underlay as available and as practical to manage file size.

NUID SIP Hydraulic Model -

FCA and BRC confirmed approach regarding system pressurization with NUID. Following the agreed approach discussed with NUID and elevation information from FireWhat, FCA modeled the primary and secondary system elements (i.e. primary and secondary system canals and laterals) with EPANET hydraulic modeling software. Flow assumptions were based upon the rates agreed with NUID staff. FCA and BRC ran multiple iterations on the model to most effectively develop system elements (i.e. piping, pressure reducing elements - PRV stations, hydroelectric power plant locations, etc). Pipe materials and associated diameters were determined during this analysis.

NUID SIP Phasing Approach -

In conjunction with the system model and upon review with NUID, FCA and BRC developed a system improvement cost estimate that was broken down by District laterals and associated main canal. This will allow the District flexibility in implementation development and design considerations based upon funding availability and other critical considerations.

NUID SIP Conservation Table -

BRC developed a table indicating water conservation estimates based upon historic diversions, desired delivery rates within a fully piped system, and also corroborated by the loss assessment program results.

Final SIP Mapping -

In conjunction with NUID staff, FCA and BRC developed a final modernization map indicating primary and secondary canal system elements, indicating existing and proposed piping, and other key system elements.

Reconnaissance-Level Cost Estimate -

FCA and BRC coordinated with a reputable material vendor and developed reconnaissance-level cost estimating for the proposed piping system and pumping identified for the District.

SIP Reporting -

FCA and BRC compiled the results of the SIP study into this System Improvement Plan draft report for review and comment by NUID. Comments received were incorporated as appropriate into the Final SIP Report. The report summarizes all findings for elements identified above and includes mapping.

2.3 Goals and Objectives – District Meeting(s)

As indicated in the scope, BRC and FCA met with District staff on December 1, 2016. Black Rock Consulting and District staff discussed key project parameters required to establish the approach for the SIP.

The meeting was attended by:

Mike Britton, District Manager
Dan Kaler, FCA Staff Engineer
Preston Brown, FCA Project Manager
Kevin L. Crew, Principal, Black Rock Consulting

Key agenda items addressed were as summarized below:

1) Data Needs: District Water Right Certificates, District's Water Management and Conservation Plan, District's Most Recent Irrigated Acre Accounting (Direct River Points of Delivery and Primary Diversion).

   These materials were either provided to FCA and BRC and discussed in some detail, or direction was provided on where to obtain these materials. Clarifications were provided by the District.

2) What are the plans for piping and pressurization of the District?

   The District has some segments of piping already in place. Certain segments of existing pipe may tolerate pressurization whereas others likely will not. With only a few noted exceptions, the entire system should be modeled and new proposed pipe sized. The District will evaluate what pipes it may wish to preserve once it has the model results, including anticipated pressures, etc. and as it designs and implements its improvements.

   Generally, the District plans to pipe a majority of its system, however, the prioritization and timing of piping will be an ongoing consideration by the District.

   It is anticipated that pressures within the piped system will support significant hydroelectric power generation potential while subsequently providing pressurized water for individual patrons, thus mitigating pumping energy costs.

3) Given that water rights would dictate a delivery of 11.22 GPM/Acre for peak delivery flow rate (including transmission loss) to the District's irrigated properties, what flow rate should be used in the model for peak flow rates?

   The model should use 7 GPM/Acre for normal delivery modeling at 5 FT/S velocities or less in system elements per NRCS guidelines. The one exception is that the main canal from the point of diversion on the Deschutes and to the Crooked River Pump Station does not have any individual take offs. This section was modeled at higher velocities to reduce pipe size requirements. It must also be confirmed that one additional condition will work within the proposed systems: an uncommon high flow rate of 9 GPM/Acre with allowance for velocities to exceed 5

FT/S should be evaluated. This would ensure that the system will operate satisfactorily under future scenarios if additional irrigated lands were attributed to the canal system and furthermore, to address climate change scenarios.

4) FCA and BRC indicated that it planned to break the canal piping cost estimates into groups ranging from $30 million to $45 million. Most project groups incorporate a section of the main canal to provide adequate pressurization of the investigated lateral. Each project group can be broken down into smaller increments if necessary to provide the District with a high level of flexibility in project financial planning and implementation packaging. The primary feed canal upstream of the first patron turnout was broken into 3 separate groups with cost estimates not held to the other project group standard.

   The District agreed with this approach.

5) Does the District anticipate any shift of acreage or flow rates within the District boundary and service areas?

   No, the District does not anticipate any shift in acreage or flow rates. It should be noted that not all 58,887 acres are normally irrigated annually, given fallowing or other reasons. However, the SIP should assume that all lands may be irrigated in any given season.

6) Does the District anticipate any new water reuse or retention ponds?

   Yes, the District provided locations where they envisioned the installation of reuse or retention ponds. If the system were fully piped, these reuse or retention ponds would not be necessary. However, in the interim they will need to be incorporated into the system to address tail-water issues, capture irrigation run-off, and address flows in times of emergency such as utility grid outage and repairs to pipelines.

Section 3

Existing System

3.0 Existing System Description

Please refer to Figure 3.0.1 regarding the existing District Delivery System that indicates the District service territory boundary, measurement points, and the primary/secondary canal system.

Under its water rights, NUID diverts water directly from the Deschutes River, via natural flow and releases from Wickiup Reservoir. The source of diverted water is based upon multiple water rights that govern the District's storage and direct river diversion limitations. Wickiup Reservoir has the capacity for 200,000 acre-feet of water which is released on an ordered or as-needed basis by the patrons. Water released from Wickiup Reservoir travels through the Deschutes River System to Bend, Oregon. In Bend, the District diverts its water from the Deschutes into the main canal at river mile 160, its primary point of diversion. Supplemental water can be supplied from the Crooked River via a pumping plant adjacent to the District's main canal crossing of the Crooked River. The Crooked River Pump Station (CRPS) consists of nine vertical shaft pumps with a total capacity of 200 CFS and a total dynamic head of 150 feet. The pumping plant discharges directly into NUID's main canal, and such discharges are measured through District Supervisory Control and Data Acquisitions (SCADA) and telemetry systems to analyze water conservation and enhance water management strategies. In addition to supplemental water, the CRPS supplies primary water for 5,164.9 acres of irrigated cropland.

As indicated in Figure 3.0.1, the NUID main canal conveys water generally north from its point of diversion in Bend, roughly 65 miles, terminating at the northern end of the District. The initial 11.7 miles of canal are lined, thus reducing seepage loss; however, the remainder of the conveyance system is open earthen and/or basalt and is trapezoidal in geometry. The main canal provides water directly to patrons and multiple laterals indicated in Figure 3.0.1. There are approximately 192 miles of open laterals and sublaterals, most of which remain un-piped, although the District has piped selective laterals known to have high water loss (see Figure 3.0.1 for a visual representation of piped laterals). Many of these piped segments are indicated to be upgraded to newer, pressure rated, HDPE pipe. If the District so chooses, retention of these pipes will be considered on a case-by-case basis during the design of future piping improvements.

Water diverted into North Unit Irrigation District experiences roughly 1,100 - 1,200 feet of elevation differential from its point of diversion at the south to the northern extremities of the District. Dependent on economics, there are multiple locations throughout the District where hydropower may be feasible.

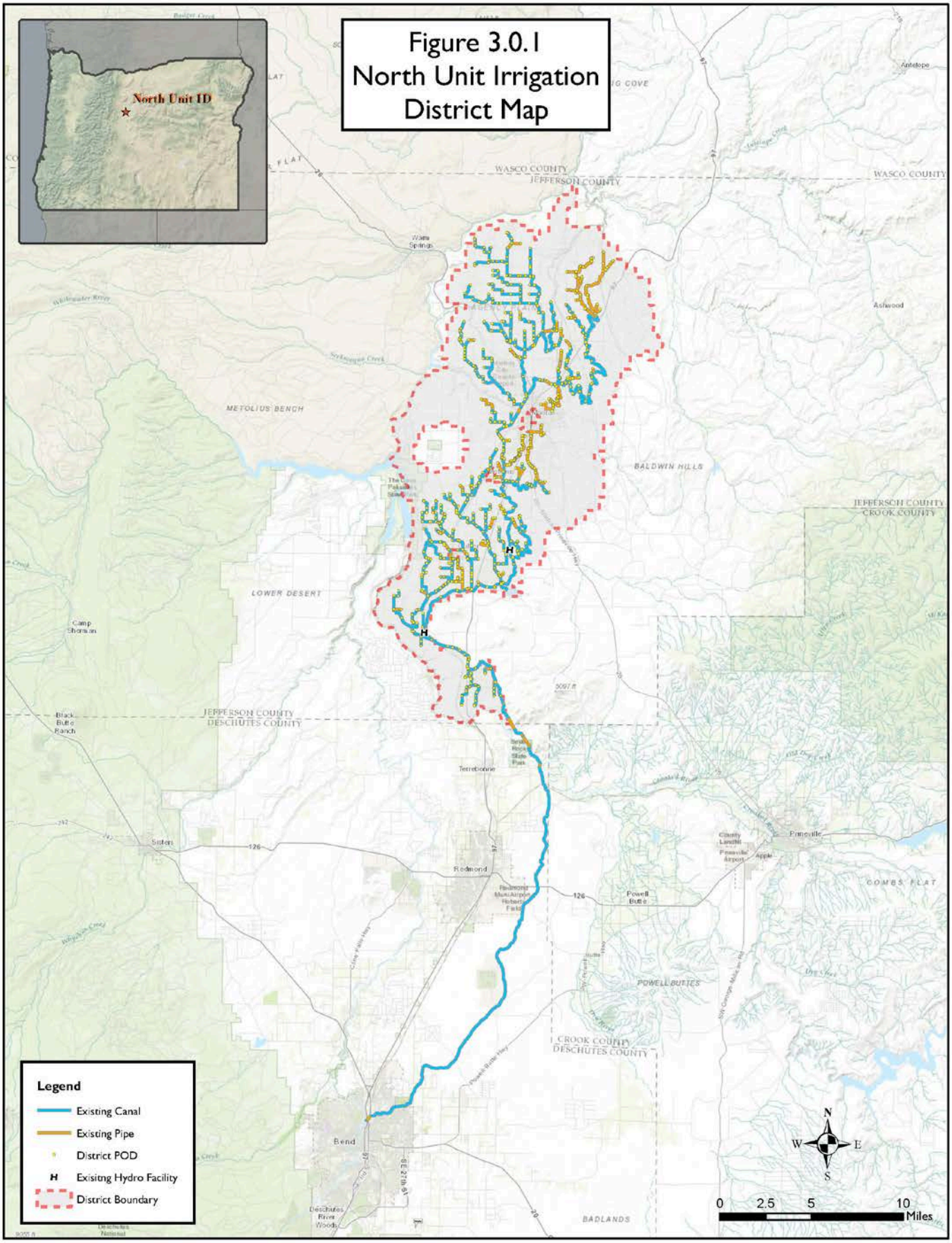


Figure 3.0.1 North Unit Irrigation District Map

3.1 Water Supply and Certificates

North Unit Irrigation District operates based on multiple water right certificates. Complete water right information is not included in this SIP but may be obtained from the Oregon Water Resources Department or the District's Water Management and Conservation Plan. It should be noted that the District's water rights change from time to time with conservation activities, hydroelectric power development, transfers, and other water right activities. For the purposes of this SIP, the primary goal is to evaluate the modernization of the District's conveyance system, therefore, information regarding Water Right Certificates #72279, #72280 #72281, #72282 #72283, #72284, #90177, #51229, and #51230 are summarized below. There are multiple, smaller, water rights, in addition to the ones listed below.

Certificate 72279 & 72280

Source: Deschutes River, a tributary to the Columbia River
Priority: February 28, 1913
Use: Primary irrigation of 50,049.9 acres
Duty: 1/40 CFS per acre, not to exceed 5.25 acre-feet per acre per year
Maximum Rate: 1,101 CFS

Certificate 72281 & 72282

Source: Crooked River, a tributary to the Deschutes River
Priority: June 23, 1955
Use: Supplemental irrigation of 49,999.9 acres
Duty: 1/40 CFS per acre, not to exceed 4 acre-feet per acre per year
Maximum Rate: 200 CFS

Certificate 90177

Source: Crooked River, a tributary to the Deschutes River
Priority: September 18, 1968
Use: Primary irrigation of 4,932 acres and industrial use of 5 acres. Supplemental irrigation of 37.3 acres. Inchoate irrigation of 78.6 acres.
Duty: 1/40 CFS per acre, not to exceed 3.97 acre-feet per acre per year
Maximum Rate: 117.44 CFS

Certificate 51229

Source: Deschutes River, a tributary to the Columbia River
Priority: February 29, 1913
Use: Storage of 200,000 acre-feet in Wickiup Reservoir
Duty: N/A
Maximum Rate: N/A

Certificate 51230

Source: Deschutes River, a tributary to the Columbia River
Priority: February 29, 1913
Use: Secondary storage (re-regulating reservoir) of 5,650 acre-feet in Haystack Reservoir
Duty: N/A
Maximum Rate: N/A

For the purposes of this SIP, the most critical elements of this certificate are the duty and the rates allowable for diversion and District use. No water transmission loss assumption was noted in the certificates. The extent of water loss mitigation is further discussed in the System Loss Assessment section of this SIP.

3.2 On-Farm Water Demand Analysis - Acreage and Duty

As indicated above, in combination with water right #72281 and #72279, the current cumulative allowable diversion during peak irrigation season is 11.22 GPM/Acre for a vast majority of the District. For simplicity, this was assumed over the entire District.

For the purposes of this SIP, and based upon District input, a SIP design delivery flow rate was established at the calculated on-farm rate of 7 GPM/Acre. At these rates and based upon the Natural Resources Conservation Service criteria, 5 FT/S was used as a maximal velocity criterion for proposed piping of the system. The pipe models were also evaluated to an extreme value of 9 GPM/Acre to ensure that the system would still function properly and to provide future flexibility to the District. Under this higher flow rate, velocities were evaluated to ensure that they did not dramatically exceed the 5 FT/S criteria. It should be noted that there are two locations within NUID that would require a booster pump or higher exiting pressure from a PRV to operate at 9 GPM/Acre. See Section 4.4 for further discussion.

3.3 System Loss Assessment

Black Rock Consulting worked with the District to coordinate a seepage loss study performed by Farmers Conservation Alliance staff under the direction of Black Rock Consulting principal, Kevin L. Crew, P.E and David C. Prull, P.E. During the summer of 2016, the Seepage Loss Assessment Program (LAP) funded by the Farmers Conservation Alliance, the Energy Trust of Oregon and supported by Oregon State University and the Oregon Water Resources Department was implemented in 7 of the 8 Central Oregon irrigation districts. The outcome of the LAP was used to inform the Districts of current system losses and to enhance SIP development for these Districts. The program included the use of newly purchased and calibrated Flowtracker II technology, manual, office and field training, all in accordance with the United States Geological Survey and United States Bureau of Reclamation “Discharge Measurements at Gauging Stations – Chapter 8 of Book 3, Section A, Techniques and Methods 3-A8”. The program was managed by Oregon Registered Professional Engineers, Kevin L. Crew, P.E. and David C. Prull, P.E.

The primary purpose of the LAP program, as applied to the Districts, was to perform a one-time measurement program in each District to inform the District SIPs of approximate water losses throughout the system. With the vast number of measurements that needed to be collected,

measurements were performed at different times of the irrigation season within each District. This resulted in data that was not always obtained during peak conditions. Results of the study were used to provide a strong indication of losses. The results were interpolated or extrapolated based upon the maximal expected loss within each District as indicated in the SIP below. The final loss information was used to identify losses associated by project phase or lateral depending upon each specific District SIP. In instances where grants are to be allocated in direct exchange for conserved irrigation water (dedicated by revised water rights certificates to instream flow), the grantor may be compelled to confirm these seepage loss results. This can be accomplished by conducting a subsequent loss measurement program performed by the USGS and/or the Oregon Water Resources Department prior to project implementation.

For NUID, the LAP was implemented throughout the District's primary canal and system laterals. Results for the LAP study within NUID are included in Appendix A to this SIP. A tabulated summary of the results is provided in Table 3.3.1.

Table 3.3.1 North Unit Irrigation District Water Loss Assessment

NORTH UNIT IRRIGATON DISTRICT WATER LOSS ASSESSMENT				
CANAL/LATERAL	MEASURED (Y/N)	LOSS MEASURED (CFS)	ADJUSTMENT FACTOR	ADJUSTED CONSERVATION ESTIMATE (CFS)
31	N	1.1 [1]	0.85	0.9
32	N	0.4 [1]	0.85	0.3
34	Y	1.3	0.85	1.1
37	Y - Partially Piped	7.78 [2]	0.85	6.6
38	Y	1.3	0.85	1.1
41	Y - Partially Piped	5.8 [2]	0.85	4.9
42	N	0.2 [1]	0.85	0.1
43	Y - Partially Piped	16.0 [2]	0.85	13.5
45	Y	3.0	0.85	2.6
48	N	0.4 [1]	0.85	0.4
50	Y	0.4	0.85	0.3
51	Y - Partially Piped	2.1	0.85	1.8
52	N - Piped	0.0	0.85	0.0
53	N - Piped	0.5 [1]	0.85	0.0
55	Y	0.7	0.85	0.6
56	Y	0.1	0.85	0.1
57	Y	4.3	0.85	3.7
58	Y - Partially Piped	16.1	0.85	13.7
59	Y	1.1	0.85	1.0
60	Y	0.3	0.85	0.2
61	Y	2.3	0.85	2.0
63	Y	3.4 [2]	0.85	2.9
62	N - Piped	0.0	0.85	0.0
64	Y	4.6 [2]	0.85	7.5
P58	N - Piped	0.0	0.85	0.0
L51	N - Piped	0.1 [1]	0.85	0.0
Main Downstream of Haystack	Y	32.5	0.85	27.6
Main Upstream of Haystack	Y	96.0	0.85	81.5
Total		**205.4**		**174.4**

Notes:

1. Lateral was not measured during loss assessment program. A loss coefficient of 12% was applied to anticipated flow rate based on average loss per lateral calculated from the LAP.
2. Select sublateral(s) were not measured on this lateral due to lack of flow or low flow at time of measurement. Acutal realized loss may be higher, but data was not extrapolated. See Appendix A for more infomoration on Loss Assessment.

The adjustment factor provided in the table is the simple ratio of the estimated total piped conservation (fully piped system) at a delivery rate of 7 GPM/Acre, 174.4 CFS (see Table 3.3.2 below), versus the measured system loss of 205.4 CFS.

Total piped system conservation estimates were developed as a comparison between anticipated peak delivery and peak historical delivery rates over the last 10 years. Delivery acreages assessed for the NUID system were used to estimate the fully piped system flow rates at the peak certificate rate (7 GPM/Acre). Flow diversion data for the District was evaluated to determine the peak diverted flow rate over the last ten years of operation (approximately 820 CFS peak, at the main point of diversion from the Deschutes). Although the CRPS has a design capacity of 200 CFS it was indicated that during peak conditions the Crooked River Pump Station could also be supplying 120 CFS and Haystack Reservoir could be supplying 50 CFS for a realized peak flow of 990 CFS. The historical peak 990 CFS was compared to the peak piped flow rate of 816 CFS to estimate the potential conservation of 174.4 CFS based on a completely piped delivery system (including all laterals down to individual patron turnouts). The results of this total conservation estimate are tabulated in Table 3.3.2.

Table 3.3.2 North Unit Irrigation District Conservation Estimates

North Unit Irrigation District Water Conservation Estimates			
Diverted Acreage	Maximum Diversion (CFS)	Diversion Rate at 7 GPM/ACRE (CFS)	Estimate Conservation at 7 GPM/ACRE (CFS)
52,293	**990**	**816**	**174**
Note: Acreage is average irrigated acreage from 2001 - 2010			

Section 4

System Improvement

4.0 System Improvement Approach

The primary purpose of this SIP was to identify water conservation, hydroelectric power and pumped power conservation possibilities for the District, and to develop a mitigation strategy for system water losses. Although some limited piping has already occurred in the District, there remains a significant open canal system allowing for mitigation through piping. Consistent with its Scope of Services and the subsequent goals and direction provided by the District, FCA in concert with BRC, performed a comprehensive hydraulic model and associated piping/pressurization evaluation of the District.

There are two primary alternatives for the mitigation of seepage losses. The first is canal lining and the second is canal piping. Within each of these alternatives there are a variety of material choices. Canal lining involves the installation of an impervious system to cover the canal bottom and banks. Materials typically employed include geomembranes, rubber liners, shotcrete or similar materials. Canal lining does not provide pressurization of the irrigation system, and lining also increases canal velocities, thus increasing risk to people. Over a 50-year life cycle, it was found that canal lining may be less expensive to implement in its first installation cycle than piping, however canal lining requires significant maintenance and replacement cycles that ultimately cause it to exceed the cost of piping over time. Also, given the elevation differential across the District, the desire of the District to optimize pressurized deliveries to its patrons, and desire to reduce pumping electricity consumption, piping was chosen as the District's preferred choice for canal water loss mitigation. It should be noted that the District has installed a significant segment of shotcrete-lined main canal from the headworks in Bend north 11.7 miles. The District chose this approach due to the significant cost of piping that segment of canal versus lining it and due to its need to dramatically reduce seepage in that segment of canal. For the purposes of this SIP, a cost has been provided to pipe that segment of lined canal and the cost is significant to do so.

FCA commenced the process of hydraulic modeling for North Unit Irrigation District by receiving base EPANET (.INP) files from FireWhat in electronic form. The files were generated by FireWhat by including spatially (i.e. northing, easting, and elevation) correct patron turnout locations and the associated delivery flow rates at each turnout. Updated acreages, by patron, were provided by the District for this purpose. EPANET modeling is discussed further in Section 4.5 of this SIP. From the base files, FCA modified the data using Microsoft Excel 2016 to calculate pipe size based on flow rate. Modified data was input in EPANET and used to determine the static and dynamic pressure throughout the system. The District was modeled based on existing conditions with an intake at the Deschutes River and incremental gravity pressurization of the system.

The system was evaluated as a completely closed system, i.e. fully piped and pressurized to its extremities. The completed model was calibrated and pipes were sized based upon a peak velocity of 5 FT/S for proposed piping at 7 GPM/Acre and selected pipe manufacturer information.

Once this process was completed, the system was evaluated for cost as detailed below. "Project Groups" were developed in incremental segments, piping each lateral and associated main canal from the bottom up. This approach is subject to modification based upon available funding and District operation and preference over time.

4.1 Pipe and Valve Materials

Pipe material selections were made by Dan Kaler, E.I.T, with guidance from Kevin L. Crew, P.E., based upon 29 years of experience with large diameter piping systems including 20 years of experience in Central Oregon. From the hydraulic model, both static and dynamic pressures were evaluated throughout the system to select appropriate pipe material options. For pipe up to 63-inches in diameter, high density polyethylene solid-wall pipe was selected due to its outstanding abrasion resistance, longevity, and ability to be pulled into canal curve alignments. For pipe larger than 63-inch, high pressure steel pipe was selected. Costs for materials were obtained from large, reputable vendors that are active in bidding to Central Oregon projects.

Valves for pressure reducing stations were technically assessed and narrowed down to plunger valves and Cla-Val valves. Both use internal energy dissipation within the valve to accomplish the needed pressure-sustaining function downstream of the valves. Cla-Val valves use a control tubing and a diaphragm/bonnet arrangement to adjust pressures within the pressure reducing apparatus. No power is necessary for the operation of a Cla-Val. Should pressure reducing valves be required in the future, Cla-Val E-90-01 pressure reducing valves should be considered.

4.2 Hydroelectric Power Potential, Pumping Mitigation and Pressurization Approach

The hydraulic analysis for the District indicates that there are multiple locations in which renewable, green energy is viable by utilizing natural elevation differential within the system. The purpose of a hydroelectric power plant is to convert energy in water falling from higher elevation to lower elevation into a consumable form. There are multiple technologies that address each power site and scenario but essentially the energy stored in the water causes a shaft to rotate, that when connected to a generator produces electricity. Two types of technologies were analyzed for this report, Natel hydroEngine and conventional turbines (Francis, Pelton, Turgo, Kaplan, Crossflow). Figure 4.2.1 highlights the potential sites.

Natel develops and manufactures innovative hydroelectric turbines suitable for low-head, high-flow settings. The hydryoEngine, ranging in capacity from 25 kW to 1 MW, enables a new generation of distributed hydro installations with low project civil cost, fish-friendly operations, and a small project footprint. Distributed cascades of hydroEngines can deliver a valuable form of reliable, baseload, and cost-effective renewable energy to the grid and to utility customers.

Currently, Natel offers two classes of hydroEngines. The Fully Flooded hydroEngine is a state-of-the-art two stage impulse turbine, using straight blades mounted symmetrically on the belt perpendicular to the axis of travel. It is best suited for sites with very low head and tail water fluctuations as it works with a draft tube. The Linear Pelton (LP), Natel's most recent innovation, is a pure impulse, single-stage turbine composed of linearly-moving blade modules constrained to a path resembling a race track, or oval. The technology implements the highly efficient fluid mechanics of a Pelton style blade on a linear powertrain without requiring a draft tube, stators, wicket gates, stay vanes, or guide vanes. The turbine is installed horizontally above tailwater, requiring minimal excavation. Both system architectures utilize carbon-fiber reinforced timing belts, allowing turbines to be designed with rated capacity up to 1 MW. Reference Appendix D for further information regarding the Natel hydroEngine in relation to NUID and assumptions for the results in Table 4.2.1.

Table 4.2.1 NUID Hydropower Generation Potential - Natel HydroEngine

NUID HYDROPOWER GENERATION POTENTIAL - NATEL HYDROENGINE						
Location	Lat	Long	Available Flow (CFS)	Available Head (ft)	Nameplate kW	Estimated Annual kWh
Brinson Drop/Mile 2A	44° 4' 55.92" N	121° 17' 11.04" W	706	20.0	660.0	2,230,000
NE Purcell/Mile 2B	44° 5' 13.10" N	121° 16' 27.24" W	706	20.0	660.0	2,230,000
Littleman Drop/Mile 50A	44° 34' 15.93" N	121° 9' 31.62"W	247	10.0	112.0	501,000
Littleman Check/Mile 50B	44° 34' 19.65" N	121° 9' 36.46" W	247	9.5	116.0	516,000
Loghouse/Mile 48	44° 32' 11.71" N	121° 9' 12.77" W	254	11.7	120.0	545,000
Haystack/Mile 43	44° 30' 1.22" N	121° 9' 17.48" W	249	69.5	833.0	3,798,000
Mile 52A	44° 36' 4.81" N	121° 9' 45.08" W	247	9.8	116.0	514,000
Mile 52B	44° 36' 12.70" N	121° 9' 42.67" W	247	9.8	116.0	514,000
Airport/Mile 18	44° 37' 30.42" N	121° 7' 42.66" W	742	21.4	761.0	2,147,000
Deschutes Market/Mile 3	44° 5' 34.22" N	121° 15' 22.67" W	706	20.0	726.0	2,230,000
Total					**4,220**	**15,225,000**

Conventional, in-conduit hydropower takes advantage of pressure built over a given distance and associated fall of a piped system. The amount energy generation potential is directly related to the elevation differential (head) and amount of water (flow rate) in the system. Water in these piped systems is directed at a runner inside a protective casing. This force causes a shaft connected to the runners to rotate providing a means to drive the generator. A generator connected to the shaft converts the mechanical energy of the rotating shaft to electrical energy. The site parameters of available flow rate, flow rate range, water quality and pressure available for power generation dictate the type of conventional turbine that may be selected such as Francis, Turgo, Pelton, Crossflow, or Kaplan. For the purposes of this high-level analysis, different types of turbines were not analyzed in detail.

Consistent with the Scope of Services for this SIP, a reconnaissance-level power production evaluation was performed at multiple pressure reducing stations identified in the hydraulic model. The hydraulic model indicates that 27 pressure reducing stations will be required in a fully piped system. For the sake of this study, all locations with a flow equal to or greater than 10 CFS were considered (see Figure 4.2.1) for hydroelectric power generation. The evaluation assumed 4 feet of head-loss through the power system and 80% wire to water efficiency. Flow rates and associated head for each PRV station were extracted from EPANET. Analyzing historically delivered water information, due to diversity in the system, determined that peak flows of 7 GPM/Acre were unlikely to occur on a regular basis. Therefore, nameplate kW (or MW) values were derived from a diversified flow rate, compared to peak. A value of 40% was applied to the peak flow to calculate the nameplate power of each potential hydropower opportunity. A generalized annual energy generation, in kWh, was calculated using historical data indicating that the average irrigation season is 194 days. Energy generation calculations assumed an average flow rate over those 194 days to calculate the high-level energy generation potential. Based on these assumptions the hydropower generation sites shown in Table 4.2.2 were calculated (reconnaissance-level).

Table 4.2.2 NUID Hydropower Generation Potential - Reconnaissance Level

NUID HYDROPOWER GENERATION POTENTIAL - RECONNAISANCE LEVEL								
Location	**Lat**	**Long**	**Peak Flow @ 7 GPM/ACRE (CFS)**	**Modified Peak Flow (CFS)**	**Modified Average Flow (CFS)**	**Available Head (ft)**	**Nameplate kW**	**Estimated Annual kWh**
End of Lining	44° 10' 48" N	121° 9' 0" W	917	550.2	335.8	299.4	11,160.3	28,542,819
Crooked River Pump Station	44° 21' 36" N	121° 6' 36" W	917	550.2	335.8	230.8	8,603.2	22,002,927
Lateral 37-4	44° 30' 36" N	121° 15' 0" W	10	6	3.7	82.1	33.4	85,297
Lateral 37	44° 30' 0" N	121° 13' 12" W	23	13.8	8.4	80.1	74.9	191,598
Lateral 41	44° 31' 12" N	121° 12' 0" W	60	36	22.0	72.4	176.6	451,707
Lateral 43-7	44° 32' 60" N	121° 10' 48" W	13.56	8.136	5.0	75.7	41.7	106,639
Lateral 43	44° 32' 60" N	121° 11' 24" W	49	29.4	17.9	72.3	144.1	368,415
Lateral 43-10	44° 34' 12" N	121° 12' 0" W	16	9.6	5.9	78.0	50.7	129,736
Existing Mile 45- Hydro	44° 31' 48" N	121° 9' 0" W	583	349.8	213.5	136.1	3,225.2	8,248,470
Lateral 57	44° 39' 36" N	121° 10' 12" W	38.89	23.334	14.2	133.4	210.9	539,323
Lateral 58-11	44° 38' 60" N	121° 4' 12" W	87	52.2	31.9	102.4	362.0	925,846
Lateral 58-3	44° 39' 36" N	121° 5' 24" W	17.5	10.5	6.4	110.7	78.8	201,460
Lateral 58-9	44° 45' 0" N	121° 2' 60" W	10	6	3.7	297.5	120.9	309,246
Lateral 59	44° 41' 24" N	121° 9' 0" W	31.43	18.858	11.5	66.1	84.4	215,858
Main-0134	44° 43' 12" N	121° 7' 48" W	161.686	97.0116	59.2	79.3	520.9	1,332,146
Total							**24,888**	**63,651,487**

Pressurization of the system will occur as it is piped. The hydraulic model indicates that dynamic (i.e. pressures achieved during full flow operation of the system) will range from approximately 1 PSI to an excess of 85 PSI. In reality, system pressures will likely rise well above this pressure range as hydraulic losses (i.e. pressure losses) will be less if the system is moving less water. For example, if the system flows were reduced from 7 GPM/Acre to 5.5 GPM/Acre friction loss in the pipe will be less and dynamic pressure may be greater.

Pumping energy mitigation was based on the following assumptions for private patron (on-farm) requirements:

- 3 AC-FT/Acre of water applied to grow grass or alfalfa/season
- 70% application efficiency
- 4.28 AC-FT/Acre required to flow from the sprinkler heads/season
- 70% pumping efficiency
- 60 PSI for irrigation pressurization requirements

Where partial pressurization was anticipated by the hydraulic model, a percent of pumping mitigated was assigned to the associated lateral or main canal. The overall District private pumping mitigation and associated patron kWh savings was estimated at 40,359,738 kWh/YR. Some laterals are already piped, but won't realize full pressurization until the entire system is fully modernized. Therefore, energy savings through pump energy mitigation was included in Table 4.2.2 for those laterals.

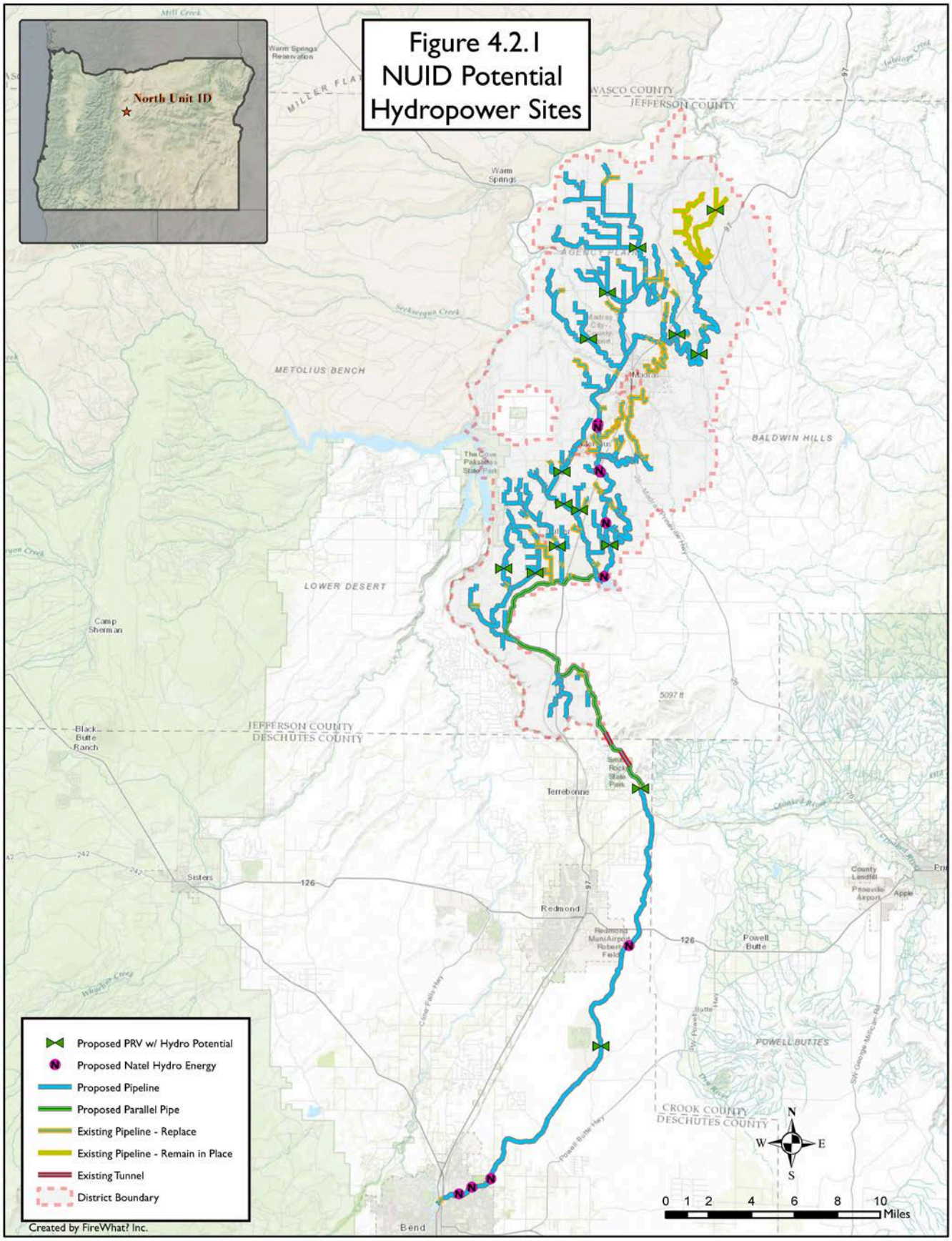


Figure 4.2.1 NUID Potential Hydropower Sites

Table 4.2.3 Estimated Pump Energy Mitigation Savings Through Pressurization

Estimated Pump Energy Mitigation Savings Through Pressurization					
Lateral	**Irrigated Acres**	**Average Pressure per Acre (PSI)**	**Estimated Pumping Mitigaton**	**70% Efficient Pumping per Acre @ 60 PSI Grass/Hay (kWh)**	**Total Pumping Savings (kWh)**
31	564	15.5	25.8%	867.8	126,278
32	208	10.5	17.5%	867.8	31,590
34	1,368	7.5	12.6%	867.8	149,063
37	5,345	31.8	53.0%	867.8	2,459,098
38	75	10.2	17.0%	867.8	11,134
41	4,398	54.7	91.2%	867.8	3,479,129
42	83	14.4	24.0%	867.8	17,189
43	6,835	55.6	92.7%	867.8	5,497,521
45	1,482	39.7	66.1%	867.8	850,148
48	237	3.2	5.3%	867.8	10,911
50	427	15.6	26.0%	867.8	96,180
51	2,571	11.5	19.2%	867.8	428,069
52	73	49.3	82.1%	867.8	52,072
53	248	55.9	93.2%	867.8	200,648
55	1,214	59.9	99.8%	867.8	1,051,841
56	414	57.6	96.1%	867.8	345,407
57	2,724	54.4	90.6%	867.8	2,141,176
58	4,452	56.9	94.8%	867.8	3,661,547
59	2,665	55.4	92.4%	867.8	2,136,766
60	755	67.8	100.0%	867.8	655,326
61	624	48.9	81.6%	867.8	441,530
63	3,440	53.9	89.8%	867.8	2,681,219
64	4,723	59.5	99.2%	867.8	4,065,130
L51	61	29.8	49.7%	867.8	26,213
MAIN	7,174	46.0	76.7%	867.8	4,777,223
P58	561	72.3	100.0%	867.8	486,896
PL41	582	62.6	100.0%	867.8	504,771
PL51	668	35.0	58.4%	867.8	338,290
PL52	380	53.4	89.1%	867.8	293,260
PL58	3,685	57.8	96.3%	867.8	3,077,922
PL62	314	58.5	97.6%	867.8	266,192
Total					**40,359,738**

4.3 Elevation Data

Quantum Spatial, of Corvallis, Oregon, was commissioned to fly LiDAR over the entirety of NUID. Elevation data and spatial layout of the districts delivery system was derived from the LiDAR data flown in November 2016. The data was post-processed to the requirements of FCA and Black Rock Consulting. Specifications for the data collection are provided in Table 4.3.1.

Table 4.3.1 LiDAR Flight Parameters

Multi-Swath Pulse Density	≥ 8 pulses/m^2
Scan Angle	≤30^o (+/-15^o from Nadir)
Returns Collected Per Laser Pulse	Up to 4
Intensity Range	1-255
Swath Overlap	50% side-lap (100% overlap)
Maximum GPS Baseline	13 nautical miles

With the use of on-ground RTK and OPUS corrections, the data was provided in 1-FT contour interval format and was considered better than 1-FT accuracy vertically.

Units for the elevation information were reported and used in the following systems:

- Horizontal Projection: Oregon State Plane (ORSP) South Zone. International Feet
- Horizontal Datum: NAD83(2011)(Epoch2010.00)
- Vertical Datum: NAVD88 using Geoid12A

4.4 District Flexibility

The system was modeled with demands for on-farm delivery rates of 7 GPM/Acre. This in and of itself is conservative because it is unlikely that every patron within the District is irrigating at the same moment, and the average District diversion is much less than this. Additionally, based on historical data, the average irrigated lands are 52,293 acres, indicating that there are roughly 6,500 acres that may not be farmed annually.

Modeled system demands were increased to 9 GPM/Acre to ensure the system could still operate at these conditions, if needed. The system still operated within acceptable operating conditions when the demand was increased to 9 GPM/Acre, with two exceptions: The Crooked River Pump Station and the piped system just downstream of the Mile-45 Hydroelectric Power Plant. Both of these locations would require additional pressurization.

In the fully piped model there is currently a pressure reducing station on the District's main canal just above the junction with the Crooked River Pump Station (CRPS), relieving all pressure to 5 PSI to mix with water supplied from the CRPS. With the system operating at 9 GPM/Acre, the

pressure required downstream of the junction with the Crooked River Pump Station would need to be 25 PSI. This could be accomplished two ways. First, the PRV on the main canal could be set at an exiting pressure of 25 PSI. Under this scenario, water supplied by the CRPS would also need to be at 25 PSI, which would require additional capacity at the pump station or a booster pump. The second option would be to have the water mix at the junction downstream of the PRV, with water supplied by the CRPS at atmospheric pressure (0 PSI) and install a booster pump downstream of the mixing junction.

The topography downstream of the Mile-45 Hydroelectric Power Plant is relatively flat. With the system operating at 9 GPM/Acre, the Mile-45 Hydroelectric Power Plant outlet pressure would need to be a minimum of 11 PSI. If the unlikely situation arose where the District would require 9 GPM/Acre, the District could either increase the exiting pressure on the power plant to 11 PSI or install a booster pump to supply the necessary pressure.

There are multiple spill points throughout the District. Spill points are locations at the end of the lateral where water is spilled into a drain. These spill points provide “carry” or “push” water and are necessary to ensure all patrons on a lateral receive their allocated water right. The District has indicated that they would like to capture these spills by means of reuse or retention reservoirs. Once captured, the water may be pumped back for irrigation use. Table 4.4.1 highlights the exact location and capacity of potential reservoir locations. Figure 4.4.1 provides a visual of the locations outlined in Table 4.4.1. Reuse or retention reservoir cost estimates are provided in the respective project groups which the reuse or retention reservoir would be utilized (see Section 5).

For the purposes of this System Improvement Plan, a reuse or retention reservoir storage size of 25 acre-feet was used as an initial size estimate for all proposed locations. A reservoir of this size was recently constructed at the 58-11, 58-9 lateral bifurcation point. This reservoir serves approximately 80 CFS of current demand (prior to full piping of the 58-11 lateral). Since that project was publicly advertised, bid, and constructed, cost information from that project was used for each of the proposed sites. Although the District does not currently have detailed flow information for drain systems not historically maintained or operated by the District, they plan to perform measurement evaluations of some or all of the proposed reuse or retention reservoir locations. When complete, this information may be used to update the various reuse or retention reservoir system sizes at each location.

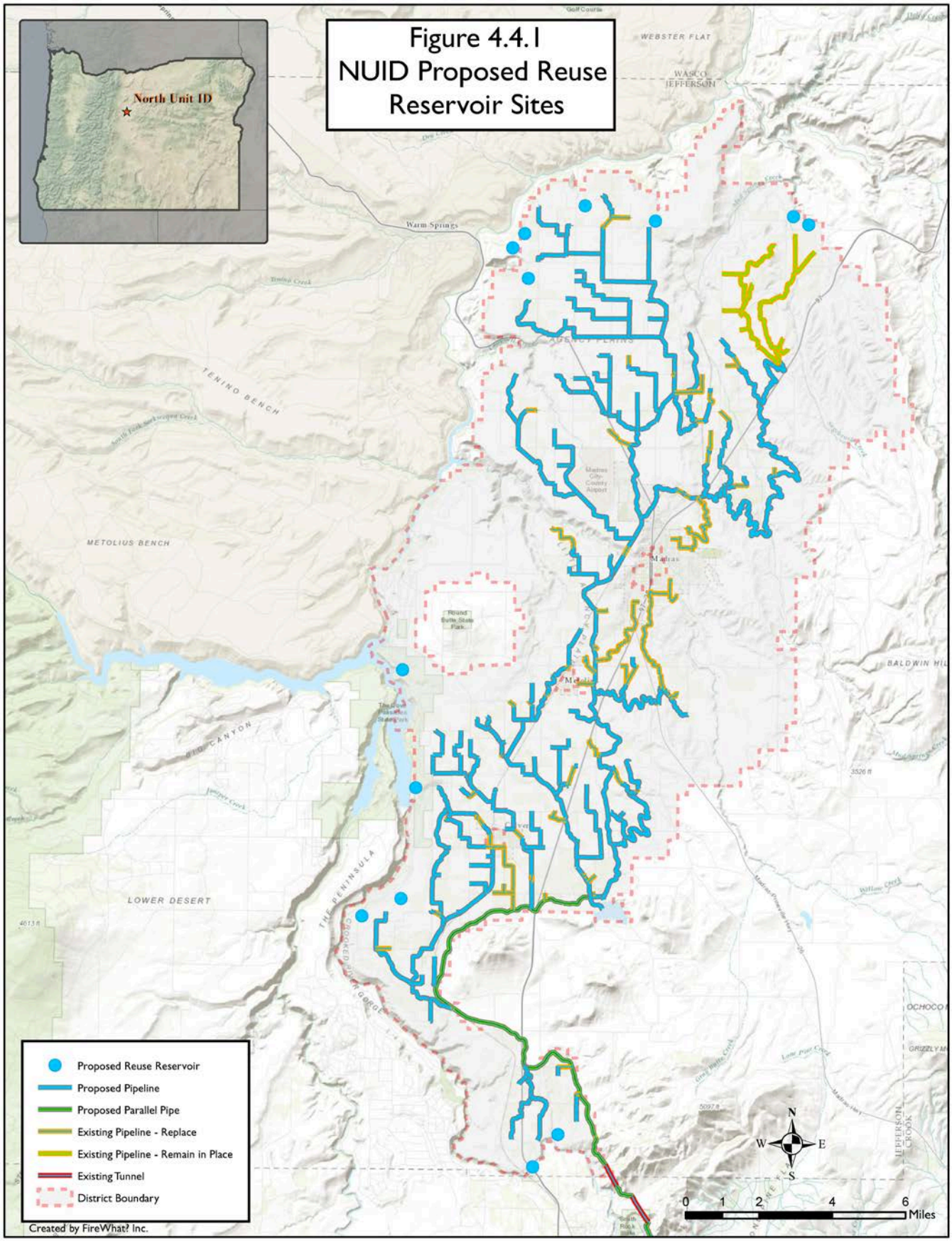


Figure 4.4.1 NUID Proposed Reuse or retention Reservoir Sites

Table 4.4.1 NUID Proposed Reuse or retention Reservoir Sites

Proposed Reuse Reservoir Sites			
Reuse Reservoir	**Capacity (Acre-feet)**	**Lat**	**Long**
Rattlesnake	25	44°44'43.84"N	121°11'57.91"W
64 Tail	25	44°45'27.40"N	121°12'29.12"W
Boyle	25	44°45'47.80"N	121°12'5.61"W
64-4 Tail	25	44°46'30.72"N	121°10'6.62"W
Main Tail	25	44°46'7.96"N	121° 7'43.00"W
58-9 Tail	25	44°46'3.32"N	121° 2'38.77"W
Mud Springs	25	44°46'15.02"N	121° 3'9.39"W
Outhouse	25	44°35'25.28"N	121°16'1.36"W
Culver Drain	25	44°29'34.13"N	121°17'18.08"W
37-3 North	25	44°29'59.59"N	121°16'0.65"W
37-3 South	25	44°32'37.69"N	121°15'33.15"W
McPheeters Turf	25	44°24'25.41"N	121°10'46.75"W
Crooked River Spill	25	44°23'39.28"N	121°11'34.30"W

4.5 Hydraulic Modeling

EPANET –

EPANET was used to model the District's proposed piped network. EPANET is a free-ware product that is maintained by the EPA. The Natural Resources Conservation Service technical offices in Oregon use EPANET exclusively for hydraulic modeling. For these reasons, EPANET was selected as the modeling software of choice for this SIP.

EPANET modeling capabilities go beyond steady-state hydraulic modeling. The software is capable of chemical transport analysis and variable flow modeling. A description of some of its capabilities follows:

EPANET is a computer program that performs extended period simulation of hydraulic and water quality behavior within pressurized pipe networks. A network consists of pipes, nodes (pipe junctions), pumps, valves, and storage tanks or reservoirs. EPANET tracks the flow of water in each pipe, the pressure at each node, the height of water in each tank, and the concentration of a chemical species throughout the network during a simulation period comprised of multiple time steps. In addition to chemical species, water age and source tracing can also be simulated.

EPANET is designed to be a research tool for improving our understanding of the movement and fate of drinking water constituents within distribution systems. It can be used for many different kinds of applications in distribution systems analysis. Sampling program design, hydraulic model calibration, chlorine residual analysis, and consumer exposure assessment are some examples. EPANET can help assess alternative

management strategies for improving water quality throughout a system. These can include:

- altering source utilization within multiple source systems,
- altering pumping and tank filling/emptying schedules,
- use of satellite treatment, such as re-chlorination at storage tanks, and
- targeted pipe cleaning and replacement.

Running under Windows, EPANET provides an integrated environment for editing network input data, running hydraulic and water quality simulations, and viewing the results in a variety of formats. These include color-coded network maps, data tables, time series graphs, and contour plots.

Hydraulic Modeling Capabilities –

Full-featured and accurate hydraulic modeling is a prerequisite for doing effective water quality modeling. EPANET contains a state-of-the-art hydraulic analysis engine that includes the following capabilities:

- places no limit on the size of the network that can be analyzed,
- computes friction headloss using the Hazen-Williams, Darcy- Weisbach, or Chezy-Manning formulas,
- includes minor head losses for bends, fittings, etc.,
- models constant or variable speed pumps,
- computes pumping energy and cost,
- models various types of valves including shutoff, check, pressure regulating, and flow control valves,
- allows storage tanks to have any shape (i.e., diameter can vary with height),
- considers multiple demand categories at nodes, each with its own pattern of time variation,
- models pressure-dependent flow issuing from emitters (sprinkler heads), and
- can base system operation on both simple tank level or timer controls and on complex rule-based controls.

Velocity Criteria –

As stated above, the maximum velocity criteria was set at 5 FT/S for on-farm deliveries at 7 GPM/Acre. The peak evaluated flow rate was 9 GPM/Acre for future system flexibility and was allowed to increase beyond 5 FT/S in modeling as indicated above.

Elevations –

As indicated above, elevation data was derived from a 2016 LiDAR flight.

Spatially Correct Layout –

Horizontal information for the various system elements and patron turnouts was collected through a field survey performed by District staff and FireWhat in 2016. Turnout locations were “snapped” to the canal centerline (perpendicular to the centerline) as determined through post-processing of the LiDAR data and locating canal and lateral centerlines. The

"snapped" locations represented turnout node locations used during hydraulic modeling of the system and were represented in the model by Northing and Easting coordinates of the Oregon State Plane South Zone.

Pressure Reduction –

Where applicable, pressure reducing stations and/or hydroelectric power plants were entered into the model as PRVs (Pressure Reducing Valves). These valves are a programmed element in EPANET. The diameter of the valve and the downstream pressure set-point are entered to establish the downstream system pressure to be held by the PRV. PRVs were also used to emulate the pressure reduction through hydroelectric plant(s).

Pipe Diameter Selection –

Pipe diameter selections were derived iteratively in the hydraulic model with the first iteration being a rough estimate. The second iteration utilized actual pipe diameters for high density polyethylene pipe material at the appropriate dimension ratio and pressure rating for each model "link" (pipe). Generally, the third iteration adjusted all pipes in the system to a range of 4 FT/S to 5 FT/S at the peak system flow rates based upon 7 GPM/ Acre.

Pipe Pressure Rating Selection –

HDPE solid-wall pipes (PE4710 resin) were sized from HDPE pipe sizing tables for the expected static pressure for each pipe segment.

Steel pipes were sized either based on the pressure rating necessary (at static head) or the minimum shipping wall thickness (AWWA M-11) whichever resulted in the thicker pipe wall. For the purposes of the SIP modeling, inch-integer inside diameters were employed.

The model for the North Unit Irrigation District is included in Appendix B of this SIP.

4.6 Cost Estimating by Lateral (and Main Canal)

Pipe Estimates –

Pipe material estimates were provided by reputable vendors that routinely supplies pipe materials to Central Oregon projects. Pipe material budgetary estimates are provided in Appendix C for reference.

PRV Station Estimates –

As indicated above, pressure reducing valves for the use in this SIP were Cla-Val brand pilot operated hydraulic pressure reducing valves. VAG plunger valves were also evaluated. It is recommended that pressure reducing valves be thoroughly evaluated in design and if used in hydroelectric power applications, alternative valves may be considered. Cla-Val cost estimates were provided by GC Systems of Washington State.

Turnouts –

For the purposes of this SIP, patron turnouts were assumed to be converted to pressurized delivery systems. A standard pressurized irrigation delivery turnout was assumed to include an appropriately sized tee from the mainline or lateral, a pressure relief valve, a gear-actuated plug valve (or gate or possibly butterfly valve in smaller turnout situations), a magnetic meter, a combination air and vacuum relief valve and associated hardware, and spool pipe segments. Based upon experience with similar installations at irrigation districts in Central Oregon, the cost of installation of a turnout was set at an estimated average cost of $8,000 per installation.

Reuse or Retention Reservoir –

Reuse or retention reservoir sites were identified by the District at multiple spill points throughout the District. For the sake of this SIP, cost estimates were taken from a bid process that occurred in 2011 for the 58-11/58-9 lateral surge pond. Eight bids were averaged and brought from 2011 to present-day value using an inflation rate of 8.4%.

Construction –

Contractor procurement may come in several forms in Oregon. Design-Bid-Build is a conventional process wherein the survey and design is developed first, and then a traditional competitive bid is held to obtain the lowest-cost responsive and responsible bidding contractor. In this process, typically the design-engineering firm will serve as the inspection/construction management firm during the course of construction. Given the magnitude of the project phases and for the purposes of this SIP, a Construction Manager General Contractor (CMGC) model was assumed. In this contractor procurement method, design would precede obtaining the contractor, however, the contractor would include construction management in its delivery of the constructed project. An estimated contractor fee structure of 12% of the project value was assumed for this construction delivery method depending upon the size of the lateral or main canal project being evaluated.

Engineering, Construction Management –

Engineering and Owner’s Representative/Inspection services typically range as high as 10%-18% of construction value. For the purposes of this SIP, and assuming that project phases are constructed sequentially and annually, it was assumed that a total fee of 6% for survey, Engineering design, and inspection/owner’s representative services would be appropriate depending upon the scale of the particular lateral or main canal project. This was based upon the experience of Black Rock Consulting on similar projects deployed in Central Oregon.

Contingency –

The contingency percentage was carefully considered. The Association for the Advancement of Cost Engineering (AACE) is a nationally recognized organization that has developed an accepted system of contingency ranges based upon project specificity level “Class”. There are 5 project Classes starting from Class 5 with only conceptual project definition to Class 1 where a project has been completely developed and bid. This SIP was considered to fall within the Class 4 definition. The AACE Class 4 project specificity level

(i.e. a project at 1%-15% definition) carries an anticipated contingency range from -15% to -30% on the low end of the range to +20% to +50% on the high end of the range. We selected a contingency value of +30% that is in the middle of the positive contingency range provided by AACE. It should be noted that the phased cost estimate is based largely upon the cost of pipe materials. Budgetary pricing for high density polyethylene pipe was found to be very competitive at the time of development of this SIP. High density polyethylene solid-wall pipe is manufactured from an oil-based pelletized product. The pellet pricing is tied directly to the cost of oil at the time of pipe manufacture ordering. Given that oil prices have been reduced in the past two years and will likely rebound, it should be anticipated that pipe material pricing will increase significantly with time. The timing of such increases will be dependent upon oil pricing, the economic conditions at the time of order, and the demand for pipe at the time of order. Steel pipe pricing was provided at anticipated rates. Steel commodity pricing and manufacturing also fluctuates significantly over time. For construction that is completed soon after the development of this SIP, the cost estimates should remain robust. For work lagging several years beyond the development of this SIP, the risk of cost change is greater. For this reason, it is recommended that every 2 years a cost evaluation be performed to update the phased construction cost estimates.

Section 5

North Unit System Improvements by Project Group

5.0 System Improvement Operational Description and Assumptions

As stated previously, the proposed improvement plan for North Unit Irrigation District is to fully pipe the entire district. In order for the system to operate effectively, there were several key components and assumptions made that are further discussed below.

The maximum steel pipe size analyzed for the District was 12 feet (144 inches) in diameter. In order to keep within the standard NRCS criterion for maximum velocity delivered to users of 5 FT/S parallel pipe was required from the Crooked River Pump Station down to Haystack Reservoir.

For the purpose of this study, it was assumed that there was no water loss in the 11.7 mile, lined portion of main canal, from the headworks in Bend to the end of the liner. If necessary, further water loss assessment would need to be completed to determine loss, if any, in the lined stretch.

There are 27 pressure reducing stations located throughout the piped system. As indicated above, these systems were designed around a maximum static pressure of 95 PSI. The outlet side of the PRVs vary from a minimum of 35 PSI to a maximum of 50 PSI, depending upon system location. In areas where the downstream pressures could exceed the maximum pressure of 95 PSI, 35 PSI was used. In areas where the downstream pressures do not exceed 95 PSI, the outlet pressure was varied incrementally to provide all users downstream of the PRV as close to an average of 60 PSI as possible.

The two tunnels located downstream of the Crooked River Pump Station have a width of 11.5 feet. It was assumed that the maximum diameter pipe that could be fit within these tunnels, with room for grout, was 11 feet. The friction losses significantly increase when forcing water served by two parallel 12-foot diameter pipes, to a single 11-foot diameter pipe. These friction losses cause additional pressure buildup in the system. In order for the system to properly operate, an exiting pressure from the CRPS of 5 PSI would be required.

The following section provides the 22 project groups outlined in the At-A-Glance tables of Section 1. Per District direction, a target price range of $30 million to $45 million was established for the project groups ranging from the first delivery to the end of the system (Project Groups 1-19). The primary feed canal sectioned from Bend until the first delivery was split into 3 strategic groups to provide the District with flexibility in piping the main canal. There was not a set target price range for these groups but rather the cost for these segments was dictated by the layout of the system (Project Groups 20-22).

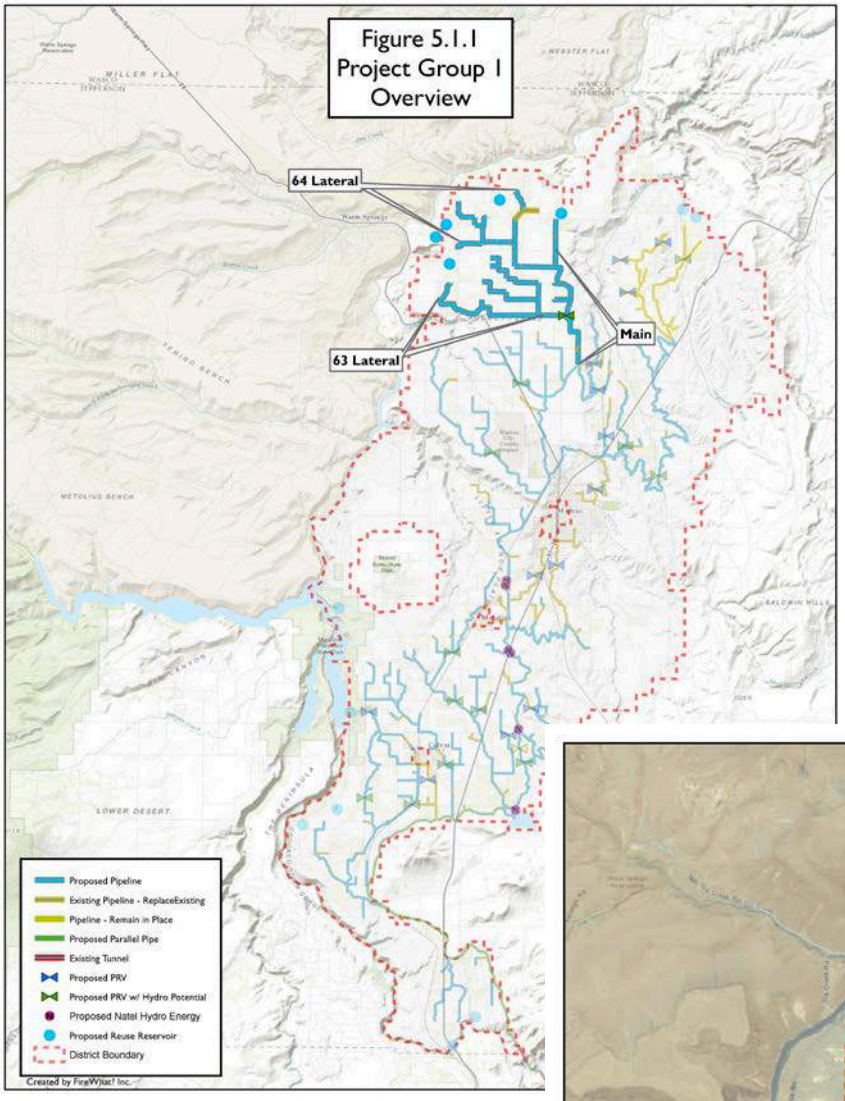


Figure 5.1.1
Project Group 1

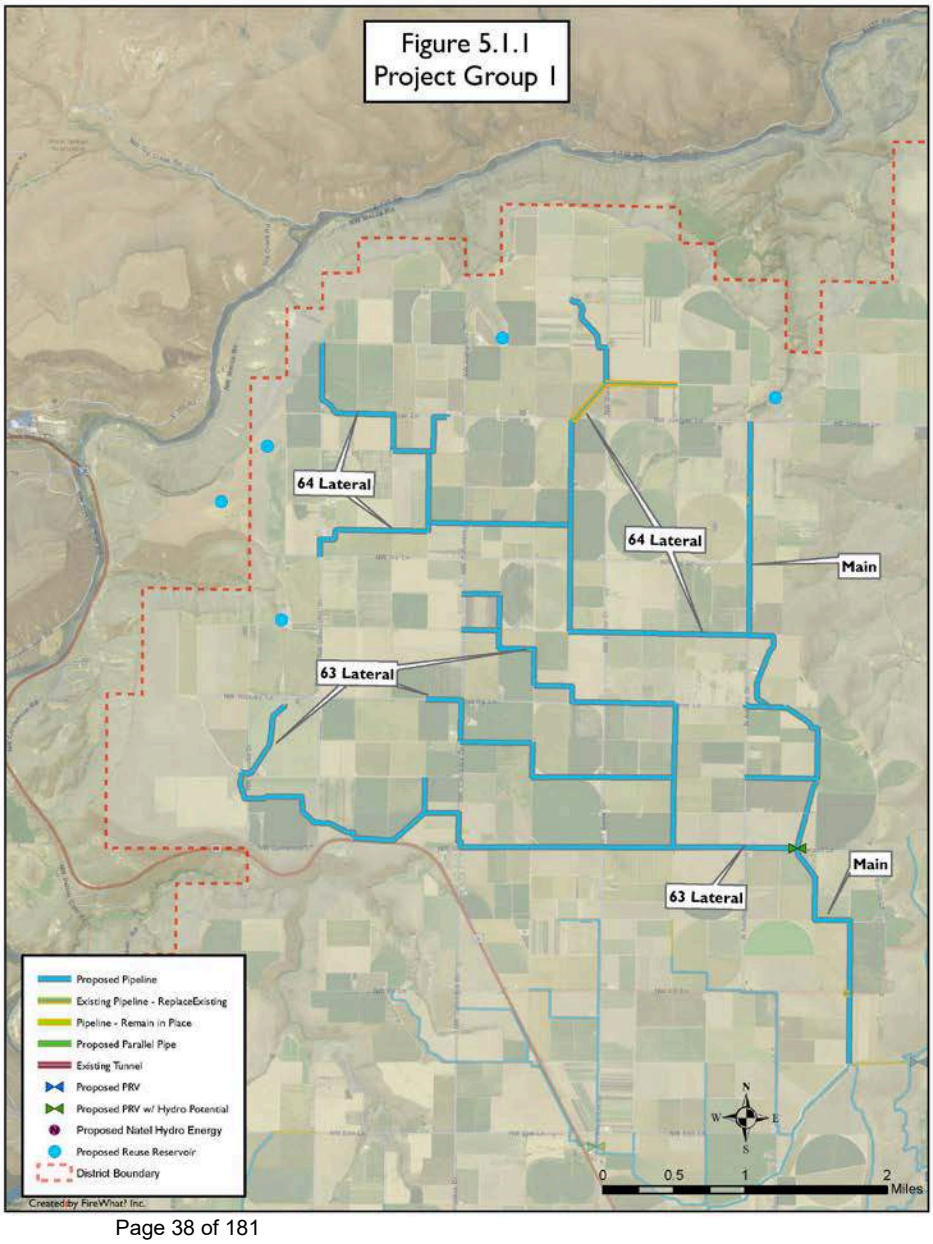


Table 5.1.1 Project Group 1 Cost Estimates

Project Group 1 - Laterals 63, 64 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation					**7,987,186**	**kWh**	
Estimated Water Conservation					**16.6**	**CFS**	
Feature	**Location**	**Dia (in)**	**Rating (DR or Steel)**	**Quantity (ft or #)**	**Unit**	**$/Unit**	**Total Cost**
Pipe	Lateral 63	16	21	2,956	LF	$38.85	$114,866
Pipe	Lateral 63	8	26	1,421	LF	$9.21	$13,092
Pipe	Lateral 63	10	26	2,779	LF	$14.30	$39,738
Pipe	Lateral 63	12	26	1,379	LF	$20.12	$27,748
Pipe	Lateral 63	14	26	3,329	LF	$24.24	$80,688
Pipe	Lateral 63	16	26	3,073	LF	$31.68	$97,333
Pipe	Lateral 63	18	26	1,967	LF	$40.09	$78,861
Pipe	Lateral 63	20	26	11,059	LF	$49.52	$547,612
Pipe	Lateral 63	24	26	8,229	LF	$71.31	$586,750
Pipe	Lateral 63	28	26	3,839	LF	$97.07	$372,633
Pipe	Lateral 63	30	26	1,001	LF	$111.44	$111,500
Pipe	Lateral 63	24	32.5	5,203	LF	$57.49	$299,107
Pipe	Lateral 63	26	32.5	327	LF	$67.53	$22,049
Pipe	Lateral 63	30	32.5	2,923	LF	$89.90	$262,791
Pipe	Lateral 63	32	32.5	2,693	LF	$102.33	$275,569
Pipe	Lateral 63	34	32.5	2,582	LF	$115.44	$298,043
Pipe	Lateral 63	48	32.5	2,622	LF	$230.13	$603,514
Pipe	Lateral 63	48	41	2,013	LF	$183.69	$369,840
Reuse Reservoir				3	EA	$232,922	$698,765
Turnouts	Lateral 63		-	41	EA	$8,000	$328,000
Lateral 63 Subtotal							**$5,228,497**
Pipe	Lateral 64	10	21	532	LF	$17.55	$9,335
Pipe	Lateral 64	12	21	1,913	LF	$24.65	$47,144
Pipe	Lateral 64	14	21	4,873	LF	$29.76	$145,041
Pipe	Lateral 64	16	21	1,718	LF	$38.85	$66,766
Pipe	Lateral 64	18	21	8,425	LF	$49.15	$414,138
Pipe	Lateral 64	20	21	2,591	LF	$60.67	$157,212
Pipe	Lateral 64	26	21	1,682	LF	$102.55	$172,492
Pipe	Lateral 64	30	21	2,532	LF	$136.60	$345,931
Pipe	Lateral 64	12	26	63	LF	$20.12	$1,275
Pipe	Lateral 64	18	26	60	LF	$40.09	$2,388
Pipe	Lateral 64	24	26	1,385	LF	$71.31	$98,748
Pipe	Lateral 64	26	26	38	LF	$83.69	$3,149
Pipe	Lateral 64	28	26	2,603	LF	$97.07	$252,654
Pipe	Lateral 64	30	26	273	LF	$111.44	$30,437
Pipe	Lateral 64	32	26	2,297	LF	$126.79	$291,187

Pipe	Lateral 64	34	26	1,352	LF	$143.15	$193,567
Pipe	Lateral 64	36	26	2,964	LF	$160.50	$475,702
Pipe	Lateral 64	48	26	422	LF	$285.22	$120,319
Pipe	Lateral 64	54	26	8,820	LF	$361.01	$3,184,312
Pipe	Lateral 64	10	32.5	897	LF	$11.56	$10,370
Pipe	Lateral 64	12	32.5	2,693	LF	$16.21	$43,670
Pipe	Lateral 64	54	32.5	1,374	LF	$291.33	$400,430
Reuse Reservoir	Lateral 64			3	EA	$232,922	$698,765
Turnouts	Lateral 64		-	56	EA	$8,000	$448,000
Lateral 64 Subtotal							**$7,613,033**
Pipe	Main-0119	84	Steel	47	LF	$760.00	$35,577
Pipe	Main-0122	84	Steel	2,541	LF	$760.00	$1,931,103
Pipe	Main-0124	78	Steel	2,731	LF	$716.00	$1,955,310
Pipe	Main-0125	78	Steel	1,987	LF	$716.00	$1,422,574
Pipe	Main-0126	66	Steel	1,328	LF	$556.00	$738,545
Pipe	Main-0130	66	Steel	16	LF	$556.00	$8,964
Pipe	Main-0131	63	32.5	3,338	LF	$396.35	$1,323,059
Pipe	Main-0132	66	Steel	82	LF	$556.00	$45,411
Pipe	Main-0133	66	Steel	1,267	LF	$556.00	$704,217
Pipe	Main-0134	78	Steel	816	LF	$716.00	$584,029
Pipe	Main-0135	78	Steel	1,349	LF	$716.00	$966,085
Pipe	Main-0137	63	32.5	2,781	LF	$396.35	$1,102,299
Pipe	Main-0138	63	32.5	535	LF	$396.35	$211,984
Pipe	Main-0139	63	32.5	132	LF	$396.35	$52,171
Pipe	Main-0140	32	26	2,558	LF	$126.79	$324,346
Pipe	Main-0141	63	32.5	46	LF	$396.35	$18,231
Pipe	Main-0142	63	32.5	980	LF	$396.35	$388,337
Pipe	Main-0143	30	26	2,011	LF	$111.44	$224,101
Pipe	Main-0144	30	26	444	LF	$111.44	$49,448
Pipe	Main-0146	26	19	2,927	LF	$112.73	$329,917
Pipe	Main-0157	63	41	14	LF	$316.44	$4,506
Reuse Reservoir				1	EA	$232,922	$232,922
PRV Station	Main	78	-	1	EA	$840,000	$840,000
Turnouts	Main		-	20	EA	$8,000	$160,000
Main Subtotal							**$13,653,136**

SUBTOTAL		$26,494,666
ENGINEERING, CM, SURVEY	6%	$1,589,680
GMCC	12%	$3,179,360
CONTINGENCY	30%	$9,379,112
TOTAL		**$40,642,818**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

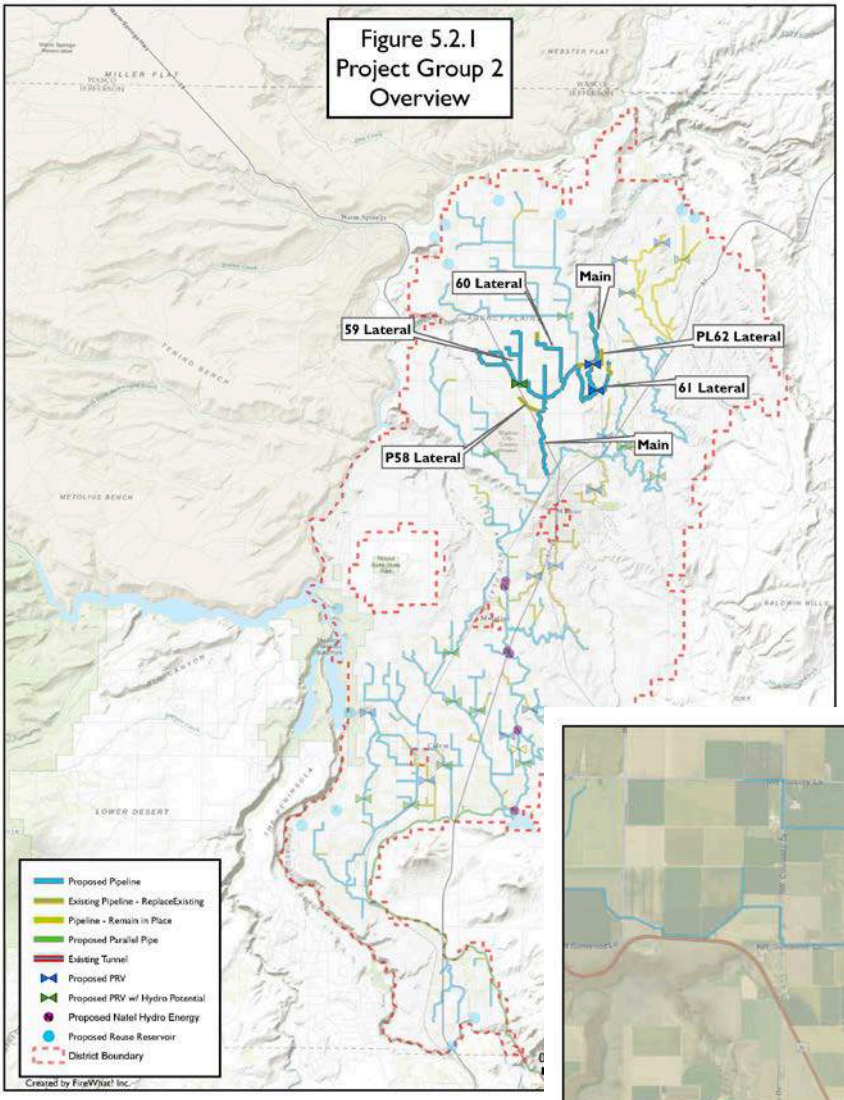


Figure 5.2.1

Project Group 2

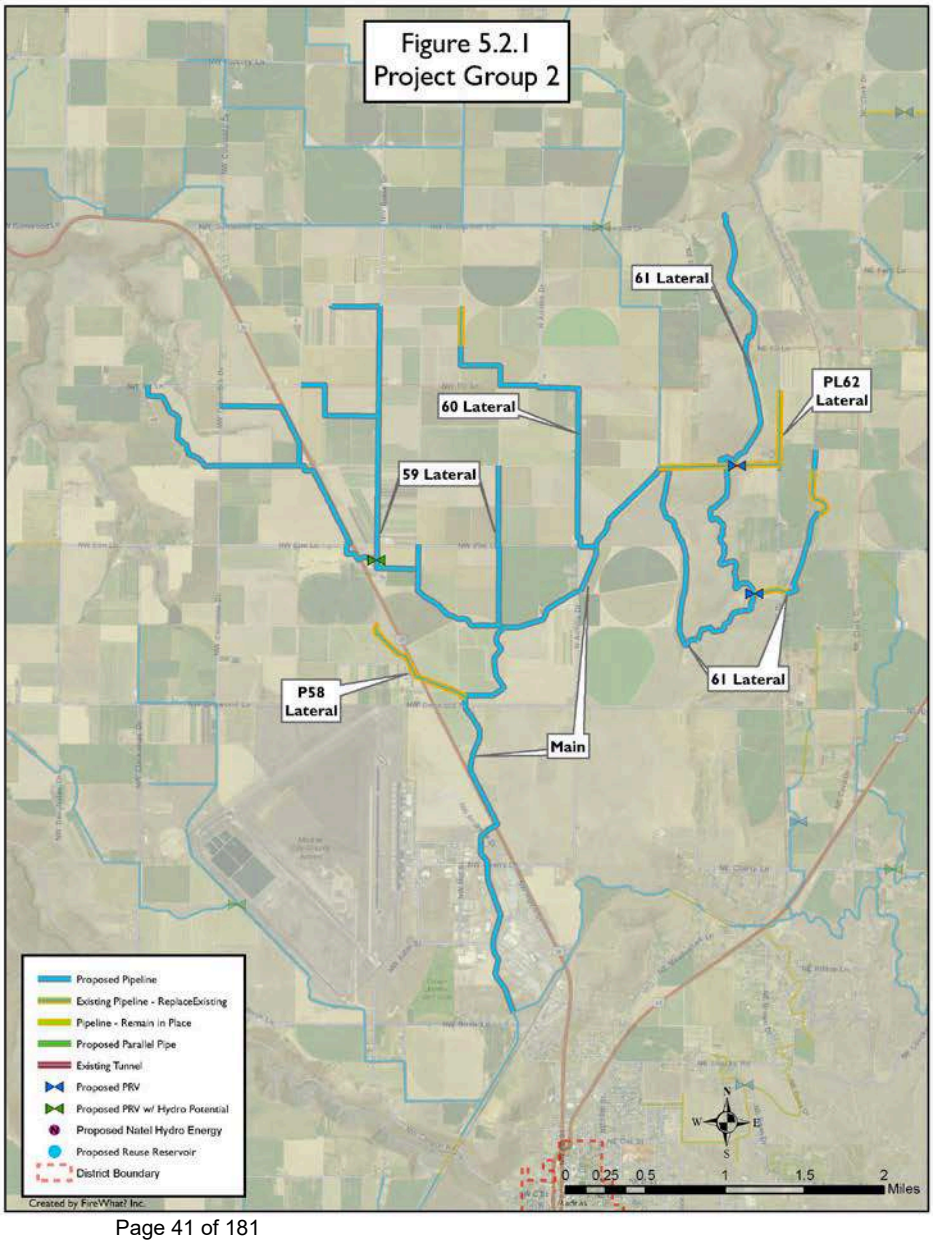


Table 5.2.1 Project Group 2 Cost Estimates

Project Group 2 - Laterals P58, 59, 60, 61, PL62 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation				**4,855,295**	**kWh**		
Estimated Water Conservation				**8.2**	**CFS**		
Feature	**Location**	**Dia (in)**	**Rating (DR or Steel)**	**Quantity (ft or #)**	**Unit**	**$/Unit**	**Total Cost**
Pipe	Lateral P58	12	21	25	LF	$24.65	$618
Pipe	Lateral P58	16	21	2,239	LF	$38.85	$86,973
Pipe	Lateral P58	18	21	1,544	LF	$49.15	$75,903
Pipe	Lateral P58	20	26	295	LF	$49.52	$14,607
Turnouts	Lateral P58			7	EA	$8,000	$56,000
Lateral P58 Subtotal							**$234,101**
Pipe	Lateral 59	10	21	2,143	LF	$17.55	$37,612
Pipe	Lateral 59	12	21	1,267	LF	$24.65	$31,228
Pipe	Lateral 59	16	21	2,724	LF	$38.85	$105,846
Pipe	Lateral 59	42	21	5,362	LF	$267.65	$1,435,126
Pipe	Lateral 59	10	26	3,747	LF	$14.30	$53,587
Pipe	Lateral 59	18	26	299	LF	$40.09	$11,985
Pipe	Lateral 59	42	26	283	LF	$218.33	$61,811
Pipe	Lateral 59	8	32.5	29	LF	$7.42	$216
Pipe	Lateral 59	10	32.5	6,301	LF	$11.56	$72,850
Pipe	Lateral 59	12	32.5	3,002	LF	$16.21	$48,674
Pipe	Lateral 59	14	32.5	1,298	LF	$19.58	$25,416
Pipe	Lateral 59	16	32.5	2,343	LF	$25.55	$59,864
Pipe	Lateral 59	18	32.5	163	LF	$32.38	$5,287
Pipe	Lateral 59	20	32.5	4,248	LF	$39.92	$169,558
Pipe	Lateral 59	24	32.5	3,190	LF	$57.49	$183,381
Pipe	Lateral 59	26	32.5	3,528	LF	$67.53	$238,220
Pipe	Lateral 59	28	32.5	358	LF	$78.36	$28,056
Pipe	Lateral 59	30	32.5	986	LF	$89.90	$88,672
Turnouts	Lateral 59			37	EA	$8,000	$296,000
PRV Station	Lateral 59	34	-	1	EA	$280,000	$280,000
Lateral 59 Subtotal							**$3,233,388**
Pipe	Lateral 60	10	19	1,336	LF	$19.27	$25,750
Pipe	Lateral 60	12	21	631	LF	$24.65	$15,564
Pipe	Lateral 60	16	21	3,201	LF	$38.85	$124,381
Pipe	Lateral 60	18	21	2,662	LF	$49.15	$130,859
Pipe	Lateral 60	20	21	2,642	LF	$60.67	$160,288
Pipe	Lateral 60	24	21	1,941	LF	$87.40	$169,621
Turnouts	Lateral 60		-	10	EA	$8,000	$80,000
Lateral 60 Subtotal							**$706,463**
Pipe	Lateral 61	20	13.5	3,019	LF	$45.73	$138,044

Pipe	Lateral 61	8	21	658	LF	$11.29	$7,434
Pipe	Lateral 61	10	21	3,525	LF	$17.55	$61,862
Pipe	Lateral 61	24	21	7,006	LF	$87.40	$612,314
Pipe	Lateral 61	10	26	3,132	LF	$14.30	$44,791
Pipe	Lateral 61	12	26	4,178	LF	$20.12	$84,047
Pipe	Lateral 61	10	32.5	2,914	LF	$11.56	$33,687
Pipe	Lateral 61	12	32.5	8,385	LF	$16.21	$135,969
Turnouts	Lateral 61		-	12	EA	$8,000	$96,000
PRV Station	Lateral 61	16	-	1	EA	$150,000	$150,000
Lateral 61 Subtotal							**$1,364,148**
Pipe	Lateral PL62	18	11	2,625	LF	$51.28	$134,611
Pipe	Lateral PL62	10	26	2,423	LF	$14.30	$34,654
Pipe	Lateral PL62	14	32.5	1,400	LF	$19.58	$27,423
Turnouts	Lateral PL62			6	EA	$8,000	$48,000
PRV Station	Lateral PL62	14	-	1	EA	$150,000	$150,000
Lateral PL62 Subtotal							**$394,688**
Pipe	Main-0102	102	Steel	5,224	LF	$1,070.00	$5,590,200
Pipe	Main-0105	102	Steel	5,950	LF	$1,070.00	$6,366,386
Pipe	Main-0106	96	Steel	1,345	LF	$952.00	$1,280,006
Pipe	Main-0108	102	Steel	306	LF	$1,070.00	$327,647
Pipe	Main-0109	96	Steel	2,288	LF	$952.00	$2,178,584
Pipe	Main-0110	84	Steel	1,566	LF	$760.00	$1,190,539
Pipe	Main-0111	90	Steel	2,554	LF	$816.00	$2,084,416
Pipe	Main-0112	90	Steel	420	LF	$816.00	$342,890
Pipe	Main-0113	90	Steel	1,241	LF	$816.00	$1,012,509
Pipe	Main-0114	90	Steel	331	LF	$816.00	$269,885
Pipe	Main-0116	90	Steel	26	LF	$816.00	$21,495
Pipe	Main-0117	84	Steel	1,816	LF	$760.00	$1,380,300
Pipe	Main-0118	84	Steel	29	LF	$760.00	$22,374
Pipe	Main-0120	84	Steel	30	LF	$760.00	$22,505
Turnouts	Main		-	14	EA	$8,000	$112,000
Main Subtotal							**$22,201,735**

SUBTOTAL		$28,134,523
ENGINEERING, CM, SURVEY	6%	$1,688,071
GMCC	12%	$3,376,143
CONTINGENCY	30%	$9,959,621
TOTAL		**$43,158,359**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

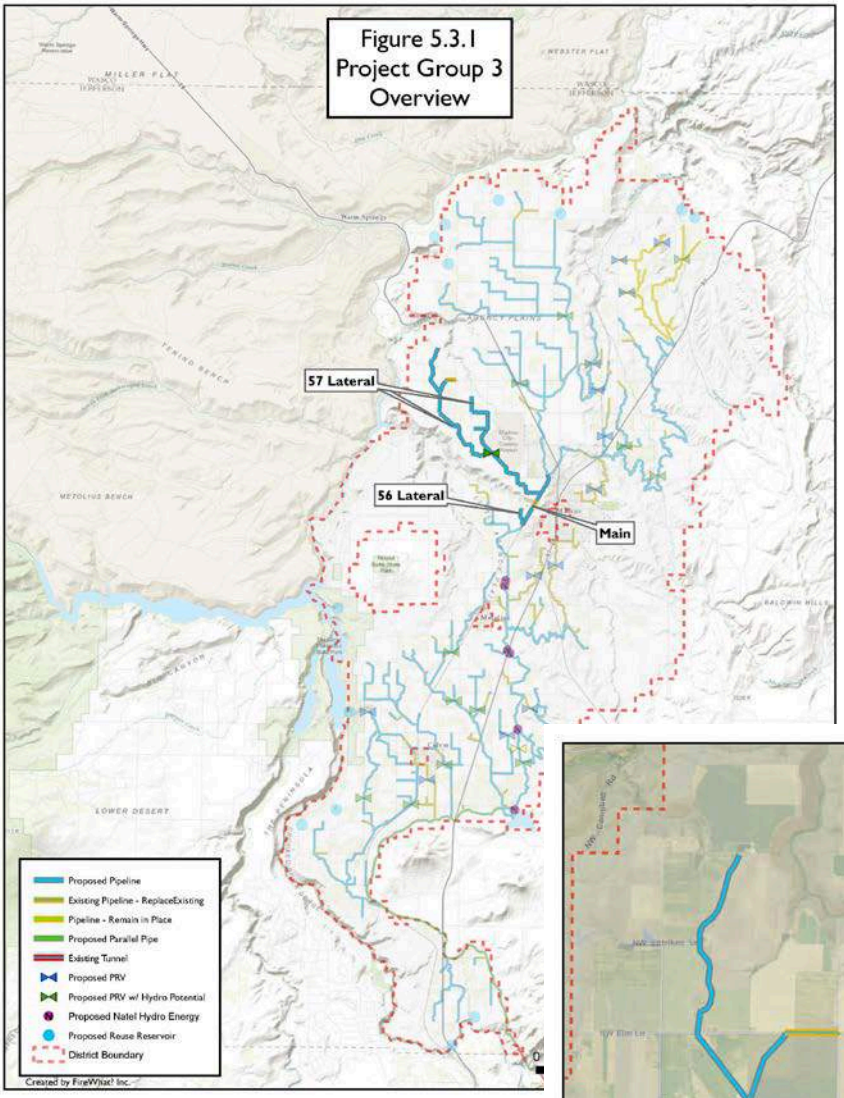


Figure 5.3.1
Project Group 3

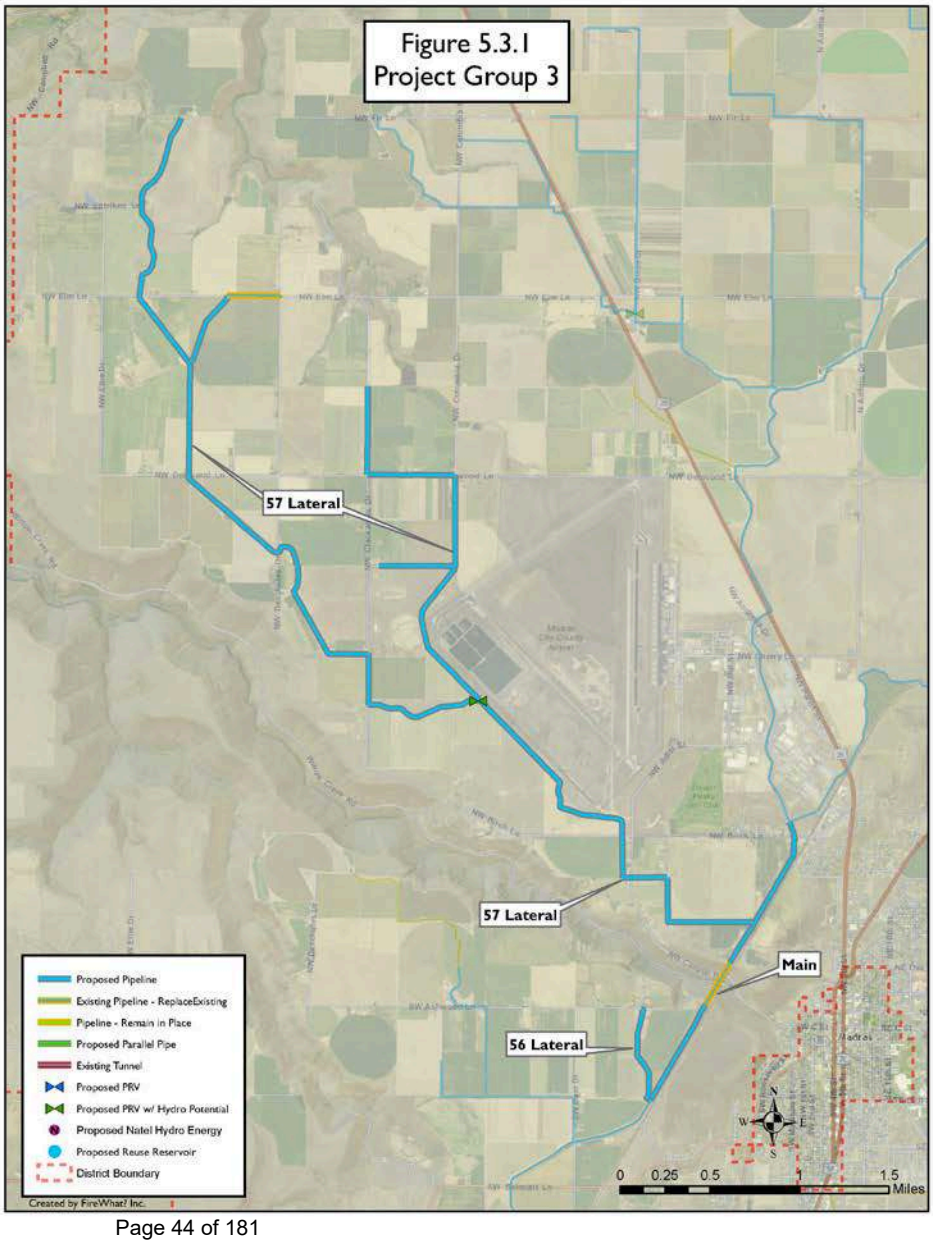


Table 5.3.1 Project Group 3 Cost Estimates

Project Group 3 - Lateral 56, 57 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation					**2,672,708**	**kWh**	
Estimated Water Conservation					**5.8**	**CFS**	
Feature	**Location**	**Dia (in)**	**Rating (DR or Steel)**	**Quantity (ft or #)**	**Unit**	**$/Unit**	**Total Cost**
Pipe	Lateral 56	18	26	119	LF	$40.09	$4,782
Pipe	Lateral 56	12	26	2,795	LF	$20.12	$56,230
Turnouts	Lateral 56		-	6	EA	$8,000	$48,000
Lateral 56 Subtotal							**$109,012**
Pipe	Lateral 57	42	21	9,583	LF	$267.65	$2,565,029
Pipe	Lateral 57	48	21	3,200	LF	$349.62	$1,118,708
Pipe	Lateral 57	8	26	2,692	LF	$9.21	$24,792
Pipe	Lateral 57	10	26	3,807	LF	$14.30	$54,434
Pipe	Lateral 57	12	26	3,996	LF	$20.12	$80,380
Pipe	Lateral 57	14	26	2,563	LF	$24.24	$62,110
Pipe	Lateral 57	16	26	1,320	LF	$31.68	$41,808
Pipe	Lateral 57	20	26	1,440	LF	$49.52	$71,329
Pipe	Lateral 57	24	26	1,696	LF	$71.31	$120,903
Pipe	Lateral 57	26	26	695	LF	$83.69	$58,194
Pipe	Lateral 57	28	26	1,010	LF	$97.07	$98,083
Pipe	Lateral 57	30	26	1,680	LF	$111.44	$187,215
Pipe	Lateral 57	32	26	3,320	LF	$126.79	$420,904
Pipe	Lateral 57	34	26	4,001	LF	$143.15	$572,782
Pipe	Lateral 57	42	26	96	LF	$218.33	$21,050
Pipe	Lateral 57	10	32.5	2,240	LF	$11.56	$25,897
Pipe	Lateral 57	18	32.5	921	LF	$32.38	$29,819
Pipe	Lateral 57	20	32.5	1,775	LF	$39.92	$70,864
Pipe	Lateral 57	24	32.5	4,932	LF	$57.49	$283,525
Pipe	Lateral 57	34	32.5	2,731	LF	$51.28	$140,046
Pipe	Lateral 57	36	41	3,425	LF	$103.32	$353,833
PRV Station	Lateral 57	40	-	1	EA	$400,000	$400,000
Turnouts	Lateral 57			55	EA	$8,000	$440,000
Lateral 57 Subtotal							**$7,241,707**
Pipe	Main-0096	144	Steel	3,272	LF	$1,978.00	$6,472,292
Pipe	Main-0097	144	Steel	1,371	LF	$1,978.00	$2,711,454
Pipe	Main-0098	144	Steel	46	LF	$1,978.00	$91,299
Pipe	Main-0099	144	Steel	702	LF	$1,978.00	$1,387,865
Pipe	Main-0100	144	Steel	1,109	LF	$1,978.00	$2,193,882
Pipe	Main-0101	144	Steel	1,473	LF	$1,978.00	$2,913,866
Pipe	Main-0155	144	Steel	1,419	LF	$1,978.00	$2,807,556
Turnouts	Main		-	3	EA	$8,000	$24,000

Main Subtotal		**$18,602,214**
SUBTOTAL		$25,952,933
ENGINEERING, CM, SURVEY	6%	$1,557,176
GMCC	12%	$3,114,352
CONTINGENCY	30%	$9,187,338
TOTAL		**$39,811,799**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

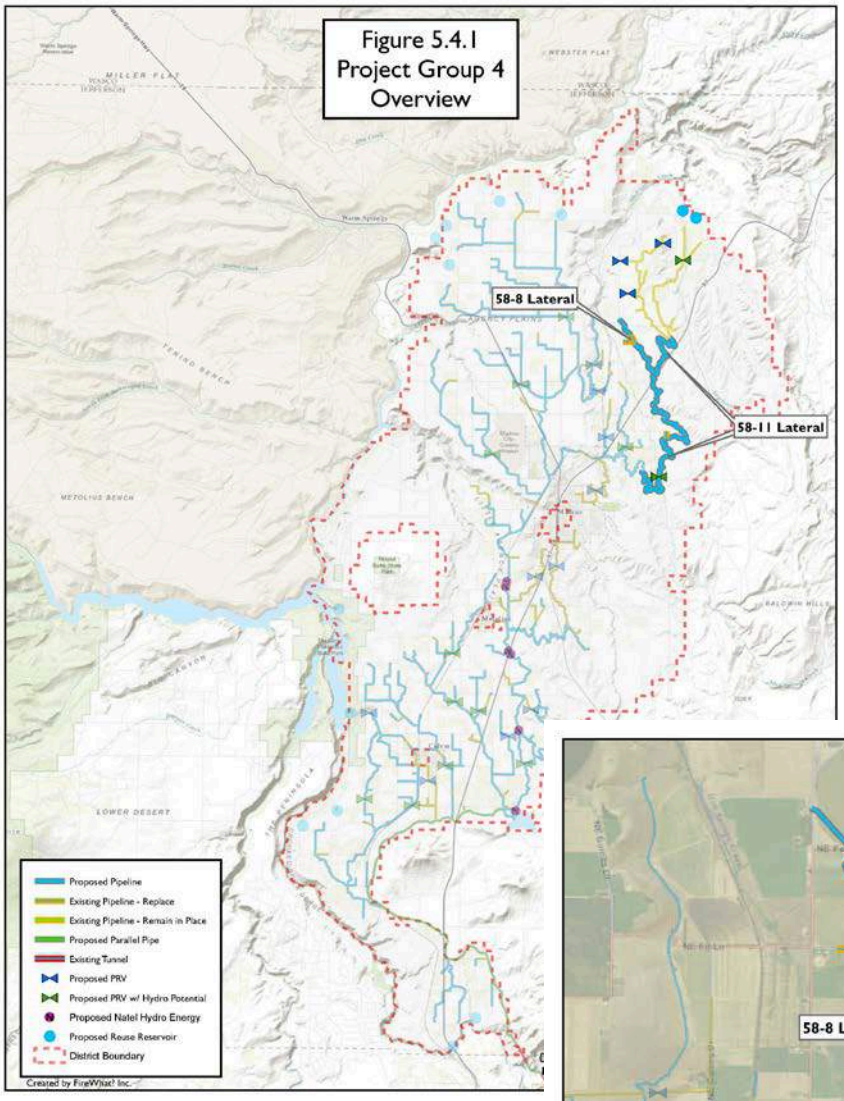


Figure 5.4.1
Project Group 4

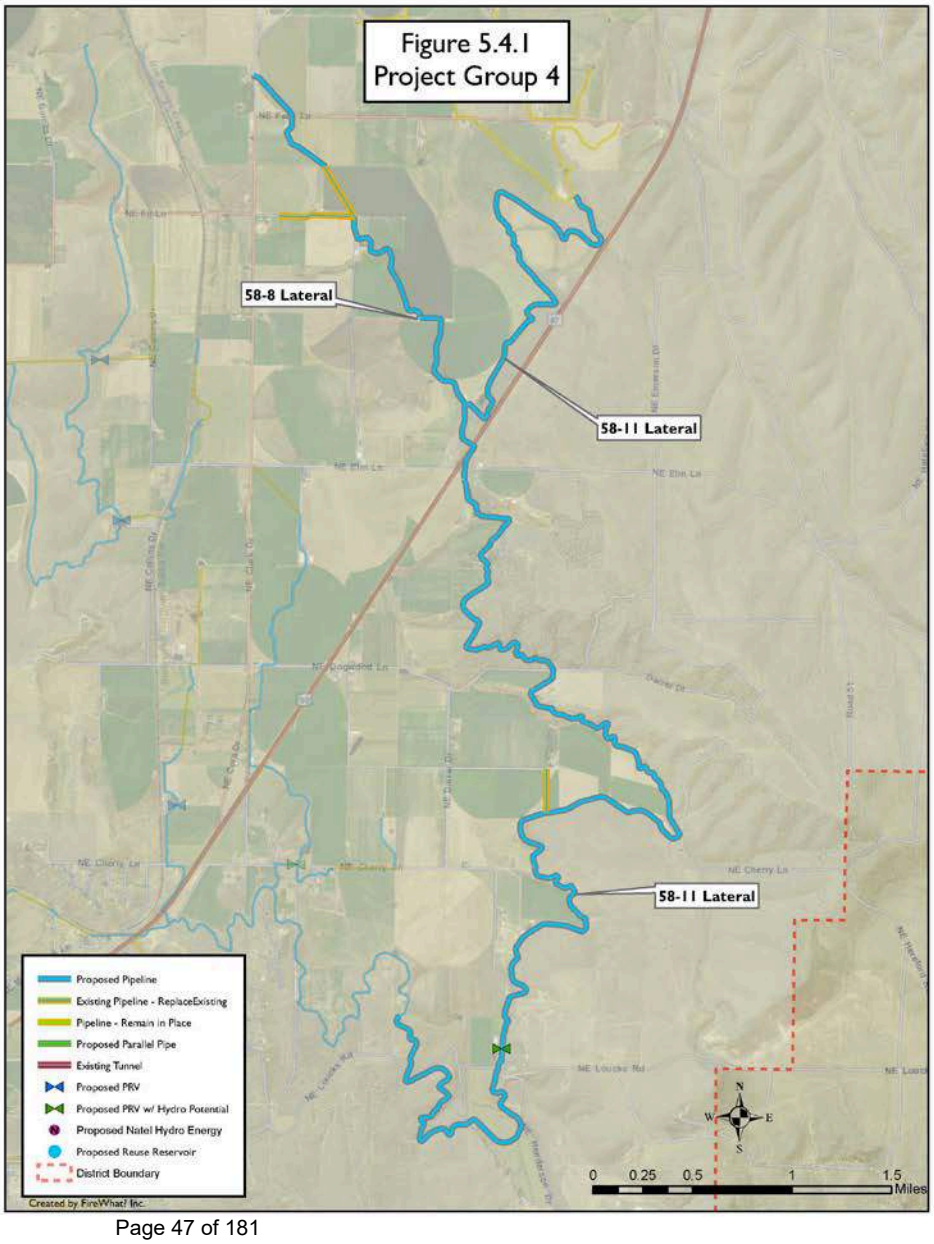


Table 5.4.1 Project Group 4 Cost Estimates

Project Group 4 - Lateral 58 - Phase 1

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation	**1,079,687**	**kWh**
Estimated Water Conservation	**6.7**	**CFS**

Feature	Location	Dia (in)	Rating (DR or Steel)	Quantity (ft or #)	Unit	$/Unit	Total Cost
Pipe	Lateral 58-PH1	10	15.5	2,777	LF	$11.64	$32,329
Pipe	Lateral 58-PH1	4	19	842	LF	$3.37	$2,838
Pipe	Lateral 58-PH1	12	19	85	LF	$27.10	$2,313
Pipe	Lateral 58-PH1	14	19	2,373	LF	$32.70	$77,580
Pipe	Lateral 58-PH1	6	21	1,199	LF	$6.64	$7,963
Pipe	Lateral 58-PH1	16	21	2,475	LF	$38.85	$96,171
Pipe	Lateral 58-PH1	63	21	12,187	LF	$602.20	$7,338,902
Pipe	Lateral 58-PH1	18	26	278	LF	$40.09	$11,131
Pipe	Lateral 58-PH1	20	26	3,675	LF	$51.28	$188,453
Pipe	Lateral 58-PH1	24	26	508	LF	$71.31	$36,259
Pipe	Lateral 58-PH1	12	32.5	1,169	LF	$16.21	$18,963
Pipe	Lateral 58-PH1	24	32.5	1,796	LF	$57.49	$103,280
Pipe	Lateral 58-PH1	26	32.5	1,014	LF	$67.53	$68,456
Pipe	Lateral 58-PH1	54	41	13,429	LF	$232.48	$3,122,141
Pipe	Lateral 58-PH1	63	41	33,972	LF	$316.44	$10,750,082
Reuse Reservoir				2	EA	$232,922	$465,844
PRV Station	Lateral PL58-12	10	-	1	EA	$150,000	$150,000
PRV Station	Lateral 58-11	10	-	1	EA	$150,000	$150,000
PRV Station	Lateral 58-11	14	-	1	EA	$150,000	$150,000
PRV Station	Lateral PL58-9	18	-	1	EA	$200,000	$200,000
PRV Station	Lateral 58-PH1	60	-	1	EA	$560,000	$560,000
Turnouts	Lateral 58-PH1	-	-	23	EA	$8,000	$184,000

SUBTOTAL		$23,716,704
ENGINEERING, CM, SURVEY	6%	$1,423,002
GMCC	12%	$2,846,005
CONTINGENCY	30%	$8,395,713
TOTAL		**$36,381,425**

Notes:
1. Steel rated to 100 PSI
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded
3. Project group 4 consists of Lateral 58-8 and a split of 58-11 due to project costs
4. Reuse Reservoir are on the ends of 58-9 and 58-11 laterals, but have be included as part of this cost estimate

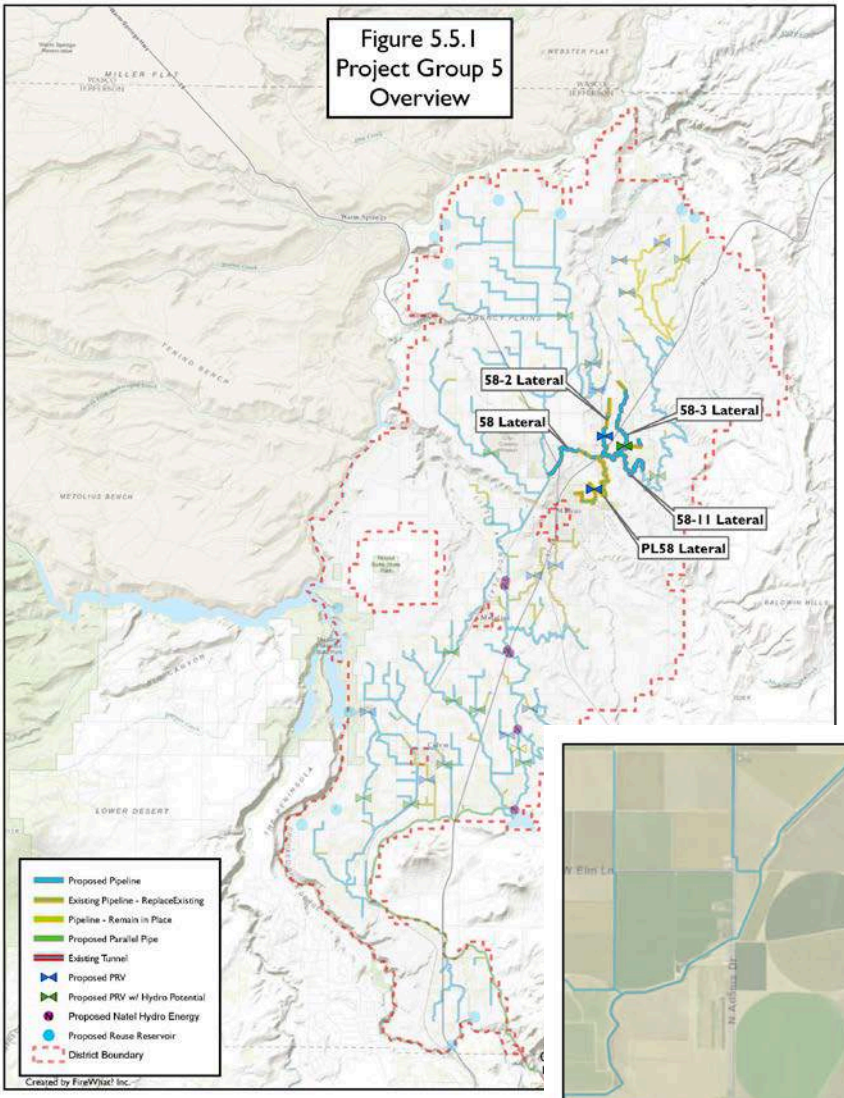


Figure 5.5.1
Project Group 5

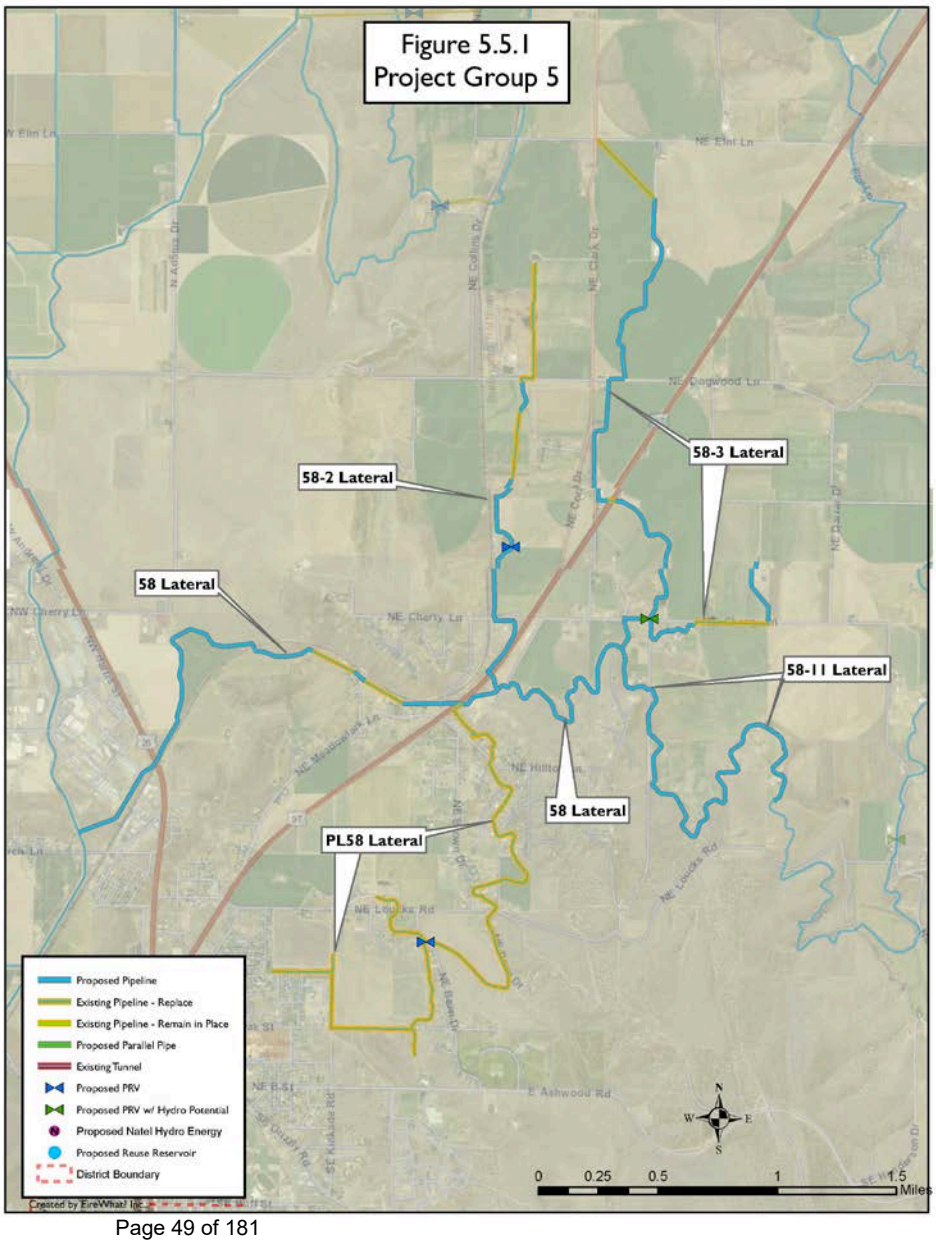


Table 5.5.1 Project Group 5 Cost Estimates

Project Group 5 - Lateral 58 - Phase 2

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation	**2,581,860**	**kWh**
Estimated Water Conservation	**7.0**	**CFS**

Feature	Location	Dia (in)	Rating (DR or Steel)	Quantity (ft or #)	Unit	$/Unit	Total Cost
Pipe	Lateral 58-PH2	16	19	2,283	LF	$42.68	97,425
Pipe	Lateral 58-PH2	28	19	573	LF	$130.74	74,927
Pipe	Lateral 58-PH2	4	21	1,773	LF	$3.08	5,457
Pipe	Lateral 58-PH2	10	21	3,462	LF	$51.28	177,543
Pipe	Lateral 58-PH2	12	21	2,105	LF	$24.65	51,891
Pipe	Lateral 58-PH2	14	21	503	LF	$29.76	14,979
Pipe	Lateral 58-PH2	16	21	5,002	LF	$38.85	194,334
Pipe	Lateral 58-PH2	18	21	12,039	LF	$49.15	591,763
Pipe	Lateral 58-PH2	28	21	731	LF	$118.93	86,941
Pipe	Lateral 58-PH3	63	21	11,717	LF	$602.20	7,055,853
Pipe	Lateral 58-PH2	4	26	3,011	LF	$2.50	7,518
Pipe	Lateral 58-PH2	12	26	2,217	LF	$20.12	44,595
Pipe	Lateral 58-PH2	20	26	2,630	LF	$49.52	130,252
Pipe	Lateral 58-PH2	6	32.5	1,240	LF	$4.39	5,441
Pipe	Lateral 58-PH2	8	32.5	1,669	LF	$7.42	12,377
Pipe	Lateral 58-PH2	12	32.5	2,054	LF	$16.21	33,301
Pipe	Lateral 58-PH2	14	32.5	3,137	LF	$19.58	61,426
Pipe	Lateral 58-PH2	16	32.5	1,497	LF	$25.55	38,237
Pipe	Lateral 58-PH2	20	32.5	249	LF	$39.92	9,951
Pipe	Lateral 58-PH2	24	32.5	3,970	LF	$57.49	228,249
Pipe	Lateral 58-PH2	66	Steel	5,385	LF	$556.00	2,994,113
Pipe	Lateral 58-PH2	72	Steel	13,369	LF	$586.00	7,834,517
PRV Station	Lateral 58-PH2	12	-	1	EA	$150,000	150,000
PRV Station	Lateral 58-PH2	14	-	1	EA	$150,000	150,000
PRV Station	Lateral 58-PH2	26	-	1	EA	$280,000	280,000
Turnouts	Lateral 58-PH2	-	-	55	EA	$8,000	440,000
	SUBTOTAL						$20,771,090
	ENGINEERING, CM, SURVEY				6%		$1,246,265
	GMCC				12%		$2,492,531
	CONTINGENCY				30%		$7,352,966
	TOTAL						**$31,862,852**

Notes:
1. Steel rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to

operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded
3. Project group 4 consists of Lateral 58-8 and a split of 58-11 due to project costs

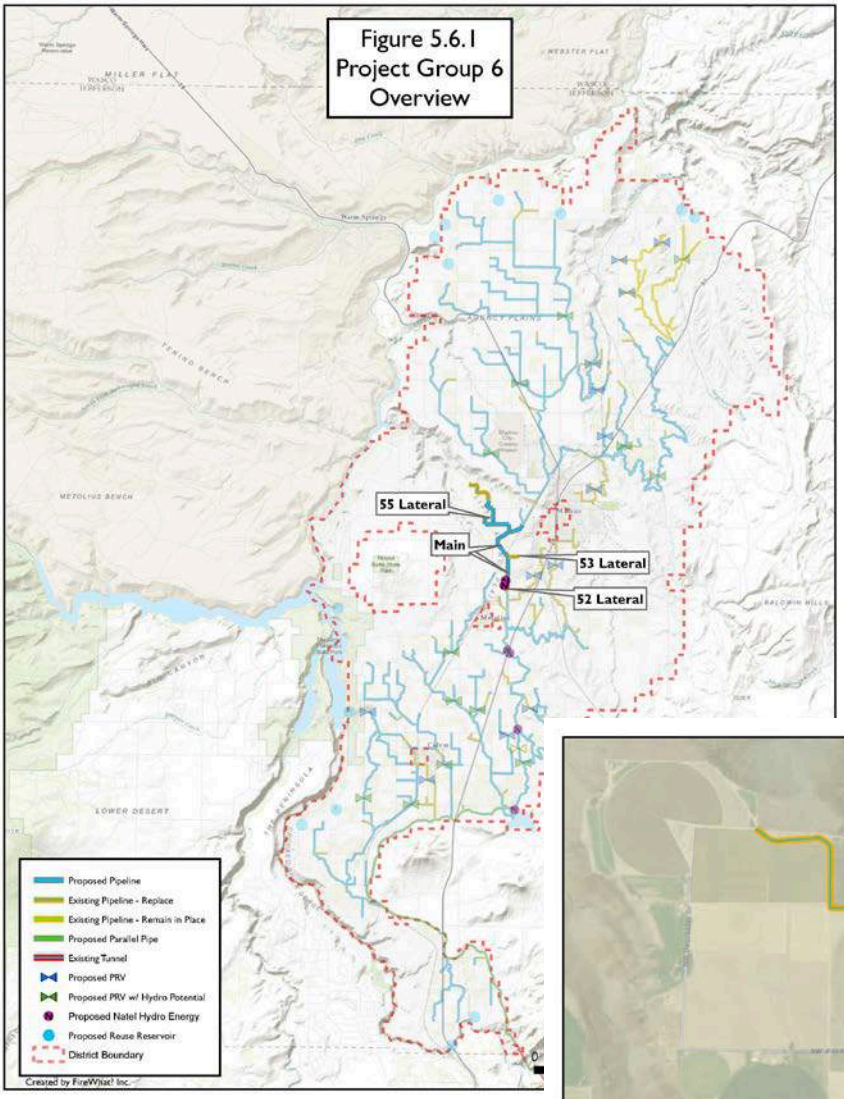


Figure 5.6.1
Project Group 6

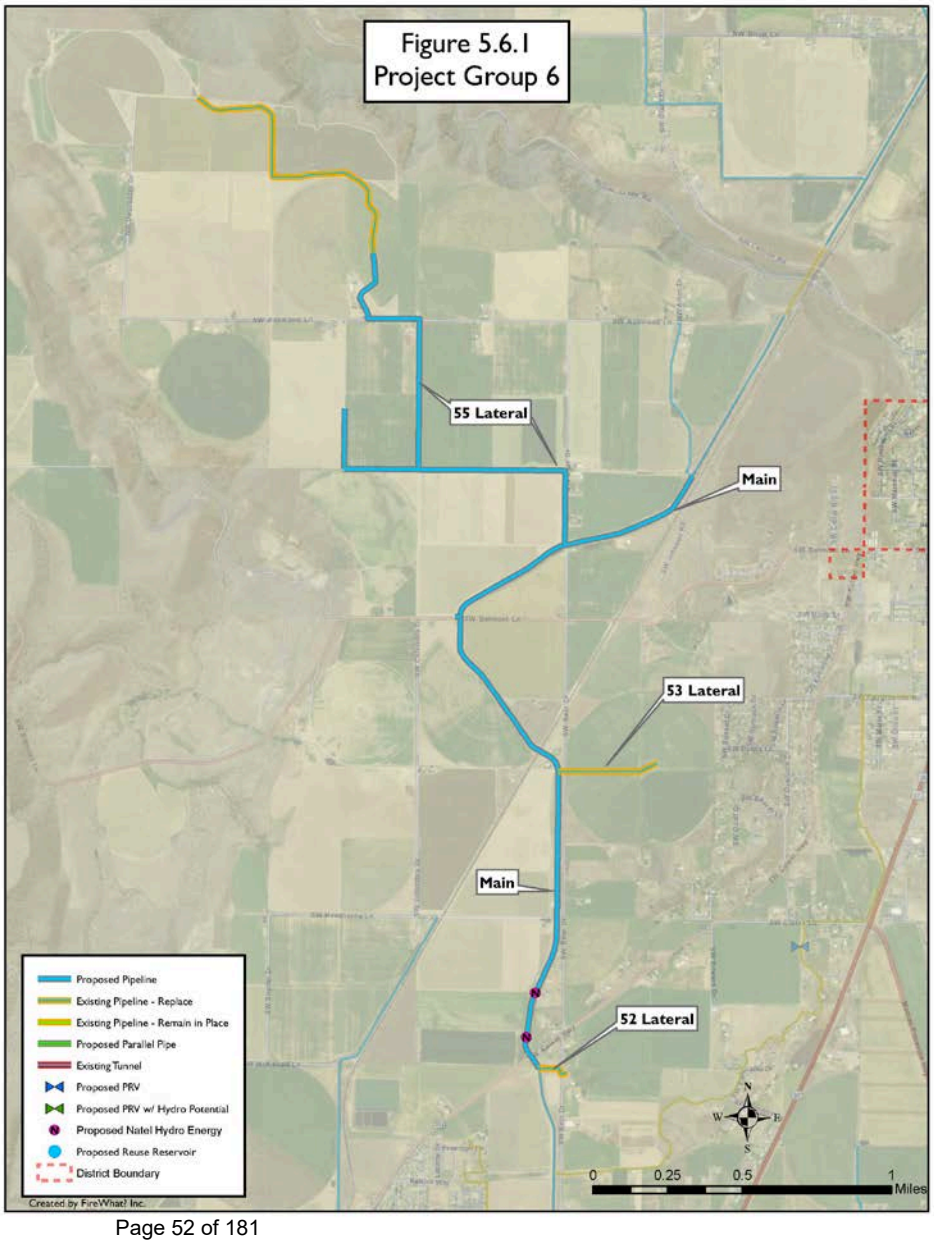


Table 5.6.1 Project Group 6 Cost Estimates

Project Group 6 - Lateral 52, 53, 55 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation					**1,738,854**	**kWh**	
Estimated Water Conservation					**3.9**	**CFS**	
Feature	**Location**	**Dia (in)**	**Rating (DR or Steel)**	**Quantity (ft or #)**	**Unit**	**$/Unit**	**Total Cost**
Pipe	Lateral 52	6	32.5	10	LF	$4.39	45
Pipe	Lateral 52	8	32.5	580	LF	$7.42	4,302
Turnouts	Lateral 52	-	-	2	EA	$8,000	16,000
Lateral 52 Subtotal							**$20,347**
Pipe	Lateral 53	4	26	16	LF	$2.50	41
Pipe	Lateral 53	12	26	1,768	LF	$20.12	35,569
Turnouts	Lateral 53	-	-	2	EA	$8,000	16,000
Lateral 53 Subtotal							**$51,610**
Pipe	Lateral 55	8	21	3,222	LF	$11.29	36,395
Pipe	Lateral 55	12	21	802	LF	$24.65	19,759
Pipe	Lateral 55	12	26	3,828	LF	$20.12	77,009
Pipe	Lateral 55	16	26	910	LF	$31.68	28,836
Pipe	Lateral 55	18	26	2,664	LF	$40.09	106,812
Pipe	Lateral 55	20	26	1,321	LF	$51.28	67,760
Pipe	Lateral 55	28	26	2,598	LF	$97.07	252,148
Pipe	Lateral 55	30	26	1,320	LF	$111.44	147,151
Turnouts	Lateral 55	-	-	11	EA	$8,000	88,000
Lateral 55 Subtotal							**$823,870**
Pipe	Main-0069	144	Steel	161	LF	$1,978.00	319,191
Pipe	Main-0072	144	Steel	835	LF	$1,978.00	1,650,979
Pipe	Main-0073	144	Steel	167	LF	$1,978.00	330,270
Pipe	Main-0074	144	Steel	883	LF	$1,978.00	1,745,629
Pipe	Main-0074	144	Steel	883	LF	$1,978.00	1,745,629
Pipe	Main-0076	144	Steel	469	LF	$1,978.00	927,295
Pipe	Main-0077	144	Steel	464	LF	$1,978.00	916,868
Pipe	Main-0078	144	Steel	108	LF	$1,978.00	213,821
Pipe	Main-0079	144	Steel	31	LF	$1,978.00	61,034
Pipe	Main-0081	144	Steel	1,068	LF	$1,978.00	2,112,209
Pipe	Main-0084	144	Steel	22	LF	$1,978.00	43,946
Pipe	Main-0085	144	Steel	1,461	LF	$1,978.00	2,889,930
Pipe	Main-0086	144	Steel	585	LF	$1,978.00	1,157,447
Pipe	Main-0086	144	Steel	585	LF	$1,978.00	1,157,447
Pipe	Main-0087	144	Steel	644	LF	$1,978.00	1,274,224
Pipe	Main-0088	144	Steel	2,263	LF	$1,978.00	4,476,616
Pipe	Main-0089	144	Steel	67	LF	$1,978.00	131,815
Pipe	Main-0090	144	Steel	1,231	LF	$1,978.00	2,435,332

Pipe	Main-0091	144	Steel	419	LF	$1,978.00	828,666
Pipe	Main-0092	144	Steel	297	LF	$1,978.00	587,090
Pipe	Main-0093	144	Steel	1,832	LF	$1,978.00	3,623,222
Pipe	Main-0094	144	Steel	563	LF	$1,978.00	1,113,476
Turnouts	Main	-	-	7	EA	$8,000	56,000
Main Subtotal							**$29,798,136**

SUBTOTAL		$30,693,962
ENGINEERING, CM, SURVEY	6%	$1,841,638
GMCC	12%	$3,683,275
CONTINGENCY	30%	$10,865,663
TOTAL		**$47,084,538**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

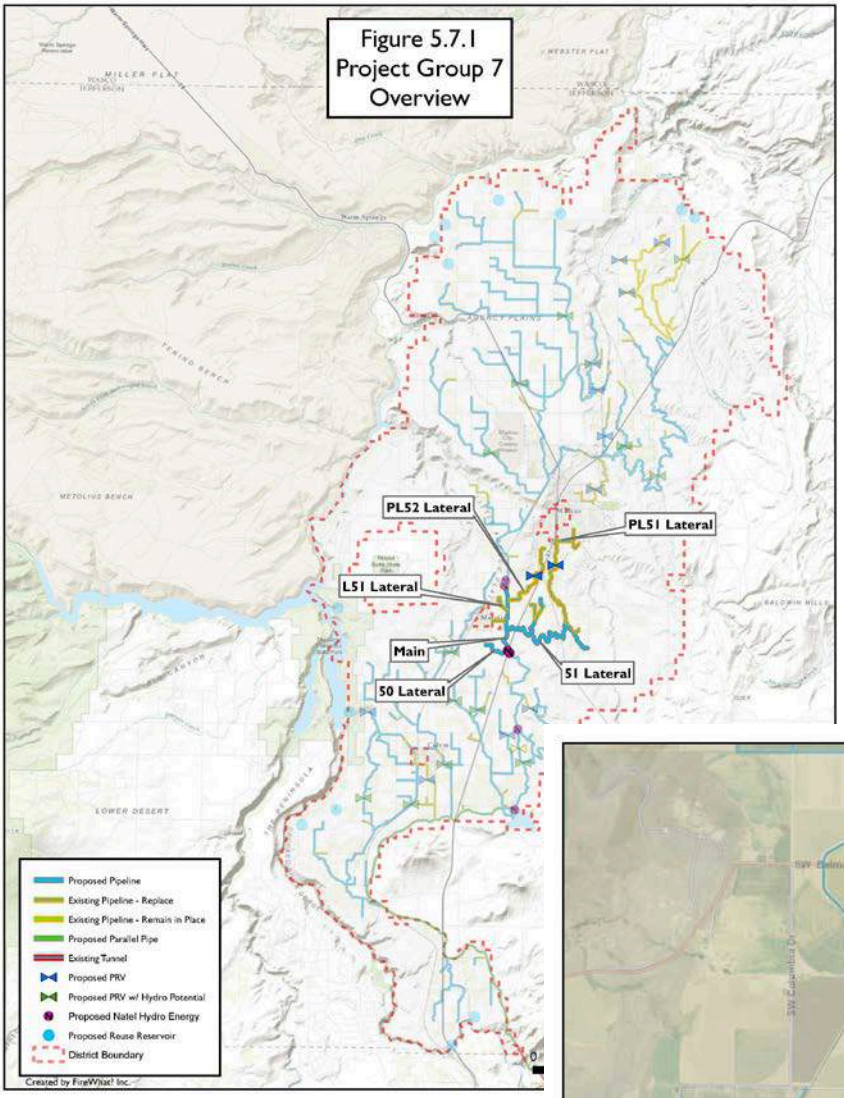


Figure 5.7.1
Project Group 7

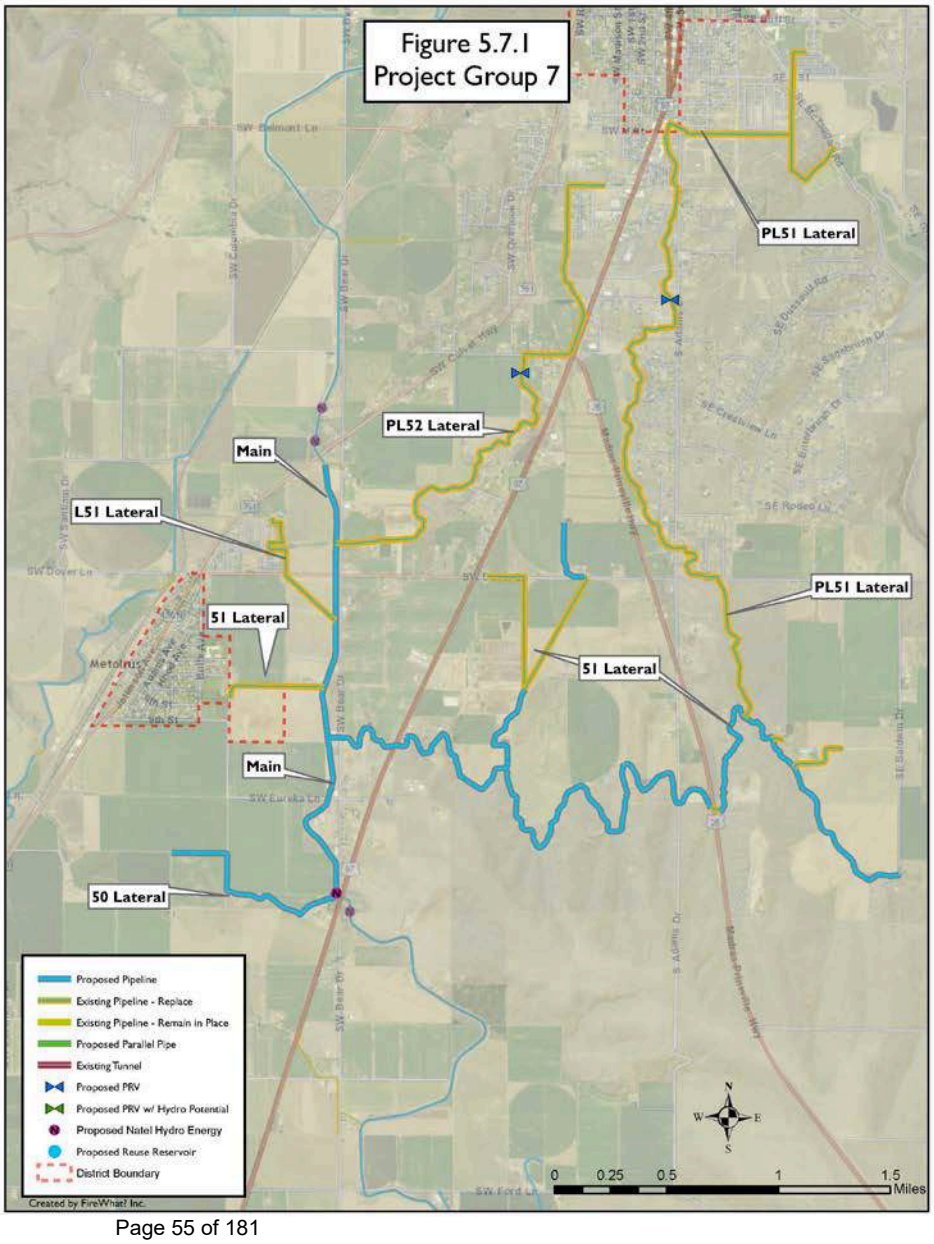


Table 5.7.1 Project Group 7 Cost Estimates

Project Group 7 - Lateral PL52, L51, PL51, 50, 51 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation						**1,492,220**	**kWh**
Estimated Water Conservation						**4.5**	**CFS**
Feature	**Location**	**Dia (in)**	**Rating (DR or Steel)**	**Quantity (ft or #)**	**Unit**	**$/Unit**	**Total Cost**
Pipe	Lateral 50	14	32.5	509	LF	$19.58	9,969
Pipe	Lateral 50	16	32.5	4,469	LF	$25.55	114,156
Pipe	Lateral 50	18	32.5	102	LF	$32.38	3,308
Turnouts	Lateral 50	-	-	4	EA	$8,000	32,000
Lateral 50 Subtotal							**$159,434**
Pipe	Lateral L51	6	32.5	3,856	LF	$4.39	16,916
Turnouts	Lateral L51	-	-	3	EA	$8,000	24,000
Lateral L51 Subtotal							**$40,916**
Pipe	Lateral PL51	10	19	1,374	LF	$19.27	26,477
Pipe	Lateral PL51	6	21	2,262	LF	$6.64	15,025
Pipe	Lateral PL51	10	21	325	LF	$17.55	5,701
Pipe	Lateral PL51	12	21	5,160	LF	$24.65	127,192
Pipe	Lateral PL51	8	26	1,412	LF	$9.21	13,005
Pipe	Lateral PL51	12	26	2,696	LF	$20.12	54,232
Pipe	Lateral PL51	16	26	1,302	LF	$31.68	41,255
Pipe	Lateral PL51	8	32.5	1,162	LF	$7.42	8,621
Pipe	Lateral PL51	10	32.5	7,425	LF	$11.56	85,841
Pipe	Lateral PL51	12	32.5	1,485	LF	$16.21	24,076
Pipe	Lateral PL51	16	32.5	2,346	LF	$25.55	59,923
PRV Station	Lateral PL52	10	-	1	EA	$150,000	150,000
Turnouts	Lateral PL51	-	-	27	EA	$8,000	216,000
Lateral PL51 Subtotal							**$827,348**
Pipe	Lateral 51	4	26	3,532	LF	$2.50	8,819
Pipe	Lateral 51	10	26	1,640	LF	$14.30	23,451
Pipe	Lateral 51	4	32.5	366	LF	$2.01	737
Pipe	Lateral 51	10	32.5	511	LF	$11.56	5,905
Pipe	Lateral 51	12	32.5	5,508	LF	$16.21	89,305
Pipe	Lateral 51	16	32.5	920	LF	$25.55	23,503
Pipe	Lateral 51	20	32.5	619	LF	$39.92	24,706
Pipe	Lateral 51	28	32.5	1,800	LF	$78.36	141,052
Pipe	Lateral 51	30	32.5	2,344	LF	$89.90	210,713
Pipe	Lateral 51	32	32.5	1,917	LF	$102.33	196,216
Pipe	Lateral 51	36	41	6,943	LF	$103.32	717,389
Pipe	Lateral 51	42	41	12,554	LF	$140.65	1,765,686

Pipe	Lateral 51	48	41	1,424	LF	$183.69	261,637
Turnouts	Lateral 51	-	-	25	EA	$8,000	200,000
Lateral 51 Subtotal							**$3,669,118**
Pipe	Lateral PL52	10	21	3,420	LF	$17.55	60,022
Pipe	Lateral PL52	4	26	722	LF	$2.50	1,802
Pipe	Lateral PL52	12	26	115	LF	$20.12	2,319
Pipe	Lateral PL52	14	26	2,731	LF	$24.24	66,187
Pipe	Lateral PL52	16	26	2,133	LF	$31.68	67,557
Pipe	Lateral PL52	4	32.5	2,291	LF	$2.01	4,609
Pipe	Lateral PL52	6	32.5	2,346	LF	$4.39	10,293
Pipe	Lateral PL52	8	32.5	813	LF	$7.42	6,030
Pipe	Lateral PL52	10	32.5	423	LF	$11.56	4,885
PRV Station	Lateral PL52	10	-	1	EA	$150,000	150,000
Turnouts	Lateral PL52			32	EA	$8,000	256,000
Lateral PL52 Subtotal							**$629,703**
Pipe	Main-0057	144	Steel	2,727	LF	$1,978.00	5,394,760
Pipe	Main-0058	144	Steel	1,383	LF	$1,978.00	2,735,754
Pipe	Main-0060	144	Steel	51	LF	$1,978.00	101,629
Pipe	Main-0063	144	Steel	1,221	LF	$1,978.00	2,415,378
Pipe	Main-0064	144	Steel	60	LF	$1,978.00	119,475
Pipe	Main-0065	144	Steel	27	LF	$1,978.00	52,976
Pipe	Main-0066	144	Steel	30	LF	$1,978.00	59,180
Pipe	Main-0067	144	Steel	1,606	LF	$1,978.00	3,176,564
Pipe	Main-0068	144	Steel	1,814	LF	$1,978.00	3,587,572
Pipe	Main-0070	144	Steel	1,887	LF	$1,978.00	3,733,388
Turnouts	Main	-	-	5	EA	$8,000	40,000
Main Subtotal							**$21,416,677**

SUBTOTAL		$26,743,194
ENGINEERING, CM, SURVEY	6%	$1,604,592
GMCC	12%	$3,209,183
CONTINGENCY	30%	$9,467,091
TOTAL		**$41,024,060**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

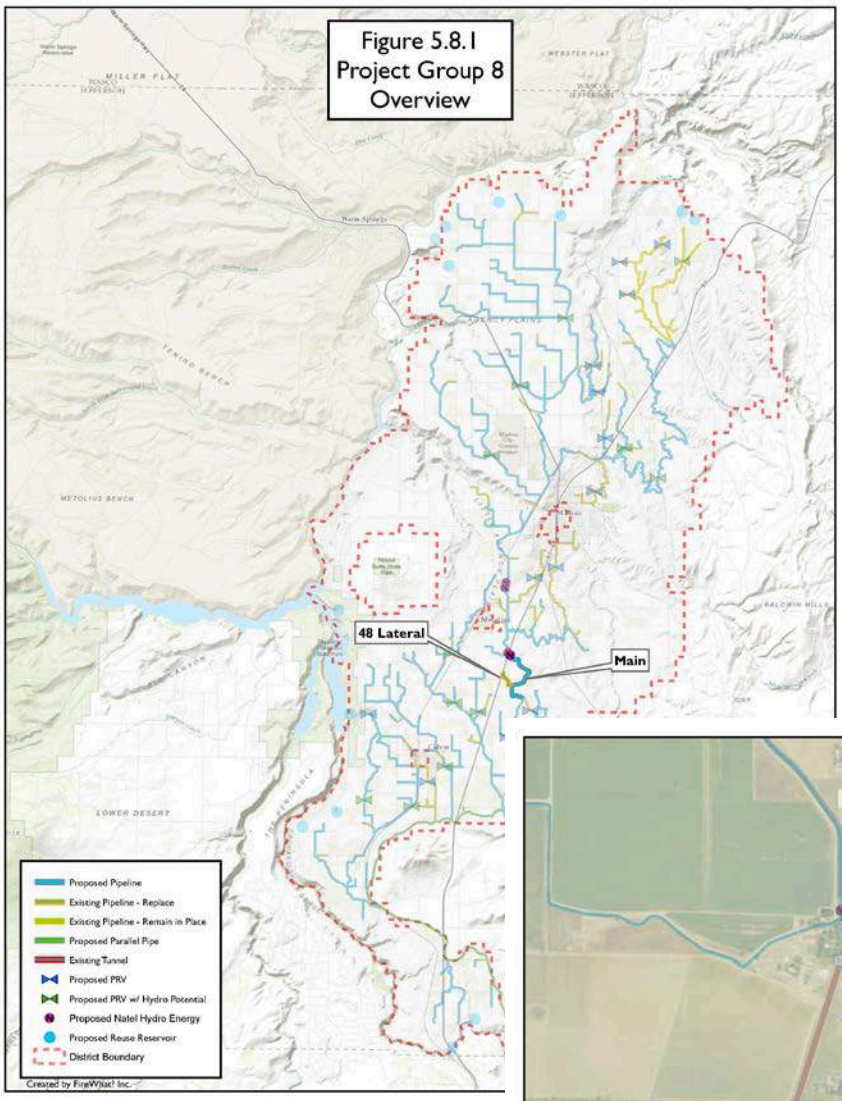


Figure 5.8.1
Project Group 8

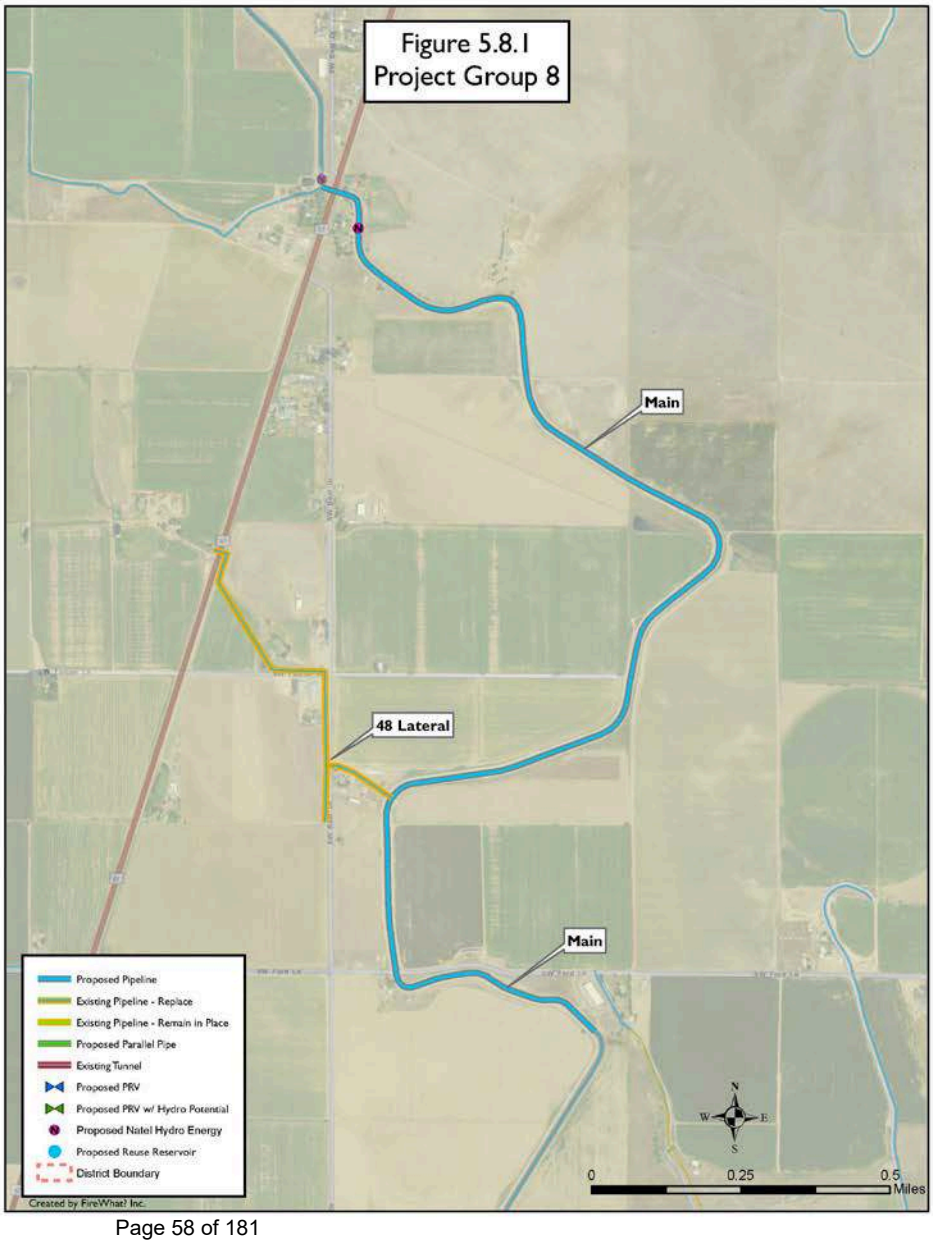


Table 5.8.1 Project Group 8 Cost Estimates

Project Group 8 - Lateral 48 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation						**259,078**	**kWh**
Estimated Water Conservation						**3.2**	**CFS**
Feature	**Location**	**Dia (in)**	**Rating (DR or Steel)**	**Quantity (ft or #)**	**Unit**	**$/Unit**	**Total Cost**
Pipe	Lateral 48	8	32.5	2,265	LF	$7.42	16,800
Pipe	Lateral 48	10	32.5	831	LF	$11.56	9,608
Pipe	Lateral 48	12	32.5	656	LF	$16.21	10,632
Turnouts	Lateral 48			7	EA	$8,000	56,000
Lateral 48 Subtotal							**$93,039**
Pipe	Main-0050	144	Steel	3,345	LF	$1,978.00	6,616,898
Pipe	Main-0051	144	Steel	2,917	LF	$1,978.00	5,769,589
Pipe	Main-0052	144	Steel	237	LF	$1,978.00	469,004
Pipe	Main-0054	144	Steel	1,138	LF	$1,978.00	2,250,990
Pipe	Main-0057	144	Steel	2,727	LF	$1,978.00	5,394,760
Pipe	Main-0058	144	Steel	1,383	LF	$1,978.00	2,735,754
Pipe	Main-0059	144	Steel	597	LF	$1,978.00	1,181,611
Pipe	Main-0060	144	Steel	51	LF	$1,978.00	101,629
Pipe	Main-0062	144	Steel	263	LF	$1,978.00	520,453
Pipe	Main-0064	144	Steel	60	LF	$1,978.00	119,475
Pipe	Main-0065	144	Steel	27	LF	$1,978.00	52,976
Turnouts	Main	-	-	4	EA	$8,000	32,000
Main Subtotal							**$25,245,138**
	SUBTOTAL						$25,338,177
	ENGINEERING, CM, SURVEY				6%		$1,520,291
	GMCC				12%		$3,040,581
	CONTINGENCY				30%		$8,969,715
	TOTAL						**$38,868,763**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

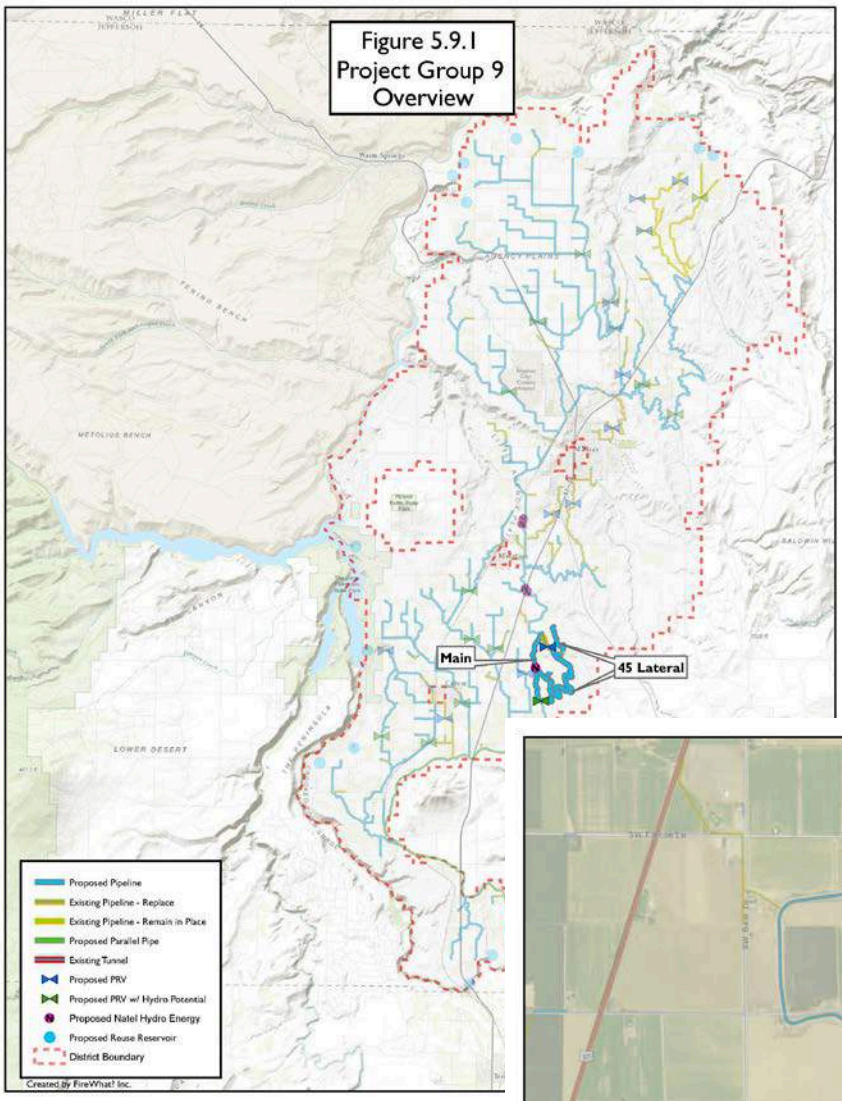


Figure 5.9.1
Project Group 9

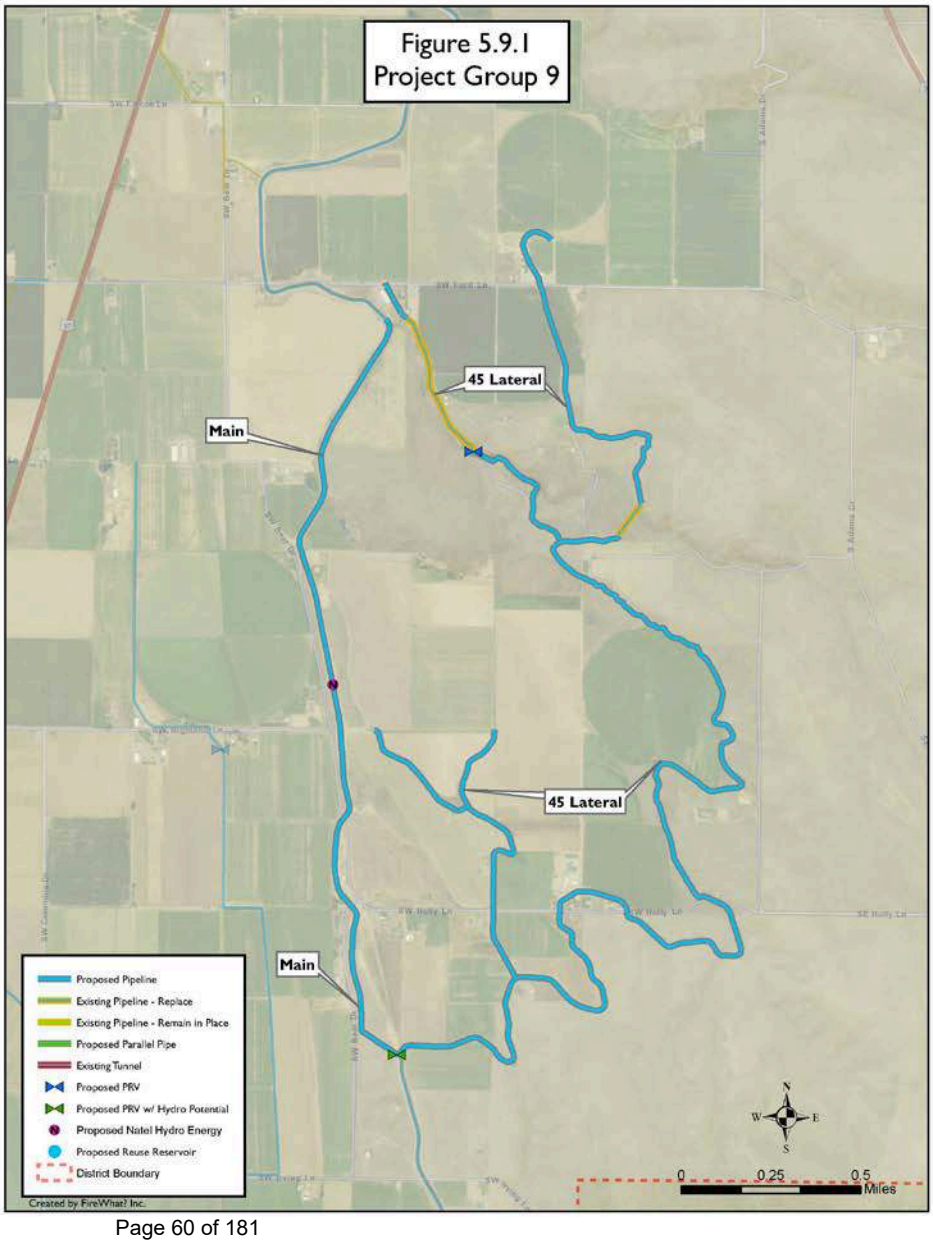


Table 5.9.1 Project Group 9 Cost Estimates

Project Group 9 - Lateral 45 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation	**850,148**	**kWh**
Estimated Water Conservation	**5.7**	**CFS**

Feature	Location	Dia (in)	Rating (DR or Steel)	Quantity (ft or #)	Unit	$/Unit	Total Cost
Pipe	Lateral 45	8	21	2,983	LF	$11.29	33,694
Pipe	Lateral 45	10	21	2,519	LF	$17.55	44,197
Pipe	Lateral 45	12	21	2,131	LF	$24.65	52,530
Pipe	Lateral 45	14	26	1,835	LF	$24.24	44,479
Pipe	Lateral 45	18	26	6,429	LF	$40.09	257,715
Pipe	Lateral 45	24	26	12,885	LF	$71.31	918,773
Pipe	Lateral 45	10	32.5	2,878	LF	$11.56	33,269
Pipe	Lateral 45	26	32.5	3,643	LF	$67.53	245,961
Pipe	Lateral 45	30	32.5	3,055	LF	$89.90	274,658
Pipe	Lateral 45	32	32.5	128	LF	$102.33	13,136
PRV Station	Lateral 45	10	-	1	EA	$150,000	150,000
Turnouts	Lateral 45			25	EA	$8,000	200,000
Lateral 45 Subtotal							**$2,268,414**
Pipe	Main-0049-2	144	Steel	11,787	LF	$1,978.00	23,315,435
Pipe	Main-0049-1-2	144	Steel	2,655	LF	$1,978.00	5,251,590
Turnouts	Main	-	-	0	EA	$8,000	0
Main Subtotal							**$28,567,025**
	SUBTOTAL						$30,835,438
	ENGINEERING, CM, SURVEY				6%		$1,850,126
	GMCC				12%		$3,700,253
	CONTINGENCY				30%		$10,915,745
	TOTAL						**$47,301,562**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

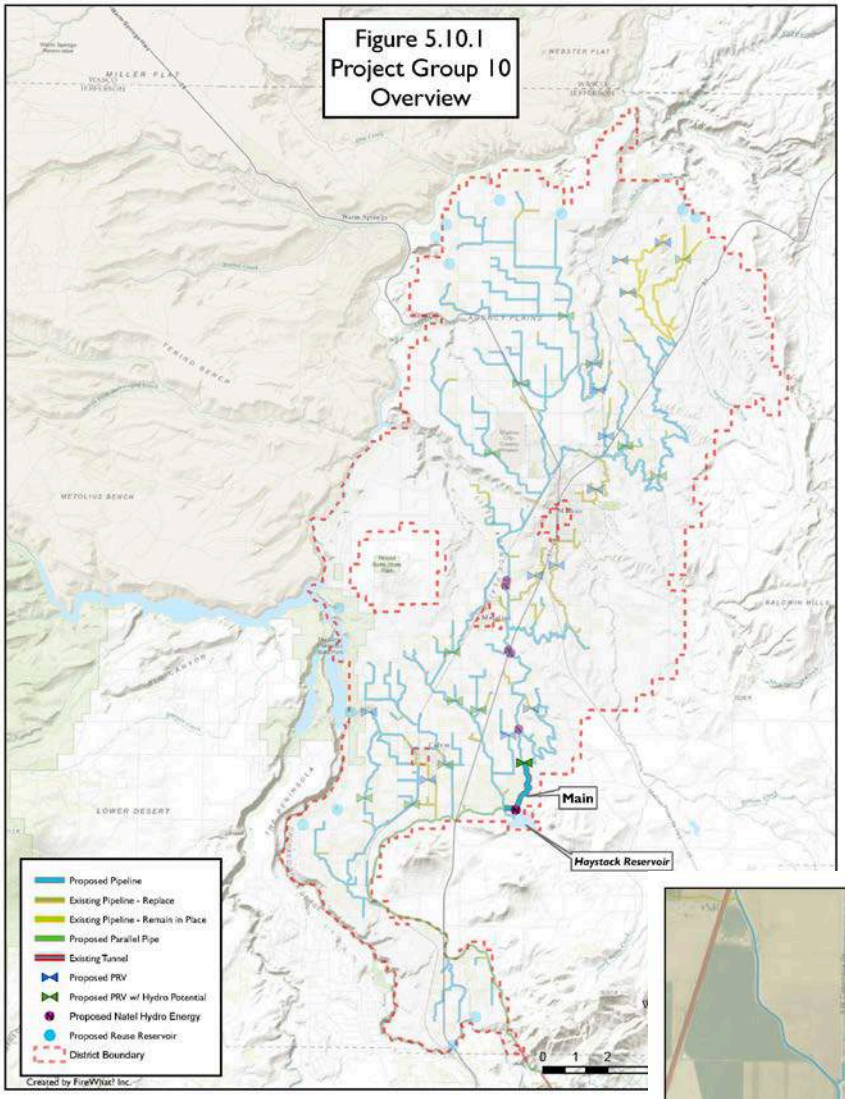


Figure 5.10.1
Project Group 10

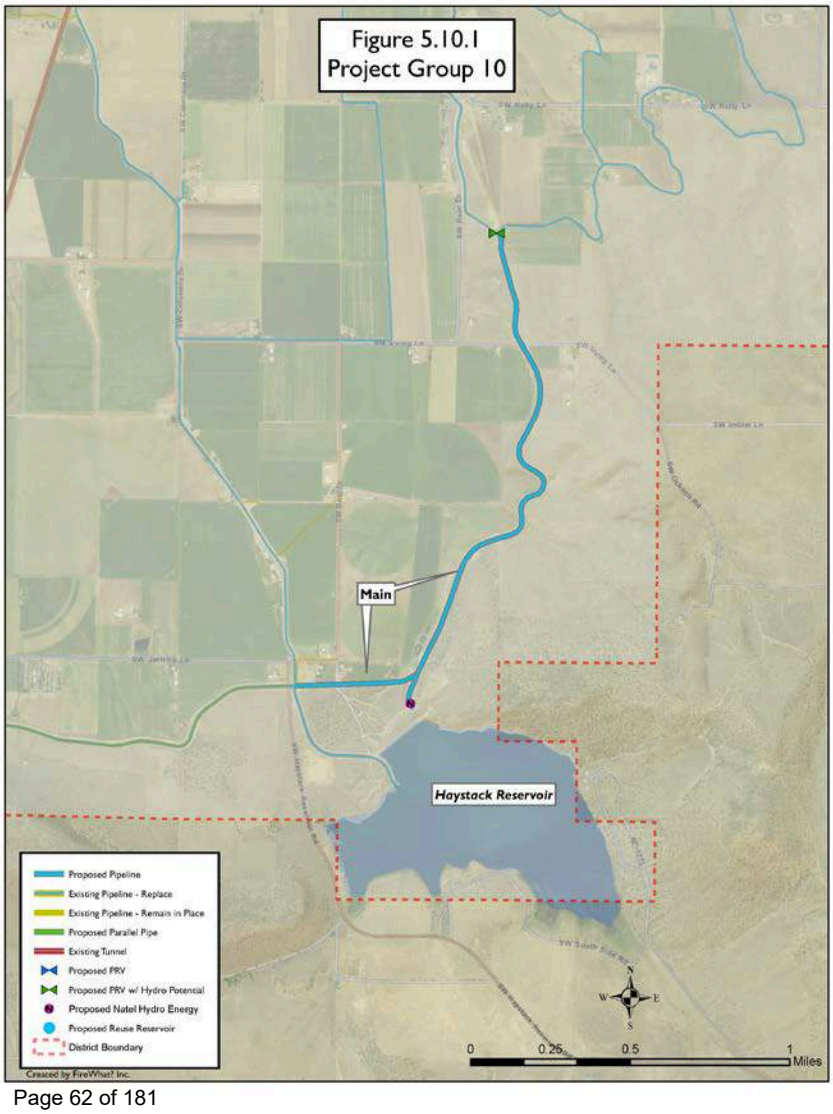


Table 5.10.1 Project Group 10 Cost Estimates

Project Group 10 - Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation	**186,126**	**kWh**
Estimated Water Conservation	**2.8**	**CFS**

Feature	Location	Dia (in)	Rating (DR or Steel)	Quantity (ft or #)	Unit	$/Unit	Total Cost
Pipe	Main-0041	144	Steel	6,729	LF	$1,978.00	13,309,959
Pipe	Main-0045A	108	Steel	1,982	LF	$1,172.00	2,322,395
Pipe	Main-0045B	108	Steel	1,982	LF	$1,172.00	2,322,395
Pipe	Main-0047	144	Steel	1,811	LF	$1,978.00	3,582,138
Pipe	Main-0048	144	Steel	70	LF	$1,978.00	138,910
PRV Station	Main-0047	144	-	1	EA	$1,120,000	1,120,000
Turnouts	Main	-	-	3	EA	$8,000	24,000
	SUBTOTAL						$22,819,797
	ENGINEERING, CM, SURVEY				6%		$1,369,188
	GMCC				12%		$2,738,376
	CONTINGENCY				30%		$8,078,208
	TOTAL						**$35,005,569**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

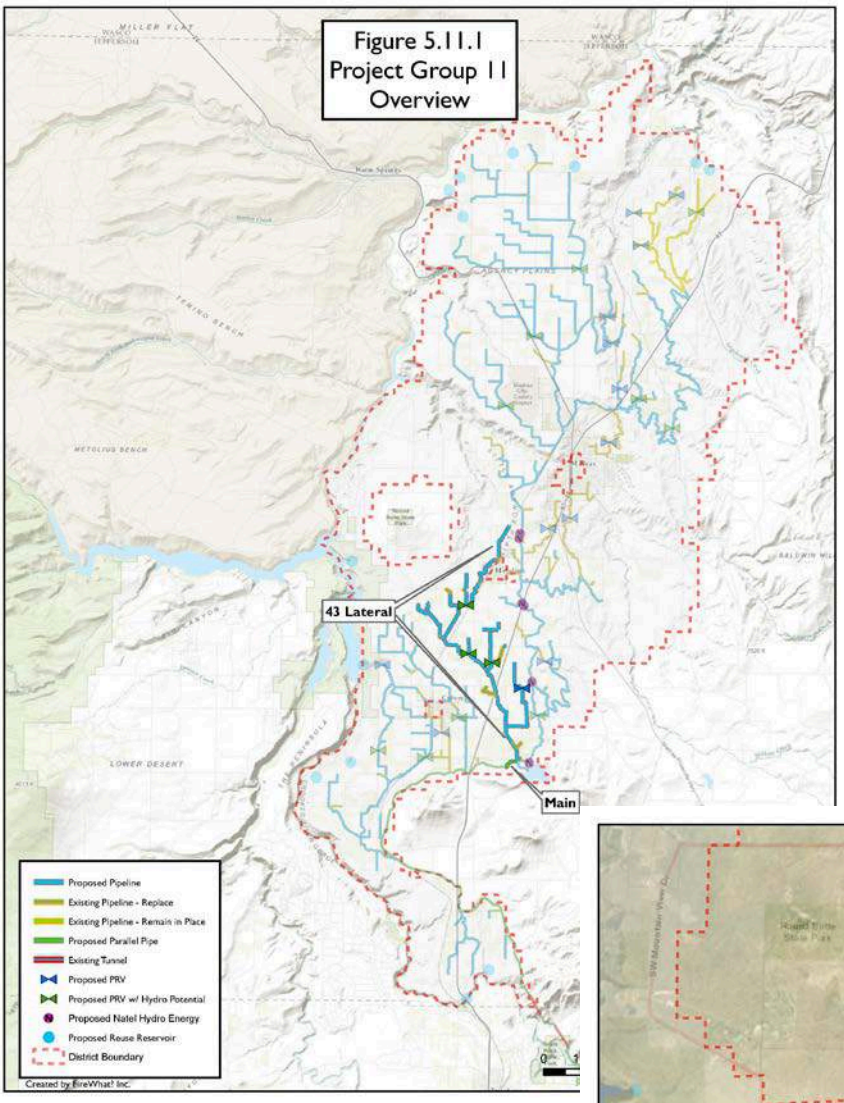


Figure 5.11.1
Project Group 11

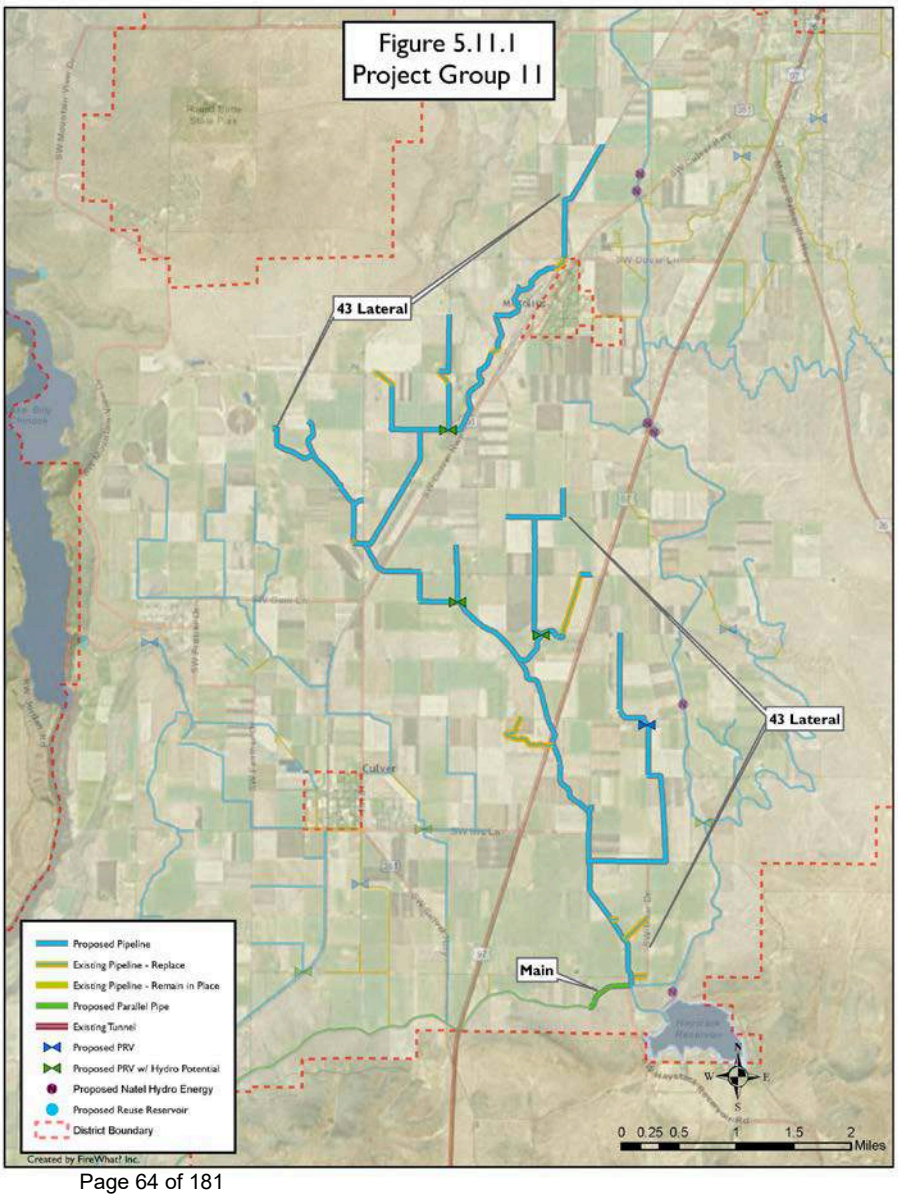


Table 5.11.1 Project Group 11 Cost Estimates

Project Group 11 - Lateral 43 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation	**5,683,646**	**kWh**
Estimated Water Conservation	**14.7**	**CFS**

Feature	Location	Dia (in)	Rating (DR or Steel)	Quantity (ft or #)	Unit	$/Unit	Total Cost
Pipe	Lateral 43	18	19	2,356	LF	$54.02	127,303
Pipe	Lateral 43	6	21	2,409	LF	$6.64	15,998
Pipe	Lateral 43	8	21	3,617	LF	$11.29	40,858
Pipe	Lateral 43	10	21	1,705	LF	$17.55	29,914
Pipe	Lateral 43	12	21	1,691	LF	$24.65	41,681
Pipe	Lateral 43	14	21	657	LF	$29.76	19,558
Pipe	Lateral 43	16	21	1,986	LF	$38.85	77,150
Pipe	Lateral 43	20	21	1,872	LF	$60.67	113,580
Pipe	Lateral 43	24	21	6,499	LF	$87.40	568,047
Pipe	Lateral 43	28	21	1,317	LF	$118.93	156,604
Pipe	Lateral 43	32	21	1,303	LF	$155.39	202,407
Pipe	Lateral 43	34	21	4,819	LF	$175.38	845,246
Pipe	Lateral 43	48	21	3,945	LF	$349.62	1,379,337
Pipe	Lateral 43	54	21	29	LF	$442.36	12,742
Pipe	Lateral 43	63	21	10,467	LF	$602.20	6,303,099
Pipe	Lateral 43	4	26	81	LF	$2.50	202
Pipe	Lateral 43	6	26	3,105	LF	$5.43	16,858
Pipe	Lateral 43	8	26	141	LF	$9.21	1,302
Pipe	Lateral 43	10	26	3,858	LF	$14.30	55,172
Pipe	Lateral 43	12	26	7,640	LF	$20.12	153,688
Pipe	Lateral 43	14	26	1,275	LF	$24.24	30,897
Pipe	Lateral 43	16	26	1,761	LF	$31.68	55,789
Pipe	Lateral 43	18	26	4,252	LF	$40.09	170,460
Pipe	Lateral 43	20	26	4,028	LF	$49.52	199,437
Pipe	Lateral 43	24	26	7,938	LF	$71.31	566,008
Pipe	Lateral 43	26	26	540	LF	$83.69	45,210
Pipe	Lateral 43	42	26	3,188	LF	$218.33	695,944
Pipe	Lateral 43	63	26	1,277	LF	$491.34	627,391
Pipe	Lateral 43	4	32.5	2,750	LF	$2.01	5,533
Pipe	Lateral 43	8	32.5	2,066	LF	$7.42	15,326
Pipe	Lateral 43	10	32.5	3,109	LF	$11.56	35,940
Pipe	Lateral 43	12	32.5	3,389	LF	$16.21	54,947
Pipe	Lateral 43	14	32.5	1,297	LF	$19.58	25,404
Pipe	Lateral 43	16	32.5	1,356	LF	$25.55	34,633

Pipe	Lateral 43	18	32.5	355	LF	$32.38	11,508
Pipe	Lateral 43	24	32.5	4,701	LF	$57.49	270,237
Pipe	Lateral 43	26	32.5	3,378	LF	$67.53	228,108
Pipe	Lateral 43	42	32.5	1,336	LF	$176.16	235,348
Pipe	Lateral 43	48	32.5	1,690	LF	$230.13	388,869
Pipe	Lateral 43	48	41	48	LF	$183.69	8,745
Pipe	Lateral 43	63	41	125	LF	$316.44	39,408
Pipe	Lateral 43	66	Steel	4,935	LF	$556.00	2,743,974
PRV Station	Lateral 43	14	-	1	EA	$150,000	150,000
PRV Station	Lateral 43	22	-	1	EA	$200,000	200,000
PRV Station	Lateral 43	46	-	1	EA	$400,000	400,000
PRV Station	Lateral 43	24	-	1	EA	$200,000	200,000
Turnouts	Lateral 43			109	EA	$8,000	872,000
Lateral 43 Subtotal							**$18,471,861**
Pipe	Main-0037A	120	Steel	1,875	LF	$1,370.00	2,568,810
Pipe	Main-0037B	120	Steel	1,875	LF	$1,370.00	2,568,810
Pipe	Main-0038A	120	Steel	407	LF	$1,370.00	557,292
Pipe	Main-0038B	120	Steel	407	LF	$1,370.00	557,292
Turnouts	Main	-	-	3	EA	$8,000	24,000
Main Subtotal							**$6,276,204**

SUBTOTAL		$24,748,066
ENGINEERING, CM, SURVEY	6%	$1,484,884
GMCC	12%	$2,969,768
CONTINGENCY	30%	$8,760,815
TOTAL		**$37,963,533**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

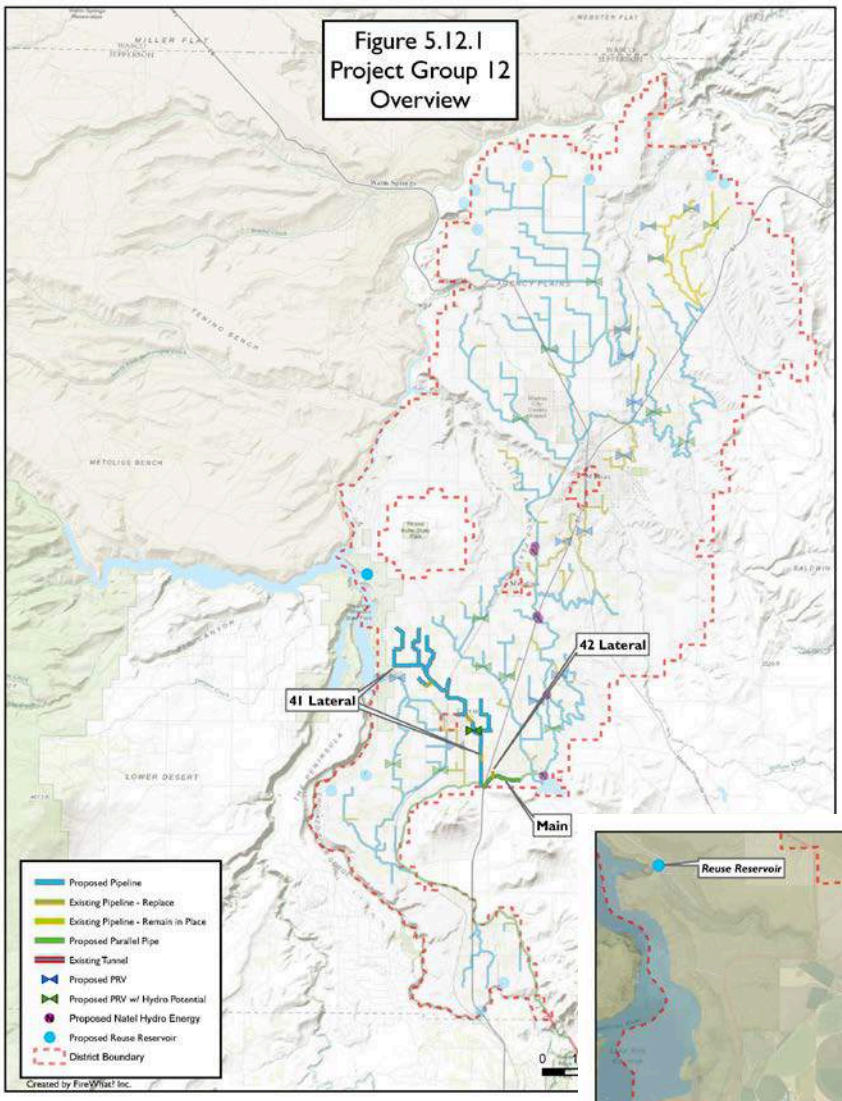


Figure 5.12.1
Project Group 12

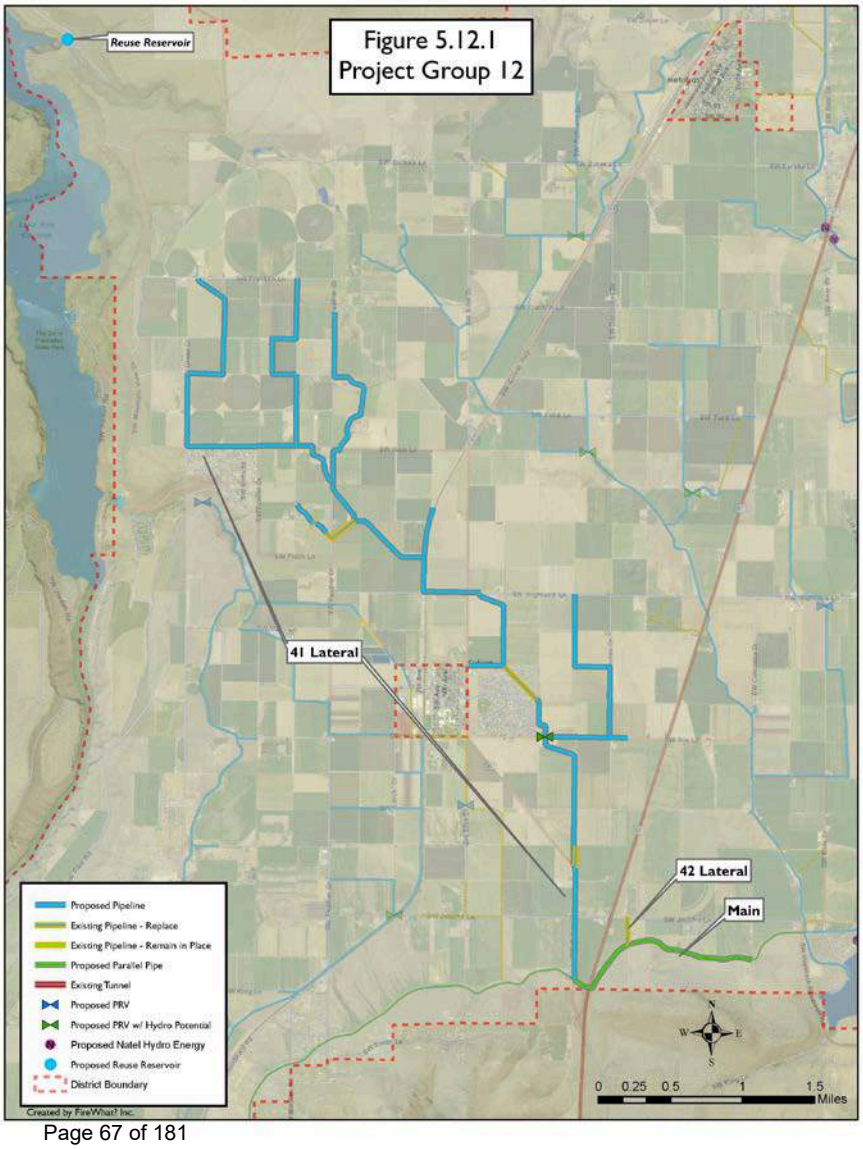


Table 5.12.1 Project Group 12 Cost Estimates

Project Group 12 - Laterals 41, 42 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation	**3,620,402**	**kWh**
Estimated Water Conservation	**8.7**	**CFS**

Feature	Location	Dia (in)	Rating (DR or Steel)	Quantity (ft or #)	Unit	$/Unit	Total Cost
Pipe	Lateral 41	8	21	1,014	LF	$11.29	11,452
Pipe	Lateral 41	12	21	4,848	LF	$24.65	119,488
Pipe	Lateral 41	14	21	231	LF	$29.76	6,889
Pipe	Lateral 41	16	21	6,386	LF	$38.85	248,100
Pipe	Lateral 41	54	21	3,413	LF	$442.36	1,509,926
Pipe	Lateral 41	8	26	1,023	LF	$9.21	9,422
Pipe	Lateral 41	10	26	2,415	LF	$14.30	34,533
Pipe	Lateral 41	12	26	1,649	LF	$20.12	33,170
Pipe	Lateral 41	14	26	87	LF	$24.24	2,100
Pipe	Lateral 41	16	26	5,336	LF	$31.68	169,034
Pipe	Lateral 41	18	26	1,369	LF	$40.09	54,885
Pipe	Lateral 41	20	26	2,616	LF	$49.52	129,545
Pipe	Lateral 41	24	26	5,298	LF	$71.31	377,805
Pipe	Lateral 41	30	26	2,276	LF	$111.44	253,697
Pipe	Lateral 41	34	26	1,686	LF	$143.15	241,380
Pipe	Lateral 41	36	26	2,205	LF	$160.50	353,925
Pipe	Lateral 41	42	26	3,791	LF	$218.33	827,602
Pipe	Lateral 41	54	26	2,039	LF	$361.01	735,962
Pipe	Lateral 41	8	32.5	2,700	LF	$7.42	20,025
Pipe	Lateral 41	12	32.5	1,327	LF	$16.21	21,521
Pipe	Lateral 41	16	32.5	2,561	LF	$25.55	65,428
Pipe	Lateral 41	18	32.5	1,320	LF	$32.38	42,740
Pipe	Lateral 41	20	32.5	1,281	LF	$39.92	51,125
Pipe	Lateral 41	24	32.5	2,354	LF	$57.49	135,323
Pipe	Lateral 41	42	32.5	464	LF	$176.16	81,706
Pipe	Lateral 41	48	32.5	3,221	LF	$230.13	741,291
Pipe	Lateral 41	54	32.5	1,892	LF	$291.33	551,240
Pipe	Lateral 41	48	41	3,358	LF	$183.69	616,848
Pipe	Lateral 41	54	41	2,325	LF	$232.48	540,627
Reuse Reservoir				1	EA	$232,922	232,922
PRV Station	Lateral 41	52	-	1	EA	$560,000	560,000
Turnouts	Lateral 41			87	EA	$8,000	696,000
Lateral 41 Subtotal							**$9,475,712**
Pipe	Lateral 42	4	32.5	931	LF	$2.01	1,873

Pipe	Lateral 42	8	32.5	98	LF	$7.42	725
Turnouts	Lateral 42			8	EA	$8,000.00	64,000
Lateral 42 Subtotal							**$66,599**
Pipe	Main-0029A	120	Steel	42	LF	$1,370.00	57,688
Pipe	Main-0029B	120	Steel	42	LF	$1,370.00	57,688
Pipe	Main-0030A	120	Steel	2,681	LF	$1,370.00	3,673,076
Pipe	Main-0030B	120	Steel	2,681	LF	$1,370.00	3,673,076
Pipe	Main-0031A	120	Steel	2,840	LF	$1,370.00	3,890,192
Pipe	Main-0031B	120	Steel	2,840	LF	$1,370.00	3,890,192
Pipe	Main-0039A	120	Steel	2,007	LF	$1,370.00	2,749,603
Pipe	Main-0039B	120	Steel	2,007	LF	$1,370.00	2,749,603
Turnouts	Main	-	-	2	EA	$8,000	16,000
Main Subtotal							**$20,757,117**

SUBTOTAL		$30,299,428
ENGINEERING, CM, SURVEY	6%	$1,817,966
GMCC	12%	$3,635,931
CONTINGENCY	30%	$10,725,997
TOTAL		**$46,479,322**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

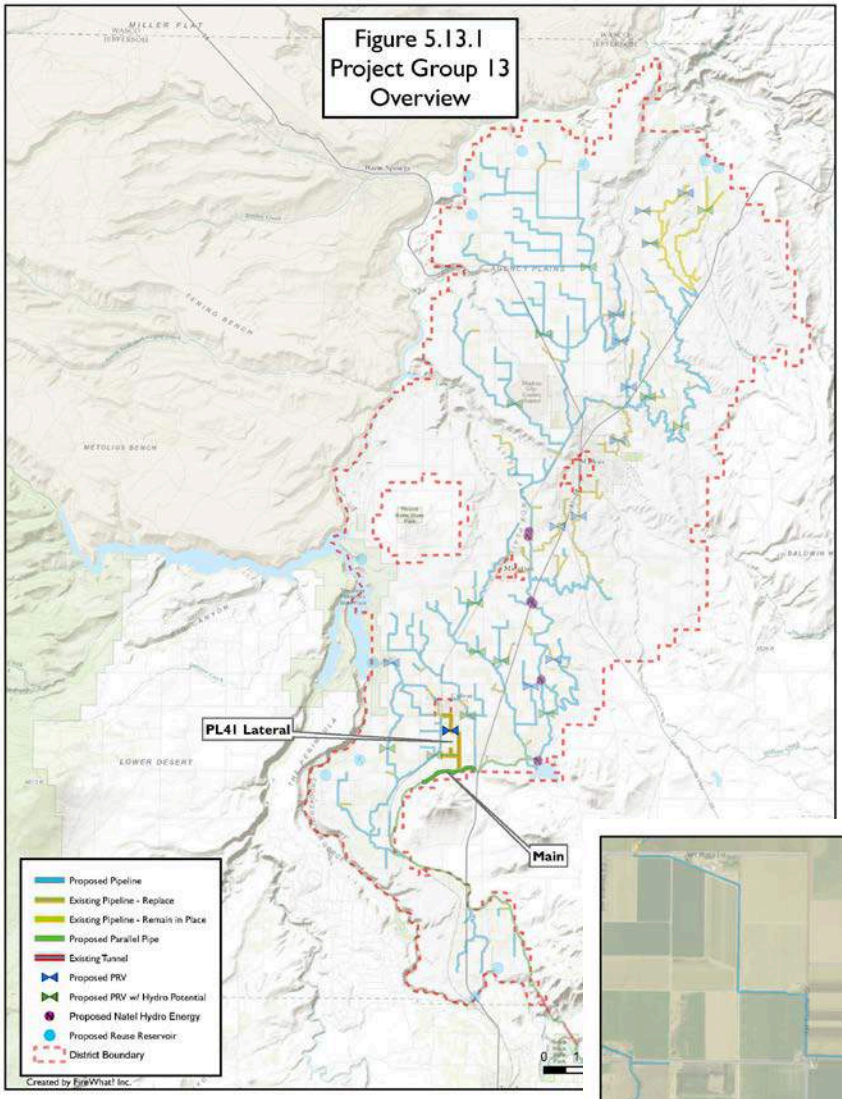


Figure 5.13.1
Project Group 13

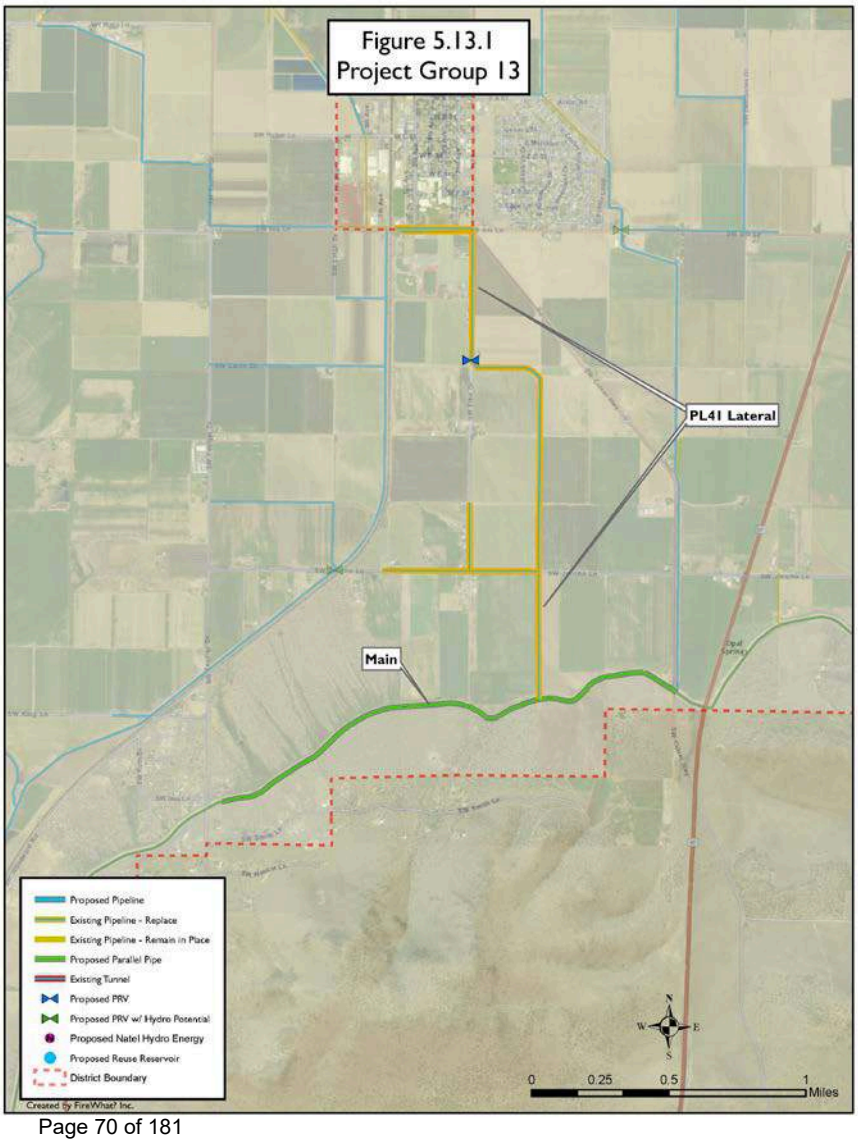


Table 5.13.1 Project Group 13 Cost Estimates

Project Group 13 - Laterals PL41 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation						**877,022**	**kWh**
Estimated Water Conservation						**4.4**	**CFS**
Feature	**Location**	**Dia (in)**	**Rating (DR or Steel)**	**Quantity (ft or #)**	**Unit**	**$/Unit**	**Total Cost**
Pipe	Lateral PL41	4	21	1,102	LF	$3.08	$3,392
Pipe	Lateral PL41	8	21	593	LF	$11.29	$6,697
Pipe	Lateral PL41	10	21	1,377	LF	$17.55	$24,167
Pipe	Lateral PL41	14	21	1,245	LF	$29.76	$37,042
Pipe	Lateral PL41	16	21	1,313	LF	$38.85	$51,017
Pipe	Lateral PL41	6	26	574	LF	$5.43	$3,118
Pipe	Lateral PL41	8	26	727	LF	$9.21	$6,698
Pipe	Lateral PL41	10	26	1,329	LF	$14.30	$18,999
Pipe	Lateral PL41	18	26	1,291	LF	$40.09	$51,752
Pipe	Lateral PL41	24	26	2,469	LF	$71.31	$176,037
Pipe	Lateral PL41	4	32.5	2,783	LF	$2.01	$5,599
Pipe	Lateral PL41	6	32.5	1,095	LF	$4.39	$4,804
Pipe	Lateral PL41	8	32.5	1,434	LF	$7.42	$10,636
PRV Station	Lateral PL41	8	-	1	EA	$150,000	$150,000
Turnouts	Lateral PL41			31	EA	$8,000	$248,000
Lateral PL41 Subtotal							**$797,960**
Pipe	Main-0025A	120	Steel	5,233	LF	$1,370.00	$7,168,678
Pipe	Main-0025B	120	Steel	5,233	LF	$1,370.00	$7,168,678
Pipe	Main-0026A	120	Steel	19	LF	$1,370.00	$25,629
Pipe	Main-0026B	120	Steel	19	LF	$1,370.00	$25,629
Pipe	Main-0027A	120	Steel	1,524	LF	$1,370.00	$2,088,083
Pipe	Main-0027B	120	Steel	1,524	LF	$1,370.00	$2,088,083
Pipe	Main-0028A	120	Steel	20	LF	$1,370.00	$27,041
Pipe	Main-0028B	120	Steel	20	LF	$1,370.00	$27,041
Pipe	Main-0032A	120	Steel	1,470	LF	$1,370.00	$2,014,307
Pipe	Main-0032B	120	Steel	1,470	LF	$1,370.00	$2,014,307
Pipe	Main-0033A	120	Steel	708	LF	$1,370.00	$970,082
Pipe	Main-0033B	120	Steel	708	LF	$1,370.00	$970,082
Pipe	Main-0034A	120	Steel	15	LF	$1,370.00	$20,123
Pipe	Main-0034B	120	Steel	15	LF	$1,370.00	$20,123
Turnouts	Main	-	-	6	EA	$8,000	$48,000
Main Subtotal							**$24,675,887**
SUBTOTAL							$25,473,847
ENGINEERING, CM, SURVEY						6%	$1,528,431
GMCC						12%	$3,056,862

CONTINGENCY	30%	$9,017,742
TOTAL		**$39,076,882**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

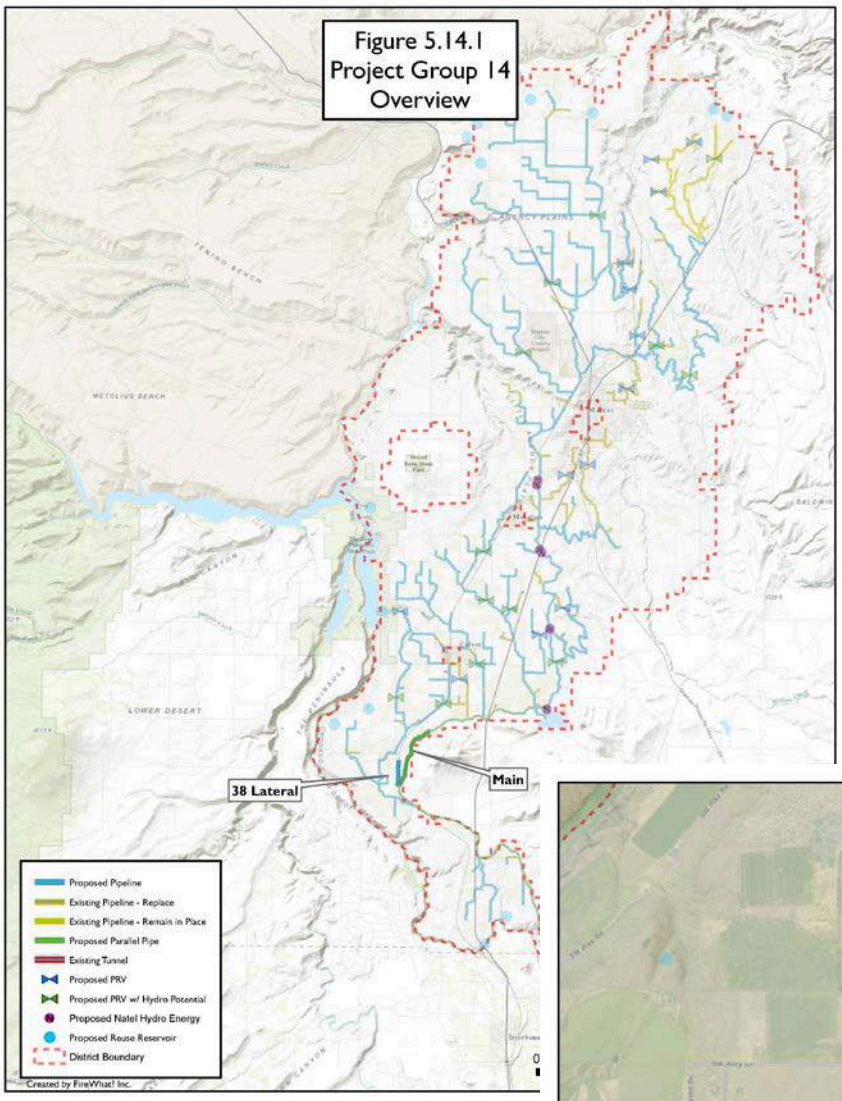


Figure 5.14.1
Project Group 14

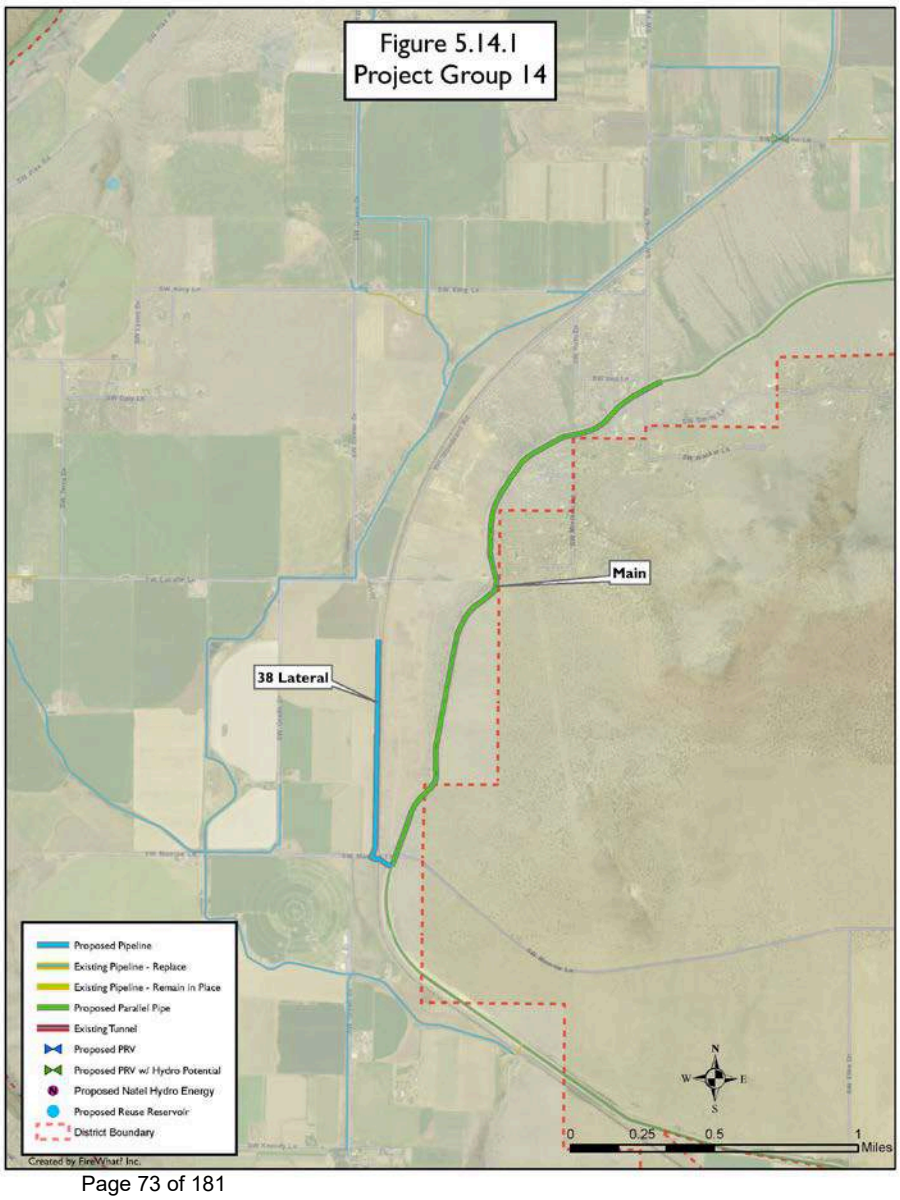


Table 5.14.1 Project Group 14 Cost Estimates

Project Group 14 - Laterals 38 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation						**73,176**	**kWh**
Estimated Water Conservation						**6.6**	**CFS**
Feature	**Location**	**Dia (in)**	**Rating (DR or Steel)**	**Quantity (ft or #)**	**Unit**	**$/Unit**	**Total Cost**
Pipe	Lateral 38	6	32.5	3,946	LF	$4.39	17,313
Pipe	Lateral 38	8	32.5	480	LF	$7.42	3,564
Turnouts	Lateral 38			3	EA	$8,000	24,000
Lateral 38 Subtotal							**$44,876**
Pipe	Main-0024A	120	Steel	11,133	LF	$1,370.00	15,252,308
Pipe	Main-0024B	120	Steel	11,133	LF	$1,370.00	15,252,308
Turnouts	Main	-	-	1	EA	$8,000	8,000
Main Subtotal							**$30,512,617**
	SUBTOTAL						$30,557,493
	ENGINEERING, CM, SURVEY				6%		$1,833,450
	GMCC				12%		$3,666,899
	CONTINGENCY				30%		$10,817,353
	TOTAL						**$46,875,195**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

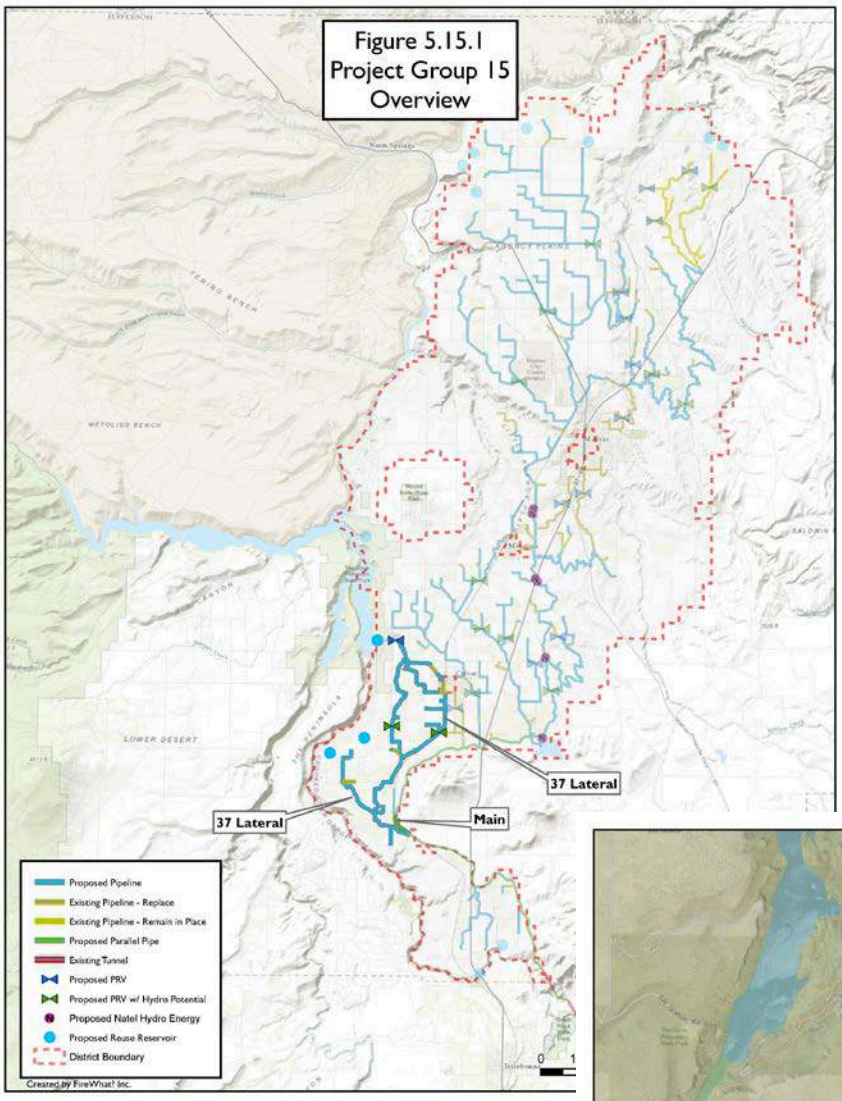


Figure 5.15.1
Project Group 15

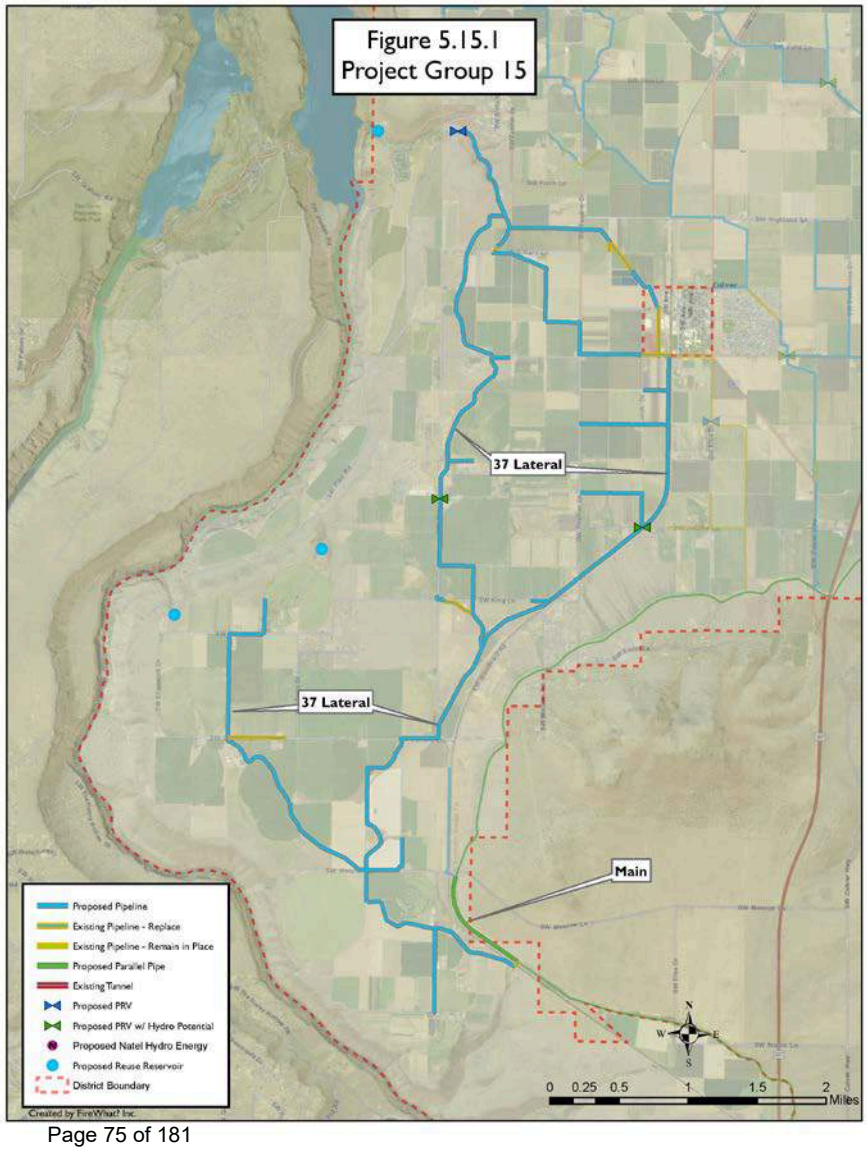


Table 5.15.1 Project Group 15 Cost Estimates

Project Group 15 - Laterals 37 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation	**2,521,140**	**kWh**
Estimated Water Conservation	**8.8**	**CFS**

Feature	Location	Dia (in)	Rating (DR or Steel)	Quantity (ft or #)	Unit	$/Unit	Total Cost
Pipe	Lateral 37	10	19	4,051	LF	$19.27	78,057
Pipe	Lateral 37	24	19	5,617	LF	$96.05	539,560
Pipe	Lateral 37	32	21	3,013	LF	$155.39	468,202
Pipe	Lateral 37	34	21	1,573	LF	$175.38	275,947
Pipe	Lateral 37	4	26	3,202	LF	$2.50	7,993
Pipe	Lateral 37	10	26	1,303	LF	$14.30	18,635
Pipe	Lateral 37	10	26	5,926	LF	$14.30	84,736
Pipe	Lateral 37	12	26	1,431	LF	$20.12	28,796
Pipe	Lateral 37	14	26	403	LF	$24.24	9,776
Pipe	Lateral 37	16	26	2,394	LF	$31.68	75,851
Pipe	Lateral 37	26	26	1,462	LF	$83.69	122,317
Pipe	Lateral 37	34	26	2,729	LF	$143.15	390,607
Pipe	Lateral 37	36	26	456	LF	$160.50	73,219
Pipe	Lateral 37	48	26	4,576	LF	$285.22	1,305,123
Pipe	Lateral 37	6	32.5	3,337	LF	$4.39	14,637
Pipe	Lateral 37	8	32.5	6,218	LF	$7.42	46,120
Pipe	Lateral 37	10	32.5	5,910	LF	$11.56	68,326
Pipe	Lateral 37	12	32.5	2,849	LF	$16.21	46,195
Pipe	Lateral 37	14	32.5	6,688	LF	$19.58	130,978
Pipe	Lateral 37	16	32.5	4,725	LF	$25.55	120,715
Pipe	Lateral 37	18	32.5	3,228	LF	$32.38	104,538
Pipe	Lateral 37	20	32.5	6,624	LF	$39.92	264,411
Pipe	Lateral 37	24	32.5	1,750	LF	$57.49	100,582
Pipe	Lateral 37	26	32.5	1,518	LF	$67.53	102,493
Pipe	Lateral 37	28	32.5	1,302	LF	$78.36	102,051
Pipe	Lateral 37	30	32.5	6,545	LF	$89.90	588,394
Pipe	Lateral 37	32	32.5	4,241	LF	$102.33	433,957
Pipe	Lateral 37	48	41	7,196	LF	$183.69	1,321,937
Pipe	Lateral 37	63	41	8,192	LF	$316.44	2,592,377
Reuse Reservoir	Lateral 37			3	EA	$232,922	698,765
PRV Station	Lateral 37	22	-	1	EA	$200,000	200,000
PRV Station	Lateral 37	10	-	1	EA	$150,000	150,000
PRV Station	Lateral 37	30	-	1	EA	$280,000	280,000
Turnouts	Lateral 37			87	EA	$8,000	696,000

Lateral 37 Subtotal							**$11,541,295**
Pipe	Main-0023A	120	Steel	4,456	LF	$1,370.00	6,105,191
Pipe	Main-0023B	120	Steel	4,456	LF	$1,370.00	6,105,191
Turnouts	Main	-	-	1	EA	$8,000	8,000
Main Subtotal							**$12,218,381**

SUBTOTAL		$23,759,676
ENGINEERING, CM, SURVEY	6%	$1,425,581
GMCC	12%	$2,851,161
CONTINGENCY	30%	$8,410,925
TOTAL		**$36,447,344**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

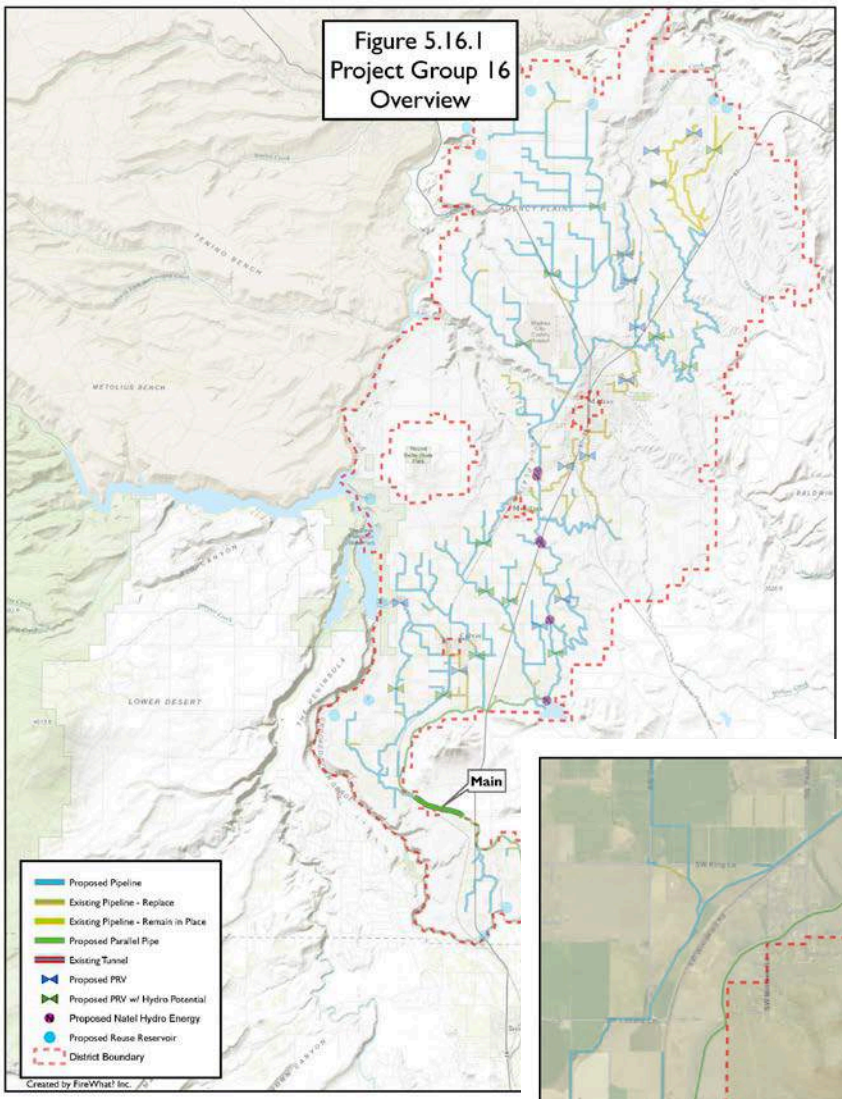


Figure 5.16.1
Project Group 16

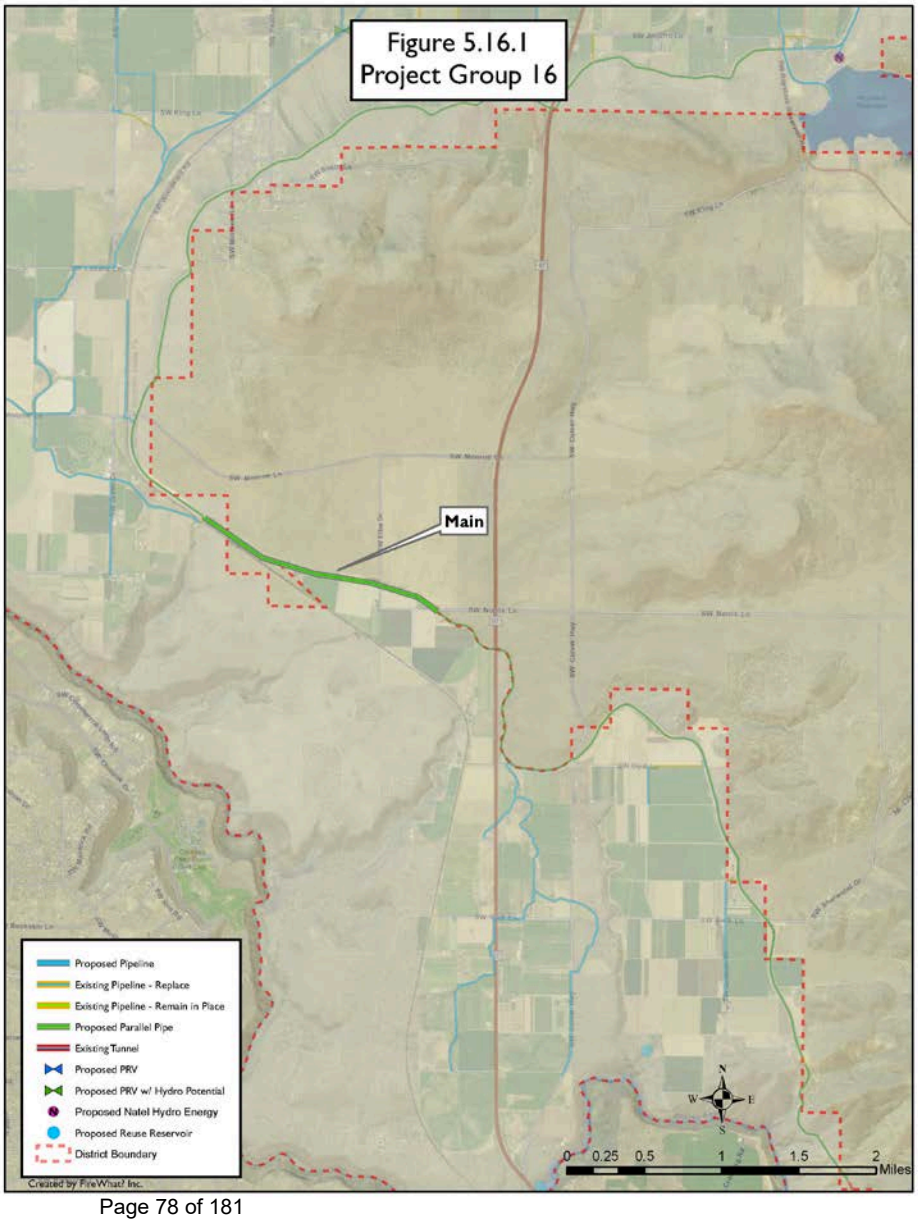


Table 5.16.1 Project Group 16 Cost Estimates

Project Group 16 - Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation	**248,167**	**kWh**
Estimated Water Conservation	**4.2**	**CFS**

Feature	Location	Dia (in)	Rating (DR or Steel)	Quantity (ft or #)	Unit	$/Unit	Total Cost
Pipe	Main-0015A	144	Steel	5,117	LF	$1,978.00	10,122,283
Pipe	Main-0015B	144	Steel	5,117	LF	$1,978.00	10,122,283
Pipe	Main-0016A	144	Steel	1,377	LF	$1,978.00	2,723,731
Pipe	Main-0016B	144	Steel	1,377	LF	$1,978.00	2,723,731
Pipe	Main-0017A	144	Steel	1,965	LF	$1,978.00	3,887,279
Pipe	Main-0017B	144	Steel	1,965	LF	$1,978.00	3,887,279
Turnouts	Main	-	-	4	EA	$8,000	32,000
	SUBTOTAL						$33,498,585
	ENGINEERING, CM, SURVEY				6%		$2,009,915
	GMCC				12%		$4,019,830
	CONTINGENCY				30%		$11,858,499
	TOTAL						**$51,386,830**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

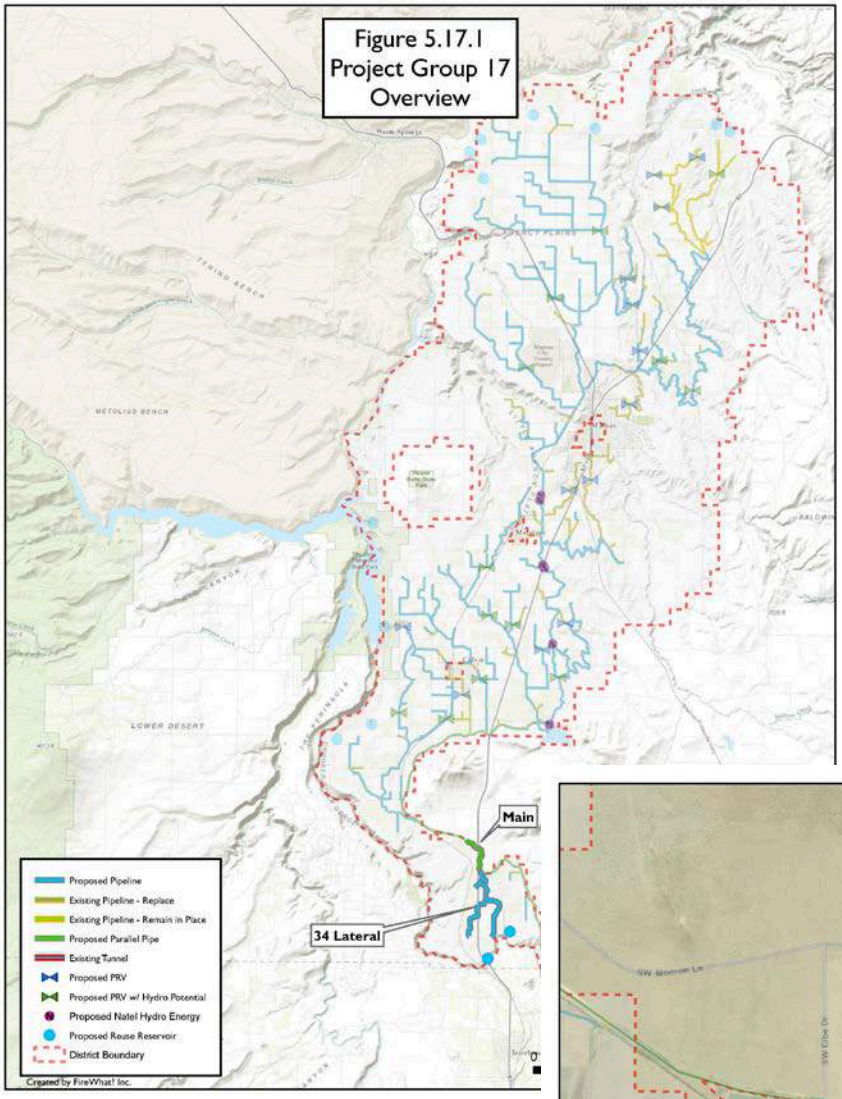


Figure 5.17.1
Project Group 17

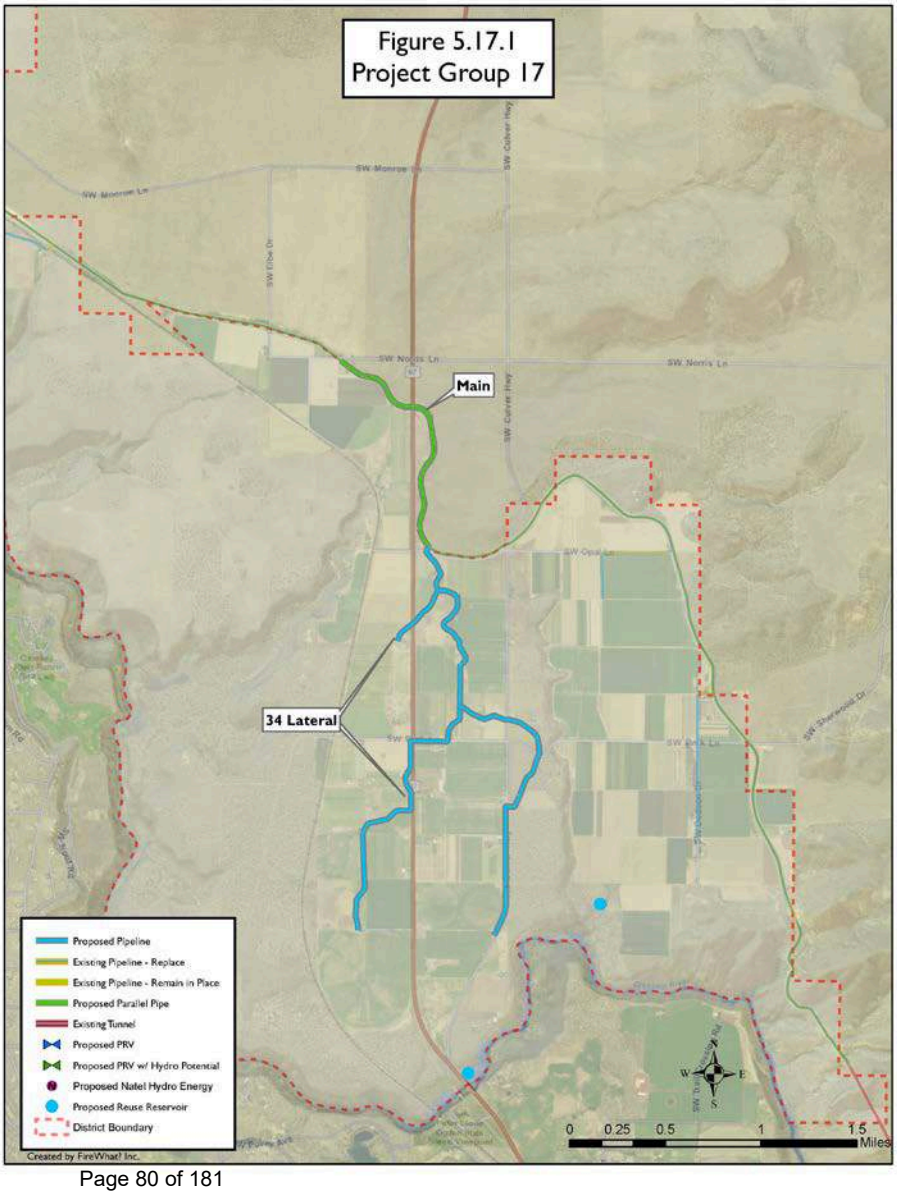


Table 5.17.1 Project Group 17 Cost Estimates

Project Group 17 - Laterals 34 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation	**211,105**	**kWh**
Estimated Water Conservation	**4.6**	**CFS**

Feature	Location	Dia (in)	Rating (DR or Steel)	Quantity (ft or #)	Unit	$/Unit	Total Cost
Pipe	Lateral 34	6	32.5	140	LF	$4.39	615
Pipe	Lateral 34	8	32.5	1,346	LF	$7.42	9,984
Pipe	Lateral 34	10	32.5	3,279	LF	$11.56	37,904
Pipe	Lateral 34	12	32.5	2,613	LF	$16.21	42,366
Pipe	Lateral 34	14	32.5	3,129	LF	$19.58	61,284
Pipe	Lateral 34	16	32.5	5,125	LF	$25.55	130,917
Pipe	Lateral 34	18	32.5	1,903	LF	$32.38	61,627
Pipe	Lateral 34	20	32.5	1,151	LF	$39.92	45,944
Pipe	Lateral 34	26	32.5	2,668	LF	$67.53	180,151
Pipe	Lateral 34	28	32.5	1,401	LF	$78.36	109,780
Pipe	Lateral 34	30	32.5	1,392	LF	$89.90	125,109
Reuse Reservoir	Lateral 34			1	EA	$232,922	232,922
Turnouts	Lateral 34			30	EA	$8,000	240,000
Lateral 34 Subtotal							**$1,278,602**
Pipe	Main-0009A	144	Steel	603	LF	$1,978.00	1,192,572
Pipe	Main-0009B	144	Steel	603	LF	$1,978.00	1,192,572
Pipe	Main-0010A	144	Steel	1,327	LF	$1,978.00	2,625,477
Pipe	Main-0010B	144	Steel	1,327	LF	$1,978.00	2,625,477
Pipe	Main-0018A	144	Steel	585	LF	$1,978.00	1,156,821
Pipe	Main-0018B	144	Steel	585	LF	$1,978.00	1,156,821
Pipe	Main-0019A	144	Steel	868	LF	$1,978.00	1,716,254
Pipe	Main-0019B	144	Steel	868	LF	$1,978.00	1,716,254
Pipe	Main-0020A	144	Steel	266	LF	$1,978.00	526,818
Pipe	Main-0020B	144	Steel	266	LF	$1,978.00	526,818
Pipe	Main-0021A	144	Steel	1,965	LF	$1,978.00	3,886,016
Pipe	Main-0021B	144	Steel	1,965	LF	$1,978.00	3,886,016
Pipe	Main-0022A	144	Steel	1,528	LF	$1,978.00	3,021,854
Pipe	Main-0022B	144	Steel	1,528	LF	$1,978.00	3,021,854
Turnouts	Main	-	-	1	EA	$8,000	8,000
Main Subtotal							**$28,259,624**

SUBTOTAL		$29,538,226
ENGINEERING, CM, SURVEY	6%	$1,772,294
GMCC	12%	$3,544,587
CONTINGENCY	30%	$10,456,532
TOTAL		**$45,311,639**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

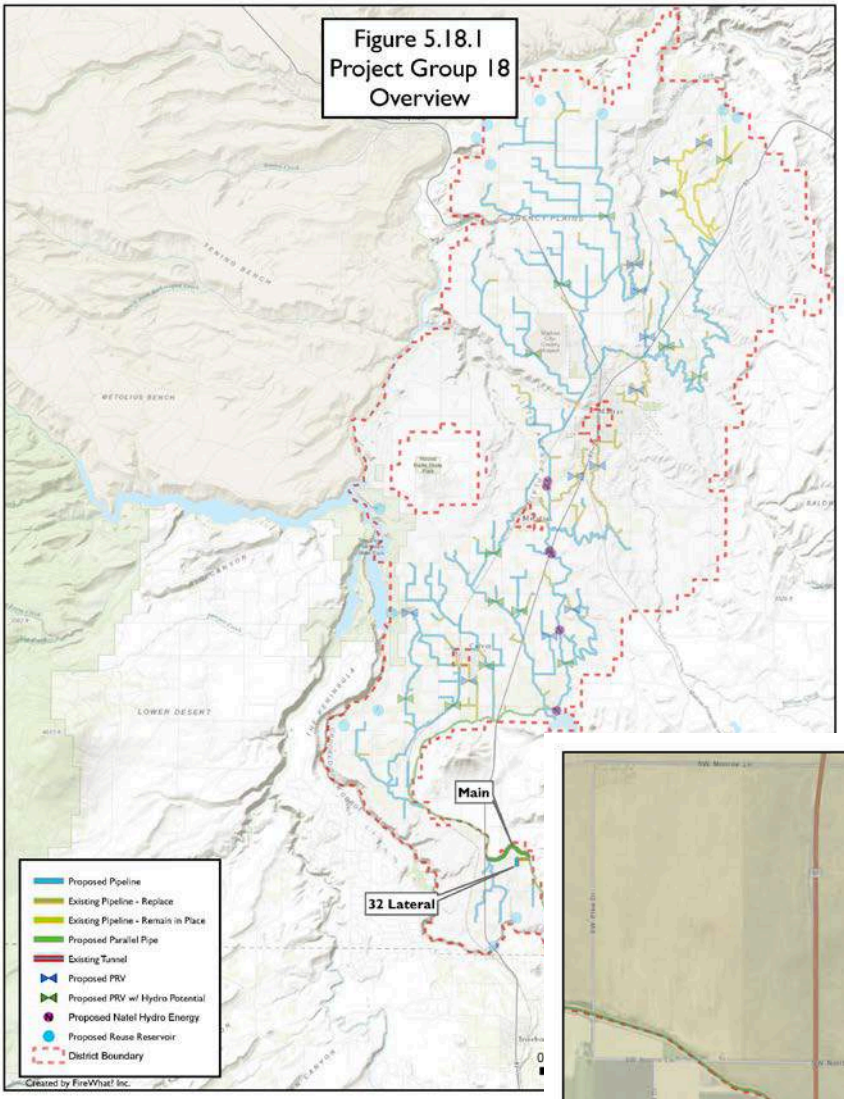


Figure 5.18.1
Project Group 18

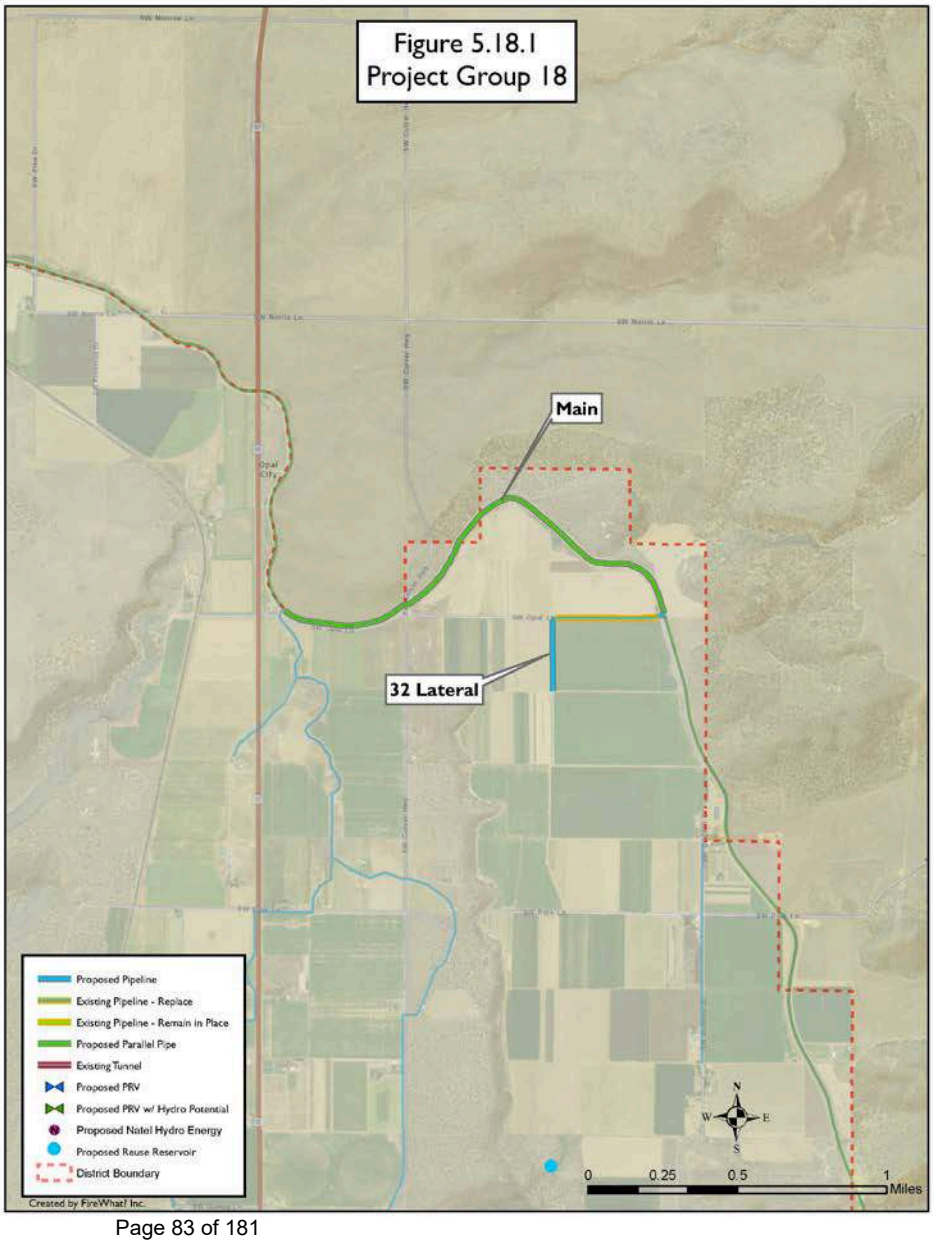


Table 5.18.1 Project Group 18 Cost Estimates

Project Group 18 - Laterals 32 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation	**93,632**	**kWh**
Estimated Water Conservation	**4.6**	**CFS**

Feature	Location	Dia (in)	Rating (DR or Steel)	Quantity (ft or #)	Unit	$/Unit	Total Cost
Pipe	Lateral 32	12	32.5	86	LF	$16.21	1,401
Pipe	Lateral 32	6	32.5	1,858	LF	$4.39	8,152
Turnouts	Lateral 32			4	EA	$8,000	32,000
Lateral 32 Subtotal							**$41,553**
Pipe	Main-0011A	144	Steel	2,299	LF	$1,978.00	4,547,534
Pipe	Main-0011B	144	Steel	2,299	LF	$1,978.00	4,547,534
Pipe	Main-0014A	144	Steel	6,367	LF	$1,978.00	12,594,668
Pipe	Main-0014B	144	Steel	6,367	LF	$1,978.00	12,594,668
Turnouts	Main	-	-	1	EA	$8,000	8,000
Main Subtotal							**$34,292,404**

SUBTOTAL		$34,333,957
ENGINEERING, CM, SURVEY	6%	$2,060,037
GMCC	12%	$4,120,075
CONTINGENCY	30%	$12,154,221
TOTAL		**$52,668,291**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

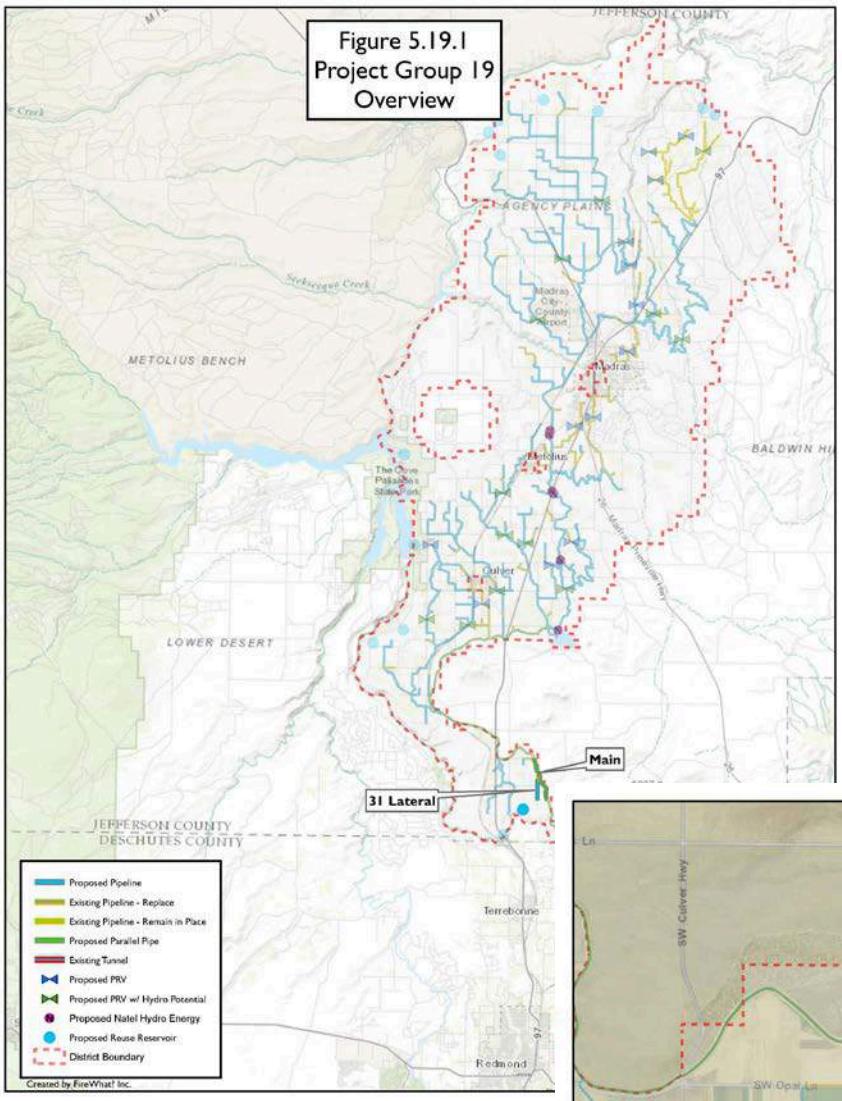


Figure 5.19.1
Project Group 19

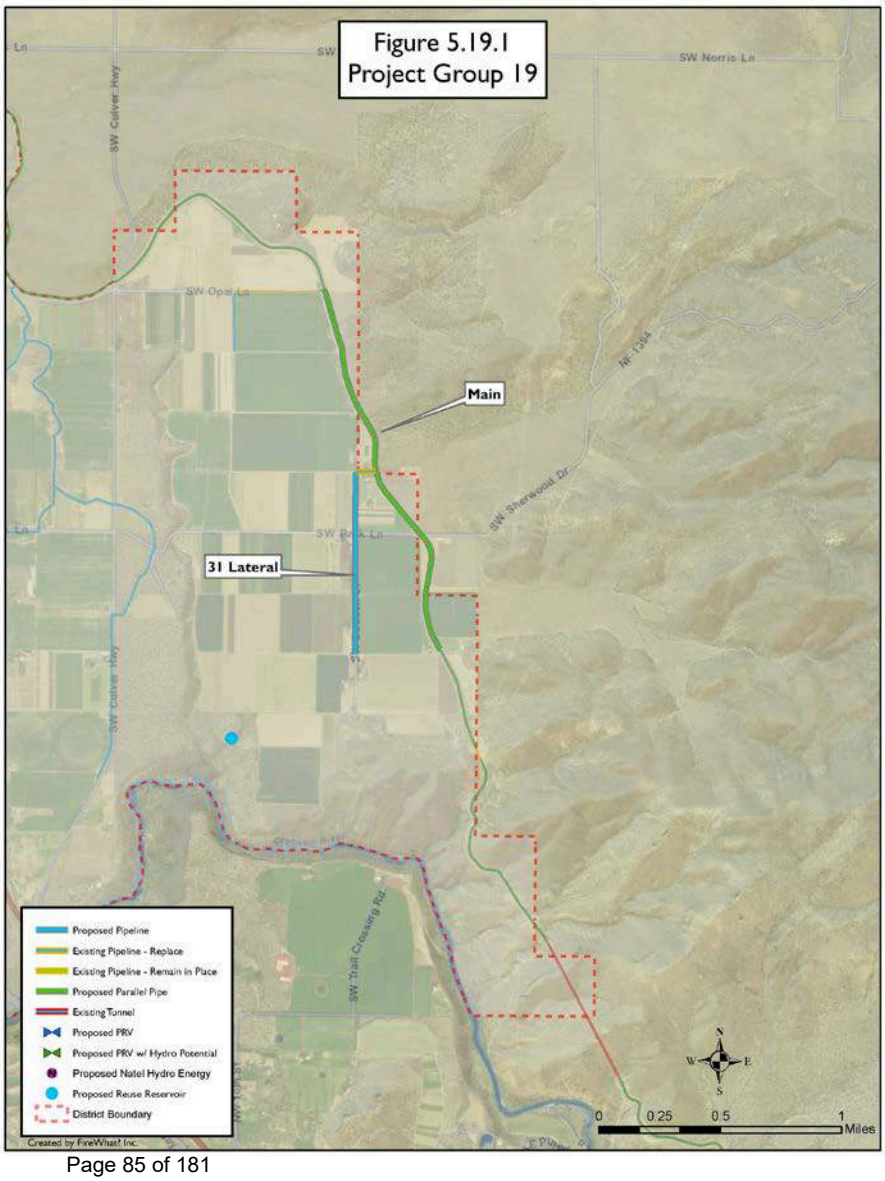


Table 5.19.1 Project Group 19 Cost Estimates

Project Group 19 - Laterals 31 & Associated Main Canal

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation	**250,362**	**kWh**
Estimated Water Conservation	**5.1**	**CFS**

Feature	Location	Dia (in)	Rating (DR or Steel)	Quantity (ft or #)	Unit	$/Unit	Total Cost
Pipe	Lateral 31	12	32.5	1,306	LF	$16.21	21,177
Pipe	Lateral 31	14	32.5	1,095	LF	$19.58	21,434
Pipe	Lateral 31	16	32.5	1,553	LF	$25.55	39,676
Pipe	Lateral 31	18	32.5	381	LF	$32.38	12,338
Pipe	Lateral 31	20	32.5	72	LF	$39.92	2,862
Reuse Reservoir	Lateral 31			1	EA	$232,922	232,922
Turnouts	Lateral 31			7	EA	$8,000	56,000
Lateral 31 Subtotal							**$386,409**
Pipe	Main-0007A	144	Steel	4,368	LF	$1,978.00	8,639,285
Pipe	Main-0007B	144	Steel	4,368	LF	$1,978.00	8,639,285
Pipe	Main-0013A	144	Steel	4,172	LF	$1,978.00	8,253,200
Pipe	Main-0013B	144	Steel	4,172	LF	$1,978.00	8,253,200
Turnouts	Main	-	-	2	EA	$8,000	16,000
Main Subtotal							**$33,800,969**

SUBTOTAL		$34,187,378
ENGINEERING, CM, SURVEY	6%	$2,051,243
GMCC	12%	$4,102,485
CONTINGENCY	30%	$12,102,332
TOTAL		**$52,443,438**

Notes:
1. Steel pipe rated to 100 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

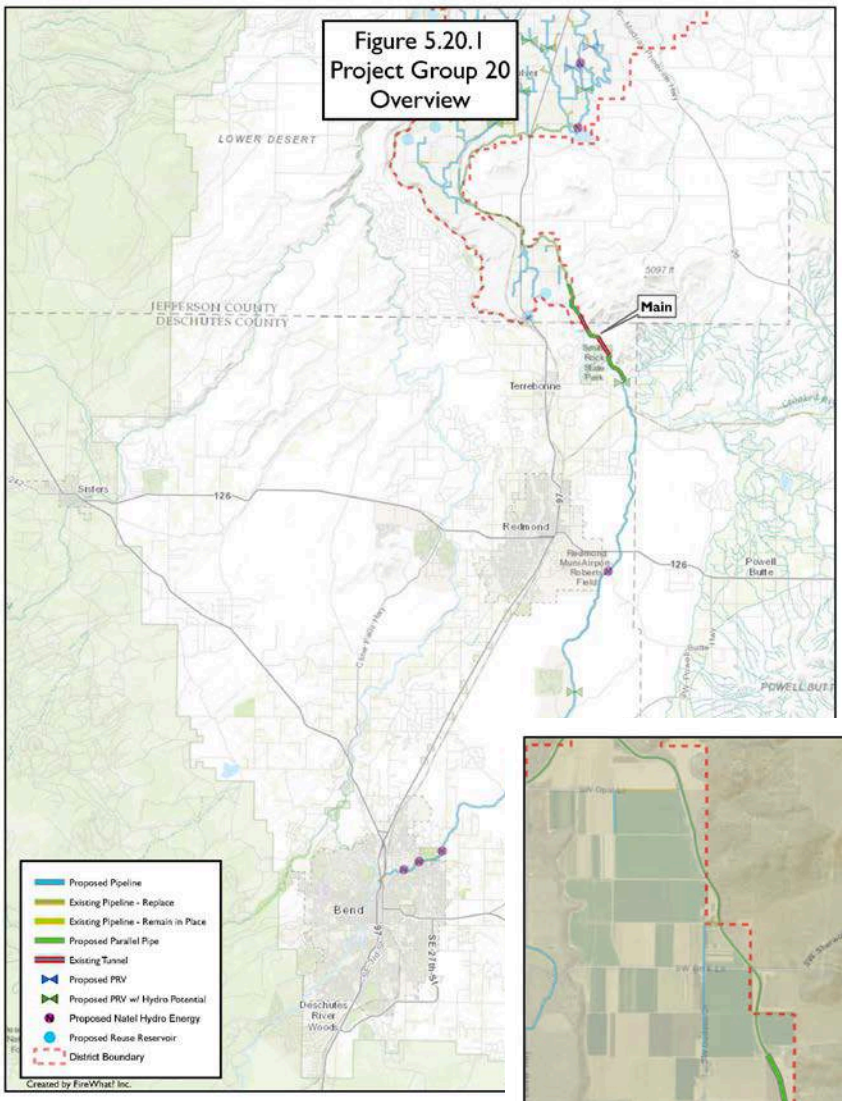


Figure 5.20.1
Project Group 20

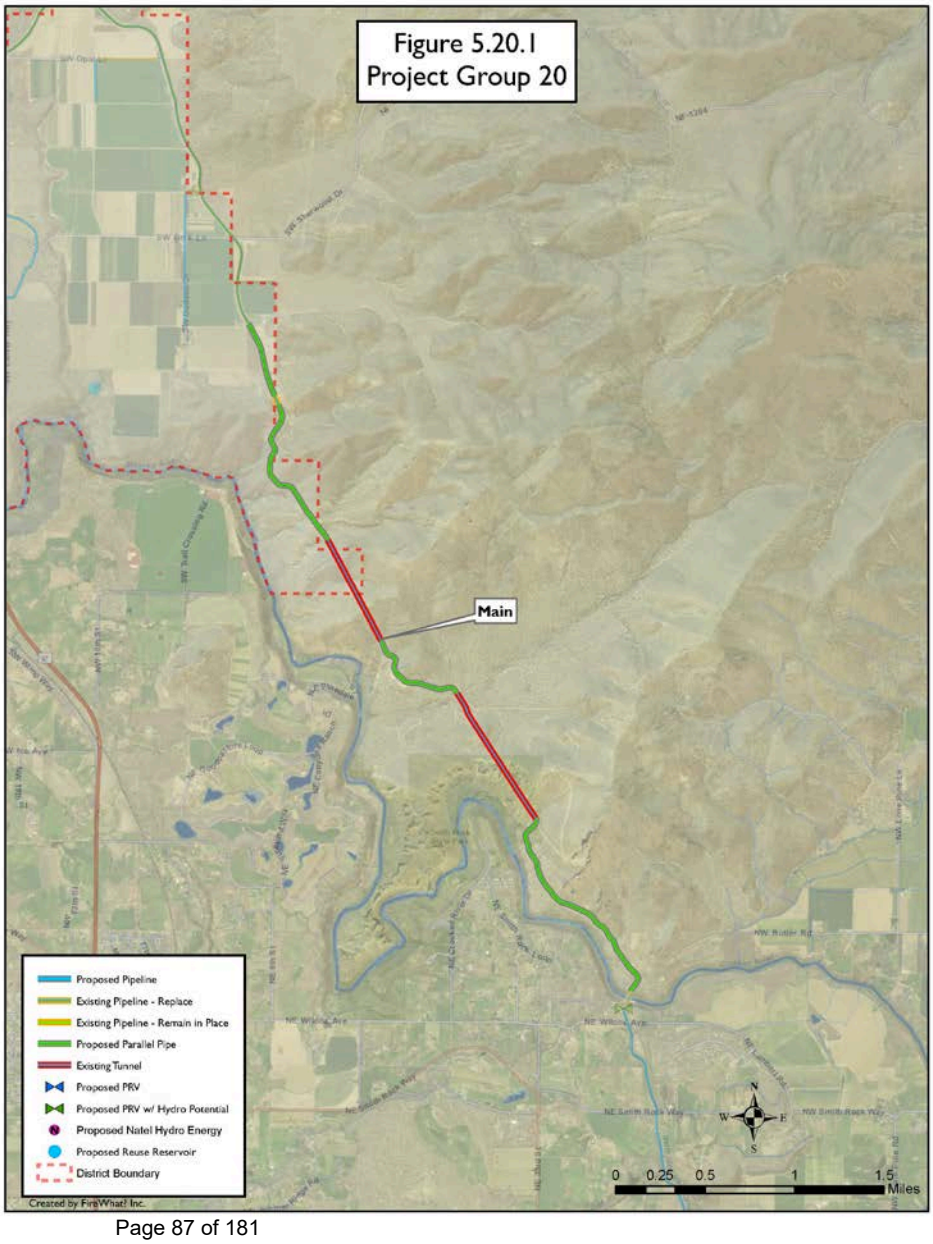


Table 5.20.1 Project Group 20 Cost Estimates

Project Group 20 - Main Canal - Crooked River Pump Station to First Delivery

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation	**0**	**kWh**
Estimated Water Conservation	**12.4**	**CFS**

Feature	Location	Dia (in)	Rating (DR or Steel)	Quantity (ft or #)	Unit	$/Unit	Total Cost
Pipe	Main-0002A	144	Steel	6,731	LF	$1,978.00	13,313,829
Pipe	Main-0002B	144	Steel	6,731	LF	$1,978.00	13,313,829
Pipe	Main-0003A	132	Steel	523	LF	$1,672.00	875,259
Pipe	Main-0004A	144	Steel	3,168	LF	$1,978.00	6,266,107
Pipe	Main-0004B	144	Steel	3,168	LF	$1,978.00	6,266,107
Pipe	Main-0005A	144	Steel	4,894	LF	$1,978.00	9,679,679
Pipe	Main-0005B	144	Steel	4,894	LF	$1,978.00	9,679,679
Pipe	Main-0006A	144	Steel	2,285	LF	$1,978.00	4,519,156
Pipe	Main-0006B	144	Steel	2,285	LF	$1,978.00	4,519,156
Pipe	Main-0151A	132	Steel	3,449	LF	$1,672.00	5,766,040
Pipe	Main-0152A	132	Steel	391	LF	$1,672.00	654,239
Pipe	Main-0153A	132	Steel	3,353	LF	$1,672.00	5,606,333
Pipe	Main-0154A	144	Steel	273	LF	$1,978.00	539,220
Pipe	Main-0154B	144	Steel	273	LF	$1,978.00	539,220
	SUBTOTAL						$81,537,852
	ENGINEERING, CM, SURVEY				6%		$4,892,271
	GMCC				12%		$9,784,542
	CONTINGENCY				30%		$28,864,400
	TOTAL						**$125,079,066**

Notes:
1. Steel rated to 200 PSI.
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

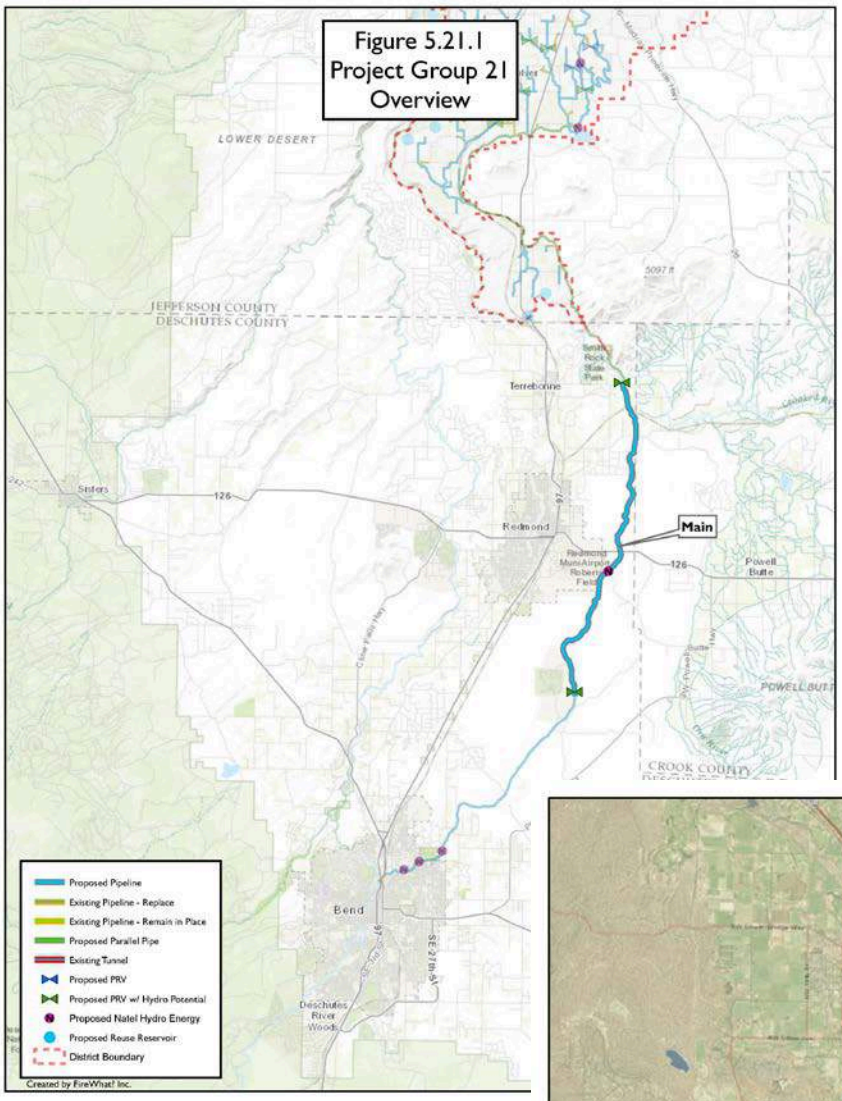


Figure 5.21.1
Project Group 21

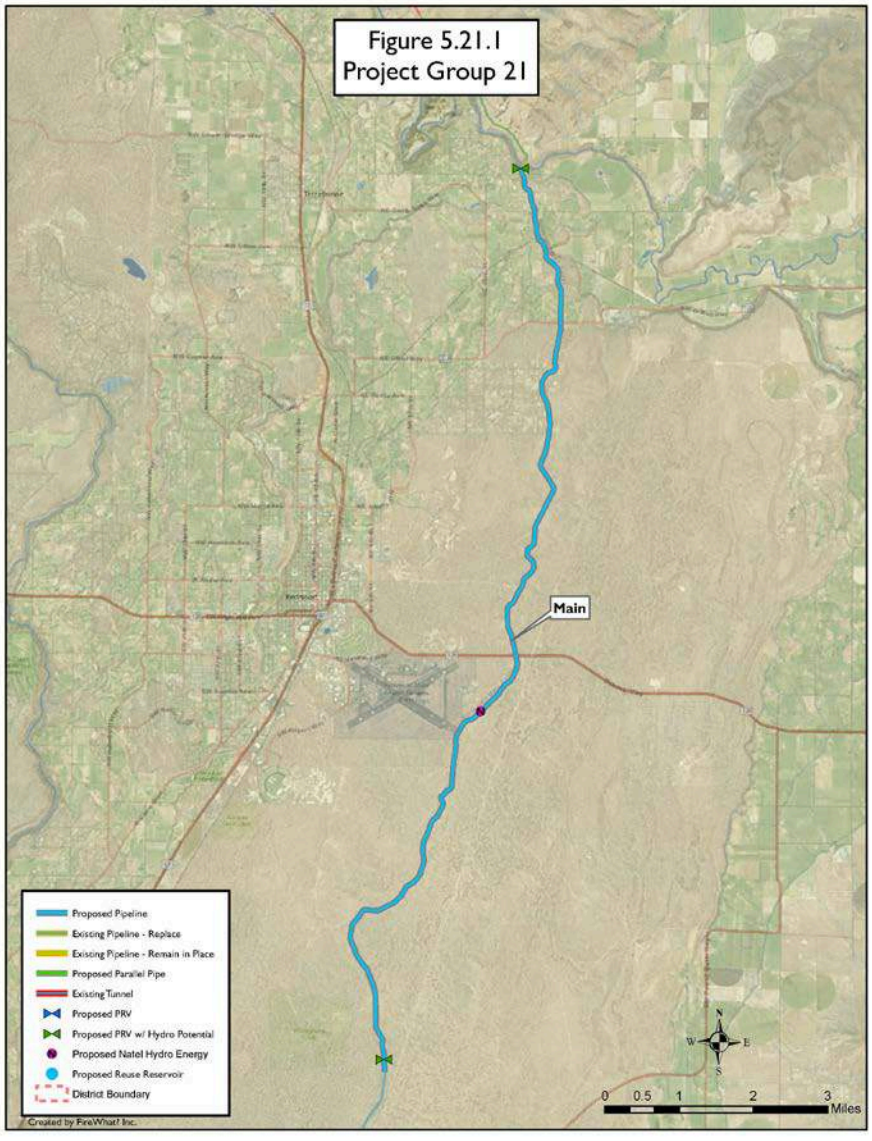


Table 5.21.1 Project Group 21 Cost Estimates

Project Group 21 - Main Canal - End of Lining to Crooked River Pump Station

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation	**0**	**kWh**
Estimated Water Conservation	**35.9**	**CFS**

Feature	Location	Dia (in)	Rating (DR or Steel)	Quantity (ft or #)	Unit	$/Unit	Total Cost
Pipe	Main-0001-2	144	Steel	72,840	LF	$1,978.00	144,076,689
PRV Station	Main-0001-2	144	-	1	LF	$1,120,000	1,120,000
	SUBTOTAL						$145,196,689
	ENGINEERIN, CM, SURVEY				6%		$8,711,801
	GMCC				12%		$17,423,603
	CONTIGENCY				30%		$51,399,628
	TOTAL						**$222,731,721**

Notes:
1. Steel rated to 200 PSI
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 feet were excluded.

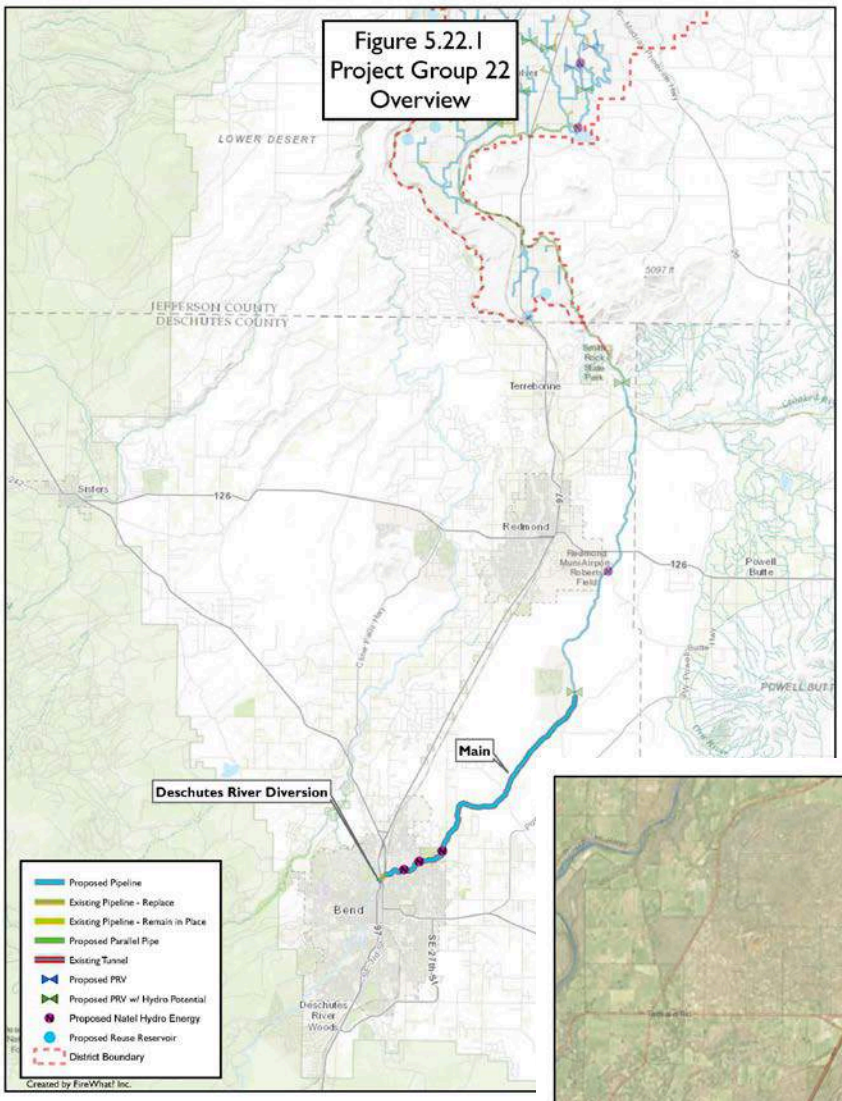


Figure 5.22.1
Project Group 22

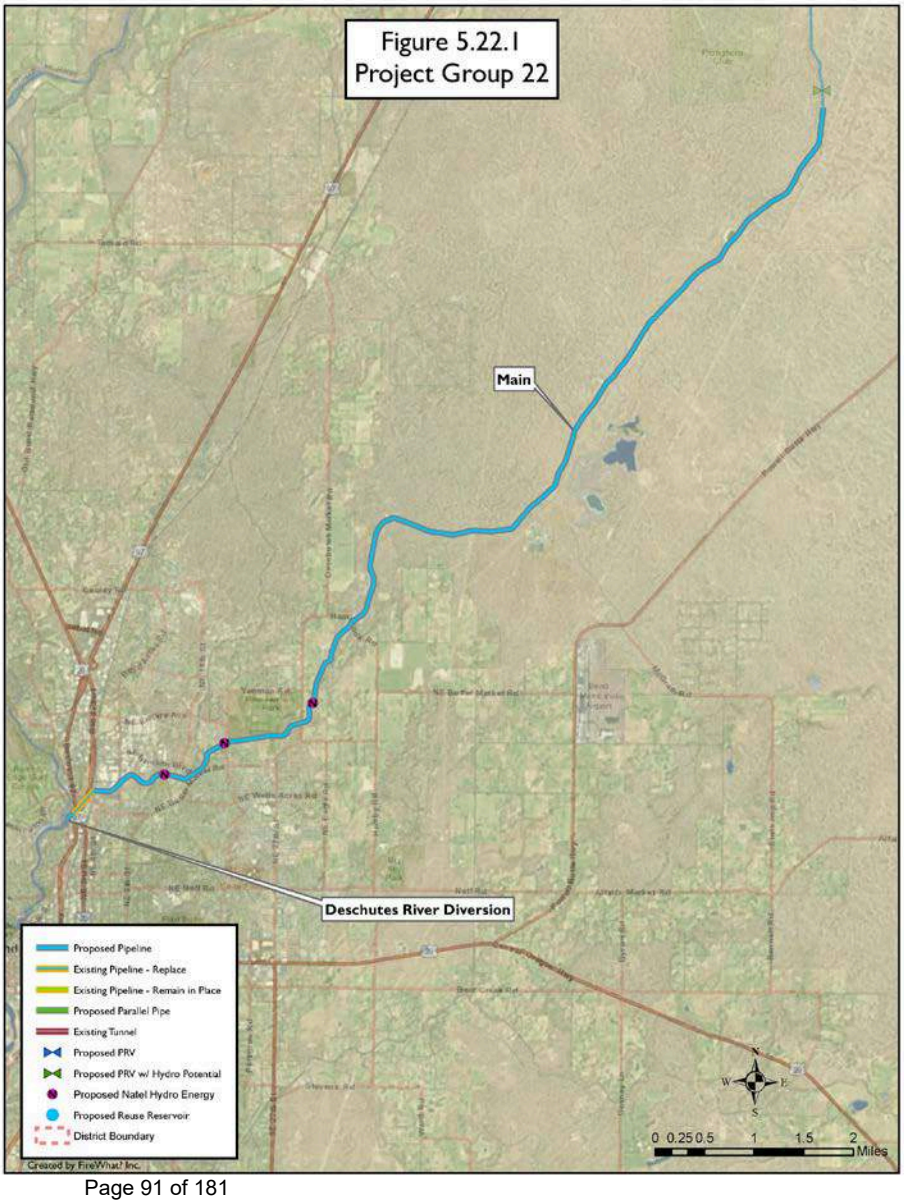


Table 5.22.1 Project Group 22 Cost Estimate

Project Group 22 - Main Canal - Headworks to End of Lining

North Unit Irrigation District

Reconnaissance - Level Construction Cost Estimates 5/18/2017

Estimated Energy Conservation	**0**	**kWh**
Estimated Water Conservation	**0.0**	**CFS**

Feature	Location	Dia (in)	Rating (DR or Steel)	Quantity (ft or #)	Unit	$/Unit	Total Cost
Pipe	Main-0001	144	Steel	61,964	LF	$1,978.00	122,564,792
Pipe	Highway-97-Bypass	144	Steel	1,630	LF	$1,978.00	3,223,481
	SUBTOTAL						$125,788,273
	ENGINEERING, CM, SURVEY				6%		$7,547,296
	GMCC				12%		$15,094,593
	CONTINGENCY				30%		$44,529,049
	TOTAL						**$192,959,211**

Notes:
1. Steel rated to 200 PSI
2. Due to limitations with EPANET, there are short sections of pipes between nodes that are required for EPANET to operate. To reduce insignificant data in the table, pipe lengths less than 5 ft were excluded

APPENDIX A

TABULATED SEEPAGE LOSS DATA

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
Main Canal Deschutes River to Haystack Reservoir

Final
03-10-17

(green)	= Spill (Loss)
(yellow)	= Not Measured or Estimated
(red)	= Return Flow
(purple)	= Included in the Study Reach and in a Sub-Lateral

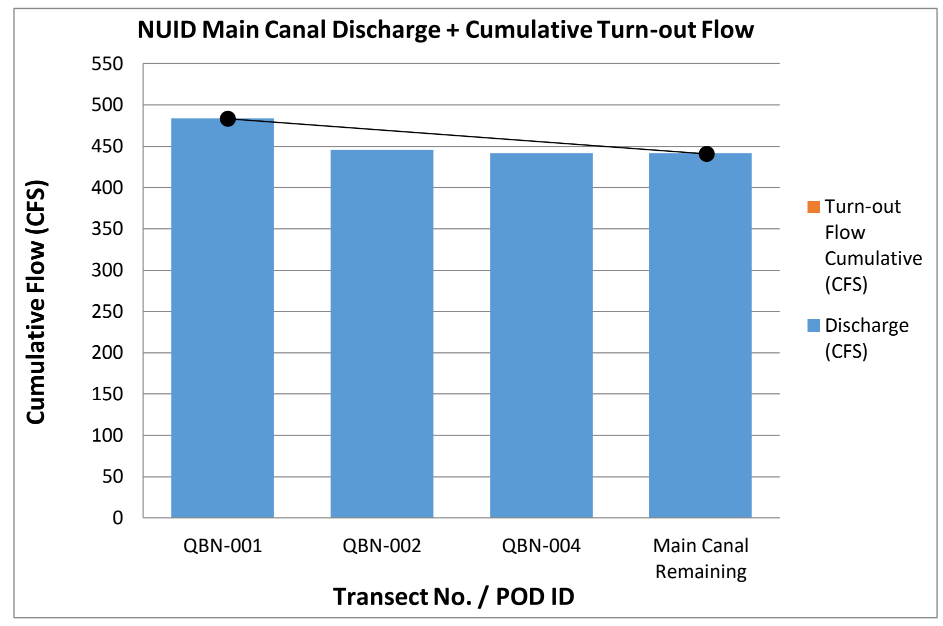
Transect No. POD #ID	**Discharge (CFS)**	**Turn-out Flow Rate (CFS)**	**Turn-out Flow Cumulative (CFS)**	**Comments**
Main Canal Deschutes River to Crooked River Inflow (ADCP Boat Measurements)				
QBN-001	**483.735**		0.00	8/2/16, Stnd. Deviation 12.686
QBN-002	**445.73**		0.00	8/2/16, Stnd. Deviation 8.757
QBN-004	**441.55**		0.00	8/2/16, Stnd. Deviation 10.352
Main Canal Remaining	**441.55**		0.00	
Crooked River Inflow		*84.00*		Inflow
Main Canal Crooked River to Haystack Reservoir (ADCP Boat Measurements)				
Crooked River Inflow		*84.00*		Inflow
QBN-006	**531.44**		0.00	8/2/16, Stnd. Deviation 6.815
R-34-A &B		-19.60		
R-31 Lat		-1.20		
R-32		0.00		
R-33		0.00		No measurement recorded, assumed OFF
R-34-C		-0.80		
R-34-D		0.00		No measurement recorded, assumed OFF
R-34-A		-0.70		
R-34-B-1		-1.20		
R-34-E		-1.00		
R-34-F-1		0.00		No measurement recorded, assumed OFF
R-34-G		0.00		No measurement recorded, assumed OFF
R-34-H		0.00		No measurement recorded, assumed OFF
R-34-I		0.00		No measurement recorded, assumed OFF
R-34-J		-1.70		
R-34-K		0.00		No measurement recorded, assumed OFF
R-34-L		0.00		No measurement recorded, assumed OFF
R-34-M		0.00		No measurement recorded, assumed OFF
QBN-008	**476.12**		26.20	8/2/16, Stnd. Deviation 9.452
37 Lat		-60.00		
QBN-009	**396.86**		86.20	8/3/16, Stnd. Deviation 6.190
38 Lat		-1.25		
QBN-010	**397.93**		87.45	8/3/16, Stnd. Deviation 3.009
41 Lat		-3.90		Pipeline
QBN-012	**387.19**		91.35	8/3/16, Stnd. Deviation 4.721
R-41-E		-0.60		
R-41-D		0.00		No measurement recorded, assumed OFF
Main 41 Lat		-35.20		
R-41-F		-0.40		
R-41-G-1		-0.80		
42 lat		-0.50		Pipeline
R-41-I		-0.90		
QBN-013	**347.88**		129.75	8/3/16, Stnd. Deviation 3.454
Main Canal Remaining	**347.88**		129.75	

Main Canal Deschutes River to Crooked River

Main Canal Crooked River to Hystack Reservoir

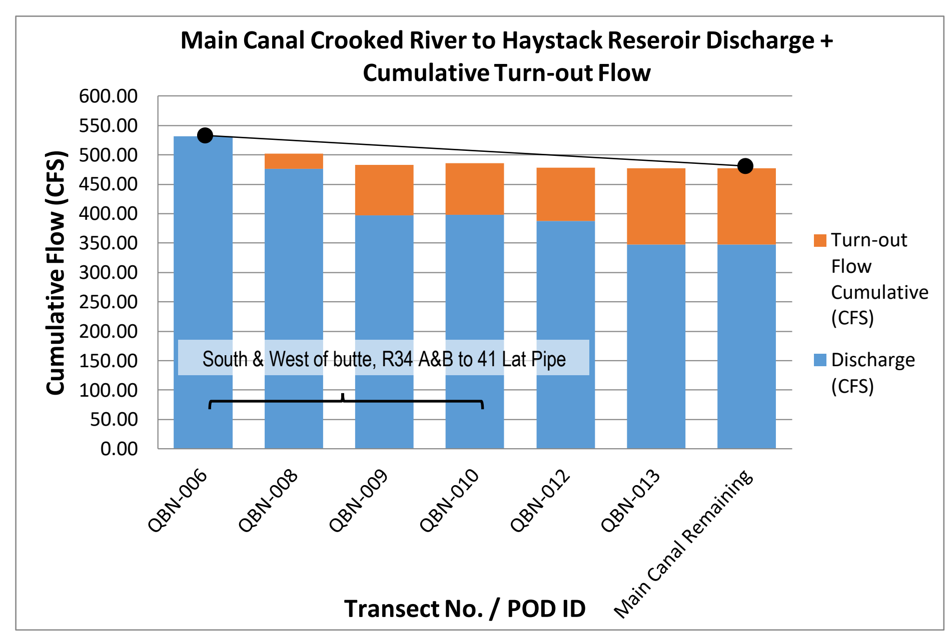
NUID Main Canal Discharge Measurements Deschutes River to Haystack Res

Over-all Main Canal Intake to the Study Reaches	=	1015.18		
Over-all Main Canal Spill from the Study Reaches	=	0.00		
Over-all Main Canal Turnouts + Flow Remaining	=	-919.18		
Over-all Main Canal Seepage Loss in the Study Reaches	=	96.00	=	9.46%



Main Canal from Deschutes River to Crooked River Inflow

Main Canal Intake Desch River to Crooked River	=	483.74		
Main Canal Spill from the Study Reach	=	0.00		
Main Canal Turnouts + Flow Remaining	=	-441.55		
Main Canal Seepage Loss in the Study Reach	=	42.19	=	8.72%



Main Canal from Crooked River Inflow to Haystack Reservoir

Main Canal Crooked River to Haystack Res. Intake to Reach	=	531.44		
Main Canal Spill from the Study Reach	=	0.00		
Main Canal Turnouts + Flow Remaining	=	-477.63		
Main Canal Seepage Loss in the Study Reach	=	53.82	=	10.13%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
Main Canal Below Haystack Reservoir

Final
03-10-17

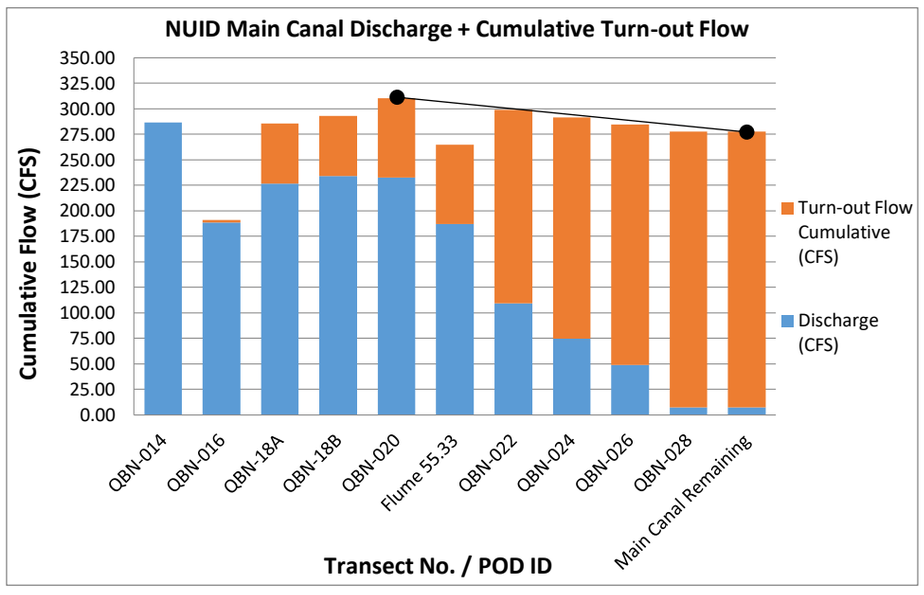
	= Spill (Loss)
	= Not Measured or Estimated
	= Return Flow
	= Included in the Study Reach and in a Sub-Lateral

Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments
Main Canal Below Haystack Reservoir (ADCP Boat Measurements)				
QBN-014	**286.38**		0.00	7/26/16, Stnd. Deviation 4.849
Lateral 45-3		*8.22*	0.00	Return Flow
R-51-Dead		0.00		Abandoned
R-51-F		0.00		Closed
48-Lat Out Take		-1.10		Piped
R-51 G, G-1, H		0.00		Meas. Device R-51 G, closed
45-2 Lat		-5.49		Piped at Out Take
R-51-Dead		0.00		Abandoned
R-51-I		0.00		Closed
R-51-J		0.00		Closed
R-51-NUID		-0.30		Pulling 0.2 CFS, 0.1 CFS left
Lateral 50		-3.61		4 feet Cippolletti weir, 0.42 feet depth
QBN-016	**188.45**		2.28	7/26/16, Stnd. Deviation 16.561
R-51-K		-3.20		Direct read measure at measure device
R-51-L		-0.10		
51 Lateral		-20.96		7 feet Cippolletti weir, 0.94 feet depth
M-51		-25.00		
L-51		-0.20		
R-51-M		-0.79		2 feet Cippolletti weir, 0.24 feet depth
PL-52		-2.85		Meas. Device PL-52
L-52 Lat		-1.50		
R-53-A		0.00		Closed
R-53-B		-0.01		2 feet Cippolletti weir, 0.01 feet depth
R-53-C		0.00		Closed
R-53-C1		0.00		Closed
R-53-D		0.00		Closed
R-53-NUID		0.00		Closed
R-53-D1		0.00		Closed
R-53-F		-0.83		2 feet Cippolletti weir, 0.25 feet depth
R-53-F1		0.00		Closed but leaking
R-53-F2		-0.55		2 feet Cippolletti weir, 0.19 feet depth
R53-F3		-0.51		2 feet Cippolletti weir, 0.18 feet depth
R-53 Dead		0.00		Abandoned
R-53-G		0.00		Closed
QBN-18A	**226.49**		58.78	7/26/2016, Stnd. Deviation 9.998
QBN-18B	**234.03**		58.78	7/27/2016, Stnd. Deviation 3.833
R-53-H		0.00		Closed
R-53-H Meter		0.00		Closed
PL-53 Lat		-2.90		
R-53-H-3		0.00		Closed
R-53-H-1		0.00		Closed
R-53-H-2		0.00		Closed
R-53-H-4		-2.67		4 ft Cippolletti w/ 0.34 ft depth at crest
R-53-I + R53-I-A		-1.39		R-53-A = 2 ft Cip. @ 0.35 ft D, R-53-I closed
R-53-J		0.00		Abandoned
R-53-K		-1.50		
55 Lat		-7.67		5 ft Cippolletti w/ 0.60 ft depth at crest
R-53-M		0.00		Abandoned
R-53-L		0.00		Closed
R-53-Dead		0.00		Abandoned
R-53-N		0.00		Closed
R-53-O		-0.79		2 ft Cippolletti w/ 0.24 ft depth at crest
R-53-P		-0.64		2 ft Cippolletti w/ 0.21 ft depth at crest
R-56-Lat Continued		-1.29		4 ft Cippolletti w/ 0.21 ft depth at crest
QBN-020	**232.57**		77.63	7/27/2016, Stnd. Deviation 15.440
Flume 55.33	**187.00**		77.63	
Main 57 Lat		-15.73		8 ft Cippolletti w/ 0.71 ft depth at crest
R-57-A		0.00		Closed
R-57-B		0.00		Closed
R-57-C		0.00		Closed
R-57-D		-0.74		2 ft Cippolletti w/ 0.23 ft depth at crest
Main 58 Lat		-94.78		
R-57-E		-0.60		2 ft Cippolletti w/ 0.20 ft depth at crest
R-57-F		0.00		Closed
R-57-G		0.00		Abandoned
R-57-Dead		0.00		Abandoned
R-PL NUID		0.00		Closed
I-58		0.00		Does not exist
QBN-022	**109.44**		189.48	7/27/2016, Stnd. Deviation 2.495
R-57-I		0.00		Closed
R-57-I-2		0.00		Closed
P-58-Lat		-1.30		
R-57-Dead		0.00		Abandoned

NUID Main Canal

NUID Main Canal Discharge Measurements Haystack to Tailwater

Over-all Main Canal Intake to the Study Reach	=	232.57	
Over-all Main Canal Spill from the Study Reach	=	0.00	
Over-all Main Canal Turnouts + Flow Remaining	=	-200.0	
Over-all Main Canal Seepage Loss in the Study Reach	=	32.53	= 13.99%



NUID Main Canal Intake to the Study Reach	=	232.57	
NUID Main Canal Spill from the Study Reach	=	0.00	
NUID Main Canal Turnouts + Flow Remaining	=	-200.04	
NUID Main Canal Seepage Loss in the Study Reach	=	32.53	= 13.99%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
Main Canal Below Haystack Reservoir

Final
03-10-17

Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments
59-Lat		-8.16		7 ft Cippolletti w/ 0.50 ft depth at crest
R-59-I		0.00		Closed
R-57-M + R-57-N		0.00		Closed
R-57-O		-2.33		3 ft Cippolletti w/ 0.38 ft depth at crest
R-57-O-2(P)		-0.46		
R-63-A		0.00		Closed
R-63-A-1		0.00		Closed
R-63-A-2		0.00		Closed
R-63-A-3		0.00		Closed
60 Lat		-4.99		5 ft Cippolletti w/ 0.45 ft depth at crest
R-63-B		0.00		Closed
R-63-C		0.00		Closed
61-Lat		-6.37		5 ft Cippolletti w/ 0.53 ft depth at crest
PL-62		-2.65		
R-63-D		0.00		Closed
R-63-E		0.00		Closed
R-63-F		-1.26		2 ft Cippolletti w/ 0.33 ft depth at crest
QBN-024	**74.63**		217.00	7/27/2016, Stnd. Deviation 5.141
R-63-G		0.00		Closed
R-63-H		0.00		Closed
R-63-I		0.00		Closed
R-63-J		0.00		Closed
R-63-K		-1.25		
R-63-L		-0.30		
R-63-NUID				No measurement recorded
R-63-M		-1.00		
M-63-Lat		-15.31		
R-64-A				No measurement recorded
R-64-B		0.00		Closed
R-64-C		0.00		Closed
R-64-D		0.00		Closed
R-64-E		-0.50		
R-64-F		-0.20		
R-64-1 Lat		0.00		Closed
R-64-G Dead		0.00		Abandoned
QBN-026	**49.07**		235.56	7/27/2016, Stnd. Deviation 0.823
R-64-H		-0.60		
6-64-G-1		-0.40		
R-64-2 Lat		0.00		Closed
R-64-2-A		0.00		
R-64-I		0.00		Closed
R-64-I-1		0.00		Closed
R-64-J		-2.50		
Main 64 Lat		-28.80		
R-64-K				No measurement recorded
R-64-L		0.00		Closed
R-64-N		-2.00		
R-64-O		-0.50		
R-64-P		0.00		
R-64-R		0.00		found
QBN-028	**7.31**		270.36	7/27/2016, Stnd. Deviation 0.081
R-64-Q Take Out		0.00		
Main Canal Remaining	**7.31**		270.36	

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
Laterals

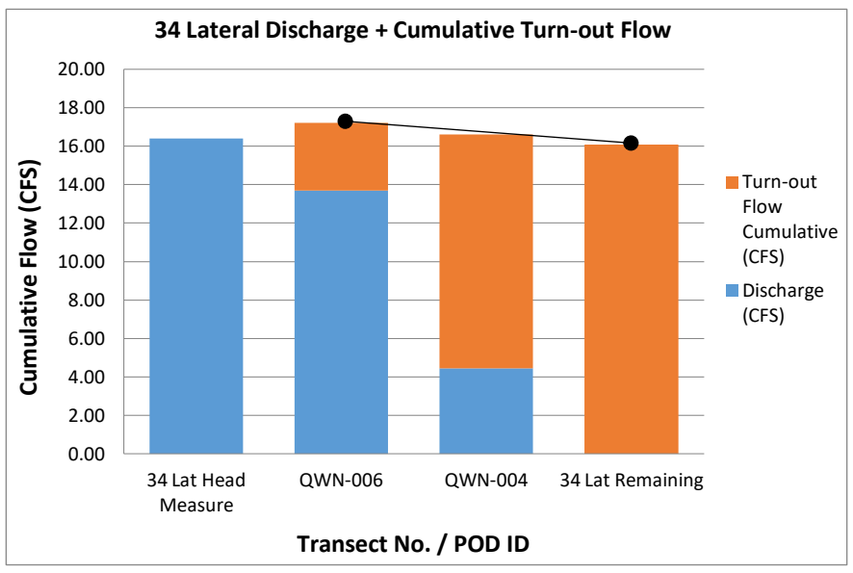
Final
03-10-17

	= Spill (Loss)
	= Not Measured or Estimated
	= Return Flow
	= Included in the Study Reach and in a Sub-Lateral

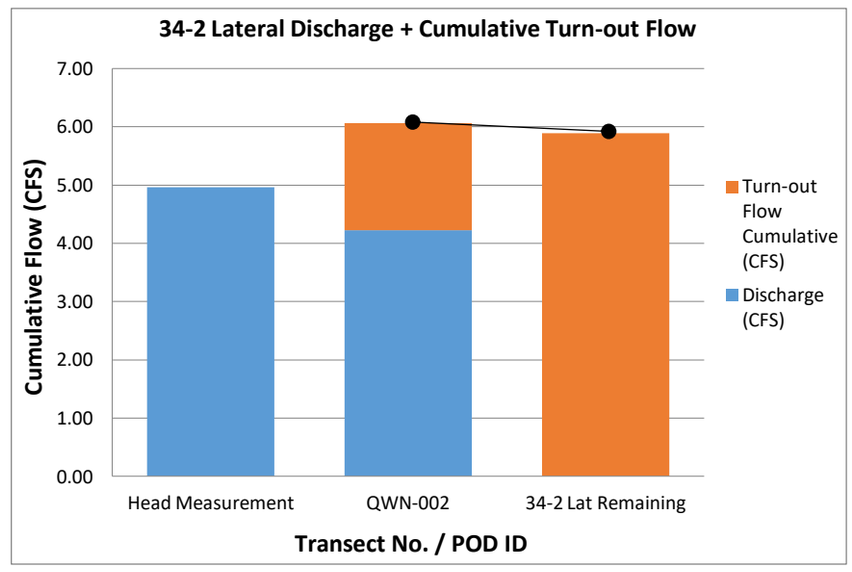
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
34 Lateral					34 Lateral
34 Lat Head Measure	**16.40**		0.00	8/4/16, measure device signal output recorded	
34-1 Lat		-1.19		3 ft Cipolletti, 0.24 ft depth	
34-C		0.00		No measurement recorded, assumed OFF	
34-D		-1.22		2 ft Cipolletti, 0.32 ft depth	
34-D-2		-1.11		2 ft Cipolletti, 0.30 ft depth	
QWN-006	**13.70**		3.52	8/4/16, measurement rated as "Good"	
34-E-1		-0.69		2 ft Cipolletti, 0.22 ft depth	
34-2 Lat		-5.05		4 ft Cipolletti, 0.52 ft depth	
34-F		-2.31		2 ft Cipolletti, 0.49 ft depth	
34-G		0.00		No measurement recorded, assumed OFF	
34-3-B		0.00		No measurement recorded, assumed OFF	
34-H		-0.60		2 ft Cipolletti, 0.20 ft depth	
QWN-004	**4.44**		12.17	8/4/16, measurement rated as "Fair"	
34-H-1		-0.43		2 ft Cipolletti, 0.16 ft depth	
34-I		-0.35		2 ft Cipolletti, 0.14 ft depth	
34-K		-0.10		2 ft Cipolletti, 0.06 ft depth	
34-L		0.00		No measurement recorded, assumed OFF	
34-M		-0.43		2 ft Cipolletti, 0.16 ft depth	
34 -N Continued (34 N)		-2.60		2 ft Cipolletti, 0.53 ft depth (to pond)	
34 Lat Remaining	**0.00**		16.08		
34-2 Lateral					34-2 Lateral
Head Measurement	**4.96**		0.00	8/4/16, head weir, 4 ft Cipolletti, 0.52 ft depth	
34-2-A		-0.15		Measure device signal output recorded	
34-2-B		-1.69		2 ft Cipolletti, 0.40 ft depth	
34-2-B-1		0.00		No measurement recorded, assumed OFF	
QWN-002	**4.22**		1.84	8/4/16, measurement rated as "Good"	
34-2-C		0.00		No measurement recorded, assumed OFF	
34-2-D		-0.94		2 ft Cipolletti, 0.27 ft depth	
34-2-G-1		-1.38		2 ft Cipolletti, 0.35 ft depth	
34-2-H		-0.99		2 ft Cipolletti, 0.28 ft depth	
34-2-I		-0.74		2 ft Cipolletti, 0.23 ft depth	
34-2 Lat Remaining	**0.00**		5.89		
37 Lateral					
37 Lat Head Measure	**60.00**		0.00	8/3/16, head of Lat weir or flow meter	
37-A		-0.70		3 ft Cipolletti, 0.17 ft depth	
37-B		-0.21		2 ft Cipolletti, 0.10 ft depth	
37-C		0.00		No measurement recorded, assumed OFF	
37-1 Lat		-2.52		4 ft Cipolletti, 0.33 ft depth	
QWN-008	**61.27**		3.43	8/3/16, measurement rated as "Good"	
37-G		-3.42		3 ft Cipolletti, 0.49 ft depth	
37-2 Lat		-0.20		4 ft Cipolletti, 0.06 ft depth	
37-3 Lat		-19.17		6 ft Cipolletti, 0.98 ft depth	
QWN-018	**37.79**		26.22	8/3/16, measurement rated as "Good"	
37-J		-0.18		2 ft Cipolletti, 0.09 ft depth	
37-K		-0.69		2 ft Cipolletti, 0.22 ft depth	
37-L		0.00		No measurement recorded, assumed OFF	
37-M		-2.29		2 ft Cipolletti, 0.49 ft depth	
QWN-020	**33.13**		29.38	8/3/16, measurement rated as "Good"	
37-N		0.00		No measurement recorded, assumed OFF	
37-N-1		-1.75		2 ft Cipolletti, 0.41 ft depth	
QWN-024	**33.69**		31.13	Rated "Poor", very turbulent, large rocks	
37-4 Lat		-15.21		8/3/16, 6 ft Cipolletti, 0.84 ft depth	

Over-all NUID Discharge Measurements in Laterals

Over-all NUID Laterals Intake to the Study Reaches	=	647.78	
Over-all NUID Lateral Spill from the Study Reaches	=	-1.03	
Over-all NUID Laterals Turnouts + Flow Remaining	=	-576.17	
Over-all NUID Laterals Seepage Loss in Study Reaches	=	70.58	= 10.90%



34 Lateral Intake to the Study Reach	=	13.70
34 Lateral Spill from the Study Reach	=	0.00
34 Lateral Turnoutss + Flow Remaining	=	-12.56
34 Lateral Seepage Loss in the Study Reach	=	1.14 = 8.34%

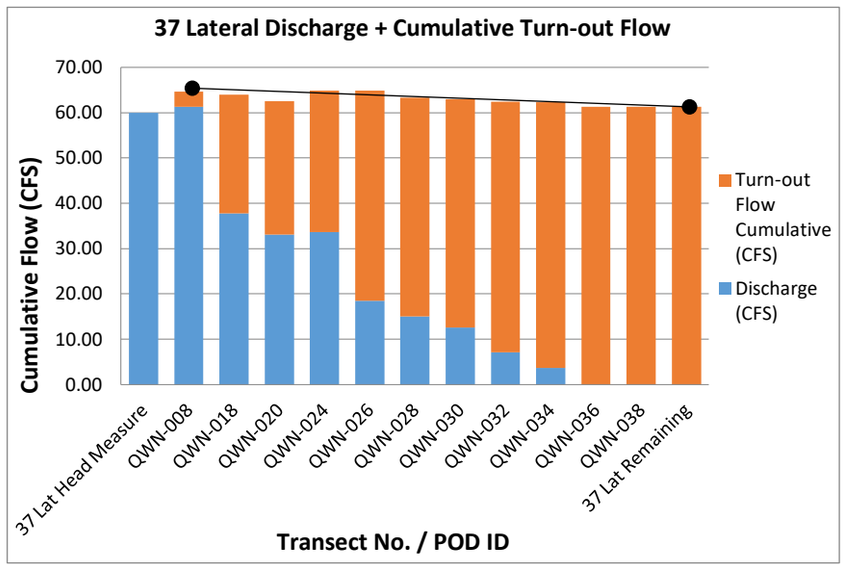


34-2 Lateral Intake to the Study Reach	=	4.22
34-2 Lateral Spill from the Study Reach	=	0.00
34-2 Lateral Turnouts + Flow Remaining	=	-4.05
34-2 Lateral Seepage Loss in the Study Reach	=	0.17 = 4.12%

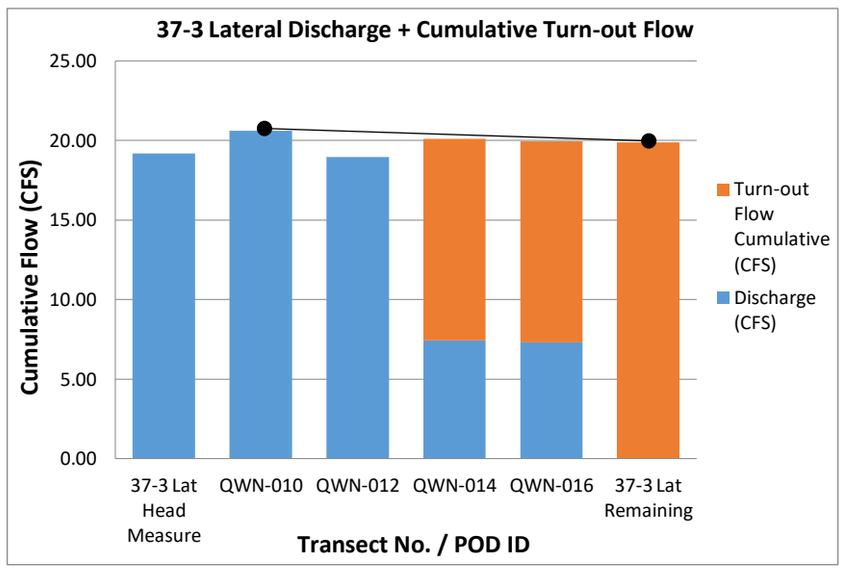
NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
Laterals

Final
03-10-17

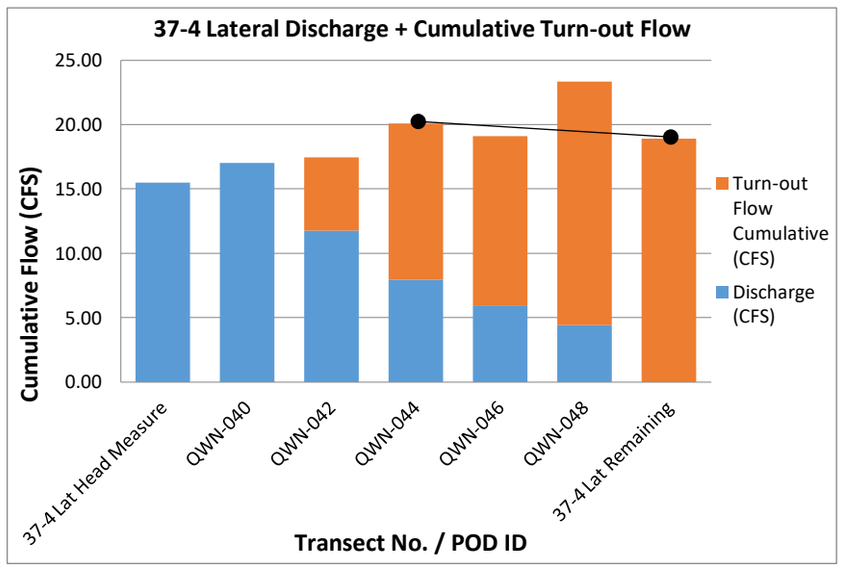
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
37-O		0.00		No measurement recorded, assumed OFF	37 Lateral
QWN-026	**18.52**		46.34	8/3/16, measurement rated as "Good"	
37-Q		0.00		No measurement recorded, assumed OFF	
37-R		-1.38		2 ft Cipolletti, 0.35 ft depth	
37-S		0.00		No measurement recorded, assumed OFF	
37-T		0.00		No measurement recorded, assumed OFF	
37-U		0.00		No measurement recorded, assumed OFF	
37-V		0.00		No measurement recorded, assumed OFF	
37-X		-0.60		2 ft Cipolletti, 0.20 ft depth	
QWN-028	**15.04**		48.32	Measurement rated as "Good"	
37-Y		0.00		No measurement recorded, assumed OFF	
37-5 Lat		-2.06		8/3/16, 3 ft Cipolletti, 0.35 ft depth	
QWN-030	**12.56**		50.38	Measurement rated as "Good"	
37-Z-1		-2.29		2 ft Cipolletti, 0.49 ft depth	
37-6 Lat		-0.20		4 ft Cipolletti, 0.06 ft depth	
37-Z-2		0.00		No measurement recorded, assumed OFF	
37-7 Lat		-2.37		3 ft Cipolletti, 0.38 ft depth	
QWN-032	**7.14**		55.24	8/3/16, measurement rated as "Good"	
37-8 Lat		-3.42		8/3/16, 3 ft Cipolletti, 0.49 ft depth	
37-Z-5		0.00		No measurement recorded, assumed OFF	
37-Z-6-DEAD		0.00		No measurement recorded, assumed OFF	
37-Z-7		0.00		No measurement recorded, assumed OFF	
QWN-034	**3.66**		58.66	8/3/16, rated as "Fair", silty substrate	
37-9 Lat		0.00		No measurement recorded, assumed OFF	
37-Z-8		0.00		No measurement recorded, assumed OFF	
37-Z-9		0.00		No measurement recorded, assumed OFF	
37-Z-10		-1.56		2 ft Cipolletti, 0.38 ft depth	
37-10-A		-0.10		2 ft Cipolletti, 0.06 ft depth	
37-Z-12		-0.60		2 ft Cipolletti, 0.20 ft depth	
37-Z-13		-0.43		2 ft Cipolletti, 0.16 ft depth	
QWN-036			61.35	Too little flow for instrument	
QWN-038			61.35	Too much veg, too little flow for instrument	
37 Lat Remaining	**0.00**		61.35		
37-3 Lateral					37-3 Lateral
37-3 Lat Head Measure	**19.17**		0.00	8/3/16, head weir 6 ft Cipolletti, 0.98 ft depth	
37-3-A		0.00		No measurement recorded, assumed OFF	
QWN-010	**20.62**		0.00	8/3/16, measurement rated "Good"	
QWN-012	**18.96**		0.00	8/3/16, not rated, noted mostly flat, no veg	
37-3-B		0.00		No measurement recorded, assumed OFF	
37-3-C		-4.17		3 ft Cipolletti, 0.56 ft depth	
37-3-D		-2.75		4 ft Cipolletti, 0.35 ft depth	
PL-37-3-1-A		-0.99		2 ft Cipolletti, 0.28 ft depth	
PL-37-3-1-B		-2.15		2 ft Cipolletti, 0.47 ft depth	
37-3-E		-2.58		2 ft Cipolletti, 0.53 ft depth	
QWN-014	**7.45**		12.64	8/3/16, measurement rated "Good"	
QWN-016	**7.30**		12.64	8/3/16, measurement rated "Good"	
37-3-H		-1.07		2 ft Rectangular, 0.30 ft depth	
37-3-F&G		0.00		No measurement recorded, assumed OFF	
37-3-J		-3.12		2 ft Cipolletti, 0.60 ft depth	
37-3-J-1		-0.83		2 ft Cipolletti, 0.25 ft depth	
37-3-I&K		-2.22		2 ft Cipolletti, 0.48 ft depth	
37-3 Lat Remaining	**0.00**		19.88		
37-4 Lateral					37-4 Lateral
37-4 Lat Head Measure	**15.48**		0.00	8/4/16, head weir, 6 ft Cipolletti, 0.85 ft depth	
QWN-040	**17.00**		0.00	8/4/16, measurement rated as "Good"	
37-4-1 Lat		-5.69		4 ft Cipolletti, 0.57 ft depth	
QWN-042	**11.77**		5.69	8/4/16, measurement rated as "Good"	
37-4-A		0.00		No measurement recorded, assumed OFF	
37-4-B		-2.22		2 ft Cipolletti, 0.48 ft depth	
37-4-C		-4.21		2 ft Cipolletti, 0.73 ft depth	
QWN-044	**7.97**		12.12	Measurement rated as "Good"	
37-4-C-1		0.00		No measurement recorded, assumed OFF	
37-4-C-2		0.00		No measurement recorded, assumed OFF	
37-4-D-1		-1.04		2 ft Cipolletti, 0.29 ft depth	
37-4-F		0.00		No measurement recorded, assumed OFF	
QWN-046	**5.93**		13.16	Measurement rated as "Good"	
37-4-G		0.00		No measurement recorded, assumed OFF	
37-4-G-1		0.00		No measurement recorded, assumed OFF	
37-4-H		0.00		No measurement recorded, assumed OFF	
37-4-I		0.00		No measurement recorded, assumed OFF	
37-4-J		-3.86		2 ft Cipolletti, 0.69 ft depth	
37-4-K		-1.88		2 ft Cipolletti, 0.43 ft depth	
QWN-048	**4.42**		18.90	Rated "Poor", canal flooded over banks	
37-4 Lat Remaining	**0.00**		18.90		



37 Lateral Intake to the Study Reach = 61.27
37 Lateral Spill from the Study Reach = 0.00
37 Lateral Turnouts + Flow Remaining = -57.92
37 Lateral Seepage Loss in the Study Reach = 3.35 = 5.47%



37-3 Lateral Intake to the Study Reach = 20.62
37-3 Lateral Spill from the Study Reach = 0.00
37-3 Lateral Turnouts + Flow Remaining = -19.88
37-3 Lateral Seepage Loss in the Study Reach = 0.74 = 3.59%

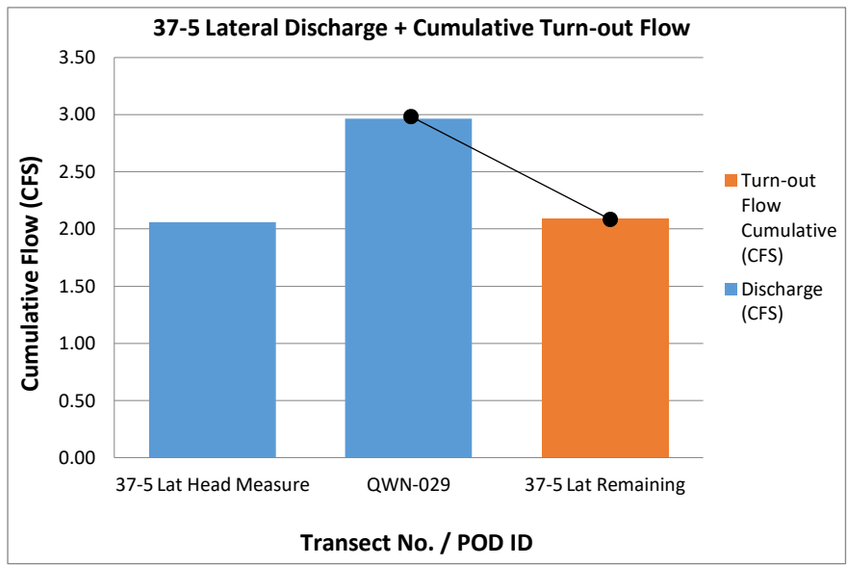


37-4 Lateral Intake to the Study Reach = 7.97
37-4 Lateral Spill from the Study Reach = 0.00
37-4 Lateral Turnouts + Flow Remaining = -6.78
37-4 Lateral Seepage Loss in the Study Reach = 1.19 = 14.93%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
Laterals

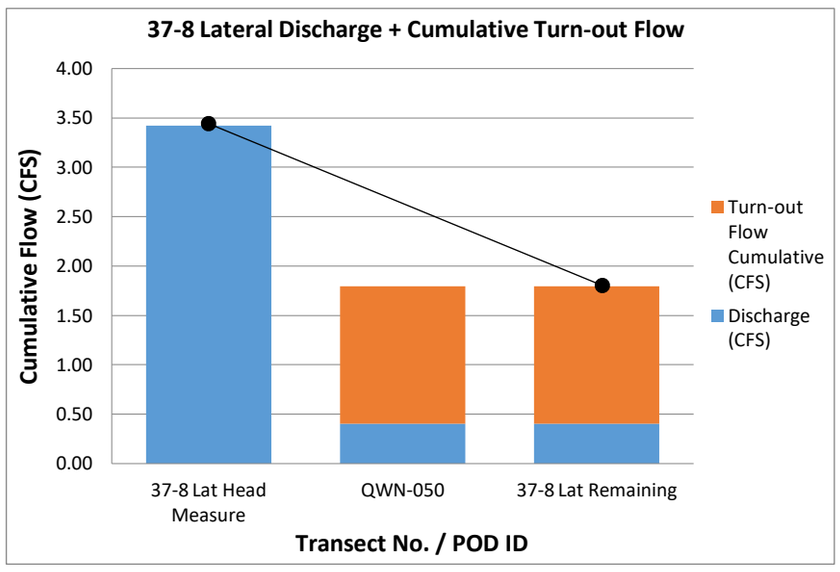
Final
03-10-17

Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
37-5 Lateral					37-5 Lateral
37-5 Lat Head Measure	**2.06**		0.00	8/3/16, head weir, 3 ft cipolletti, 0.35 ft depth	
QWN-029	**2.96**		0.00	8/3/16, measure rated "Poor", narrow cana	
37-5-C		-0.88		2 ft Cipolletti, 0.26 ft depth	
37-5-D		-1.21		2 ft Cipolletti, 0.32 ft depth	
37-5 Lat Remaining	**0.00**		2.09		
37-6 Lateral					37-6 Lateral
37-6 Lat Head Measure	**0.20**		0.00	8/3/16, head weir, 4 ft Cipolletti, 0.02 ft depth	
QWN-031				8/3/16, no measurement, min flow, very silty	
37-8 Lateral					37-8 Lateral
37-8 Lat Head Measure	**3.42**		0.00	8/3/16, head weir, 3 ft cipolletti, 0.49 ft depth	
37-8-A		0.00		No measurement recorded, assumed OFF	
37-8-B		0.00		No measurement recorded, assumed OFF	
37-8-C		-1.04		2 ft Cipolletti, 0.29 ft depth	
37-8-E		-0.35		2 ft Cipolletti, 0.14 ft depth	
QWN-050	**0.40**		1.39	8/3/16, measurement rated as "Poor", silty	
37-8 Lat Remaining	**0.40**		1.39		
38 Lateral					38 Lateral
38 Lat Head Measure	**2.33**		0.00	8/4/16, head weir, 3 ft Cipolletti, 0.38 ft depth	
38-A		-0.04		2 ft Cipolletti, 0.03 ft depth	
QWN-022	**2.42**		0.04	8/4/16, measurement rated as "Good"	
38-C		-1.04		2 ft Cipolletti, 0.29 ft depth	
38 Lat Remaining	**0.00**		1.08		

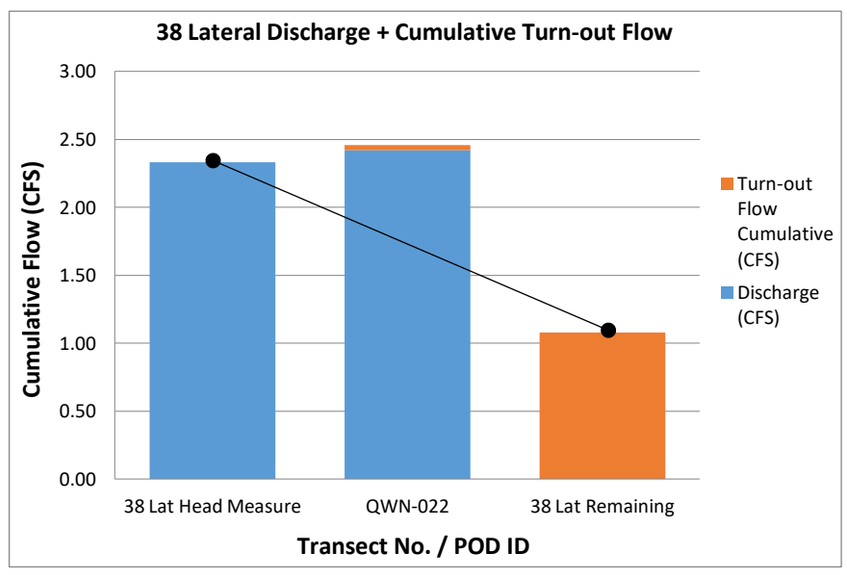


37-5 Lateral Intake to the Study Reach = 2.96
37-5 Lateral Spill from the Study Reach = 0.00
37-5 Lateral Turnouts + Flow Remaining = -2.09
37-5 Lateral Seepage Loss in the Study Reach = 0.87 = 29.51%

No Loss Assessment Evaluation Made



37-8 Lateral Intake to the Study Reach = 3.42
37- 8 Lateral Spill from the Study Reach = 0.00
37-8 Lateral Turnouts + Flow Remaining = -1.79
37-8 Lateral Seepage Loss in the Study Reach = 1.63 = 47.56%

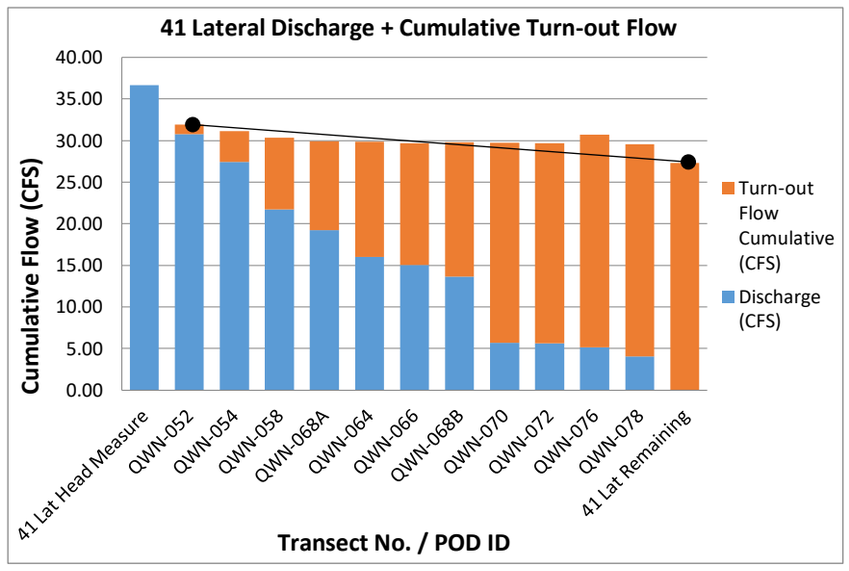


38 Lateral Intake to the Study Reach = 2.33
38 Lateral Spill from the Study Reach = 0.00
38 Lateral Turnouts + Flow Remaining = -1.08
38 Lateral Seepage Loss in the Study Reach = 1.25 = 53.65%

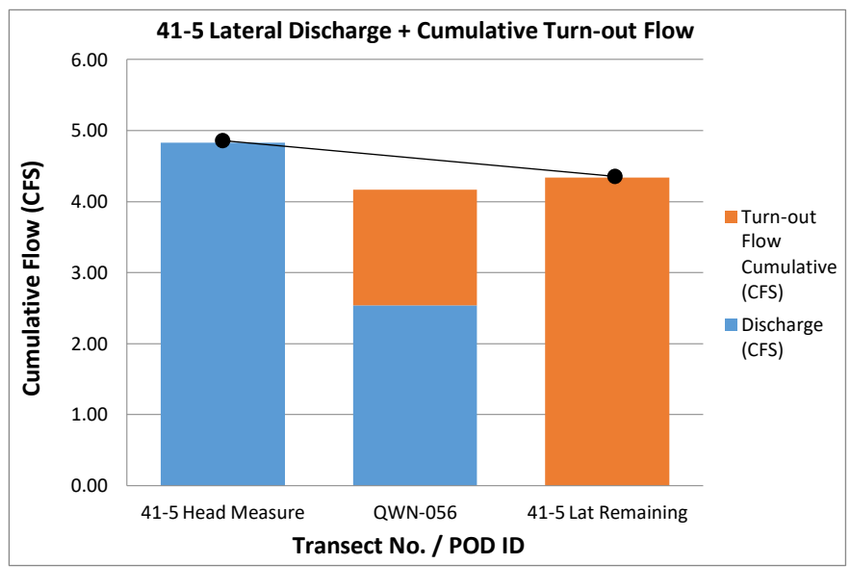
NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
Laterals

Final
03-10-17

Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
41 Lateral					
41 Lat Head Measure	**36.65**		0.00	8/1/16, head weir or meter output recorded	
41-A		0.00		No measurement recorded, assumed OFF	
41-B		0.00		No measurement recorded, assumed OFF	
41-C		-0.55		2 ft Cipolletti, 0.19 ft depth	
41-F		-0.60		2 ft Cipolletti, 0.20 ft depth	
QWN-052	**30.76**		1.15	8/1/16, measurement rated as "Good"	
41-H		0.00		No measurement recorded, assumed OFF	
41-3-A		-2.52		4 ft Cipolletti, 0.33 ft depth	
41-G		0.00		No measurement recorded, assumed OFF	
QWN-054	**27.44**		3.67	8/1/16, measurement rated as "Good"	
41-5 Lat		-4.83		5 ft Cipolletti, 0.44 ft depth	
41-I		0.00		No measurement recorded, assumed OFF	
41-J		0.00		No measurement recorded, assumed OFF	
41-6 Lat		-0.10		2 ft Cipolletti, 0.06 ft depth	
41-M		0.00		No measurement recorded, assumed OFF	
41-L		0.00		No measurement recorded, assumed OFF	
QWN-058	**21.72**		8.60	8/1/16, measurement rated as "Good"	
41-7 Lat		-1.20		4 ft Cipolletti, 0.20 ft depth	
41-N		-0.88		2 ft Cipolletti, 0.26 ft depth	
QWN-068A	**19.25**		10.68	8/1/16, measurement rated as "Good"	
41-P		-1.38		2 ft Cipolletti, 0.35 ft depth	
41-8 Lat		-1.77		4 ft Cipolletti, 0.26 ft depth	
41-Q		0.00		No measurement recorded, assumed OFF	
QWN-064	**16.02**		13.83	8/1/16, measure rated as "Poor", large boulde	
41-R		-0.79		2 ft Cipolletti, 0.24 ft depth	
QWN-066	**15.04**		14.62	8/1/16, measurement rated as "Fair", silt	
41-9 Lat		-1.03		3 ft Cipolletti, 0.22 ft depth	
41-S		-0.51		2 ft Cipolletti, 0.18 ft depth	
QWN-068B	**13.62**		16.16	8/1/16, measurement rated as "Fair", silt	
41-10 Lat		-3.23		4 ft Cipolletti, 0.39 ft depth	
41-T		-0.25		2 ft Cipolletti, 0.11 ft depth	
41-T-1		0.00		No measurement recorded, assumed OFF	
41-U		0.00		No measurement recorded, assumed OFF	
41-V		-0.55		2 ft Cipolletti, 0.19 ft depth	
41-W		0.00		No measurement recorded, assumed OFF	
41-11 Lat		-3.87		4 ft Cipolletti, 0.44 ft depth	
41-X		0.00		No measurement recorded, assumed OFF	
QWN-070	**5.68**		24.06	Measurement rated "Fair", vegetated banks	
41-Z-DEAD		0.00		No measurement recorded, assumed OFF	
41-Z-1		0.00		No measurement recorded, assumed OFF	
QWN-072	**5.62**		24.06	8/1/16, measurement rated as "Good"	
41-Z-2		0.00		No measurement recorded, assumed OFF	
41-Z-3		-0.55		2 ft Cipolletti, 0.19 ft depth	
41-Z-5		0.00		No measurement recorded, assumed OFF	
41-Z-6		-0.94		2 ft Cipolletti, 0.27 ft depth	
QWN-076	**5.14**		25.55	8/1/16, measurement rated as "Excellent"	
41-Z-7		0.00		No measurement recorded, assumed OFF	
QWN-078	**4.03**		25.55	8/1/16, measurement rated as "Fair"	
41-Z-11		-1.75		2 ft Cipolletti, 0.41 ft depth	
41 Lat Remaining	**0.00**		27.30		
					41 Lateral
41-5 Lateral					
41-5 Head Measure	**4.83**		0.00	8/1/16, head weir, 5 ft Cipolletti, 0.44 ft depth	
41-5-A DEAD		0.00		No measurement recorded, assumed OFF	
41-5-1 Lat		0.00		No measurement recorded, assumed OFF	
41-5-B		0.00		No measurement recorded, assumed OFF	
41-5-C		0.00		No measurement recorded, assumed OFF	
41-5-D		-1.63		2 ft Cipolletti, 0.39 ft depth	
41-5-E		0.00		No measurement recorded, assumed OFF	
QWN-056	**2.54**		1.63	8/1/16, rated "Poor", shallow, narrow	
41-5-G		-0.83		2 ft Cipolletti, 0.25 ft depth	
41-5-H&I		-1.88		2 ft Cipolletti, 0.43 ft depth	
41-5 Lat Remaining	**0.00**		4.34		
					41-5 Lateral
41-7 Lateral					
41-7 Lat Head Measure	**1.20**		0.00	8/1/16, head weir, 4 ft Cipolletti, 0.20 ft depth	
QWN-084	**1.33**		0.00	8/1/16, measure rated "Fair", slow velocity	
QWN-086				8/1/16, no measure, too shallow, too slow	
					41-7 Lateral



41 Lateral Intake to the Study Reach	=	30.76
41 Lateral Spill from the Study Reach	=	0.00
41 Lateral Turnouts + Flow Remaining	=	-26.15
41 Lateral Seepage Loss in the Study Reach	=	4.61 = 14.98%



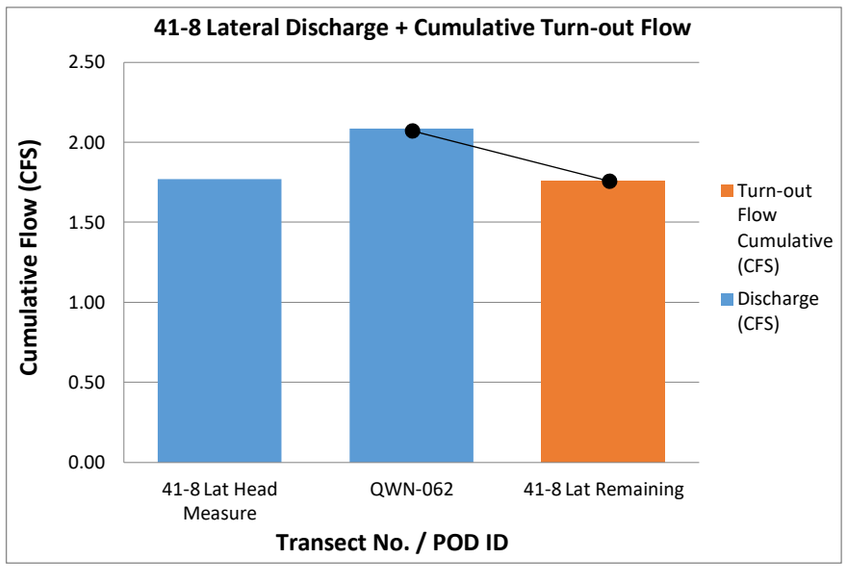
41-5 Lateral Intake to the Study Reach	=	4.83
41-5 Lateral Spill from the Study Reach	=	0.00
41-5 Lateral Turnouts + Flow Remaining	=	-4.34
41-5 Lateral Seepage Loss in the Study Reach	=	0.49 = 10.14%

No Loss Assessment Evaluation Made

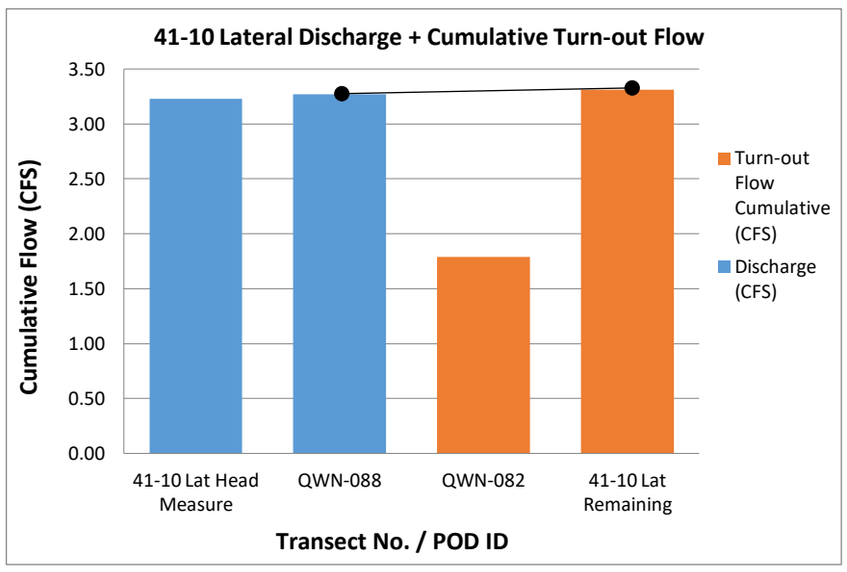
NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
Laterals

Final
03-10-17

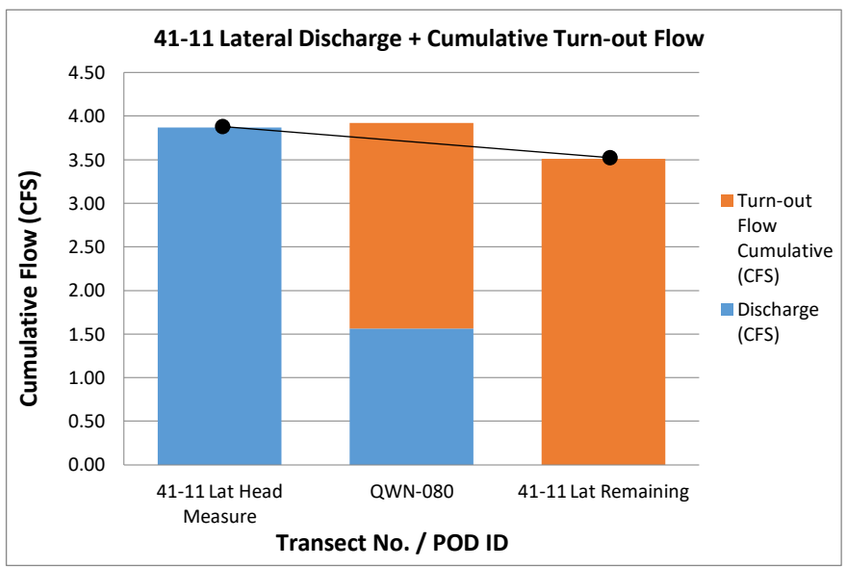
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
41-8 Lateral					41-8 Lateral
41-8 Lat Head Measure	**1.77**		0.00	8/1/16, head weir, 4 ft Cipolletti, 0.26 ft depth	
QWN-062	**2.09**		0.00	8/1/16, measurement rated as "Good"	
41-8-B		-1.21		2 ft Cipolletti, 0.32 ft depth	
41-8-C		-0.55		2 ft Cipolletti, 0.19 ft depth	
41-8 Lat Remaining	**0.00**		1.76		
41-10 Lateral					41-10 Lateral
41-10 Lat Head Measure	**3.23**		0.00	8/1/16, head weir, 4 ft Cipolletti, 0.39 ft depth	
QWN-088	**3.27**		0.00	8/2/16, rated "Poor", very narrow, lots of veg	
41-10-A		0.00		No measurement recorded, assumed OFF	
41-10-B		-1.10		8/1/16, 2 ft Cipolletti, 0.3 ft depth	
41-10-C		0.00		No measurement recorded, assumed OFF	
41-10-D		-0.69		8/1/16, 2 ft Cipolletti, 0.22 ft depth	
QWN-082			1.79	8/2/16, no measure, too much veg + slow vel	
41-10-E		-0.88		8/1/16, 2 ft Cipolletti, 0.26 ft depth	
41-10-G&H		-0.64		8/1/16, 2 ft Cipolletti, 0.21 ft depth	
41-10 Lat Remaining	**0.00**		3.31		
41-11 Lateral					41-11 Lateral
41-11 Lat Head Measure	**3.87**		0.00	8/1/16, head weir, 4 ft Cipolletti, 0.44 ft depth	
41-11-A		0.00		No measurement recorded, assumed OFF	
41-11-A-1		0.00		No measurement recorded, assumed OFF	
41-11-B		-0.88		8/1/16, 2 ft Cipolletti, 0.26 ft depth	
41-11-C		0.00		No measurement recorded, assumed OFF	
41-11-D		-0.69		Not shown on map, but recorded in notes	
41-11-E		-0.79		8/1/16, 2 ft Cipolletti, 0.24 ft depth	
41-11-F		0.00		No measurement recorded, assumed OFF	
41-11-G		0.00		No measurement recorded, assumed OFF	
41-11-H		0.00		No measurement recorded, assumed OFF	
QWN-080	**1.56**		2.36	8/1/16, measurement rated "Poor", silty	
41-11-K		-1.15		8/1/16, 2 ft Cipolletti, 0.31 ft depth	
41-11 Lat Remaining	**0.00**		3.51		



41-8 Lateral Intake to the Study Reach = 2.09
41-8 Lateral Spill from the Study Reach = 0.00
41-8 Lateral Turnouts + Flow Remaining = -1.76
41-8 Lateral Seepage Loss in the Study Reach = 0.33 = 15.64%



41-10 Lateral Intake to the Study Reach = 3.27
41-10 Lateral Spill from the Study Reach = 0.00
41-10 Lateral Turnouts + Flow Remaining = -3.31
41-10 Lateral Seepage Loss in the Study Reach = -0.04 = -1.22%



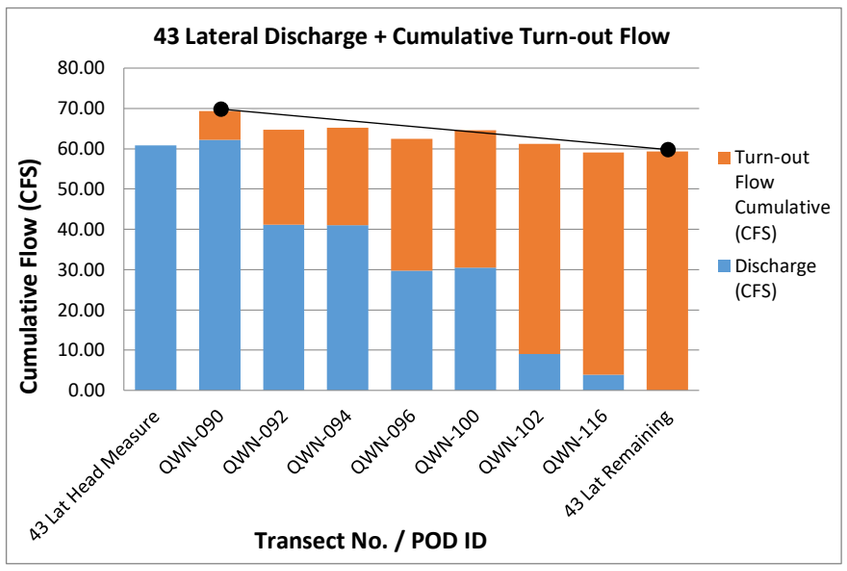
41-11 Lateral Intake to the Study Reach = 3.87
41-11 Lateral Spill from the Study Reach = 0.00
41-11 Lateral Turnouts + Flow Remaining = -3.51
41-11 Lateral Seepage Loss in the Study Reach = 0.36 = 9.30%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
Laterals

Final
03-10-17

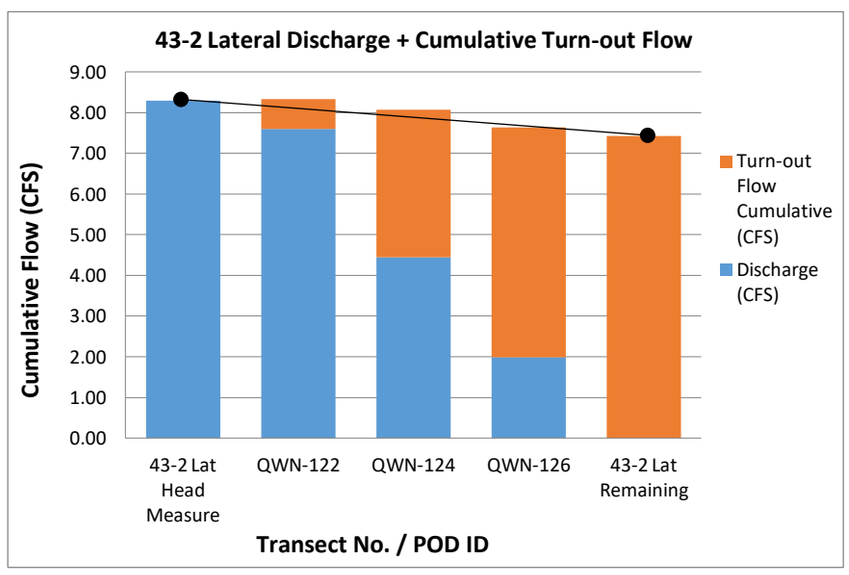
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments
43 Lateral				
43 Lat Head Measure	**60.80**		0.00	8/2/16, head weir / flow meter, record value
43-E		-1.10		meter
PL-43-A		-2.55		meter
PL-43-B		-1.25		meter
43-1-A		-0.50		meter
43-1-B		-1.00		meter
43-D		0.00		No measurement recorded, assumed OFF
43-F		0.00		No measurement recorded, assumed OFF
43-G		-0.74		8/2/16, 2 ft Cipolletti, 0.23 ft depth
QWN-090	**62.21**		7.14	8/2/16, measurement rated as "Good"
43-H		0.00		No measurement recorded, assumed OFF
43-I		-4.63		3 ft Cipolletti, 0.60 ft depth
43-J		-2.29		2 ft Cipolletti, 0.49 ft depth
43-H-1		0.00		No measurement recorded, assumed OFF
43-2 Lat		-9.19		6 ft Cipolletti, 0.60 ft depth
43-3-B		-0.32		2 ft Cipolletti, 0.13 ft depth
QWN-092	**41.12**		23.57	8/2/16, measure rated "Poor", silty left bank
43-L		0.00		No measurement recorded, assumed OFF
43-K		-0.50		meter
PL-43-5 Lat		0.00		No measurement recorded, assumed OFF
43-M		-0.06		2 ft Cipolletti, 0.04 ft depth
43-O		0.00		No measurement recorded, assumed OFF
43-N		0.00		No measurement recorded, assumed OFF
QWN-094	**41.02**		24.13	8/2/16, measurement rated as "Good"
43-DEAD		0.00		No measurement recorded, assumed OFF
43-7 Lat		-6.80		6 ft Cipolletti, 0.49 ft depth
43-P		-1.82		2 ft Cipolletti, 0.42 ft depth
QWN-096	**29.67**		32.75	8/2/16, rated "Fair", STAGE CHANGE = +.04
43-S		0.00		No measurement recorded, assumed OFF
43-T		0.00		No measurement recorded, assumed OFF
43-Q		0.00		No measurement recorded, assumed OFF
43-9 Lat		-0.15		4 ft Cipolletti, 0.05 ft depth
43-U		-1.21		2 ft Cipolletti, 0.32 ft depth
43-V-DEAD		0.00		No measurement recorded, assumed OFF
QWN-100	**30.46**		34.11	8/2/16, measurement rated as "Excellent"
43-W		-1.50		2 ft Cipolletti, 0.37 ft depth
43-X		-0.83		2 ft Cipolletti, 0.25 ft depth
43-X-1		0.00		No measurement recorded, assumed OFF
43-Y		0.00		No measurement recorded, assumed OFF
43-10 Lat		-15.25		7 ft Cipolletti, 0.76 ft depth
43-Z-2		-0.35		2 ft Cipolletti, 0.14 ft depth
QWN-102	**9.10**		52.04	8/2/16, measure rated 'Fair', veg up + down st
43-Z-1		0.00		No measurement recorded, assumed OFF
43-11 Lat		0.00		No measurement recorded, assumed OFF
43-Z-2 DEAD		0.00		No measurement recorded, assumed OFF
43-Z-2		0.00		No measurement recorded, assumed OFF
43-12 Lat		-2.51		2 ft Cipolletti, 0.52 ft depth
43-Z-3		-0.64		3 ft Cipolletti, 0.16 ft depth
QWN-116	**3.86**		55.19	8/2/16, measurement rated as "Good"
43-Z-6		-1.50		meter
43-Z-5		-0.51		2 ft Cipolletti, 0.18 ft depth
43-Z-8		-1.44		2 ft Cipolletti, 0.36 ft depth
43-Z-9		-0.13		2 ft Cipolletti, 0.07 ft depth
43-Z-7		-0.50		meter
43 Lat Remaining	**0.00**		59.27	
43-2 Lateral				
43-2 Lat Head Measure	**8.29**		0.00	7/28/16, head weir, 6 ft Cipolletti, 0.56 ft dept
43-2-A		0.00		No measurement recorded, assumed OFF
43-2-B		0.00		No measurement recorded, assumed OFF
43-2-D		-0.74		2 ft Cipolletti, 0.23 ft depth
QWN-122	**7.59**		0.74	7/28/16, measurement rated as "Good"
43-2-E		-1.44		2 ft Cipolletti, 0.36 ft depth
43-2-E-1		0.00		No measurement recorded, assumed OFF
43-2-F		-1.44		
43-2-G		0.00		No measurement recorded, assumed OFF
QWN-124	**4.45**		3.62	7/28/16, measurement rated as "Good"
43-2-G-1		0.00		No measurement recorded, assumed OFF
43-2-H		-2.02		2 ft Cipolletti, 0.45 ft depth
43-2-I		0.00		No measurement recorded, assumed OFF
QWN-126	**1.99**		5.64	7/28/16, measure rated "Fair", bank veg
43-2-J		-0.60		2 ft Cipolletti, 0.2 ft depth
43-2-K		-0.04		2 ft Cipolletti, 0.03 ft depth
43-2-L		-1.15		2 ft Cipolletti, 0.31 ft depth
43-2 Lat Remaining	**0.00**		7.43	

43 Lateral



43 Lateral Intake to the Study Reach	=	62.21	
43 Lateral Spill from the Study Reach	=	0.00	
43 Lateral Turnouts + Flow Remaining	=	-52.13	
43 Lateral Seepage Loss in the Study Reach	=	10.08	= 16.20%

43-2 Lateral



43-2 Lateral Intake to the Study Reach	=	8.29	
43-2 Lateral Spill from the Study Reach	=	0.00	
43-2 Lateral Turnouts + Flow Remaining	=	-7.43	
43-2 Lateral Seepage Loss in the Study Reach	=	0.86	= 10.37%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
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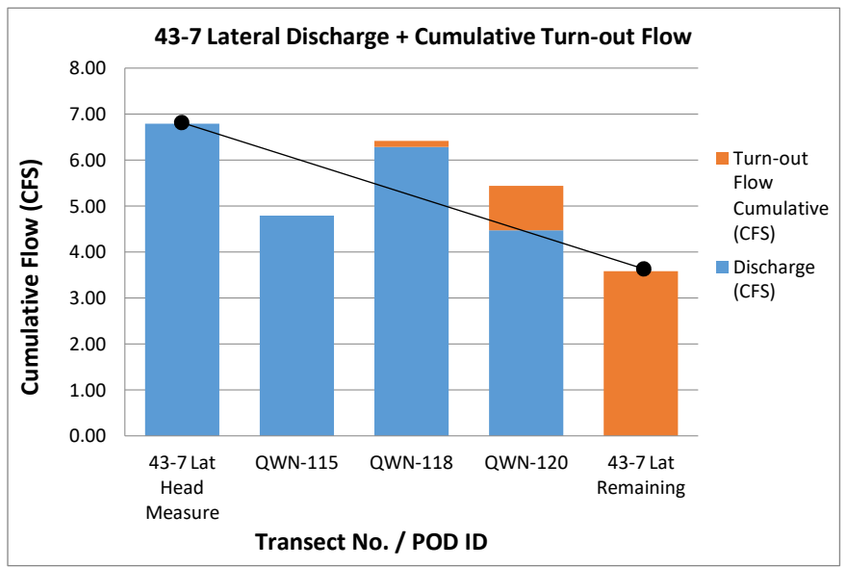
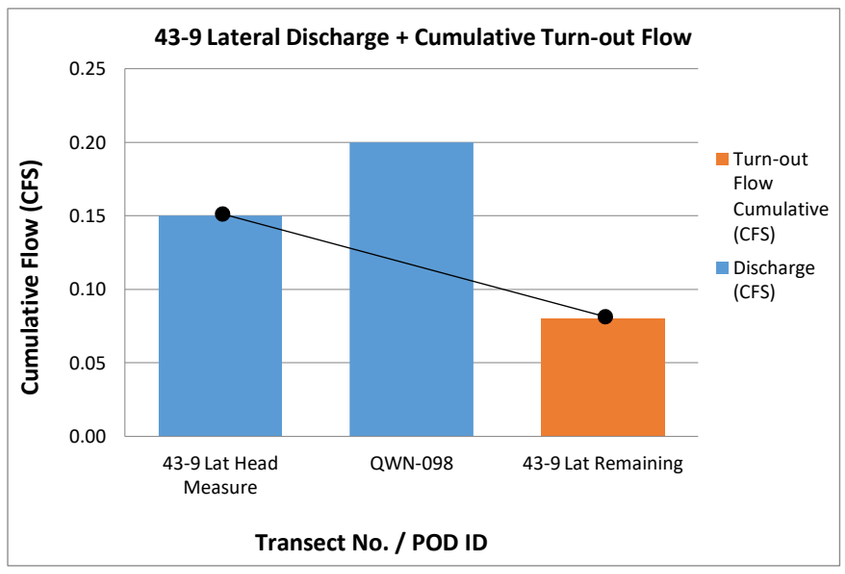
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
43-7 Lateral					43-7 Lateral
43-7 Lat Head Measure	**6.80**		0.00	8/2/16, head weir, 6 ft Cipolletti, 0.49 ft depth	
QWN-115	**4.79**		0.00	8/2/16, measurement rated as "Good"	
43-7-1 Lat		-0.13		2 ft Cipolletti, 0.07 ft depth	
43-7-A		0.00		No measurement recorded, assumed OFF	
QWN-118	**6.29**		0.13	8/2/16, measurement rated as "Good"	
43-7-B		0.00		No measurement recorded, assumed OFF	
43-7-B-1		0.00		No measurement recorded, assumed OFF	
43-7-C		-0.83		2 ft Cipolletti, 0.25 ft depth	
43-7-D		0.00		No measurement recorded, assumed OFF	
QWN-120	**4.48**		0.96	8/2/16, measurement rated as "Good"	
43-7-2 Lat		-0.63		4 ft Cipolletti, 0.13 ft depth	
43-7-Dead		0.00		OFF	
43-7-E		-1.15		2 ft Cipolletti, 0.31 ft depth	
43-7-G		-0.85		4 ft Rectangular, 0.16 ft depth	
43-7 Lat Remaining	**0.00**		3.59		
43-7-1 Lateral					43-7-1 Lateral
43-7-1 Lat Head Measure	**0.13**			8/2/16, head weir, 2 ft Cipolletti, 0.07 ft depth	
QWN-116				8/2/16, no measurement, piped	
43-7-1-G		-0.13		2 ft Cipolletti, 0.07 ft depth	
43-7-1 Lat Remaining	**0.00**		0.13		
43-7-2- Lateral					43-7-2- Lateral
43-7-2 Lat Head Measure	**0.63**			8/2/16, head weir, 4 ft Cipolletti, 0.13 ft depth	
43-7-2-A		0.00		No measurement recorded, assumed OFF	
43-7-2- Dead		0.00		OFF	
43-7-2-C		-0.55		2 ft Cipolletti, 0.19 ft depth	
43-7-2 Lat Remaining	**0.00**		0.55		
43-9 Lateral					43-9 Lateral
43-9 Lat Head Measure	**0.15**		0.00	8/2/16, head weir, 4 ft Cipolletti, 0.05 ft depth	
QWN-098	**0.20**		0.00	8/2/16, no measure, little flow, est. 0.2 cfs	
43-9-A		0.00		No measurement recorded, assumed OFF	
43-9-Dead		0.00		OFF	
43-9-B		0.00		No measurement recorded, assumed OFF	
43-9-C		-0.08		2 ft Cipolletti, 0.05 ft depth	
43-9 Lat Remaining	**0.00**		0.08		



43-7 Lateral Intake to the Study Reach	=	6.80
43-7 Lateral Spill from the Study Reach	=	0.00
43-7 Lateral Turnouts + Flow Remaining	=	-3.59
43-7 Lateral Seepage Loss in the Study Reach	=	3.21 = 47.21%

No Loss Assessment Evaluation Made

43-7-2 Lateral Intake to the Study Reach	=	0.63
43-7-2 Lateral Spill from the Study Reach	=	0.00
43-7-2 Lateral Turnouts + Flow Remaining	=	-0.55
43-7-2 Lateral Seepage Loss in the Study Reach	=	0.08 = 12.70%



43-9 Lateral Intake to the Study Reach	=	0.15
43-9 Lateral Spill from the Study Reach	=	0.00
43-9 Lateral Turnouts + Flow Remaining	=	-0.08
43-9 Lateral Seepage Loss in the Study Reach	=	0.07 = 46.67%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
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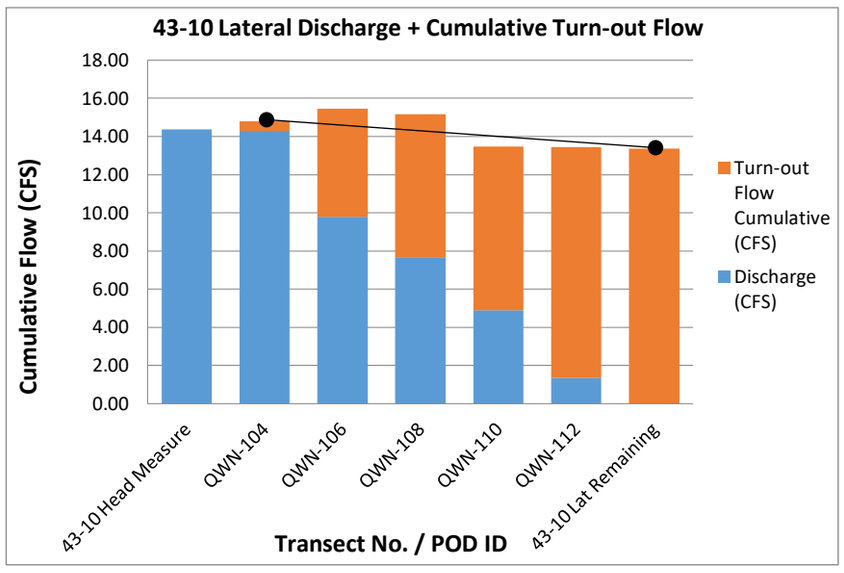
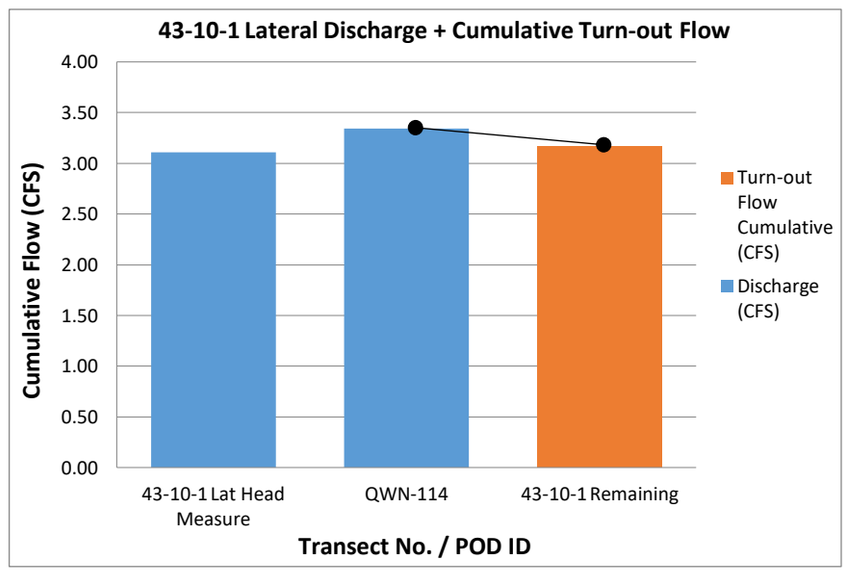
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
43-10 Lateral					43-10 Lateral
43-10 Head Measure	**14.36**		0.00	7/27/16, head weir or flow meter output value	
43-10-A		0.00		No measurement recorded, assumed OFF	
43-10-B		-0.51		2 ft Cipolletti, 0.18 ft depth	
QWN-104	**14.28**		0.51	7/27/16, rated "Fair", veg upstream	
43-10-C		-0.99		2 ft Cipolletti, 0.28 ft depth	
43-10-D		-1.04		2 ft Cipolletti, 0.29 ft depth	
43-10-1 Lat		-3.11		4 ft Cipolletti, 0.38 ft depth	
43-10-F		0.00		No measurement recorded, assumed OFF	
QWN-106	**9.80**		5.65	7/27/16, measurement rated as "Good"	
43-10-2 Lat		-1.40		7/27/16, 3 ft Cipolletti, 0.27 ft depth	
43-10-G		0.00		No measurement recorded, assumed OFF	
43-10-G-1		0.00		No measurement recorded, assumed OFF	
43-10-H		-0.43		2 ft Cipolletti, 0.16 ft depth	
QWN-108	**7.69**		7.48	7/27/16, measurement rated as "Good"	
43-10-H-1		-1.10		meter	
43-10-3 Lat		0.00		No measurement recorded, assumed OFF	
43-10-4 Lat		0.00		No measurement recorded, assumed OFF	
QWN-110	**4.89**		8.58	7/27/16, measurement rated as "Good"	
43-10-I		0.00		No measurement recorded, assumed OFF	
43-10-J		-2.58		2 ft Cipolletti, 0.53 ft depth	
43-10-K		0.00		No measurement recorded, assumed OFF	
43-10-L		-0.94		2 ft Cipolletti, 0.27 ft depth	
QWN-112	**1.34**		12.10	7/27/16, measurement rated as "Good"	
43-10-N		-0.43		3 ft Cipolletti, 0.16 ft depth	
43-10-O		-0.83		2 ft Cipolletti, 0.25 ft depth	
43-10 Lat Remaining	**0.00**		13.36		
43-10-1 Lateral					43-10-1 Lateral
43-10-1 Lat Head Measure	**3.11**		0.00	7/27/16, head weir, 4 ft Cipolletti, 0.38 ft dept	
QWN-114	**3.34**		0.00	7/27/16, rated as "Poor", narrow, lots of veg	
43-10-1-A-A		-1.25		3 ft Cipolletti, 0.25 ft depth	
43-10-1-A		0.00		No measurement recorded, assumed OFF	
43-10-1-B		0.00		No measurement recorded, assumed OFF	
43-10-1-C		-1.82		2 ft Cipolletti, 0.42 ft depth	
43-10-1-D		-0.10		2 ft Cipolletti, 0.06 ft depth	
43-10-1-E		0.00		No measurement recorded, assumed OFF	
43-10-1 Remaining	**0.00**		3.17		
43-12 Lateral					43-12- Lateral
43-12 Lat Head Measure	**2.51**		0.00	8/2/16, head weir, 2 ft Cipolletti, 0.52 ft dep	
43-12-A		-1.21		2 ft Cipolletti, 0.32 ft depth	
43-12-A-1		0.00		No measurement recorded, assumed OFF	
43-12-B		-1.26		2 ft Cipolletti, 0.33 ft depth	
43-12 Lat Remaining	**0.00**		2.47		



43-10 Lateral Intake to the Study Reach	=	14.28	
43-10 Lateral Spill from the Study Reach	=	0.00	
43-10 Lateral Turnouts + Flow Remaining	=	-12.85	
43-10 Lateral Seepage Loss in the Study Reach	=	1.43	= 10.02%



43-10-1 Lateral Intake to the Study Reach	=	3.34	
43-10-1 Lateral Spill from the Study Reach	=	0.00	
43-10-1 Lateral Turnouts + Flow Remaining	=	-3.17	
43-10-1 Lateral Seepage Loss in the Study Reach	=	0.17	= 5.19%

43-12 Lateral Intake to the Study Reach	=	2.51	
43-12 Lateral Spill from the Study Reach	=	0.00	
43-12 Lateral Turnouts + Flow Remaining	=	-2.47	
43-12 Lateral Seepage Loss in the Study Reach	=	0.04	= 1.59%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
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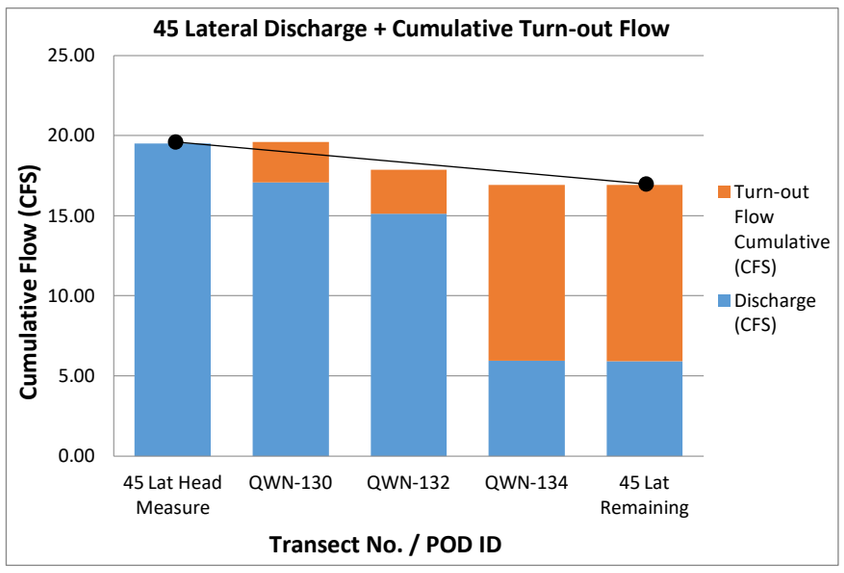
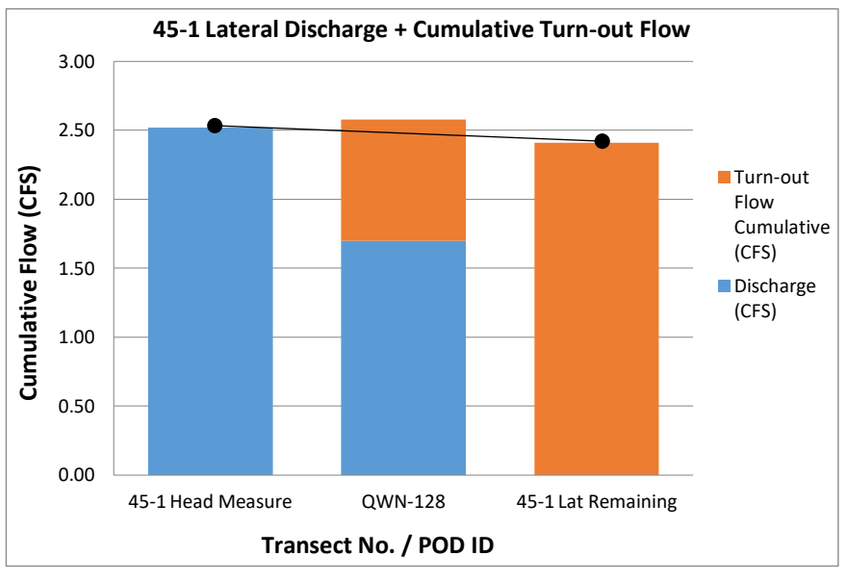
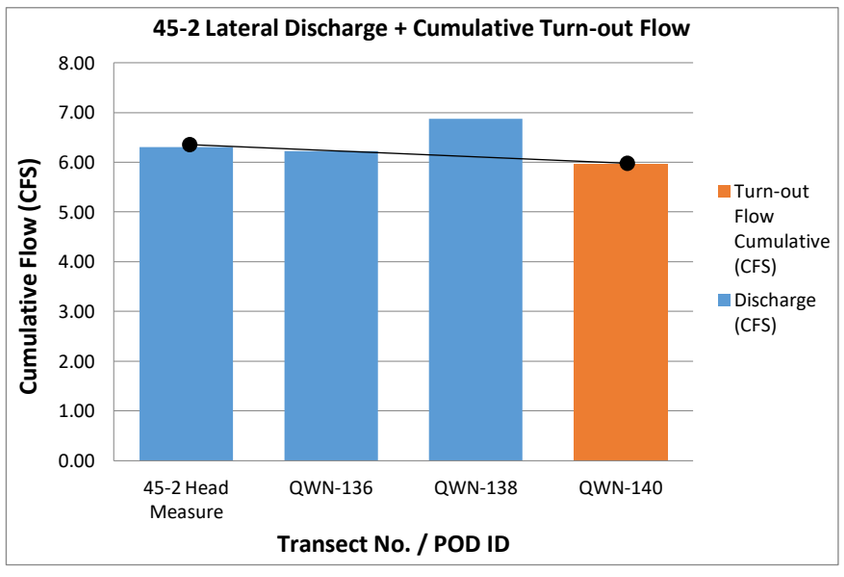
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
45-Lateral					
45 Lat Head Measure	**19.50**		0.00	7/28/16, head weir, 8 ft Cipolletti, 0.82 ft dept	
R-51-E		0.00		No measurement recorded, assumed OFF	
R51-E-1		0.00		No measurement recorded, assumed OFF	
R51-E-1-A		0.00		No measurement recorded, assumed OFF	
45-1 Lat		-2.52		4 ft Cipolletti, 0.33 ft depth	
45-A		0.00		No measurement recorded, assumed OFF	
QWN-130	**17.07**		2.52	7/28/16, rated "Fair", slight turbulent	
45-B&C		-0.22		meter	
QWN-132	**15.13**		2.74	7/28/16, measurement rated as "Good"	
45-D		-1.82		2 ft Cipolletti, 0.42 ft depth	
45-Dead		0.00		No measurement recorded, assumed OFF	
45-D-1		0.00		No measurement recorded, assumed OFF	
45-2 Lat		-6.42		3 ft Cipolletti, 0.72 ft depth	
QWN-134	**5.93**		10.98	7/28/16, measurement rated as "Good"	
45-Dead		0.00		No measurement recorded, assumed OFF	
45-2-Dead		0.00		No measurement recorded, assumed OFF	
45-D-2		0.00		No measurement recorded, assumed OFF	
45-E		0.00		No measurement recorded, assumed OFF	
45-G		0.00		No measurement recorded, assumed OFF	
45-3 Lat		0.00		No measurement recorded, assumed OFF	
45 Lat Remaining	**5.93**		10.98	Lat 45-3 assumed return flow to Main Canal	
					45 Lateral
45-1 Lateral					
45-1 Head Measure	**2.52**		0.00	7/28/16, head weir, 4 ft Cipolletti, 0.33 ft dept	
45-1-A		-0.88		2 ft Cipolletti, 0.26 ft depth	
QWN-128	**1.70**		0.88	7/28/16, measure rated "Fair", lots of silt	
45-1-1-A&B		-1.21		2 ft Cipolletti, 0.32 ft depth	
45-1-B		-0.32		2 ft Cipolletti, 0.13 ft depth	
45-1 Lat Remaining	**0.00**		2.41		
					45-1 Lateral
45-2 Lateral					
45-2 Head Measure	**6.30**		0.00	7/28/16, head weir, 4 ft Cipolletti, 0.61 ft dept	
QWN-136	**6.22**		0.00	7/28/16, measure rated as "Poor", lots of veg	
45-2-A		0.00		No measurement recorded, assumed OFF	
45-2-B		0.00		No measurement recorded, assumed OFF	
QWN-138	**6.88**		0.00	7/28/16, measure rated as "Good"	
45-2-C		-2.24		3 ft Cipolletti, 0.37 ft depth	
45-2-D		0.00		No measurement recorded, assumed OFF	
45-2-E		-1.21		2 ft Cipolletti, 0.32 ft depth	
45-2-F		-2.51		2 ft Cipolletti, 0.52 ft depth	
QWN-140	**0.00**		5.96	7/28/16, no measure, no water present	
45-2 Lat Remaining	**0.00**		5.96		
					45-2 Lateral



45 Lateral Intake to the Study Reach	=	19.50
45 Lateral Spill from the Study Reach	=	0.00
45 Lateral Turnouts + Flow Remaining	=	-16.91
45 Lateral Seepage Loss in the Study Reach	=	2.59 = 13.28%



45-1 Lateral Intake to the Study Reach	=	2.52
45-1 Lateral Spill from the Study Reach	=	0.00
45-1 Lateral Turnouts + Flow Remaining	=	-2.41
45-1 Lateral Seepage Loss in the Study Reach	=	0.11 = 4.37%



45-2 Lateral Intake to the Study Reach	=	6.30
45-2 Lateral Spill from the Study Reach	=	0.00
45-2 Lateral Turnouts + Flow Remaining	=	-5.96
45-2 Lateral Seepage Loss in the Study Reach	=	0.34 = 5.40%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
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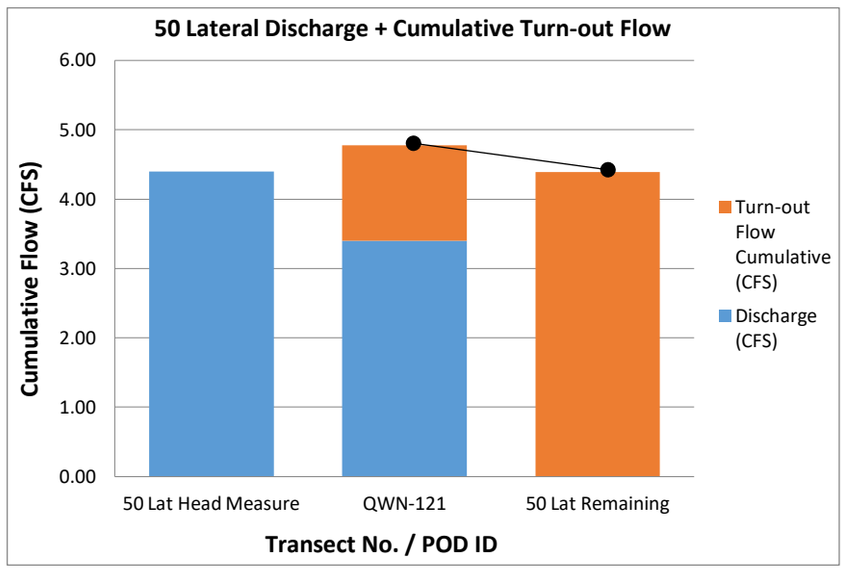
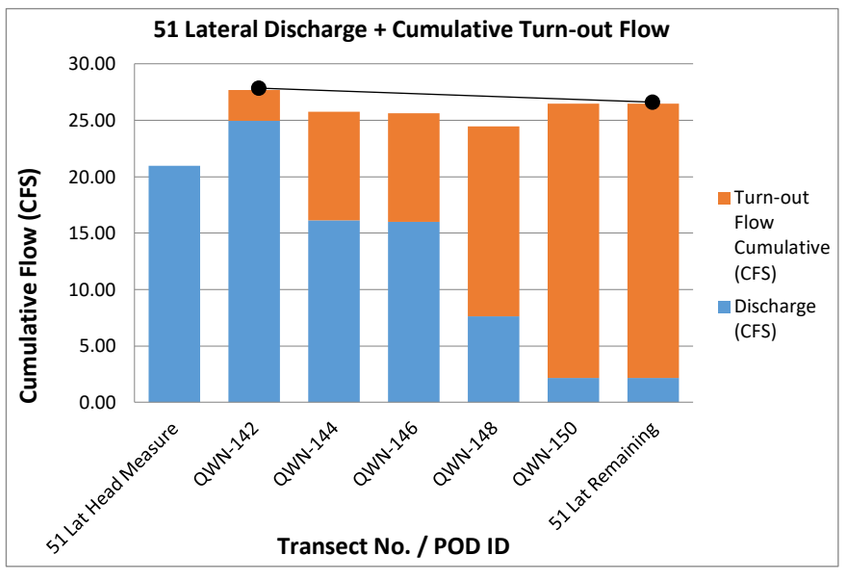
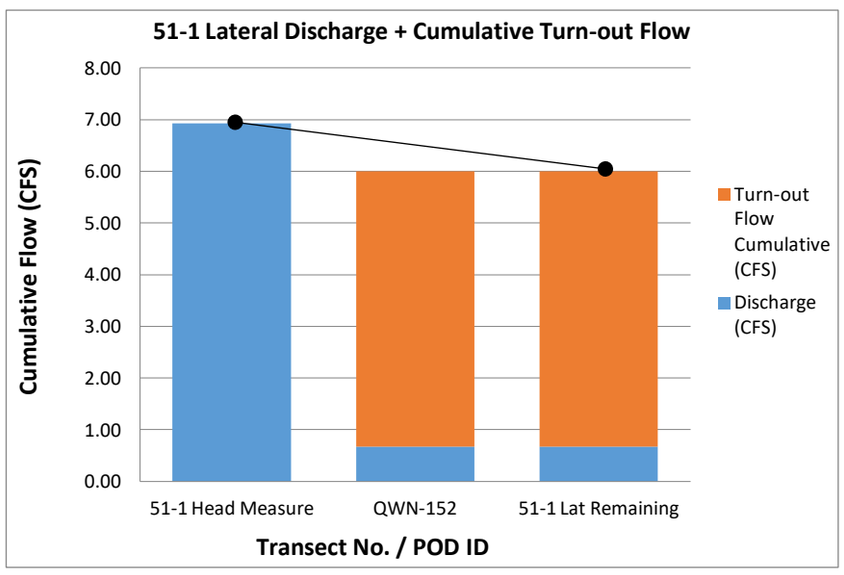
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
50 Lateral					
50 Lat Head Measure	**4.40**		0.00	7/28/16, head weir, 4 ft Cipolletti, 0.48 ft dept	
50-A		0.00		No measurement recorded, assumed OFF	
50-B		-1.38		2 ft Cipolletti, 0.35 ft depth	
QWN-121	**3.40**		1.38	7/28/16, measure rated "Fair", fast, riffles	
50-C		-3.01		3 ft Cipolletti, 0.45 ft depth	
50 Lat Remaining	**0.00**		4.39		
					50 Lateral
51 Lateral					
51 Lat Head Measure	**20.96**		0.00	7/27/16, head weir, 7 ft Cipolletti, 0.94 ft dept	
51-A		0.00		No measurement recorded, assumed OFF	
51-B		-2.71		3 ft Cipolletti, 0.42 ft depth	
QWN-142	**24.96**		2.71	7/27/16, measurement rated as "Good"	
51-1 Lat		-6.93		4 ft Cipolletti, 0.65 ft depth	
51-DEAD		0.00		No measurement recorded, assumed OFF	
QWN-144	**16.12**		9.64	7/27/16, measurement rated "Excellent"	
51-C		0.00		No measurement recorded, assumed OFF	
51-D		0.00		No measurement recorded, assumed OFF	
51-D-1		0.00		No measurement recorded, assumed OFF	
51-D-2		0.00		No measurement recorded, assumed OFF	
QWN-146	**16.00**		9.64	7/27/16, measurement rated "Excellent"	
PL-51		0.00		No measurement recorded, assumed OFF	
PL-51-4		-1.75		meter	
PL-51-5		-2.90		2 ft Cipolletti, 0.57 ft depth	
PL-51-6		-2.50		meter	
QWN-148	**7.65**		16.79	7/27/16, measure rated "Poor"	
51-E		-0.13		2 ft Cipolletti, 0.07 ft depth	
51-F		0.00		No measurement recorded, assumed OFF	
51-G		-4.96		4 ft Cipolletti, 0.52 ft depth	
51-H		-2.43		3 ft Cipolletti, 0.39 ft depth	
QWN-150	**2.16**		24.31	7/27/16, measurement rated as "Good"	
51 Lat Remaining	**2.16**		24.31		
					51 Lateral
51-1 Lateral					
51-1 Head Measure	**6.93**		0.00	7/27/16, head weir, 4 ft Cipolletti, 0.65 ft dept	
51-1-A		-4.12		2 ft Cipolletti, 0.72 ft depth	
51-1-B & B-1		-0.22		1 ft Cipolletti, 0.16 ft depth	
51-1-C		0.00		No measurement recorded, assumed OFF	
51-1-D		0.00		No measurement recorded, assumed OFF	
51-1-E		-0.99		2 ft Cipolletti, 0.28 ft depth	
51-1-F		0.00		No measurement recorded, assumed OFF	
QWN-152	**0.67**		5.33	7/27/16, measurement rated as "Fair"	
51-1 Lat Remaining	**0.67**		5.33		
					51-1 Lateral



50 Lateral Intake to the Study Reach	=	3.40
50 Lateral Spill from the Study Reach	=	0.00
50 Lateral Turnouts + Flow Remaining	=	-3.01
50 Lateral Seepage Loss in the Study Reach	=	0.39 = 11.45%



51 Lateral Intake to the Study Reach	=	24.96
51 Latara Spill from the Study Reach	=	0.00
51 Lateral Turnouts + Flow Remaining	=	-23.76
51 Lateral Seepage Loss in the Study Reach	=	1.20 = 4.79%



51-1 Lateral Intake to the Study Reach	=	6.93
51-1- Lateral Spill from the Study Reach	=	0.00
51-1 Lateral Turnouts + Flow Remaining	=	-6.00
51-1 Lateral Seepage Loss in the Study Reach	=	0.93 = 13.42%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
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Final
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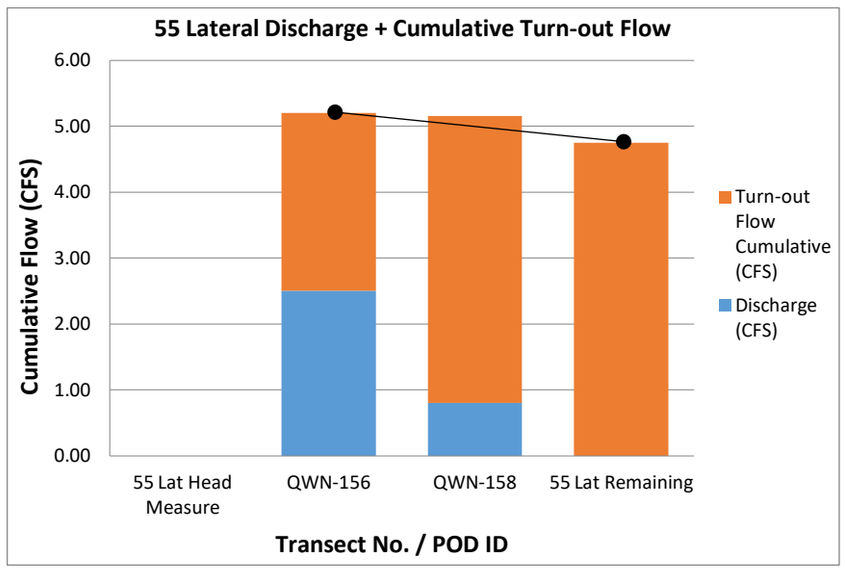
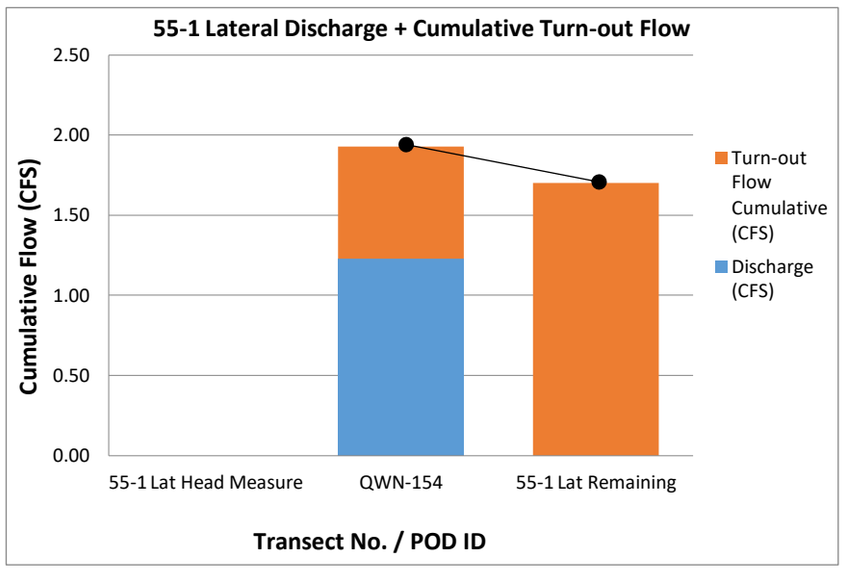
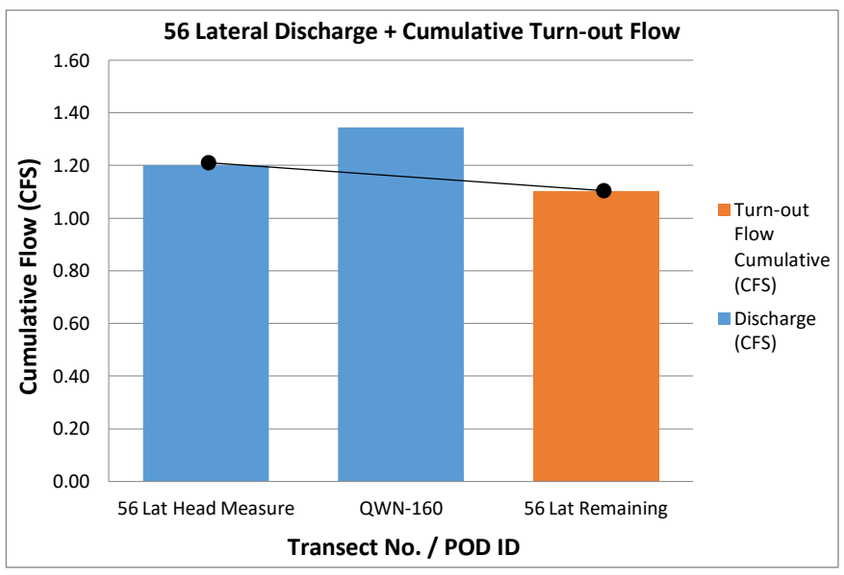
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
55 Lateral					
55 Lat Head Measure			0.00	No measurement values recorded	
55-A		-1.00		Measure device signal output recorded	
55-B		0.00		No measurement recorded, assumed OFF	
55-1-A		-0.70		Measure device signal output recorded	
55-1-B-1		-1.00		Measure device signal output recorded	
QWN-156	**2.50**		2.70	7/26/16, measurement rated as "Good"	
55-C		-1.40		Measure device signal output recorded	
55-2-A		-0.25		Measure device signal output recorded	
QWN-158	**0.81**		4.35	7/26/16, not rated, notes indicate silt cond.	
55-E		0.00		No measurement recorded, assumed OFF	
55-F		-0.40		Measure device signal output recorded	
55 Lat Remaining	**0.00**		4.75		55 Lateral
55-1 Lateral					
55-1 Lat Head Measure			0.00	No measurement value recorded	
55-1-A		-0.70		Measure device signal output recorded	
QWN-154	**1.23**		0.70	7/26/16, measurement rated as "Good"	
55-1-B-1		-1.00		Measure device signal output recorded	
55-1 Lat Remaining	**0.00**		1.70		55-1 Lateral
56 Lateral					
56 Lat Head Measure	**1.20**		0.00	7/28/16, head weir, 4 ft Cipolletti, 0.20 ft dept	
QWN-160	**1.34**		0.00	7/28/16, not rated, notes indicate mild silt con	
56-A		0.00		No measurement recorded, assumed OFF	
56-B		-1.10		3 ft Cipolletti, 0.23 ft depth	
56 Lat Remaining	**0.00**		1.10		56 Lateral



55 Lateral Intake to the Study Reach = 2.50
55 Lateral Spill from the Study Reach = 0.00
55 Lateral Turnouts + Flow Remaining = -2.05
55 Lateral Seepage Loss in the Study Reach = 0.45 = 18.04%



55-1 Lateral Intake to the Study Reach = 1.23
55-1 Lateral Spill from the Study Reach = 0.00
55-1 Lateral Turnouts + Flow Remaining = -1.00
55-1 Lateral Seepage Loss in the Study Reach = 0.23 = 18.56%



56 Lateral Intake to the Study Reach = 1.20
56 Lateral Spill from the Study Reach = 0.00
56 Lateral Turnouts + Flow Remaining = -1.10
56 Lateral Seepage Loss in the Study Reach = 0.10 = 8.33%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
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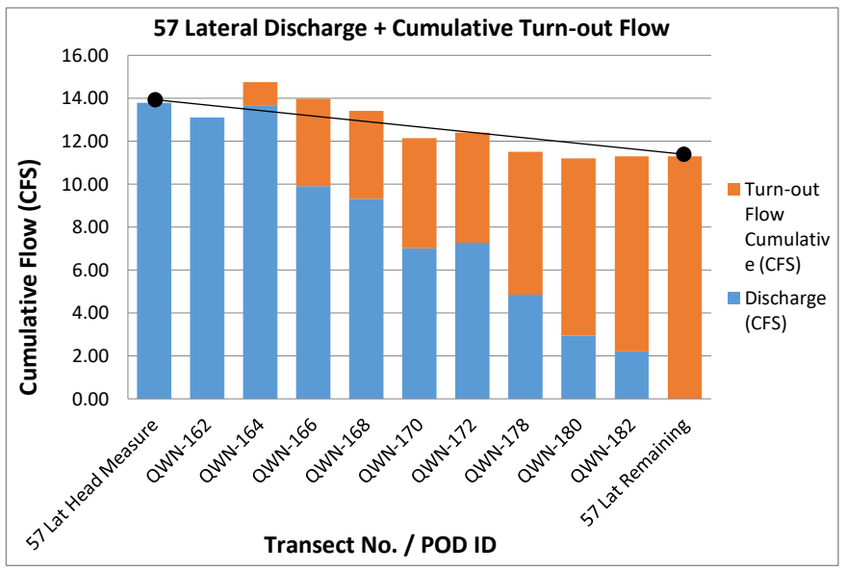
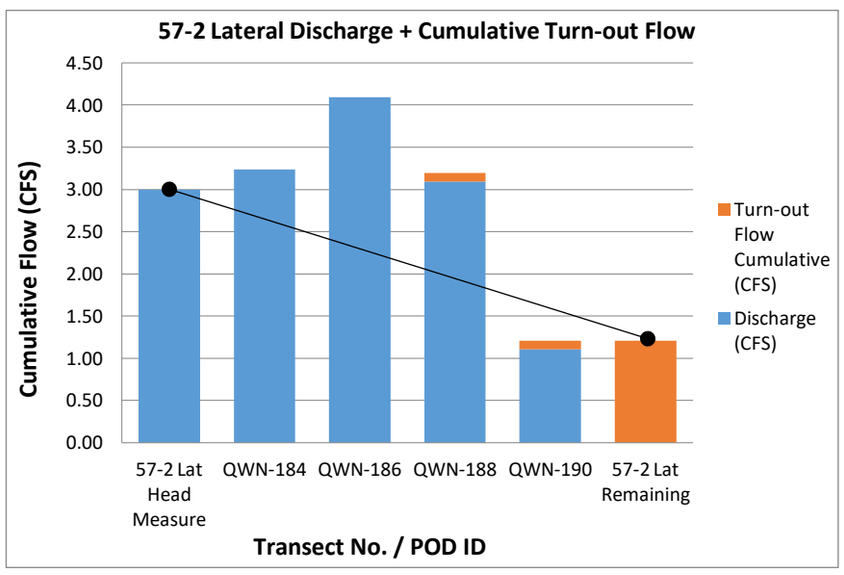
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
57 Lateral					
57 Lat Head Measure	**13.79**		0.00	7/25/16, head weir, 8 ft Cipolletti, 0.65 ft dept	
QWN-162	**13.11**		0.00	Measurement rated as "Good"	
57-A		0.00		No measurement recorded, assumed OFF	
57-A-1		0.00		No measurement recorded, assumed OFF	
57-B		0.00		No measurement recorded, assumed OFF	
57-C		0.00		No measurement recorded, assumed OFF	
57-D		0.00		No measurement recorded, assumed OFF	
57-E		-0.28		2 ft Cipolletti, 0.12 ft depth	
57-F		0.00		No measurement recorded, assumed OFF	
57-G		0.00		No measurement recorded, assumed OFF	
57-I-1		-0.80		Measure device signal output recorded	
QWN-164	**13.67**		1.08	7/25/16, measurement rated as "Fair"	
57-2 Lat		-3.00		5 ft Cipolletti, 0.32 ft depth	
QWN-166	**9.90**		4.08	7/25/16, measurement rated as "Good"	
57-I-2		0.00		No measurement recorded, assumed OFF	
57-J		0.00		No measurement recorded, assumed OFF	
57-K		0.00		No measurement recorded, assumed OFF	
QWN-168	**9.32**		4.08	7/25/16, measurement rated as "Good"	
57-L		0.00		No measurement recorded, assumed OFF	
57-L-1		-0.35		2 ft Cipolletti, 0.14 ft depth	
57-M		0.00		No measurement recorded, assumed OFF	
57-N		0.00		No measurement recorded, assumed OFF	
57-O		-0.70		meter	
QWN-170	**7.01**		5.13	7/25/16, measure rated "Good"	
57-P		0.00		No measurement recorded, assumed OFF	
57-Q		0.00		No measurement recorded, assumed OFF	
57-R		0.00		No measurement recorded, assumed OFF	
57-S		0.00		No measurement recorded, assumed OFF	
57-T		0.00		No measurement recorded, assumed OFF	
57-U		0.00		No measurement recorded, assumed OFF	
QWN-172	**7.27**		5.13	7/25/16, measurement rated "Fair"	
57-V		0.00		No measurement recorded, assumed OFF	
57-V-1		-1.10		Measure device signal output recorded	
57-6 Lat		-0.42		3 ft Cipolletti, 0.12 ft depth	
57-W		0.00		No measurement recorded, assumed OFF	
57-X		0.00		No measurement recorded, assumed OFF	
QWN-178	**4.85**		6.65	7/25/16, measurement rated "Fair"	
57-X-1		0.00		No measurement recorded, assumed OFF	
57-Y		-1.25		Measure device signal output recorded	
57-Y-1		-0.35		Meter	
57-Z		0.00		No measurement recorded, assumed OFF	
57-Z-1		0.00		No measurement recorded, assumed OFF	
57-Z-2		0.00		No measurement recorded, assumed OFF	
57-Z-3		0.00		No measurement recorded, assumed OFF	
57-Z-4 DEAD		0.00		No measurement recorded, assumed OFF	
QWN-180	**2.96**		8.25	7/25/16, rated "Poor", mild silt, lots of veg	
57-Z-5		0.00		No measurement recorded, assumed OFF	
57-Z-6		-0.83		2 ft Cipolletti, 0.25 ft depth	
QWN-182	**2.21**		9.08	7/25/16, rated "Fair", moderate silt	
57-Z-7		-2.21		Tailwater flow to pond at turn-out 57-Z-7	
57 Lat Remaining	**0.00**		11.29		
57-2 Lateral					
57-2 Lat Head Measure	**3.00**		0.00	7/25/16, head weir, 5 ft Cipolletti, 0.32 ft dept	
QWN-184	**3.23**		0.00	7/25/16, measurement rated as "Good"	
57-2-A Lat		0.00		No measurement recorded, assumed OFF	
57-2-A Lat QWN-192	0.00		1.21	7/25/16, no measure, stagnant water, no flow	
57-2-A Lat QWN-194	0.00		0.00	7/25/16, no measure, no water, no flow	
QWN-186	**4.09**		0.00	7/25/16, measurement rated as "Fair"	
57-2-B		-0.10		Measure device signal output recorded	
57-2-B-2		0.00		No measurement recorded, assumed OFF	
QWN-188	**3.09**		0.10	7/25/16, measurement rated as "Good"	
57-2-C		0.00		No measurement recorded, assumed OFF	
57-2-D		0.00		No measurement recorded, assumed OFF	
57-2-E		0.00		No measurement recorded, assumed OFF	
QWN-190	**1.11**		0.10	7/25/16, measure rated as "Poor", very silty	
57-2-F		-0.74		2 ft Cipolletti, 0.23 ft depth	
57-2-G		-0.37		3 ft Cipolletti, 0.11 ft depth	
57-2-H		0.00		No measurement recorded, assumed OFF	
57-2 Lat Remaining	**0.00**		1.21		

57 Lateral

57-2 Lat



57 Lateral Intake to the Study Reach	=	13.79	
57 Lateral Spill from the Study Reach	=	0.00	
57 Lateral Turnouts + Flow Remaining	=	-11.29	
57 Lateral Seepage Loss in the Study Reach	=	2.50	= 18.13%



57-2 Lateral Intake to the Study Reach	=	3.00	
57-2 Lateral Spill from the Study Reach	=	0.00	
57-2 Lateral Turnouts + Flow Remaining	=	-1.21	
57-2 Lateral Seepage Loss in the Study Reach	=	1.79	= 59.67%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
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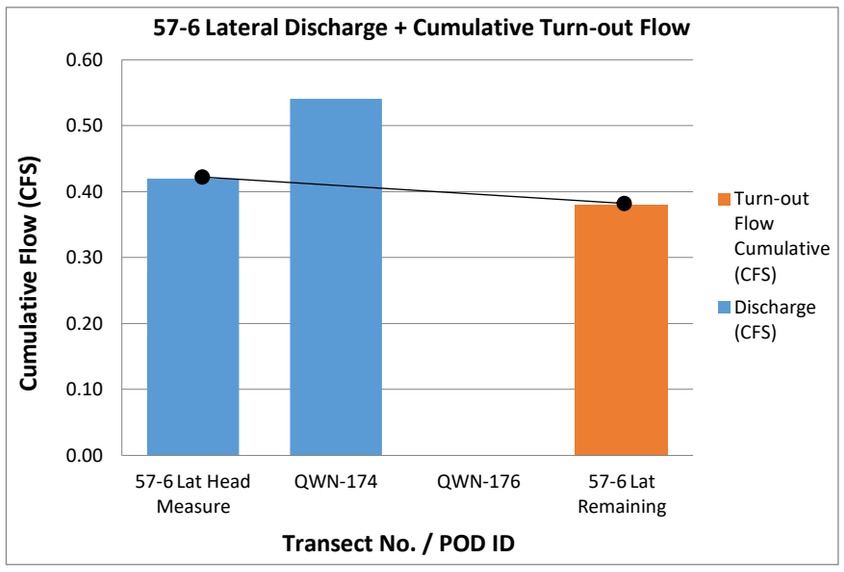
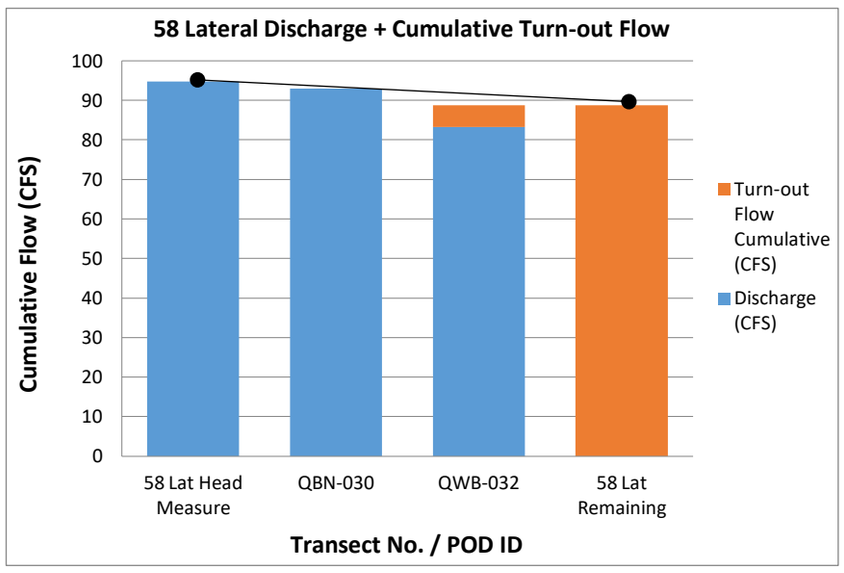
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
57-6 Lateral					
57-6 Lat Head Measure	**0.42**		0.00	7/25/16, head weir, 3 ft Cipolletti, 0.12 ft dept	
QWN-174	**0.54**		0.00	7/25/16, measure rated "Poor", lots veg + rock	
QWN-176			0.00	7/25/16, no measureable velocity, stagnant at	
57-6-A		-0.28		2 ft cipolletti, 0.12 ft depth	
57-6-B		-0.10		2 ft cipolletti, 0.06 ft depth	
57-6 Lat Remaining	**0.00**		0.38		
58 Lateral					
58 Lat Head Measure	**94.78**		0.00	7/28/16, head weir or flow meter output value	
QBN-030	**92.93**		0.00	7/28/16, Stnd. Dev. 1.422	
58-Dead		0.00		No measurement recorded, assumed OFF	
58-A		0.00		No measurement recorded, assumed OFF	
58-B		0.00		No measurement recorded, assumed OFF	
58-C		0.00		No measurement recorded, assumed OFF	
58-F		0.00		No measurement recorded, assumed OFF	
PL-58-1		-1.50		7/28/2016, measure device output recorded	
58-2-Lat		-4.00		7/28/2016, measure device output recorded	
QWB-032	**83.22**		5.50	7/28/16, Stnd. Dev. 1.836	
58-G		-1.10		7/28/2016, measure device output recorded	
58-H & H-1		0.00		No measurement recorded, assumed OFF	
58-I		-0.25		7/28/2016, measure device output recorded	
58-3 Lat		-13.50		7/28/2016, measure device output recorded	
58-11 Lat		-68.37		= QWB-032 less sum turnouts to 58-3 Lat	
58 Lat Remaining	**0.00**		88.72		
58-2 Lateral					
58-2- Lat Head Measure	**2.08**		0.00	7/21/16, head weir, 4 ft cipolletti, 0.29 ft dept	
58-2-A		-0.64		2 ft cipolletti, 0.21 ft depth	
58-2-B		0.00		No measurement recorded, assumed OFF	
58-2-C		-0.79		2 ft cipolletti, 0.24 ft depth	
QWN-200	**0.73**		1.43	7/21/16, measure rated as "Poor", little flow	
58-2-D		0.00		No measurement recorded, assumed OFF	
58-2-E		0.00		No measurement recorded, assumed OFF	
58-2-G		0.00		No measurement recorded, assumed OFF	
58-2-H		-0.60		2 ft cipolletti, 0.20 ft depth	
58-2 Lat Remaining	**0.00**		2.03		

57-6 Lateral



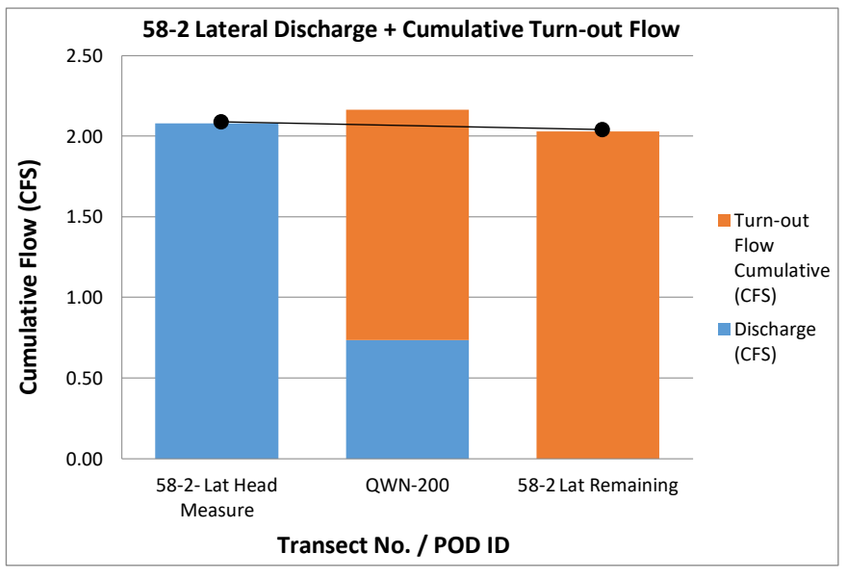
57-6 Lateral Intake to the Study Reach	=	0.42	
57-6 Lateral Spill from the Study Reach	=	0.00	
57-6 Lateral Turnouts + Flow Remaining	=	-0.38	
57-6 Lateral Seepage Loss in the Study Reach	=	0.04	= 9.52%

58 Lateral



58 Lateral Intake to the Study Reach	=	94.78	
58 Lateral Spill from the Study Reach	=	0.00	
58 Lateral Turnouts + Flow Remaining	=	-88.72	
58 Lateral Seepage Loss in the Study Reach	=	6.06	= 6.40%

58-2 lateral



58-2 Lateral Intake to the Study Reach	=	2.08	
58-2 Lateral Spill from the Study Reach	=	0.00	
58-2 Lateral Turnouts + Flow Remaining	=	-2.03	
58-2 Lateral Seepage Loss in the Study Reach	=	0.05	= 2.40%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
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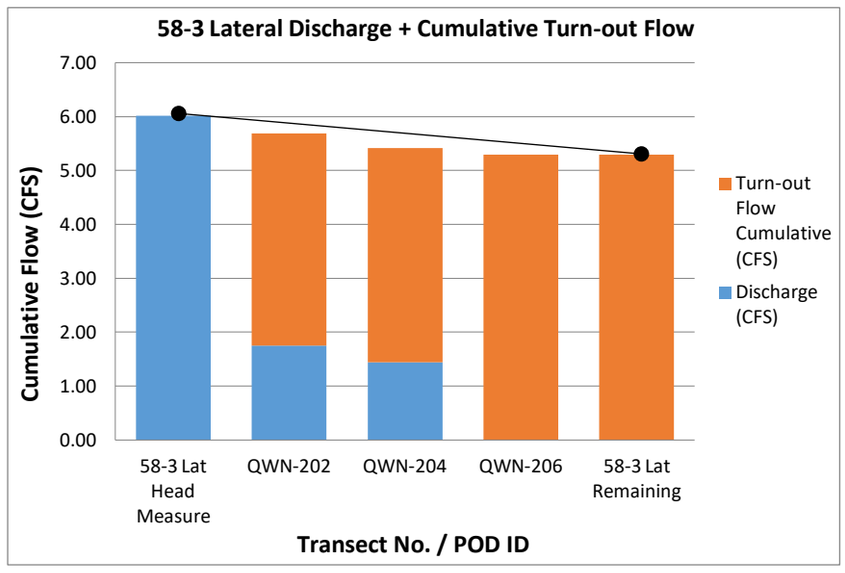
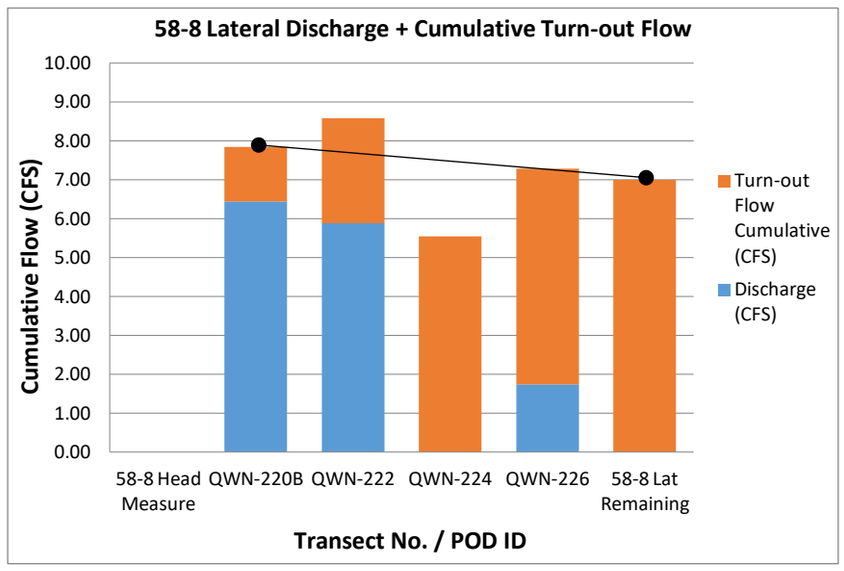
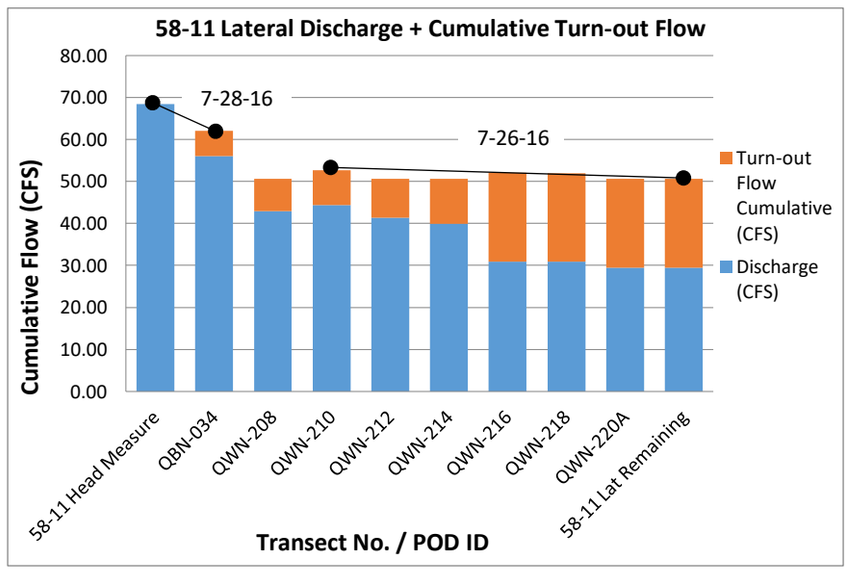
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
58-3 Lateral					58-3 Lateral
58-3 Lat Head Measure	**6.02**		0.00	7/21/16, head weir, 5 ft cipolletti, 0.51 ft dept	
58-3-A		0.00		No measurement recorded, assumed OFF	
58-3-A-1		-0.55		2 ft Cipolletti, 0.19 ft depth	
58-3-A-2		0.00		No measurement recorded, assumed OFF	
58-3-1 Lat		-2.18		4 ft Cipolletti, 0.3 ft depth	
58-3-B		-1.21		2 ft Cipolletti, 0.32 ft depth	
QWN-202	**1.75**		3.94	7/21/16, measurement rated as "Good"	
58-3-C		-0.04		2 ft Cipolletti, 0.03 ft depth	
58-3-DEAD		0.00		No measurement recorded, assumed OFF	
58-3-D		0.00		No measurement recorded, assumed OFF	
58-3-E		0.00		No measurement recorded, assumed OFF	
58-3-E		0.00		No measurement recorded, assumed OFF	
58-3-F		0.00		No measurement recorded, assumed OFF	
58-3-G		0.00		No measurement recorded, assumed OFF	
53-3-2-A		0.00		No measurement recorded, assumed OFF	
QWN-204	**1.44**		3.98	7/21/16, measurement rated as "Good"	
58-3-H		0.00		No measurement recorded, assumed OFF	
58-3-I		-1.10		2 ft Cipolletti, 0.3 ft depth	
58-3-J&K		-0.21		2 ft Cipolletti, 0.1 ft depth	
QWN-206			5.29	7/21/16, no measurement, piped section	
58-3 Lat Remaining	**0.00**		5.29		
58-8 Lateral					58-8 Lateral
58-8 Head Measure			0.00	No head weir measurement value recorded	
58-8-A		-1.40		Measure device signal output recorded	
QWN-220B	**6.44**		1.40	7/26/16, added transect, rated "Good"	
58-8-B		0.00		No measurement recorded, assumed OFF	
58-8-C		0.00		No measurement recorded, assumed OFF	
58-8-D		-1.30		Measure device signal output recorded	
QWN-222	**5.88**		2.70	7/26/16, measurement rated as "Good"	
58-8-E		-2.05		Measure device signal output recorded	
58-8-F		0.00		No measurement recorded, assumed OFF	
58-8-H&G		-0.80		Measure device signal output recorded	
QWN-224			5.55	7/26/16, no measurement, piped section	
58-8-K DEAD		0.00		Abandoned	
58-8-L DEAD		0.00		Abandoned	
58-8-M		0.00		No measurement recorded, assumed OFF	
58-8-Dead 3		0.00		Abandoned	
QWN-226	**1.74**		5.55	7/26/16, measurement rated as "Good"	
58-8-N		0.00		No measurement recorded, assumed OFF	
58-8-O		-0.45		Measure device signal output recorded	
58-8-P		-1.00		Measure device signal output recorded	
58-8 Lat Remaining	**0.00**		7.00		
58-11 Lateral					58-11 Lateral
58-11 Head Measure	**68.37**		0.00	7/28/16, QWB-032 less turnouts to 58-3 Lat	
58-11-A		-0.20		Measure device signal output recorded	
58-11-A1		0.00		No measurement recorded, assumed OFF	
58-11-B		0.00		No measurement recorded, assumed OFF	
58-11-D		-3.80		Measure device signal output recorded	
58-11-E		0.00		No measurement recorded, assumed OFF	
58-11-F		0.00		No measurement recorded, assumed OFF	
58-11-G		0.00		No measurement recorded, assumed OFF	
58-11-H		0.00		No measurement recorded, assumed OFF	
58-11-I		-0.60		meter	
58-11-Dead 2		0.00		Abandoned	
58-11-J		-0.50		Measure device signal output recorded	
58-11-J-1		-0.90		meter	
58-11-K		0.00		No measurement recorded, assumed OFF	
58-11-L&M		0.00		No measurement recorded, assumed OFF	
QBN-034	**56.06**		6.00	7/28/2016, ADCP boat measurement	
58-11-6 Lat		-1.75		7/26/16, piped	
58-11-M-Dead (58-11-M-1)		0.00		Abandoned	
58-11 Spill Gate		0.00		No measurement recorded, assumed OFF	
QWN-208	**42.88**		7.75	7/26/16, Wading measurement, rated "Good"	
58-11-N		-0.60		Measure device signal output recorded	
QWN-210	**44.36**		8.35	7/26/16, Wading measurement, not rated, veg	
58-11-O		-0.90		Measure device signal output recorded	
QWN-212	**41.36**		9.25	7/26/12, Wading measurement, not rated	
58-11-O-1		0.00		No measurement recorded, assumed OFF	
58-11-P		0.00		No measurement recorded, assumed OFF	
58-11-Q		-1.10		Measure device signal output recorded	
58-11-R		-0.40		meter	
QWN-214	**39.91**		10.75	7/26/16, Wading measurement, rated "Good"	
58-11-S		0.00		No measurement recorded, assumed OFF	
58-11-S-1		0.00		No measurement recorded, assumed OFF	



58-3 Lateral Intake to the Study Reach	=	6.02
58-3 Lateral Spill from the Study Reach	=	0.00
58-3 Lateral Turnouts + Flow Remaining	=	-5.29
58-3 Lateral Seepage Loss in the Study Reach	=	0.73 = 12.13%



58-8 Lateral Intake to the Study Reach	=	6.44
58-8 Lateral Spill from the Study Reach	=	0.00
58-8 Lateral Turnouts + Flow Remaining	=	-5.60
58-8 Lateral Seepage Loss in the Study Reach	=	0.84 = 13.07%



Upper Reach 58-11 Lateral ADCP measurements 7-28-16

58-11 Lateral Intake to the Study Reach	=	68.37
58-11 Lateral Spill from the Study Reach	=	0.00
58-11 Lateral Turnouts + Flow Remaining	=	-62.06
58-11 Lateral Seepage Loss in the Study Reach	=	6.31 = 9.23%

Lower Reach 58-11 Lateral Wading measurements 7-26-16

58-11 Lateral Intake to the Study Reach	=	44.36
58-11 Lateral Spill from the Study Reach	=	0.00
58-11 Lateral Turnouts + Flow Remaining	=	-42.22
58-11 Lateral Seepage Loss in the Study Reach	=	2.14 = 4.81%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
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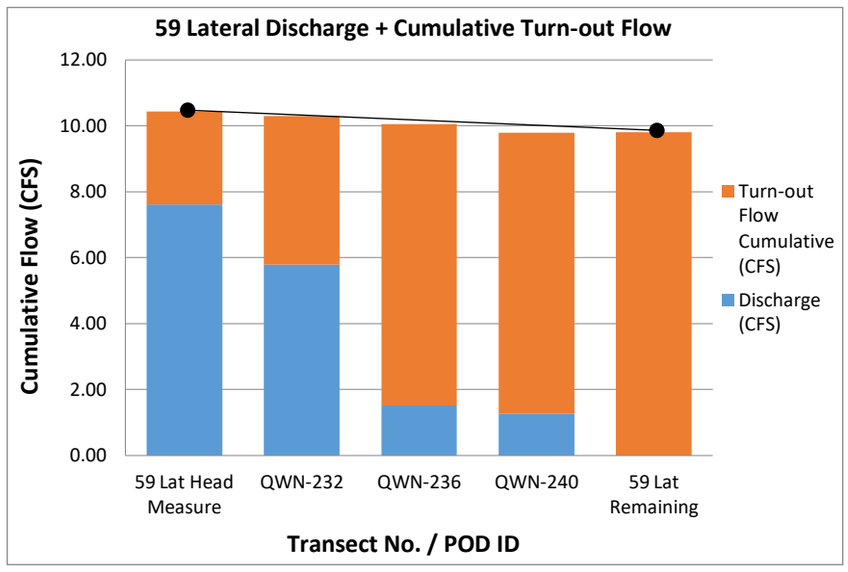
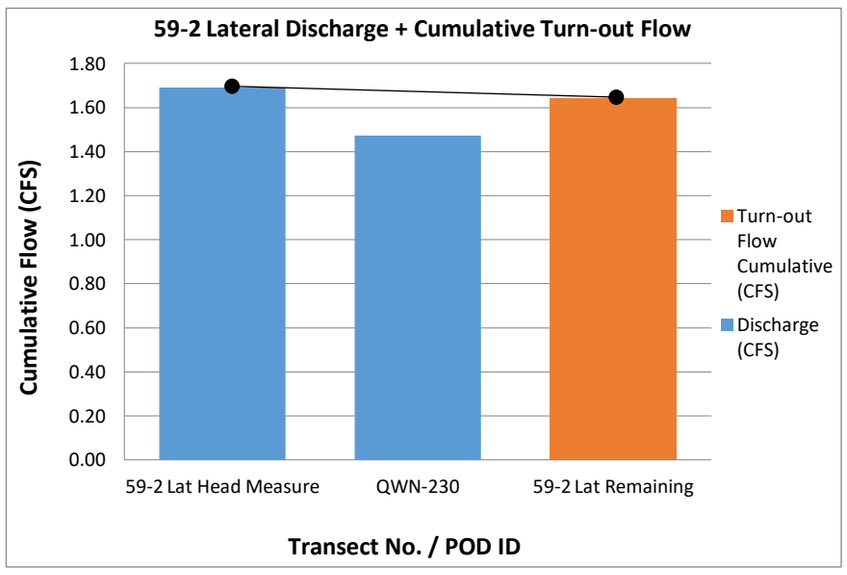
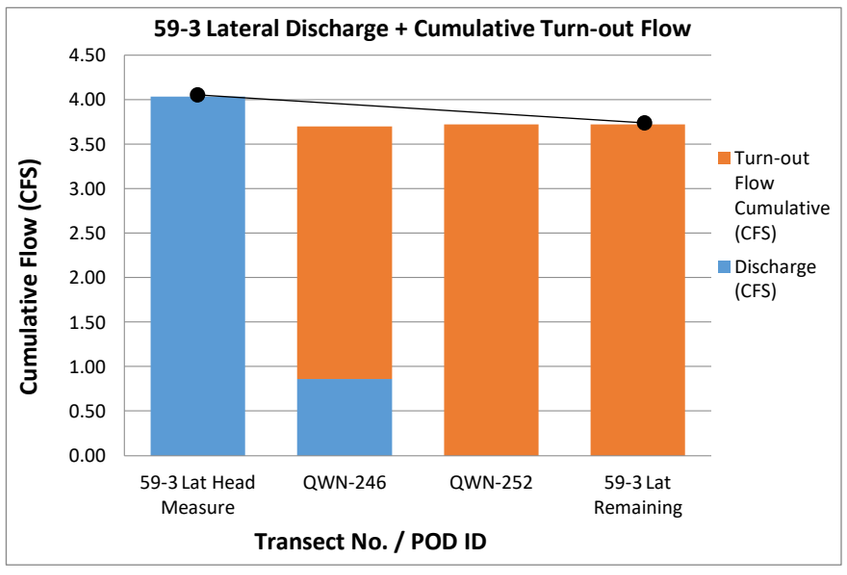
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
58-8 Lat		-7.84		Sum of QWN-220B + Turn-out 58-8-A flow	
58-11-T-Dead		0.00		Abandoned	
58-11-T		-2.55		Measure device signal output recorded	
QWN-216	**30.94**		21.14	7/26/16, Wading measurements, not rated	
QWN-218	**30.86**		21.14	7/26/16, Wading measurements, not rated	
58-11-Dead 9		0.00		Abandoned	
58-11-Dead 8		0.00		Abandoned	
QWN-220A	**29.43**		21.14	7/26/16, Wading measurement, rated "Good"	
58-11 Lat Remaining	**29.43**		21.14	To PL58-9, PL58-9-2, PL58-9-1-Lat, & PL58-11	
59 Lateral					59 Lateral
59-1 Lat		-2.81		7/20/16, 3 ft Cipolletti, 0.43 ft depth	
R57-M		0.00		No measurement recorded, assumed OFF	
R57-N		0.00		No measurement recorded, assumed OFF	
59 Lat Head Measure	**7.62**	0.00	2.81	Unclear value recorded, est. from notes	
59-A		0.00		No measurement recorded, assumed OFF	
59-2 Lat		-1.69		2 ft Cipolletti, 0.4 ft depth	
QWN-232	**5.79**		4.50	7/20/16, measurement rated as "Good"	
59-3 Lat		-4.03		5 ft Cipolletti, 0.39 ft depth	
59-B		0.00		No measurement recorded, assumed OFF	
59-C		0.00		No measurement recorded, assumed OFF	
59-D		0.00		No measurement recorded, assumed OFF	
59-E		0.00		No measurement recorded, assumed OFF	
QWN-236	**1.52**		8.53	7/20/16, measurement rated as "Good"	
59-F		0.00		No measurement recorded, assumed OFF	
59-4 Lat		0.00		No measurement recorded, no flow	
59-G		0.00		No measurement recorded, assumed OFF	
59-H		0.00		No measurement recorded, assumed OFF	
QWN-240	**1.27**		8.53	7/20/16, measurement rated as "Good"	
59-I		0.00		No measurement recorded, assumed OFF	
59-J		0.00		No measurement recorded, assumed OFF	
59-L		-0.06		2 ft Cipolletti, 0.04 ft depth	
59-K		0.00		No measurement recorded, assumed OFF	
59-5 Lat		-1.21		2 ft Cipolletti, 0.32 ft depth	
59 Lat Remaining	**0.00**		9.80		
59-2 Lateral					59-2 Lateral
59-2 Lat Head Measure	**1.69**		0.00	7/20/16, head weir, 2 ft cipolletti, 0.4 ft depth	
QWN-230	**1.47**		0.00	7/20/16, rated "Poor", back eddy right bank	
59-2-A&B		-1.64		3 ft Cipolletti, 0.3 ft depth	
59-2 Lat Remaining	**0.00**		1.64		
59-3 Lateral					59-3 Lateral
59-3 Lat Head Measure	**4.03**		0.00	7/20/16, head weir, 5 ft Cipolletti, 0.39 ft dept	
59-3-A		-0.90		Measure device signal output recorded	
59-3-B		0.00		No measurement recorded, assumed OFF	
59-3-C		-1.94		Measure device signal output recorded	
59-3-1 Lat		0.00		No measurement recorded, assumed OFF	
QWN-246	**0.86**		2.84	7/20/16, measurement rated as "Good"	
59-3-D		-0.35		2 ft Cipolletti, 0.14 ft depth	
59-E		0.00		No measurement recorded, assumed OFF	
59-3-F&G		-0.21		2 ft Cipolletti, 0.1 ft depth	
59-F		-0.32		2 ft Cipolletti, 0.13 ft depth	
QWN-252	**0.00**		3.72	7/20/16, no measurement, no water	
59-3 Lat Remaining	**0.00**		3.72		



59 Lateral Intake to the Study Reach	=	7.62
59 Lateral Spill from the Study Reach	=	0.00
59 Lateral Turnouts + Flow Remaining	=	-6.99
59 Lateral Seepage Loss in the Study Reach	=	0.63 = 8.27%



59-2 Lateral Intake to the Study Reach	=	1.69
59-2 Lateral Spill from the Study Reach	=	0.00
59-2 Lateral Turnouts + Flow Remaining	=	-1.64
59-2 Lateral Seepage Loss in the Study Reach	=	0.05 = 2.96%



59-3 Lateral Intake to the Study Reach	=	4.03
59-3 Lateral Spill from the Study Reach	=	0.00
59-3 Lateral Turnouts + Flow Remaining	=	-3.72
59-3 Lateral Seepage Loss in the Study Reach	=	0.31 = 7.69%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
Laterals

Final
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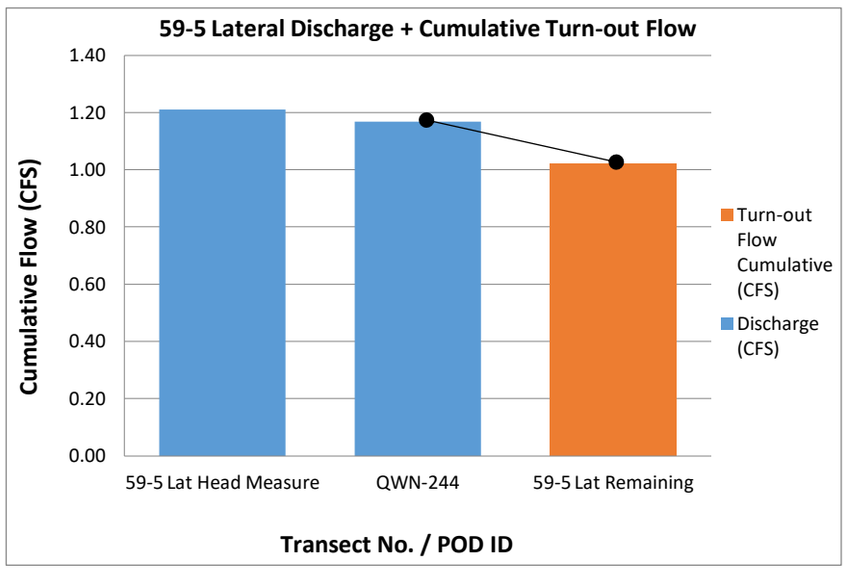
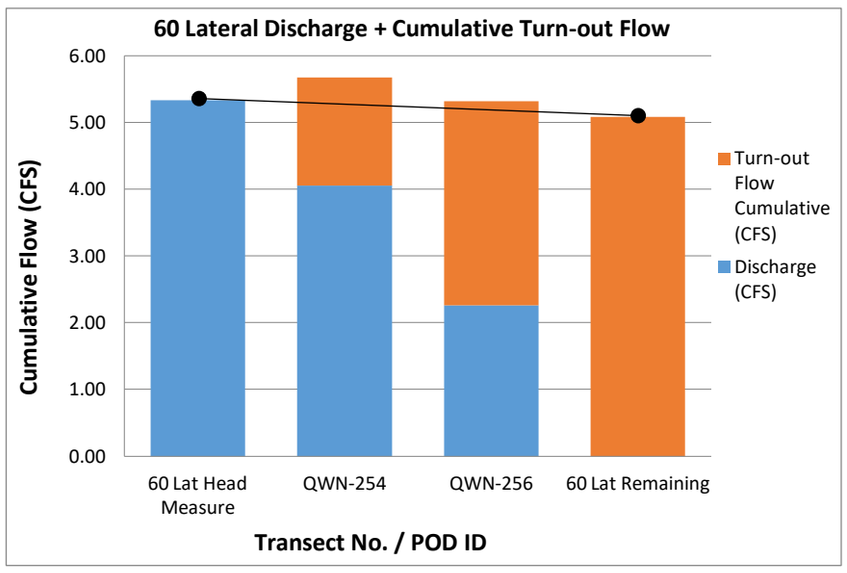
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
59-3-1 Lateral					59-3-1 Lateral
59-3-1 Lat Head Measure	**0.00**		0.00	No measurement recorded	
QWN-248	**0.00**		0.00	7/20/16, no measure, 0.1 ft depth, no flow	
QWN-250	**0.00**		0.00	7/20/16, no measurement, no water	
59-4 Lateral					59-4 Lateral
59-4 Lat Head Measure	**0.00**		0.00	No measurement recorded	
QWN-238	**0.00**		0.00	7/20/16, no measurement, no flow	
QWN-242	**0.00**		0.00	7/20/16, no measure, no flow, stagnant water	
59-5 Lateral					59-5 Lateral
59-5 Lat Head Measure	**1.21**		0.00	7/20/16, head weir, 2 ft Cipolletti, 0.32 ft dept	
QWN-244	**1.17**		0.00	7/20/16, measurement rated as "Good"	
59-5-A		-0.55		2 ft Cipolletti, 0.19 ft depth	
59-5-B		-0.47		2 ft Cipolletti, 0.17 ft depth	
59-5 Lat Remaining	**0.00**		1.02		
60 Lateral					60 Lateral
60 Lat Head Measure	**5.33**		0.00	7/20/16, head weir, 5 ft Cipolletti, 0.47 ft dept	
60-A		-1.62		Measure device signal output recorded	
60-B		0.00		No measurement recorded, assumed OFF	
60-C		0.00		No measurement recorded, assumed OFF	
QWN-254	**4.05**		1.62	7/20/16, measure rated as "Fair", fast riffles	
60-D		0.00		No measurement recorded, assumed OFF	
60-E		0.00		No measurement recorded, assumed OFF	
60-F		-1.44		2 ft Cipolletti, 0.36 ft depth	
QWN-256	**2.26**		3.06	7/20/16, measurement rated as "Good"	
60-G		0.00		No measurement recorded, assumed OFF	
60-H		-2.02		2 ft Cipolletti, 0.45 ft depth	
60-J&K		0.00		No measurement recorded, assumed OFF	
60 Lat Remaining	**0.00**		5.08		

No Loss Assessment Evaluation Made

No Loss Assessment Evaluation Made



59-5 Lateral Intake to the Study Reach	=	1.17
59-5 Lateral Spill from the Study Reach	=	0.00
59-5 Lateral Turnouts + Flow Remaining	=	-1.02
59-5 Lateral Seepage Loss in the Study Reach	=	0.15 = 12.72%



60 Lateral Intake to the Study Reach	=	5.33
60 Lateral Spill from the Study Reach	=	0.00
60 Lateral Turnouts + Flow Remaining	=	-5.08
60 Lateral Seepage Loss in the Study Reach	=	0.25 = 4.69%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
Laterals

Final
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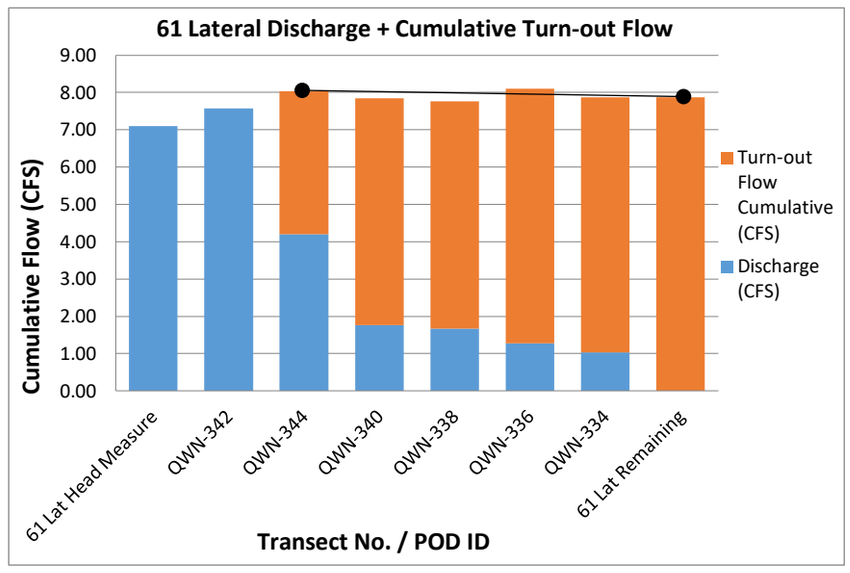
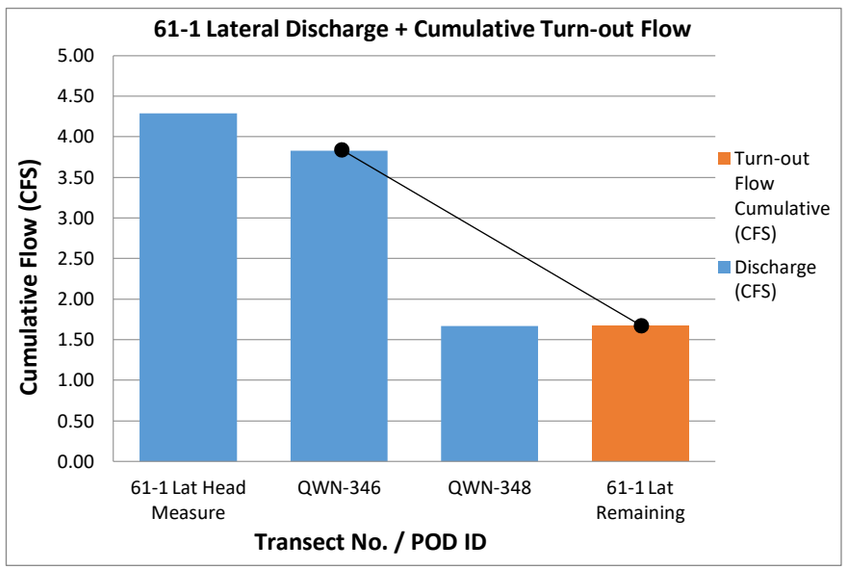
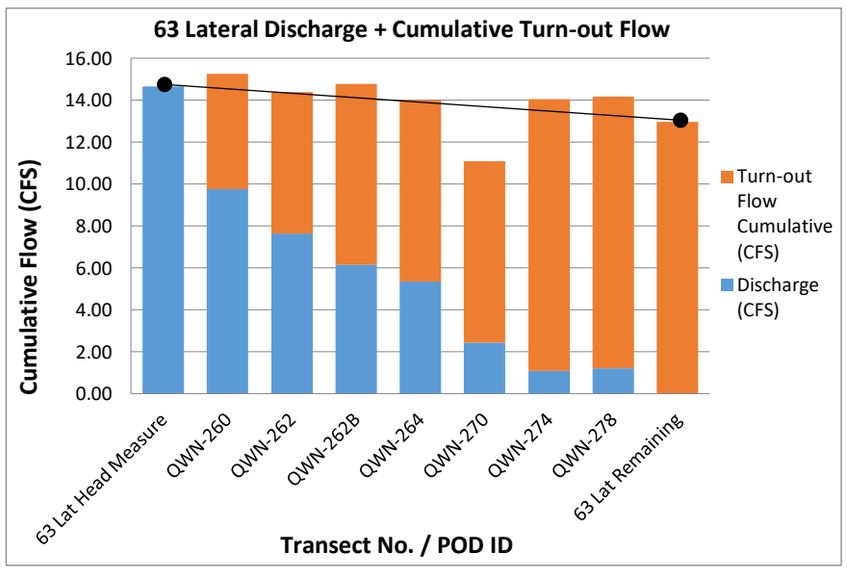
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
61 Lateral					61 Lateral
61 Lat Head Measure	**7.10**		0.00	7/21/16, 5 ft Cipolletti, 0.57 ft depth	
QWN-342	**7.57**		0.00	7/21/16, measure rated "Excellent", uniform s	
61-1 Lat		-3.83		7/21/16, QWN-346	
QWN-344	**4.20**		3.83	7/21/16, measure rated "Good", some silt	
61-B DEAD		0.00		No measurement recorded, assumed OFF	
61-B-1		0.00		No measurement recorded, assumed OFF	
61-B-2		-0.94		2 ft Cipolletti, 0.27 ft depth	
61-C		0.00		No measurement recorded, assumed OFF	
61-2 lat		-1.32		3 ft Cipolletti, 0.26 ft depth	
61-Dead		0.00		Abandoned	
61 Dead 2		0.00		Abandoned	
QWN-340	**1.76**		6.09	Not rated, gradual RB, steep LB	
61 Dead 3		0.00		Abandoned	
61-G		0.00		No measurement recorded, assumed OFF	
61-H		0.00		No measurement recorded, assumed OFF	
QWN-338	**1.67**		6.09	7/21/16, not rated, notes indicate no veg, no s	
61-Dead 4		0.00		Abandoned	
61-J		-0.75		meter	
61-J-2		0.00		No measurement recorded, assumed OFF	
61-K		0.00		No measurement recorded, assumed OFF	
61-L		0.00		No measurement recorded, assumed OFF	
QWN-336	**1.27**		6.84	7/21/16, measurement rated as "Good"	
QWN-334	**1.03**		6.84	7/21/16, measurement rated as "Good"	
61-11-A waste		-1.03		61-11-A waste (Loss)	
61 Lat Remaining	**0.00**		7.87		
61-1 Lateral					61-1 Lateral
61-1 Lat Head Measure	**4.29**		0.00	7/21/16, 3 ft Cipolletti, 0.57 ft depth	
QWN-346	**3.83**		0.00	7/21/16, measurement rated as "Good"	
QWN-348	**1.67**		0.00	7/21/16, measurement rated as "Good"	
61-1-A		-1.67		At point of use, assumed delivery = QWN-348	
61-1 Lat Remaining	**0.00**		1.67		
63 Lateral					63 Lateral
63 Lat Head Measure	**14.65**		0.00	7/20/16, head weir, 7 ft Cipolletti, 0.74 ft dept	
63-A		0.00		No measurement recorded, assumed OFF	
63-A-1		0.00		No measurement recorded, assumed OFF	
63-1 Lat		-5.49		8 ft Cipolletti, 0.35 ft depth	
63-B		0.00		No measurement recorded, assumed OFF	
QWN-260	**9.75**		5.49	7/20/16, measurement rated as "Good"	
63-C		-1.25		Measure device signal output recorded	
QWN-262	**7.63**		6.74	7/20/16, measurement rated as "Good"	
63-D		-1.90		Measure device signal output recorded	
63-E		0.00		No measure recorded 7/20/16, assumed OFF	
QWN-262B	**6.14**		8.64	7/20/16, extra measure, rated as "Good"	
63-F		0.00		No measure recorded 7/20/16, assumed OFF	
QWN-264	**5.35**		8.64	7/20/16, measure rated "Fair", veg on banks	
63-G		0.00		No measure recorded 7/20/16, assumed OFF	
63-2 Lat		0.00		No measurement recorded, assumed OFF	
63-I		0.00		No measurement recorded, assumed OFF	
63-H		0.00		No measurement recorded, assumed OFF	
QWN-270	**2.45**		8.64	7/20/16, rated "Good", uniform conditions	
63-J		0.00		No measurement recorded, assumed OFF	
63-K		0.00		No measurement recorded, assumed OFF	
63-L&M DEAD		0.00		No measurement recorded, assumed OFF	
63-N-DEAD		0.00		No measurement recorded, assumed OFF	
63-4 Lat		-3.11		7/19/16, (day earlier) 4 ft Cipolletti, 0.38 ft dep	
63-O		-1.20		Measure device signal output recorded	
63-R		0.00		No measurement recorded, assumed OFF	
QWN-274	**1.09**		12.95	7/20/16, measure rated "Good", uniform + sha	
63-P DEAD		0.00		No measurement recorded, assumed OFF	
QWN-278	**1.21**		12.95	Not rated, uneven + turbulent	
63 Lat Remaining	**0.00**		12.95		



61 Lateral Intake to the Study Reach	=	4.20
61 Lateral Spill from the Study Reach	=	-1.03
61 Lateral Turnouts + Flow Remaining	=	-3.01
61 Lateral Seepage Loss in the Study Reach	=	0.16 = 3.88%



61-1 Lateral Intake to the Study Reach	=	3.83
61-1 Lateral Spill from the Study Reach	=	0.00
61-1 Lateral Turnouts + Flow Remaining	=	-1.67
61-1 Lateral Seepage Loss in the Study Reach	=	2.16 = 56.37%

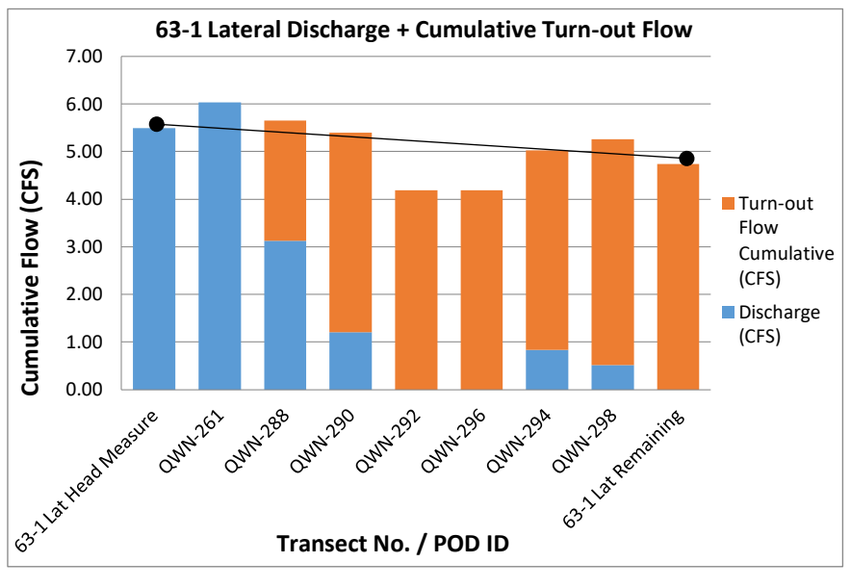


63 Lateral Intake to the Study Reach	=	14.65
63 Lateral Spill from the Study Reach	=	0.00
63 Lateral Turnouts + Flow Remaining	=	-12.95
63 Lateral Seepage Loss in the Study Reach	=	1.70 = 11.60%

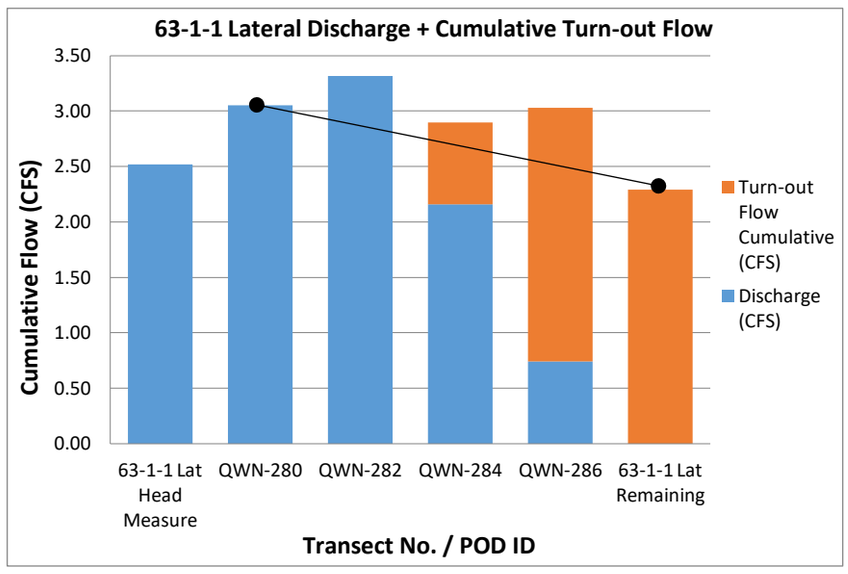
NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
Laterals

Final
03-10-17

Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
63-1 Lateral					63-1 Lateral
63-1 Lat Head Measure	**5.49**		0.00	7/19/16, head weir, 8 ft Cipolletti, 0.35 ft dept	
QWN-261	**6.04**		0.00	7/19/16, measurement rated as "Good"	
63-1-A		0.00		No measurement recorded, assumed OFF	
63-1-1 Lat		-2.52		4 ft Cipolletti, 0.33 ft depth	
63-1-B		0.00		No measurement recorded, assumed OFF	
QWN-288	**3.13**		2.52	7/19/16, measurement rated as "Good"	
63-1-C		-0.64		2 ft Cipolletti, 0.21 ft depth	
63-1-D		-1.03		3 ft Cipolletti, 0.22 ft depth	
63-1-E		0.00		No measurement recorded, assumed OFF	
QWN-290	**1.21**		4.19	7/19/16, measurement rated as "Fair"	
63-1-F		0.00		No measurement recorded, assumed OFF	
63-1-G		0.00		No measurement recorded, assumed OFF	
QWN-292			4.19	7/19/16, no measure, no flow velocity	
63-1-H		0.00		No measurement recorded, assumed OFF	
63-1-J		0.00		No measurement recorded, assumed OFF	
63-1-K		0.00		No measurement recorded, assumed OFF	
QWN-296			4.19	7/19/16, no measure, no flow velocity	
63-1-L		0.00		No measurement recorded, assumed OFF	
QWN-294	**0.84**		4.19	7/19/16, measurement rated as "Good"	
63-1-M		0.00		No measurement recorded, assumed OFF	
63-1-N		-0.55		2 ft Cipolletti, 0.19 ft depth	
63-1-O		0.00		No measurement recorded, assumed OFF	
QWN-298	**0.51**		4.74	7/19/16, measure rated as "Fair", deep silt	
63-1 Lat Remaining	**0.00**		4.74		
63-1-1 Lateral					63-1-1 Lateral
63-1-1 Lat Head Measure	**2.52**		0.00	7/19/16, head weir, 4 ft Cipolletti, 0.33 ft dept	
QWN-280	**3.05**		0.00	7/19/16, measurement rated as "Good"	
63-1-1-A		0.00		No measurement recorded, assumed OFF	
QWN-282	**3.32**		0.00	7/19/16, measure rated as "Excellent"	
63-1-1-B		-0.74		2 ft Cipolletti, 0.23 ft depth	
63-1-1-C		0.00		No measurement recorded, assumed OFF	
63-1-1-D		0.00		No measurement recorded, assumed OFF	
63-1-1-E		0.00		No measurement recorded, assumed OFF	
63-1-1-F		0.00		No measurement recorded, assumed OFF	
QWN-284	**2.16**		0.74	7/19/16, measure rated as "Good"	
63-1-1-G		0.00		No measurement recorded, assumed OFF	
63-1-1-H		-1.00		Measure device signal output recorded	
63-1-1-J		-0.55		2 ft Cipolletti, 0.19 ft depth	
QWN-286	**0.74**		2.29	7/19/16, rated "Fair", mild silt, root influence	
63-1-1 Lat Remaining	**0.00**		2.29		
63-2 Lat					63-2 Lateral
63-2 Lat Head Measure	**0.00**			No measurement recorded, assumed OFF	
QWN-266	**0.00**			7/20/16, no measurement, no water	
QWN-268	**0.00**			7/20/16, no measurement, no water	
63-4 Lat					63-4 Lateral
63-4 Lat Head Measure	**3.11**		0.00	7/19/16, head weir, 4 ft Cipolletti, 0.38 ft dept	
63-4-A		-1.75		Measure device signal output recorded	
63-4-B DEAD		0.00		No measurement recorded, assumed OFF	
QWN-272	**1.09**		1.75	7/19/16, rated "Fair", silty middle of canal	
QWN-276	**1.38**		1.75	7/19/16, rated "Poor", silty substrate, eddy	
63-4-C		-0.94		2 ft Cipolletti, 0.27 ft depth	
63-4-D		-0.21		2 ft Cipolletti, 0.1 ft depth	
63-4 Lat Remaining	**0.00**		2.90		

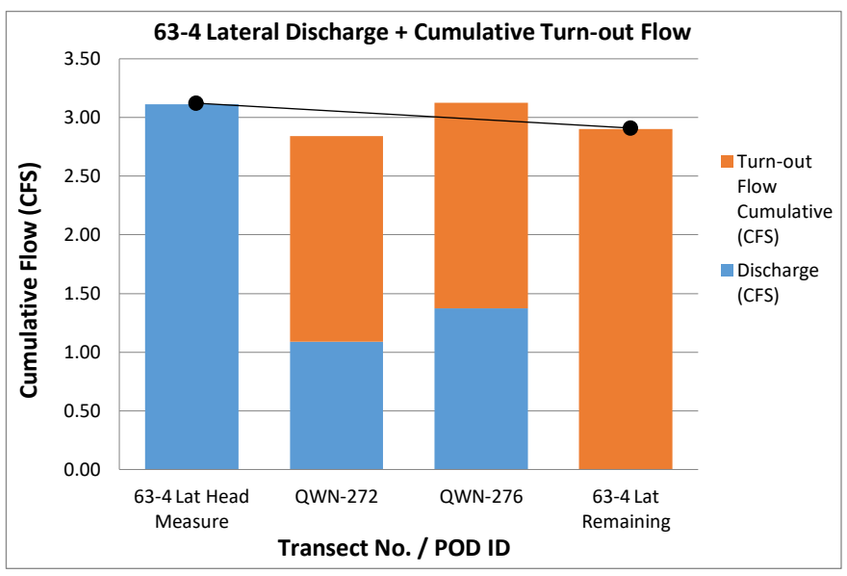


63-1 Lateral Intake to the Study Reach	=	5.49
63-1 Lateral Spill from the Study Reach	=	0.00
63-1 Lateral Turnouts + Flow Remaining	=	-4.74
63-1 Lateral Seepage Loss in the Study Reach	=	0.75 = 13.66%



63-1-1 Lateral Intake to the Study Reach	=	3.05
63-1-1 Lateral Spill from the Study Reach	=	0.00
63-1-1 Lateral Turnouts + Flow Remaining	=	-2.29
63-1-1 Lateral Seepage Loss in the Study Reach	=	0.76 = 24.93%

No Loss Assessment Evaluation Made



63-4 Lateral Intake to the Study Reach	=	3.11
63-4 Lateral Spill from the Study Reach	=	0.00
63-4 Lateral Turnouts + Flow Remaining	=	-2.90
63-4 Lateral Seepage Loss in the Study Reach	=	0.21 = 6.75%

NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
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Final
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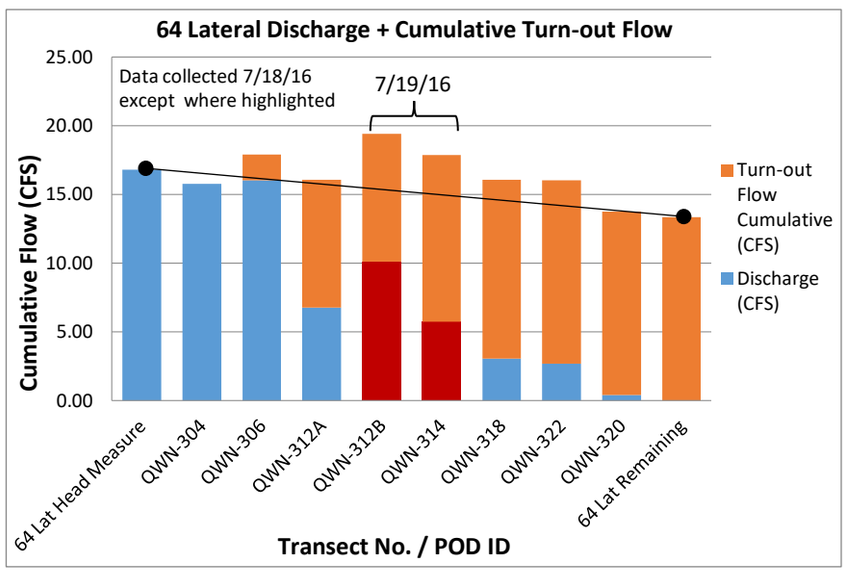
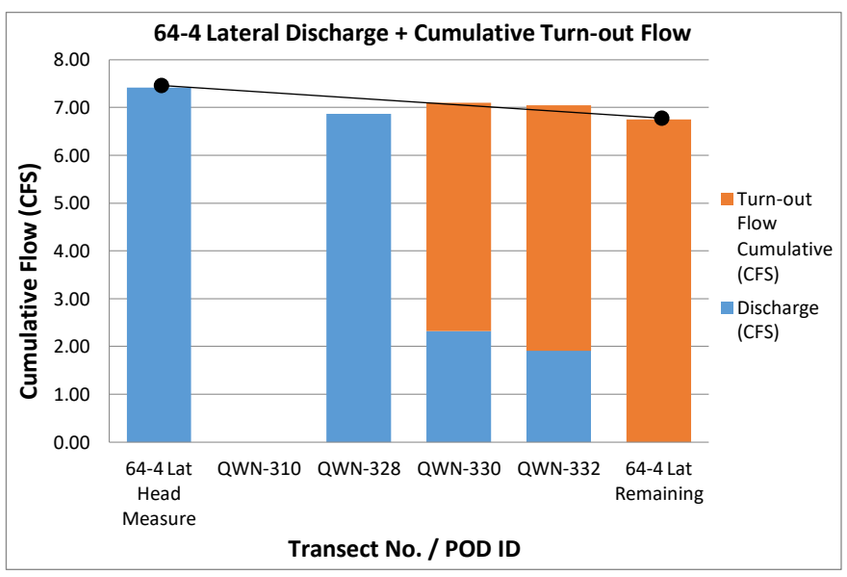
Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
64 Lateral					64 Lateral
64 Lat Head Measure	**16.77**		0.00	7/18/16, head weir, 7 ft cipolletti, 0.81 ft dept	
64-A		0.00		No measurement recorded, assumed OFF	
64-1-A		0.00		QWN-302, no measurement, no flow	
QWN-302		0.00		7/18/16, no measure, no flow 64-1-A Lat	
QWN-304	**15.77**		0.00	7/18/16, measurement rated as "Good"	
64-2 Lat		0.00		No measurement recorded, assumed OFF	
64-B		0.00		No measurement recorded, assumed OFF	
64-3-A		-1.88		7/18/16, 2 ft cipolletti, 0.43 ft depth	
QWN-306	**16.03**		1.88	7/18/16, measurement rated as "Good"	
64-C		0.00		No measurement recorded, assumed OFF	
64-D		0.00		No measurement recorded, assumed OFF	
64-4 Lat		-7.42		7/18/16, 6 ft cipolletti, 0.52 ft depth	
QWN-312A	**6.75**		9.30	7/18/16, measure rated as "Fair", veg, silt	
QWN-312B	**10.08**		9.30	7/19/16, measure rated as "Fair", veg, silt	
64-E		-1.03		7/18/16, 3 ft cipolletti, 0.22 ft depth	
64-F		0.00		No measurement recorded, assumed OFF	
64-G		0.00		No measurement recorded, assumed OFF	
64-H		0.00		No measurement recorded, assumed OFF	
64-J		-0.10		Measure device signal output recorded	
64-5 Lat		-1.72		7/18/16, 3 ft cipolletti, 0.31 ft depth	
64-K		0.00		No measurement recorded, assumed OFF	
QWN-314	**5.72**		12.15	7/19/16, measurement rated as "Good"	
64-K-1		-0.50		measure device signal output recorded	
64-6 Lat		-0.37		3 ft cipolletti, 0.11 ft depth	
64-O		0.00		No measurement recorded, assumed OFF	
QWN-318	**3.03**		13.02	7/18/16, measure rated "Fair", deep silt	
64-L		0.00		No measurement recorded, assumed OFF	
64-M		-0.30		Recorded flow rate 0.30 cfs	
64-N		0.00		No measurement recorded, assumed OFF	
64-N-1		0.00		No measurement recorded, assumed OFF	
64-P		0.00		No measurement recorded, assumed OFF	
64-Q		0.00		No measurement recorded, assumed OFF	
QWN-322	**2.68**		13.32	7/18/16, not rated, moderate silt	
64-R		0.00		No measurement recorded, assumed OFF	
64-S		0.00		No measurement recorded, assumed OFF	
64-T		0.00		No measurement recorded, assumed OFF	
64-U		0.00		No measurement recorded, assumed OFF	
64-V		0.00		No measurement recorded, assumed OFF	
QWN-320	**0.40**		13.32	7/18/16, measurement rated as "Poor"	
64 Lat Remaining	**0.00**		13.32		
64-1 Lateral					64-1 Lateral
64-1 Lat Head Measure	**0.00**		0.00	no measurement	
QWN-300	**0.00**		0.00	7/18/16, no measurement, very little flow	
64-3-A Lateral					64-3-A Lateral
64-3-A Lat Head Measure	**1.90**		0.00	Head of Lat weir, 2 ft cipolletti, 0.43 ft depth	
QWN-308	**1.88**		0.00	7/18/16, measure rated as "Fair", narrow	
QWN-308A	**1.87**		0.00	7/18/16, measure rated as "Poor"	
QWN-308B	**1.90**		0.00	7/18/16, measure rated as "Poor"	
64-4 Lateral					64-4 Lateral
64-4 Lat Head Measure	**7.42**		0.00	7/18/16, head weir, 6 ft cipolletti, 0.52 ft dept	
QWN-310			0.00	No measurement made	
64-4-1 Lat		0.00		No measurement recorded, assumed OFF	
64-4-A		0.00		No measurement recorded, assumed OFF	
QWN-328	**6.86**		0.00	7/18/16, measure rated "Fair", deep silt	
64-4-B		-0.53		3 ft cipolletti, 0.14 ft depth	
64-4-C		0.00		No measurement recorded, assumed OFF	
64-4-2 Lat		-3.73		Pipe, est. flow from measure device output rec	
64-4-H		-0.51		2 ft cipolletti, 0.18 ft depth	
QWN-330	**2.32**		4.77	7/18/16, measurement rated as "Poor"	
64-4-E		0.00		No measurement recorded, assumed OFF	
64-4-F		-0.37		3 ft cipolletti, 0.11 ft depth	
64-4-G		0.00		No measurement recorded, assumed OFF	
QWN-332	**1.91**		5.14	7/18/16, rated "Fair", silty substrate	
64-4-H		-0.50		2 ft cipolletti, 0.18 ft depth	
64-4-K		-0.28		2 ft cipolletti, 0.12 ft depth	
64-4-J OLD		0.00		No measurement recorded, assumed OFF	
64-4-I		-0.83		2 ft cipolletti, 0.25 ft depth	
64-4 Lat Remaining	**0.00**		6.75		



64 Lateral Intake to the Study Reach = 16.77
64 Lateral Spill from the Study Reach = 0.00
64 Lateral Turnouts + Flow Remaining = -13.32
64 Lateral Seepage Loss in the Study Reach = 3.45 = 20.57%

No loss assessment made on 64-1 Lat

No loss assessment made on 64-3-A Lat

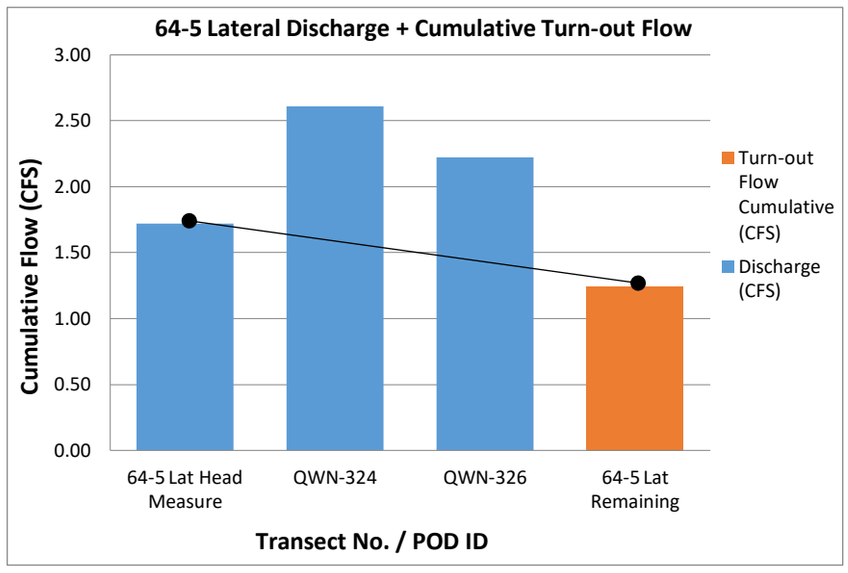


64-4 Lateral Intake to the Study Reach = 7.42
64-4 Lateral Spill from the Study Reach = 0.00
64-4 Lateral Turnouts + Flow Remaining = -6.75
64-4 Lateral Seepage Loss in the Study Reach = 0.67 = 9.03%

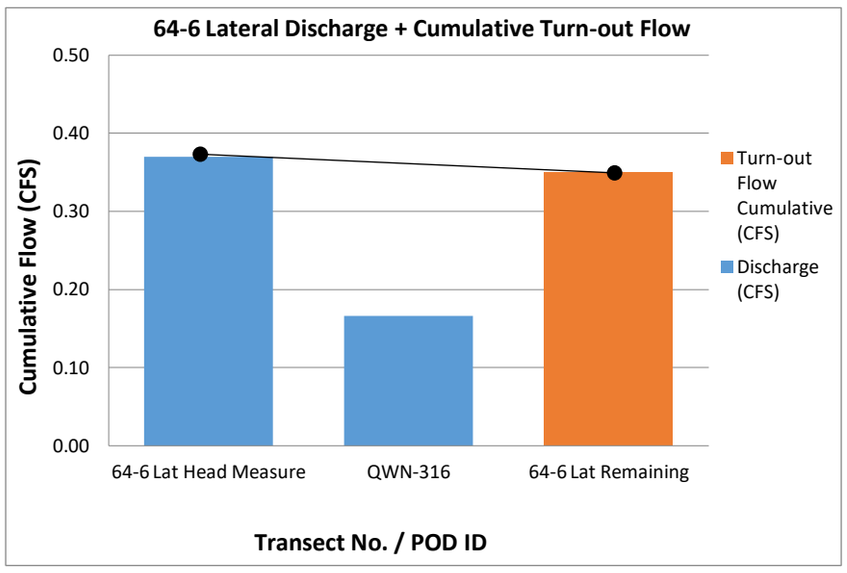
NORTH UNIT IRRIGATION DISTRICT - DISCHARGE FLOW MEASUREMENTS
Laterals

Final
03-10-17

Transect No. POD #ID	Discharge (CFS)	Turn-out Flow Rate (CFS)	Turn-out Flow Cumulative (CFS)	Comments	
64-5 Lateral					64-5 Lateral
64-5 Lat Head Measure	**1.72**		0.00	7/19/16, head weir, 3 ft cipolletti, 0.31 ft dept	
QWN-324	**2.61**		0.00	7/19/16, measure rated "Fair", thick silt	
QWN-326	**2.22**		0.00	7/19/16, rated "Poor", silty, lots of veg	
64-5-A-1		-1.04		Measurement device signal output	
64-5-B-2		-0.20		Measurement device signal output	
64-5 Lat Remaining	**0.00**		1.24		
64-6 Lat					64-6 Lateral
64-6 Lat Head Measure	**0.37**		0.00	7/18/16, head weir, 3 ft cipolletti, 0.11 ft dept	
QWN-316	**0.17**		0.00	7/18/16, measurement rated as "Poor"	
64-6-C		-0.35		2 ft cipolletti, 0.14 ft depth	
64-6 Lat Remaining	**0.00**		0.35		



64-5 Lateral Intake to the Study Reach	=	1.72
64-5 Lateral Spill from the Study Reach	=	0.00
64-5 Lateral Turnouts + Flow Remaining	=	-1.24
64-5 Lateral Seepage Loss in the Study Reach	=	0.48 = 27.91%

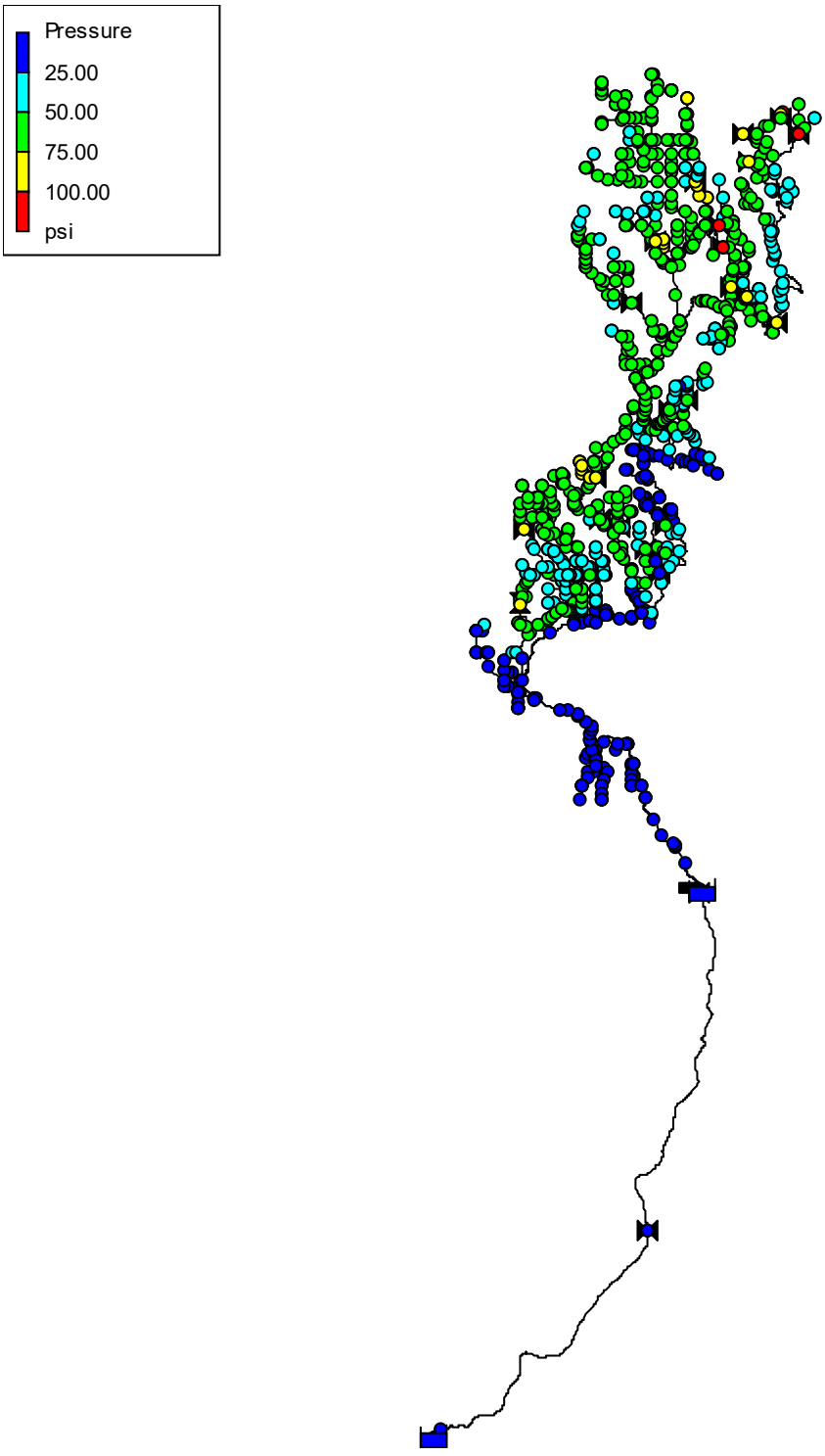


64-6 Lateral Intake to the Study Reach	=	0.37
64-6 Lateral Spill from the Study Reach	=	0.00
64-6 Lateral Turnouts + Flow Remaining	=	-0.35
64-6 Lateral Seepage Loss in the Study Reach	=	0.02 = 5.41%

APPENDIX B

EPANET HYDRAULIC MODEL OUTPUT

North Unit Irrigation District



EPANET NODE OUTPUTS

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi
Junc 31-B	2,876.2	140.0	140.0	2,883.4	3.1
Junc 31-C	2,863.5	537.6	537.6	2,881.9	8.0
Junc 31-D	2,847.4	727.3	727.3	2,873.9	11.5
Junc 31-E	2,830.5	721.7	721.7	2,868.0	16.3
Junc 31-F	2,820.7	699.3	699.3	2,863.0	18.4
Junc 31-G	2,819.5	557.2	557.2	2,863.1	18.9
Junc 32-A	2,869.8	766.5	766.5	2,882.0	5.3
Junc 32-B	2,870.3	150.5	150.5	2,882.0	5.0
Junc 32-C	2,870.3	228.2	228.2	2,882.0	5.0
Junc 32-E	2,822.4	308.7	308.7	2,860.7	16.6
Junc 34-1-A	2,864.5	866.6	866.6	2,869.0	2.0
Junc 34-1-B	2,864.5	497.7	497.7	2,871.5	3.0
Junc 34-2-A	2,853.7	46.9	46.9	2,860.9	3.1
Junc 34-2-B	2,853.1	494.2	494.2	2,857.2	1.8
Junc 34-2-B-1	2,846.5	49.0	49.0	2,849.0	1.1
Junc 34-2-C	2,839.9	254.1	254.1	2,842.9	1.3
Junc 34-2-D	2,839.8	250.6	250.6	2,842.9	1.3
Junc 34-2-E	2,829.3	509.6	509.6	2,837.8	3.7
Junc 34-2-G-1	2,817.0	385.7	385.7	2,824.7	3.3
Junc 34-2-H	2,817.1	113.4	113.4	2,823.4	2.7
Junc 34-2-I	2,817.9	254.8	254.8	2,823.4	2.4
Junc 34-3-B	2,833.2	247.8	247.8	2,856.7	10.2
Junc 34-A	2,868.5	222.6	222.6	2,879.7	4.9
Junc 34-B	2,868.8	458.5	458.5	2,879.6	4.7
Junc 34-C	2,866.0	270.9	270.9	2,875.5	4.1
Junc 34-D	2,864.3	112.7	112.7	2,874.0	4.2
Junc 34-D-1	2,862.6	240.8	240.8	2,871.3	3.8
Junc 34-D-2	2,862.4	242.2	242.2	2,869.7	3.2
Junc 34-E	2,858.1	191.1	191.1	2,866.8	3.7
Junc 34-E-1	2,858.4	215.6	215.6	2,866.7	3.6
Junc 34-F	2,844.9	950.6	950.6	2,862.9	7.8
Junc 34-G	2,834.4	90.3	90.3	2,859.6	10.9
Junc 34-H	2,832.7	151.2	151.2	2,854.9	9.6
Junc 34-H-1	2,828.7	100.1	100.1	2,845.4	7.3
Junc 34-I	2,828.7	246.4	246.4	2,845.4	7.2
Junc 34-K	2,827.7	208.6	208.6	2,845.2	7.6
Junc 34-L	2,827.8	258.3	258.3	2,845.2	7.5
Junc 34-M	2,827.7	525.7	525.7	2,845.2	7.6
Junc 34-N	2,818.7	1,108.1	1,108.1	2,826.8	3.5
Junc 34NUID	2,868.9	11.9	11.9	2,879.7	4.7
Junc 37-10-A	2,618.7	7.0	7.0	2,709.6	39.4
Junc 37-1-A	2,857.0	268.8	268.8	2,870.3	5.7
Junc 37-1-B	2,843.8	1,018.5	1,018.5	2,865.5	9.4
Junc 37-1-C	2,838.5	46.9	46.9	2,855.0	7.2

Junc 37-1-C-1	2,840.0	154.7	154.7	2,854.6	6.3
Junc 37-1-D	2,840.1	42.0	42.0	2,854.5	6.2
Junc 37-1-E	2,839.4	291.9	291.9	2,854.5	6.5
Junc 37-1-F	2,839.9	676.2	676.2	2,854.4	6.3
Junc 37-2-C	2,825.6	876.4	876.4	2,858.0	14.0
Junc 37-3-C	2,841.0	1,603.0	1,603.0	2,860.0	8.2
Junc 37-3-D	2,835.9	2,283.4	2,283.4	2,852.0	7.0
Junc 37-3-E	2,828.4	1,103.2	1,103.2	2,851.5	10.0
Junc 37-3-F	2,794.1	738.5	738.5	2,835.9	18.1
Junc 37-3-G	2,794.5	564.2	564.2	2,835.9	18.0
Junc 37-3-H	2,798.3	547.4	547.4	2,836.2	16.4
Junc 37-3-I	2,748.4	567.7	567.7	2,825.9	33.6
Junc 37-3-J	2,775.8	815.5	815.5	2,831.7	24.2
Junc 37-3-J-1	2,775.8	259.0	259.0	2,831.7	24.2
Junc 37-3-K	2,748.2	681.8	681.8	2,825.9	33.7
Junc 37-4-1-A	2,722.5	253.4	253.4	2,847.2	54.0
Junc 37-4-1-B	2,721.4	417.2	417.2	2,844.9	53.5
Junc 37-4-1-C	2,721.4	1,518.3	1,518.3	2,844.9	53.5
Junc 37-4-B	2,656.7	1,114.4	1,114.4	2,760.5	45.0
Junc 37-4-C	2,656.5	184.8	184.8	2,760.5	45.1
Junc 37-4-C-1	2,652.4	27.3	27.3	2,758.6	46.0
Junc 37-4-C-2	2,652.6	7.0	7.0	2,758.5	45.9
Junc 37-4-D-1	2,636.8	67.9	67.9	2,755.4	51.4
Junc 37-4-D-2	2,633.6	280.0	280.0	2,749.8	50.4
Junc 37-4-F	2,632.6	738.5	738.5	2,750.6	51.2
Junc 37-4-G	2,627.8	244.3	244.3	2,743.9	50.3
Junc 37-4-G-1	2,628.0	51.1	51.1	2,743.9	50.2
Junc 37-4-H	2,627.7	105.0	105.0	2,743.6	50.2
Junc 37-4-I-1	2,620.0	235.9	235.9	2,731.8	48.4
Junc 37-4-I-2	2,619.9	245.7	245.7	2,731.8	48.5
Junc 37-4-J	2,623.4	252.0	252.0	2,734.3	48.1
Junc 37-4-K	2,622.2	753.9	753.9	2,729.2	46.4
Junc 37-4-L	2,622.2	103.6	103.6	2,729.2	46.4
Junc 37-4-L-1	2,618.5	152.6	152.6	2,711.3	40.2
Junc 37-4-M	2,618.2	207.2	207.2	2,711.1	40.3
Junc 37-4NONE	2,598.1	84.0	84.0	2,668.6	30.6
Junc 37-5-B	2,650.1	492.1	492.1	2,748.9	42.8
Junc 37-5-C	2,650.1	219.1	219.1	2,748.9	42.8
Junc 37-5-D-1	2,646.4	30.1	30.1	2,738.2	39.8
Junc 37-5-D-2	2,646.4	751.1	751.1	2,738.2	39.8
Junc 37-6-C	2,622.9	547.4	547.4	2,735.4	48.8
Junc 37-7-A	2,635.1	65.1	65.1	2,744.0	47.2
Junc 37-7-B	2,635.4	262.5	262.5	2,742.3	46.3
Junc 37-7-C	2,634.6	440.3	440.3	2,744.0	47.4
Junc 37-8-B	2,622.3	497.0	497.0	2,739.4	50.8
Junc 37-8-C	2,616.3	524.3	524.3	2,734.5	51.2
Junc 37-8-D	2,616.7	530.6	530.6	2,728.2	48.3
Junc 37-8-E	2,614.0	1,017.1	1,017.1	2,728.3	49.6

Junc 37-9-A	2,623.4	536.9	536.9	2,714.3	39.4
Junc 37-9-B	2,623.4	146.3	146.3	2,714.3	39.4
Junc 37-A	2,866.0	865.9	865.9	2,875.5	4.1
Junc 37-B	2,863.5	74.2	74.2	2,872.7	4.0
Junc 37-C	2,864.6	215.6	215.6	2,872.6	3.5
Junc 37-D	2,863.8	58.8	58.8	2,872.5	3.8
Junc 37-E	2,863.7	193.9	193.9	2,872.5	3.8
Junc 37-F	2,853.2	686.0	686.0	2,870.4	7.5
Junc 37-G	2,845.7	1,808.8	1,808.8	2,870.0	10.5
Junc 37-J	2,846.9	2.8	2.8	2,867.3	8.9
Junc 37-K	2,845.3	1,203.3	1,203.3	2,866.4	9.2
Junc 37-L	2,812.5	197.4	197.4	2,864.5	22.6
Junc 37-M	2,812.4	905.1	905.1	2,864.5	22.6
Junc 37-N	2,803.6	81.9	81.9	2,862.2	25.4
Junc 37-N-1	2,792.6	1,055.6	1,055.6	2,861.3	29.8
Junc 37NUID	2,865.9	23.1	23.1	2,875.5	4.2
Junc 37-O	2,731.0	541.8	541.8	2,855.6	54.0
Junc 37-Q	2,729.8	651.0	651.0	2,849.2	51.7
Junc 37-S	2,710.2	459.2	459.2	2,846.0	58.9
Junc 37-T	2,709.0	421.4	421.4	2,845.5	59.2
Junc 37-U	2,703.3	49.7	49.7	2,842.7	60.4
Junc 37-V	2,702.0	72.1	72.1	2,842.7	61.0
Junc 37-W	2,690.0	71.4	71.4	2,840.2	65.1
Junc 37-X	2,693.4	284.2	284.2	2,840.3	63.6
Junc 37-Y	2,681.6	128.8	128.8	2,762.4	35.0
Junc 37-Z	2,682.6	108.5	108.5	2,762.3	34.5
Junc 37-Z-1	2,663.4	1,201.2	1,201.2	2,756.5	40.3
Junc 37-Z-10	2,618.5	22.4	22.4	2,709.5	39.4
Junc 37-Z-12	2,618.4	669.9	669.9	2,709.1	39.3
Junc 37-Z-13	2,617.7	253.4	253.4	2,709.1	39.6
Junc 37-Z-15	2,607.9	123.2	123.2	2,687.2	34.4
Junc 37-Z-16	2,427.9	1,091.3	1,091.3	2,554.9	55.0
Junc 37-Z-2	2,647.3	198.8	198.8	2,753.6	46.1
Junc 37-Z-3	2,639.1	126.7	126.7	2,750.3	48.2
Junc 37-Z-5	2,626.6	4.9	4.9	2,730.1	44.9
Junc 37-Z-7	2,626.8	42.0	42.0	2,729.3	44.4
Junc 37-Z-8	2,623.7	123.2	123.2	2,717.7	40.7
Junc 37-Z-9	2,623.5	78.4	78.4	2,717.4	40.7
Junc 38-A	2,835.7	84.0	84.0	2,871.1	15.4
Junc 38-B	2,806.8	299.6	299.6	2,819.0	5.3
Junc 38-C	2,807.4	144.2	144.2	2,819.0	5.0
Junc 41-10-A	2,611.4	329.0	329.0	2,755.9	62.6
Junc 41-10-B	2,606.3	537.6	537.6	2,749.7	62.2
Junc 41-10-C	2,601.8	81.2	81.2	2,744.3	61.8
Junc 41-10-D	2,601.8	196.7	196.7	2,740.0	59.9
Junc 41-10-E	2,593.9	258.3	258.3	2,731.3	59.6
Junc 41-10-F	2,593.9	467.6	467.6	2,731.3	59.6
Junc 41-10-G	2,591.4	402.5	402.5	2,724.2	57.5

Junc 41-10-H	2,591.4	168.7	168.7	2,724.2	57.5
Junc 41-11-A	2,608.6	529.2	529.2	2,751.9	62.1
Junc 41-11-A-1	2,608.0	66.5	66.5	2,752.0	62.4
Junc 41-11-B	2,608.5	254.1	254.1	2,751.9	62.1
Junc 41-11-C	2,608.6	261.1	261.1	2,751.9	62.1
Junc 41-11-D	2,601.7	438.9	438.9	2,747.4	63.1
Junc 41-11-E	2,599.7	153.3	153.3	2,743.9	62.5
Junc 41-11-F	2,599.3	81.9	81.9	2,743.6	62.5
Junc 41-11-G	2,593.3	361.2	361.2	2,738.6	62.9
Junc 41-11-H	2,592.9	172.9	172.9	2,738.4	63.0
Junc 41-11-I	2,588.5	338.8	338.8	2,719.2	56.6
Junc 41-11-J	2,591.0	401.1	401.1	2,718.0	55.0
Junc 41-11-K	2,589.1	291.9	291.9	2,718.0	55.9
Junc 41-11-L	2,589.1	551.6	551.6	2,718.0	55.9
Junc 41-2-A	2,756.3	260.4	260.4	2,854.2	42.4
Junc 41-2-B	2,756.1	250.6	250.6	2,854.2	42.5
Junc 41-3-A	2,742.0	1,012.9	1,012.9	2,855.3	49.1
Junc 41-5-1-A	2,688.6	257.6	257.6	2,776.7	38.2
Junc 41-5-1-B	2,688.8	283.5	283.5	2,776.6	38.1
Junc 41-5-B	2,677.3	350.0	350.0	2,777.2	43.3
Junc 41-5-C	2,672.2	501.2	501.2	2,776.2	45.1
Junc 41-5-D	2,658.8	529.2	529.2	2,771.7	48.9
Junc 41-5-E	2,659.9	259.7	259.7	2,771.2	48.2
Junc 41-5-F	2,651.0	263.9	263.9	2,762.8	48.4
Junc 41-5-G	2,651.0	265.3	265.3	2,762.8	48.4
Junc 41-5-H	2,643.8	555.8	555.8	2,754.5	48.0
Junc 41-5-I	2,641.0	1,100.4	1,100.4	2,754.4	49.2
Junc 41-6-A	2,660.6	393.4	393.4	2,772.5	48.5
Junc 41-6-C	2,660.6	65.1	65.1	2,772.5	48.5
Junc 41-6-D	2,660.6	67.9	67.9	2,772.5	48.5
Junc 41-6-E	2,660.6	65.1	65.1	2,772.5	48.5
Junc 41-7-A	2,643.5	1,627.5	1,627.5	2,777.3	58.0
Junc 41-8-A	2,622.4	205.1	205.1	2,767.0	62.7
Junc 41-8-B	2,621.5	1,080.1	1,080.1	2,766.5	62.8
Junc 41-8-C	2,617.9	179.2	179.2	2,763.0	62.9
Junc 41-8-D	2,618.4	788.2	788.2	2,763.3	62.8
Junc 41-9-A	2,619.9	66.5	66.5	2,759.4	60.4
Junc 41-9-A-1	2,621.0	273.7	273.7	2,755.1	58.1
Junc 41-9-C	2,619.1	146.3	146.3	2,754.9	58.8
Junc 41-9-D	2,621.4	271.6	271.6	2,749.3	55.4
Junc 41-9-E	2,618.2	155.4	155.4	2,749.2	56.8
Junc 41-9-F	2,618.2	107.1	107.1	2,749.2	56.8
Junc 41-A	2,809.8	117.6	117.6	2,860.0	21.7
Junc 41-B	2,809.6	168.0	168.0	2,860.0	21.8
Junc 41-C	2,781.0	490.0	490.0	2,858.4	33.5
Junc 41-F	2,762.5	242.9	242.9	2,857.7	41.3
Junc 41-G	2,742.4	582.4	582.4	2,855.3	48.9
Junc 41-H	2,742.4	443.1	443.1	2,855.3	48.9

Junc 41-I	2,703.6	12.6	12.6	2,784.2	34.9
Junc 41-J	2,703.5	9.8	9.8	2,784.0	34.9
Junc 41-K	2,688.5	773.5	773.5	2,782.5	40.8
Junc 41-K-1	2,688.4	35.7	35.7	2,782.5	40.8
Junc 41-L	2,675.5	515.9	515.9	2,780.5	45.5
Junc 41-M	2,675.3	529.9	529.9	2,780.5	45.6
Junc 41-N	2,636.3	287.7	287.7	2,776.6	60.8
Junc 41NUID	2,844.6	18.2	18.2	2,863.0	8.0
Junc 41-O	2,642.8	583.8	583.8	2,776.6	58.0
Junc 41-P	2,634.0	742.0	742.0	2,774.0	60.7
Junc 41-Q	2,626.6	80.5	80.5	2,772.0	63.0
Junc 41-R	2,623.9	753.9	753.9	2,771.0	63.8
Junc 41-S	2,621.2	676.9	676.9	2,766.3	62.9
Junc 41-T	2,619.3	21.7	21.7	2,762.3	62.0
Junc 41-T-1	2,617.3	27.3	27.3	2,759.9	61.8
Junc 41-U	2,617.2	11.9	11.9	2,759.7	61.7
Junc 41-U-1	2,617.1	184.1	184.1	2,759.4	61.7
Junc 41-V	2,617.4	270.2	270.2	2,758.8	61.3
Junc 41-X	2,611.8	21.0	21.0	2,756.5	62.7
Junc 41-Y	2,609.1	408.8	408.8	2,753.1	62.4
Junc 41-Z	2,609.3	22.4	22.4	2,752.0	61.8
Junc 41-Z-1	2,606.6	29.4	29.4	2,747.4	61.0
Junc 41-Z-11	2,585.4	993.3	993.3	2,712.4	55.0
Junc 41-Z-12	2,585.4	573.3	573.3	2,712.4	55.0
Junc 41-Z-13	2,585.2	437.5	437.5	2,712.4	55.1
Junc 41-Z-2	2,605.2	483.7	483.7	2,744.5	60.3
Junc 41-Z-3	2,605.6	599.9	599.9	2,744.4	60.1
Junc 41-Z-5	2,603.3	530.6	530.6	2,740.1	59.3
Junc 41-Z-6	2,602.1	531.3	531.3	2,740.0	59.8
Junc 41-Z-7	2,597.1	124.6	124.6	2,732.7	58.8
Junc 41-Z-8	2,591.3	48.3	48.3	2,725.9	58.3
Junc 41-Z-9	2,586.0	388.5	388.5	2,713.8	55.4
Junc 43-10-1-A-A	2,558.6	529.9	529.9	2,738.1	77.8
Junc 43-10-1-B	2,552.2	482.3	482.3	2,734.4	79.0
Junc 43-10-1-B-1	2,539.3	42.0	42.0	2,726.0	80.9
Junc 43-10-1-C	2,539.3	900.2	900.2	2,726.0	80.9
Junc 43-10-1-C-1	2,539.3	21.0	21.0	2,726.0	80.9
Junc 43-10-1-D	2,539.3	359.1	359.1	2,726.0	80.9
Junc 43-10-2-A	2,537.3	119.0	119.0	2,652.1	49.8
Junc 43-10-2-B	2,530.5	256.9	256.9	2,646.5	50.3
Junc 43-10-2-C	2,530.2	273.0	273.0	2,646.4	50.3
Junc 43-10-2-D	2,525.2	222.6	222.6	2,644.5	51.7
Junc 43-10-2-E	2,506.5	261.8	261.8	2,630.4	53.7
Junc 43-10-3-B	2,518.9	898.8	898.8	2,648.1	56.0
Junc 43-10-4-A	2,514.4	256.2	256.2	2,642.6	55.5
Junc 43-10-4-B	2,514.1	829.5	829.5	2,642.6	55.7
Junc 43-10-A	2,581.7	172.9	172.9	2,752.8	74.1
Junc 43-10-B	2,582.0	88.9	88.9	2,752.8	74.0

Junc 43-10-C	2,579.8	307.3	307.3	2,750.7	74.1
Junc 43-10-D	2,579.8	271.6	271.6	2,750.7	74.1
Junc 43-10-F	2,566.3	505.4	505.4	2,747.4	78.5
Junc 43-10-G	2,562.2	185.5	185.5	2,665.4	44.7
Junc 43-10-G-1	2,536.1	44.1	44.1	2,658.0	52.8
Junc 43-10-H	2,534.9	104.3	104.3	2,657.1	52.9
Junc 43-10-H-1	2,529.2	551.6	551.6	2,653.6	53.9
Junc 43-10-I	2,510.3	67.2	67.2	2,638.0	55.3
Junc 43-10-J	2,503.9	1,027.6	1,027.6	2,629.7	54.5
Junc 43-10-K	2,492.8	235.9	235.9	2,622.0	56.0
Junc 43-10-L	2,492.7	522.9	522.9	2,621.8	56.0
Junc 43-10-N	2,482.1	907.9	907.9	2,600.7	51.4
Junc 43-10-O	2,484.1	294.7	294.7	2,599.7	50.1
Junc 43-10-P	2,482.7	457.1	457.1	2,599.6	50.6
Junc 43-11-B	2,614.5	22.4	22.4	2,759.5	62.8
Junc 43-12-A	2,609.2	718.2	718.2	2,751.6	61.7
Junc 43-12-A-1	2,608.1	39.2	39.2	2,751.6	62.2
Junc 43-12-B	2,608.7	547.4	547.4	2,751.5	61.9
Junc 43-1-A	2,810.9	114.1	114.1	2,854.1	18.7
Junc 43-1-B	2,811.2	393.4	393.4	2,854.0	18.6
Junc 43-2-A	2,744.5	460.6	460.6	2,852.4	46.7
Junc 43-2-B	2,727.2	263.9	263.9	2,848.9	52.7
Junc 43-2-D	2,704.6	563.5	563.5	2,845.3	61.0
Junc 43-2-E	2,687.0	345.8	345.8	2,837.9	65.4
Junc 43-2-F	2,674.6	646.8	646.8	2,831.9	68.1
Junc 43-2-G	2,673.4	527.8	527.8	2,830.1	67.9
Junc 43-2-G-1	2,654.8	4.2	4.2	2,758.7	45.0
Junc 43-2-H	2,653.9	1,064.0	1,064.0	2,757.5	44.9
Junc 43-2-I	2,642.1	227.5	227.5	2,751.1	47.2
Junc 43-2-J	2,634.7	431.9	431.9	2,737.4	44.5
Junc 43-2-J-1	2,625.1	93.8	93.8	2,727.8	44.5
Junc 43-2-K	2,634.3	569.8	569.8	2,737.4	44.7
Junc 43-2-K-1	2,625.2	84.0	84.0	2,727.8	44.5
Junc 43-2-L	2,624.9	467.6	467.6	2,727.7	44.5
Junc 43-3-A	2,700.9	254.8	254.8	2,850.4	64.8
Junc 43-3-C	2,692.0	60.2	60.2	2,847.8	67.5
Junc 43-3-D	2,691.2	543.2	543.2	2,847.7	67.8
Junc 43-7-1-E	2,614.2	532.0	532.0	2,747.0	57.6
Junc 43-7-1-F	2,603.9	126.0	126.0	2,742.6	60.1
Junc 43-7-1-G	2,604.2	219.8	219.8	2,742.6	60.0
Junc 43-7-2-A	2,587.4	547.4	547.4	2,742.0	67.0
Junc 43-7-2-C	2,577.5	973.0	973.0	2,733.3	67.5
Junc 43-7-B	2,629.4	111.3	111.3	2,763.8	58.2
Junc 43-7-B-1	2,614.1	750.4	750.4	2,760.4	63.4
Junc 43-7-C	2,614.2	531.3	531.3	2,760.1	63.2
Junc 43-7-D	2,602.6	495.6	495.6	2,754.9	66.0
Junc 43-7-E	2,588.7	819.0	819.0	2,743.6	67.1
Junc 43-7-G	2,588.1	542.5	542.5	2,743.4	67.3

Junc 43-9-A	2,658.4	271.6	271.6	2,765.2	46.3
Junc 43-9-B	2,616.7	273.0	273.0	2,757.5	61.0
Junc 43-9-C	2,616.9	245.0	245.0	2,757.3	60.9
Junc 43-9-D	2,616.8	527.8	527.8	2,757.3	60.9
Junc 43-9-E	2,616.9	946.4	946.4	2,757.3	60.9
Junc 43-A	2,849.1	14.7	14.7	2,857.7	3.7
Junc 43-C	2,843.4	720.3	720.3	2,858.0	6.3
Junc 43-D	2,840.5	887.6	887.6	2,856.1	6.8
Junc 43-E	2,840.5	343.7	343.7	2,856.5	6.9
Junc 43-F	2,818.1	89.6	89.6	2,855.5	16.2
Junc 43-G	2,816.5	119.7	119.7	2,855.5	16.9
Junc 43-H	2,800.5	282.1	282.1	2,854.4	23.3
Junc 43-H-1	2,799.5	825.3	825.3	2,854.1	23.7
Junc 43-I	2,800.3	696.5	696.5	2,854.1	23.3
Junc 43-J	2,801.4	2,426.9	2,426.9	2,854.2	22.9
Junc 43-K	2,695.8	731.5	731.5	2,848.3	66.1
Junc 43-M	2,694.9	748.3	748.3	2,847.1	65.9
Junc 43-N	2,694.4	564.2	564.2	2,846.5	65.9
Junc 43NUID	2,827.2	37.8	37.8	2,857.0	12.9
Junc 43-O	2,694.1	14.0	14.0	2,846.5	66.1
Junc 43-P	2,692.7	629.3	629.3	2,844.2	65.6
Junc 43-Q-1	2,690.7	942.9	942.9	2,839.6	64.5
Junc 43-S	2,689.9	542.5	542.5	2,839.7	64.9
Junc 43-S-1	2,691.9	247.1	247.1	2,839.9	64.1
Junc 43-T	2,690.3	693.0	693.0	2,839.5	64.7
Junc 43-U	2,689.0	337.4	337.4	2,770.1	35.2
Junc 43-W	2,653.1	529.9	529.9	2,768.5	50.0
Junc 43-X	2,653.6	443.8	443.8	2,768.5	49.8
Junc 43-X-1	2,633.5	792.4	792.4	2,766.4	57.6
Junc 43-Y	2,618.1	171.5	171.5	2,762.8	62.7
Junc 43-Z	2,614.8	95.2	95.2	2,761.0	63.4
Junc 43-Z-1	2,612.0	220.5	220.5	2,759.8	64.0
Junc 43-Z-10	2,576.5	437.5	437.5	2,705.2	55.8
Junc 43-Z-2	2,609.3	101.5	101.5	2,756.8	63.9
Junc 43-Z-3	2,608.8	903.7	903.7	2,751.7	61.9
Junc 43-Z-5	2,600.7	541.1	541.1	2,742.4	61.4
Junc 43-Z-6	2,608.6	1,045.1	1,045.1	2,744.9	59.1
Junc 43-Z-7	2,605.3	537.6	537.6	2,735.3	56.3
Junc 43-Z-8	2,605.9	485.8	485.8	2,732.1	54.7
Junc 43-Z-8-A	2,606.3	26.6	26.6	2,732.2	54.6
Junc 43-Z-9	2,605.9	644.7	644.7	2,732.1	54.7
Junc 45-1-1-A	2,684.6	482.3	482.3	2,809.4	54.1
Junc 45-1-1-B	2,684.6	131.6	131.6	2,809.4	54.1
Junc 45-1-A	2,733.4	427.7	427.7	2,839.5	46.0
Junc 45-1-B	2,708.8	442.4	442.4	2,823.2	49.6
Junc 45-1-C	2,704.8	507.5	507.5	2,817.4	48.8
Junc 45-2-A	2,732.0	10.5	10.5	2,787.4	24.0
Junc 45-2-B	2,731.5	314.3	314.3	2,787.3	24.2

Junc 45-2-B-1	2,728.3	252.0	252.0	2,780.9	22.8
Junc 45-2-C	2,726.4	956.9	956.9	2,779.0	22.8
Junc 45-2-D	2,727.3	19.6	19.6	2,778.9	22.3
Junc 45-2-E	2,727.7	640.5	640.5	2,775.4	20.7
Junc 45-2-F	2,728.7	1,186.5	1,186.5	2,775.4	20.3
Junc 45-3-B	2,661.5	270.2	270.2	2,771.4	47.6
Junc 45-3-C	2,661.3	602.7	602.7	2,771.4	47.7
Junc 45-A	2,758.0	348.6	348.6	2,846.3	38.3
Junc 45-B	2,754.1	1,168.3	1,168.3	2,837.2	36.0
Junc 45-C	2,754.1	241.5	241.5	2,837.2	36.0
Junc 45-D	2,747.8	606.2	606.2	2,821.7	32.0
Junc 45-D-1	2,738.8	112.7	112.7	2,807.6	29.8
Junc 45-D-2	2,668.3	228.2	228.2	2,778.3	47.7
Junc 45-G	2,662.3	8.4	8.4	2,773.8	48.4
Junc 48-1-A	2,611.0	363.3	363.3	2,623.5	5.4
Junc 48-1-B	2,611.7	257.6	257.6	2,623.5	5.1
Junc 48-1-C	2,611.7	29.4	29.4	2,623.5	5.1
Junc 48-A	2,618.2	235.2	235.2	2,622.6	1.9
Junc 48-A-1	2,618.4	15.4	15.4	2,622.4	1.7
Junc 48-B	2,607.5	63.7	63.7	2,618.0	4.5
Junc 48-C	2,600.2	690.9	690.9	2,607.3	3.1
Junc 50-A	2,614.4	29.4	29.4	2,626.5	5.2
Junc 50-B	2,575.5	289.8	289.8	2,614.6	17.0
Junc 50-C	2,563.0	1,814.4	1,814.4	2,612.2	21.3
Junc 51-1-A	2,565.4	1,939.7	1,939.7	2,616.6	22.2
Junc 51-1-B	2,485.3	57.4	57.4	2,570.4	36.9
Junc 51-1-B-1	2,485.3	77.0	77.0	2,570.4	36.9
Junc 51-1-C	2,511.5	347.2	347.2	2,593.1	35.4
Junc 51-1-D	2,457.9	498.4	498.4	2,581.9	53.7
Junc 51-1-E	2,457.9	535.5	535.5	2,581.9	53.7
Junc 51-1-F	2,456.3	17.5	17.5	2,581.9	54.4
Junc 51-4-Pump	2,600.0	4.2	4.2	2,624.2	10.5
Junc 51-A	2,602.3	1,276.1	1,276.1	2,626.3	10.4
Junc 51-B	2,598.6	1,001.0	1,001.0	2,621.6	10.0
Junc 51-D	2,590.3	615.3	615.3	2,611.3	9.1
Junc 51-D-1	2,587.4	190.4	190.4	2,609.1	9.4
Junc 51-D-2	2,584.5	165.9	165.9	2,606.3	9.4
Junc 51-E	2,575.6	678.3	678.3	2,589.7	6.1
Junc 51-F	2,575.1	771.4	771.4	2,585.1	4.3
Junc 51-G	2,575.4	4,919.6	4,919.6	2,585.1	4.2
Junc 51-H	2,575.5	2,365.3	2,365.3	2,585.1	4.2
Junc 51NUID	2,627.3	22.4	22.4	2,629.5	1.0
Junc 52-A-A	2,509.0	247.1	247.1	2,622.7	49.3
Junc 52-A-B	2,507.7	264.6	264.6	2,622.6	49.8
Junc 55-1-A	2,469.8	511.7	511.7	2,612.7	62.0
Junc 55-1-B	2,459.4	518.0	518.0	2,604.0	62.7
Junc 55-1-B-1	2,459.9	807.8	807.8	2,604.0	62.5
Junc 55-1-D	2,464.7	2,199.4	2,199.4	2,608.8	62.5

Junc 55-2-A	2,455.1	1,002.4	1,002.4	2,595.9	61.0
Junc 55-A	2,472.6	1,031.1	1,031.1	2,619.1	63.5
Junc 55-B	2,473.1	19.6	19.6	2,616.0	62.0
Junc 55-C	2,459.2	962.5	962.5	2,600.1	61.1
Junc 55-E	2,449.7	732.9	732.9	2,576.6	55.0
Junc 55-F	2,441.8	621.6	621.6	2,542.2	43.5
Junc 55-G	2,441.9	91.7	91.7	2,542.2	43.4
Junc 56-A	2,477.1	90.3	90.3	2,605.5	55.6
Junc 56-B	2,476.5	357.7	357.7	2,605.5	55.9
Junc 56-C	2,476.5	1,028.3	1,028.3	2,605.4	55.9
Junc 57-2-A-1	2,393.3	526.4	526.4	2,517.8	53.9
Junc 57-2-A-2	2,393.6	454.3	454.3	2,517.8	53.8
Junc 57-2-B	2,408.7	513.1	513.1	2,524.9	50.3
Junc 57-2-B-2	2,402.4	260.4	260.4	2,523.5	52.5
Junc 57-2-C	2,395.6	966.0	966.0	2,521.9	54.7
Junc 57-2-CPUMP	2,387.2	9.8	9.8	2,515.1	55.4
Junc 57-2-D	2,382.2	534.8	534.8	2,509.1	55.0
Junc 57-2-E	2,382.0	525.0	525.0	2,509.1	55.1
Junc 57-2-F	2,375.5	443.1	443.1	2,483.1	46.6
Junc 57-2-G	2,375.5	286.3	286.3	2,483.1	46.7
Junc 57-6-A	2,373.9	575.4	575.4	2,489.3	50.0
Junc 57-6-B	2,372.4	486.5	486.5	2,479.2	46.3
Junc 57-6-C	2,374.1	522.2	522.2	2,479.6	45.7
Junc 57-A	2,448.3	67.2	67.2	2,617.0	73.1
Junc 57-A-1	2,443.3	37.8	37.8	2,616.0	74.8
Junc 57-B	2,443.8	32.2	32.2	2,615.4	74.4
Junc 57-C	2,443.7	31.5	31.5	2,614.9	74.2
Junc 57-D	2,443.4	548.1	548.1	2,614.9	74.3
Junc 57-E	2,443.3	119.7	119.7	2,614.8	74.3
Junc 57-F	2,443.3	27.3	27.3	2,614.8	74.3
Junc 57-G	2,440.5	137.2	137.2	2,612.4	74.5
Junc 57-H	2,440.4	417.9	417.9	2,612.4	74.5
Junc 57-I	2,440.7	37.1	37.1	2,612.4	74.4
Junc 57-I-1-B	2,436.8	60.2	60.2	2,608.8	74.5
Junc 57-I-1-C	2,432.4	602.0	602.0	2,533.3	43.7
Junc 57-I-2	2,433.0	299.6	299.6	2,533.2	43.4
Junc 57-J	2,432.9	275.1	275.1	2,533.2	43.4
Junc 57-K	2,413.6	48.3	48.3	2,530.2	50.6
Junc 57-L	2,410.1	135.8	135.8	2,527.9	51.1
Junc 57-L-1	2,385.4	89.6	89.6	2,523.8	60.0
Junc 57-M	2,389.1	472.5	472.5	2,522.1	57.6
Junc 57-N	2,384.8	312.9	312.9	2,519.8	58.5
Junc 57NONE	2,413.5	8.4	8.4	2,530.4	50.7
Junc 57NUID	2,452.1	64.4	64.4	2,616.0	71.0
Junc 57-O	2,385.1	478.1	478.1	2,519.8	58.4
Junc 57-P	2,376.0	146.3	146.3	2,516.4	60.9
Junc 57-Q	2,376.1	984.2	984.2	2,512.6	59.1
Junc 57-R	2,376.1	91.0	91.0	2,512.6	59.1

Junc 57-S	2,375.7	219.8	219.8	2,512.4	59.2
Junc 57-T	2,375.1	257.6	257.6	2,511.0	58.9
Junc 57-T-1	2,375.6	266.0	266.0	2,508.8	57.7
Junc 57-U	2,375.6	89.6	89.6	2,508.9	57.8
Junc 57-V	2,375.1	1,017.1	1,017.1	2,506.1	56.8
Junc 57-V-1	2,375.1	224.7	224.7	2,506.0	56.8
Junc 57-X	2,374.7	489.3	489.3	2,503.9	56.0
Junc 57-X-1	2,374.3	25.2	25.2	2,500.2	54.6
Junc 57-Y	2,374.4	933.8	933.8	2,500.2	54.5
Junc 57-Y-1	2,372.3	258.3	258.3	2,497.3	54.2
Junc 57-Z	2,372.6	106.4	106.4	2,495.8	53.4
Junc 57-Z-1	2,373.2	1,109.5	1,109.5	2,495.3	52.9
Junc 57-Z-2	2,373.0	226.8	226.8	2,495.3	53.0
Junc 57-Z-3	2,372.2	443.1	443.1	2,490.5	51.3
Junc 57-Z-5	2,370.7	245.0	245.0	2,483.7	49.0
Junc 57-Z-6	2,369.8	413.7	413.7	2,480.0	47.7
Junc 57-Z-7	2,366.0	1,047.2	1,047.2	2,465.1	42.9
Junc 58-11-A	2,436.5	29.4	29.4	2,601.0	71.3
Junc 58-11-A-1	2,435.8	5.6	5.6	2,599.1	70.8
Junc 58-11-B	2,435.6	276.5	276.5	2,595.8	69.4
Junc 58-11-D	2,434.6	1,822.8	1,822.8	2,590.3	67.5
Junc 58-11-E	2,433.2	560.0	560.0	2,588.0	67.1
Junc 58-11-F	2,433.7	240.1	240.1	2,587.8	66.8
Junc 58-11-G	2,431.2	499.1	499.1	2,579.3	64.2
Junc 58-11-I	2,391.0	159.6	159.6	2,471.8	35.0
Junc 58-11-J	2,390.0	262.5	262.5	2,468.6	34.0
Junc 58-11-J-1	2,390.8	256.2	256.2	2,468.2	33.5
Junc 58-11-K	2,388.3	431.2	431.2	2,464.8	33.2
Junc 58-11-M	2,387.5	99.4	99.4	2,463.5	32.9
Junc 58-11-N	2,380.4	340.9	340.9	2,454.8	32.2
Junc 58-11-O	2,375.9	665.7	665.7	2,451.1	32.6
Junc 58-11-O-1	2,375.1	46.9	46.9	2,450.0	32.5
Junc 58-11-P	2,374.8	138.6	138.6	2,449.7	32.5
Junc 58-11-Q	2,373.3	480.2	480.2	2,448.3	32.5
Junc 58-11-R	2,373.0	150.5	150.5	2,447.6	32.3
Junc 58-11-S	2,371.4	240.8	240.8	2,446.6	32.6
Junc 58-11-S-1	2,371.5	35.0	35.0	2,446.6	32.6
Junc 58-11-T	2,371.7	871.5	871.5	2,445.9	32.2
Junc 58-11-Z-10	1,996.9	1,472.8	1,472.8	2,282.4	123.7
Junc 58-11-Z-4	2,243.4	1,071.7	1,071.7	2,401.7	68.6
Junc 58-11-Z-4-A	2,161.8	569.8	569.8	2,277.1	50.0
Junc 58-11-Z-4-A-1	2,161.8	546.0	546.0	2,277.1	50.0
Junc 58-11-Z-5	2,242.0	961.8	961.8	2,399.3	68.2
Junc 58-11-Z-6	2,246.7	58.1	58.1	2,386.3	60.5
Junc 58-11-Z-7	2,245.0	477.4	477.4	2,381.9	59.3
Junc 58-11-Z-8	2,211.8	314.3	314.3	2,292.6	35.0
Junc 58-11-Z-9	2,070.7	996.8	996.8	2,287.0	93.7
Junc 58-2-A	2,439.0	216.3	216.3	2,601.1	70.2

Junc 58-2-B	2,400.7	294.0	294.0	2,504.5	45.0
Junc 58-2-C	2,380.5	499.1	499.1	2,500.5	52.0
Junc 58-2-D	2,372.3	353.5	353.5	2,499.2	55.0
Junc 58-2-E	2,314.6	520.8	520.8	2,469.6	67.2
Junc 58-2-G	2,297.9	497.7	497.7	2,464.2	72.1
Junc 58-2-H	2,297.9	497.7	497.7	2,464.2	72.1
Junc 58-3-1-A	2,381.8	42.7	42.7	2,485.4	44.9
Junc 58-3-1-A-1	2,382.2	32.9	32.9	2,483.2	43.8
Junc 58-3-1-B	2,380.7	32.2	32.2	2,481.0	43.5
Junc 58-3-1-C	2,368.7	271.6	271.6	2,469.2	43.5
Junc 58-3-1-D	2,368.0	153.3	153.3	2,469.2	43.9
Junc 58-3-1-D-1	2,366.4	49.7	49.7	2,469.2	44.6
Junc 58-3-1-E	2,351.6	539.7	539.7	2,461.8	47.7
Junc 58-3-1-G	2,351.7	475.3	475.3	2,461.7	47.7
Junc 58-3-1-H	2,351.7	503.3	503.3	2,461.7	47.7
Junc 58-3-2-A	2,299.1	330.4	330.4	2,463.9	71.4
Junc 58-3-A	2,415.7	46.9	46.9	2,599.9	79.8
Junc 58-3-A-1	2,415.7	242.9	242.9	2,599.9	79.8
Junc 58-3-A-2	2,415.8	47.6	47.6	2,599.9	79.8
Junc 58-3-B	2,382.0	487.9	487.9	2,486.9	45.5
Junc 58-3-C	2,365.2	942.2	942.2	2,478.3	49.0
Junc 58-3-D	2,357.7	70.0	70.0	2,477.6	52.0
Junc 58-3-E	2,356.6	33.6	33.6	2,476.7	52.0
Junc 58-3-F	2,324.8	37.8	37.8	2,469.7	62.8
Junc 58-3-F-1	2,313.9	7.0	7.0	2,467.0	66.4
Junc 58-3-G	2,306.1	955.5	955.5	2,465.6	69.1
Junc 58-3-H	2,287.7	1,181.6	1,181.6	2,449.6	70.1
Junc 58-3-I	2,287.6	529.2	529.2	2,449.6	70.2
Junc 58-3-J	2,263.7	146.3	146.3	2,425.9	70.3
Junc 58-3-K	2,262.8	1,010.8	1,010.8	2,425.9	70.7
Junc 58-8-A	2,341.0	780.5	780.5	2,443.3	44.3
Junc 58-8-C	2,336.4	1,048.6	1,048.6	2,437.5	43.9
Junc 58-8-D	2,316.1	992.6	992.6	2,436.3	52.1
Junc 58-8-E	2,294.6	477.4	477.4	2,421.9	55.1
Junc 58-8-F	2,295.5	838.6	838.6	2,421.6	54.6
Junc 58-8-G	2,219.1	123.9	123.9	2,391.2	74.6
Junc 58-8-H	2,254.6	340.2	340.2	2,400.0	63.0
Junc 58-8-M	2,259.4	508.2	508.2	2,409.3	65.0
Junc 58-8-N	2,235.6	509.6	509.6	2,395.5	69.3
Junc 58-8-O	2,236.1	523.6	523.6	2,395.0	68.8
Junc 58-8-P	2,235.0	760.2	760.2	2,395.0	69.4
Junc 58-A	2,450.0	532.7	532.7	2,612.6	70.5
Junc 58-B	2,449.0	45.5	45.5	2,611.9	70.6
Junc 58-C	2,445.1	217.0	217.0	2,610.6	71.7
Junc 58-D	2,445.3	168.0	168.0	2,610.6	71.7
Junc 58-F	2,439.8	121.1	121.1	2,609.5	73.5
Junc 58-G	2,438.1	200.9	200.9	2,606.4	72.9
Junc 58-G-1	2,437.2	126.0	126.0	2,604.3	72.4

Junc 58-H	2,437.3	11.2	11.2	2,604.3	72.4
Junc 58-H-1	2,436.9	14.0	14.0	2,604.3	72.5
Junc 58-I	2,436.7	48.3	48.3	2,603.8	72.4
Junc 58-J	2,435.6	35.0	35.0	2,602.3	72.2
Junc 58-K	2,434.7	37.8	37.8	2,602.2	72.6
Junc 58-L	2,434.9	35.0	35.0	2,602.2	72.5
Junc 58NONE	2,363.9	6.3	6.3	2,477.9	49.4
Junc 59-3-A	2,418.5	525.0	525.0	2,534.6	50.3
Junc 59-3-C	2,412.5	978.6	978.6	2,528.8	50.4
Junc 59-3-D	2,394.7	499.8	499.8	2,513.2	51.4
Junc 59-3-D-2	2,393.4	267.4	267.4	2,506.4	49.0
Junc 59-3-E	2,392.2	704.9	704.9	2,506.4	49.5
Junc 59-3-F	2,388.2	313.6	313.6	2,498.2	47.7
Junc 59-3-G	2,388.2	637.7	637.7	2,498.2	47.7
Junc 59-4-A	2,388.9	235.9	235.9	2,506.0	50.8
Junc 59-4-B	2,390.7	645.4	645.4	2,505.8	49.9
Junc 59-A	2,430.3	224.0	224.0	2,605.3	75.8
Junc 59-B	2,420.2	32.9	32.9	2,535.9	50.2
Junc 59-C	2,416.0	779.8	779.8	2,534.0	51.1
Junc 59-D	2,414.5	538.3	538.3	2,533.2	51.4
Junc 59-E	2,414.1	553.7	553.7	2,532.9	51.5
Junc 59-F	2,404.1	133.7	133.7	2,528.8	54.0
Junc 59-G	2,400.4	845.6	845.6	2,524.2	53.7
Junc 59-H	2,399.7	814.1	814.1	2,524.1	53.9
Junc 59-I	2,388.8	738.5	738.5	2,514.9	54.6
Junc 59-J	2,388.1	298.9	298.9	2,513.6	54.4
Junc 59-K	2,388.5	618.1	618.1	2,513.0	54.0
Junc 59-L	2,388.5	1,104.6	1,104.6	2,513.0	54.0
Junc 60-A	2,450.1	519.4	519.4	2,604.3	66.8
Junc 60-B	2,447.1	537.6	537.6	2,601.9	67.1
Junc 60-C	2,439.2	518.7	518.7	2,595.2	67.6
Junc 60-D	2,432.8	504.7	504.7	2,590.5	68.4
Junc 60-E	2,419.8	54.6	54.6	2,577.9	68.5
Junc 60-F	2,421.1	1,010.8	1,010.8	2,577.9	67.9
Junc 60-G	2,410.1	525.7	525.7	2,565.0	67.1
Junc 60-H	2,408.2	551.6	551.6	2,560.5	66.0
Junc 60-J	2,397.9	530.6	530.6	2,549.7	65.8
Junc 60-K	2,397.8	532.7	532.7	2,549.7	65.8
Junc 61-11-A	2,212.2	1,080.8	1,080.8	2,300.0	38.0
Junc 61-1-A	2,437.0	928.2	928.2	2,589.7	66.1
Junc 61-2-A	2,267.0	37.1	37.1	2,392.1	54.2
Junc 61-2-B	2,231.1	147.7	147.7	2,375.3	62.5
Junc 61-2-C	2,222.0	139.3	139.3	2,367.4	63.0
Junc 61-2-D	2,222.4	447.3	447.3	2,367.1	62.7
Junc 61-2-E	2,222.4	195.3	195.3	2,367.1	62.7
Junc 61-B-1	2,327.5	27.3	27.3	2,408.3	35.0
Junc 61-B-2	2,327.3	680.4	680.4	2,408.3	35.1
Junc 61-C	2,304.8	107.8	107.8	2,403.7	42.9

Junc 61-G	2,277.3	75.6	75.6	2,354.5	33.5
Junc 61-J	2,245.9	72.8	72.8	2,328.0	35.6
Junc 61-L	2,244.3	454.3	454.3	2,327.7	36.1
Junc 63-1-1-A	2,376.3	1,051.4	1,051.4	2,498.8	53.1
Junc 63-1-1-B	2,363.1	386.4	386.4	2,493.1	56.3
Junc 63-1-1-C	2,360.9	588.0	588.0	2,490.0	55.9
Junc 63-1-1-E	2,348.0	308.0	308.0	2,482.0	58.1
Junc 63-1-1-F	2,347.9	1,151.5	1,151.5	2,482.0	58.1
Junc 63-1-1-G	2,343.4	257.6	257.6	2,471.2	55.4
Junc 63-1-1-H	2,340.0	676.9	676.9	2,465.9	54.6
Junc 63-1-1-J	2,340.2	1,081.5	1,081.5	2,465.8	54.4
Junc 63-1-A	2,388.5	508.2	508.2	2,507.7	51.6
Junc 63-1-B	2,387.4	550.9	550.9	2,505.4	51.1
Junc 63-1-C	2,384.6	541.1	541.1	2,502.5	51.1
Junc 63-1-D	2,378.4	1,056.3	1,056.3	2,499.4	52.4
Junc 63-1-E	2,366.8	503.3	503.3	2,488.8	52.9
Junc 63-1-F	2,363.0	515.9	515.9	2,485.0	52.9
Junc 63-1-G	2,357.7	263.2	263.2	2,477.6	51.9
Junc 63-1-H	2,357.5	507.5	507.5	2,477.5	52.0
Junc 63-1-J	2,349.6	271.6	271.6	2,466.5	50.7
Junc 63-1-K-1	2,341.2	140.0	140.0	2,451.5	47.8
Junc 63-1-K-2	2,341.1	533.4	533.4	2,451.4	47.8
Junc 63-1-M	2,341.8	259.0	259.0	2,457.7	50.2
Junc 63-1-N	2,337.5	524.3	524.3	2,448.0	47.9
Junc 63-1-O	2,337.4	527.8	527.8	2,448.0	47.9
Junc 63-2-A	2,337.6	525.7	525.7	2,478.1	60.9
Junc 63-2-B	2,337.7	619.5	619.5	2,478.1	60.8
Junc 63-4-A	2,334.1	121.1	121.1	2,458.1	53.7
Junc 63-4-C	2,328.9	1,036.7	1,036.7	2,444.2	50.0
Junc 63-4-D	2,329.9	1,293.6	1,293.6	2,444.2	49.5
Junc 63-A	2,402.6	513.8	513.8	2,515.0	48.7
Junc 63-A-1	2,390.5	1,027.6	1,027.6	2,511.5	52.4
Junc 63-B	2,390.2	487.2	487.2	2,511.4	52.5
Junc 63-C	2,385.4	998.2	998.2	2,506.3	52.4
Junc 63-D	2,370.9	341.6	341.6	2,500.1	56.0
Junc 63-E	2,362.3	770.0	770.0	2,497.9	58.7
Junc 63-F	2,353.6	232.4	232.4	2,493.9	60.8
Junc 63-G	2,348.3	259.0	259.0	2,491.3	62.0
Junc 63-H	2,343.6	86.1	86.1	2,485.1	61.3
Junc 63-I	2,343.7	859.6	859.6	2,485.3	61.3
Junc 63-J	2,340.9	61.6	61.6	2,480.0	60.3
Junc 63-K	2,337.5	1,011.5	1,011.5	2,474.4	59.3
Junc 63NUID	2,414.2	19.6	19.6	2,597.5	79.4
Junc 63-O	2,336.3	541.1	541.1	2,459.3	53.3
Junc 63-R	2,336.5	1,087.1	1,087.1	2,459.3	53.2
Junc 64-1-A	2,363.2	186.2	186.2	2,504.0	61.0
Junc 64-2-A	2,362.9	536.9	536.9	2,503.1	60.7
Junc 64-2-B	2,362.8	515.9	515.9	2,503.0	60.8

Junc 64-3-A	2,355.1	1,004.5	1,004.5	2,499.2	62.5
Junc 64-3-B	2,355.1	302.4	302.4	2,499.2	62.4
Junc 64-4-1-A	2,347.1	1,017.1	1,017.1	2,492.0	62.8
Junc 64-4-1-B	2,346.7	2,064.3	2,064.3	2,491.9	62.9
Junc 64-4-2-B	2,328.9	270.9	270.9	2,465.2	59.0
Junc 64-4-2-C	2,328.9	842.1	842.1	2,465.2	59.0
Junc 64-4-2-D	2,329.2	1,106.7	1,106.7	2,464.9	58.8
Junc 64-4-2-E	2,329.2	818.3	818.3	2,464.9	58.8
Junc 64-4-2-F	2,329.3	310.1	310.1	2,464.9	58.8
Junc 64-4-B	2,334.3	1,785.7	1,785.7	2,484.7	65.2
Junc 64-4-C	2,334.2	30.1	30.1	2,484.7	65.2
Junc 64-4-D	2,327.5	33.6	33.6	2,478.6	65.5
Junc 64-4-E	2,325.7	389.9	389.9	2,473.5	64.0
Junc 64-4-F	2,326.3	541.8	541.8	2,473.3	63.7
Junc 64-4-H	2,325.0	912.8	912.8	2,464.9	60.6
Junc 64-4-I	2,324.1	1,093.4	1,093.4	2,462.3	59.9
Junc 64-4-K	2,324.1	896.0	896.0	2,462.3	59.9
Junc 64-5-A	2,331.2	624.4	624.4	2,481.7	65.2
Junc 64-5-A-1	2,330.3	975.1	975.1	2,450.0	51.9
Junc 64-5-B	2,331.0	541.1	541.1	2,446.6	50.1
Junc 64-5-C	2,330.9	533.4	533.4	2,446.7	50.2
Junc 64-6-A	2,328.7	55.3	55.3	2,468.5	60.6
Junc 64-6-B	2,327.5	543.2	543.2	2,467.6	60.7
Junc 64-6-C	2,327.9	413.0	413.0	2,467.5	60.5
Junc 64-6-D	2,327.5	253.4	253.4	2,467.6	60.7
Junc 64-A	2,370.3	528.5	528.5	2,505.7	58.6
Junc 64-B	2,357.8	527.8	527.8	2,500.5	61.9
Junc 64-C	2,348.6	778.4	778.4	2,495.9	63.8
Junc 64-D	2,348.6	249.9	249.9	2,495.9	63.8
Junc 64-E	2,347.9	516.6	516.6	2,492.5	62.7
Junc 64-F	2,348.2	179.2	179.2	2,492.3	62.5
Junc 64-G	2,339.1	1,280.3	1,280.3	2,489.5	65.2
Junc 64-H	2,339.1	351.4	351.4	2,489.5	65.2
Junc 64-J	2,337.0	237.3	237.3	2,486.9	64.9
Junc 64-K	2,336.0	411.6	411.6	2,482.7	63.6
Junc 64-K-1	2,333.4	509.6	509.6	2,477.3	62.4
Junc 64-L	2,333.0	126.0	126.0	2,473.3	60.8
Junc 64-M	2,333.9	1,164.8	1,164.8	2,473.3	60.4
Junc 64-METER#1	2,286.5	1,820.7	1,820.7	2,486.1	86.5
Junc 64-METER#2	2,286.5	1,214.5	1,214.5	2,486.1	86.5
Junc 64-N	2,333.1	140.0	140.0	2,473.2	60.7
Junc 64-N-1	2,333.1	688.1	688.1	2,473.2	60.7
Junc 64-O	2,333.3	217.7	217.7	2,477.2	62.3
Junc 64-P	2,330.3	278.6	278.6	2,468.9	60.1
Junc 64-R	2,320.2	436.8	436.8	2,456.3	59.0
Junc 64-S	2,319.3	373.1	373.1	2,452.8	57.9
Junc 64-T	2,318.8	77.0	77.0	2,448.3	56.1
Junc 64-U	2,318.8	1,288.0	1,288.0	2,446.4	55.3

Junc 64-V	2,318.8	1,017.8	1,017.8	2,446.4	55.3
Junc HAY-RES-EXIT	2,777.4	0.0	0.0	2,857.3	34.6
Junc HAY-RES-FEED	2,842.9	0.1	0.1	2,858.4	6.7
Junc HAY-RES-MERGE	2,758.9	0.0	0.0	2,857.3	42.6
Junc HG-31	2,868.0	0.0	0.0	2,883.6	6.8
Junc HG-32	2,866.6	0.0	0.0	2,882.5	6.9
Junc HG-34	2,865.9	0.0	0.0	2,880.0	6.1
Junc HG-34-1	2,867.4	0.0	0.0	2,877.0	4.2
Junc HG-34-2	2,858.2	0.0	0.0	2,866.7	3.7
Junc HG-37	2,862.7	0.0	0.0	2,875.8	5.7
Junc HG-37-1	2,863.7	0.0	0.0	2,872.5	3.8
Junc HG-37-2	2,849.0	0.0	0.0	2,869.2	8.8
Junc HG-37-4	2,735.0	0.0	0.0	2,856.5	52.7
Junc HG-37-4-1	2,725.6	0.0	0.0	2,852.1	54.8
Junc HG-37-4-D	2,636.8	0.0	0.0	2,755.4	51.4
Junc HG-37-4-I	2,623.7	0.0	0.0	2,734.9	48.2
Junc HG-37-5	2,681.9	0.0	0.0	2,762.4	34.9
Junc HG-37-6	2,648.6	0.0	0.0	2,753.7	45.6
Junc HG-37-7	2,639.5	0.0	0.0	2,750.4	48.0
Junc HG-37-8	2,634.0	0.0	0.0	2,745.4	48.3
Junc HG-37-9	2,623.8	0.0	0.0	2,717.7	40.7
Junc HG-38	2,847.3	0.0	0.0	2,873.5	11.3
Junc HG-41	2,843.9	0.0	0.0	2,862.6	8.1
Junc HG-41-10	2,618.4	0.0	0.0	2,762.5	62.4
Junc HG-41-11	2,611.8	0.0	0.0	2,756.5	62.7
Junc HG-41-2	2,762.0	0.0	0.0	2,857.8	41.5
Junc HG-41-3	2,741.8	0.0	0.0	2,855.3	49.2
Junc HG-41-5	2,703.4	0.0	0.0	2,784.2	35.0
Junc HG-41-5-1	2,687.8	0.0	0.0	2,780.2	40.0
Junc HG-41-6	2,675.3	0.0	0.0	2,780.5	45.6
Junc HG-41-7	2,643.4	0.0	0.0	2,777.3	58.0
Junc HG-41-9	2,621.2	0.0	0.0	2,766.3	62.9
Junc HG-42	2,843.7	0.0	0.0	2,861.4	7.7
Junc HG-43	2,842.1	0.0	0.0	2,858.4	7.0
Junc HG-43-1	2,817.3	0.0	0.0	2,855.5	16.6
Junc HG-43-10	2,613.6	0.0	0.0	2,761.1	63.9
Junc HG-43-10-1	2,566.6	0.0	0.0	2,747.4	78.4
Junc HG-43-10-2	2,561.6	0.0	0.0	2,665.5	45.0
Junc HG-43-10-3	2,518.9	0.0	0.0	2,648.4	56.1
Junc HG-43-10-4	2,514.9	0.0	0.0	2,644.0	55.9
Junc HG-43-11	2,613.2	0.0	0.0	2,759.5	63.4
Junc HG-43-12	2,609.3	0.0	0.0	2,753.8	62.6
Junc HG-43-2	2,748.0	0.0	0.0	2,852.7	45.4
Junc HG-43-5	2,694.0	0.0	0.0	2,847.5	66.5
Junc HG-43-7	2,692.1	0.0	0.0	2,844.2	65.9
Junc HG-43-7-1	2,674.2	0.0	0.0	2,766.5	40.0
Junc HG-43-7-2	2,589.7	0.0	0.0	2,749.8	69.4
Junc HG-43-9	2,689.4	0.0	0.0	2,770.2	35.0

Junc HG-45	2,757.2	0.0	0.0	2,853.4	41.7
Junc HG-45-1	2,757.4	0.0	0.0	2,846.4	38.6
Junc HG-45-1-1	2,709.2	0.0	0.0	2,825.1	50.2
Junc HG-45-2	2,740.0	0.0	0.0	2,807.4	29.2
Junc HG-45-3	2,662.0	0.0	0.0	2,773.7	48.4
Junc HG-48	2,628.7	0.0	0.0	2,631.3	1.1
Junc HG-50	2,612.3	0.0	0.0	2,629.3	7.4
Junc HG-51	2,603.5	0.0	0.0	2,627.6	10.4
Junc HG-51-1	2,598.0	0.0	0.0	2,618.3	8.8
Junc HG-51-5	2,580.1	0.0	0.0	2,596.4	7.1
Junc HG-51-6	2,578.6	0.0	0.0	2,594.6	6.9
Junc HG-52-A	2,503.2	0.0	0.0	2,625.4	53.0
Junc HG-53	2,480.4	0.0	0.0	2,623.7	62.1
Junc HG-55	2,479.6	0.0	0.0	2,622.0	61.7
Junc HG-55-1	2,472.0	0.0	0.0	2,612.9	61.0
Junc HG-56	2,478.9	0.0	0.0	2,621.2	61.7
Junc HG-57	2,454.4	0.0	0.0	2,619.6	71.6
Junc HG-57-2	2,435.1	0.0	0.0	2,538.9	45.0
Junc HG-57-2-A	2,409.6	0.0	0.0	2,529.9	52.1
Junc HG-57-6	2,376.6	0.0	0.0	2,504.0	55.2
Junc HG-58	2,453.2	0.0	0.0	2,618.9	71.8
Junc HG-58-11-Z-4-A	2,242.0	0.0	0.0	2,399.4	68.2
Junc HG-58-2	2,439.3	0.0	0.0	2,607.9	73.1
Junc HG-58-3	2,436.5	0.0	0.0	2,602.6	71.9
Junc HG-58-3-1	2,383.1	0.0	0.0	2,487.0	45.0
Junc HG-58-3-A	2,415.4	0.0	0.0	2,600.3	80.1
Junc HG-58-6	2,387.2	0.0	0.0	2,462.9	32.8
Junc HG-58-8	2,370.6	0.0	0.0	2,446.1	32.7
Junc HG-58-9-1	2,358.1	0.0	0.0	2,430.0	31.2
Junc HG-58-9-3	1,988.8	0.0	0.0	2,081.4	40.2
Junc HG-59	2,452.2	0.0	0.0	2,610.1	68.4
Junc HG-59-1	2,451.8	0.0	0.0	2,609.7	68.4
Junc HG-59-2	2,424.7	0.0	0.0	2,604.4	77.9
Junc HG-59-3	2,420.6	0.0	0.0	2,536.0	50.0
Junc HG-59-3-1	2,408.8	0.0	0.0	2,522.9	49.5
Junc HG-59-4	2,400.8	0.0	0.0	2,524.3	53.5
Junc HG-60	2,451.8	0.0	0.0	2,607.1	67.3
Junc HG-61	2,451.1	0.0	0.0	2,604.4	66.4
Junc HG-61-2	2,327.4	0.0	0.0	2,408.2	35.0
Junc HG-63	2,413.7	0.0	0.0	2,517.6	45.0
Junc HG-63-1	2,390.3	0.0	0.0	2,511.5	52.5
Junc HG-63-1-1	2,385.8	0.0	0.0	2,506.1	52.2
Junc HG-63-1-K	2,347.2	0.0	0.0	2,463.6	50.4
Junc HG-63-2	2,343.9	0.0	0.0	2,488.6	62.7
Junc HG-63-4	2,335.9	0.0	0.0	2,459.5	53.5
Junc HG-64	2,376.2	0.0	0.0	2,507.3	56.8
Junc HG-64-1	2,413.0	0.0	0.0	2,515.3	44.3
Junc HG-64-2	2,384.9	0.0	0.0	2,511.0	54.7

Junc HG-64-3	2,353.3	0.0	0.0	2,499.5	63.4
Junc HG-64-4	2,348.7	0.0	0.0	2,495.2	63.5
Junc HG-64-4-1	2,345.9	0.0	0.0	2,492.2	63.4
Junc HG-64-4-2	2,330.2	0.0	0.0	2,478.7	64.4
Junc HG-64-5	2,336.0	0.0	0.0	2,483.8	64.1
Junc HG-64-6	2,333.3	0.0	0.0	2,477.2	62.4
Junc HG-L51	2,523.4	0.0	0.0	2,626.7	44.7
Junc HG-M51	2,603.4	0.0	0.0	2,627.2	10.3
Junc HG-P58	2,452.4	0.0	0.0	2,612.5	69.4
Junc HG-PL37-3-1	2,828.4	0.0	0.0	2,851.5	10.0
Junc HG-PL41	2,845.6	0.0	0.0	2,864.1	8.0
Junc HG-PL41-1	2,749.0	0.0	0.0	2,859.4	47.9
Junc HG-PL43	2,840.6	0.0	0.0	2,856.4	6.9
Junc HG-PL51-4	2,581.3	0.0	0.0	2,598.6	7.5
Junc HG-PL52	2,503.4	0.0	0.0	2,626.0	53.2
Junc HG-PL58	2,356.1	0.0	0.0	2,434.3	33.9
Junc HG-PL58-1	2,438.9	0.0	0.0	2,608.5	73.5
Junc HG-PL58-12	2,260.8	0.0	0.0	2,417.9	68.1
Junc HG-PL58-1-2	2,418.2	0.0	0.0	2,522.1	45.0
Junc HG-PL58-13	2,256.5	0.0	0.0	2,413.7	68.1
Junc HG-PL58-9-2	2,347.3	0.0	0.0	2,429.4	35.6
Junc HG-PL62	2,451.1	0.0	0.0	2,604.4	66.4
Junc HG-R43	2,842.8	0.0	0.0	2,858.3	6.8
Junc HG-R53-I	2,480.2	0.0	0.0	2,622.7	61.7
Junc HG-R63-H-G	2,435.0	0.0	0.0	2,602.7	72.7
Junc HG-R64-P	2,344.7	0.0	0.0	2,495.9	65.5
Junc HG-TUM-RES-FEED	2,842.3	0.0	0.0	2,858.4	7.0
Junc L51-A	2,523.8	0.0	0.0	2,606.6	35.9
Junc L51-A-1	2,509.9	69.3	69.3	2,579.6	30.2
Junc L51-B	2,509.9	69.3	69.3	2,579.6	30.2
Junc L51-C	2,509.9	287.0	287.0	2,579.6	30.2
Junc L59-1-A	2,435.7	529.9	529.9	2,599.1	70.8
Junc L59-1-B	2,427.9	532.7	532.7	2,590.4	70.4
Junc L59-1-C	2,424.7	511.0	511.0	2,580.6	67.6
Junc L59-1-D	2,423.9	532.7	532.7	2,580.7	67.9
Junc L59-2-A	2,420.7	540.4	540.4	2,597.9	76.8
Junc L59-2-B	2,421.2	543.2	543.2	2,597.9	76.6
Junc L59-3-1-A	2,400.9	510.3	510.3	2,505.1	45.2
Junc L59-3-1-B	2,402.1	479.5	479.5	2,501.2	43.0
Junc L59-3-1-C	2,402.1	487.2	487.2	2,501.2	43.0
Junc L59-3-1-D	2,402.1	107.1	107.1	2,501.2	43.0
Junc L59-3-1-E	2,402.1	14.0	14.0	2,501.2	43.0
Junc L59-3-1-F	2,402.1	17.5	17.5	2,501.2	43.0
Junc L59-5-A	2,376.0	376.6	376.6	2,479.4	44.8
Junc L59-5-B	2,376.0	853.3	853.3	2,479.4	44.8
Junc M51-A	2,600.7	835.1	835.1	2,623.2	9.8
Junc M51-B	2,598.3	691.6	691.6	2,619.1	9.0
Junc M51-C	2,586.1	462.0	462.0	2,616.6	13.2

Junc M51-C-1	2,586.3	21.0	21.0	2,616.6	13.1
Junc M51-C-2	2,586.2	128.8	128.8	2,616.6	13.2
Junc M51-D	2,582.9	79.1	79.1	2,615.3	14.1
Junc M51-E	2,586.2	262.5	262.5	2,616.6	13.2
Junc NODE-1	2,872.9	0.0	0.0	2,882.1	4.0
Junc NODE-10	2,627.6	0.0	0.0	2,735.2	46.6
Junc NODE-10-1	2,891.9	0.0	0.0	2,887.1	-2.1
Junc NODE-11	2,625.2	0.0	0.0	2,725.2	43.3
Junc NODE-1-1	3,551.7	0.0	0.0	3,563.8	5.2
Junc NODE-11-1	2,869.2	0.0	0.0	2,885.7	7.2
Junc NODE-12	2,624.9	0.0	0.0	2,717.9	40.3
Junc NODE-12-1	2,869.1	0.0	0.0	2,885.6	7.1
Junc NODE-14-1	2,864.7	0.0	0.0	2,881.9	7.5
Junc NODE-16	2,729.3	0.0	0.0	2,851.4	52.9
Junc NODE-17	2,644.9	0.0	0.0	2,757.2	48.6
Junc NODE-18	2,722.6	0.1	0.1	2,849.2	54.9
Junc NODE-19	2,683.6	0.0	0.0	2,782.4	42.8
Junc NODE-2	2,868.5	0.0	0.0	2,881.8	5.8
Junc NODE-20	2,678.8	0.0	0.0	2,780.6	44.1
Junc NODE-21	2,625.7	0.0	0.0	2,772.1	63.4
Junc NODE-2-1	3,550.7	0.0	0.0	3,562.1	5.0
Junc NODE-22	2,622.3	0.0	0.0	2,758.0	58.8
Junc NODE-23	2,620.0	0.0	0.0	2,754.3	58.2
Junc NODE-24	2,843.9	0.0	0.0	2,861.4	7.6
Junc NODE-25	2,697.1	0.0	0.0	2,850.7	66.5
Junc NODE-26	2,660.5	0.0	0.0	2,760.8	43.5
Junc NODE-27	2,539.5	0.0	0.0	2,731.1	83.0
Junc NODE-28	2,532.9	0.0	0.0	2,650.6	51.0
Junc NODE-29	2,530.0	0.0	0.0	2,646.6	50.5
Junc NODE-3	2,836.8	0.0	0.0	2,869.4	14.1
Junc NODE-30	2,529.3	0.0	0.0	2,653.5	53.8
Junc NODE-31	2,525.1	0.0	0.0	2,652.7	55.3
Junc NODE-3-1	2,890.8	0.0	0.0	2,902.3	5.0
Junc NODE-32	2,508.7	0.0	0.0	2,637.3	55.7
Junc NODE-33	2,510.0	0.0	0.0	2,633.9	53.7
Junc NODE-34	2,737.4	0.0	0.0	2,803.2	28.5
Junc NODE-35	2,738.9	0.0	0.0	2,800.4	26.6
Junc NODE-36	2,671.9	0.0	0.0	2,787.3	50.0
Junc NODE-37	2,664.6	0.0	0.0	2,774.1	47.5
Junc NODE-38	2,662.5	0.0	0.0	2,771.7	47.3
Junc NODE-39	2,630.6	0.0	0.0	2,627.3	-1.5
Junc NODE-4	2,846.5	0.0	0.0	2,869.2	9.9
Junc NODE-40	2,545.0	0.0	0.0	2,606.9	26.8
Junc NODE-41	2,509.2	0.0	0.0	2,592.9	36.3
Junc NODE-4-1	2,889.2	0.0	0.0	2,902.1	5.6
Junc NODE-42	2,585.9	0.0	0.0	2,604.7	8.2
Junc NODE-43	2,587.9	0.0	0.0	2,604.3	7.1
Junc NODE-44	2,353.9	0.0	0.0	2,418.8	28.1

Junc NODE-45	2,480.7	0.0	0.0	2,623.6	61.9
Junc NODE-46	2,480.5	0.0	0.0	2,623.5	62.0
Junc NODE-47	2,455.1	0.0	0.0	2,588.9	58.0
Junc NODE-48	2,450.9	0.0	0.0	2,581.3	56.5
Junc NODE-49	2,451.3	0.0	0.0	2,576.4	54.2
Junc NODE-5	2,795.6	0.0	0.0	2,836.2	17.6
Junc NODE-50	2,462.1	0.0	0.0	2,620.4	68.6
Junc NODE-51	2,451.3	0.0	0.0	2,620.0	73.1
Junc NODE-5-1	2,887.7	0.0	0.0	2,900.2	5.4
Junc NODE-52	2,450.2	0.0	0.0	2,611.5	69.9
Junc NODE-53	2,444.9	0.0	0.0	2,610.7	71.8
Junc NODE-54	2,444.4	0.0	0.0	2,610.4	71.9
Junc NODE-55	2,444.3	0.0	0.0	2,609.6	71.7
Junc NODE-56	2,340.0	0.0	0.0	2,439.6	43.2
Junc NODE-57	2,407.8	0.0	0.0	2,504.5	41.9
Junc NODE-58	2,366.3	0.0	0.0	2,495.8	56.1
Junc NODE-59	2,355.5	0.0	0.0	2,487.1	57.0
Junc NODE-6	2,722.3	0.0	0.0	2,847.3	54.1
Junc NODE-60	2,352.6	0.0	0.0	2,483.1	56.5
Junc NODE-61	2,383.0	0.0	0.0	2,479.2	41.7
Junc NODE-6-1	2,890.4	0.0	0.0	2,894.6	1.8
Junc NODE-62	2,370.0	0.0	0.0	2,469.4	43.1
Junc NODE-63	2,366.3	0.0	0.0	2,478.0	48.4
Junc NODE-64	2,272.1	0.0	0.0	2,442.1	73.6
Junc NODE-65	2,295.2	0.0	0.0	2,420.9	54.5
Junc NODE-66	2,294.6	0.0	0.0	2,420.7	54.7
Junc NODE-67	2,267.6	0.0	0.0	2,413.5	63.2
Junc NODE-68	2,306.2	0.0	0.0	2,425.0	51.5
Junc NODE-69	2,272.5	0.0	0.0	2,419.9	63.9
Junc NODE-7	2,872.1	0.0	0.0	2,875.6	1.5
Junc NODE-70	2,331.6	0.0	0.0	2,423.0	39.6
Junc NODE-71	2,283.9	0.0	0.0	2,401.6	51.0
Junc NODE-7-1	2,893.0	0.0	0.0	2,893.8	0.4
Junc NODE-72	2,238.7	0.0	0.0	2,385.4	63.6
Junc NODE-73	2,233.4	0.0	0.0	2,375.5	61.6
Junc NODE-74	2,331.3	0.0	0.0	2,485.4	66.8
Junc NODE-75	2,329.2	0.0	0.0	2,465.0	58.8
Junc NODE-76	2,331.2	0.0	0.0	2,478.7	63.9
Junc NODE-78	2,485.3	0.0	0.0	2,570.4	36.9
Junc NODE-79	2,607.8	0.0	0.0	2,745.0	59.4
Junc NODE-8	2,631.8	0.0	0.0	2,746.7	49.8
Junc NODE-80	2,243.9	0.0	0.0	2,401.9	68.5
Junc NODE-81	2,725.2	0.0	0.0	2,851.8	54.9
Junc NODE-8-1	2,886.7	0.0	0.0	2,893.4	2.9
Junc NODE-82	2,724.0	0.0	0.0	2,847.5	53.6
Junc NODE-83	2,614.9	0.0	0.0	2,747.1	57.3
Junc NODE-84	2,438.8	0.0	0.0	2,602.6	71.0
Junc NODE-9	2,628.4	0.0	0.0	2,743.4	49.8

Junc NODE-9-1	2,877.9	0.0	0.0	2,892.5	6.3
Junc P58-A	2,456.2	232.4	232.4	2,611.5	67.3
Junc P58-B	2,456.2	357.0	357.0	2,611.4	67.3
Junc P58-B-1	2,434.2	586.6	586.6	2,605.0	74.0
Junc P58-C	2,433.4	496.3	496.3	2,604.0	73.9
Junc P58-D	2,431.5	28.0	28.0	2,602.1	73.9
Junc P58-E	2,427.0	772.1	772.1	2,594.3	72.5
Junc P58-G	2,428.3	1,455.3	1,455.3	2,594.1	71.8
Junc PL37-3-1-A	2,822.9	275.8	275.8	2,843.3	8.8
Junc PL37-3-1-B	2,818.5	1,103.2	1,103.2	2,840.9	9.7
Junc PL41-1-A	2,716.9	33.6	33.6	2,846.4	56.2
Junc PL41-1-B	2,712.8	34.3	34.3	2,844.6	57.1
Junc PL41-1-C	2,709.1	37.1	37.1	2,843.4	58.2
Junc PL41-1-D	2,698.7	312.9	312.9	2,839.8	61.1
Junc PL41-1-E	2,698.8	295.4	295.4	2,839.8	61.1
Junc PL41-1-F	2,721.9	28.7	28.7	2,848.7	54.9
Junc PL41-1-G	2,721.6	32.2	32.2	2,848.7	55.0
Junc PL41-1-G-1	2,719.2	25.9	25.9	2,848.2	55.9
Junc PL41-1-H	2,707.8	32.9	32.9	2,840.6	57.6
Junc PL41-1-I	2,697.4	31.5	31.5	2,833.8	59.1
Junc PL41-1-J	2,693.3	128.8	128.8	2,830.3	59.4
Junc PL41-A	2,747.8	270.9	270.9	2,859.3	48.3
Junc PL41-B	2,747.6	258.3	258.3	2,859.3	48.4
Junc PL41-C	2,730.3	205.8	205.8	2,854.9	54.0
Junc PL41-D	2,701.7	272.3	272.3	2,847.2	63.0
Junc PL41-E	2,701.1	259.0	259.0	2,847.1	63.3
Junc PL41-F	2,701.1	275.8	275.8	2,847.1	63.3
Junc PL41-G	2,682.0	507.5	507.5	2,839.8	68.4
Junc PL41-H	2,681.8	515.9	515.9	2,839.9	68.5
Junc PL41-I	2,672.0	0.7	0.7	2,775.7	44.9
Junc PL41-J	2,671.9	307.3	307.3	2,775.7	45.0
Junc PL41-K	2,664.7	0.7	0.7	2,771.4	46.2
Junc PL41-L	2,662.2	13.3	13.3	2,770.3	46.8
Junc PL41-M	2,657.8	77.0	77.0	2,769.0	48.2
Junc PL41-N	2,649.6	9.1	9.1	2,761.9	48.7
Junc PL41-N-1	2,644.9	10.5	10.5	2,757.5	48.8
Junc PL41-O	2,643.5	105.0	105.0	2,756.8	49.1
Junc PL41-P	2,641.2	70.7	70.7	2,751.5	47.8
Junc PL41-P-1	2,638.9	156.1	156.1	2,738.7	43.2
Junc PL41-Q	2,635.3	42.0	42.0	2,750.7	50.0
Junc PL41-R	2,638.8	14.7	14.7	2,738.7	43.3
Junc PL41-S	2,636.1	13.3	13.3	2,738.7	44.4
Junc PL42-A	2,800.0	35.7	35.7	2,848.3	20.9
Junc PL42-B	2,799.9	66.5	66.5	2,848.3	20.9
Junc PL42-C	2,800.0	11.9	11.9	2,848.3	20.9
Junc PL42-D	2,800.0	35.0	35.0	2,848.3	20.9
Junc PL42-E	2,799.7	14.0	14.0	2,848.3	21.0
Junc PL43-5-A	2,697.2	555.1	555.1	2,845.3	64.2

Junc PL43-5-A-1	2,690.7	287.0	287.0	2,828.3	59.6
Junc PL43-5-B	2,689.9	197.4	197.4	2,826.6	59.3
Junc PL43-7-1-A	2,673.5	10.5	10.5	2,762.8	38.7
Junc PL43-7-1-B	2,673.2	44.8	44.8	2,762.8	38.9
Junc PL43-7-1-C	2,663.0	107.1	107.1	2,761.8	42.8
Junc PL43-7-1-D	2,659.8	277.2	277.2	2,760.6	43.7
Junc PL43-A	2,768.8	527.1	527.1	2,847.6	34.1
Junc PL43-B	2,768.8	500.5	500.5	2,847.6	34.1
Junc PL51	2,582.4	56.7	56.7	2,599.7	7.5
Junc PL51-4-A	2,508.3	286.3	286.3	2,586.8	34.0
Junc PL51-4-C	2,483.1	138.6	138.6	2,581.0	42.4
Junc PL51-4-D	2,483.3	93.8	93.8	2,581.0	42.3
Junc PL51-4-E	2,483.4	536.9	536.9	2,581.0	42.3
Junc PL51-4-F	2,478.3	15.4	15.4	2,574.1	41.5
Junc PL51-4-H	2,465.1	90.3	90.3	2,568.4	44.8
Junc PL51-4-I	2,453.1	21.0	21.0	2,563.9	48.0
Junc PL51-4-J	2,443.9	30.8	30.8	2,560.5	50.5
Junc PL51-4-L	2,423.8	236.6	236.6	2,543.8	52.0
Junc PL51-4-N	2,418.2	37.8	37.8	2,535.6	50.9
Junc PL51-4-O	2,417.2	3.5	3.5	2,532.5	49.9
Junc PL51-4-O-1	2,417.2	4.9	4.9	2,532.5	49.9
Junc PL51-4-P	2,392.9	14.0	14.0	2,473.7	35.0
Junc PL51-4-Q	2,375.2	4.2	4.2	2,465.0	39.0
Junc PL51-4-R	2,382.2	4.2	4.2	2,463.7	35.3
Junc PL51-4-S	2,381.2	1.4	1.4	2,459.9	34.1
Junc PL51-4-S-1	2,358.7	13.3	13.3	2,452.6	40.7
Junc PL51-4-T	2,358.7	2.1	2.1	2,450.0	39.6
Junc PL51-4-U	2,358.9	1.4	1.4	2,447.2	38.3
Junc PL51-4-W	2,332.8	97.3	97.3	2,410.8	33.8
Junc PL51-4-W-1	2,336.3	116.2	116.2	2,411.2	32.5
Junc PL51-4-X	2,291.5	508.9	508.9	2,403.6	48.6
Junc PL51-4-Y	2,269.1	161.7	161.7	2,399.9	56.7
Junc PL51-4-Z-1	2,265.6	268.1	268.1	2,393.7	55.5
Junc PL51-5-A	2,555.9	247.1	247.1	2,594.1	16.6
Junc PL51-5-B	2,555.6	480.9	480.9	2,594.1	16.7
Junc PL51-6-A	2,530.9	459.9	459.9	2,588.8	25.1
Junc PL51-6-B	2,530.8	814.1	814.1	2,588.9	25.2
Junc PL52-B	2,479.9	19.6	19.6	2,622.1	61.7
Junc PL52-C	2,477.0	32.2	32.2	2,620.1	62.0
Junc PL52-C-1	2,457.5	34.3	34.3	2,617.0	69.1
Junc PL52-C-2	2,476.8	35.0	35.0	2,620.1	62.1
Junc PL52-E	2,476.9	298.2	298.2	2,620.1	62.1
Junc PL52-F	2,473.1	192.5	192.5	2,615.8	61.8
Junc PL52-H	2,470.7	105.0	105.0	2,607.1	59.1
Junc PL52-I	2,470.5	30.1	30.1	2,603.8	57.8
Junc PL52-J	2,459.3	28.0	28.0	2,601.7	61.7
Junc PL52-K	2,459.1	14.7	14.7	2,601.6	61.7
Junc PL52-N	2,459.1	27.3	27.3	2,601.5	61.7

Junc PL52-O	2,458.8	18.9	18.9	2,599.7	61.0
Junc PL52-P	2,458.8	151.9	151.9	2,599.0	60.8
Junc PL52-Q	2,454.6	500.5	500.5	2,598.2	62.2
Junc PL52-R	2,456.1	17.5	17.5	2,598.2	61.6
Junc PL52-R-1	2,441.7	57.4	57.4	2,588.6	63.7
Junc PL52-S	2,440.2	215.6	215.6	2,581.7	61.3
Junc PL52-T	2,416.6	10.5	10.5	2,579.6	70.6
Junc PL52-V	2,410.4	39.9	39.9	2,491.2	35.0
Junc PL52-W	2,406.7	49.7	49.7	2,490.6	36.3
Junc PL52-X	2,397.0	12.6	12.6	2,489.5	40.1
Junc PL52-Y	2,397.0	68.6	68.6	2,489.5	40.1
Junc PL52-Z	2,397.0	31.5	31.5	2,489.5	40.1
Junc PL52-Z-1	2,395.6	41.3	41.3	2,488.5	40.3
Junc PL52-Z-10	2,351.5	16.8	16.8	2,406.2	23.7
Junc PL52-Z-2	2,394.8	57.4	57.4	2,487.0	40.0
Junc PL52-Z-3	2,388.0	137.9	137.9	2,483.7	41.5
Junc PL52-Z-4	2,367.0	13.3	13.3	2,458.5	39.6
Junc PL52-Z-5	2,363.6	39.2	39.2	2,450.1	37.5
Junc PL52-Z-6	2,363.7	127.4	127.4	2,450.0	37.4
Junc PL52-Z-7	2,363.5	86.1	86.1	2,450.0	37.5
Junc PL52-Z-8	2,358.9	5.6	5.6	2,421.5	27.1
Junc PL52-Z-9	2,337.9	179.9	179.9	2,406.4	29.7
Junc PL53-A	2,481.1	1,399.3	1,399.3	2,610.7	56.2
Junc PL53-C	2,481.5	275.8	275.8	2,610.8	56.0
Junc PL53-D	2,481.6	60.9	60.9	2,610.6	55.9
Junc PL58-11-U	2,336.0	701.4	701.4	2,429.3	40.4
Junc PL58-11-V	2,334.4	770.7	770.7	2,429.2	41.1
Junc PL58-11-W	2,326.7	534.8	534.8	2,428.9	44.3
Junc PL58-11-X	2,305.1	1,050.0	1,050.0	2,424.8	51.9
Junc PL58-11-Y	2,272.4	548.8	548.8	2,416.2	62.3
Junc PL58-11-Z	2,289.4	629.3	629.3	2,422.5	57.6
Junc PL58-11-Z-1	2,261.3	775.6	775.6	2,410.8	64.8
Junc PL58-11-Z-2	2,269.9	12.6	12.6	2,419.7	64.9
Junc PL58-11-Z-3	2,244.8	346.5	346.5	2,403.2	68.6
Junc PL58-11-Z-4	2,243.6	131.6	131.6	2,401.9	68.6
Junc PL58-11-Z-5	2,241.8	1,183.7	1,183.7	2,399.3	68.3
Junc PL58-12-A	2,228.9	259.7	259.7	2,344.3	50.0
Junc PL58-1-2-A	2,417.1	16.8	16.8	2,521.9	45.4
Junc PL58-1-2-A-1	2,415.5	2.1	2.1	2,520.8	45.6
Junc PL58-12-B	2,214.5	752.5	752.5	2,331.8	50.8
Junc PL58-1-2-B	2,412.2	36.4	36.4	2,518.9	46.2
Junc PL58-1-2-C	2,399.6	1,032.5	1,032.5	2,512.6	49.0
Junc PL58-1-2-D	2,399.6	354.9	354.9	2,512.6	49.0
Junc PL58-1-2-D-1	2,399.6	8.4	8.4	2,512.6	49.0
Junc PL58-13-A	2,255.1	445.2	445.2	2,405.9	65.3
Junc PL58-13-B	2,254.3	380.8	380.8	2,405.6	65.5
Junc PL58-13-C	2,252.4	1,610.0	1,610.0	2,395.4	62.0
Junc PL58-1-A	2,444.3	9.1	9.1	2,606.9	70.5

Junc PL58-1-B	2,436.4	646.1	646.1	2,602.4	71.9
Junc PL58-1-C	2,430.9	7.0	7.0	2,591.1	69.4
Junc PL58-1-D	2,428.7	86.8	86.8	2,583.3	67.0
Junc PL58-1-E	2,428.1	20.3	20.3	2,582.8	67.0
Junc PL58-1-F	2,423.2	19.6	19.6	2,572.4	64.6
Junc PL58-1-G	2,420.0	397.6	397.6	2,561.7	61.4
Junc PL58-1-H	2,418.7	242.2	242.2	2,555.2	59.1
Junc PL58-1-J	2,414.9	9.1	9.1	2,519.5	45.4
Junc PL58-1-J-1	2,411.7	5.6	5.6	2,518.0	46.0
Junc PL58-1-K	2,412.8	16.1	16.1	2,516.6	45.0
Junc PL58-1-L	2,410.9	116.2	116.2	2,512.5	44.0
Junc PL58-1-M	2,406.0	142.8	142.8	2,501.9	41.6
Junc PL58-1-N	2,406.0	94.5	94.5	2,501.9	41.6
Junc PL58-1-Q	2,325.9	23.8	23.8	2,438.9	48.9
Junc PL58-1-R	2,325.9	23.1	23.1	2,438.9	48.9
Junc PL58-1-S	2,330.7	102.2	102.2	2,420.6	39.0
Junc PL58-1-T	2,330.6	50.4	50.4	2,420.6	39.0
Junc PL58-6-A	2,367.5	1,158.5	1,158.5	2,455.4	38.1
Junc PL58-6-C	2,367.4	507.5	507.5	2,455.4	38.1
Junc PL58-6-D	2,367.5	22.4	22.4	2,455.4	38.1
Junc PL58-9-1-B	2,345.2	147.7	147.7	2,404.0	25.5
Junc PL58-9-1-C	2,345.0	263.9	263.9	2,404.0	25.6
Junc PL58-9-2-B	2,329.9	1,503.6	1,503.6	2,423.0	40.3
Junc PL58-9-2-C	2,329.9	651.0	651.0	2,423.0	40.3
Junc PL58-9-3-A	1,929.3	413.0	413.0	2,070.3	61.1
Junc PL58-9-3-B	1,886.7	38.5	38.5	2,051.2	71.3
Junc PL58-9-3-C	1,879.6	56.7	56.7	2,050.9	74.2
Junc PL58-9-A	2,360.2	1,331.4	1,331.4	2,432.9	31.5
Junc PL58-9-D	2,308.9	450.1	450.1	2,414.9	45.9
Junc PL58-9-E	2,305.4	39.9	39.9	2,412.7	46.5
Junc PL58-9-F	2,307.0	978.6	978.6	2,412.8	45.8
Junc PL58-9-G	2,254.6	336.7	336.7	2,405.1	65.2
Junc PL58-9-H	2,001.7	340.2	340.2	2,082.5	35.0
Junc PL58-9-I	1,962.9	1,132.6	1,132.6	2,078.1	49.9
Junc PL58-9-J	1,952.3	999.6	999.6	2,075.4	53.3
Junc PL58-9-K	1,952.5	151.2	151.2	2,065.1	48.8
Junc PL58-9-L	1,953.0	1,120.0	1,120.0	2,065.3	48.7
Junc PL62-A	2,285.4	343.0	343.0	2,377.8	40.0
Junc PL62-B	2,285.4	117.6	117.6	2,377.8	40.0
Junc PL62-C	2,236.0	879.2	879.2	2,369.3	57.8
Junc PL62-C-1	2,235.4	140.0	140.0	2,369.2	58.0
Junc PL62-D	2,211.0	256.2	256.2	2,352.5	61.3
Junc PL62-E	2,211.0	476.7	476.7	2,352.5	61.3
Junc PL62-F	2,211.0	331.1	331.1	2,352.5	61.3
Junc R34-A	2,868.5	510.3	510.3	2,884.9	7.1
Junc R34-B	2,868.5	759.5	759.5	2,884.9	7.1
Junc R34-B-1	2,875.8	567.7	567.7	2,883.4	3.3
Junc R34-C	2,866.3	928.9	928.9	2,880.7	6.2

Junc R34-E	2,865.4	251.3	251.3	2,879.9	6.3
Junc R34-F	2,865.4	22.4	22.4	2,879.9	6.3
Junc R34-F-1	2,865.0	2.8	2.8	2,879.5	6.3
Junc R34-G	2,865.5	56.7	56.7	2,879.3	6.0
Junc R34-H	2,865.4	24.5	24.5	2,879.1	5.9
Junc R34-I	2,864.4	727.3	727.3	2,878.7	6.2
Junc R34-J	2,864.6	707.7	707.7	2,878.2	5.9
Junc R34-K	2,865.6	99.4	99.4	2,878.1	5.4
Junc R34-L	2,865.0	352.1	352.1	2,877.6	5.5
Junc R34-M	2,865.1	42.0	42.0	2,877.2	5.3
Junc R40-A	2,845.8	35.0	35.0	2,867.6	9.5
Junc R41-A	2,845.5	127.4	127.4	2,864.9	8.4
Junc R41-B	2,845.7	470.4	470.4	2,864.9	8.3
Junc R41-C	2,845.9	506.8	506.8	2,864.9	8.2
Junc R41-D	2,844.9	446.6	446.6	2,863.3	8.0
Junc R41-D-1	2,844.9	366.1	366.1	2,863.3	8.0
Junc R41-E	2,845.0	530.6	530.6	2,863.3	8.0
Junc R41-F	2,846.9	304.5	304.5	2,862.5	6.8
Junc R41-F-1	2,847.2	49.7	49.7	2,860.8	5.9
Junc R41-G	2,846.5	7.0	7.0	2,860.8	6.2
Junc R41-G-1	2,846.5	357.7	357.7	2,860.8	6.2
Junc R41-H	2,843.7	226.1	226.1	2,860.2	7.2
Junc R41-I	2,842.9	251.3	251.3	2,859.4	7.1
Junc R41-J	2,842.6	32.2	32.2	2,859.2	7.2
Junc R41-K	2,843.2	101.5	101.5	2,858.4	6.6
Junc R43-A	2,850.7	760.2	760.2	2,858.2	3.3
Junc R43-A-1	2,843.8	35.0	35.0	2,858.3	6.3
Junc R43-B	2,851.6	14.7	14.7	2,858.1	2.8
Junc R51-D	2,757.8	134.4	134.4	2,854.2	41.8
Junc R51-D-1	2,757.4	40.6	40.6	2,854.2	42.0
Junc R51-D-2	2,757.5	207.9	207.9	2,854.2	41.9
Junc R51-E	2,759.7	381.5	381.5	2,853.1	40.5
Junc R51-E-1	2,760.6	7.7	7.7	2,853.1	40.1
Junc R51-E-1-A	2,759.7	111.3	111.3	2,853.1	40.5
Junc R51-E-2	2,760.6	915.6	915.6	2,853.1	40.1
Junc R51-F	2,629.3	97.3	97.3	2,631.4	0.9
Junc R51-G	2,628.4	907.2	907.2	2,630.1	0.7
Junc R51-G-1	2,628.4	91.0	91.0	2,630.1	0.7
Junc R51-H	2,628.4	11.2	11.2	2,630.1	0.8
Junc R51-I	2,627.4	151.2	151.2	2,629.7	1.0
Junc R51-J	2,627.3	7.0	7.0	2,629.5	1.0
Junc R51-K	2,617.3	853.3	853.3	2,629.0	5.1
Junc R51-K-1	2,603.1	1,624.7	1,624.7	2,628.2	10.9
Junc R51-K-2	2,603.6	22.4	22.4	2,628.2	10.7
Junc R51-L	2,603.5	663.6	663.6	2,627.6	10.4
Junc R51-L-PUMP	2,603.4	4.9	4.9	2,627.6	10.5
Junc R51-M	2,523.8	15.4	15.4	2,626.6	44.6
Junc R53-A	2,503.7	24.5	24.5	2,625.4	52.8

Junc R53-B	2,501.8	408.1	408.1	2,625.3	53.5
Junc R53-C	2,502.4	44.1	44.1	2,625.3	53.3
Junc R53-C-1	2,494.4	14.7	14.7	2,625.1	56.6
Junc R53-D	2,494.6	429.8	429.8	2,625.0	56.5
Junc R53-D-1	2,487.4	27.3	27.3	2,624.7	59.5
Junc R53-F	2,487.3	235.2	235.2	2,624.5	59.5
Junc R53-F-1	2,487.3	60.2	60.2	2,624.5	59.5
Junc R53-F-2	2,487.3	112.0	112.0	2,624.5	59.5
Junc R53-F-2-6	2,487.3	11.9	11.9	2,624.5	59.5
Junc R53-F-3	2,487.3	63.7	63.7	2,624.5	59.4
Junc R53-G	2,481.0	270.2	270.2	2,624.2	62.1
Junc R53-H	2,480.3	456.4	456.4	2,623.7	62.1
Junc R53-H-1	2,480.0	421.4	421.4	2,623.2	62.1
Junc R53-H-2	2,479.9	520.8	520.8	2,623.1	62.0
Junc R53-H-3	2,480.2	88.9	88.9	2,623.4	62.1
Junc R53-H-4	2,479.6	1,691.2	1,691.2	2,622.7	62.0
Junc R53-I	2,483.0	65.8	65.8	2,622.0	60.2
Junc R53-I-A	2,483.0	574.0	574.0	2,621.9	60.2
Junc R53-K	2,479.6	954.1	954.1	2,622.0	61.7
Junc R53-L	2,479.4	280.0	280.0	2,621.7	61.7
Junc R53-M	2,479.4	28.7	28.7	2,621.9	61.7
Junc R53-N	2,484.1	348.6	348.6	2,620.8	59.3
Junc R53-O	2,483.1	273.0	273.0	2,620.8	59.7
Junc R53-P	2,483.1	802.9	802.9	2,620.8	59.7
Junc R57-A	2,455.1	130.9	130.9	2,619.4	71.2
Junc R57-B	2,454.1	960.4	960.4	2,619.6	71.7
Junc R57-C	2,453.7	331.1	331.1	2,619.3	71.8
Junc R57-D	2,453.3	174.3	174.3	2,619.0	71.8
Junc R57-E	2,452.8	29.4	29.4	2,618.9	72.0
Junc R57-F	2,452.9	5.6	5.6	2,618.9	71.9
Junc R57-I-1	2,452.0	178.5	178.5	2,612.7	69.6
Junc R57-L	2,452.8	665.0	665.0	2,611.6	68.8
Junc R57-M	2,450.7	1,024.8	1,024.8	2,609.6	68.8
Junc R57-N	2,450.7	101.5	101.5	2,609.6	68.8
Junc R57-O	2,452.1	681.1	681.1	2,612.7	69.6
Junc R57-P	2,452.9	157.5	157.5	2,608.4	67.4
Junc R63-A	2,453.3	1,038.8	1,038.8	2,608.1	67.1
Junc R63-A-1	2,452.6	179.2	179.2	2,608.1	67.4
Junc R63-A-2	2,452.6	978.6	978.6	2,608.1	67.4
Junc R63-A-3	2,452.8	88.2	88.2	2,607.9	67.2
Junc R63-B	2,451.8	124.6	124.6	2,605.8	66.7
Junc R63-C	2,451.8	401.8	401.8	2,605.8	66.7
Junc R63-D	2,451.1	1,033.9	1,033.9	2,604.4	66.4
Junc R63-E	2,451.5	496.3	496.3	2,604.3	66.2
Junc R63-F	2,451.4	555.1	555.1	2,604.3	66.3
Junc R63-G	2,434.9	538.3	538.3	2,601.0	72.0
Junc R63-H	2,434.6	1,071.7	1,071.7	2,601.0	72.1
Junc R63-I	2,427.1	396.2	396.2	2,600.3	75.1

Junc R63-J	2,427.2	504.0	504.0	2,600.3	75.0
Junc R63-K	2,420.0	984.2	984.2	2,599.2	77.6
Junc R63-L	2,414.5	30.1	30.1	2,597.5	79.3
Junc R63-M	2,413.8	688.1	688.1	2,596.8	79.3
Junc R64-1-A	2,403.0	530.6	530.6	2,500.1	42.1
Junc R64-1-B	2,403.5	527.1	527.1	2,500.1	41.9
Junc R64-1-C	2,403.5	515.9	515.9	2,500.1	41.9
Junc R64-2-B	2,382.0	472.5	472.5	2,506.2	53.8
Junc R64-2-C	2,382.0	507.5	507.5	2,506.2	53.8
Junc R64-B	2,413.9	1,242.5	1,242.5	2,516.4	44.4
Junc R64-C	2,413.9	498.4	498.4	2,516.4	44.4
Junc R64-D	2,413.9	481.6	481.6	2,516.4	44.4
Junc R64-E	2,412.9	393.4	393.4	2,515.4	44.4
Junc R64-F	2,413.0	503.3	503.3	2,515.3	44.3
Junc R64-G-1	2,390.4	494.2	494.2	2,511.6	52.5
Junc R64-H	2,390.5	802.2	802.2	2,511.7	52.5
Junc R64-I	2,380.3	227.5	227.5	2,508.3	55.5
Junc R64-I-1	2,376.5	259.0	259.0	2,507.3	56.7
Junc R64-J	2,376.6	532.7	532.7	2,507.3	56.6
Junc R64-L	2,359.4	723.8	723.8	2,502.0	61.8
Junc R64-L-1	2,355.4	14.7	14.7	2,500.9	63.0
Junc R64-M	2,286.5	3,330.6	3,330.6	2,486.1	86.5
Junc R64-N	2,344.7	1,657.6	1,657.6	2,495.9	65.5
Junc R64-O	2,344.0	450.8	450.8	2,494.9	65.4
Junc R64-P	2,343.9	256.9	256.9	2,494.9	65.4
Junc R64-Q	2,286.5	382.2	382.2	2,486.1	86.5
Junc SPILL-37-8	2,607.1	0.0	0.0	2,717.5	47.8
Junc SPILL-45	2,629.6	0.0	0.0	2,632.9	1.4
Junc CRPRV	2,890.8	0.0	0.0	3,121.4	99.9
Junc EndOfLining	3,197.9	0.0	0.0	3,497.0	129.6
Junc StartOfPipe	3,197.9	0.0	0.0	3,197.9	0.0
Junc PRV_45-0010_INLET	2,672.0	0.0	0.0	2,789.2	50.8
Junc PRV_43-7_INLET	2,675.0	0.0	0.0	2,837.6	70.5
Junc PRV_37-0026_INLET	2,682.0	0.0	0.0	2,837.5	67.4
Junc PRV_37-4_INLET	2,657.0	0.0	0.0	2,837.5	78.2
Junc PRV_PL41_INLET	2,672.0	0.0	0.0	2,833.3	69.9
Junc PRV_41-0008_INLET	2,703.5	0.0	0.0	2,851.3	64.1
Junc PRV_43-0025_INLET	2,690.0	0.0	0.0	2,837.7	64.0
Junc PRV_43-2_INLET	2,655.0	0.0	0.0	2,819.9	71.5
Junc PRV_43-10_INLET	2,562.0	0.0	0.0	2,743.9	78.8
Junc PRV_37_INLET	2,428.0	0.0	0.0	2,634.3	89.4
Junc PRV_HYDRO_INLET	2,757.0	0.0	0.0	2,853.4	41.8
Junc PRV_HYDRO_OUTLET	2,757.0	0.0	0.0	2,757.0	0.0
Junc FCV_HYDRO_INLET	2,757.0	0.0	0.0	2,757.0	0.0
Junc FCV_HYDRO_OUTLET	2,757.0	0.0	0.0	2,637.8	-51.6
Junc HYDRO_OUTLET	2,635.5	0.0	0.0	2,637.8	1.0
Junc PRV_ATM_INLET	2,635.5	0.0	0.0	2,637.8	1.0
Junc PRV_ATM_OUTLET	2,635.5	0.0	0.0	2,637.8	1.0

Junc PRV_MAIN-0049-1_INLET1	2,757.0	0.0	0.0	2,853.4	41.8
Junc PRV_MAIN-0049-1_OUTLET1	2,757.0	0.0	0.0	2,757.0	0.0
Junc PRV_MAIN-0049-1_INLET2	2,635.5	0.0	0.0	2,755.9	52.2
Junc PRV_MAIN-0049-1_OUTLET2	2,635.5	0.0	0.0	2,637.8	1.0
Junc PRV_PL51-4-0012_INLET	2,393.0	0.0	0.0	2,518.8	54.5
Junc PRV_PL52-0017_INLET	2,411.0	0.0	0.0	2,572.6	70.0
Junc PRV_57-0019_INLET	2,436.0	0.0	0.0	2,598.7	70.5
Junc PRV_59-0002_INLET	2,421.0	0.0	0.0	2,602.4	78.6
Junc PRV_61-001_INLET	2,328.0	0.0	0.0	2,576.1	107.5
Junc PRV_PL62-0000_INLET	2,286.0	0.0	0.0	2,590.6	132.0
Junc PRV_58-2-0001_INLET	2,401.0	0.0	0.0	2,586.6	80.4
Junc PRV_58-3-0007_INLET	2,384.0	0.0	0.0	2,598.5	92.9
Junc PRV_PL58-1-0014	2,419.0	0.0	0.0	2,551.7	57.5
Junc PRV_58-11-0002_INLET	2,391.0	0.0	0.0	2,574.1	79.3
Junc PRV_PL58-9-0007_INLET	2,002.0	0.0	0.0	2,380.0	163.8
Junc PRV_PL58-11-0022_INLET	2,212.0	0.0	0.0	2,368.0	67.6
Junc PRV_58-11-0023	2,162.0	0.0	0.0	2,371.2	90.7
Junc PRV_PL58-12-0000_INLET	2,229.0	0.0	0.0	2,407.0	77.1

EPANET LINKS OUTPUTS						
Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 31-0000	13.6	16.83	135	3,243.1	4.68	4.02
Pipe 31-0001	1,306.1	11.92	135	1,256.5	3.61	3.73
Pipe 31-0002	1,094.5	13.09	135	1,978.2	4.72	5.47
Pipe 31-0003	7.5	8.06	135	699.3	4.4	8.45
Pipe 31-0004	1,553.1	14.96	135	2,705.5	4.94	5.1
Pipe 31-0005	70.6	18.70	135	3,950.8	4.62	3.47
Pipe 31-0006	367.5	16.83	135	3,243.1	4.68	4.02
Pipe 31-0007	1.0	18.70	135	3,810.8	4.45	3.27
Pipe 32-0000	72.2	11.92	135	1,453.9	4.18	4.89
Pipe 32-0001	14.3	11.92	135	1,453.9	4.18	4.87
Pipe 32-0002	17.8	6.19	135	308.7	3.29	6.73
Pipe 32-0003	0.9	8.06	135	536.9	3.38	5.22
Pipe 32-0004	9.0	8.06	135	687.4	4.32	8.21
Pipe 32-0005	1,840.4	6.19	135	308.7	3.29	6.74
Pipe 32-0006	1,290.1	6.19	135	308.7	3.29	6.74
Pipe 34-0000	110.5	28.04	135	9,576.0	4.98	2.48
Pipe 34-0001	983.9	16.83	135	2,936.5	4.23	3.35
Pipe 34-0002	9.9	18.70	135	4,102.7	4.79	3.74
Pipe 34-0003	1,141.1	18.70	135	3,887.1	4.54	3.37
Pipe 34-0004	4.0	24.30	135	6,461.0	4.47	2.41
Pipe 34-0005	752.3	26.17	135	7,247.8	4.32	2.08
Pipe 34-0006	1,150.6	24.30	135	6,652.1	4.6	2.54
Pipe 34-0007	592.4	24.30	135	6,894.3	4.77	2.72
Pipe 34-0008	920.9	24.30	135	7,135.1	4.94	2.89
Pipe 34-0009	78.6	28.04	135	9,341.5	4.85	2.37
Pipe 34-0010	1,200.4	28.04	135	8,883.0	4.62	2.16
Pipe 34-0011	2.3	28.04	135	9,353.4	4.86	2.37
Pipe 34-0012	2,712.7	10.05	135	1,108.1	4.48	6.78
Pipe 34-0013	6.2	13.09	135	1,842.4	4.39	4.79
Pipe 34-0014	69.7	14.96	135	2,100.7	3.83	3.2
Pipe 34-0015	3.6	14.96	135	2,347.1	4.28	3.88
Pipe 34-0016	2,223.9	14.96	135	2,447.2	4.47	4.24
Pipe 34-0017	919.3	16.83	135	2,846.2	4.1	3.16
Pipe 34-0018	382.9	14.96	135	2,598.4	4.74	4.73
Pipe 34-0019	0.0	11.92	135	1,633.8	4.7	0
Pipe 34-0020	648.7	26.17	135	7,518.7	4.48	2.22
Pipe 34-1-0000	1,266.7	11.92	135	1,364.3	3.92	4.34
Pipe 34-1-0001	565.9	10.05	135	866.6	3.5	4.3
Pipe 34-2-0000	1,481.9	14.96	135	2,358.3	4.3	3.96
Pipe 34-2-0001	140.2	6.19	135	368.2	3.93	9.34
Pipe 34-2-0002	1,346.2	8.06	135	753.9	4.74	9.73
Pipe 34-2-0003	1,333.8	11.92	135	1,263.5	3.63	3.77
Pipe 34-2-0004	12.2	11.92	135	1,514.1	4.35	5.27
Pipe 34-2-0005	1,361.2	13.09	135	1,768.2	4.22	4.45

Pipe 34-2-0006	1,761.9	13.09	135	1,817.2	4.33	4.68
Pipe 34-2-0007	962.7	14.96	135	2,311.4	4.22	3.81
Pipe 34-2-0008	10.3	4.21	135	113.4	2.61	6.89
Pipe 37-0000	100.4	59.74	135	41,125.1	4.71	0.93
Pipe 37-0001	9.8	59.74	135	37,447.3	4.29	0.77
Pipe 37-0002	2.4	59.74	135	37,253.4	4.26	0.8
Pipe 37-0003	2,702.5	59.74	135	37,194.6	4.26	0.77
Pipe 37-0004	72.7	59.74	135	39,946.3	4.57	0.88
Pipe 37-0005	84.4	59.74	135	40,161.9	4.6	0.89
Pipe 37-0006	3,230.6	59.74	135	40,236.1	4.61	0.89
Pipe 37-0007	10.8	59.74	135	40,259.2	4.61	0.9
Pipe 37-0008	524.3	59.74	135	36,508.6	4.18	0.74
Pipe 37-0009	1,224.5	59.74	135	34,699.8	3.97	0.68
Pipe 37-0010	1,555.3	45.52	135	23,280.7	4.59	1.22
Pipe 37-0011	1.9	59.74	135	33,823.4	3.87	0.65
Pipe 37-0012	729.5	45.52	135	23,277.9	4.59	1.22
Pipe 37-0013	2,246.6	45.52	135	20,972.1	4.14	1
Pipe 37-0014	49.1	45.52	135	21,877.2	4.31	1.08
Pipe 37-0015	1,718.0	45.52	135	22,074.6	4.35	1.1
Pipe 37-0016	897.8	45.52	135	20,890.2	4.12	1
Pipe 37-0017	4,575.8	44.09	135	19,834.6	4.17	1.06
Pipe 37-0018	456.2	33.06	135	12,874.5	4.81	1.93
Pipe 37-0019	2,728.7	31.23	135	12,332.7	5.17	2.35
Pipe 37-0020	1,351.7	30.57	135	11,681.6	5.11	2.36
Pipe 37-0021	903.0	28.73	135	10,679.2	5.29	2.7
Pipe 37-0022	6.9	28.73	135	10,751.3	5.32	2.74
Pipe 37-0023	1,025.1	28.73	135	10,801.0	5.35	2.76
Pipe 37-0024	221.7	30.57	135	11,222.4	4.91	2.19
Pipe 37-0025	15.8	28.04	135	8,702.4	4.52	2.08
Pipe 37-0026	1,055.1	28.73	135	10,323.6	5.11	2.54
Pipe 37-0027	2,873.1	28.04	135	8,593.9	4.47	2.03
Pipe 37-0028	15.6	29.91	135	10,194.8	4.66	2.04
Pipe 37-0029	23.0	28.73	135	10,395.0	5.14	2.57
Pipe 37-0030	1,302.3	26.17	135	7,392.7	4.41	2.15
Pipe 37-0031	30.3	22.44	135	5,878.6	4.77	2.98
Pipe 37-0032	29.1	24.30	135	6,845.3	4.74	2.68
Pipe 37-0033	1,259.2	22.44	135	5,751.9	4.67	2.86
Pipe 37-0034	1,287.1	24.30	135	6,646.5	4.6	2.54
Pipe 37-0035	227.7	59.74	135	41,125.1	4.71	0.93
Pipe 37-0036	442.8	22.44	135	5,751.9	4.67	2.86
Pipe 37-0037	1,810.3	13.09	135	2,007.6	4.79	5.63
Pipe 37-0038	904.3	13.09	135	2,007.6	4.79	5.63
Pipe 37-0039	753.7	13.09	135	1,960.7	4.67	5.38
Pipe 37-0040	147.7	13.09	135	2,002.7	4.77	5.6
Pipe 37-0041	1,369.1	13.09	135	1,960.7	4.67	5.38
Pipe 37-0042	29.1	13.09	135	1,960.7	4.67	5.39
Pipe 37-0045	6.1	11.92	135	1,277.5	3.67	3.83
Pipe 37-0046	1,214.5	10.05	135	1,075.9	4.35	6.42

Pipe 37-0047	2,476.9	4.13	135	123.2	2.95	8.83
Pipe 37-0048	1.9	6.19	135	376.6	4.02	9.76
Pipe 37-0049	39.8	10.05	135	1,154.3	4.67	7.32
Pipe 37-0050	11.3	10.05	135	1,068.9	4.32	6.35
Pipe 37-0051	71.7	10.05	135	1,046.5	4.23	6.1
Pipe 37-0054	725.0	4.13	135	0.1	0	0
Pipe 37-0055	627.5	18.70	135	3,744.3	4.37	3.14
Pipe 37-0058	4,051.0	9.55	135	1,091.3	4.89	8.45
Pipe 37-1-0000	506.6	14.96	135	2,499.0	4.56	4.4
Pipe 37-1-0001	18.0	10.05	135	1,010.1	4.09	5.71
Pipe 37-1-0002	12.5	10.05	135	968.1	3.92	5.28
Pipe 37-1-0003	55.9	10.05	135	1,164.8	4.71	7.44
Pipe 37-1-0004	1,307.1	10.05	135	1,211.7	4.9	8
Pipe 37-1-0005	1,342.0	14.96	135	2,230.2	4.07	3.57
Pipe 37-1-0006	9.6	8.06	135	676.2	4.25	7.94
Pipe 37-2-0000	2,541.7	10.05	135	876.4	3.54	4.39
Pipe 37-3-0000	4,225.1	29.91	135	10,542.7	4.81	2.17
Pipe 37-3-0001	3,982.7	18.70	135	4,174.1	4.88	3.84
Pipe 37-3-0002	201.6	24.30	135	6,656.3	4.6	2.54
Pipe 37-3-0003	3,656.3	28.04	135	8,939.7	4.64	2.19
Pipe 37-3-0004	3.3	18.70	135	3,626.7	4.24	2.96
Pipe 37-3-0005	61.4	11.92	135	1,302.7	3.75	3.99
Pipe 37-3-0006	4.3	8.06	135	564.2	3.55	5.68
Pipe 37-3-0007	1,174.2	14.96	135	2,324.0	4.24	3.85
Pipe 37-3-0008	1.9	7.92	135	567.7	3.7	6.18
Pipe 37-3-0009	1.3	11.92	135	1,508.5	4.34	5.19
Pipe 37-3-0010	1,428.5	11.71	135	1,249.5	3.72	4.02
Pipe 37-3-0011	17.2	22.44	135	5,277.3	4.28	2.43
Pipe 37-4-0000	1,461.5	23.88	135	6,960.1	4.99	3.01
Pipe 37-4-0001	5,617.4	21.32	135	4,771.2	4.29	2.6
Pipe 37-4-0002	1,310.8	16.83	135	3,089.8	4.46	3.68
Pipe 37-4-0003	691.0	16.83	135	3,437.7	4.96	4.48
Pipe 37-4-0004	4.4	16.83	135	3,444.7	4.97	4.52
Pipe 37-4-0005	4.4	16.83	135	3,369.8	4.86	4.33
Pipe 37-4-0006	715.0	18.70	135	3,472.0	4.06	2.73
Pipe 37-4-0007	11.7	18.70	135	3,656.8	4.27	3
Pipe 37-4-0008	1,616.3	13.09	135	1,950.9	4.65	5.34
Pipe 37-4-0009	57.6	13.09	135	2,055.9	4.9	5.88
Pipe 37-4-0010	11.6	14.96	135	2,107.0	3.85	3.22
Pipe 37-4-0011	1,691.0	14.96	135	2,351.3	4.29	3.93
Pipe 37-4-0012	0.4	6.19	135	463.4	4.94	14.44
Pipe 37-4-0013	1,994.4	6.19	135	359.8	3.84	8.95
Pipe 37-4-0014	637.1	10.05	135	1,217.3	4.92	8.07
Pipe 37-4-0016	8.8	4.21	135	207.2	4.78	21.05
Pipe 37-4-0017	734.4	8.06	135	481.6	3.03	4.24
Pipe 37-4-0018	997.4	6.19	135	280.0	2.99	5.62
Pipe 37-4-0019	127.6	11.92	135	1,469.3	4.22	4.98
Pipe 37-4-0020	1.4	6.19	135	245.7	2.62	4.56

Pipe 37-4-1-0000	71.0	14.70	135	2,188.9	4.14	3.75
Pipe 37-4-1-0001	1,143.3	14.70	135	2,188.9	4.14	3.75
Pipe 37-4-1-0002	77.3	14.70	135	2,188.9	4.14	3.75
Pipe 37-4-1-0003	11.3	14.70	135	2,188.9	4.14	3.74
Pipe 37-4-1-0004	3.0	11.71	135	1,518.3	4.52	5.84
Pipe 37-4-1-0005	403.4	12.86	135	1,935.5	4.78	5.73
Pipe 37-5-0000	2,636.5	11.92	135	1,492.4	4.29	5.13
Pipe 37-5-0001	0.1	8.06	135	751.1	4.72	8.65
Pipe 37-5-0002	1,027.4	8.06	135	781.2	4.91	10.4
Pipe 37-5-0003	0.5	10.05	135	1,000.3	4.05	5.62
Pipe 37-6-0000	3,394.4	8.06	135	547.4	3.44	5.38
Pipe 37-7-0000	628.7	8.06	135	767.9	4.83	10.07
Pipe 37-7-0001	2.4	8.06	135	702.8	4.42	8.52
Pipe 37-7-0002	341.0	6.19	135	262.5	2.8	4.99
Pipe 37-8-0000	1,283.5	18.70	135	3,744.3	4.37	3.14
Pipe 37-8-0001	1,091.5	14.70	135	2,723.0	5.15	5.62
Pipe 37-8-0002	1,217.7	16.83	135	3,247.3	4.68	4.03
Pipe 37-8-0003	16.2	11.92	135	1,705.9	4.9	6.56
Pipe 37-8-0004	1,303.2	9.87	135	1,175.3	4.93	8.26
Pipe 37-9-0000	417.1	8.06	135	683.2	4.3	8.11
Pipe 37-9-0001	0.0	8.06	135	536.9	3.38	0
Pipe 38-0000	480.5	8.06	135	527.8	3.32	5.03
Pipe 38-0001	3,946.4	6.19	135	443.8	4.73	13.2
Pipe 38-0002	2.3	4.21	135	144.2	3.32	10.76
Pipe 41-0000	87.4	51.21	135	30,785.3	4.8	1.15
Pipe 41-0001	2,210.0	51.21	135	30,480.8	4.75	1.13
Pipe 41-0002	1,303.8	50.48	135	30,195.2	4.84	1.19
Pipe 41-0003	28.0	51.21	135	30,363.2	4.73	1.12
Pipe 41-0004	20.4	50.48	135	29,194.2	4.68	1.12
Pipe 41-0005	2,018.5	49.60	135	28,951.3	4.81	1.2
Pipe 41-0006	568.0	50.48	135	29,705.2	4.76	1.15
Pipe 41-0007	3.1	49.60	135	28,951.3	4.81	1.16
Pipe 41-0008	3,413.4	48.55	135	26,912.9	4.66	1.16
Pipe 41-0009	14.5	49.60	135	27,938.4	4.64	1.13
Pipe 41-0010	2.5	49.60	135	27,356.0	4.54	1.08
Pipe 41-0011	5.0	45.52	135	22,546.3	4.45	1.11
Pipe 41-0012	1,333.3	45.52	135	22,523.9	4.44	1.14
Pipe 41-0013	155.7	45.52	135	22,533.7	4.44	1.14
Pipe 41-0014	105.7	45.52	135	21,714.7	4.28	1.07
Pipe 41-0015	10.6	45.52	135	21,750.4	4.29	1.08
Pipe 41-0016	1,681.5	45.52	135	21,714.7	4.28	1.07
Pipe 41-0017	47.6	45.52	135	21,714.7	4.28	1.07
Pipe 41-0018	12.6	45.52	135	21,123.2	4.16	1.01
Pipe 41-0019	458.6	39.26	135	18,449.9	4.89	1.62
Pipe 41-0020	5.4	38.58	135	17,866.1	4.9	1.63
Pipe 41-0021	1,594.2	38.58	135	17,578.4	4.83	1.62
Pipe 41-0022	5.2	39.26	135	18,449.9	4.89	1.6
Pipe 41-0023	6.0	45.52	135	20,593.3	4.06	0.97

Pipe 41-0024	3,221.1	44.87	135	20,077.4	4.07	0.99
Pipe 41-0025	1,268.8	38.58	135	16,836.4	4.62	1.49
Pipe 41-0026	43.8	38.58	135	14,583.8	4	1.14
Pipe 41-0027	12.6	22.04	135	5,192.6	4.37	2.57
Pipe 41-0028	2,118.3	22.04	135	4,740.4	3.99	2.18
Pipe 41-0029	493.0	22.04	135	4,762.8	4.01	2.2
Pipe 41-0030	1,337.7	22.04	135	4,711.0	3.96	2.16
Pipe 41-0031	1,336.9	22.04	135	5,171.6	4.35	2.57
Pipe 41-0032	908.6	27.55	135	9,095.1	4.9	2.46
Pipe 41-0033	234.6	27.55	135	9,365.3	5.04	2.6
Pipe 41-0034	43.0	33.06	135	12,728.8	4.76	1.89
Pipe 41-0035	878.4	38.58	135	14,503.3	3.98	1.13
Pipe 41-0036	1,686.3	31.23	135	12,051.9	5.05	2.25
Pipe 41-0037	2,162.1	33.06	135	13,749.4	5.14	2.18
Pipe 41-0038	63.0	27.55	135	9,610.3	5.17	2.72
Pipe 41-0039	70.8	27.55	135	9,561.3	5.15	2.7
Pipe 41-0040	106.2	27.55	135	9,549.4	5.14	2.69
Pipe 41-0041	893.2	27.55	135	9,588.6	5.16	2.71
Pipe 41-0042	1,346.6	14.38	135	2,440.9	4.82	5.11
Pipe 41-0043	1,330.3	18.37	135	3,627.4	4.39	3.23
Pipe 41-0044	30.3	18.37	135	4,227.3	5.12	4.29
Pipe 41-0045	10.1	16.53	135	3,096.8	4.63	4.03
Pipe 41-0046	1,298.1	14.38	135	2,565.5	5.07	5.61
Pipe 41-0047	2,452.5	14.38	135	2,392.6	4.73	4.93
Pipe 41-0048	197.2	12.59	135	2,004.1	5.16	6.78
Pipe 41-0049	0.2	9.66	135	1,010.8	4.42	7.43
Pipe 41-0050	0.2	5.96	135	437.5	5.03	14.93
Pipe 41-10-0000	1,437.5	14.70	135	2,441.6	4.62	4.59
Pipe 41-10-0001	1,741.3	14.70	135	2,112.6	3.99	3.51
Pipe 41-10-0002	1,807.9	11.46	135	1,297.1	4.03	4.79
Pipe 41-10-0003	771.0	11.71	135	1,493.8	4.45	5.6
Pipe 41-10-0004	877.8	11.71	135	1,575.0	4.69	6.18
Pipe 41-10-0005	0.0	5.96	135	402.5	4.63	17.72
Pipe 41-10-0006	0.4	9.66	135	829.5	3.63	4.88
Pipe 41-10-0007	1,013.1	7.75	135	571.2	3.88	7.05
Pipe 41-11-0000	1,241.6	18.37	135	3,902.5	4.72	3.7
Pipe 41-11-0001	808.8	14.70	135	2,352.7	4.45	4.29
Pipe 41-11-0002	1,288.4	14.38	135	2,117.5	4.18	3.93
Pipe 41-11-0003	72.3	14.70	135	2,199.4	4.16	3.78
Pipe 41-11-0004	1,354.5	16.53	135	2,791.6	4.17	3.32
Pipe 41-11-0005	4.6	16.53	135	3,052.7	4.56	3.95
Pipe 41-11-0006	2.4	18.37	135	3,581.9	4.34	3.16
Pipe 41-11-0007	11.6	18.37	135	3,836.0	4.64	3.58
Pipe 41-11-0008	0.8	7.75	135	551.6	3.75	6.58
Pipe 41-11-0009	0.9	9.66	135	843.5	3.69	5.06
Pipe 41-11-0010	264.5	11.46	135	1,244.6	3.87	4.44
Pipe 41-11-0011	2,775.2	11.46	135	1,583.4	4.93	6.93
Pipe 41-11-0012	34.3	12.59	135	1,756.3	4.53	5.3

Pipe 41-2-0000	745.9	8.06	135	511.0	3.21	4.74
Pipe 41-2-0001	1.5	6.19	135	250.6	2.67	4.7
Pipe 41-5-0000	2,353.8	22.44	135	4,366.6	3.54	1.72
Pipe 41-5-0001	897.7	18.70	135	3,825.5	4.47	3.27
Pipe 41-5-0002	383.0	18.70	135	3,475.5	4.06	2.74
Pipe 41-5-0003	0.1	13.09	135	1,920.1	4.58	4.33
Pipe 41-5-0004	1,327.3	11.92	135	1,656.2	4.76	6.22
Pipe 41-5-0005	2,459.0	14.96	135	2,185.4	3.99	3.44
Pipe 41-5-0006	102.2	14.96	135	2,445.1	4.46	4.23
Pipe 41-5-0007	1,319.9	16.83	135	2,974.3	4.29	3.43
Pipe 41-5-0008	19.5	10.05	135	1,100.4	4.45	6.69
Pipe 41-5-1-0000	667.8	8.06	135	541.1	3.4	5.27
Pipe 41-5-1-0001	8.4	6.19	135	283.5	3.02	5.75
Pipe 41-6-0000	1,286.3	8.06	135	591.5	3.72	6.21
Pipe 41-6-0001	0.1	4.21	135	65.1	1.5	4.33
Pipe 41-6-0002	0.1	4.21	135	133.0	3.07	7.67
Pipe 41-6-0003	0.1	4.21	135	198.1	4.57	20.17
Pipe 41-8-0000	1,276.0	14.70	135	2,252.6	4.26	3.96
Pipe 41-8-0001	558.4	9.87	135	967.4	4.06	5.76
Pipe 41-8-0002	14.1	4.13	135	179.2	4.29	17.66
Pipe 41-8-0003	86.6	12.86	135	2,047.5	5.06	6.36
Pipe 41-9-0000	1,091.7	9.87	135	1,020.6	4.28	6.36
Pipe 41-9-0001	248.0	9.87	135	954.1	4	5.61
Pipe 41-9-0002	516.7	9.87	135	954.1	4	5.61
Pipe 41-9-0003	24.2	7.92	135	680.4	4.43	8.77
Pipe 41-9-0004	110.5	7.92	135	534.1	3.48	5.6
Pipe 41-9-0005	888.4	7.92	135	534.1	3.48	5.6
Pipe 41-9-0006	10.1	6.08	135	262.5	2.9	5.46
Pipe 41-9-0007	1.8	4.13	135	155.4	3.72	13.58
Pipe 42-0000	92.0	8.06	135	577.5	3.63	5.94
Pipe 42-0001	925.7	4.21	135	163.1	3.76	13.52
Pipe 42-0002	3.7	8.06	135	520.8	3.27	4.89
Pipe 42-0003	2.1	8.06	135	527.8	3.32	5.06
Pipe 42-0004	2.6	4.21	135	80.5	1.86	3.68
Pipe 42-0005	0.2	4.21	135	115.5	2.66	7.16
Pipe 42-0006	1.5	4.21	135	14.0	0.32	0
Pipe 42-0007	1.2	4.21	135	127.4	2.94	8.48
Pipe 43-0000	2,750.4	4.21	135	0.1	0	0
Pipe 43-0001	433.9	66.00	125	48,878.9	4.58	0.91
Pipe 43-0002	1,645.0	66.00	125	48,158.6	4.52	0.88
Pipe 43-0003	34.9	66.00	125	45,392.2	4.26	0.79
Pipe 43-0004	346.1	66.00	125	46,787.3	4.39	0.84
Pipe 43-0005	724.8	66.00	125	45,899.7	4.3	0.81
Pipe 43-0006	116.8	66.00	125	47,814.9	4.48	0.87
Pipe 43-0007	1,419.8	66.00	125	45,182.9	4.24	0.78
Pipe 43-0008	3.7	66.00	125	45,302.6	4.25	0.78
Pipe 43-0009	2,268.1	56.64	135	35,200.9	4.48	0.9
Pipe 43-0010	8.4	59.74	135	41,777.4	4.78	0.96

Pipe 43-0011	1,276.9	57.86	135	40,952.1	5	1.08
Pipe 43-0012	116.1	59.74	135	42,473.9	4.86	0.98
Pipe 43-0013	210.1	66.00	125	44,900.8	4.21	0.78
Pipe 43-0014	2,815.7	56.64	135	34,342.7	4.37	0.86
Pipe 43-0015	585.9	56.64	135	32,571.7	4.15	0.78
Pipe 43-0016	93.5	56.64	135	31,809.4	4.05	0.75
Pipe 43-0017	898.6	56.64	135	33,611.2	4.28	0.83
Pipe 43-0018	718.5	56.64	135	31,823.4	4.05	0.75
Pipe 43-0019	3,086.6	56.64	135	31,245.2	3.98	0.72
Pipe 43-0020	47.6	45.52	135	19,838.7	3.91	0.91
Pipe 43-0021	116.7	43.15	135	24,280.9	5.33	1.7
Pipe 43-0022	1,326.9	39.26	135	18,527.6	4.91	1.64
Pipe 43-0023	9.1	39.26	135	18,971.4	5.03	1.69
Pipe 43-0024	1,689.8	44.87	135	19,501.3	3.96	0.94
Pipe 43-0025	1,236.2	43.15	135	22,102.5	4.85	1.43
Pipe 43-0026	30.9	43.15	135	22,795.5	5	1.52
Pipe 43-0027	88.3	43.15	135	23,738.4	5.21	1.63
Pipe 43-0028	28.8	48.55	135	25,157.3	4.36	1.03
Pipe 43-0029	2,473.0	43.15	135	24,528.0	5.38	1.74
Pipe 43-0030	797.5	22.04	135	6,028.4	5.07	3.41
Pipe 43-0031	42.1	23.88	135	6,366.5	4.56	2.55
Pipe 43-0032	75.5	22.04	135	6,050.8	5.09	3.43
Pipe 43-0033	498.1	23.88	135	6,271.3	4.49	2.48
Pipe 43-0034	10.3	14.70	135	2,739.8	5.18	5.7
Pipe 43-0035	1,010.4	22.04	135	4,622.1	3.89	2.08
Pipe 43-0036	1,355.8	11.71	135	1,694.7	5.05	7.07
Pipe 43-0037	1,980.8	18.37	135	3,718.4	4.5	3.38
Pipe 43-0038	925.1	22.04	135	5,926.9	4.98	3.3
Pipe 43-0039	1,030.6	38.58	135	17,563.7	4.82	1.62
Pipe 43-0040	2,157.0	38.58	135	17,735.2	4.87	1.64
Pipe 43-0041	1.8	7.92	135	644.7	4.2	7.98
Pipe 43-0042	13.9	9.87	135	1,130.5	4.74	7.68
Pipe 43-0043	386.8	9.87	135	1,157.1	4.85	8.02
Pipe 43-0044	433.4	9.87	135	978.6	4.1	5.88
Pipe 43-0045	2,408.4	5.96	135	437.5	5.03	15.46
Pipe 43-1-0000	302.6	8.06	135	507.5	3.19	4.68
Pipe 43-10-0000	3,825.2	30.57	135	11,197.2	4.89	2.18
Pipe 43-10-0001	1,301.8	28.73	135	10,356.5	5.13	2.55
Pipe 43-10-0002	0.8	28.73	135	10,628.1	5.26	2.82
Pipe 43-10-0003	3.5	30.57	135	11,108.3	4.86	2.18
Pipe 43-10-0004	990.8	30.57	135	10,935.4	4.78	2.09
Pipe 43-10-0005	22.3	24.30	135	6,383.3	4.42	2.35
Pipe 43-10-0006	3.2	25.17	135	8,022.0	5.17	2.98
Pipe 43-10-0007	1,109.1	22.44	135	6,049.4	4.91	3.14
Pipe 43-10-0008	259.8	22.44	135	6,153.7	4.99	3.24
Pipe 43-10-0009	3,355.8	24.30	135	6,197.8	4.29	2.23
Pipe 43-1-0001	14.0	6.19	135	393.4	4.19	10.57
Pipe 43-10-0010	1,313.5	25.17	135	7,516.6	4.85	2.68

Pipe 43-10-0011	35.3	22.44	135	5,497.8	4.46	2.63
Pipe 43-10-0012	306.8	22.44	135	5,497.8	4.46	2.63
Pipe 43-10-0013	1,627.2	22.44	135	5,497.8	4.46	2.63
Pipe 43-10-0014	2,154.5	22.04	135	4,599.0	3.87	2.06
Pipe 43-10-0015	148.0	16.53	135	3,446.1	5.15	4.91
Pipe 43-10-0016	690.4	16.53	135	3,446.1	5.15	4.91
Pipe 43-10-0017	854.9	16.53	135	3,446.1	5.15	4.91
Pipe 43-10-0018	3,114.7	11.71	135	1,659.7	4.94	6.8
Pipe 43-10-0019	52.1	14.70	135	2,182.6	4.13	3.73
Pipe 43-10-0020	1,698.7	14.70	135	2,418.5	4.57	4.51
Pipe 43-10-0021	93.5	7.92	135	751.8	4.9	10.54
Pipe 43-10-0022	7.6	6.08	135	457.1	5.05	15.23
Pipe 43-10-0023	1,962.7	18.37	135	3,513.3	4.25	3.04
Pipe 43-10-1-0000	1,985.7	14.38	135	2,334.5	4.61	4.71
Pipe 43-10-1-0001	665.0	11.46	135	1,322.3	4.11	4.96
Pipe 43-10-1-0002	657.1	12.59	135	1,804.6	4.65	5.58
Pipe 43-10-1-0003	1,025.8	11.46	135	1,322.3	4.11	4.96
Pipe 43-10-1-0004	0.2	11.46	135	1,280.3	3.98	4.5
Pipe 43-10-1-0005	0.2	5.96	135	380.1	4.37	11.24
Pipe 43-10-1-0006	0.3	5.96	135	359.1	4.13	11.25
Pipe 43-10-2-0000	1,894.5	10.05	135	1,133.3	4.58	7.07
Pipe 43-10-2-0001	268.6	10.05	135	1,014.3	4.1	5.76
Pipe 43-10-2-0002	686.6	10.05	135	1,014.3	4.1	5.76
Pipe 43-10-2-0003	19.4	10.05	135	1,014.3	4.1	5.75
Pipe 43-10-2-0004	2,603.5	6.08	135	261.8	2.89	5.42
Pipe 43-10-2-0005	432.4	8.06	135	484.4	3.05	4.29
Pipe 43-10-2-0006	12.3	8.06	135	757.4	4.76	9.81
Pipe 43-10-3-0000	70.6	10.05	135	898.8	3.64	4.6
Pipe 43-10-4-0000	200.0	9.87	135	1,085.7	4.55	7.13
Pipe 43-10-4-0001	2.7	9.87	135	829.5	3.48	4.36
Pipe 43-11-0000	81.1	4.13	135	22.4	0.54	0.38
Pipe 43-12-0000	496.4	11.71	135	1,304.8	3.89	4.36
Pipe 43-12-0001	11.6	11.71	135	1,265.6	3.77	4.12
Pipe 43-12-0002	1.5	7.92	135	547.4	3.56	5.99
Pipe 43-2-0000	119.2	22.04	135	5,751.2	4.84	3.12
Pipe 43-2-0001	1,279.7	22.04	135	5,290.6	4.45	2.68
Pipe 43-2-0002	1,345.3	21.58	135	5,026.7	4.41	2.7
Pipe 43-2-0003	3,429.0	21.58	135	4,463.2	3.92	2.16
Pipe 43-2-0004	2,220.6	11.92	135	1,647.1	4.74	6.15
Pipe 43-2-0005	355.4	16.83	135	2,938.6	4.24	3.35
Pipe 43-2-0006	2,356.4	15.99	135	2,942.8	4.7	4.31
Pipe 43-2-0007	543.9	17.98	135	3,470.6	4.39	3.3
Pipe 43-2-0008	1,328.3	17.98	135	4,117.4	5.2	4.53
Pipe 43-2-0009	1,297.2	13.09	135	1,874.6	4.47	4.96
Pipe 43-2-0010	2.4	8.06	135	561.4	3.53	5.66
Pipe 43-2-0011	4.7	6.19	135	467.6	4.99	14.54
Pipe 43-2-0012	1,316.7	8.06	135	645.4	4.06	7.3
Pipe 43-2-0013	2.4	10.05	135	1,215.2	4.91	7.99

Pipe 43-3-0000	62.0	9.66	135	858.2	3.76	5.12
Pipe 43-3-0001	335.7	7.75	135	603.4	4.1	7.8
Pipe 43-3-0002	4.7	7.75	135	543.2	3.69	6.44
Pipe 43-3-0003	300.1	9.66	135	1,039.5	4.55	7.3
Pipe 43-3-0004	3,277.0	7.75	135	484.4	3.29	5.19
Pipe 43-3-0005	73.0	4.05	135	197.4	4.92	23.25
Pipe 43-7-0000	1,725.2	21.58	135	6,087.9	5.34	3.85
Pipe 43-7-0001	1,362.4	22.44	135	4,770.5	3.87	2.02
Pipe 43-7-0002	1,575.8	22.04	135	4,659.2	3.92	2.11
Pipe 43-7-0003	1,463.8	16.53	135	2,881.9	4.31	3.53
Pipe 43-7-0004	1,095.0	16.53	135	3,377.5	5.05	4.73
Pipe 43-7-0005	84.1	18.37	135	3,908.8	4.73	3.71
Pipe 43-7-0006	1,301.4	11.71	135	1,361.5	4.06	4.72
Pipe 43-7-0007	40.7	7.92	135	542.5	3.53	5.76
Pipe 43-7-1-0000	905.4	11.92	135	1,317.4	3.79	4.07
Pipe 43-7-1-0001	2.7	11.92	135	1,306.9	3.76	4.01
Pipe 43-7-1-0002	148.3	10.05	135	1,155.0	4.67	7.32
Pipe 43-7-1-0003	260.1	11.92	135	1,262.1	3.63	3.76
Pipe 43-7-1-0004	18.4	10.05	135	1,155.0	4.67	7.33
Pipe 43-7-1-0005	2,803.9	9.87	135	877.8	3.68	4.81
Pipe 43-7-1-0006	17.4	9.87	135	877.8	3.68	4.82
Pipe 43-7-1-0007	490.9	6.08	135	345.8	3.82	9.07
Pipe 43-7-1-0008	3.0	6.08	135	219.8	2.43	3.94
Pipe 43-7-2-0000	1,340.0	11.71	135	1,520.4	4.53	5.78
Pipe 43-7-2-0001	1,342.6	9.66	135	973.0	4.26	6.46
Pipe 43-9-0000	1,355.7	14.96	135	2,263.8	4.13	3.67
Pipe 43-9-0001	1,274.8	12.86	135	1,992.2	4.92	6.05
Pipe 43-9-0002	0.1	11.71	135	1,474.2	4.39	4.34
Pipe 43-9-0003	3.8	7.92	135	527.8	3.44	5.52
Pipe 43-9-0004	19.7	11.71	135	1,719.2	5.12	7.26
Pipe 45-0000	128.4	29.91	135	10,374.7	4.74	2.11
Pipe 45-0001	0.2	28.04	135	9,459.1	4.91	2.45
Pipe 45-0002	3,047.6	28.04	135	8,958.6	4.65	2.2
Pipe 45-0003	0.3	28.04	135	9,340.1	4.85	2.38
Pipe 45-0004	7.2	28.04	135	9,451.4	4.91	2.41
Pipe 45-0005	22.2	24.30	135	6,967.1	4.82	2.77
Pipe 45-0006	3,620.3	24.30	135	6,618.5	4.58	2.52
Pipe 45-0007	4.6	22.44	135	5,450.2	4.42	2.6
Pipe 45-0008	5,989.5	22.04	135	5,208.7	4.38	2.6
Pipe 45-0009	6,786.1	22.04	135	4,602.5	3.87	2.07
Pipe 45-0010	2,210.4	9.66	135	1,109.5	4.86	8.24
Pipe 45-0011	109.3	22.04	135	4,489.8	3.78	1.97
Pipe 45-0012	1,326.6	10.05	135	1,109.5	4.49	6.8
Pipe 45-0013	933.5	10.05	135	881.3	3.56	4.44
Pipe 45-0014	63.6	10.05	135	881.3	3.56	4.44
Pipe 45-0015	466.0	10.05	135	872.9	3.53	4.36
Pipe 45-0016	35.9	10.05	135	872.9	3.53	4.36
Pipe 45-0017	52.1	10.05	135	872.9	3.53	4.36

Pipe 45-0018	5.2	8.06	135	602.7	3.79	6.43
Pipe 45-1-0000	1,138.0	12.86	135	1,991.5	4.92	6.04
Pipe 45-1-0001	2,131.1	11.46	135	1,563.8	4.86	6.77
Pipe 45-1-0002	308.3	9.66	135	949.9	4.16	6.18
Pipe 45-1-0003	1,028.9	7.75	135	507.5	3.45	5.66
Pipe 45-1-1-0000	1,954.3	7.75	135	613.9	4.18	8.05
Pipe 45-1-1-0001	0.4	4.05	135	131.6	3.28	10.49
Pipe 45-2-0000	897.2	16.53	135	3,380.3	5.05	4.74
Pipe 45-2-0001	584.1	16.53	135	3,380.3	5.05	4.74
Pipe 45-2-0002	2,741.4	16.53	135	3,380.3	5.05	4.74
Pipe 45-2-0003	1,624.6	16.53	135	3,055.5	4.57	3.93
Pipe 45-2-0004	18.2	16.53	135	3,369.8	5.04	4.71
Pipe 45-2-0006	665.9	12.86	135	1,827.0	4.51	5.15
Pipe 45-2-0007	2.7	9.87	135	1,186.5	4.98	8.34
Pipe 45-2-0008	31.2	12.86	135	1,846.6	4.56	5.26
Pipe 45-2-0009	563.0	16.53	135	2,803.5	4.19	3.35
Pipe 48-0000	655.7	11.92	135	1,655.5	4.76	6.21
Pipe 48-0001	831.0	10.05	135	1,005.2	4.07	5.66
Pipe 48-0002	14.1	8.06	135	770.0	4.84	10.11
Pipe 48-0003	452.3	8.06	135	754.6	4.75	9.75
Pipe 48-0004	1,293.1	8.06	135	690.9	4.34	8.28
Pipe 48-1-0000	505.7	8.06	135	650.3	4.09	7.4
Pipe 48-1-0001	0.5	6.19	135	287.0	3.06	5.85
Pipe 48-1-0002	0.3	4.21	135	29.4	0.68	0.86
Pipe 50-0000	102.2	16.83	135	2,986.9	4.31	3.45
Pipe 50-0001	509.1	13.09	135	1,814.4	4.33	4.66
Pipe 50-0002	3,717.8	14.96	135	2,104.2	3.84	3.2
Pipe 50-0003	750.8	14.96	135	2,133.6	3.89	3.29
Pipe 51-0000	918.8	14.96	135	2,480.1	4.53	4.34
Pipe 51-0001	3.0	10.05	135	803.6	3.25	3.74
Pipe 51-0002	2.1	10.05	135	932.4	3.77	4.94
Pipe 51-0003	366.2	4.21	135	79.1	1.82	3.54
Pipe 51-0004	5.1	8.06	135	541.1	3.4	5.29
Pipe 51-0005	473.6	10.05	135	953.4	3.86	5.13
Pipe 51-0006	671.2	11.92	135	1,645.0	4.73	6.14
Pipe 51-0007	1,424.3	45.52	135	20,207.6	3.98	0.94
Pipe 51-0008	1,294.2	39.83	135	18,931.5	4.87	1.59
Pipe 51-0009	7,342.6	39.83	135	14,453.6	3.72	0.96
Pipe 51-0010	1,639.4	39.83	135	18,927.3	4.87	1.59
Pipe 51-0011	2,277.6	39.83	135	17,926.3	4.62	1.44
Pipe 51-0012	856.6	34.14	135	13,482.0	4.73	1.8
Pipe 51-0013	1,534.5	34.14	135	13,647.9	4.78	1.84
Pipe 51-0014	1,160.5	34.14	135	13,838.3	4.85	1.88
Pipe 51-0015	251.2	34.14	135	13,482.0	4.73	1.8
Pipe 51-0016	2,562.9	34.14	135	13,482.0	4.73	1.79
Pipe 51-0017	2,344.0	28.04	135	8,734.6	4.54	2.1
Pipe 51-0018	909.3	29.91	135	10,008.6	4.57	1.97
Pipe 51-0019	1,008.2	29.91	135	10,736.6	4.9	2.24

Pipe 51-0020	577.4	34.14	135	13,425.3	4.71	1.78
Pipe 51-0021	6.1	26.17	135	7,284.9	4.35	2.09
Pipe 51-0022	1.3	14.96	135	2,365.3	4.32	4.07
Pipe 51-0023	1,794.0	26.17	135	8,056.3	4.81	2.53
Pipe 51-1-0000	618.9	18.70	135	3,472.7	4.06	2.73
Pipe 51-1-0001	1,803.7	11.92	135	1,533.0	4.41	5.39
Pipe 51-1-0002	3,524.1	4.13	135	134.4	3.22	10.37
Pipe 51-1-0003	0.3	4.13	135	134.4	3.22	9.88
Pipe 51-1-0004	3.4	4.13	135	57.4	1.37	2.14
Pipe 51-1-0005	3,032.7	11.92	135	1,398.6	4.02	4.54
Pipe 51-1-0006	32.1	10.05	135	1,051.4	4.25	6.16
Pipe 51-1-0007	1,640.0	9.87	135	1,051.4	4.41	6.72
Pipe 51-1-0008	4.6	4.13	135	17.5	0.42	0.21
Pipe 51-1-0009	0.0	7.92	135	553.0	3.6	7.5
Pipe 52-0000	580.1	8.06	135	511.7	3.22	4.75
Pipe 52-0001	10.2	6.19	135	264.6	2.82	5.05
Pipe 53-0000	1,749.4	11.71	135	1,736.0	5.17	7.4
Pipe 53-0001	16.3	4.13	135	60.9	1.46	2.39
Pipe 53-0002	18.7	11.71	135	1,460.2	4.35	5.36
Pipe 55-0001	2,664.4	16.53	135	3,411.1	5.1	4.82
Pipe 55-0002	1,312.7	25.72	135	7,448.0	4.6	2.38
Pipe 55-0003	1,284.9	25.72	135	7,467.6	4.61	2.39
Pipe 55-0004	1,318.5	11.71	135	1,446.2	4.31	5.27
Pipe 55-0005	910.3	14.70	135	2,448.6	4.63	4.62
Pipe 55-0006	1,442.5	11.71	135	1,446.2	4.31	5.27
Pipe 55-0007	801.6	11.46	135	1,446.2	4.5	5.86
Pipe 55-0008	21.2	7.92	135	713.3	4.65	9.56
Pipe 55-0009	3,221.8	7.75	135	713.3	4.85	10.63
Pipe 55-0010	0.6	7.75	135	621.6	4.23	8.23
Pipe 55-1-0000	46.2	18.37	135	4,036.9	4.89	3.94
Pipe 55-1-0001	6.3	7.92	135	518.0	3.37	5.27
Pipe 55-1-0002	1,067.1	11.71	135	1,325.8	3.95	4.49
Pipe 55-1-0003	1,275.3	18.37	135	3,525.2	4.27	3.06
Pipe 56-0000	119.3	16.53	135	2,900.8	4.34	3.57
Pipe 56-0001	2.1	14.70	135	2,279.2	4.31	4.02
Pipe 56-0002	2,788.4	11.71	135	1,476.3	4.4	5.48
Pipe 56-0003	7.7	14.70	135	2,552.2	4.82	4.98
Pipe 56-0004	5.3	9.87	135	1,028.3	4.31	6.43
Pipe 56-0005	6.8	11.71	135	1,386.0	4.13	4.88
Pipe 57-0000	96.4	38.58	135	19,067.3	5.23	1.88
Pipe 57-0001	1.7	37.76	135	18,099.9	5.19	1.9
Pipe 57-0002	269.5	37.76	135	18,831.4	5.4	2.04
Pipe 57-0003	1,986.9	37.76	135	17,480.4	5.01	1.78
Pipe 57-0004	8.1	37.76	135	17,898.3	5.13	1.86
Pipe 57-0005	14.0	37.76	135	18,035.5	5.17	1.89
Pipe 57-0006	1,286.8	37.76	135	18,072.6	5.18	1.89
Pipe 57-0007	8.0	37.76	135	18,219.6	5.22	1.91
Pipe 57-0008	30.0	37.76	135	18,767.7	5.38	2.03

Pipe 57-0009	257.5	37.76	135	18,799.2	5.39	2.03
Pipe 57-0010	921.2	43.15	135	18,869.2	4.14	1.07
Pipe 57-0011	2,278.6	43.15	135	18,936.4	4.15	1.08
Pipe 57-0012	1,969.3	31.23	135	11,531.8	4.83	2.07
Pipe 57-0013	3,424.5	34.14	135	12,901.0	4.52	1.65
Pipe 57-0014	41.0	31.78	135	12,299.0	4.97	2.15
Pipe 57-0015	2.4	31.78	135	12,023.9	4.86	2.07
Pipe 57-0016	1,427.9	31.78	135	11,724.3	4.74	1.96
Pipe 57-0017	60.8	31.78	135	11,715.9	4.74	1.96
Pipe 57-0018	1,199.3	31.78	135	11,667.6	4.72	1.95
Pipe 57-0019	5,720.9	37.76	135	17,420.2	4.99	1.77
Pipe 57-0020	1,548.0	29.39	135	10,178.7	4.81	2.21
Pipe 57-0021	10.4	29.39	135	10,656.8	5.04	2.42
Pipe 57-0022	1,174.7	31.23	135	10,969.7	4.59	1.89
Pipe 57-0023	857.4	31.23	135	11,442.2	4.79	2.04
Pipe 57-0024	0.4	27.55	135	9,048.2	4.87	2.73
Pipe 57-0025	1,002.2	27.55	135	8,479.8	4.56	2.16
Pipe 57-0026	580.8	27.55	135	8,737.4	4.7	2.28
Pipe 57-0027	96.5	27.55	135	8,957.2	4.82	2.39
Pipe 57-0028	1,761.4	29.39	135	10,032.4	4.74	2.15
Pipe 57-0029	1,000.3	25.72	135	8,124.2	5.02	2.79
Pipe 57-0030	10.2	25.72	135	8,390.2	5.18	2.95
Pipe 57-0031	26.1	22.04	135	5,298.3	4.46	2.68
Pipe 57-0032	469.6	18.37	135	3,591.7	4.35	3.17
Pipe 57-0033	1,649.7	22.04	135	4,809.0	4.04	2.24
Pipe 57-0034	693.0	23.88	135	6,882.4	4.93	2.95
Pipe 57-0035	0.7	16.53	135	3,258.5	4.87	4.27
Pipe 57-0036	1,319.8	14.70	135	2,149.0	4.06	3.63
Pipe 57-0037	166.1	18.37	135	3,485.3	4.22	3
Pipe 57-0038	804.8	18.37	135	3,850.0	4.66	3.61
Pipe 57-0039	2.3	23.88	135	7,107.1	5.09	3.19
Pipe 57-0040	19.7	22.04	135	4,783.8	4.02	2.23
Pipe 57-0041	688.4	11.71	135	1,460.9	4.35	5.37
Pipe 57-0042	949.4	11.71	135	1,705.9	5.08	7.16
Pipe 57-0043	2,238.3	9.87	135	1,047.2	4.39	6.67
Pipe 57-2-0000	4,931.6	22.44	135	4,519.2	3.67	1.83
Pipe 57-2-0001	1,195.2	12.86	135	1,789.2	4.42	4.95
Pipe 57-2-0002	2,604.3	7.92	135	729.4	4.75	9.97
Pipe 57-2-0003	6.0	11.71	135	1,254.4	3.74	4.08
Pipe 57-2-0004	381.5	16.83	135	3,025.4	4.36	3.54
Pipe 57-2-0005	539.4	16.83	135	2,765.0	3.99	2.99
Pipe 57-2-0006	1,367.3	12.86	135	1,799.0	4.44	5.01
Pipe 57-2-0007	2.8	6.08	135	443.1	4.9	14.39
Pipe 57-2-0008	2,240.0	10.05	135	980.7	3.97	5.41
Pipe 57-2-0009	3.9	8.06	135	526.4	3.31	4.96
Pipe 57-2-0010	1,775.2	18.70	135	3,538.5	4.13	2.83
Pipe 57-6-0000	2,351.8	11.71	135	1,584.1	4.72	6.24
Pipe 57-6-0001	1,568.3	9.87	135	1,008.7	4.23	6.22

Pipe 57-6-0002	87.5	7.92	135	486.5	3.17	4.71
Pipe 58-0000	7,482.1	72.00	125	58,872.8	4.64	0.84
Pipe 58-0001	838.0	72.00	125	58,340.1	4.6	0.82
Pipe 58-0002	522.7	72.00	125	58,294.6	4.59	0.82
Pipe 58-0003	1,013.0	72.00	125	58,294.6	4.59	0.82
Pipe 58-0004	19.2	72.00	125	58,294.6	4.59	0.83
Pipe 58-0005	301.2	72.00	125	57,909.6	4.56	0.81
Pipe 58-0006	3.6	72.00	125	58,126.6	4.58	0.81
Pipe 58-0007	958.6	72.00	125	57,909.6	4.56	0.81
Pipe 58-0008	113.9	72.00	125	57,909.6	4.56	0.81
Pipe 58-0009	1,222.1	72.00	125	57,788.5	4.55	0.81
Pipe 58-0010	895.0	72.00	125	54,324.9	4.28	0.72
Pipe 58-0011	1,522.2	66.00	125	51,445.8	4.82	1
Pipe 58-0012	2,097.7	66.00	125	51,244.9	4.81	0.99
Pipe 58-0013	2.0	66.00	125	51,107.7	4.79	1.08
Pipe 58-0014	451.0	66.00	125	51,093.7	4.79	0.98
Pipe 58-0015	1,308.1	66.00	125	51,045.4	4.79	0.98
Pipe 58-0016	4.1	66.00	125	51,118.9	4.79	0.96
Pipe 58-11-0000	1,222.3	56.64	135	42,760.9	5.44	1.29
Pipe 58-11-0001	1,485.9	56.64	135	42,731.5	5.44	1.29
Pipe 58-11-0002	4,716.8	56.64	135	39,327.4	5.01	1.11
Pipe 58-11-0003	2,512.5	56.64	135	42,725.9	5.44	1.29
Pipe 58-11-0004	7,470.0	56.64	135	39,826.5	5.07	1.13
Pipe 58-11-0005	187.9	56.64	135	40,066.6	5.1	1.14
Pipe 58-11-0006	2,016.2	56.64	135	40,626.6	5.17	1.18
Pipe 58-11-0007	4,292.0	56.64	135	42,449.4	5.41	1.28
Pipe 58-11-0008	4,030.6	59.74	135	38,649.1	4.42	0.83
Pipe 58-11-0009	476.6	59.74	135	38,905.3	4.45	0.84
Pipe 58-11-0010	3,775.6	59.74	135	39,167.8	4.48	0.85
Pipe 58-11-0011	1,658.7	59.74	135	38,217.9	4.37	0.81
Pipe 58-11-0012	675.8	59.74	135	38,118.5	4.36	0.81
Pipe 58-11-0013	10,927.2	59.74	135	36,430.1	4.17	0.74
Pipe 58-11-0014	5,081.3	59.74	135	36,089.2	4.13	0.73
Pipe 58-11-0015	1,561.1	59.74	135	35,423.5	4.05	0.7
Pipe 58-11-0016	836.8	59.74	135	34,331.5	3.93	0.66
Pipe 58-11-0017	1,374.9	59.74	135	34,607.3	3.96	0.67
Pipe 58-11-0018	433.3	59.74	135	35,376.6	4.05	0.7
Pipe 58-11-0019	1,027.1	59.74	135	34,757.8	3.98	0.68
Pipe 58-11-0020	2,112.7	59.74	135	35,238.0	4.03	0.7
Pipe 58-11-0021	147.9	51.21	135	27,428.1	4.27	0.93
Pipe 58-11-0022	13,281.6	51.21	135	26,556.6	4.14	0.87
Pipe 58-11-0023	2,777.4	9.28	135	1,115.8	5.29	10.13
Pipe 58-11-0024	0.0	8.06	135	569.8	3.58	20.49
Pipe 58-13-0000	1,531.4	14.38	135	2,436.0	4.81	5.09
Pipe 58-13-0001	44.1	12.59	135	1,990.8	5.13	6.7
Pipe 58-13-0002	1,418.9	11.46	135	1,610.0	5.01	7.14
Pipe 58-2-0000	1,735.8	16.18	135	2,879.1	4.49	3.91
Pipe 58-2-0001	2,282.6	14.21	135	2,662.8	5.39	6.36

Pipe 58-2-0002	648.8	11.92	135	1,516.2	4.36	5.28
Pipe 58-2-0003	1,003.4	14.96	135	2,368.8	4.32	3.99
Pipe 58-2-0004	256.9	13.09	135	1,869.7	4.46	4.93
Pipe 58-2-0005	1,521.8	11.71	135	1,516.2	4.52	5.76
Pipe 58-2-0006	695.0	11.71	135	1,516.2	4.52	5.76
Pipe 58-2-0007	2,103.7	11.46	135	1,516.2	4.72	6.39
Pipe 58-2-0008	807.4	9.66	135	995.4	4.36	6.74
Pipe 58-2-0009	0.1	7.75	135	497.7	3.38	6
Pipe 58-3-0000	87.3	25.17	135	8,284.5	5.34	3.22
Pipe 58-3-0001	14.7	25.17	135	8,249.5	5.32	3.19
Pipe 58-3-0002	620.5	25.17	135	8,176.7	5.27	3.14
Pipe 58-3-0003	8.5	25.17	135	8,211.7	5.29	3.15
Pipe 58-3-0004	38.1	5.96	135	337.4	3.88	9.55
Pipe 58-3-0005	2.5	5.96	135	242.9	2.79	5.11
Pipe 58-3-0006	0.4	5.96	135	289.8	3.33	7.6
Pipe 58-3-0007	573.1	24.88	135	7,839.3	5.17	3.07
Pipe 58-3-0008	31.8	22.44	135	5,738.6	4.66	2.85
Pipe 58-3-0009	3,548.3	22.44	135	5,250.7	4.26	2.42
Pipe 58-3-0010	168.9	22.44	135	4,308.5	3.5	1.68
Pipe 58-3-0011	85.7	22.44	135	4,308.5	3.5	1.67
Pipe 58-3-0012	135.4	22.44	135	4,302.2	3.49	1.67
Pipe 58-3-0013	1,634.6	18.37	135	4,198.6	5.08	4.23
Pipe 58-3-0014	249.3	18.70	135	4,232.2	4.94	3.94
Pipe 58-3-0015	3,697.1	16.18	135	2,867.9	4.48	3.88
Pipe 58-3-0016	347.5	18.37	135	4,153.8	5.03	4.15
Pipe 58-3-0017	351.3	16.18	135	3,198.3	4.99	4.75
Pipe 58-3-0018	648.4	18.37	135	4,160.8	5.04	4.16
Pipe 58-3-0019	1.4	11.46	135	1,686.3	5.25	7.78
Pipe 58-3-0020	843.2	9.66	135	1,157.1	5.07	8.91
Pipe 58-3-0021	1,810.3	9.66	135	1,157.1	5.07	8.91
Pipe 58-3-0022	1.6	9.66	135	1,010.8	4.42	7.02
Pipe 58-3-1-0000	493.4	14.96	135	2,100.7	3.83	3.19
Pipe 58-3-1-0001	321.1	13.09	135	1,992.9	4.75	5.55
Pipe 58-3-1-0002	393.1	13.09	135	2,025.1	4.83	5.72
Pipe 58-3-1-0003	368.5	13.09	135	2,058.0	4.91	5.89
Pipe 58-3-1-0004	1,756.5	13.09	135	1,992.9	4.75	5.55
Pipe 58-3-1-0005	33.8	13.09	135	1,992.9	4.75	5.55
Pipe 58-3-1-0006	3.4	13.09	135	1,943.2	4.63	5.28
Pipe 58-3-1-0007	1,404.9	11.92	135	1,518.3	4.37	5.29
Pipe 58-3-1-0008	3.3	13.09	135	1,789.9	4.27	4.55
Pipe 58-3-1-0009	3.0	8.06	135	475.3	2.99	4.11
Pipe 58-3-1-0010	6.6	10.05	135	978.6	3.96	5.39
Pipe 58-6-0000	1,169.5	11.92	135	1,688.4	4.85	6.44
Pipe 58-6-0001	0.1	4.21	135	22.4	0.52	0
Pipe 58-6-0002	3.8	10.05	135	1,180.9	4.78	7.61
Pipe 58-8-0000	1,013.8	24.30	135	6,903.4	4.78	2.72
Pipe 58-8-0001	3,584.4	18.37	135	4,081.7	4.94	4.02
Pipe 58-8-0002	54.9	16.53	135	2,765.7	4.13	3.27

Pipe 58-8-0003	90.9	18.37	135	3,604.3	4.36	3.19
Pipe 58-8-0004	222.8	16.53	135	2,765.7	4.13	3.27
Pipe 58-8-0005	1,796.5	22.44	135	6,122.9	4.97	3.21
Pipe 58-8-0006	508.5	22.04	135	5,074.3	4.27	2.48
Pipe 58-8-0007	1,199.0	5.96	135	464.1	5.34	17.24
Pipe 58-8-0008	842.4	4.00	135	123.9	3.16	10.42
Pipe 58-8-0009	1,558.0	14.38	135	2,301.6	4.55	4.58
Pipe 58-8-0010	917.3	14.38	135	2,301.6	4.55	4.58
Pipe 58-8-0011	2,372.8	12.44	135	1,793.4	4.73	5.85
Pipe 58-8-0012	3.0	7.66	135	523.6	3.65	6.33
Pipe 58-8-0013	85.4	11.33	135	1,283.8	4.09	4.97
Pipe 59-0000	199.7	38.58	135	18,652.2	5.12	1.81
Pipe 59-0001	24.3	28.04	135	8,569.4	4.45	2.02
Pipe 59-0002	1,646.7	37.76	135	14,112.0	4.04	1.2
Pipe 59-0003	1,593.0	24.30	135	6,664.7	4.61	2.55
Pipe 59-0004	97.0	24.30	135	7,218.4	4.99	2.96
Pipe 59-0005	358.0	26.17	135	7,756.7	4.63	2.35
Pipe 59-0006	962.1	28.04	135	8,536.5	4.44	2.01
Pipe 59-0007	675.0	37.76	135	15,195.6	4.35	1.37
Pipe 59-0008	1,837.8	24.30	135	6,531.0	4.52	2.46
Pipe 59-0009	80.7	38.58	135	16,545.9	4.54	1.45
Pipe 59-0010	3,040.2	37.76	135	15,419.6	4.42	1.41
Pipe 59-0011	2.7	38.58	135	15,521.1	4.26	1.28
Pipe 59-0012	32.0	22.44	135	5,649.7	4.58	2.77
Pipe 59-0013	2,616.2	18.70	135	3,990.0	4.66	3.53
Pipe 59-0014	32.7	22.44	135	4,804.1	3.9	2.05
Pipe 59-1-0000	2,724.3	14.38	135	2,106.3	4.16	3.89
Pipe 59-1-0001	1,266.9	11.46	135	1,576.4	4.9	6.87
Pipe 59-1-0002	1,324.1	9.66	135	1,043.7	4.57	7.36
Pipe 59-1-0003	5.3	7.75	135	511.0	3.48	5.72
Pipe 59-2-0000	819.3	9.66	135	1,083.6	4.74	7.89
Pipe 59-2-0001	2.8	7.75	135	543.2	3.69	6.38
Pipe 59-3-0000	511.1	22.44	135	5,542.6	4.5	2.67
Pipe 59-3-0001	2,614.0	22.44	135	5,017.6	4.07	2.22
Pipe 59-3-0002	2,342.7	14.96	135	2,423.4	4.42	4.16
Pipe 59-3-0003	1,631.4	18.70	135	4,039.0	4.72	3.61
Pipe 59-3-0004	1,297.8	13.09	135	1,923.6	4.59	5.2
Pipe 59-3-0005	0.4	8.06	135	637.7	4.01	7.51
Pipe 59-3-0006	1,596.0	10.05	135	951.3	3.85	5.11
Pipe 59-3-0007	7.3	11.92	135	1,656.2	4.76	6.25
Pipe 59-3-1-0000	2,994.5	11.92	135	1,615.6	4.64	5.94
Pipe 59-3-1-0001	0.0	4.21	135	17.5	0.4	0
Pipe 59-3-1-0002	585.0	10.05	135	1,105.3	4.47	6.75
Pipe 59-3-1-0003	0.0	8.06	135	625.8	3.94	21.88
Pipe 59-3-1-0004	0.0	4.21	135	138.6	3.19	0
Pipe 59-3-1-0005	0.0	4.21	135	31.5	0.73	0
Pipe 59-4-0000	4,120.2	10.05	135	881.3	3.56	4.44
Pipe 59-4-0001	28.6	8.06	135	645.4	4.06	7.3

Pipe 59-5-0000	299.0	16.53	135	3,251.5	4.86	4.41
Pipe 59-5-0001	0.7	14.96	135	2,334.5	4.26	3.88
Pipe 59-5-0002	3,747.1	9.87	135	1,229.9	5.16	8.98
Pipe 59-5-0003	163.3	16.83	135	2,952.6	4.26	3.38
Pipe 59-5-0004	0.2	9.87	135	853.3	3.58	4.48
Pipe 60-0000	923.9	21.58	135	5,286.4	4.64	2.96
Pipe 60-0001	1,016.9	21.58	135	4,767.0	4.18	2.44
Pipe 60-0002	1,393.6	17.98	135	4,229.4	5.34	4.76
Pipe 60-0003	631.4	11.46	135	1,614.9	5.02	7.19
Pipe 60-0004	2,644.1	16.18	135	3,206.0	5	4.77
Pipe 60-0005	1,248.5	17.98	135	3,710.7	4.69	3.74
Pipe 60-0006	3,201.4	14.38	135	2,140.6	4.23	4.01
Pipe 60-0007	18.1	16.18	135	3,151.4	4.92	4.62
Pipe 60-0008	1,336.4	9.55	135	1,063.3	4.76	8.05
Pipe 60-0009	1.6	7.66	135	532.7	3.71	6.66
Pipe 61-0000	7,005.9	21.58	135	4,393.9	3.85	2.1
Pipe 61-0001	3,018.7	16.86	135	3,465.7	4.98	4.51
Pipe 61-0002	8,385.5	11.92	135	1,683.5	4.84	6.41
Pipe 61-0003	19.3	16.83	135	2,758.0	3.98	2.98
Pipe 61-0004	2.1	16.83	135	3,438.4	4.96	4.45
Pipe 61-0005	4,123.1	11.71	135	1,607.9	4.79	6.42
Pipe 61-0006	3,525.4	9.66	135	1,080.8	4.73	7.85
Pipe 61-0007	54.8	11.71	135	1,535.1	4.57	5.89
Pipe 61-2-0000	696.5	10.05	135	1,074.5	4.35	6.4
Pipe 61-2-0001	410.6	10.05	135	966.7	3.91	5.27
Pipe 61-2-0002	1,806.7	10.05	135	966.7	3.91	5.27
Pipe 61-2-0003	1,255.9	9.87	135	929.6	3.9	5.35
Pipe 61-2-0004	1,849.6	9.87	135	929.6	3.9	5.35
Pipe 61-2-0005	26.7	9.87	135	929.6	3.9	5.35
Pipe 61-2-0006	0.8	4.05	135	195.3	4.86	22.78
Pipe 61-2-0007	630.3	7.75	135	781.9	5.32	12.61
Pipe 61-2-0008	27.9	7.75	135	642.6	4.37	8.76
Pipe 63-0000	2,013.3	45.52	135	24,077.2	4.75	1.29
Pipe 63-0001	3,717.8	18.37	135	4,079.6	4.94	4.01
Pipe 63-0002	2,228.2	22.04	135	5,091.1	4.28	2.49
Pipe 63-0003	957.5	22.04	135	6,098.4	5.13	3.48
Pipe 63-0004	83.3	22.04	135	5,238.8	4.41	2.63
Pipe 63-0005	1,998.1	22.04	135	5,152.7	4.33	2.55
Pipe 63-0006	1,215.0	25.72	135	7,243.6	4.47	2.26
Pipe 63-0007	1,042.1	25.72	135	7,502.6	4.63	2.41
Pipe 63-0008	1,581.8	25.72	135	7,735.0	4.78	2.55
Pipe 63-0009	32.1	29.91	135	10,332.0	4.72	2.09
Pipe 63-0010	2,660.9	29.91	135	9,844.8	4.5	1.91
Pipe 63-0011	32.2	44.87	135	22,535.8	4.57	1.22
Pipe 63-0012	1,000.5	27.55	135	8,505.0	4.58	2.17
Pipe 63-0013	2,923.3	28.04	135	8,846.6	4.6	2.15
Pipe 63-0014	2,590.3	44.87	135	23,563.4	4.78	1.33
Pipe 63-0015	28.8	11.71	135	1,628.2	4.85	6.57

Pipe 63-0016	306.1	14.70	135	2,451.4	4.63	4.63
Pipe 63-0017	2,956.5	14.38	135	2,330.3	4.6	4.69
Pipe 63-0018	4.0	11.46	135	1,293.6	4.02	4.82
Pipe 63-0019	2.0	9.87	135	1,087.1	4.56	7.1
Pipe 63-1-0000	1,802.4	31.78	135	12,203.8	4.94	2.12
Pipe 63-1-0001	326.5	24.30	135	6,194.3	4.29	2.23
Pipe 63-1-0002	779.4	31.78	135	11,695.6	4.73	1.96
Pipe 63-1-0003	1,056.4	22.44	135	5,643.4	4.58	2.76
Pipe 63-1-0004	1,217.8	18.37	135	3,542.7	4.29	3.09
Pipe 63-1-0005	1,926.1	16.53	135	3,026.8	4.53	3.86
Pipe 63-1-0006	2,675.9	18.37	135	4,046.0	4.9	3.95
Pipe 63-1-0007	1,366.5	22.44	135	5,102.3	4.14	2.29
Pipe 63-1-0008	34.3	16.53	135	2,763.6	4.13	3.26
Pipe 63-1-0009	1,350.5	11.71	135	1,311.1	3.91	4.4
Pipe 63-1-0010	480.0	12.86	135	1,984.5	4.9	6
Pipe 63-1-0011	2,766.4	14.70	135	2,256.1	4.26	3.97
Pipe 63-1-0012	1,431.0	9.87	135	1,052.1	4.41	6.73
Pipe 63-1-0013	2.8	7.92	135	524.3	3.41	5.42
Pipe 63-1-0014	1,412.7	7.92	135	673.4	4.39	8.6
Pipe 63-1-0015	4.8	7.92	135	533.4	3.47	5.59
Pipe 63-1-1-0000	2,779.9	22.44	135	5,501.3	4.46	2.63
Pipe 63-1-1-0001	2,961.5	22.04	135	4,449.9	3.74	1.94
Pipe 63-1-1-0002	1,105.9	12.86	135	1,758.4	4.34	4.8
Pipe 63-1-1-0003	1,743.2	12.86	135	2,016.0	4.98	6.18
Pipe 63-1-1-0004	10.4	9.87	135	1,081.5	4.54	7.08
Pipe 63-1-1-0005	6.9	16.53	135	3,167.5	4.74	4.2
Pipe 63-1-1-0006	2,670.7	18.37	135	3,475.5	4.21	2.98
Pipe 63-1-1-0007	777.0	18.37	135	4,063.5	4.92	3.99
Pipe 63-2-0000	1,335.4	9.87	135	1,145.2	4.8	7.87
Pipe 63-2-0001	1.2	7.92	135	619.5	4.03	7.43
Pipe 64-0000	11.8	50.48	135	30,508.8	4.89	1.2
Pipe 64-0001	3,530.1	49.60	135	26,373.9	4.38	1.01
Pipe 64-0002	959.1	49.60	135	27,680.8	4.6	1.1
Pipe 64-0003	791.7	49.60	135	29,261.4	4.86	1.22
Pipe 64-0004	6.8	49.60	135	28,724.5	4.77	1.18
Pipe 64-0005	2,196.4	49.60	135	28,208.6	4.68	1.14
Pipe 64-0006	1,329.5	49.60	135	29,447.6	4.89	1.24
Pipe 64-0007	1,362.7	50.48	135	29,976.1	4.81	1.17
Pipe 64-0008	1,285.1	29.39	135	10,668.0	5.05	2.41
Pipe 64-0009	22.2	31.23	135	11,256.7	4.71	1.98
Pipe 64-0010	1,011.6	29.39	135	10,905.3	5.16	2.51
Pipe 64-0011	1,339.2	33.06	135	13,232.8	4.95	2.03
Pipe 64-0012	6.8	49.60	135	26,124.0	4.34	1
Pipe 64-0013	421.8	44.09	135	25,345.6	5.33	1.66
Pipe 64-0014	1,535.9	33.06	135	12,537.0	4.69	1.83
Pipe 64-0015	88.7	33.06	135	12,716.2	4.75	1.88
Pipe 64-0016	427.8	25.72	135	7,994.0	4.94	2.71
Pipe 64-0017	7.8	22.04	135	5,807.9	4.88	3.21

Pipe 64-0018	1,279.6	17.98	135	3,471.3	4.39	3.3
Pipe 64-0019	2.2	18.37	135	3,611.3	4.37	3.2
Pipe 64-0020	53.0	22.04	135	4,299.4	3.62	1.82
Pipe 64-0021	14.2	22.04	135	5,464.2	4.6	2.85
Pipe 64-0022	1,309.8	22.04	135	5,590.2	4.7	2.96
Pipe 64-0023	37.6	23.88	135	7,072.8	5.07	3.09
Pipe 64-0024	2,170.4	25.72	135	7,582.4	4.68	2.46
Pipe 64-0025	2,678.0	16.18	135	3,192.7	4.98	4.73
Pipe 64-0026	399.8	14.38	135	2,305.8	4.56	4.6
Pipe 64-0027	925.1	14.38	135	2,382.8	4.71	4.89
Pipe 64-0028	961.9	16.18	135	2,755.9	4.3	3.6
Pipe 64-0029	1.8	9.66	135	1,017.8	4.46	7.01
Pipe 64-1-0000	2,693.2	11.92	135	1,573.6	4.52	5.65
Pipe 64-1-0001	1.5	10.05	135	1,057.7	4.28	6.17
Pipe 64-1-0002	2.3	8.06	135	530.6	3.34	5.11
Pipe 64-2-0000	895.5	10.05	135	980.0	3.96	5.4
Pipe 64-2-0001	1.7	8.06	135	472.5	2.97	4.06
Pipe 64-3-0000	63.4	11.71	135	1,306.9	3.89	4.37
Pipe 64-3-0001	2.1	6.08	135	302.4	3.34	7.07
Pipe 64-4-0000	1,330.1	31.23	135	12,112.8	5.07	2.27
Pipe 64-4-0001	2,532.4	26.97	135	9,031.4	5.07	2.69
Pipe 64-4-0002	273.1	27.55	135	9,031.4	4.86	2.43
Pipe 64-4-0003	1,673.2	23.38	135	7,215.6	5.39	3.57
Pipe 64-4-0004	4.6	25.72	135	7,245.7	4.47	2.25
Pipe 64-4-0005	8.9	23.38	135	7,215.6	5.39	3.57
Pipe 64-4-0006	13.1	17.98	135	3,867.5	4.89	4.04
Pipe 64-4-0007	1,298.7	17.98	135	3,833.9	4.84	3.97
Pipe 64-4-0008	2,132.7	16.18	135	2,902.2	4.53	3.97
Pipe 64-4-0009	31.7	16.18	135	3,444.0	5.37	5.45
Pipe 64-4-0010	0.5	9.66	135	1,093.4	4.79	8.12
Pipe 64-4-0011	385.9	12.59	135	1,989.4	5.13	6.69
Pipe 64-4-1-0000	59.6	16.53	135	3,081.4	4.61	3.99
Pipe 64-4-1-0001	9.2	12.86	135	2,064.3	5.1	6.44
Pipe 64-4-2-0000	3.8	9.66	135	1,128.4	4.94	8.5
Pipe 64-4-2-0001	5.2	5.96	135	310.1	3.57	8.15
Pipe 64-4-2-0002	3.8	9.66	135	1,106.7	4.84	8.2
Pipe 64-4-2-0003	2,618.6	16.18	135	3,348.1	5.22	5.17
Pipe 64-4-2-0004	44.8	14.38	135	2,235.1	4.42	4.34
Pipe 64-4-2-0005	2.5	16.18	135	3,077.2	4.8	4.5
Pipe 64-5-0000	348.7	14.38	135	2,674.0	5.28	6.05
Pipe 64-5-0001	4,487.2	12.59	135	2,049.6	5.28	7.07
Pipe 64-5-0002	428.7	9.66	135	1,074.5	4.7	7.77
Pipe 64-5-0003	8.2	7.75	135	541.1	3.68	6.38
Pipe 64-6-0000	1,912.6	11.46	135	1,264.9	3.93	4.57
Pipe 64-6-0001	6.3	5.96	135	413.0	4.75	13.89
Pipe 64-6-0002	0.0	7.75	135	666.4	4.53	10.48
Pipe 64-6-0003	93.3	9.66	135	1,209.6	5.3	9.67
Pipe HIGHWAY-97-BYPASS	1,629.7	144.00	125	411,985.9	8.12	1.05

Pipe L51-0000	1,640.4	6.19	135	425.6	4.54	12.21
Pipe L51-0001	2,214.3	6.19	135	425.6	4.54	12.21
Pipe L51-0002	0.4	4.21	135	69.3	1.6	2.55
Pipe L51-0003	1.2	6.19	135	356.3	3.8	8.73
Pipe MAIN-0000	513.6	144.00	125	411,985.9	8.12	1.05
Pipe MAIN-0001	61,962.4	144.00	125	411,985.9	8.12	1.05
Pipe MAIN-0001-2	72,839.6	144.00	125	411,985.9	8.12	1.05
Pipe MAIN-0002A	6,731.0	144.00	125	205,993.0	4.06	0.29
Pipe MAIN-0002B	6,731.0	144.00	125	205,993.0	4.06	0.29
Pipe MAIN-0003A	523.5	132.00	125	411,985.9	9.66	1.61
Pipe MAIN-0004A	3,167.9	144.00	125	205,993.0	4.06	0.29
Pipe MAIN-0004B	3,167.9	144.00	125	205,993.0	4.06	0.29
Pipe MAIN-0005A	4,893.7	144.00	125	205,993.0	4.06	0.29
Pipe MAIN-0005B	4,893.7	144.00	125	205,993.0	4.06	0.29
Pipe MAIN-0006A	2,284.7	144.00	125	205,993.0	4.06	0.29
Pipe MAIN-0006B	2,284.7	144.00	125	205,993.0	4.06	0.29
Pipe MAIN-0007A	4,367.7	144.00	125	205,358.1	4.05	0.29
Pipe MAIN-0007B	4,367.7	144.00	125	205,358.1	4.05	0.29
Pipe MAIN-0008A	9.3	144.00	125	205,737.8	4.05	0.29
Pipe MAIN-0008B	9.3	144.00	125	205,737.8	4.05	0.29
Pipe MAIN-0009A	602.9	144.00	125	197,403.3	3.89	0.27
Pipe MAIN-0009B	602.9	144.00	125	197,403.3	3.89	0.27
Pipe MAIN-0010A	1,327.3	144.00	125	197,266.4	3.89	0.27
Pipe MAIN-0010B	1,327.3	144.00	125	197,266.4	3.89	0.27
Pipe MAIN-0011A	2,299.1	144.00	125	202,191.3	3.98	0.28
Pipe MAIN-0011B	2,299.1	144.00	125	202,191.3	3.98	0.28
Pipe MAIN-0012A	12.7	144.00	125	197,392.1	3.89	0.27
Pipe MAIN-0012B	12.7	144.00	125	197,392.1	3.89	0.27
Pipe MAIN-0013A	4,172.5	144.00	125	203,382.7	4.01	0.28
Pipe MAIN-0013B	4,172.5	144.00	125	203,382.7	4.01	0.28
Pipe MAIN-0014A	6,367.4	144.00	125	202,655.7	3.99	0.28
Pipe MAIN-0014B	6,367.4	144.00	125	202,655.7	3.99	0.28
Pipe MAIN-0015A	5,117.4	144.00	125	196,260.2	3.87	0.27
Pipe MAIN-0015B	5,117.4	144.00	125	196,260.2	3.87	0.27
Pipe MAIN-0016A	1,377.0	144.00	125	196,281.2	3.87	0.27
Pipe MAIN-0016B	1,377.0	144.00	125	196,281.2	3.87	0.27
Pipe MAIN-0017A	1,965.3	144.00	125	196,457.2	3.87	0.27
Pipe MAIN-0017B	1,965.3	144.00	125	196,457.2	3.87	0.27
Pipe MAIN-0018A	584.8	144.00	125	197,236.7	3.89	0.27
Pipe MAIN-0018B	584.8	144.00	125	197,236.7	3.89	0.27
Pipe MAIN-0019A	867.7	144.00	125	197,265.0	3.89	0.27
Pipe MAIN-0019B	867.7	144.00	125	197,265.0	3.89	0.27
Pipe MAIN-0020A	266.3	144.00	125	196,506.9	3.87	0.27
Pipe MAIN-0020B	266.3	144.00	125	196,506.9	3.87	0.27
Pipe MAIN-0021A	1,964.6	144.00	125	196,860.8	3.88	0.27
Pipe MAIN-0021B	1,964.6	144.00	125	196,860.8	3.88	0.27
Pipe MAIN-0022A	1,527.7	144.00	125	197,224.4	3.89	0.27
Pipe MAIN-0022B	1,527.7	144.00	125	197,224.4	3.89	0.27

Pipe MAIN-0023A	4,456.3	120.00	125	175,697.6	4.98	0.53
Pipe MAIN-0023B	4,456.3	120.00	125	175,697.6	4.98	0.53
Pipe MAIN-0024A	11,133.1	120.00	125	175,433.7	4.98	0.53
Pipe MAIN-0024B	11,133.1	120.00	125	175,433.7	4.98	0.53
Pipe MAIN-0025A	5,232.6	120.00	125	175,416.2	4.98	0.53
Pipe MAIN-0025B	5,232.6	120.00	125	175,416.2	4.98	0.53
Pipe MAIN-0026A	18.7	120.00	125	175,352.5	4.97	0.54
Pipe MAIN-0026B	18.7	120.00	125	175,352.5	4.97	0.54
Pipe MAIN-0027A	1,524.1	120.00	125	174,863.9	4.96	0.52
Pipe MAIN-0027B	1,524.1	120.00	125	174,863.9	4.96	0.52
Pipe MAIN-0028A	19.7	120.00	125	175,117.3	4.97	0.52
Pipe MAIN-0028B	19.7	120.00	125	175,117.3	4.97	0.52
Pipe MAIN-0029A	42.1	120.00	125	156,600.9	4.44	0.42
Pipe MAIN-0029B	42.1	120.00	125	156,600.9	4.44	0.42
Pipe MAIN-0030A	2,681.1	120.00	125	156,312.2	4.43	0.42
Pipe MAIN-0030B	2,681.1	120.00	125	156,312.2	4.43	0.42
Pipe MAIN-0031A	2,839.6	120.00	125	156,600.9	4.44	0.43
Pipe MAIN-0031B	2,839.6	120.00	125	156,600.9	4.44	0.43
Pipe MAIN-0032A	1,470.3	120.00	125	172,674.3	4.9	0.51
Pipe MAIN-0032B	1,470.3	120.00	125	172,674.3	4.9	0.51
Pipe MAIN-0033A	708.1	120.00	125	172,002.7	4.88	0.51
Pipe MAIN-0033B	708.1	120.00	125	172,002.7	4.88	0.51
Pipe MAIN-0034A	14.7	120.00	125	172,268.0	4.89	0.52
Pipe MAIN-0034B	14.7	120.00	125	172,268.0	4.89	0.52
Pipe MAIN-0035A	2.3	120.00	125	172,451.0	4.89	0.42
Pipe MAIN-0035B	2.3	120.00	125	172,451.0	4.89	0.42
Pipe MAIN-0036A	739.0	120.00	125	171,993.5	4.88	0.51
Pipe MAIN-0036B	739.0	120.00	125	171,993.5	4.88	0.51
Pipe MAIN-0037A	1,875.0	120.00	125	156,057.4	4.43	0.42
Pipe MAIN-0037B	1,875.0	120.00	125	156,057.4	4.43	0.42
Pipe MAIN-0038A	406.8	120.00	125	156,073.5	4.43	0.42
Pipe MAIN-0038B	406.8	120.00	125	156,073.5	4.43	0.42
Pipe MAIN-0039A	2,007.0	120.00	125	156,199.1	4.43	0.42
Pipe MAIN-0039B	2,007.0	120.00	125	156,199.1	4.43	0.42
Pipe MAIN-0040A	111.8	120.00	125	156,006.6	4.43	0.42
Pipe MAIN-0041	6,729.0	144.00	125	262,271.8	5.17	0.46
Pipe MAIN-0042A	39.0	108.00	125	131,153.4	4.59	0.51
Pipe MAIN-0042B	39.0	108.00	125	131,153.4	4.59	0.51
Pipe MAIN-0043A	21.7	108.00	125	131,567.1	4.61	0.52
Pipe MAIN-0043B	21.7	108.00	125	131,567.1	4.61	0.52
Pipe MAIN-0044A	19.5	120.00	125	156,006.5	4.43	0.43
Pipe MAIN-0044B	19.5	120.00	125	156,006.5	4.43	0.43
Pipe MAIN-0045A	1,981.6	108.00	125	131,135.9	4.59	0.51
Pipe MAIN-0045B	1,981.6	108.00	125	131,135.9	4.59	0.51
Pipe MAIN-0046	7.2	144.00	125	261,929.5	5.16	0.44
Pipe MAIN-0047	1,811.0	144.00	125	261,888.9	5.16	0.45
Pipe MAIN-0048	70.2	144.00	125	262,137.4	5.16	0.46
Pipe MAIN-0049-1-2	2,655.0	144.00	125	251,514.2	4.95	0.42

Pipe MAIN-0049-2	11,787.4	144.00	125	251,514.2	4.95	0.42
Pipe MAIN-0050	3,345.2	144.00	125	251,514.2	4.95	0.42
Pipe MAIN-0051	2,916.9	144.00	125	249,761.4	4.92	0.42
Pipe MAIN-0052	237.1	144.00	125	251,416.9	4.95	0.42
Pipe MAIN-0054	1,138.0	144.00	125	248,752.0	4.9	0.41
Pipe MAIN-0055	0.5	144.00	125	249,670.4	4.92	0.46
Pipe MAIN-0056	5.0	144.00	125	248,763.2	4.9	0.44
Pipe MAIN-0057	2,727.4	144.00	125	245,584.5	4.84	0.4
Pipe MAIN-0058	1,383.1	144.00	125	243,937.4	4.81	0.4
Pipe MAIN-0059	597.4	144.00	125	248,571.4	4.9	0.41
Pipe MAIN-0060	51.4	144.00	125	243,959.8	4.81	0.4
Pipe MAIN-0061	0.3	144.00	125	248,593.8	4.9	0.74
Pipe MAIN-0062	263.1	144.00	125	248,600.8	4.9	0.41
Pipe MAIN-0063	1,221.1	144.00	125	223,061.3	4.39	0.34
Pipe MAIN-0064	60.4	144.00	125	243,268.9	4.79	0.4
Pipe MAIN-0065	26.8	144.00	125	243,273.8	4.79	0.4
Pipe MAIN-0066	29.9	144.00	125	220,155.6	4.34	0.33
Pipe MAIN-0067	1,605.9	144.00	125	220,581.2	4.35	0.33
Pipe MAIN-0068	1,813.7	144.00	125	220,140.2	4.34	0.33
Pipe MAIN-0069	161.4	144.00	125	216,932.1	4.27	0.32
Pipe MAIN-0070	1,887.5	144.00	125	217,443.8	4.28	0.32
Pipe MAIN-0071	11.3	144.00	125	216,863.5	4.27	0.3
Pipe MAIN-0072	834.7	144.00	125	216,455.4	4.26	0.32
Pipe MAIN-0073	167.0	144.00	125	216,907.6	4.27	0.32
Pipe MAIN-0074	882.5	144.00	125	216,010.9	4.26	0.32
Pipe MAIN-0075	191.1	144.00	125	216,440.7	4.26	0.32
Pipe MAIN-0076	468.8	144.00	125	213,038.0	4.2	0.31
Pipe MAIN-0077	463.5	144.00	125	213,038.0	4.2	0.31
Pipe MAIN-0078	108.1	144.00	125	213,038.0	4.2	0.31
Pipe MAIN-0079	30.9	144.00	125	214,774.0	4.23	0.32
Pipe MAIN-0080	4.6	144.00	125	215,560.8	4.25	0.32
Pipe MAIN-0081	1,067.9	144.00	125	215,500.6	4.25	0.32
Pipe MAIN-0082	1.7	144.00	125	215,636.4	4.25	0.28
Pipe MAIN-0083	1.8	144.00	125	215,748.4	4.25	0.41
Pipe MAIN-0084	22.2	144.00	125	215,624.5	4.25	0.32
Pipe MAIN-0085	1,461.0	144.00	125	215,230.4	4.24	0.32
Pipe MAIN-0086	585.2	144.00	125	215,983.6	4.25	0.32
Pipe MAIN-0087	644.2	144.00	125	212,949.1	4.2	0.31
Pipe MAIN-0088	2,263.2	144.00	125	209,675.9	4.13	0.3
Pipe MAIN-0089	66.6	144.00	125	210,315.7	4.14	0.3
Pipe MAIN-0090	1,231.2	144.00	125	212,006.9	4.18	0.31
Pipe MAIN-0091	418.9	144.00	125	212,527.7	4.19	0.31
Pipe MAIN-0092	296.8	144.00	125	200,223.1	3.94	0.28
Pipe MAIN-0093	1,831.8	144.00	125	199,914.4	3.94	0.28
Pipe MAIN-0094	562.9	144.00	125	200,194.4	3.94	0.28
Pipe MAIN-0096	3,272.1	144.00	125	197,013.6	3.88	0.27
Pipe MAIN-0097	1,370.8	144.00	125	197,013.6	3.88	0.27
Pipe MAIN-0098	46.2	144.00	125	177,946.3	3.51	0.22

Pipe MAIN-0099	701.7	144.00	125	176,480.5	3.48	0.22
Pipe MAIN-0100	1,109.1	144.00	125	176,654.8	3.48	0.22
Pipe MAIN-0101	1,473.1	144.00	125	176,985.9	3.49	0.22
Pipe MAIN-0102	5,224.5	102.00	125	117,572.7	4.62	0.55
Pipe MAIN-0103	1.8	144.00	125	176,445.5	3.48	0.14
Pipe MAIN-0104	2.6	144.00	125	176,474.9	3.48	0.28
Pipe MAIN-0105	5,949.9	102.00	125	117,508.3	4.61	0.55
Pipe MAIN-0106	1,344.5	96.00	125	112,721.0	5	0.69
Pipe MAIN-0107	1.7	102.00	125	117,329.8	4.61	0.59
Pipe MAIN-0108	306.2	102.00	125	116,648.7	4.58	0.54
Pipe MAIN-0109	2,288.4	96.00	125	112,056.0	4.97	0.68
Pipe MAIN-0110	1,566.5	84.00	125	85,675.1	4.96	0.79
Pipe MAIN-0111	2,554.4	90.00	125	93,403.8	4.71	0.66
Pipe MAIN-0112	420.2	90.00	125	93,246.3	4.7	0.66
Pipe MAIN-0113	1,240.8	90.00	125	90,961.5	4.59	0.63
Pipe MAIN-0114	330.7	90.00	125	91,049.7	4.59	0.63
Pipe MAIN-0115	4.0	90.00	125	92,028.3	4.64	0.61
Pipe MAIN-0116	26.3	90.00	125	92,207.5	4.65	0.65
Pipe MAIN-0117	1,816.2	84.00	125	85,148.7	4.93	0.78
Pipe MAIN-0118	29.4	84.00	125	85,273.3	4.94	0.78
Pipe MAIN-0119	46.8	84.00	125	77,177.1	4.47	0.66
Pipe MAIN-0120	29.6	84.00	125	80,754.8	4.68	0.71
Pipe MAIN-0121	0.9	84.00	125	76,622.0	4.44	0.56
Pipe MAIN-0122	2,540.9	84.00	125	76,125.7	4.41	0.64
Pipe MAIN-0123	3.3	84.00	125	79,720.9	4.62	0.66
Pipe MAIN-0124	2,730.9	78.00	125	74,515.7	5	0.88
Pipe MAIN-0125	1,986.8	78.00	125	72,631.3	4.88	0.84
Pipe MAIN-0126	1,328.3	66.00	125	47,816.3	4.48	0.87
Pipe MAIN-0127	1.0	78.00	125	72,611.7	4.88	0.76
Pipe MAIN-0129	0.0	66.00	125	47,317.9	4.44	0
Pipe MAIN-0130	16.1	66.00	125	46,836.3	4.39	0.83
Pipe MAIN-0131	3,338.1	58.89	135	43,123.5	5.08	1.09
Pipe MAIN-0132	81.7	66.00	125	45,200.4	4.24	0.78
Pipe MAIN-0133	1,266.6	66.00	125	45,593.8	4.28	0.8
Pipe MAIN-0134	815.7	78.00	125	72,581.6	4.87	0.84
Pipe MAIN-0135	1,349.3	78.00	125	73,615.5	4.94	0.86
Pipe MAIN-0136	2.1	78.00	125	74,119.5	4.98	0.94
Pipe MAIN-0137	2,781.1	58.89	135	40,847.1	4.81	0.98
Pipe MAIN-0138	534.8	58.89	135	41,827.1	4.93	1.03
Pipe MAIN-0139	131.6	58.89	135	42,321.3	4.98	1.05
Pipe MAIN-0140	2,558.2	29.39	135	9,851.8	4.66	2.08
Pipe MAIN-0141	46.0	58.89	135	40,360.6	4.75	0.96
Pipe MAIN-0142	979.8	58.89	135	40,619.6	4.78	0.97
Pipe MAIN-0143	2,010.9	27.55	135	9,113.3	4.9	2.47
Pipe MAIN-0144	443.7	27.55	135	9,128.0	4.91	2.48
Pipe MAIN-0145	1.3	27.55	135	8,405.6	4.52	2.15
Pipe MAIN-0146	2,926.7	23.10	135	6,748.0	5.17	3.34
Pipe MAIN-0147	1.0	23.10	135	6,365.8	4.87	2.99

Pipe MAIN-0148	0.9	15.99	135	3,035.2	4.85	4.53
Pipe MAIN-0149	0.9	9.55	135	1,214.5	5.44	10.18
Pipe MAIN-0150A	536.9	144.00	125	206,231.7	4.06	0.29
Pipe MAIN-0150B	539.2	144.00	125	205,754.2	4.05	0.29
Pipe MAIN-0151A	3,448.6	132.00	125	411,985.9	9.66	1.61
Pipe MAIN-0152A	391.3	144.00	125	411,985.9	8.12	1.05
Pipe MAIN-0153A	3,353.1	132.00	125	411,985.9	9.66	1.61
Pipe MAIN-0154A	272.6	144.00	125	205,993.0	4.06	0.29
Pipe MAIN-0154B	272.6	144.00	125	205,993.0	4.06	0.29
Pipe MAIN-0155	1,419.4	144.00	125	197,013.6	3.88	0.27
Pipe MAIN-0156	615.2	4.21	135	0.0	0	0
Pipe MAIN-0157	14.2	59.74	135	43,626.8	4.99	1.05
Pipe P58-0000	284.8	18.37	135	3,927.7	4.75	3.74
Pipe P58-0001	427.5	14.38	135	2,255.4	4.46	4.41
Pipe P58-0002	292.2	16.18	135	2,751.7	4.29	3.59
Pipe P58-0003	1,252.1	16.18	135	3,338.3	5.21	5.14
Pipe P58-0004	10.2	18.37	135	3,695.3	4.47	3.33
Pipe P58-0005	1,811.1	14.38	135	2,227.4	4.4	4.31
Pipe P58-0006	25.1	11.46	135	1,455.3	4.53	5.92
Pipe PL37-3-1-0000	1,865.4	11.92	135	1,379.0	3.96	4.43
Pipe PL37-3-1-0001	356.6	10.05	135	1,103.2	4.46	6.72
Pipe PL41-0000	2,468.7	22.04	135	4,379.2	3.68	1.88
Pipe PL41-0001	24.5	16.53	135	3,385.9	5.06	4.75
Pipe PL41-0002	1,264.1	16.53	135	2,856.7	4.27	3.47
Pipe PL41-0003	2.3	16.53	135	3,115.0	4.66	4.06
Pipe PL41-0004	376.0	6.19	135	412.3	4.4	11.52
Pipe PL41-0005	593.2	6.19	135	421.4	4.49	11.99
Pipe PL41-0006	294.3	8.06	135	498.4	3.13	4.52
Pipe PL41-0007	238.2	8.06	135	511.7	3.22	4.75
Pipe PL41-0008	14.0	8.06	135	513.1	3.23	4.78
Pipe PL41-0009	887.6	8.06	135	512.4	3.22	4.76
Pipe PL41-0010	11.5	14.38	135	2,378.6	4.7	4.89
Pipe PL41-0011	1,301.4	14.38	135	2,650.9	5.24	5.96
Pipe PL41-0012	0.2	14.38	135	2,102.8	4.15	3.86
Pipe PL41-0013	1,244.6	12.59	135	1,843.8	4.75	5.81
Pipe PL41-0014	10.2	11.46	135	1,327.9	4.13	5
Pipe PL41-0015	1,377.2	9.66	135	820.4	3.59	4.71
Pipe PL41-0016	33.4	6.19	135	401.8	4.28	10.98
Pipe PL41-0017	1,091.4	4.21	135	184.1	4.24	16.91
Pipe PL41-0018	23.3	4.21	135	28.0	0.65	0.51
Pipe PL41-0019	212.5	4.21	135	13.3	0.31	0.13
Pipe PL41-0020	92.5	6.19	135	217.7	2.32	3.53
Pipe PL41-0021	671.1	4.21	135	42.0	0.97	1.1
Pipe PL41-0022	785.1	4.21	135	112.7	2.6	6.82
Pipe PL41-1-0000	1,328.6	9.87	135	993.3	4.17	6.05
Pipe PL41-1-0001	443.1	6.08	135	280.0	3.09	6.14
Pipe PL41-1-0002	126.5	6.08	135	219.1	2.42	3.9
Pipe PL41-1-0003	337.7	4.05	135	193.2	4.81	22.34

Pipe PL41-1-0004	332.8	4.05	135	128.8	3.21	10.54
Pipe PL41-1-0005	431.3	4.05	135	160.3	3.99	15.81
Pipe PL41-1-0006	4.7	6.08	135	247.8	2.74	4.86
Pipe PL41-1-0007	517.0	7.92	135	713.3	4.65	9.57
Pipe PL41-1-0008	455.1	7.75	135	608.3	4.14	7.92
Pipe PL41-1-0009	137.8	7.75	135	645.4	4.39	8.84
Pipe PL41-1-0010	210.3	7.92	135	679.7	4.43	8.75
Pipe PL41-1-0011	2.6	5.96	135	312.9	3.6	8.28
Pipe PL43-0000	1,497.1	10.05	135	1,027.6	4.16	5.9
Pipe PL43-0001	0.1	8.06	135	527.1	3.31	4.38
Pipe PL51-4-0000	2,345.7	14.96	135	2,688.7	4.91	5.04
Pipe PL51-4-0001	1,293.3	14.70	135	2,402.4	4.54	4.46
Pipe PL51-4-0002	869.4	11.71	135	1,617.7	4.82	6.49
Pipe PL51-4-0003	1,049.2	11.71	135	1,633.1	4.87	6.6
Pipe PL51-4-0004	6.5	14.70	135	2,170.0	4.1	3.69
Pipe PL51-4-0005	2.5	14.70	135	2,263.8	4.28	4.05
Pipe PL51-4-0006	2,738.8	11.46	135	1,475.6	4.59	6.08
Pipe PL51-4-0007	544.3	11.46	135	1,506.4	4.69	6.32
Pipe PL51-4-0008	777.2	11.71	135	1,527.4	4.55	5.83
Pipe PL51-4-0009	1,876.9	11.46	135	1,239.0	3.85	4.4
Pipe PL51-4-0010	0.1	9.66	135	1,197.7	5.24	10.63
Pipe PL51-4-0011	324.8	9.66	135	1,201.2	5.26	9.55
Pipe PL51-4-0012	1,374.1	9.55	135	1,192.8	5.34	9.96
Pipe PL51-4-0013	982.3	10.05	135	1,169.0	4.73	7.49
Pipe PL51-4-0014	501.2	10.05	135	1,170.4	4.73	7.5
Pipe PL51-4-0015	178.1	10.05	135	1,174.6	4.75	7.55
Pipe PL51-4-0016	1,135.5	10.05	135	1,178.8	4.77	7.6
Pipe PL51-4-0017	3,894.2	10.05	135	1,152.2	4.66	7.29
Pipe PL51-4-0018	348.7	10.05	135	1,155.7	4.67	7.33
Pipe PL51-4-0019	385.0	10.05	135	1,153.6	4.67	7.31
Pipe PL51-4-0020	845.5	8.06	135	722.4	4.54	8.99
Pipe PL51-4-0021	68.0	8.06	135	606.2	3.81	6.5
Pipe PL51-4-0022	1,412.1	7.92	135	508.9	3.31	5.12
Pipe PL51-4-0023	1,268.2	5.96	135	429.8	4.94	14.96
Pipe PL51-4-0024	994.2	5.96	135	268.1	3.08	6.24
Pipe PL51-5-0000	249.0	8.06	135	728.0	4.58	9.12
Pipe PL51-5-0001	5.6	6.19	135	247.1	2.63	4.46
Pipe PL51-6-0000	1,484.8	11.92	135	1,274.0	3.66	3.82
Pipe PL51-6-0001	4.7	6.19	135	459.9	4.9	14.12
Pipe PL52-0000	710.6	14.70	135	2,696.4	5.1	5.52
Pipe PL52-0001	303.1	14.70	135	2,277.1	4.3	4.04
Pipe PL52-0002	1,017.6	9.66	135	1,190.7	5.21	9.39
Pipe PL52-0003	3.4	11.71	135	1,691.2	5.04	7.02
Pipe PL52-0004	126.3	12.86	135	1,860.6	4.6	5.33
Pipe PL52-0005	344.5	12.86	135	1,879.5	4.64	5.43
Pipe PL52-0006	2.3	12.86	135	1,906.8	4.71	5.51
Pipe PL52-0007	17.4	12.86	135	1,921.5	4.75	5.66
Pipe PL52-0008	367.8	12.86	135	1,949.5	4.82	5.81

Pipe PL52-0009	548.4	12.86	135	1,979.6	4.89	5.98
Pipe PL52-0010	1,324.1	12.86	135	2,084.6	5.15	6.58
Pipe PL52-0011	745.4	14.70	135	2,311.4	4.37	4.15
Pipe PL52-0012	2.9	14.70	135	2,346.4	4.44	4.29
Pipe PL52-0013	2.3	14.70	135	2,644.6	5	5.28
Pipe PL52-0014	806.0	9.66	135	1,133.3	4.96	8.57
Pipe PL52-0015	111.9	11.71	135	1,708.7	5.09	7.18
Pipe PL52-0016	368.3	14.70	135	2,676.8	5.06	5.45
Pipe PL52-0017	1,233.9	9.66	135	907.2	3.97	5.68
Pipe PL52-0018	363.0	9.66	135	917.7	4.02	5.8
Pipe PL52-0019	0.0	8.06	135	736.4	4.63	21.66
Pipe PL52-0020	286.3	10.05	135	817.6	3.31	3.86
Pipe PL52-0021	136.2	10.05	135	867.3	3.51	4.31
Pipe PL52-0022	502.6	8.06	135	606.2	3.81	6.5
Pipe PL52-0023	194.6	8.06	135	663.6	4.17	7.68
Pipe PL52-0024	115.8	8.06	135	704.9	4.43	8.59
Pipe PL52-0025	0.0	10.05	135	805.0	3.26	0
Pipe PL52-0026	611.7	6.19	135	455.0	4.85	13.82
Pipe PL52-0027	1,728.1	6.19	135	468.3	4.99	14.58
Pipe PL52-0028	1,415.1	4.21	135	202.3	4.66	20.14
Pipe PL52-0029	2.5	6.19	135	329.7	3.52	7.55
Pipe PL52-0030	3.9	6.19	135	415.8	4.43	11.72
Pipe PL52-0031	721.9	4.13	135	196.7	4.71	20.99
Pipe PL52-0032	875.8	4.21	135	16.8	0.39	0.2
Pipe PL58-1-0000	614.4	6.19	135	237.3	2.53	4.14
Pipe PL58-1-0001	0.1	4.21	135	94.5	2.18	6.45
Pipe PL58-1-0002	3,011.3	4.13	135	199.5	4.78	21.55
Pipe PL58-1-0003	1,316.8	4.05	135	152.6	3.8	14.43
Pipe PL58-1-0004	9.7	4.05	135	50.4	1.26	1.87
Pipe PL58-1-0005	446.5	4.05	135	46.9	1.17	1.62
Pipe PL58-1-0006	0.0	4.05	135	23.8	0.59	0
Pipe PL58-1-0007	22.2	7.75	135	646.1	4.39	8.85
Pipe PL58-1-0008	3,088.6	16.18	135	2,808.4	4.38	3.73
Pipe PL58-1-0009	415.8	8.06	135	583.8	3.67	6.06
Pipe PL58-1-0010	236.5	8.06	135	569.1	3.58	5.78
Pipe PL58-1-0011	625.8	6.19	135	436.8	4.66	12.82
Pipe PL58-1-0012	751.1	8.06	135	553.0	3.48	5.48
Pipe PL58-1-0013	262.5	8.06	135	574.7	3.61	5.89
Pipe PL58-1-0014	503.3	12.59	135	2,034.9	5.24	6.97
Pipe PL58-1-0015	1,757.3	14.38	135	2,674.7	5.28	6.05
Pipe PL58-1-0016	1,704.7	14.38	135	2,694.3	5.32	6.14
Pipe PL58-1-0017	1,456.5	14.38	135	2,277.1	4.5	4.49
Pipe PL58-1-0018	83.3	14.38	135	2,714.6	5.36	6.22
Pipe PL58-1-0019	2,087.0	16.18	135	2,801.4	4.37	3.71
Pipe PL58-1-0020	301.7	16.18	135	3,463.6	5.4	5.5
Pipe PL58-1-0021	777.7	16.18	135	3,454.5	5.39	5.48
Pipe PL58-11-0000	2.4	59.74	135	34,572.3	3.96	0.6
Pipe PL58-11-0001	3,738.2	39.26	135	16,601.9	4.4	1.34

Pipe PL58-11-0002	1,298.4	33.06	135	12,996.2	4.86	1.96
Pipe PL58-11-0003	1,265.8	32.37	135	12,366.9	4.82	1.98
Pipe PL58-11-0004	3,366.7	38.58	135	14,595.0	4.01	1.15
Pipe PL58-11-0005	322.6	39.26	135	15,129.8	4.01	1.12
Pipe PL58-11-0006	93.3	39.26	135	15,900.5	4.21	1.23
Pipe PL58-11-0007	3,367.8	25.17	135	8,130.5	5.24	3.11
Pipe PL58-11-0008	1,617.1	28.73	135	10,566.5	5.23	2.65
Pipe PL58-11-0009	124.8	30.57	135	11,591.3	5.07	2.32
Pipe PL58-11-0010	738.1	30.57	135	11,578.7	5.06	2.32
Pipe PL58-11-0011	445.0	25.17	135	7,784.0	5.02	2.86
Pipe PL58-11-0012	31.7	11.71	135	1,598.8	4.76	6.36
Pipe PL58-11-0013	1,310.9	7.75	135	548.8	3.73	6.54
Pipe PL58-11-0014	739.6	7.75	135	775.6	5.28	12.42
Pipe PL58-11-0015	3.1	25.17	135	7,784.0	5.02	2.83
Pipe PL58-11-0016	782.2	23.38	135	6,580.7	4.92	3.01
Pipe PL58-11-0017	71.6	25.17	135	7,652.4	4.93	2.78
Pipe PL58-11-0018	8.9	21.58	135	5,464.9	4.79	3.13
Pipe PL58-11-0019	2.4	21.58	135	4,503.1	3.95	2.2
Pipe PL58-11-0020	2,555.3	16.18	135	3,319.4	5.18	5.09
Pipe PL58-11-0021	905.4	16.18	135	3,261.3	5.09	4.92
Pipe PL58-11-0022	3,327.9	15.75	135	2,783.9	4.58	4.19
Pipe PL58-11-0023	626.7	11.01	135	1,472.8	4.96	7.36
Pipe PL58-11-0024	1,069.1	14.38	135	2,469.6	4.88	5.22
Pipe PL58-12-0000	1,491.0	9.55	135	1,012.2	4.53	7.35
Pipe PL58-1-2-0000	36.7	11.92	135	1,451.1	4.17	4.86
Pipe PL58-12-0001	1,282.2	8.06	135	752.5	4.73	9.7
Pipe PL58-1-2-0001	0.2	4.21	135	8.4	0.19	0
Pipe PL58-1-2-0002	0.3	6.19	135	363.3	3.87	8.73
Pipe PL58-1-2-0003	219.6	11.92	135	1,434.3	4.12	4.76
Pipe PL58-1-2-0004	400.6	11.92	135	1,432.2	4.12	4.75
Pipe PL58-1-2-0005	1,390.3	11.92	135	1,395.8	4.01	4.53
Pipe PL58-9-0000	716.0	29.91	135	9,954.7	4.55	1.95
Pipe PL58-9-0001	1,437.5	28.04	135	8,623.3	4.48	2.05
Pipe PL58-9-0002	229.8	26.17	135	8,211.7	4.9	2.62
Pipe PL58-9-0003	4,230.0	22.04	135	6,057.1	5.09	3.44
Pipe PL58-9-0004	699.0	22.04	135	5,607.0	4.72	2.98
Pipe PL58-9-0005	54.9	22.04	135	4,628.4	3.89	2.09
Pipe PL58-9-0006	3,306.9	21.58	135	4,588.5	4.02	2.28
Pipe PL58-9-0007	7,506.9	19.37	135	4,251.8	4.63	3.35
Pipe PL58-9-0008	321.8	18.70	135	3,911.6	4.57	3.4
Pipe PL58-9-0009	2,173.2	7.92	135	508.2	3.31	5.11
Pipe PL58-9-0010	133.4	4.05	135	56.7	1.41	2.31
Pipe PL58-9-0011	3,167.3	4.05	135	95.2	2.37	6.02
Pipe PL58-9-0012	761.6	16.83	135	3,403.4	4.91	4.4
Pipe PL58-9-0013	2,649.6	11.92	135	1,271.2	3.65	3.81
Pipe PL58-9-0014	717.0	14.96	135	2,270.8	4.14	3.69
Pipe PL58-9-0015	19.8	4.21	135	151.2	3.48	11.74
Pipe PL58-9-1-0000	2,261.8	6.19	135	411.6	4.39	11.48

Pipe PL58-9-1-0001	4.2	4.21	135	147.7	3.4	11.29
Pipe PL58-9-2-0000	1,899.2	14.96	135	2,154.6	3.93	3.35
Pipe PL58-9-2-0001	17.9	14.96	135	2,154.6	3.93	3.34
Pipe PL58-9-2-0002	1.6	8.06	135	651.0	4.09	7.45
Pipe PL62-0000	2,625.2	14.53	135	2,543.8	4.92	5.25
Pipe PL62-0001	2,423.3	9.87	135	1,064.0	4.46	6.87
Pipe PL62-0002	17.0	10.05	135	1,204.0	4.87	7.91
Pipe PL62-0003	0.2	14.96	135	2,200.8	4.02	3.96
Pipe PL62-0004	1,400.3	13.09	135	2,083.2	4.97	6.02
Pipe PL62-0005	0.0	6.08	135	331.1	3.66	6
Pipe PL62-0006	0.0	9.87	135	807.8	3.39	5.91
Pipe R43-0000	27.7	10.05	135	827.4	3.35	3.95
Pipe R43-0001	55.8	4.21	135	67.2	1.55	2.61
Pipe R43-0002	788.2	4.21	135	37.8	0.87	0.9
Pipe R43-0003	254.7	4.21	135	52.5	1.21	1.66
Pipe R53-I-0000	91.5	7.92	135	639.8	4.17	7.82
Pipe R53-I-0001	2.3	7.92	135	574.0	3.74	6.36
Pipe R63-H-G-0000	241.2	11.46	135	1,610.0	5.01	7.14
Pipe R63-H-G-0001	3.7	9.66	135	1,071.7	4.69	7.72
Pipe R64-P-0000	101.0	7.92	135	707.7	4.61	9.43
Pipe R64-P-0001	2.2	6.08	135	256.9	2.84	5.3
Pipe 37-0053	5,925.6	9.87	135	1,175.3	4.93	8.26
Pipe MAIN-0095	46.8	144.00	125	208,721.8	4.11	0.3
Pipe 55-0000	1,320.4	27.55	135	8,498.7	4.57	2.17
Pipe PLHYDRO-1	10.0	144.00	125	0.0	0	0
Pipe PLHYRDRO-2	10.0	144.00	125	0.0	0	0
Pipe PLHYDRO-3	2,645.0	144.00	125	0.0	0	0
Pipe PLHYDRO-4	10.0	144.00	125	0.0	0	0
Pipe MAIN-0049-1-3	10.0	144.00	125	251,514.2	4.95	0.42
Pipe MAIN-0049-1-1	10.0	144.00	125	251,514.2	4.95	0.42
Pipe MAIN-0040B	111.8	120.00	125	156,006.6	4.43	0.42

APPENDIX C

PIPE BUDGET ESTIMATES FROM VENDORS

Northwest Pipe Company
12005 N. Burgard, Portland, OR 97203
Phone: (503) 285-1400, (800) 824-9824
Fax: (503) 382-2327

To: Kevin Crew
Blackrock Engineering
Phone: 541-480-6257
Email: Kevin Crew [blackrockci@gmail.com]

Date: March 15, 2017
Project: COIT Feasibility Study
Quotation No. OR-13-17231

Budgetary Quotation

We are pleased to offer prices for steel pipe for the above noted project for materials as listed below. The estimating prices are provided for reference only and Northwest Pipe shall not be bound by pricing or any other provisions herein. Final pricing and delivery can be provided once project requirements are finalized.

SPECIFICATIONS:

Pipe: Manufactured and tested per AWWA C200.
Length: 60 ft
Joints: Bell & Spigot for Lap Welding
Coating: Polyurethane per AWWA C222
Lining: Polyurethane per AWWA C222
Freight: Prices are FOB our plant with full freight allowed to jobsite. Jobsite shall specifically mean truckbed delivery as close to installation site as possible with truck under it's own power. All unloading shall be done by the buyer.
Delivery: Delivery of pipe can commence approximately 10 -12 weeks after receipt of approved shop drawings.
Fittings/Fabrication: Allowance of approximately 5% included for fabrication of fittings
Freight included to Bend, OR. 100% RT in lieu of hydro for pipe larger than 108" diameter

Alternate 1

Item	Qty. (lf)	OD (in)	Wall (in.)	Yield (psi)	Working Pres.(psi)	D/T Ratio	Unit Price $/lf	Extension Total $
1	13,013	66	0.250	42,000	159	264	$278.00	$3,617,614.00
2	13,369	72	0.250	42,000	146	288	$293.00	$3,917,117.00
3	6,886	78	0.313	42,000	169	249	$358.00	$2,465,188.00
4	6,034	84	0.313	42,000	157	268	$380.00	$2,292,920.00
5	4,577	90	0.313	42,000	146	288	$408.00	$1,867,416.00
6	3,633	96	0.375	42,000	164	256	$476.00	$1,729,308.00
7	11,482	102	0.375	42,000	154	272	$535.00	$6,142,870.00
8	4,084	108	0.375	42,000	146	288	$586.00	$2,393,224.00
9	70,492	120	0.438	42,000	153	274	$685.00	$48,287,020.00
10	185,156	144	0.500	42,000	146	288	$989.00	$183,119,284.00
11	72,840	144	0.500	42,000	146	288	$1,011.00	$73,641,240.00
Total								$329,473,201.00

Alternate 2

Item	Qty. (lf)	OD (in)	Wall (in.)	Yield (psi)	Working Pres.(psi)	D/T Ratio	Unit Price $/lf	Extension Total $
1	13,013	66	0.250	42,000	159	264	$278.00	$3,617,614.00
2	13,369	72	0.250	42,000	146	288	$293.00	$3,917,117.00
3	6,886	78	0.313	42,000	169	249	$358.00	$2,465,188.00
4	6,034	84	0.313	42,000	157	268	$380.00	$2,292,920.00
5	4,577	90	0.313	42,000	146	288	$408.00	$1,867,416.00
6	3,633	96	0.375	42,000	164	256	$476.00	$1,729,308.00
7	11,482	102	0.375	42,000	154	272	$535.00	$6,142,870.00
8	4,084	108	0.375	42,000	146	288	$586.00	$2,393,224.00
9	70,492	120	0.438	42,000	153	274	$685.00	$48,287,020.00
10	185,156	144	0.500	42,000	146	288	$989.00	$183,119,284.00
11	209,256	144	0.625	70,000	304	230	$1,201.00	$251,316,456.00
Total								$507,148,417.00

If you have any questions, or need additional information, please contact me in our sales department at (503) 382-2434 or cell phone at 503-939-8700.

Sincerely,

Jeffrey S. Curl

Sales Representative
Northwest Pipe Company

Dan Kaler

From: Ken.Douglas@Ferguson.com
Sent: Wednesday, March 22, 2017 1:19 PM
To: daniel.kaler@fcasolutions.org
Cc: blackrockci@gmail.com; Aaron.Bondi@Ferguson.com
Subject: RE: North Unit

Dan
For budgetary purposes, please see attached pipe sizing chart link for budgetary purposes.

http://www.performancepipe.com/en-us/Documents/PP%20152%204710%20IPS%20Size%20and%20Dimension%20Sheet.pdf

For the freight estimates use $1400.00 to $1500.00 per truck, Reno to Madras.

For your sizes of 4" to 54" use 1.10 per lb (54" can ship with 2ea sticks per truck)

For the 63" pipe use $1.20 per lb and I have the weights listed below. (63" can only ship 1ea stick per truck)

63" SDR21- 248.72LBS/FT

63" SDR26- 202.94LBS/FT

63" SDR32.5- 163.73LBS/FT

63" SDR41- I will forward you the pounds per foot as soon as I get it.

Please feel free to contact me with any questions

Thanks

Ken Douglas
Branch Manager
Ferguson Waterworks, a Wolseley company 3292 S. Hwy 97 Redmond, Or. 97756
T: (541) 548-2865 C: (541) 948-0922 F: (541) 548-2664
www.ferguson.com

From: Dan Kaler [mailto:daniel.kaler@fcasolutions.org]
Sent: Thursday, March 16, 2017 12:49 PM
To: Douglas, Ken [Ferguson] - 1614 Redmond
Cc: blackrockci@gmail.com; Bondi, Aaron [Ferguson] - 1614 Redmond
Subject: FW: North Unit

[ATTENTION] This email contains an attachment that includes macros or other active content that could pose a security risk to Ferguson. These macros have been removed. If this email is from a legitimate sender and the attachment is not working as expected, please contact Ferguson IT support at 757-989-2500 and select option 1 for assistance. **[ATTENTION]**

Ken,

I sent the message below to Aaron and received an auto reply saying he was out until 3/22. Would you be able to assist with the cost estimates outlined in the attached document?

I am working with Kevin Crew on a System Improvement Plan for North Unit Irrigation District. At this point in the study, I am running through cost estimates for piping the entire district. For preliminary calcs, I have been using a $/lb per foot based on antiquated data (I'm guessing it's still pretty darn close though). Could you please provide cost estimates for the HDPE pipe in the attached document? Also, please let me know if these are bid type prices or budgetary. Please include in the estimate, freight to Madras, OR (or Bend is fine).

Thanks!
Dan Kaler

From: Dan Kaler [mailto:daniel.kaler@fcasolutions.org]
Sent: Thursday, March 16, 2017 12:23 PM
To: Aaron.Bondi@Ferguson.com
Cc: blackrockci@gmail.com
Subject: North Unit

Good Afternoon Aaron,

I am working with Kevin Crew on a System Improvement Plan for North Unit Irrigation District. At this point in the study, I am running through cost estimates for piping the entire district. For preliminary calcs, I have been using a $/lb per foot based on antiquated data (I'm guessing it's still pretty darn close though). Could you please provide cost estimates for the HDPE pipe in the attached document? Also, please let me know if these are bid type prices or budgetary. Please include in the estimate, freight to Madras, OR (or Bend is fine).

Thanks,
Dan Kaler

.....
daniel kaler | fca | cell 952.215.7493 | office 541.716.6085 | farmerscreen.org

blog | instagram | facebook | twitter | linkedin

APPENDIX D

NATEL HYDROENGINE REPORT

Natel Energy

Technology

Natel Energy develops and and manufactures innovative hydroelectric turbines suitable for low-head, high-flow settings. The hydroEngine®, ranging in capacity from 25 kW to 1 MW, enables a new generation of distributed hydro installations with low project civil costs, fish-friendly operations, and small project footprint. Distributed cascades of hydroEngines can deliver to the grid and to utility customers a valuable form of reliable, baseload, cost-effective renewable energy.

The North Unit Irrigation District (NUID) project is an ideal example of cascaded sites throughout the same canal, interconnecting to the grid at nearby Points of Interconnect (POI). Localized POI's improve the project by reducing the need to install costly and environmentally impactful distribution infrastructure.

Currently, Natel offers two classes of hydroEngines. The Fully Flooded hydroEngine® is a state-of- the-art two stage impulse turbine, using straight blades mounted symmetrically on the belt perpendicular to the axis of travel. It is best suited for sites with very low heads and tailwater fluctuations as it works with a draft tube. The Linear Pelton (LP), Natel's most recent innovation, is a pure impulse, single-stage turbine composed of linearly-moving blade modules constrained to a path resembling a racetrack, or oval. The technology implements the highly efficient fluid mechanics of a Pelton style blade on a linear powertrain without requiring a draft tube, stators, wicket gates, stay vanes, or guide vanes. The turbine is installed horizontally above tailwater, requiring minimal excavation. Both system architecture's utilize carbon-fiber reinforced timing belts, allowing turbines to be designed with rated capacity of up to 1 MW.

The hydroEngine's plant layout means the turbine can be depowered while allowing instant full bypass. In irrigation canals, the ability to safely depower the runner without affecting flow rate can have important operational benefits for canal operators.

Assumptions

The hydropower system will achieve a water-to-wire efficiency of 71%. The assumptions driving this number are:

Eff_water-to-wire = eff_shaft x eff_gearbox x eff_generator

Turbine shaft efficiency: 78% (this includes all hydraulic and mechanical losses internal to the turbine)
Speed increaser efficiency: 97% (typical gearbox and synchronous belt power transmission efficiency is at least this high, and may be as high as 98%)
Generator efficiency: 94% (typical generator efficiency may be as high as 96%)

Thus
Eff_water-to-wire = 0.78 x 0.97 x 0.94 = 0.71

The water to wire efficiency calculation utilizes the net head available to the turbine. Losses such as head loss across the trashrack and penstock minor losses subtract from the gross head, to result in the net head available to the turbine.

H_net = H_gross - H_lossses

The following calculations assume a 20% head loss through the penstock and intake, and outlet.

Thus
H_net ~ 0.80 x H_gross

In our calculations, the head at each is based on the canal's original engineering drawings from USBR and does not account for fluctuations of tailwater and headwater which could result in additional losses.

Natel has evaluated NUID's main canal for quality hydropower sites. In 2015 Natel commissioned one site within the main canal and currently is in active development of ten additional sites. These sites were selected based a set of specific requirements including flow (cfs) and head (ft) data provided by NUID and USBR, the drops existing infrastructure, the proximity to the POI and distribution line capacity.

We assume flows are only available during the irrigation season, mid April through mid October. We used an average of the flow data from 2006-2016 to calculate our generation.

Calculations

For the NUID main canal, Natel factors in 1 CMS per mile of infiltration loss. In addition, for sites south (upstream) of Haystack Reservoir, Natel uses flow data from 2006-2016. In

2015 a new flow gauge was installed at Haystack Reservoir which provides accurate flow for all sites north of the reservoir. Natel has calculated generation for sites north of Haystack reservoir using the one year of flow data provided by the district. The flow data used by Natel is based on flow generation curve accounting for all days in the flow data. These generation figures are based on current flow data only and generation numbers may change with updated flow or head data.

FCA calculations differ from Natel's in several ways.
In an email to Natel, FCA explained their modeling assumptions as follows:
"

- *Growing season is 194 days*
- *Out of those 194 days, hydroelectric facility is operating 90% (174.6 days)*
- *Diversity of 60%. Average flow rate it is 60% of flow rate used to determine nameplate kW. Based on historical on-farm water delivery rates.*

"

The chart below summarizes the expected generation, using Natel's modeling methods.

Site name	Site Latitude/ Longitude	Canal Mile Marker	Gross Head (m)*	Plant Flow (cms)	kW	Annual MWh
Brinson Drop/Mile 2A	44.082201, -121.286401	1.78	6.09	20	660	2230
NE Purcell/Mile 2B	44.086971, -121.274233	2.11	6.09	20	660	2230
Deschutes Market/ Mile 3	44.092839, -121.256296	3.52	6.09	20	660	2230
Airport Drop/Mile 18	44.251184, -121.128517	18.34	6.7	21	761	2147
Haystack Reservoir/ Mile 43	44.500374, -121.154865	~45	18.2	7.1	833	3798
Loghouse/Mile 48	44.536587, -121.153547	47.98	3.66	7.2	120	545
Littleman Drop/Mile 50A	44.571091, -121.158783	~51	2.98	7	112	501
Littleman Check/Mile 50B	44.572124, -121.160127	~51	3.05	7	116	516
Dean Choin (1)/Mile 52A	44.601337, -121.162522	53.69	3.05	7	116	514

Dean Choin (2)/Mile 52B	44.603526, -121.161854	53.84	3.05	7	116	514

*Generation calculations based on design head.