Bureau of Reclamation

WaterSMART FY 2018

Water and Energy Efficiency Grant Application

Group II

Kennewick Irrigation District

2018 HDPE Canal Lining and

Water Conservation Project, Washington

Applicant:

Kennewick Irrigation District
2015 South Ely Street
Kennewick, WA 99337

Project Manager:

Charles Freeman
District Manager
2015 South Ely Street
Kennewick, WA 99337
cfreeman@kid.org
Office (509) 586-6012 Fax (509) 586-7663

May 10, 2018

Table of Contents

May 10, 2018
Kennewick Irrigation District
Kennewick, Washington
Benton County
Project Title: KID WaterSMART FY 2018 Canal Lining Project

TECHNICAL PROPOSAL

Executive Summary

The Kennewick Irrigation District (KID or District) submits this application for Funding Opportunity Announcement No. BOR-DO-18-F006 under **Water Conservation** for **Group II Funding** through the 2018 WaterSMART: Water and Energy Efficiency Grant Program from the Bureau of Reclamation (USBR).

The Kennewick Irrigation District is a federal Bureau of Reclamation supplied irrigation district and is a current recipient of Reclamation project water.

The KID has a project which would use this grant funding to install 5.63 miles of HDPE (high density polyethylene) geomembrane canal liner in the following areas:

- 20,533 lineal feet of the KID Main Canal – Division II
- 1,719 lineal feet of the KID Main Canal – Division III
- 7,448 lineal feet of the KID Main Canal – Division IV

This project will result in quantifiable and sustained water savings of 1,237 acre feet annually. Total project costs are $3,427,873.80 with KID contributing $2,427,873.80 or 70.8%. The schedule for this project would begin in the fall of 2018 and would be completed the spring of 2021.

Background Data

The Kennewick Division is part of the Bureau of Reclamation's Yakima Project in Washington and diverts water from the Yakima River at Prosser Dam, river mile 47.1. Lands within the KID are located south of the Yakima River and Columbia River and extend to the foot of the Horse Heaven Hills. The KID's canal system ends and spills water back to the Columbia River near river mile 317.5. The map on the following page shows the geographic location of the project.

Water rights for the KID can be traced to an August 6, 1891 water right claim filed by the Yakima Irrigation and Improvement Company and a conditional final order issued through the State of Washington Department of Ecology v. Acquavella adjudication which confirm a pro-ratable May 10, 1905 water right held by USBR for the benefit of the KID water users. KID's water rights provide a maximum annual diversion of 102,674 acre feet and a maximum instantaneous Yakima River diversion of 345 cubic feet per second (cfs). The diversion at Prosser Dam is the last USBR diversion on the Yakima River. From this diversion, water travels in the Chandler diversion canal to the Chandler Power and Pumping Plant.

The drive water that powers the two hydraulic pumps at Chandler pump water into the KID Main Canal at a rate of 5 units drive water to 4 units pumped water. So, for every 100 acre

feet of water conserved by KID and not pumped, an additional 125 acre-feet of water is conserved by not utilizing the drive water for pumping. The unused capacity in the Chandler Diversion Canal may then be used by Reclamation to divert additional water to produce additional electricity at Chandler according to the Reclamation staff at the Columbia Cascade area office.

KID delivers irrigation water to its customers via 74 miles of canal and over 300 miles of distribution water mains. The Main Canal was constructed in four divisions. The first three divisions are approximately 24 miles in length in total. At the Main Canal mile 14.5 the Badger Siphon diverts water to the Badger East and Badger West Lateral Canals which are 17 miles and 3 miles in length respectively. Division III of the Main Canal ends at the Amon Siphon and the Main Canal spillway. The Amon Siphon supplies water to Division IV of the Main Canal, the Highland Feeder Canal and the Amon Pump Laterals in Kennewick. Division IV of the Main Canal is approximately 18 miles in length.

KID has approximately 32.12 miles of earthen canal; 12.56 miles of concrete lined canal; 8.43 miles of EPDM lined canal; 15.5 miles of HDPE lined canal; 5.54 miles of PVC lined canal and 4.82 miles of siphon.

KID is a heavily urbanized district with 23,775 customers. Of these customers, 360 own parcels eight acres and larger, representing 9,667 acres of agricultural customers who grow alfalfa and grass hay, corn, wheat, pumpkins, asparagus, apples, cherries, peaches, pears, grapes and plums. In the urbanized areas of the District, irrigation water is used predominately for lawn watering, landscape and garden areas.

The District has a rolling 5 year capital plan that includes; lining and piping canals, conducting water management planning, installing water measurement devices, automation and telemetry and initiating programs and policies that improve water quality and more efficient water use.

This project is an integral part of KID's capital plan. In 2010, the District identified approximately 54.5 miles of canal to be lined. As of 2018, the District has completed lining approximately 24.0 miles of canal. KID is committed to lining an additional 4.2 miles of canal under its remaining 2016 WaterSMART Grant. The proposed project will line an additional 5.6 miles over three years for a total of 33.8 miles lined.

KID has a long and positive relationship with Reclamation that includes previous grant awards for the following projects:

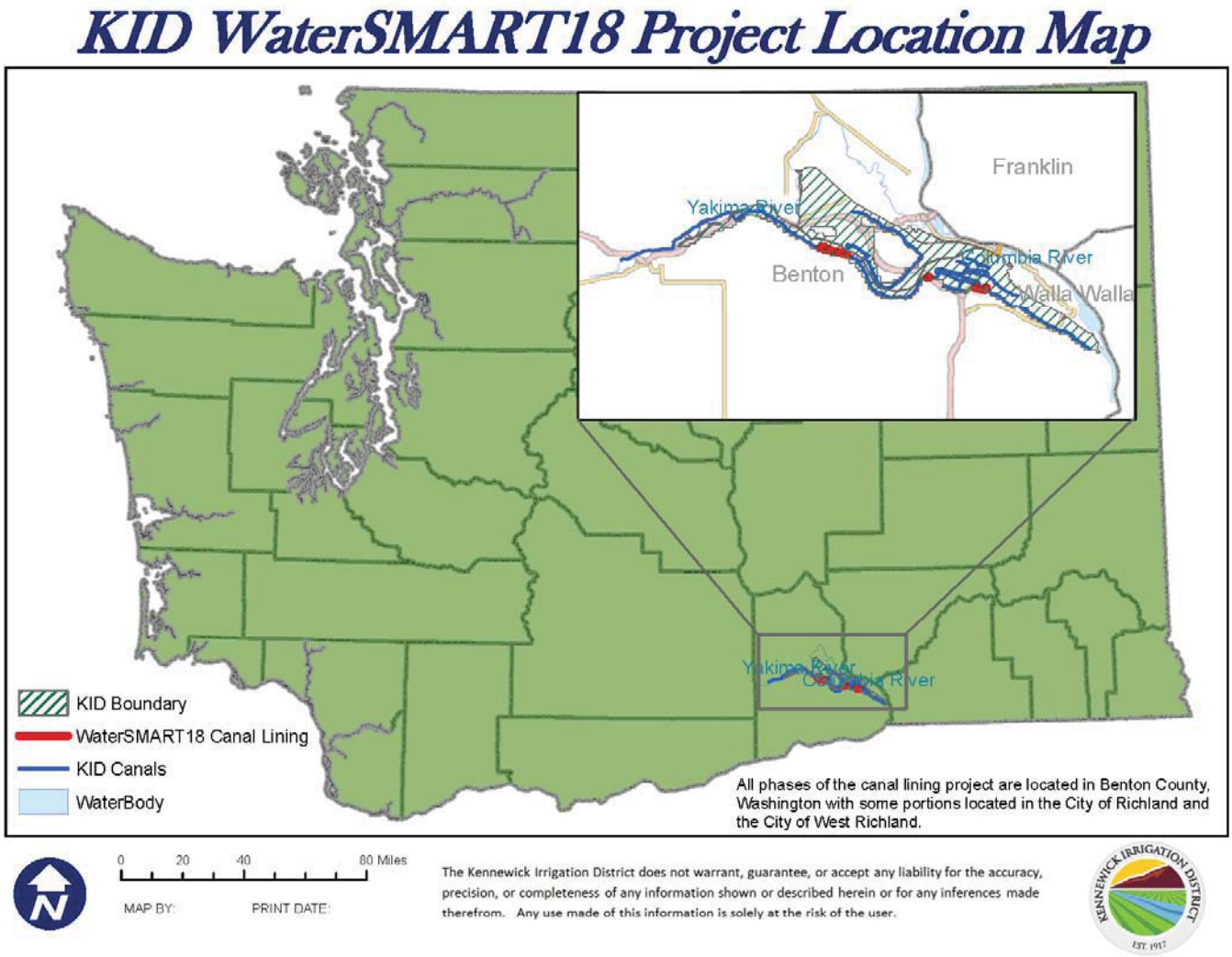
- 2016 WaterSMART: Water and Energy Efficiency Grant;
- 2013 WaterSMART: Water and Energy Efficiency Grant;
- 2011 WaterSMART: Water and Energy Efficiency Grant;
- 2011 Field Services Grant for poly-urea membrane lining of concrete panels;
- 2009 Seepage Reduction project;
- 2007 Technology Grant for the installation of a SCADA system on critical portions of the KID canal system.

Additionally, KID meets regularly with the USBR's Yakima Field Office staff regarding regional water supply and quality as well as actively participating in regional water supply

planning efforts under the authority of the Yakima River Basin Water Enhancement Project (YRBWEP).

Project Location

The vicinity maps and canal cross section figures shown on pages 22-26 show the geographic location and the installation details of the proposed HDPE lining project. Pages 27-28 are pictures of previous canal lining projects. The project is located in southeastern Washington State, including portions of Kennewick and unincorporated Benton County.



Technical Project Description

The project areas selected were based on water conservation, and public safety due to the substantial elevation changes from the canal embankment to downhill properties immediately adjacent to the canal.

KID has divided the HDPE canal project lining areas into 3 phases as shown below to match the duration of the WaterSMART grant.

Phase I (2018-2019)

- Main Canal – Division III: Station 1210+00 to Station 1227+19

The Main Canal Division III lining project proposes to line approximately 1,000 lineal feet of existing earth lined canal. From Station 1210+00 to Station 1227+19 the cross sectional width of the Badger East Lateral is about 56 feet for this section. The HDPE liner is placed in strips across the canal and welded. Strips are approximately 23 feet in width.

Phase II (2019-2020)

- Main Canal – Division II: Station 470+80 to Station 676+13

The Main Canal – Division II lining project proposes to line approximately 16,028 lineal feet of existing earth lined canal. From Station 471+68 to Station 676+13 the cross sectional width of the Main Canal is about 56 feet for this section. The HDPE liner is placed in strips across the canal and welded. Strips are approximately 23 feet in width.

Phase III (2020-2021)

- Main Canal – Division IV: Station 1541+50 to Station 1615+98

Main Canal – Division IV project proposes to line approximately 7,360 lineal feet of existing earth lined canal. From Station 1541+50 to Station 1615+98 the cross sectional width of the Main Canal – Division IV is about 56 feet for this section. The HDPE liner is placed in strips across the canal and welded. Strips are approximately 23 feet in width.

Evaluation Criteria

A. Quantifiable Water Savings (30 points)

KID's annual average water supply from the past 6 years is approximately 89,792 acre feet which includes deliveries to customers, operational spills, seepage and evaporation. The annual average water supply is excluding the 2015 pro-rationed water year due to drought. The total estimated amount of water conserved for all three phases is 1,237 acre-feet annually, through reduced canal seepage.

To calculate seepage losses the following formula is used:	
$S = \frac{(SR) * (WP) * (L) * (D)}{Acre}$	
S	Seepage in Acre-Feet/ Water Season, in ft./day
SR	Seepage rate (from USGS Study* see below)
WP	Wetted Perimeter of Canal Reach to be lined, in sq.ft.
L	Length of Canal Reach, in ft.
D	Days in Water Season

The Seepage rate was determined by a study shown in the attached excerpt, which was completed by the United States Geological Survey* (USGS) published in 1997 entitled "Changes in Ground-Water Levels and Ground-Water Budgets, from Predevelopment to 1986, in Parts of the Pasco Basin, WA.". (See Attachment A,

pages 30-31) In this study most of the reaches of the Main Canal which are proposed to be lined had a seepage rate established. The soil types for this analysis are shown in the attached excerpt from the "Soil Survey Benton County Area, Washington," issued by the United States Department of Agriculture, Soil Conservation Service in 1971. (See Attachment B, pages 32-37) Note: KID's water right is April 1 to October 31. Applying this formula results in the seepage amounts shown in the table below:

WaterSMART Seepage Analysis

Phase	***Location***	***Canal Section***	***Seepage Rates (ft/d)****	***Wetted Perimeter (ft)***	***Length (ft)***	***Days***	***Seepage (Acft/Year)***
			SR	***WP***	***L***	***D***	***S***
1	MC 22.9 to 23.2	Main Canal Division 3	0.4	39.3	1005	210	76
2	MC 8.9 to 12.8	Main Canal Division 2	0.3	42.8	16028	210	992
3	D4 29.2 to 30.6	Main Canal Division 4	0.2	23.7	7360	210	168
							Total 1,237

Upon completion of the project, the 60-Mil HDPE lining that is proposed effectively eliminates seepage loss. A detailed specification and description of the 60-Mil HDPE lining is included. (See attachment C, page 38)

Verifying the actual canal seepage reduction will be completed by inflow/outflow tests within the canal reaches to be lined. KID began inflow/outflow baseline testing at the end of the water season 2012, and will be continue with inflow/outflow testing every year in the future. The baseline inflow/outflow testing is completed at the beginning and end of the water season, when no water deliveries are occurring, allowing for a more accurate calculation of the water loss in the canal reach. In addition to the beginning and end of season testing, KID has a SCADA system that provides data to calculate losses in the canal reaches.

Water that seeps from KID canals returns to the lower Yakima and Columbia Rivers. Conserved water is governed by the 2001 State v. Acquavella settlement agreement, and its 2011 amendment, both entered into by KID, USBR, the Washington State Department of Ecology and the Yakama Indian Nation.

That portion of the water conserved by the project, which is required to stay in the Yakima River (412 acre feet), will stay in stream. The 825 acre feet of conserved water which is not required to stay in the river, can be better managed by KID and

beneficially used in drought years in a manner consistent with the State v. Acquavella settlement agreement. KID is allowed, but is not obligated to leave all conserved water in the Yakima River per the State v. Acquavella settlement agreement. The following table details where the conserved water will go.

Table of Water Conserved Resulting From Project			
Conserved Water	Drive Water at Chandler Pumps Not Diverted at Prosser for Conserved Water	**TOTAL**	
412 AF	515 AF	927 AF	**MINIMUM** addition to in stream flow
825 AF	1031 AF	1,856 AF	**67%** of Conserved Water together with Associated Drive Water total
1,237 AF	1,546 AF	2,783 AF	

In addition to the water conserved as shown in the table above, canal flows will be improved and transit times reduced allowing for more efficient water delivery. Water management will also be improved due to the safety and security of KID's canal facilities as a result of this project, especially for areas adjacent to or below canal embankments.

1.4% of the total average water supply will be conserved as a direct result of this

$$\frac{1{,}237\ (Estimated\ Amount\ of\ Water\ Conserved)}{89{,}792\ \ (Average\ Annual\ Water\ Supply)} = 1.4\%$$

B. Water Supply Reliability (18 points)

Project Support
In the past KID has received support from the Benton County Water Conservancy Board, the Benton County Conservation District and the Benton County Commissioners for similar projects to line existing earthen canals. In addition KID has received positive feedback from city leaders from the Cities of Kennewick, Richland and West Richland.

Benefits to Endangered Species
The species listed under the Endangered Species Act (ESA) in the Yakima River in Benton County include bull trout and mid-Columbia ESU steelhead. The water conservation savings resulting from the seepage reduction of this canal lining project will directly benefit the listed and other species of fish in the Yakima River.

The Prosser to Chandler reach of the Yakima River is identified as priority habitat for both ESA listed steelhead and bull trout. The Prosser to Chandler reach of the Yakima River is subject to reduced flows; particularly during peak water use summer months during drought years, due in part to Reclamation withdrawals for irrigation water. Both fish species are dependent on water for habitat. Approval of the project would incrementally improve their habitat and be a step toward eventual de-listing under ESA. A steelhead recovery plan is in place for the Yakima River basin, and goal number one of the Recovery Plan in the Lower Yakima River is increasing flows in the Prosser to Chandler Reach.

Water Marketing

The lining project allows KID to market 67% of the conserved water, or 825 acre feet, pursuant to the 2001 State v. Acquavella Settlement agreement for in stream flows in critical reaches of the Yakima River. The amount of water marketed will not exceed the amount of water conserved, and that portion which is available for marketing, would occur in a manner consistent with the formulas outlined in Sections 5 and 6 of the 2001 State v. Acquavella settlement agreement.

Other Contributions to Water Supply Sustainability

The water conserved by this project will be particularly beneficial to fish in drought and shortage years by increasing in-stream flows in a critical reach during critical low flow periods. Downstream benefits of additional flows continue through to the Pacific Ocean.

The Yakima Basin is a water short basin and the climate in the Basin is changing. Significant droughts occurred in 1977, 2001, 2005 and 2015. Intensive planning efforts have been ongoing since the 1970's to cure the long-term water supply shortages. KID had participated in the formulation of the Yakima Basin Integrated Plan and has endorsed its implementation. There has been significant tension and litigation over water supply for several decades. The State v. Acquavella adjudication has been ongoing since 1977.

In drought years, KID's water supply is pro-rationed based on the projected total water supply available in the basin. KID is dependent on return flows from other upstream USBR Yakima Project diversions including but not limited to, the Sunnyside Valley, Roza, Wapato and Kittitas Irrigation Districts. During drought years, the reduced water supply diminishes crop production, increased KID operation costs and increases competition for a scare resource. The lining project will incrementally reduce the negative effects of drought.

Upstream return flows are diminished when conservation projects are implemented upstream. Reducing KID's canal seepage improves long-term water supply sustainability in the Yakima Basin by reducing the District's water needs. Reduced water needs will reduce competition for scarce water from upstream sources in drought years and will incrementally reduce water related conflict.

This project implements prior collaboration with the Yakama Nation, Ecology, KID and USBR through the settlement agreement. The project will make additional water available to Indian Tribes through increased in stream flows provided to benefit ESA listed steelhead and fisheries important to the Yakama Nation.

Urbanization has stressed the KID system, which adds to the need to line canals to improve safety of downhill property owners and to improve the operational efficiency of the canal system. The project will also provide an increase in public safety levels by helping to prevent canal embankment failures which may result in property damage and/or loss of life.

C. Implementing Hydropower (18 points)

Implementing Renewable Energy Projects Related to Water Management and Delivery

Reduced diversions could allow for a commensurate increase in hydropower production through the Chandler generation station by USBR, according to USBR's Columbia Cascades Area staff. The increase in hydropower is calculated through the following equations:

$$hp = \frac{h_a * Q * SG}{3956}$$

Where:

hp = Horsepower

h_a = elevation difference = 618.48 ft. – 507.00 ft. (Centerline of Chandler Hydraulic Turbine) = 111.48 ft.

Q = Flow = 1,237 x (5/4 drive water ratio at Chandler) Acre-ft per 210 day water season = 1,666 gallons per min.

SG = Specific Gravity of Water = 1

$$hp = \frac{(111.48 \text{ ft.}) * (1{,}666 \text{ gpm}) * (1)}{3956} = 46.95 \text{ hp}$$

And using:

Total KWH = .7457 * hp * 24 hrs * 210 days

Where:

1 hp = .7457 KW

Total KWH = (.7457) * (46.95 hp) * (24 hrs.) * (210 days) = 176,453 KWH

Assuming a pump efficiency of 70%, the estimated commensurate increase in hydropower is 123,517 KWH per year of water conserved.

Increasing Energy Efficiency in Water Management

The proposed canal lining project increases hydraulic energy efficiency and water management by reducing the amount of energy necessary to deliver water in the KID system

The Bureau of Reclamation operates the Chandler Power and Pumping Plant which produces electricity for Reclamation and pumps water to the KID Main Canal utilizing two 167 cfs hydraulically powered pumps. These pumps lift the water delivered to KID from an elevation of 618.48 ft at the Chandler Canal to an elevation of 719.99 ft at the KID Main Canal, this lift that is provided equates to approximately 13,000 KWH per 100 Acre-Feet of water conserved. The total equivalent electrical energy reduced by not diverting the water conserved by the proposed lining project is calculated through the following equations:

$$hp = \frac{h_a * Q * SG}{3956}$$

Where:

hp = Horsepower

h_a = elevation difference = 719.99 ft. – 618.48 ft. = 101.51 ft.

Q = Flow = 1,237 Acre-ft per 210 day water season = 1,333 gallons per min.

SG = Specific Gravity of Water = 1

$$hp = \frac{(101.51 \text{ ft.}) * (1{,}333 \text{ gpm}) * (1)}{3956} = 34.20 \text{ hp}$$

And using:

Total KWH = .7457 * hp * 24 hrs * 210 days

Where:

1 hp = .7457 KW

Total KWH = (.7457) * (34.20 hp) * (24 hrs.) * (210 days) = 128,835 KWH

Assuming an electrical pump efficiency of 80%, the estimated equivalent energy savings for the conserved water is 161,044 KWH per year.

This equivalent energy savings is for the conserved canal seepage only, and does not include the drive water that is saved by not pumping water into the KID canal. This benefit to the project can be verified by measuring the amount of water diverted to the KID Main Canal. Reclamation currently measures the KID diversion on the Hydromet system. KID's water right is from April 1 to October 31.

D. Complementing On-Farm Irrigation Improvements (10 points)

Canal lining allows for KID to better manage the delivery of our irrigation water. The lined canals improve efficiency and reliability in the delivery of irrigation water to our farmers and growers. With continued canal lining and future improvements in automation, KID plans to shorten the water order times required for farmers and growers. Shortened water order times allow for farmers and growers to optimize irrigation efficiency by timing water use with climate conditions. This also helps farmers and grower in the development of their decision-making models and in the development of their Irrigation Water Management Plans (IWMP).

In addition, KID has seen many of our farmers and growers install on-farm improvements such as lined storage reservoirs. This generally allows them to better manage their water though irrigation scheduling and limits operational spills and over-applied irrigation.

E. Department of the Interior Priorities (10 points)

In addition to canal lining improving KID's drought resiliency by reducing seepage (which also improves Reclamation's ability to generate electricity by improving hydropower capacity, and reduces KID's power needs), canal lining provides needed infrastructure improvements to provide for better public safety by reducing the risk of a canal breach. As KID's canal program, which included programmatic environmental review at the beginning of the program, has focused on lining canals within the highly urbanized sections of the canal system, we have developed better relationships with those living directly adjacent to the canal system, as well as improving the overall trust that the community has in KID having reliable water delivery. Further KID has displayed the importance of these improvements by proposing funding levels greater than the required 50/50 cost share which also highlights that effective public/private partnerships make federal participation more cost effective.

F. Implementation and Results (6 points)

Subcriterion No.F.1 – Project Planning
The KID has a Water Conservation Plan adopted in April of 2009 and a December 2010 Feasibility Study in place supporting this project. This project implements the District's Water Conservation Plan, YRBWEP Integrated Plan, and Feasibility Study goals and objectives.

Additionally, this project implements the District's 5 year capital plan. The liner has been engineered specifically for the affected canal segments being lined. The project improves implementation of the USBR's Yakima Project operations plan.

The KID will be competing a HDPE canal lining project of the same type in March of 2019 on the KID Main Canal Division II and Badger East Lateral. The design and

specifications for the prior HDPE liner project are very similar and will be utilized again for the new project.

Subcriterion No.F.2 – Performance Measures

The performance measure that will verify the actual canal seepage reduction of 1,237 AF will be performed by completing inflow/outflow tests within the canal reaches to be lined. KID began inflow/outflow baseline testing at the end of the 2012 water season, and will be continue with inflow/outflow testing every year in the future. The baseline inflow/outflow testing is completed at the beginning and end of the water season, when no water deliveries are occurring, allowing for a more accurate calculation of the water loss in the canal reach. In addition to the beginning of season, end of season testing, KID has a SCADA system that provides data to calculate losses in the canal reaches.

The performance measure that will verify increased electricity production will be verified through the number of KWH produced by USBR at the Chandler Power and Pumping Plant, through the existing metering system at the site.

The performance measure that will verify the equivalent energy of 138,635 KWH per year is the reduced actual total diversion to KID from Reclamation as measured at the KID Main Canal. In this manner, the total number of acre feet reduced from the diversion will be able to be calculated to equivalent energy savings.

G. Nexus to Reclamation Project (4 points)

This project is connected to Reclamation project activities by meeting the goals of the District's Water Conservation Plan, and implementing Reclamation's Yakima Basin Integrated Water Management Plan (Integrated Plan).

The Kennewick Irrigation District is a federal Bureau of Reclamation supplied irrigation district and is a current recipient of Reclamation project water.

The proposed canal lining project involves Reclamation owned canals, which by contract are transferred works.

The project is located within the Kennewick Division of Reclamation's Yakima Project, which is within the Yakima River Basin. The proposed work will contribute water to a basin where a Reclamation project is located.

H. Additional Non-Federal Funding (4 points)

$$\frac{\$2,427,873.80 \text{ (Non-Federal Funding; KID's Share)}}{\$3,427,873.80 \text{ (Total project Cost)}} = 70.8\%$$

PROJECT BUDGET

Funding Plan and Letters of Commitment

KID is requesting the maximum funding under Group II or $1,000,000. The total cost for this project is estimated at $3,427,873.80. The Board of Directors approved submission of this grant application and matching funds from the KID capital improvement budget through the 2018-2021 budgets.

No letters of commitment from other organizations are applicable. The only funding partners are KID rate payers. The KID Board will authorized the submittal of this grant application for 2018 WaterSMART funding by resolution during a board meeting on May 15, 2018.

Table Summary of Non-Federal and Federal Funding Sources

Funding Sources	Funding Amount
Non Federal Entities: 1) KID In-Kind Contribution	*$1,577,090.75
2) KID Cash Contribution	$850,783.05
Non Federal Subtotal:	$2,427,873.80
Other Federal Entities 1) None	0
Other Federal Subtotal:	0
Requested Reclamation Funding:	$1,000,000
Total Project Funding:	$3,427,873.80

(* denotes in-kind contribution)

KID is requesting Reclamation funding according to the following schedule.

Funding Group II request			
	Year 1 (FY 2018)	Year 2 (FY 2019)	Year 3 (FY 2020)
Funding requested	$200,000	$450,000	$350,000

Salaries and Wages

Budget Item Description		Phase I Rate	Unit	Quantity	Total	Phase II Rate	Unit	Quantity	Total	Phase III Rate	Unit	Quantity	Total
1)	Program Manager	$ 72.68	/Hr	40	$ 2,907.24	$ 76.32	/Hr	120	$ 9,157.81	$ 80.13	/Hr	80	$ 6,410.46
2)	Staff Engineer	$ 39.17	/Hr	320	$ 12,532.80	$ 41.12	/Hr	960	$ 39,478.32	$ 43.18	/Hr	640	$ 27,634.82
3)	Inspector/Field Technician	$ 31.64	/Hr	120	$ 3,796.38	$ 33.22	/Hr	360	$ 11,958.60	$ 34.88	/Hr	300	$ 10,463.77
4)	Foreman	$ 38.73	/Hr	300	$ 11,620.35	$ 40.67	/Hr	900	$ 36,604.10	$ 42.70	/Hr	425	$ 18,149.53
5)	Field Operations Lead	$ 34.18	/Hr	300	$ 10,253.25	$ 35.89	/Hr	900	$ 32,297.74	$ 37.68	/Hr	425	$ 16,014.29
6)	Maintenance/Canal	$ 27.66	/Hr	2200	$ 60,845.40	$ 29.04	/Hr	6600	$ 191,663.01	$ 30.49	/Hr	3295	$ 100,470.62
7)	Part-Time Labor/Seasonal	$ 14.58	/Hr	800	$ 11,667.60	$ 15.31	/Hr	2000	$ 30,627.45	$ 16.08	/Hr	1134	$ 18,234.05
8)	Comptroller	$ 64.84	/Hr	12	$ 778.05	$ 68.08	/Hr	12	$ 816.95	$ 71.48	/Hr	12	$ 857.80
9)	Senior Accountant	$ 35.86	/Hr	12	$ 430.29	$ 37.65	/Hr	12	$ 451.80	$ 39.53	/Hr	12	$ 474.39
10)	Accounting Tech/Clerk	$ 29.34	/Hr	12	$ 352.04	$ 30.80	/Hr	12	$ 369.65	$ 32.34	/Hr	12	$ 388.13
				Subtotal	**$ 115,183.40**			Subtotal	**$ 353,425.43**			Subtotal	**$ 199,097.89**

Fringe

Budget Item Description		Phase I Rate	Unit	Quantity	Total	Phase II Rate	Unit	Quantity	Total	Phase III Rate	Unit	Quantity	Total
10)	Program Manager	$ 31.65	/Hr	40	$ 1,266.02	$ 33.87	/Hr	120	$ 4,063.94	$ 36.24	/Hr	80	$ 2,898.94
11)	Staff Engineer	$ 17.06	/Hr	320	$ 5,457.86	$ 18.25	/Hr	960	$ 17,519.72	$ 19.53	/Hr	640	$ 12,497.40
12)	Inspector/Field Technician	$ 13.78	/Hr	120	$ 1,653.79	$ 14.75	/Hr	360	$ 5,308.67	$ 15.78	/Hr	300	$ 4,733.57
13)	Foreman	$ 21.60	/Hr	300	$ 6,480.99	$ 23.12	/Hr	900	$ 20,803.98	$ 24.73	/Hr	425	$ 10,511.79
14)	Field Operations Lead	$ 19.06	/Hr	300	$ 5,717.01	$ 20.39	/Hr	900	$ 18,351.60	$ 21.82	/Hr	425	$ 9,272.66
15)	Maintenance/Canal	$ 15.42	/Hr	2200	$ 33,921.14	$ 16.50	/Hr	6600	$ 108,886.86	$ 17.65	/Hr	3295	$ 58,166.21
16)	Part-Time Labor/Seasonal	$ 3.15	/Hr	800	$ 2,516.64	$ 3.37	/Hr	2000	$ 6,732.01	$ 3.60	/Hr	1134	$ 4,084.24
17)	Comptroller	$ 32.95	/Hr	12	$ 395.34	$ 35.25	/Hr	12	$ 423.02	$ 37.72	/Hr	12	$ 452.63
18)	Senior Accountant	$ 18.22	/Hr	12	$ 218.67	$ 19.50	/Hr	12	$ 233.97	$ 20.86	/Hr	12	$ 250.35
19)	Accounting Tech/Clerk	$ 14.91	/Hr	12	$ 178.86	$ 15.95	/Hr	12	$ 191.38	$ 17.06	/Hr	12	$ 204.78
				Subtotal	**$ 57,806.32**			Subtotal	**$ 182,515.15**			Subtotal	**$ 103,072.56**

KID Owned Equipment

Budget Item Description		Phase I Rate	Unit	Quantity	Total	Phase II Rate	Unit	Quantity	Total	Phase III Rate	Unit	Quantity	Total
20)	CAT 312C Excavator	$ 45.32	/Hr	40	$ 1,812.80	$ 45.32	/Hr	120	$ 5,438.40	$ 45.32	/Hr	80	$ 3,625.60
21)	JD 310SJ Loader/Backhoe	$ 23.32	/Hr	8	$ 186.56	$ 23.32	/Hr	8	$ 186.56	$ 23.32	/Hr	8	$ 186.56
22)	JD 650J Crawler/Dozer	$ 42.21	/Hr	160	$ 6,753.60	$ 42.21	/Hr	480	$ 20,260.80	$ 42.21	/Hr	320	$ 13,507.20
23)	JD 450G Crawler/Dozer	$ 27.56	/Hr	80	$ 2,204.80	$ 27.56	/Hr	24	$ 661.44	$ 27.56	/Hr	320	$ 8,819.20
24)	Mack GUB13 Dump Truck (1)	$ 51.04	/Hr	240	$ 12,249.60	$ 51.04	/Hr	720	$ 36,748.80	$ 51.04	/Hr	480	$ 24,499.20
25)	Mack GUB13 Dump Truck (2)	$ 51.04	/Hr	240	$ 12,249.60	$ 51.04	/Hr	720	$ 36,748.80	$ 51.04	/Hr	480	$ 24,499.20
26)	JD 544J Loader	$ 53.24	/Hr	120	$ 6,388.80	$ 53.24	/Hr	360	$ 19,166.40	$ 53.24	/Hr	320	$ 17,036.80
27)	JD 770A Motor Grader	$ 52.94	/Hr	8	$ 423.52	$ 52.94	/Hr	8	$ 423.52	$ 52.94	/Hr	8	$ 423.52
28)	CAT 301.8 Mini-Excavator	$ 8.77	/Hr	8	$ 70.16	$ 8.77	/Hr	8	$ 70.16	$ 8.77	/Hr	8	$ 70.16
29)	CAT 563C Roller	$ 56.94	/Hr	20	$ 1,138.80	$ 56.94	/Hr	60	$ 3,416.40	$ 56.94	/Hr	80	$ 4,555.20
30)	Ford L8000 Water Truck	$ 56.98	/Hr	160	$ 9,116.80	$ 56.98	/Hr	480	$ 27,350.40	$ 56.98	/Hr	320	$ 18,233.60
31)	CAT 140M Grader	$ 66.00	/Hr	80	$ 5,280.00	$ 66.00	/Hr	240	$ 15,840.00	$ 66.00	/Hr	160	$ 10,560.00
32)	JD 850K Dozer	$ 92.10	/Hr	80	$ 7,368.00	$ 92.10	/Hr	240	$ 22,104.00	$ 92.10	/Hr	320	$ 29,472.00
33)	JD 85D Excavator	$ 30.96	/Hr	80	$ 2,476.80	$ 30.96	/Hr	240	$ 7,430.40	$ 30.96	/Hr	20	$ 619.20
34)	Truck Option (Pal-Finger)	$ 26.32	/Hr	20	$ 526.40	$ 26.32	/Hr	60	$ 1,579.20	$ 26.32	/Hr	20	$ 526.40
35)	JD 160G Excavator	$ 47.83	/Hr	40	$ 1,913.20	$ 47.83	/Hr	60	$ 2,869.80	$ 47.83	/Hr	20	$ 956.60
36)	Ford F-800 Palfinger	$ 43.31	/Hr	8	$ 346.48	$ 43.31	/Hr	8	$ 346.48	$ 43.31	/Hr	8	$ 346.48

37)	Bobcat T770 (Skid Steer)	$ 18.14	/Hr	80	$ 1,451.20	$ 18.14	/Hr	240	$ 4,353.60	$ 18.14	/Hr	160	$ 2,902.40
38)	Mack CV713 Dump Truck	$ 51.04	/Hr	240	$ 12,249.60	$ 51.04	/Hr	720	$ 36,748.80	$ 51.04	/Hr	480	$ 24,499.20
39)	International 7400 Water Truck	$ 56.98	/Hr	160	$ 9,116.80	$ 56.98	/Hr	480	$ 27,350.40	$ 56.98	/Hr	320	$ 18,233.60
				Subtotal	**$ 93,323.52**			Subtotal	**$ 269,094.36**			Subtotal	**$ 203,572.12**

Rental Equipment		Phase I				Phase II				Phase III			
Budget Item Description		**Rate**	**Unit**	**Quantity**	**Total**	**Rate**	**Unit**	**Quantity**	**Total**	**Rate**	**Unit**	**Quantity**	**Total**
40)	JD 250G Excavator	$ 9,486.80	/Mo		$ -	$ 9,486.80	/Mo		$ -	$ 9,486.80	/Mo		$ -
41)	JD 544J Loader	$ 7,073.40	/Mo		$ -	$ 7,073.40	/Mo		$ -	$ 7,073.40	/Mo		$ -
42)	JD 844J Loader	$ 19,718.40	/Mo	1	$ 19,718.40	$ 19,718.40	/Mo	2	$ 39,436.80	$ 19,718.40	/Mo	2	$ 39,436.80
43)	Dump Truck	$ 9,744.27	/Mo	1	$ 9,744.27	$ 9,744.27	/Mo	2	$ 19,488.53	$ 9,744.27	/Mo	2	$ 19,488.53
44)	Dump Truck Pup (1)	$ 3,925.00	/Mo	1	$ 3,925.00	$ 3,925.00	/Mo	2	$ 7,850.00	$ 3,925.00	/Mo	2	$ 7,850.00
45)	Dump Truck Pup (2)	$ 3,925.00	/Mo	1	$ 3,925.00	$ 3,925.00	/Mo	2	$ 7,850.00	$ 3,925.00	/Mo	2	$ 7,850.00
46)	140M2 Grader	$ 11,988.00	/Mo	1	$ 11,988.00	$ 11,988.00	/Mo	2	$ 23,976.00	$ 11,988.00	/Mo	2	$ 23,976.00
47)	Brush Chipper	$ 3,042.89	/Mo		$ -	$ 3,042.89	/Mo		$ -	$ 3,042.89	/Mo		$ -
48)	CAT 140H Grader	$ 9,204.67	/Mo		$ -	$ 9,204.67	/Mo		$ -	$ 9,204.67	/Mo		$ -
49)	CAT 316E Excavator	$ 6,930.80	/Mo		$ -	$ 6,930.80	/Mo		$ -	$ 6,930.80	/Mo		$ -
50)	CAT 9K Telehandler	$ 4,532.80	/Mo	1	$ 4,532.80	$ 4,532.80	/Mo	2	$ 9,065.60	$ 4,532.80	/Mo	1	$ 4,532.80
51)	CAT 938K Loader	$ 6,836.40	/Mo		$ -	$ 6,836.40	/Mo		$ -	$ 6,836.40	/Mo		$ -
52)	Water Truck (5000 gallon)	$ 8,516.53	/Mo		$ -	$ 8,516.53	/Mo		$ -	$ 8,516.53	/Mo		$ -
53)	CAT D10 Dozer	$ 39,989.33	/Mo	0	$ -	$ 39,989.33	/Mo	3	$ 119,968.00	$ 39,989.33	/Mo		$ -
				Subtotal	$ 53,833.47			Subtotal	$ 227,634.93			Subtotal	$ 103,134.13
				Sales Tax (8.6%)	$ 4,629.68			Sales Tax (8.6%)	$ 19,576.60			Sales Tax (8.6%)	$ 8,869.54
				Grand Total	**$ 58,463.14**			**Grand Total**	**$ 247,211.54**			**Grand Total**	**$ 112,003.67**

Supplies/Materials		Phase I				Phase II				Phase III			
Budget Item Description		**Rate**	**Unit**	**Quantity**	**Total**	**Rate**	**Unit**	**Quantity**	**Total**	**Rate**	**Unit**	**Quantity**	**Total**
54)	HDPE	$ 0.35	SF	102,080	$ 35,728.00	$ 0.35	SF	1,607,440	$ 562,604.00	$ 0.35	SF	570,545	$ 199,690.75
55)	Trash Rack	$ 20,000.00	EA	1	$ 20,000.00	$ 20,000.00	EA	6	$ 120,000.00	$ 20,000.00	EA	3	$ 60,000.00
56)	Walk-Way Plank	$ 4,600.00	EA	0	$ -	$ 4,600.00	EA	1	$ 4,600.00	$ 4,600.00	EA	2	$ 9,200.00
57)	Gravel (Picked Up)	$ 8.32	Ton	716	$ 5,957.12	$ 8.32	Ton	7,818	$ 65,045.76	$ 8.32	Ton	2,984	$ 24,826.88
58)	Concrete	$ 116.38	CY	300	$ 34,914.00	$ 116.38	CY	580	$ 67,500.40	$ 116.38	CY	290	$ 33,750.20
59)	Rebar	$ 0.31	LF	32,640	$ 10,118.40	$ 0.31	LF	63,880	$ 19,802.80	$ 0.31	LF	31,880	$ 9,882.80
60)	Inlets (18-inch)	$ 20.00	LF	0	$ -	$ 20.00	LF	12	$ 240.00	$ 20.00	LF	0	$ -
61)	Turnout Gates	$ 793.68	EA	0	$ -	$ 793.68	EA	10	$ 7,936.80	$ 793.68	EA	2	$ 1,587.36
62)	Handrail	$ 2.66	LF	340	$ 904.40	$ 2.66	LF	1,400	$ 3,724.00	$ 2.66	LF	1,100	$ 2,926.00
63)	Weld Strips	$ 5.40	LF	560	$ 3,024.00	$ 5.40	LF	1,625	$ 8,775.00	$ 5.40	LF	660	$ 3,564.00
				Subtotal	$ 110,645.92			Subtotal	$ 860,228.76			Subtotal	$ 345,427.99
				Sales Tax (8.6%)	$ 9,515.55			Sales Tax (8.6%)	$ 73,979.67			Sales Tax (8.6%)	$ 29,706.81
				Grand Total	**$ 120,161.47**			**Grand Total**	**$ 934,208.43**			**Grand Total**	**$ 375,134.80**

Environmental Compliance		Phase I				Phase II				Phase III			
Budget Item Description		**Rate**	**Unit**	**Quantity**	**Total**	**Rate**	**Unit**	**Quantity**	**Total**	**Rate**	**Unit**	**Quantity**	**Total**
64)	Environ., Cult., and Hist. Review	$ 1,200.00	LS	1	$ 1,200.00	$ 1,200.00	LS	1	$ 1,200.00	$ 1,200.00	LS	1	$ 1,200.00

		Phase I Total	**$ 446,137.86**	**Phase II Total**	**$ 1,987,654.91**
				Phase III Total	**$ 994,081.03**
				Total Project Costs	**$ 3,427,873.80**

Budget Narrative

Salaries & Wages; Fringe: The KID Engineering Manager (Project Manager), Staff Engineers, Inspectors, Foreman, Equipment Operators, Laborers-Full and Part-Time, Comptroller, and Accounting will provide the labor for all phases and for the engineering of the project. Their actual salary rates and individual fringe benefit and tax rates are included under "Fringe" in the calculation of hours in the Budget Proposal. These wages have been increased by 5% for each phase of the project to reflect probable yearly wage increases per collective bargaining agreements. Included is a supporting spreadsheet for KID labor and benefit rates. (See Attachment E, page 43)

Equipment: Equipment Rentals are broken down into two parts:

- **KID Owned Equipment**
- **Rental Equipment**.

KID Owned Equipment is shown as items 20 to 39 of the Budget Proposal in section K. KID owned equipment rates are based on the "Construction Equipment Ownership and Operation Schedule, Region VIII" by U.S. Army Corps of Engineer's Volume 8, November 2016, excerpts of applicable sections of the pamphlet are attached. (See Attachment F, pages 44-46). The KID Foreman on the job will track hourly equipment use and report it daily to an assigned accounting technician.

Rental Equipment is shown as items 40 to 53 of the Budget Proposal in section K. Rental equipment rates are based on Washington State contract pricing. As a public agency, KID is able to enter into an agreement with the State of Washington for various contract purchases. The tabulation of these bids is attached. (See Attachment G, pages 47) Added to the rental rates from the agencies is the fuel component of the Army Corps rates for equipment.

Supplies/Materials: KID will contract with the lowest responsible bidder for materials on this project. Materials will be purchased prior to breaking ground on the project phases. Prices used in the project estimate are based bids received in 2017 and 2018. (See Attachment H, pages 48-54)

Item 54, HDPE, is based on the previous purchases of HDPE liner made in 2017. Pricing quotes range from $0.33 to $0.34 per square foot. It was assumed that prices will increase for the next liner purchase to a price near the previous high bid.

Item 55 and 56, Trash Rack and Walk-Way Plank, are based upon KID's previous canal appurtenance designs and corresponding material purchases.

Item 57 through 63, are all based on average prices of past orders.

Environmental Compliance: $1,200 is projected for technical assistance from the Yakima office of the Bureau of Reclamation to complete all of the NEPA and cultural resource compliance requirements necessary for this project.

ENVIRONMENTAL AND CULTURAL RESOURCES COMPLIANCE

Environmental compliance will be achieved by securing the applicable permits, if any, prior to any ground-disturbing activity in preparation of the canal lining installation. KID prepared and submitted a programmatic cultural and environmental review, which included the project sites, to the USBR in 2012. A categorical exclusion checklist No. 2012-CCA-103C was issued on October 26, 2012. A copy of this checklist is included. (See attachment D, pages 39-42)

This project will not create a measurable negative impact to surrounding soil and animal habitat areas, endangered or threatened species, critical habitat areas, wetlands or other surface waters inside the project boundaries. Dust impacts will be minimal during construction and improved after completion of the liner installation. Noise impacts during construction will not adversely impact ESA listed species.

Due to the District's ongoing vegetation management program, this project will not contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species of plants in our area.

The construction of the KID delivery system in its current form was completed in 1957. None of the features of the irrigation system are listed on the National Register of Historic Places, and while constructed in 1957, they have no known historical significance. This project will not result in any modifications to the features of the KID irrigation system. There are no known archeological sites in the proposed project area nor will this project impact or cause adverse effects to tribal lands, low income or minority populations.

REQUIRED PERMITS OR APPROVALS

Compliance with the National Environmental Policy Act (NEPA) has been completed. Compliance with the state environmental policy act (SEPA) is required for this project, and will be completed prior to each phase. The KID Board of Directors is required by District policy and state bidding laws to award the project materials contract(s) to the lowest responsible bidder during a public meeting. A KID/USBR grant contract is required. Applicable state and local permits, if any, will be obtained prior to construction.

LETTERS OF PROJECT SUPPORT

In a previous WaterSMART application KID has received letters of support the Benton County Water Conservancy Board, the Benton County Conservation District and the Benton County Commissioners. KID has solicited for letters of support the same organizations. Letters are forthcoming and will be sent to Reclamation as they arrive as additional attachments.

OFFICIAL RESOLUTION

Resolution 2018-19 meeting the requirements of this application is shown on the following page. The KID Board of Directors will meet on Tuesday, May 15, 2016 at which time the resolution will be adopted. The Resolution will be sent to Reclamation as an additional attachment.

Please return to:

Executive Assistant
Kennewick Irrigation District
2015 South Ely Street
Kennewick, WA 99337

KENNEWICK IRRIGATION DISTRICT
RESOLUTION 2018-19

Official Resolution for FY 2018 WaterSMART Grant Application Group II

A RESOLUTION of the Board of Directors of Kennewick Irrigation District (KID), Benton County, Washington, for the purpose of authorizing the District Secretary/Manager as official representative and signature authority for KID in matters relating to the financial and legal obligations associated with the receipt of FY 2018 WaterSMART Grant, Group II financial assistance if awarded.

WHEREAS, the Board of Directors of KID (the Board) met in regular session on May 15, 2018 with a quorum present; and

WHEREAS, KID is submitting an application for FY 2018 WaterSMART Grant funding Group II, in the amount of $1 Million dollars to complete a canal lining project with matching funds. The application is due May 10, 2018; and

WHEREAS, the Board is required to appoint an official signature authority representing KID in matters relating to the financial and legal obligations associated with the receipt of FY 2018 WaterSMART Grant, Group II financial assistance and names Charles Freeman, District Secretary Manager as that representative; and

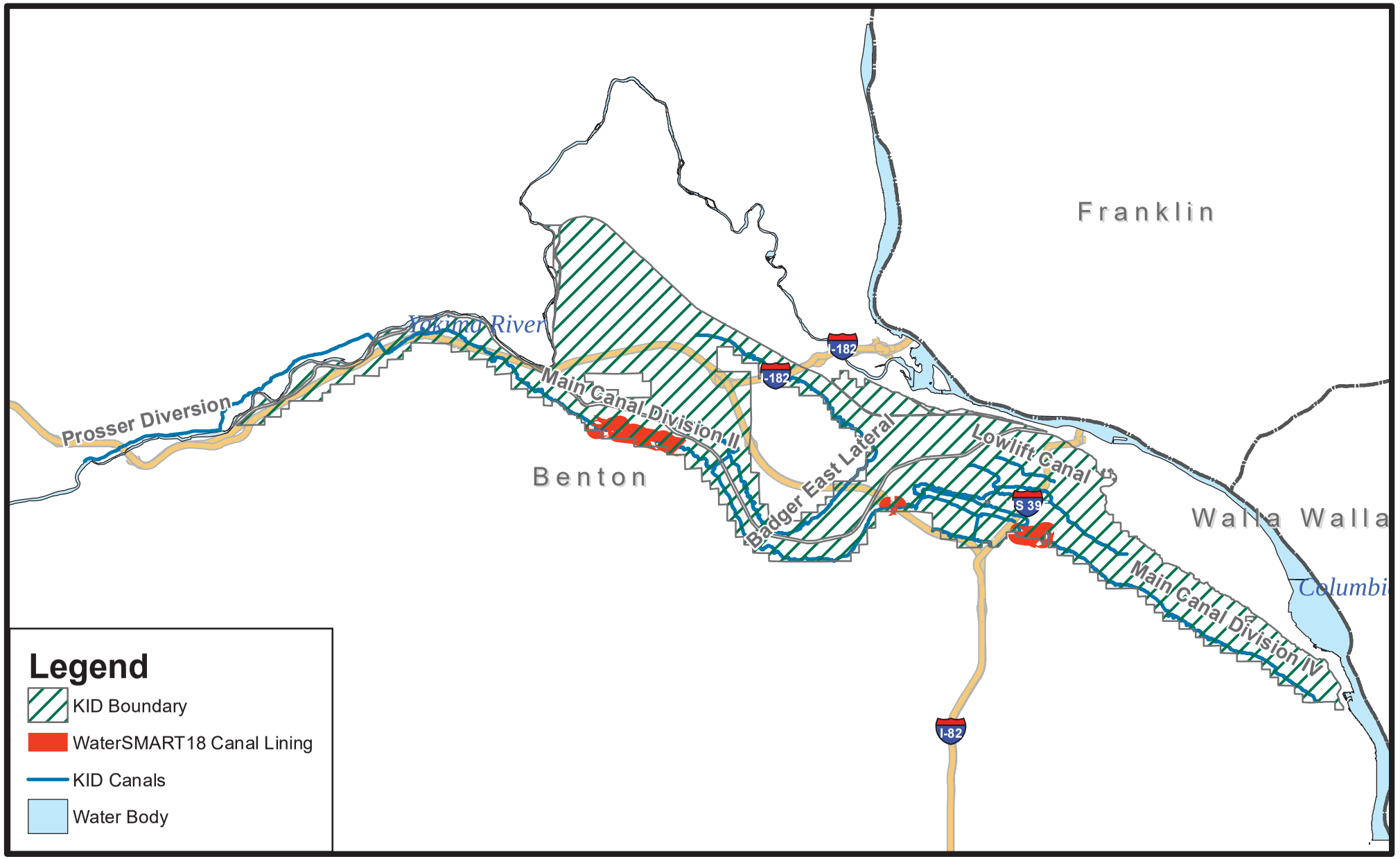
WHEREAS, KID has budgeted appropriately to complete the project and to meet the requirements of the matching funds criteria and is prepared to work with Reclamation to meet established deadlines associated with the cooperative agreement of this grant award.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE KENNEWICK IRRIGATION DISTRICT, BENTON COUNTY, WASHINGTON, that Charles Freeman, District Secretary Manager is authorized as the official representative and signature authority for KID in matters relating to the financial and legal obligations and requirements associated with the receipt of FY 2018 WaterSMART Grant, Group II financial assistance.

RESOLUTION 2018-19 IS HEREBY ADOPTED by the Board of Directors of Kennewick Irrigation District, Benton County, Washington, at a regular open public meeting thereof this 15th day of May 2018. This resolution supersedes all previous resolutions relating to the FY 2018 WaterSMART Grant Application.

_____	_____
Dean Dennis	**Kirk Rathbun**
_____	_____
Gene Huffman	**David McKenzie**
_____	
Raman Venkata	

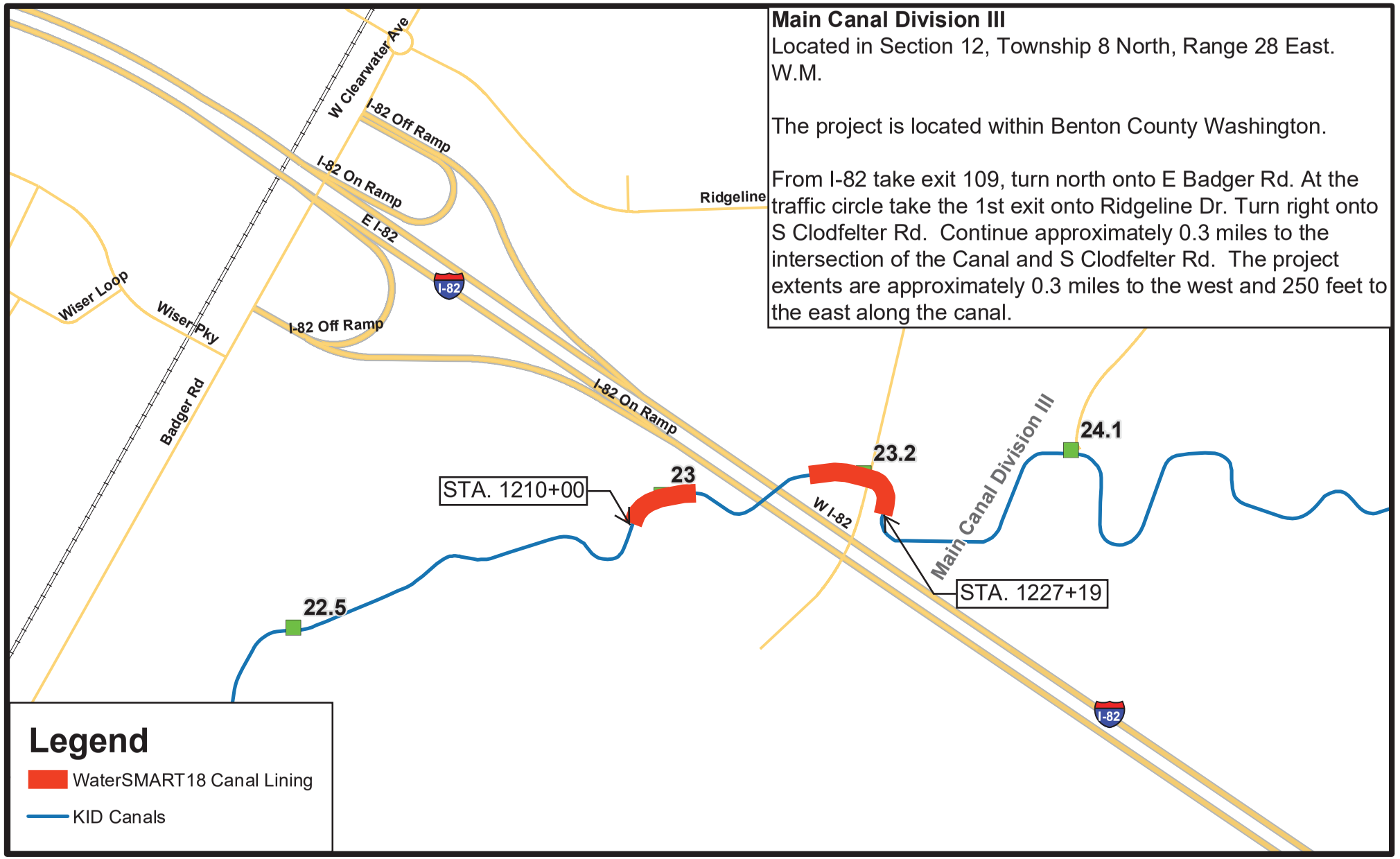
MAPS & DRAWINGS



KID WaterSMART18 Canal Lining Locator Map

N
W E
S

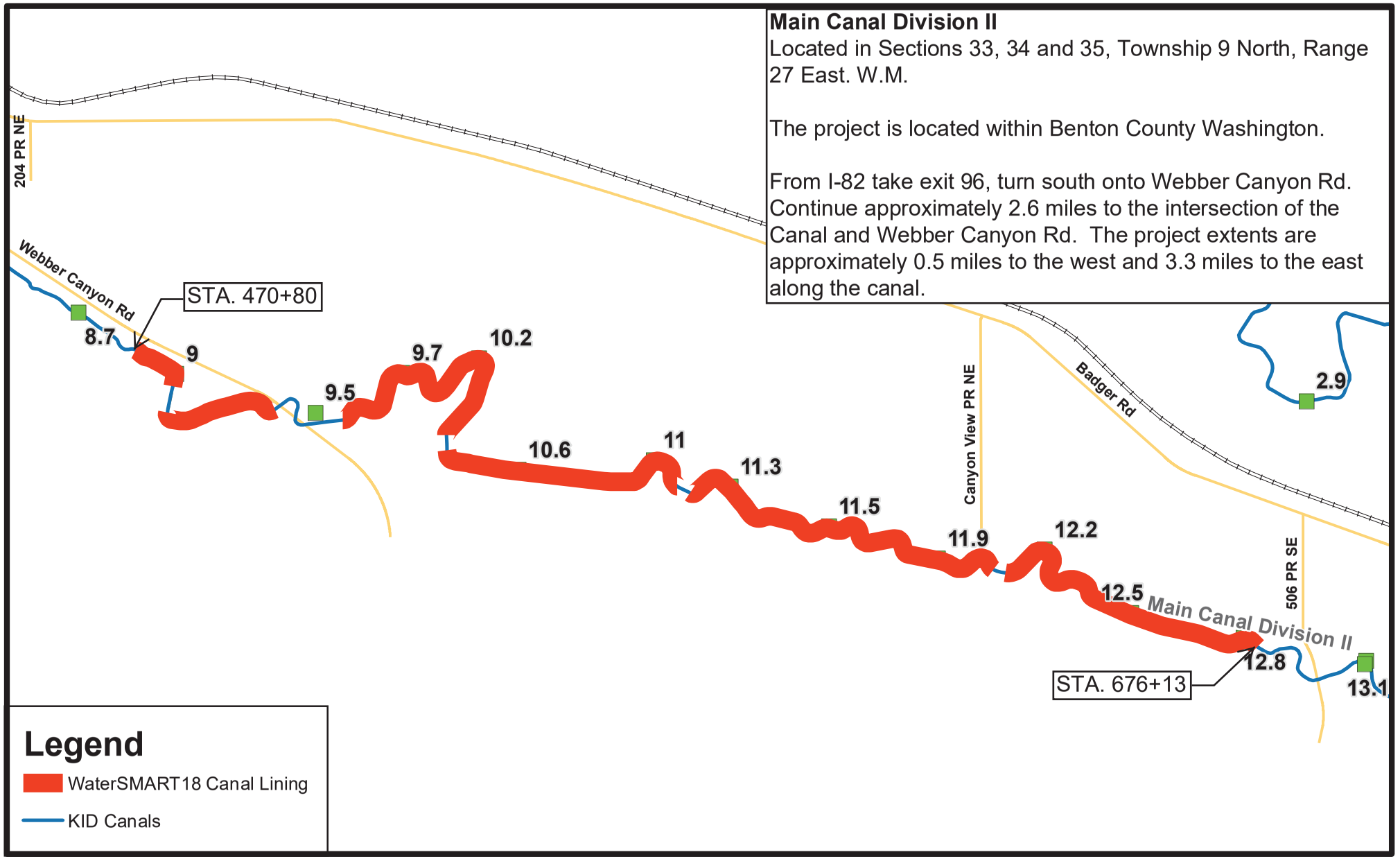
0 3.25 6.5 13
Miles



KID WaterSMART18 Canal Lining Locator Map

N
W E
S

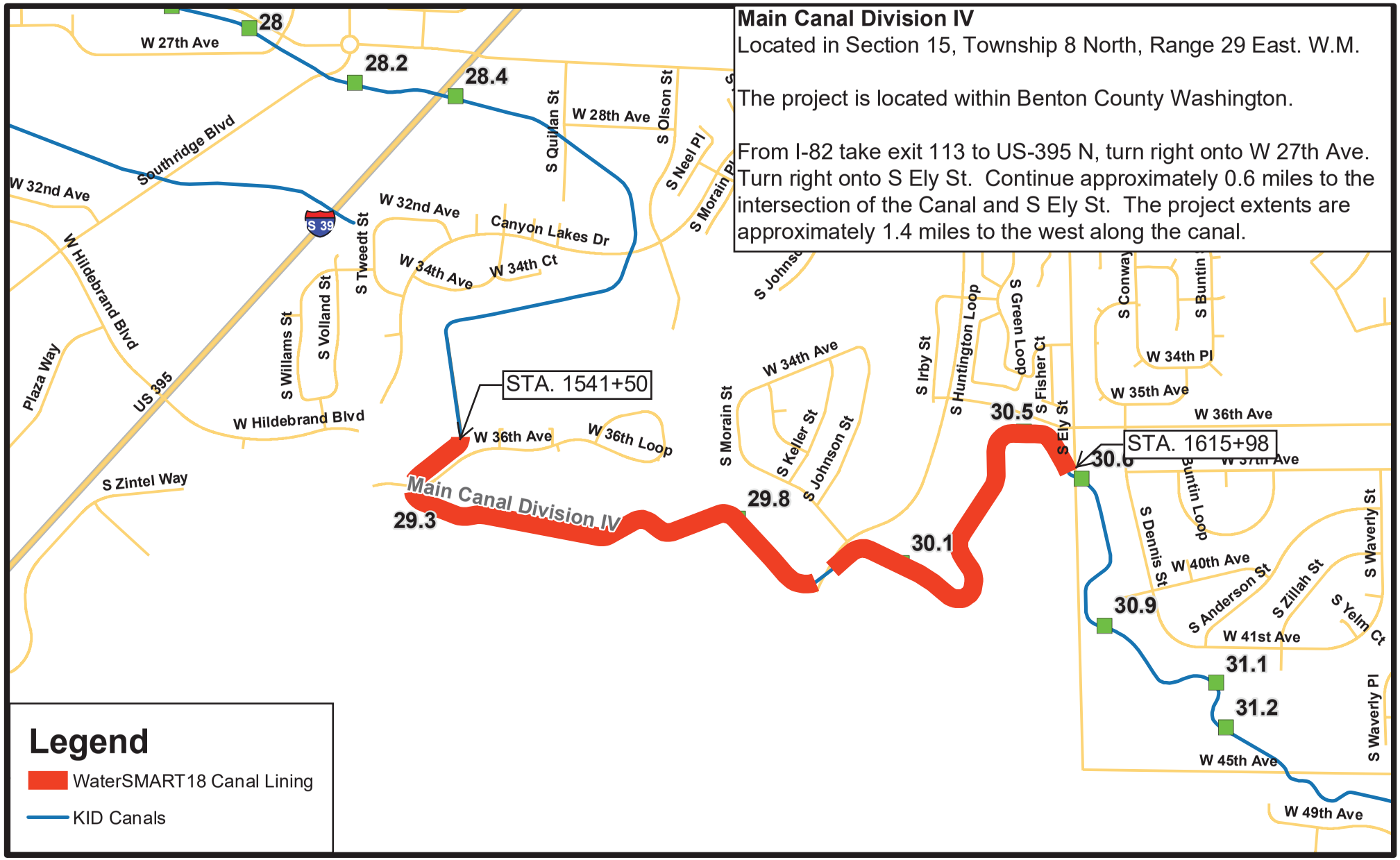
0 0.1 0.2 0.4
Miles



KID WaterSMART18 Canal Lining Locator Map

N
W E
S

0 0.25 0.5 1
Miles

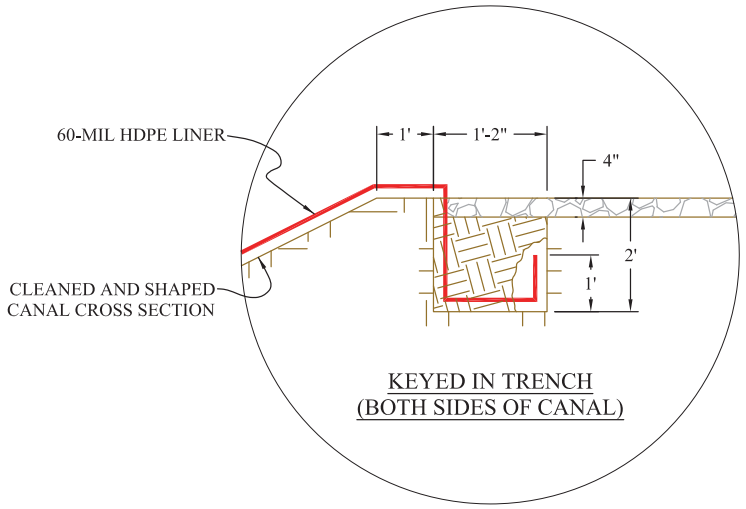


KID WaterSMART18 Canal Lining Locator Map

N
W E
S

0 0.15 0.3 0.6
Miles

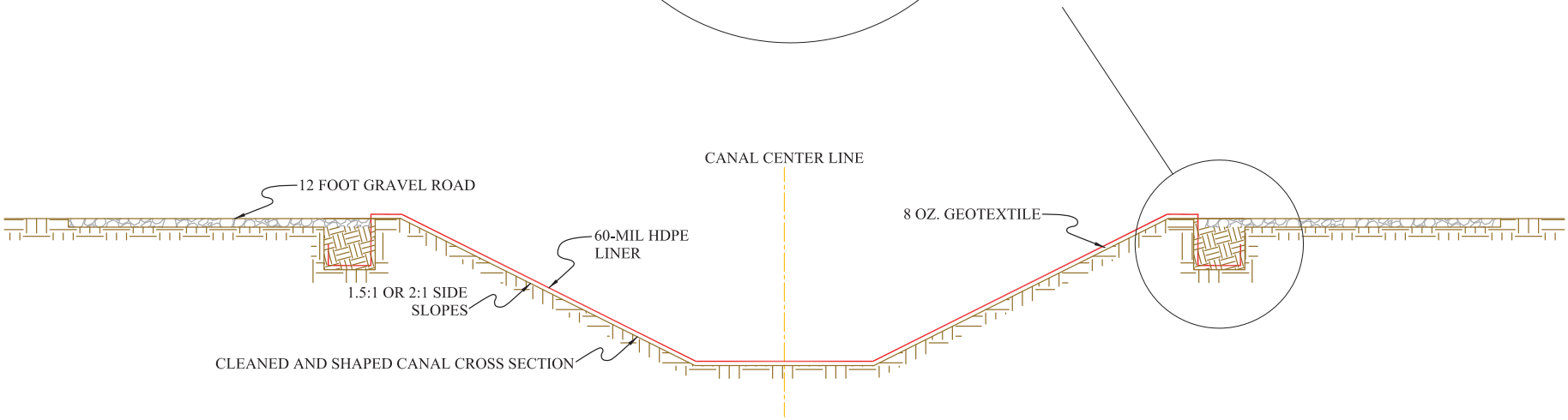
HDPE LINING



KEYED IN TRENCH
(BOTH SIDES OF CANAL)

LEGEND

60-MIL HDPE LINER



60-MIL HDPE LINING

KENNEWICK IRRIGATION DISTRICT
12 W. KENNEWICK AVE.
KENNEWICK, WASHINGTON 99336
(509) 586-9111
WWW.KID.ORG

NAME	DATE / COMPANY
DRAWN BY DPT	1.18.2016 KID
APPROVED SIGNATURE:	KID

KENNEWICK IRRIGATION DISTRICT
60-MIL HDPE CANAL LINING
DETAIL

SIZE	TYPE	DWG NO	REV
B	DWG		1

SCALE NTS | PROJECT | SHEET 1 OF 1

HDPE CANAL LINING PROJECT BY KENNEWICK IRRIGATION DISTRICT 2013-2015 PROJECT

HDPE CANAL LINING PROJECT BY KENNEWICK IRRIGATION DISTRICT 2013-2015 PROJECT

ATTACHMENTS

CHANGES IN GROUND-WATER LEVELS AND GROUND-WATER BUDGETS, FROM PREDEVELOPMENT TO 1986, IN PARTS OF THE PASCO BASIN, WASHINGTON

By B.W. Drost, S.E. Cox, and K.M. Schurr

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 96-4086

Prepared in cooperation with the

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Tacoma, Washington
1997

Table 8.--*Summary of U.S. Geological Survey canal-seepage tests by inflow-outflow method, October, 1987*

[ft^3/s; cubic foot per second; ft/d, cubic foot per day; E, compacted earth lining; C, concrete lining; P, PVC lining; U, unlined; DUNE, dune sand; TCHT, Touchet Beds; PSCO, Pasco gravels; UPRG, upper Ringold Formation; SDLM, Saddle Mountains Basalt]

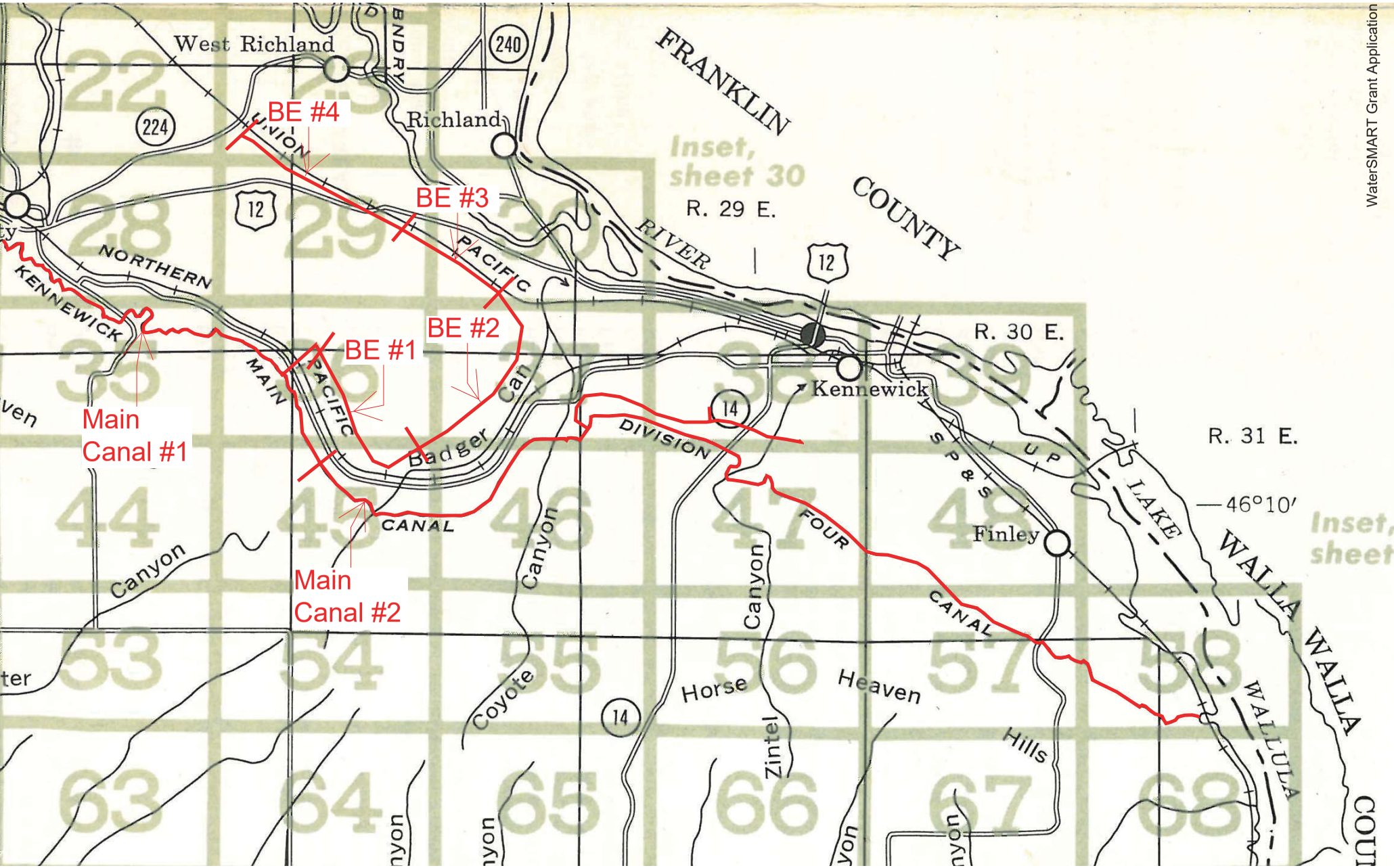
Canal reach	Discharge (ft^3/s)[1]			Change in discharge[3] (ft^3/s)	Average wetted perimeter (feet)	Length of reach (feet)	Canal lining type	Underlying hydrologic unit	Seepage rate (ft/d)
	Upstream	Adjustment[2]	Downstream						
Columbia Irrigation District									
Canal No. 1 #1	6.36	-0.07	5.21	-1.08	11.0	12,950	U[4]	PSCO	0.7
Canal No. 2 #1	23.2	-.08	22.1	-1.02	15.8	23,925	U+C[5]	PSCO	.2
Kennewick Irrigation District									
Division 4 #1[6]	7.23	-.07	5.80	-1.36	18.7	26,300	U+C[7]	TCHT	.2
Division 4 #1[8]	7.14	-.07	5.95	-1.12	18.7	26,300	U+C[7]	TCHT	.2
Division 4 #2[6]	5.80	-.14	4.31	-1.35	18.8	25,650	U[9]	TCHT	.2
Division 4 #2[8]	5.95	-.14	4.29	-1.52	18.8	25,650	U[9]	TCHT	.3
Division 4 #3[6]	4.31	-.07	2.79	-1.45	13.4	24,050	U[10]	TCHT	.4
Division 4 #3[8]	4.29	-.07	2.78	-1.44	13.4	24,050	U[10]	TCHT	.4
East Badger #1	8.12	-.04	6.84	-1.24	11.0	24,800	U	TCHT	.4
East Badger #2	6.84	-.07	5.99	-.78	10.2	20,600	U[11]	TCHT	.3
East Badger #3	5.99	-.07	3.76	-2.16	8.8	25,600	U[12]	TCHT	.8
Main Canal #1+2[6]	113	-8.37	89.5	-15.13	33.	102,325	U+C[13]	TCHT+SDLM	.4
Main Canal #1[8]	112	-8.34	95.4	-8.26	33.	63,925	U+C	TCHT+SDLM	.3
Main Canal #2[8]	95.4	-.03	89.6	-5.77	32.	38,400	U+C	TCHT+SDLM	.4
South Columbia Basin Irrigation District-Block 1									
PPL	7.79	-.18	7.57	-.04	7.8	13,102	C	PSCO	.3
South Columbia Basin Irrigation District-Block 12									
PE35.8	7.70	-1.09	5.84	-.77	11.1	18,697	U[14]	SDLM	.3

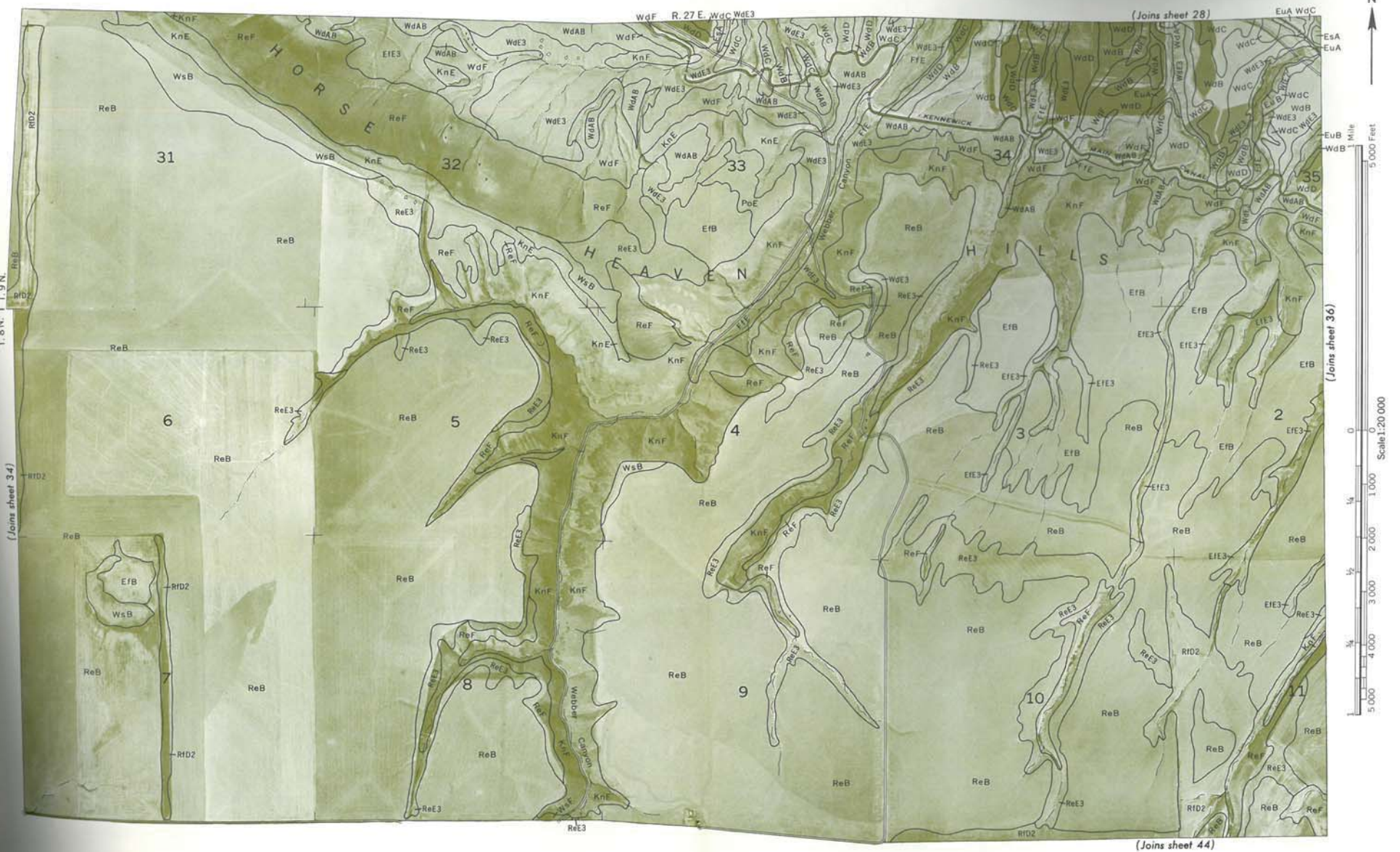
Issued July 1971

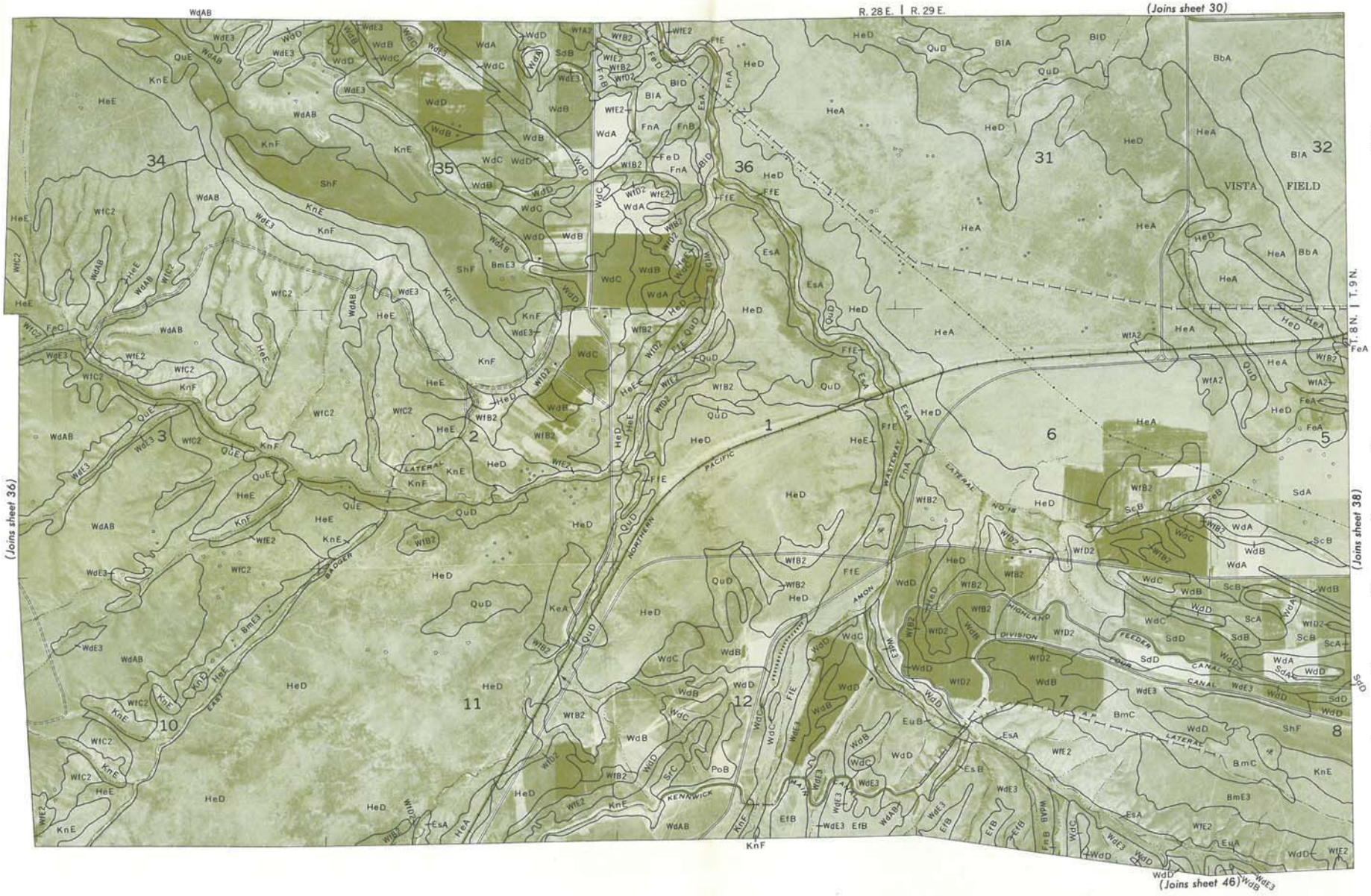
SOIL SURVEY

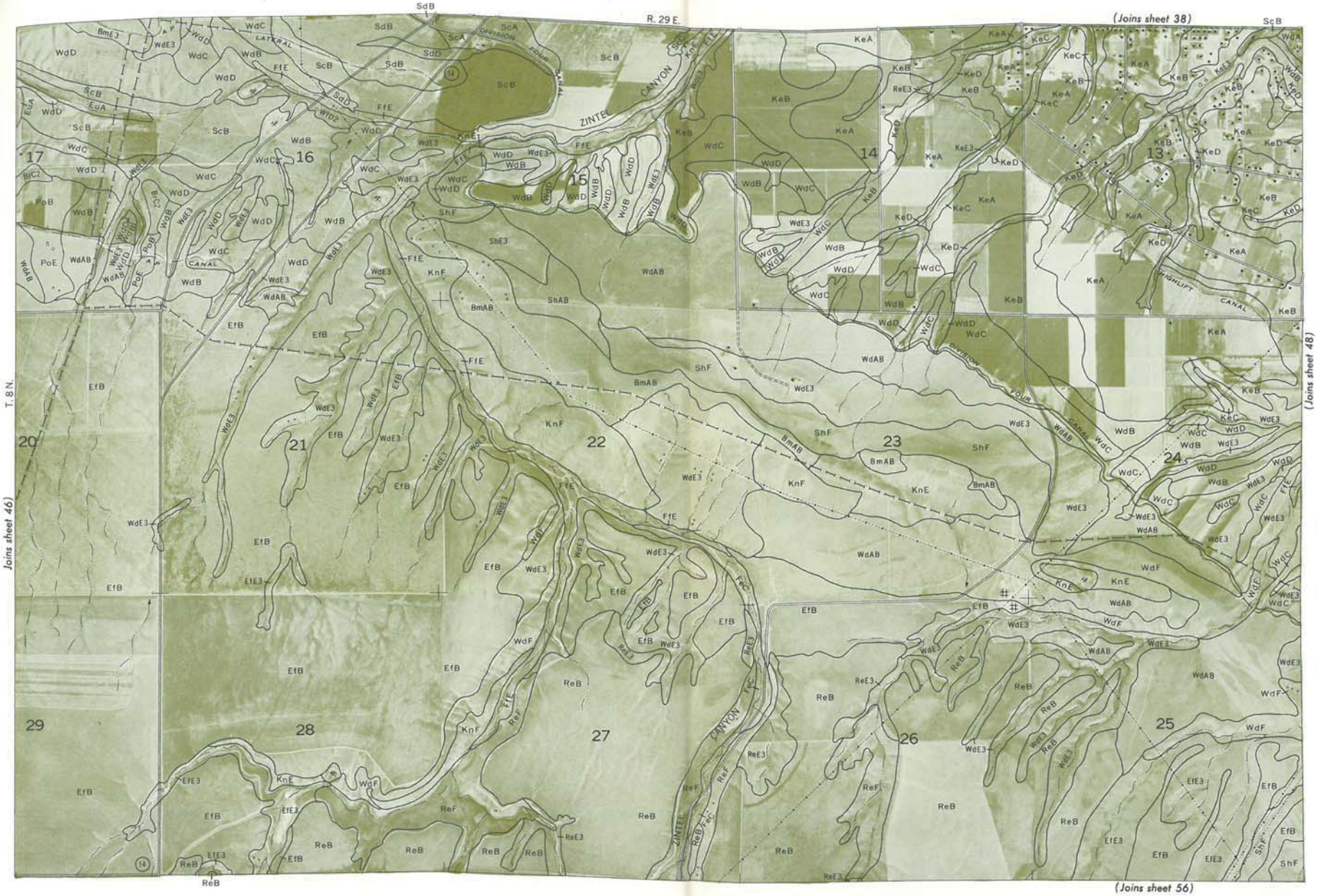
Benton County Area, Washington

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
WASHINGTON AGRICULTURAL EXPERIMENT STATION









High Density Polyethylene MicroSpike® Liner

Product Data

Property	Test Method	Frequency	Minimum Average Values				
Thickness (nominal), mil (mm)	ASTM D5994	Per Roll	30 (0.75)	40 (1.0)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (min avg), mil (mm)			29 (0.71)	38 (0.95)	57 (1.43)	76 (1.9)	95 (2.38)
Thickness (min 8 of 10), mil (mm)			27 (0.68)	36 (0.90)	54 (1.35)	72 (1.8)	90 (2.25)
Thickness (lowest individual), mil (mm)			26 (0.64)	34 (0.85)	51 (1.28)	68 (1.7)	85 (2.13)
Asperity Height mils, (mm)	ASTM D7466	2nd Roll	20 (0.51)	20 (0.51)	20 (0.51)	18 (0.46)	18 (0.46)
Density, g/cc, minimum	ASTM D792, Method B	200,000 lb	0.94	0.94	0.94	0.94	0.94
Tensile Properties (both directions)	ASTM D6693, Type IV						
Strength @ Yield, lb/in width (N/mm)	2 in/minute	20,000 lb	66 (11.6)	88 (15.4)	132 (23.1)	176 (30.8)	220 (38.5)
Elongation @ Yield, % (GL=1.3in)			13	13	13	13	13
Strength @ Break, lb/in width (N/mm)			66 (11.6)	88 (15.4)	132 (23.1.)	176 (30.8)	220 (38.5)
Elongation @ Break, % (GL=2.0in)			350	350	350	350	350
Tear Resistance, lbs. (N)	ASTM D1004	45,000 lb	23 (102)	30 (133)	45 (200)	60 (267)	72 (320)
Puncture Resistance, lbs. (N)	ASTM D4833	45,000 lb	60 (267)	90 (400)	120 (534)	150 (667)	180 (801)
Carbon Black Content, % (range)	ASTM D4218	20,000 lb	2 - 3	2 - 3	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion (Category)	ASTM D5596	45,000 lb	Only near spherical agglomerates: 10 views in Cat. 1 or 2				
Stress Crack Resistance (SP-NCTL), hrs.	ASTM D5397 Appendix	200,000 lb	500	500	500	500	500
Oxidative Induction Time, minutes	ASTM D3895, 200°C, 1 atm O_2	200,000 lb	≥140	≥140	≥140	≥140	≥140

Agru America's geomembranes are certified to pass Low Temp. Brittleness via ASTM D746 (-80°C), Dimensional Stability via ASTM D1204 (±2% @ 100°C). Oven Aging and UV Resistance are tested per GRI GM 13. These product specifications meet or exceed GRI's GM13.

Supply Information (Standard Roll Dimensions)

Thickness mil	Thickness mm	Width ft	Width m		Length ft	Length m	Area (approx.) ft²	Area (approx.) m²
30	.75	23	7	Double-Sided	930	283	21,390	1,987
				Single-Sided	980	298	22,540	2,094
40	1.0	23	7	Double-Sided	710	216	16,330	1,517
				Single-Sided	760	231	17,478	1,623
60	1.5	23	7	Double-Sided	505	154	11,615	1,079
				Single-Sided	530	161	12,190	1,132
80	2.0	23	7	Double-Sided	385	117	8,855	822
				Single-Sided	400	122	9,200	854
100	2.5	23	7	Double-Sided	310	94	7,130	662
				Single-Sided	325	99	7,475	694

Note:

Average roll weight is 3,900 lbs (1,770 kg). All rolls are supplied with two slings. Rolls are wound on a 6" core. Special length available upon request. Roll length and width have a tolerance of ±1%. The weight values may change due to project specifications (i.e. absolute minimum thickness or special length) or shipping requirments (i.e. international contanerized shipments).

500 Garrison Road, Georgetown, South Carolina 29440 843-546-0600 800-373-2478 Fax: 843-527-2738
email: salesmkg@agruamerica.com www.AgruAmerica.com

ATTACHMENT D

Copies: 103C
PN-6515
CCA-1104
CCA-1604
YAK-5000
YAK-5100

CATEGORICAL EXCLUSION CHECKLIST

PROJECT: Kennewick Irrigation District: Installation of EPDM Geomembrane Canal Liner in Main Canal Divisions I, II, III, and IV; Badger East Lateral: and, Highland Feeder Canal, Yakima Field Office
DATE: October 24, 2012

EXCLUSION CATEGORY: 516 DM Chapter 14.5 D.1. Maintenance, rehabilitation, and replacement of existing facilities which may involve a minor change in size, location, and/or operation; AND Appendix 9.4.C.3 - Minor construction activities associated with authorized projects which correct unsatisfactory environmental conditions or which merely augment or supplement or are enclosed within existing facilities.

NATURE OF ACTION: The Bureau of Reclamation (Reclamation) proposes to allow Kennewick Irrigation District (KID) to install ethylene propylene diene monomer (EPDM) geomembrane canal liner in earthen canal sections of the Main Canal Division I, II, III, and IV; Badger East Lateral: and, Highland Feeder Canal.

EVALUATION OF EXTRAORDINARY CIRCUMSTANCES FOR CATEGORICAL EXCLUSION (516 DM 2 Appendix 2: 43 CFR 46.215)

Extraordinary Circumstances Exist For This Action Which May:		No	Uncertain	Yes
1.	Have significant impacts on public health or safety.	X		
2.	Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation or refuge lands; wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (Executive Order 11990); floodplains (Executive Order 11988); national monuments; migratory birds; and other ecologically significant or critical areas.	X		
3.	Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA Section 102(2)(E)].	X		
4.	Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks.	X		
5.	Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects.	X		
6.	Have a direct relationship to other actions with individually insignificant but cumulatively significant environmental effects.	X		
7.	Have significant impacts on properties listed, or eligible for listing, on the National Register of Historic Places as determined by either the bureau or office.	X		
8.	Have significant impacts on species listed, or proposed to be listed, on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.	X		
9.	Violate a Federal law, or a State, local, or tribal law or requirement imposed for the protection of the environment.	X		
10.	Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898).	X		
11.	Limit access to and ceremonial use of Indian sacred sites on Federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007).	X		
12.	Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area or actions that may promote the introduction, growth, or expansion of the range of such species (Federal Noxious Weed Control Act and Executive Order 13112).	X		

	Yes	Uncertain	No
This action will affect Indian Trust Assets (ITAs).	___	___	X
This action will adversely affect Essential Fish Habitat.	___	___	X

NEPA ACTION RECOMMENDED:

- ☒ Categorical Exclusion
- ☐ Environmental Assessment
- ☐ Environmental Impact Statement

ENVIRONMENTAL AND TRUST ASSET COMMITMENTS, EXPLANATION AND/OR COMMENTS:

KID is an irrigation district operating within Reclamation's Yakima Project boundary, diverting water from the Yakima River at river mile 47.1. KID proposes to use EPDM geomembrane canal liner to line approximately 42 miles of earthen canal sections within KID's Main Canal Divisions I, II, III, and IV; Badger East Lateral: and, Highland Feeder Canal. The projects are intended to reduce seepage through earthen-lined canals and increase irrigation system efficiency.

The general amounts of lining and legal locations of the EPDM lining projects are as follows:

Main Canal Division I:	Approximately 6.2 miles of lining within portions of Township 9 North, Range 26 East, Sections 13, 14, 15, and 24; and, portions of Township 9 North, Range 27 East, Sections 19, 19, and 30
Main Canal Division II:	5.0 miles of lining within portions of Township 8 North, Range 27 East, Section 1; and, portions of Township 9 North, Range 27 East, Sections 33, 34, 35, and 36
Main Canal Division III:	1.7 miles of lining within portions of Township 8 North, Range 28 East, Sections 7 and 12
Main Canal Division IV:	13.8 miles of lining within portions of Township 8 North, Range 29 East, Sections 7, 9, 14, 15, 16, 23, 24 and 25; portions of Township 8 North, Range 30 East, Sections 29, 30, 32, 33, and 34; portions of Township 7 North, Range 20 East, Sections 1, 2, 3, and 12; and, portions of Township 7 North, Range 31 East, Section 7
Highland Feeder:	2.9 miles of lining within portions of Township 8 North, Range 28 East, Section 12; and portions of Township 8 North, Range 29 East, Sections 7, 9, and 10
Badger East Lateral:	12.3 miles of lining within portions of Township 9 North, Range 27 East, Section 13; portions of Township 9 North, Range 28 East, Sections 18, 19, 20, 21, 27, 28 and 35; and, portions of Township 8 North, Range 28 East, Sections 6, 7, 8, 16, and 17

KID's proposed EPDM lining project would be completed and installed within the existing canal prism and KID's ROW in the fall/winter season when the canal is dry, typically October to March. KID proposes to install 13.38 miles of lining during the 2012-2014 construction seasons. The construction schedule for the remaining 28.53 miles of lining has not been determined. KID can average 3.5 miles of canal lining installation in one fall/winter season; at this rate, the canal lining installation for the 41.9 miles could extend into 2023.

KID proposes to shape and clean the canal; over excavate the bottom of canal 18 inches by 18 inches wide every 300 feet; place 45 mil EPDM liners; and, utilize concrete as ballast in the over-excavated, trenched areas. Optionally, KID would shape and clean the canal; over excavate the bottom of canal 1 foot; place the 45 mil EPDM liners; and, utilize the over-excavated material to form gravel ballast on top of the EPDM liner. The lining will be keyed into a trench at the top of the canal embankment with the 4-foot of overlap on each roll. The trench will be one foot away from the sloped side of the canal and will be dug 1-2 foot wide and 2 foot deep with the excavated material placed on top of the membrane to anchor the lining.

Most excavation will occur within the prism of the canal and in the previously disturbed areas along the top of the canal; however, additional excavation and clearing in undisturbed agricultural areas along the canal may occur, and be kept to a minimum, to accomplish liner installation. In some of the project areas, vegetation adjacent to the opposite bank may be cleared and/or temporarily impacted in order to key-in the liner. The *Kennewick Irrigation District Programmatic Review Report, 2012-2014 CIP Programmatic Project Level Review, Final Report, August 2012* by RH2 Engineering, Inc. and Cascadia Archaeology, LLC., indicates that approximately 75,000 sf (1.7 acres) of sagebrush habitat and 11,8000 sf (0.27 acres) of other tree and shrub vegetation will be removed. Removal of sagebrush along the canal to facilitate the lining project has the potential to at least temporarily impact the ecosystem and wildlife species that rely on it. Some big sagebrush (*Artemisia tridentata*) were observed in areas adjacent to the canal, primarily on the undeveloped side of the canal (opposite of the O&M road). Sagebrush habitat is an important resource in the area for wildlife, with several species of wildlife depending on this habitat. Areas of sagebrush habitat will still exist beyond KID's ROW, and its removal is solely intended to facilitate lining installation and will be kept to a minimum. The trees and shrubs requiring removal are located in the KID ROW, an area which is supposed to be kept free of vegetation to facilitate KID's operation.

The Department of Archaeology & Historic Preservation (DAHP) letter, received by Reclamation on October 24, 2012, agreed with the Area of Potential Effect (APE) for the approximately 42 miles of lining and concurred that the current project as proposed will have No Adverse Effect on National Register eligible or listed historic and cultural resources. The Yakama Nation may request monitoring of the construction of the proposed project.

Reclamation concludes that a Biological Evaluation, under Section 7 of the Endangered Species Act (ESA), is not required for this proposed action. Reclamation determines that this Federal Action will have no affect on Threatened or Endangered species.

Any identified cultural resources and Indian trust assets would not be impacted by this project. Should cultural resources be discovered during construction, all ground disturbing activities in the area of the archeological resource will stop and the Area Office Archeologist will be contacted at (509) 575-5848. Construction will not resume until all mitigative measures developed in consultation with the State Historic Preservation Officer have been completed.

In evaluating environmental justice, there would be no adverse or significant impacts to minority or low-income populations or communities.

This Federal action will not adversely impact access to or ceremonial use of any identified Indian sacred sites, and will not adversely affect the physical integrity of any such sacred sites.

Reclamation has notified KID that the Yakama Nation may request monitoring of construction. KID will be responsible for expenses associated with the monitoring. If additional staging areas are identified that were not included in Cascadia's Cultural Resource Report, those areas will need to be surveyed prior to being utilized for staging. Reclamation requests that minimal earth work (grading, excavation, road development) and vegetation removal take place on the opposite side of the canal from the O&M road in order to reduce impacts to sagebrush habitat. Through this Federal action, Reclamation approves of KID's installation of EPDM geomembrane liner in Main Canal Divisions I, II, III, and IV; Badger East Lateral: and, Highland Feeder Canal.

Preparer: Elizabeth L Heather — Date: October 25, 2012
Environmental Protection Specialist

Concurrence with Item 7: [signature] — Date: 10/25/12
Area Office Archeologist
No Adverse Effect per consultation w/ SHPO

Concurrence with ITA Determination: Elizabeth L Heather — Date: 10/25/12
ITA designee for C. Carmack

Concurrence: [signature] — Date: 10/25/12
Field Office Manager

Concurrence: [signature] — Date: 10/25/12
Acting Environmental Programs Manager

Approved: [signature] — Date: 10/26/12
Deputy Area Office Manager

Categorical Exclusion No. 2012 - CCA - 103C — Date: 10/26/12

Retention Code : ENV-3.00
Folder # : 1195726
Control # : 12066525

STATE OF WASHINGTON

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

October 22, 2012

Ms. Candace McKinley
Environmental Program Manager
Bureau of Recreation
1917 Marsh Rd
Yakima, WA 98901-2058

In future correspondence please refer to:
Log: 102212-20-BOR
Property: Kennewick Irrigation District (Highland, Badger East laterals)
Re: NO Adverse Effect

Dear Ms. McKinley:

Thank you for contacting the Washington State Department of Archaeology and Historic Preservation (DAHP). The above referenced project has been reviewed on behalf of the State Historic Preservation Officer under provisions of Section 106 of the National Historic Preservation Act of 1966 (as amended) and 36 CFR Part 800. My review is based upon documentation contained in your communication.

First, I agree with the Area of Potential Effect (APE) as mapped in the consultant's report. I also concur that the current project as proposed will have "NO ADVERSE EFFECT" on National Register eligible or listed historic and cultural resources. If additional information on the project becomes available, or if any archaeological resources are uncovered during construction, please halt work in the area of discovery and contact the appropriate Native American Tribes and DAHP for further consultation.

Thank you for the opportunity to review and comment. If you have any questions, please contact me.

Sincerely,

Russell Holter
Project Compliance Reviewer
(360) 586-3533
russell.holter@dahp.wa.gov

ELECTRONICALLY
TRANSMITTED

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past. Shape the Future

ATTACHMENT E

Kennewick Irrigation District
WaterSMART 2018 Application
KID Labor & Benefit Rates

	2018		2019		2020		2021	
	Hourly Salary	Benefits	Hourly Salary	Benefits	Hourly Salary	Benefits	Hourly Salary	Benefits
Program Manager	$ 69.22	$ 29.58	$ 72.68	$ 31.65	$ 76.32	$ 33.87	$ 80.13	$ 36.24
Staff Engineer	$ 37.30	$ 15.94	$ 39.17	$ 17.06	$ 41.12	$ 18.25	$ 43.18	$ 19.53
Inspector/Field Technician	$ 30.13	$ 12.88	$ 31.64	$ 13.78	$ 33.22	$ 14.75	$ 34.88	$ 15.78
Foreman	$ 36.89	$ 20.19	$ 38.73	$ 21.60	$ 40.67	$ 23.12	$ 42.70	$ 24.73
Field Operations Lead	$ 32.55	$ 17.81	$ 34.18	$ 19.06	$ 35.89	$ 20.39	$ 37.68	$ 21.82
Maintenance/Canal	$ 26.34	$ 14.41	$ 27.66	$ 15.42	$ 29.04	$ 16.50	$ 30.49	$ 17.65
Part-Time Labor/Seasonal	$ 13.89	$ 2.94	$ 14.58	$ 3.15	$ 15.31	$ 3.37	$ 16.08	$ 3.60
Comptroller	$ 61.75	$ 30.79	$ 64.84	$ 32.95	$ 68.08	$ 35.25	$ 71.48	$ 37.72
Senior Accountant	$ 34.15	$ 17.03	$ 35.86	$ 18.22	$ 37.65	$ 19.50	$ 39.53	$ 20.86
Accounting Tech/Clerk	$ 27.94	$ 13.93	$ 29.34	$ 14.91	$ 30.80	$ 15.95	$ 32.34	$ 17.06

Salary Projected to Annual Increase 5%
Benefits Projected to Annual Increase 7%

Program Manager - Program management activities including but not limited to: procurement, scheduling, planning of work processes, safety, reporting, review and supervision of engineering design, coordination with property owners and utilities, payroll.

Staff Engineer - Activities include but not limited to: construction surveying, staking, engineering design, coordination with property owners and utilities, reporting, procurement.

Inspector/Field Technician - Activities include but not limited to: construction surveying, staking, coordination with property owners and utilities, reporting, testing of lining, compliance with engineering design.

Foreman - Activities include but not limited to: on-site day to day supervision of construction activities, compliance with engineering design, procurement, safety, payroll, and equipment operation.

Field Operations Lead - Activities include but not limited to: assist with on-site day to day supervision of construction activities, compliance with engineering design, procurement, safety, payroll, and equipment operation.

Maintenance/Canal - Activities include but not limited to: equipment operation, steel fabrication, HDPE lining installation, concrete forms and finishing, building roadways, cleaning and preparation of canals.

Part-Time Laborer/Seasonal - Activities include but not limited to: assist with equipment operation, steel fabrication, HDPE lining installation, concrete forms and finishing, building roadways, cleaning and preparation of canals.

Comptroller - Activities include but not limited to: review and internal auditing, cost accounting, procurement, reporting, and payroll review.

Senior Accountant - Activities include but not limited to: review and internal auditing, cost accounting, procurement, reporting, and payroll review.

Accounting Tech/Clerk - Activities include but not limited to: assist with review and internal auditing, cost accounting, procurement, reporting, and payroll review.

KID Owned Equipment Rates
based on
Construction Equipment Ownership and Operation Schedule, Region VIII
US Army Corps of Engineers, Volume 8, November 2016

Budget Item (from Table K)	KID Owned Equipment	Year	Hour Rate	DEPR	FCCM	Equipment Age Adj.	Adj. Hourly	40 Hour Adj. Monthly Rate
20)	CAT 312C Excavator	2006	$ 45.32	$ 17.93	$ 1.37	0.96	$ 44.55	$ 7,127.68
21)	JD 310SJ Loader/Backhoe	2009	$ 23.32	$ 6.67	$ 0.62	0.85	$ 22.23	$ 3,556.24
22)	JD 650J Crawler/Dozer	2008	$ 42.21	$ 11.70	$ 1.15	0.84	$ 40.15	$ 6,424.64
23)	JD 450G Crawler/Dozer	1999	$ 27.56	$ 7.51	$ 0.74	0.84	$ 26.24	$ 4,198.40
24)	Mack GUB13 Dump Truck (1)	2008	$ 48.94	$ 8.19	$ 0.82	0.84	$ 47.50	$ 7,599.74
	Truck Option - Dump Body		$ 2.10	$ 1.09	$ 0.06	0.93	$ 2.02	$ 323.12
	Subtotal		$ 51.04					$ 7,922.86
25)	Mack GUB13 Dump Truck (2)	2008	$ 48.94	$ 8.19	$ 0.82	0.84	$ 47.50	$ 7,599.74
	Truck Option - Dump Body		$ 2.10	$ 1.09	$ 0.06	0.93	$ 2.02	$ 323.12
	Subtotal		$ 51.04					$ 7,922.86
26)	JD 544J Loader	2005	$ 53.24	$ 17.95	$ 1.53	0.85	$ 50.32	$ 8,050.88
27)	JD 770A Motor Grader	1984	$ 52.94	$ 15.22	$ 1.98	0.70	$ 47.78	$ 7,644.80
28)	CAT 301.8 Mini-Excavator	2004	$ 8.77	$ 3.46	$ 0.25	0.96	$ 8.62	$ 1,379.46
29)	CAT 563C Roller	2000	$ 56.94	$ 16.11	$ 1.23	0.94	$ 55.90	$ 8,943.94
30)	Ford L8000 Water Truck	1987	$ 48.94	$ 8.19	$ 0.82	0.84	$ 47.50	$ 7,599.74
	Truck Option - Water Tank		$ 8.04	$ 4.08	$ 0.30	0.92	$ 7.69	$ 1,230.34
	Subtotal		$ 56.98					$ 8,830.08
31)	CAT 140M Grader	2013	$ 66.00	$ 20.49	$ 2.64	1.00	$ 66.00	$ 10,560.00
32)	JD 850K Dozer	2014	$ 92.10	$ 26.58	$ 2.60	1.01	$ 92.39	$ 14,782.69
33)	JD 85D Excavator	2013	$ 30.96	$ 12.14	$ 0.93	1.00	$ 30.96	$ 4,953.60
34)	Truck Option (Pal-Finger)		$ 15.00	$ 6.74	$ 0.44	0.92	$ 14.43	$ 2,308.10
35)	JD 160G Excavator	2014	$ 47.83	$ 16.86	$ 1.77	1.02	$ 48.20	$ 7,712.42
36)	Ford F-800 Palfinger	1990	$ 26.32	$ 5.34	$ 0.46	0.87	$ 25.57	$ 4,090.56
	Truck Option - Dump Body		$ 1.99	$ 1.03	$ 0.06	0.93	$ 1.91	$ 306.19
	Truck Option - Pal-Finger		$ 15.00	$ 6.74	$ 0.44	0.92	$ 14.43	$ 2,308.10
	Subtotal		$ 43.31					$ 6,704.85
37)	Bobcat T770 (Skid Steer)	2016	$ 18.14	$ 4.90	$ 0.34	1.03	$ 18.30	$ 2,927.55
38)	Mack CV713 Dump Truck	2007	$ 48.94	$ 8.19	$ 0.82	0.84	$ 47.50	$ 7,599.74
	Truck Option - Dump Body		$ 2.10	$ 1.09	$ 0.06	0.93	$ 2.02	$ 323.12
	Subtotal		$ 51.04					$ 7,922.86
39)	International 7400 Water Truck	2007	$ 48.94	$ 8.19	$ 0.82	0.84	$ 47.50	$ 7,599.74
	Truck Option - Water Tank		$ 8.04	$ 4.08	$ 0.30	0.92	$ 7.69	$ 1,230.34
	Subtotal		$ 56.98					$ 8,830.08

KID Rental Equipment Fuel Rates
based on
Construction Equipment Ownership and Operation Schedule, Region VIII
US Army Corps of Engineers, Volume 8, November 2016

Budget Item (from Table K)	KID Rental Equipment	Fuel	40 Hour Adj. Monthly Rate
40)	JD 250G Excavator	$ 12.28	$ 1,964.80
41)	JD 544J Loader	$ 10.74	$ 1,718.40
42)	JD 844J Loader	$ 25.74	$ 4,118.40
43)	Dump Truck	$ 27.36	$ 4,377.60
44)	Dump Truck Pup (1)	$ -	$ -
45)	Dump Truck Pup (2)	$ -	$ -
46)	CAT 140M2 Grader	$ 13.05	$ 2,088.00
47)	Brush Chipper	$ 3.42	$ 547.20
48)	CAT 140H Grader	$ 13.05	$ 2,088.00
49)	CAT 316E Excavator	$ 7.88	$ 1,260.80
50)	CAT TL943 Telehandler	$ 6.28	$ 1,004.80
51)	CAT 938K Loader	$ 11.79	$ 1,886.40
52)	Water Truck (5000 gallon)	$ 23.02	$ 3,683.20
53)	CAT D10 Dozer	$ 37.85	$ 6,056.00

Table 2-1. HOURLY EQUIPMENT OWNERSHIP AND OPERATING EXPENSE

CAT	ID.NO.	MODEL	EQUIPMENT DESCRIPTION	REGION 8 ENGINE HORSEPOWER AND FUEL TYPE MAIN	CARRIER	VALUE (TEV) 2013 ($)	TOTAL HOURLY RATES ($/HR) AVERAGE	STANDBY	ADJUSTABLE ELEMENTS DEPR	FCCM	FUEL	CWT
H25			*CATERPILLAR INC. (MACHINE DIVISION) (continued)*									
Item #19	H25CA021	312E	HYDRAULIC EXCAVATOR, CRAWLER, 33,080 LBS, 1.0 CY BUCKET, 18.2' MAX DIGGING DEPTH	91 HP D-off		$203,209	45.32	10.34	17.93	1.37	6.35	331
			KOBELCO AMERICA INC.									
	H25KC027	SK140SR LC	HYDRAULIC EXCAVATOR, CRAWLER, 33,100 LBS, 0.50 CY BUCKET, 17.83' MAX DIGGING DEPTH	93 HP D-off		$169,966	39.26	8.65	15.00	1.15	6.47	331
	H25KC017	SK70SR	HYDRAULIC EXCAVATOR, CRAWLER, 16,400 LBS, 0.33 CY BUCKET, 14.75' MAX DIGGING DEPTH	54 HP D-off		$105,356	24.06	5.36	9.30	0.71	3.77	168
			KOMATSU AMERICA INTERNATIONAL COMPANY									
	H25KM001	PC138USLC-10	HYDRAULIC EXCAVATOR, CRAWLER, 31,791 LBS, 1.0 CY BUCKET, 18.0' MAX DIGGING DEPTH	94 HP D-off		$168,727	39.13	8.59	14.89	1.14	6.56	326
	H25KM003	PC170LC-10	HYDRAULIC EXCAVATOR, CRAWLER, 38,100 LBS, 1.24 CY BUCKET, 19' 7" MAX DIGGING DEPTH	115 HP D-off		$181,428	43.19	9.23	16.01	1.22	8.02	416
			LINK-BELT CONSTRUCTION EQUIPMENT CO.									
	H25LB003	130 2XLC	HYDRAULIC EXCAVATOR, CRAWLER, 27,100 LBS, 0.50 CY BUCKET, 18' 2" MAX DIGGING DEPTH	95 HP D-off		$172,403	39.89	8.77	15.21	1.16	6.63	271
	H25LB005	160 X2	HYDRAULIC EXCAVATOR, CRAWLER, 35,275 LBS, 0.66 CY BUCKET, 20' 1" MAX DIGGING DEPTH	120 HP D-off		$201,444	47.34	10.25	17.77	1.36	8.37	362

Table 2-1. HOURLY EQUIPMENT OWNERSHIP AND OPERATING EXPENSE

CAT	ID.NO.	MODEL	EQUIPMENT DESCRIPTION	REGION 8 ENGINE HORSEPOWER AND FUEL TYPE MAIN	CARRIER	VALUE (TEV) 2013 ($)	TOTAL HOURLY RATES ($/HR) AVERAGE	STANDBY	ADJUSTABLE ELEMENTS DEPR	FCCM	FUEL	CWT
	SUBCATEGORY 0.12		**OVER 40,000 LBS THRU 100,000 LBS**									
			CATERPILLAR INC. (MACHINE DIVISION)									
	H25CA001	336F L	HYDRAULIC EXCAVATOR, CRAWLER, 80,500 LBS, 3.15 CY BUCKET, 26' 10" MAX DIGGING DEPTH	303 HP D-off		$395,446	81.23	14.95	24.72	2.59	21.13	805
Items #34, 51	H25CA040	318E	HYDRAULIC EXCAVATOR, CRAWLER, 40,600 LBS, 1.00 CY BUCKET, 22.50' MAX DIGGING DEPTH	113 HP D-off		$269,727	47.83	10.20	16.86	1.77	7.88	410
	H25CA022	320E L	HYDRAULIC EXCAVATOR, CRAWLER, 47,400 LBS, 1.56 CY BUCKET, 25' MAX DIGGING DEPTH	153 HP D-off		$252,962	48.66	9.57	15.81	1.66	10.67	474
	H25CA023	320DL	HYDRAULIC EXCAVATOR, CRAWLER, 49,000 LBS, 0.80 CY BUCKET, 39.0' MAX DIGGING DEPTH, LONG REACH BOOM	128 HP D-off		$336,458	58.62	12.73	21.03	2.21	8.93	536
			KOBELCO AMERICA INC.									
Item #41	H25KC028	SK260 LC	HYDRAULIC EXCAVATOR, CRAWLER, 56,890 LBS, 1.31 CY BUCKET, 23' MAX DIGGING DEPTH	176 HP D-off		$258,711	51.36	9.79	16.17	1.70	12.28	568
	H25KC029	SK260 LC LR	HYDRAULIC EXCAVATOR, CRAWLER, 56,890 LBS, 1.57 CY BUCKET, 25' MAX DIGGING DEPTH, LONG REACH BOOM	176 HP D-off		$345,091	63.74	13.05	21.57	2.26	12.28	568
	H25KC030	SK350LC	HYDRAULIC EXCAVATOR, CRAWLER, 80,900 LBS, 2.09 CY BUCKET, 27'7" MAX DIGGING DEPTH	238 HP D-off		$344,476	68.67	13.03	21.53	2.26	16.60	809
Items #39,40	H25KC019	SK210 LC	HYDRAULIC EXCAVATOR, CRAWLER, 48,000 LBS, 1.13 CY BUCKET, 22.00' MAX DIGGING DEPTH	143 HP D-off		$210,983	41.82	7.98	13.19	1.38	9.97	480

Table 3-1 Equipment Age Adjustment Factors for Ownership Cost

CATEGORY		REGION 8	Life in Years						Year Purchased New												
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
SUB		TYPE OF EQUIPMENT	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	
S30	0.22	CRUSHERS - JAW	1.04	1.03	1.02	1.00	0.97	0.93	0.90	0.90	0.87	0.84	0.82	0.78	0.73	0.70	0.69	0.68	0.68		
S30	0.30	SCREENING PLANT	1.04	1.03	1.02	1.00	0.97	0.93	0.90												
S35	0.00	SNOW REMOVAL EQUIPMENT	1.05	1.04	1.02	1.00	0.97	0.92													
S40	0.00	SOIL & ROAD STABILIZERS	1.07	1.04	1.02	1.00	0.96	0.86	0.82												
S45	0.00	SPLITTERS, ROCK & CONCRETE	1.05	1.04	1.02	1.00															
T10	0.00	TRACTOR BLADES & ATTACHMENTS (including agricultural)	1.03	1.02	1.01	1.00	0.96	0.90	0.86												
T15	0.00	TRACTORS, CRAWLER (DOZER) (ncludes blade)																			
T15	0.01	0 THRU 225 HP	1.04	1.02	1.01	1.00	0.95	0.89	0.84					Item #21,22,31							
T15	0.02	226 HP THRU 425 HP	1.03	1.02	1.01	1.00	0.96	0.90	0.85	0.86	0.83										
T15	0.03	OVER 425 HP	1.03	1.02	1.01	1.00	0.96	0.90	0.86	0.87	0.84	0.80									
T20	0.00	TRACTORS, WHEEL TYPE (DOZER)	1.07	1.06	1.04	1.00	0.98	0.94	0.92	0.91	0.88	0.83									
T25	0.00	TRACTORS, AGRICULTURAL																			
T25	0.10	CRAWLER	1.07	1.06	1.04	1.00	0.98	0.94	0.91												
T25	0.20	WHEEL	1.07	1.06	1.04	1.00	0.98	0.94													
T30	0.00	TRENCHERS, CHAIN TYPE CUTTER	1.08	1.07	1.04	1.00	0.97	0.94													
T35	0.00	TRENCHERS, WHEEL TYPE CUTTER	1.08	1.07	1.04	1.00	0.97	0.94													
T40	0.00	TRUCK OPTIONS																			
T40	0.10	CRANES / HOISTS, PERSONNEL & MATERIAL HANDLING	1.05	1.04	1.02	1.00	0.97	0.92													
T40	0.20	DUMP BODY, REAR	1.04	1.03	1.02	1.00	0.97	0.93						Item #23,24,35,37							
T40	0.30	FLATBEDS, WITH SIDES	1.05	1.04	1.02	1.00	0.97	0.92													
T40	0.41	HOIST, ELECTRIC DRIVE	1.05	1.04	1.02	1.00	0.97	0.92													
T40	0.50	TRANSIT MIXERS	1.05	1.03	1.02	1.00	0.97	0.93													

EP 1110-1-8, Vol. 8
30 Nov 16

Table 3-1 Equipment Age Adjustment Factors for Ownership Cost

CATEGORY		REGION 8	Life in Years						Year Purchased New												
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
SUB		TYPE OF EQUIPMENT	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	
T40	0.60	WATER TANKS	1.05	1.04	1.02	1.00	0.97	0.92						Item #29							
T40	0.70	ALL OTHER OPTIONS	1.05	1.04	1.02	1.00	0.97	0.92						Item #33							
T45	0.00	TRUCK TRAILERS																			
T45	0.10	BOTTOM DUMP	1.04	1.03	1.02	1.00	0.97	0.93	0.90												
T45	0.20	END DUMP	1.04	1.03	1.02	1.00	0.97	0.93	0.90												
T45	0.30	PUP TRAILER	1.04	1.03	1.02	1.00	0.97	0.93													
T45	0.41	LOWBOY, RIGID NECK, DROP DECK	1.04	1.03	1.02	1.00	0.97	0.93	0.90												
T45	0.50	FLATBED TRAILER	1.04	1.03	1.02	1.00	0.97	0.93	0.90												
T45	0.60	MISCELLANEOUS / UTILITY	1.04	1.03	1.02	1.00	0.97	0.93	0.90												
T45	0.70	WATER TANKER TRAILER	1.05	1.04	1.02	1.00	0.97	0.92	0.88												
T45	0.80	DECONTAMINATION FACILITY	1.05	1.04	1.02	1.00	0.97	0.92													
T45	0.90	TANK TRAILERS	1.05	1.04	1.02	1.00	0.97	0.92	0.88												
T50	0.00	TRUCKS, HIGHWAY (Add attachments as required)																			
T50	0.01	0 THRU 10,000 GVW	1.07	1.05	1.02	1.00	0.97	0.90													
T50	0.02	OVER 10,000 THRU 30,000 GVW (Chassis only - Add options)	1.07	1.05	1.02	1.00	0.97	0.90	0.87					Item #35							
T50	0.03	OVER 30,000 GVW (Chassis only - Add options)	1.07	1.05	1.02	1.00	0.97	0.90	0.87	0.84				Item #23, 24, 29, 37							
T55	0.00	TRUCKS, OFF-HIGHWAY																			
T55	0.10	RIGID FRAME	1.05	1.04	1.02	1.00	0.99	0.97	0.95	0.95	0.93	0.89	0.87	0.82	0.75						
T55	0.20	ARTICULATED FRAME	1.05	1.04	1.02	1.00	0.99	0.97	0.95	0.94	0.93										
T56	0.00	TRUCKS,OFF-HIGHWAY/PRIME MOVER TRACTORS & WAGONS																			
T56	0.10	PRIME MOVER TRACTORS	1.05	1.04	1.02	1.00	0.99	0.97	0.95	0.95	0.93	0.89	0.87	0.82	0.75						
T56	0.20	WAGONS, BOTTOM DUMP	1.06	1.05	1.02	1.00	0.99	0.97	0.95	0.94	0.92	0.88									

ATTACHMENT G

Budget K Estimated Rental Equipment Index					Phase I		Phase II		Phase III	
Budget Item	Description	Monthly Rental Rate (A)	Monthly Fuel Rate (B)[1]	Total Monthly Rate (A+B)	Months	Total	Months	Total	Months	Total
40)	JD 250G Excavator	$ 7,522.00	$ 1,964.80	$ 9,486.80	0	$ -	0	$ -	0	$ -
41)	JD 544J Loader	$ 5,355.00	$ 1,718.40	$ 7,073.40	0	$ -	0	$ -	0	$ -
42)	JD 844J Loader	$ 15,600.00	$ 4,118.40	$ 19,718.40	1	$ 19,718.40	2	$ 39,436.80	2	$ 39,436.80
43)	Dump Truck	$ 5,366.67	$ 4,377.60	$ 9,744.27	1	$ 9,744.27	2	$ 19,488.53	2	$ 19,488.53
44)	Dump Truck Pup (1)	$ 3,925.00	$ -	$ 3,925.00	1	$ 3,925.00	2	$ 7,850.00	2	$ 7,850.00
45)	Dump Truck Pup (2)	$ 3,925.00	$ -	$ 3,925.00	1	$ 3,925.00	2	$ 7,850.00	2	$ 7,850.00
46)	CAT 140M2 Grader	$ 9,900.00	$ 2,088.00	$ 11,988.00	1	$ 11,988.00	2	$ 23,976.00	2	$ 23,976.00
47)	Brush Chipper	$ 2,495.69	$ 547.20	$ 3,042.89	0	$ -	0	$ -	0	$ -
48)	CAT 140H Grader	$ 7,116.67	$ 2,088.00	$ 9,204.67	0	$ -	0	$ -	0	$ -
49)	CAT 316E Excavator	$ 5,670.00	$ 1,260.80	$ 6,930.80	0	$ -	0	$ -	0	$ -
50)	CAT TL943 Telehandler	$ 3,528.00	$ 1,004.80	$ 4,532.80	1	$ 4,532.80	2	$ 9,065.60	1	$ 4,532.80
51)	CAT 938K Loader	$ 4,950.00	$ 1,886.40	$ 6,836.40	0	$ -	0	$ -	0	$ -
52)	Water Truck (5000 gallon)	$ 4,833.33	$ 3,683.20	$ 8,516.53	0	$ -	0	$ -	0	$ -
53)	CAT D10 Dozer	$ 33,933.33	$ 6,056.00	$ 39,989.33	0	$ -	3	$ 119,968.00	0	$ -
					Subtotal	$ 53,833.47	Subtotal	$ 227,634.93	Subtotal	$ 103,134.13
[1]monthly fuel rates determined per Attachment F					Sales Tax (8.6%)	$ 4,629.68	Sales Tax (8.6%)	$ 19,576.60	Sales Tax (8.6%)	$ 8,869.54
					Grand Total	**$ 58,463.14**	**Grand Total**	**$ 247,211.54**	**Grand Total**	**$ 112,003.67**

Budget K Estimated Expenses Supplies/Materials Back-Up							
Budget Item	**Description**	**Unit**	**Vendor 1**	**Vendor 2**	**Vendor 3**	**Vendor 4**	**Average**
54)	HDPE Liner[1]	SF	$ 0.327	$ 0.331	$ 0.340		$ 0.33
55)	Trash Rack (Steel)[2]	EA	$ 7,672.82	$ 7,585.65	$ 8,073.37		$ 7,777.28
	Trash Rack (I-Beams)	EA	$ 5,887.00	$ 9,172.90	$ 9,906.00		$ 8,321.97
	Trash Rack (Decking)	EA	$ 3,157.90	$ 3,788.23	$ 4,755.47		$ 3,900.53
	Subtotal						$ 19,999.78
56)	Walk-Way Plank (Steel)	EA	$ 1,531.75	$ 1,438.78	$ 1,268.97		$ 1,413.17
	Walk-Way Plank (Decking)[3]	EA	$ 3,157.90	$ 3,157.90	$ 3,157.90		$ 3,157.90
	Subtotal						$ 4,571.07
57)	Gravel (Picked Up)	TON	$ 8.00	$ 9.30	$ 7.65		$ 8.32
58)	Concrete	CY	$ 112.75	$ 120.00			$ 116.38
59)	Rebar[4]	LF	$ 874.00	$ 876.47	$ 1,054.26		$ 0.31
60)	Pipes (18-inch)[5]	LF	$ 12.71	$ 16.52	$ 20.33		$ 16.52
61)	Turnout Gates	EA	$ 498.71	$ 483.50	$ 957.78	$ 1,234.72	$ 793.68
62)	Handrail	LF	$ 2.62	$ 2.78	$ 2.58		$ 2.66
63)	Weld Strips	LF	$ 4.00	$ 5.64	$ 5.95	$ 6.00	$ 5.40

[1]rounded cost to $0.35/SF for anticipated increase in material cost

[2]material is on several purchases and average cost for full assembly is calculated

[3]pricing is same as decking for budget item 55

[4]average cost of rebar was $934.91/ton, approximately 3000 LF in one ton of #4 rebar

[5]rounded cost to $20/LF for anticipated increase in material cost

KID Supplies/Materials

The KID supplies and materials that will be used on the project are shown in the K Budget Estimated Expenses as items 54 through 63. The rates for these items have been determined from previous work on Seepage Reduction Projects #R13AP13016 and #R16AP00108, the determination of these rates are explained below:

Budget Item 54: HDPE Liner

Budget Item 54 is High-Density Polyethylene (HDPE) Liner, a 60-mil textured plastic liner used to line the canal prism. The cost for the liner was determined from quotes provided to the KID from regional suppliers. The average cost for the HDPE liner was $0.33/SF however this value was rounded to $0.35/SF in anticipation of increased costs. Attached are supplier quotes provided for this material.

Figure 1. HDPE liner delivered to project site.

Budget Item 55: Trash Rack

Budget Item 55 is a Trash Rack, a fabricated steel screen used to filter canal debris, located at canal siphon entrances. The cost for the materials necessary to fabricate this item was determined from quotes provided to the KID from local steel suppliers. The average lump sum cost for a trash rack from was approximately $20,000. Attached are supplier quotes provided for this material. Figures 1 and 2 display a trash rack post fabrication and installed in the canal.

Figure 2. Trash Rack for canal siphon, post fabrication.

Figure 3. Trash Rack for canal siphon, installed.

Budget Item 56: Walk-Way Plank

Budget Item 56 is a Walk-Way Plank, a fabricated steel walkway spanning across the canal at check stations along the canal. The cost for the materials necessary to fabricate this item was determined from quotes provided to the KID from local steel suppliers. The average lump sum cost for a walkway plank was approximately $4,600. This rate includes structural steel and perforated grating. Attached are supplier quotes provided for this material. Figure 3 displays a walkway plank installed in the canal.

Figure 4. A typical Walk-Way Plank spanning across the canal.

Budget Item 57: Gravel (Picked Up)

Budget Item 57 is gravel purchased, picked up and delivered to the project site for the canal maintenance and access roads. The cost for the rock was determined from quotes provided to the KID from local suppliers. The average cost for the gravel was $8.32/ton. Attached are supplier quotes provided for this material.

Figure 5. Gravel is picked up and spread by KID crews for new canal roads.

Budget Item 58: Concrete

Budget Item 58 is concrete purchased to construct and modify a variety of structures along the canal. This included modifying existing turnouts, check structures, and siphons as well as constructing new structures for automated flow control. The cost for the concrete was determined from quotes provided to the KID from local suppliers. The average cost for the concrete was $116.38/cy. Attached are supplier quotes provided for this material. Figure 4 displays a modified turnout and check structure in the background. Figure 5 displays a modified siphon entrance and an automated control gate.

Figure 5. Modified concrete turnout (foreground) and check structure (background).

Figure 6. Modified concrete siphon entrance, with new concrete for automated flow control.

Budget Item 59: Rebar

Budget Item 48 is rebar (concrete reinforcement) purchased to reinforce the concrete structures from Budget Item 58. The cost for the reinforcement was determined from quotes provided to the KID from local suppliers. The average cost for the rebar was $934.91/ton or $0.31/LF as there are approximately 3,000 LF of rebar in one ton of #4 bar. Attached are supplier quotes provided for this material.

Budget Item 60: Inlet Pipe (18-inch)

Budget Item 60 are 18 inch diameter HDPE Corrugated Pipe culverts purchased to be installed along the canal. These drainage inlets will drain runoff from natural ravines into the canal. The cost for the pipe was determined from quotes provided to the KID from local suppliers. The average cost for the pipe was $16.52/LF however this value was rounded to $20.00/LF in anticipation of increased costs. Attached are supplier quotes provided for these supplies.

Budget Item 61: Turnout Gates

Budget Item 61 are Turnout Gates purchased to control flow from deliveries inside the canal. These are new slide gates installed at a height easily accessible for ditch patrol crews with newly modified turnouts as seen in Figure 6. The cost for the turnout gates were determined from quotes provided to the KID from local suppliers. The average cost for a turnout gate was $793.68, this was determined by taking the average price of each vendor's gate, and taking the average of the averages for the different vendors. Attached are supplier quotes provided for these supplies.

Figure 7. A newly installed turnout slide gate.

Budget Item 62: Handrail

Budget Item 62 is Handrail purchased for fall projection at several concrete structures in or near the canal. The handrail was installed at turnouts, on walk-way planks, and at siphons to prevent staff from falling into the canal during operation and maintenance. The cost for the handrail was determined from quotes provided to the KID from local suppliers. The average cost for this handrail was $2.66/LF. Attached are supplier quotes provided for these supplies. As seen in Figure 7 handrail is installed on a walkway plank spanning the canal at an automated flow control gate.

Figure 8. Handrail is installed on a walk-way plank spanning the canal.

Budget Item 63: Weld Strips

Budget Item 63 is HDPE Welding Strip purchased to weld the HPDE liner at the various concrete locations along the canal. The cost for the HDPE welding strip was determined from quotes provided to the KID from local and regional suppliers. The average cost for this weld strip was $5.40/LF. Attached are supplier quotes provided for these supplies. As seen in Figure 8 HPDE welding strip is installed on modified turnout, and seen welded to the HDPE liner in Figure 9.

Figure 9. HDPE Welding Strip is installed on a concrete modified turnout.

Figure 10. HDPE Welding Strip is welded to HDPE liner for full seal.