

Title Page

Small-Scale Water Efficiency Projects for Fiscal Year 2017

1-Project Title: Apparent Water Loss Analytics Project

2-Applicant Information:

Organization:

City of Riverside
Public Utilities department
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Riverside, CA 92501

Contact:

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List of Acronyms

AF	Acre-feet
AFY	Acre-feet per year
AMI	Automated Metering Infrastructure
AWWA	American Water Works Association
CIS	Customer Information System
CVP	Central Valley Project
Delta	Sacramento-San Joaquin Delta
DMM	Demand Management Measures
Project	Apparent Water Loss Analytics Project
Reclamation	Bureau of Reclamation
RPU	Riverside Public Utilities
SWP	State Water Project
UWMP	Urban Water Management Plan
WMWD	Western Municipal Water District

SECTION 1 – Technical Proposal and Evaluation Criteria

1.1 Executive Summary

Date: May 15, 2017
Applicant: Riverside Public Utilities
Applicant City, County, State: City of Riverside, Riverside County, California
Project Name: Apparent Water Loss Analytics

Riverside Public Utilities (RPU) is seeking grant funding for the Apparent Water Loss Analytics Project (Project) to assist in identifying losses caused by meter decay and inaccurate water meter measurement and recording. The proposed project will integrate advanced data analytics across the entire municipal meter fleet (65,000 metered connections both residential and commercial) to better understand the overall health of the agency's metering system. More specifically, utilizing data (no hardware or sensors to be installed) from existing meters and customer information system (CIS), the project will identify specific under-registering meters and quantify volumetric water loss. RPU will use this data to recover revenue, improve management tools and dashboards, increase operational efficiency and workflow management, and provide insight and direction to existing meter replacement programs administered by RPU. Additionally, the Project will increase water-use efficiency, support overall conservation, and help with meeting state mandates to reduce water loss. Further, as RPU considers Advanced Metering Infrastructure (AMI) deployment, The Apparent Water Loss Analytics Project will establish baseline data to be used as a control group to determine the marginal benefit of AMI implementation in RPU's service area. The tools and databases developed by this project will provide an analysis of the current state of RPU's meter system. And, going forward, these analytics will provide continued and ongoing monitoring and optimization of meter replacement schedules to minimize water loss.

As metering and CIS data is already being collected, the proposed Apparent Water Loss Analytics Project can be completed within two years of the grant award.

No portion of this project is located on a Federal facility.

1.2 Background Data

1.2.1 Description of Applicant

Established in 1895, Riverside Public Utilities is a consumer-owned water and electric utility that provides high quality, reliable services to a population of more than 300,000 in and around the City of Riverside (Figure 1). Although RPU has access to imported water, RPU relies mostly on local water resources and actively undertakes projects, such as this project, to avoid the need to take imported water.

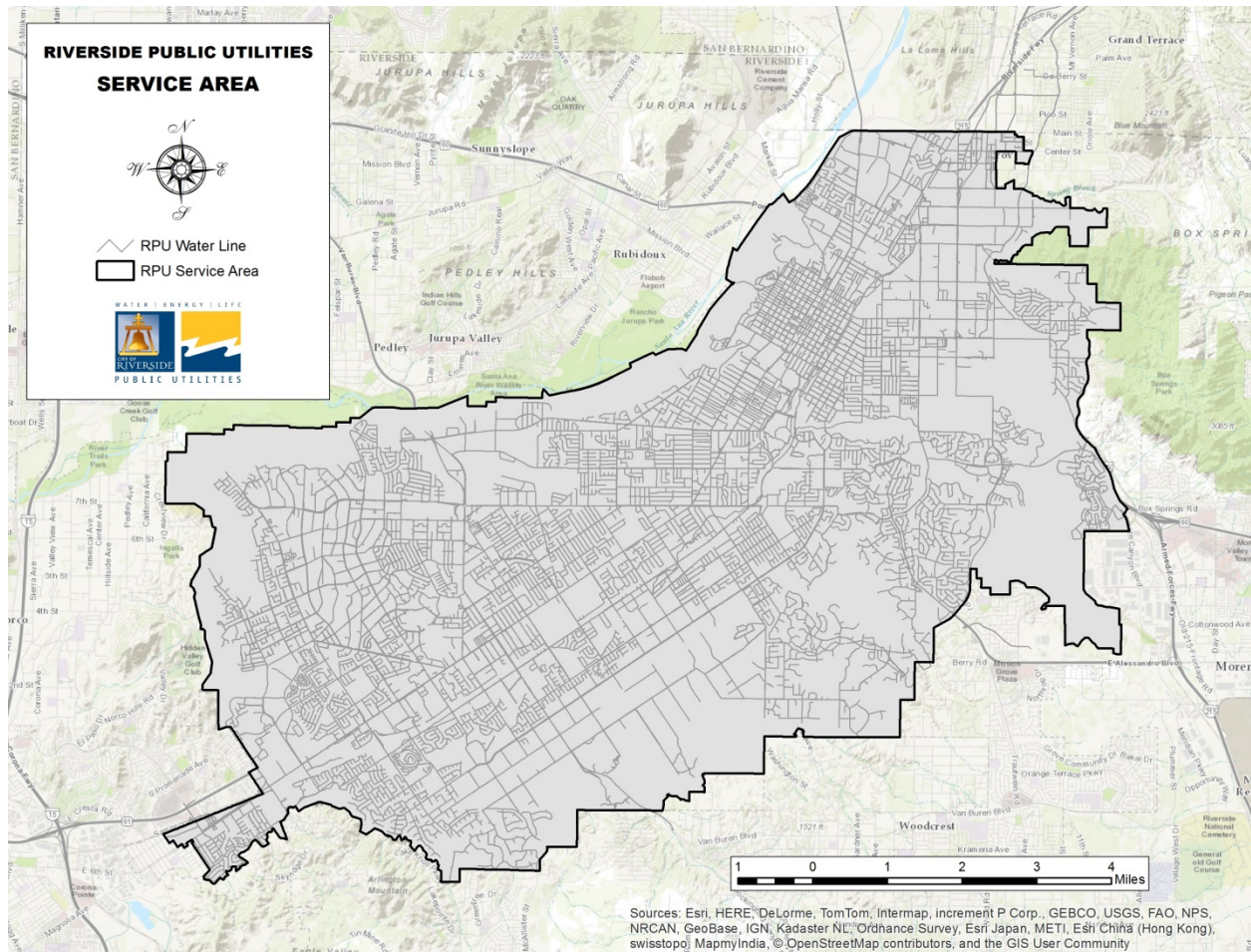


Figure 1. Riverside Public Utilities Service Area

1.2.2 Water Supplies and Demand

Supply:

RPU's water supply consists primarily of groundwater from the Bunker Hill Basin, Riverside North, and Riverside South sub-basins. RPU's extraction rights in these basins were established in the *Western Municipal Water District of Riverside County et al., vs. East San Bernardino County Water District et al.*, Riverside County Superior Court Case No. 78426 (Western-San Bernardino Judgment). Additional sources of water available to RPU include groundwater from the Rialto-Colton Basin, recycled water from the Riverside Water Quality Control Plant, and imported water from Western Municipal Water District (WMWD).

RPU has a total of 201 wells, of which 50 are potable wells; 14 are non-potable wells; 85 are monitoring wells; and 50 are not active (i.e., standby, out of service, abandoned, destroyed or

unknown). If necessary, purchased imported water, up to 30 cubic feet per second (cfs) can be conveyed to the RPU service area using existing infrastructure.

Table 1. Water Supplies – Current and Projected (Acre-Feet)

Water Supply	Additional Detail on Water Supply	2015	2020	2025	2030	2035	2040
Groundwater	Existing Water Right	85,774	85,774	85,774	85,774	85,774	85,774
Groundwater	New Projects	-	3,000	8,000	10,800	10,800	10,800
Recycled water	RWQCP	-	6,430	6,430	6,430	6,430	6,430
Purchased or Imported Water	From WMWD	21,700	21,700	21,700	21,700	21,700	21,700
	Total	107,474	116,903	121,903	124,703	124,703	124,703

Demands:

RPU's total water demands were approximately 75,000 acre-feet (AF) in 2015. This amount includes potable water, raw water for non-potable uses, and recycled water. It includes water delivered to RPU's retail customers, as well as about 6,800 AF of water delivered to other agencies (see Table 2). A portion of the demand in Table 2 comes from system losses.

Table 2. Water Demand – Current and Projected (Acre-Feet)

Use Type	Level of Treatment	2015	2020	2025	2030	2035	2040
Retail	Drinking Water	53,224	61,678	62,894	65,191	67,573	70,045
Retail	Raw Water	12823	14,200	14,200	14,200	14,200	14,200
Wholesale	Drinking Water	1622	4,300	4,300	4,300	4,300	4,300
Wholesale	Raw Water	662	2,500	2,500	2,500	2,500	2,500
Potable water Loss	Drinking Water	6302	5,278	5,375	5,559	5,750	5,948
Irrigation Water Loss	Raw Water	295	835	835	835	835	835
	Total	74,928	88,791	90,104	92,585	95,158	97,828

1.2.3 Water Supply Reliability (Potential Shortfalls in Supply)

Local groundwater supplies account for most of RPU's water supplies, with approximately 60 percent originating from the Bunker Hill Basin, which is adjudicated. RPU's water rights are based on the long-term safe yield from the Bunker Hill Basin, which includes wet, dry, and normal periods. RPU's wells are generally located in the section of the basin with the greatest thickness of water bearing layers. Thus, RPU's water supply from the Bunker Hill Basin is considered reliable during single and multi-year dry periods. In addition to water supply shortages caused by drought conditions, there are other major hazards that can degrade the quality and/or impact the quantity of water available to the RPU water system. These include: regional power outages, earthquakes, liquefaction (i.e. high groundwater levels that could compromise water delivery infrastructure), floods, chemical spills, groundwater contamination, and terrorist acts. Some of these hazards could also adversely impact the distribution systems, such as the major transmission mains or reservoirs. Interruptions to water supplies from any of the above mentioned hazards may be limited to days or even months, except for groundwater contamination, which could last several years.

Riverside Public Utilities has been planning water resource management for decades. The latest Integrated Water Resource Plan ensures that RPU has an adequate water supply through 2035. It combines the use of projects that will recycle water, utilize storm water capture, and conservation to make sure we reach production and distribution projections for the next twenty five years.

RPU has implemented several measures to improve the reliability of its water system. Actions taken to prepare for a catastrophe include:

- Establishing criteria for a proclamation of water shortage
- Developing alternate sources of water supplies
- Establishing contacts and mutual aid agreements with other agencies
- Establishing an Emergency Response Team/Coordinator
- Preparing an Emergency Response Plan (ERP)
- Developing public awareness programs
- Conduct mock emergency drills at the Emergency Operations Center annually

1.2.4 Water Delivery Systems

The RPU water delivery system consists of 954 miles of pipeline, 55 active domestic wells, 41 booster stations, 15 active reservoirs, 108,500,000 (gallons) of reservoir capacity, 6 treatment plants, 14 miles of canal, and has an average daily delivery of 63,597,627 gallons.

1.2.5 Past Working Relationship with Reclamation

Riverside Public Utilities has not had a past working relationship with Reclamation. If awarded grant funds from this current solicitation, this will be RPU's first direct Reclamation grant, based on current staff's history and knowledge.

1.3 Technical Project Description

1.3.1 Project Need

RPU estimates water losses by monitoring total water entering the distribution system and total withdrawals for retail demands, wholesale demands, or other known uses. Losses calculated in this manner include both apparent losses (due to factors such as water that is not registered as consumption because of meter error) and real losses (due to leaks in the distribution system). RPU estimates future losses from the potable system as 8 percent of potable water deliveries.

For the irrigation water system, RPU estimates losses as 5 percent of raw water deliveries, based on data from recent years. The historical percentage was considerably higher, but RPU has identified and implemented operational improvements that have significantly reduced losses from this system.

RPU has performed American Water Works Association (AWWA) water loss audits on the potable water distribution system for the past five fiscal years beginning in 2010-11. These audits provide an estimate of apparent water losses, real losses, and unavoidable real losses. The results of RPU's most recent audit, for fiscal year 2014-15, are shown below.

- Water Losses of 2,755 AF made up of approximately 906 AF apparent losses and 1,849 AF real losses
- Losses account for 5 percent of water deliveries

Accurate identification of decaying and underperforming meters will enable RPU to streamline its current meter replacement program that is based solely on meter age. An advanced analytic study will determine where apparent water losses are occurring (and have occurred historically over a time series) so those meters can be replaced to conserve water supply and capture lost revenue. Analytical techniques and methods will be used to leverage existing data that has been compiled for over a decade and utilize it to turn common data into actionable insights, such as refining RPU's existing meter replace program. Additionally, this overall system analysis will serve as a baseline to determine the marginal benefit of a future deployment of AMI compared to currently deployed meter technology.

1.3.2 Project Description, Activities and Implementation Schedule

The primary goals and expected outcomes of this project are to:

- i) Asses the current state of RPU's meter fleet, with a focus on meter registration;
- ii) Identify and prioritize under registering meters by water loss;
- iii) Quantify revenue impacts in the meter to cash vertical;

- iv) Quantify volumetric water loss;
- v) Increase operational efficiency and workflow management, and ultimately;
- vi) Provide quantitative insight for meter replacement programs.

Secondary benefits include the creation of a baseline data set to calculate the marginal benefit of eventual AMI deployment, ongoing monitoring of meter health, and with state mandates to reduce water loss.

1.3.3 Project Tasks

Project implementation will occur based on the following tasks.

Task 1: Project Management, Administration and Reporting

Project management will be provided by appropriate agency staff to ensure successful project implementation. Activities will include project administrative oversight, managing consultants, and conducting meetings as necessary to discuss project progress.

In addition, grant administration will be performed to execute the grant agreement, ensure compliance with grant requirements, prepare and submit necessary supporting grant documents and provide coordination with the grantee, project partners and the Reclamation grant manager.

Task 2: Vendor Procurement

This task includes the activities necessary to select a qualified vendor and secure a contract for the Apparent Water Loss Analytics Project. As contracting and formal bid reviews may still occur, RPU will only approve the use of equipment, technologies, and capabilities that are currently commercially available, have been implemented in other agencies, and have a proven history of success. A preference will be given to vendors utilizing “cloud” based solutions with interactive dashboards that can segment results by time, customer type, meter size, geographic distribution, etc.

Task 3: Analytic Interpretation of Data

This task includes the advanced investigation of existing collected data including current water meter system reporting, customer information system database, and utility billing histories. Activities implemented under this task may include the following:

- Use of advanced analytical techniques and methods to identify apparent losses
- Retroactive analysis of 10 years’ worth of meter and CIS data
- Quantification of current, historical, and going forward apparent water loss
- Establishment of baseline data to determine benefits of future AMI deployment
- Active comparison of apparent losses pre & post AMI deployment

- Staff training
- Community outreach
- Data management

Deliverables

The final deliverable for the project will be a consulting report which:

- Assesses the current state of RPU's meter fleet
- Identifies specific decaying meters at the customer level
- Quantifies volumetric water loss at the meter level
- Quantifies revenue loss at the meter level
- Recommends meter replacement program improvement and meter-to-cash optimization
- Describes analytical techniques and algorithms utilized

1.4 Evaluation Criteria

Descriptive narratives addressing how the proposed project meets grant criteria are provided in the following subsections. The evaluation criteria, as described in the Funding Opportunity Announcement, are presented first in *italics*, followed by specific information on the proposed project.

1.4.1 Evaluation Criterion A: Planning Efforts Supporting the Project

Does the proposed project implement a goal or address a need or problem identified in the existing planning effort?

As part of its 2015 Urban Water Management Plan, RPU evaluated several demand management measures (DMMs) including Water Waste Prevention Ordinances, Metering, Conservation Pricing, Public Education and Outreach, **Programs to Assess and Manage Distribution System Real Loss**, and Water Conservation Program Coordination and Staffing Support. A concern identified by the UWMP was water losses in the RPU system. The RPU UWMP can be found here: <http://www.riversideca.gov/utilities/pdf/2016/RPU-2015-UWMP.pdf>

Explain how the proposed project has been determined as a priority in the existing planning effort as opposed to other potential projects/measures.

The 2015 RPU's UWMP objectives include conserving water through water use efficiency and conservation measures. The UWMP section on DMMs describes how each DMM is being implemented. Further, the UWMPs lay out agency goals for reducing or maintaining per capita water

use to comply with water use targets required by the California Water Conservation Act of 2009. This project is among the measures needed for optimizing water use efficiency.

1.4.2 Evaluation Criterion B: Project Benefits

The expected project benefits to RPU's water resources, planning, and water supply delivery systems are the following:

- 1- Reduction of water loss and gallons per capita per day
- 2- Informing meter replacement programs
- 3- Identification and recovery of revenue
- 4- Improving operational efficiency and workflow planning and management
- 5- Improving conservation efforts
- 6- Monitoring ongoing meter health
- 7- Aiding in regulatory compliance with state mandates to reduce water loss

1.4.3 Evaluation Criterion C: Project Implementation

Implementation Schedule

Due to already completed and ongoing planning work, implementation of the Apparent Water Loss Analytic project would begin on receipt of funding. Based on the Funding Opportunity Announcement, award notification may be given by May 31, 2017. It is expected that funds will be awarded no later than September 30, 2017, contingent on appropriations.

The project will be completed by September 30, 2019, or within 2 years of project award, however full implementation is anticipated to occur sooner. See schedule of project activities below.

Table 3. Project Implementation Schedule

Month	1	2	3	4	5	6	7	8	9	10	11	12
Kickoff	x											
Provide Data	x											
Data Transfer		x										
Run Analytics			x	x								
Deliver Beta Results					x							
Deliver Refined Results						x						
Deliver Final Consulting Report							x					
Validate Identified Meters								x	x	x	x	
Project Completion												x

No permits will be needed for implementation of the proposed project. Project work will be conducted at existing meter locations and on RPU property. No engineering or design work is needed to support the proposed project. No new policies or administrative actions are required to implement the proposed project.

1.4.4 Evaluation Criterion D: Connection to Reclamation Project Activities

1. *How is the proposed project connected to Reclamation project activities?*

The proposed project is connected to Reclamation project activities, because it benefits the same Delta region as the Central Valley Project (CVP), a federal project, managed by Reclamation, and the largest surface water storage/delivery system in California. The applicant, RPU, can receive up to 21,700 AF of imported water from the SWP. The Water Loss Analytics project will help reduce RPU's potential need to tap into imported water sources, which in turn are closely connected to the CVP. The SWP and CVP each draw water from the Delta, where the Sacramento and San Joaquin Rivers meet, and the two projects share responsibility for in-basin use as well as for sharing surplus flows.

2. *Does the applicant receive Reclamation project water?*

The Applicant, RPU, does not receive Reclamation project water. RPU's actively tries to meet all demands with groundwater.

3. *Will the project help Reclamation meet trust responsibilities to Tribes?*

The project may help Reclamation meet trust responsibilities to Tribes to the extent that by reducing demands on SWP imports the project will help improve conditions on water resources that could benefit Reclamation projects.

4. *Is the project on Reclamation project lands or involving Reclamation facilities?*

No, the Project is neither on Reclamation lands nor does it involve Reclamation facilities.

5. *Is the project in the same basin as a Reclamation project or activity?*

No, the Project is not located in the same basin as a Reclamation project or activity.

6. *Will the proposed work contribute water to a basin where a Reclamation project is located?*

Yes, the Project will help reduce water demands locally which would keep RPU water independent from SWP water imports from the Sacramento-San Joaquin Delta. Multiple Reclamation projects are located within the Delta watershed and often closely interlinked with the SWP system, such as the CVP. By reducing the amount of water imported, this water remains in the Delta watershed, thereby also benefitting Reclamation projects.

SECTION 2 –Environmental and Cultural Resources Compliance

1. *Will the project impact the surrounding environment (e.g., soil [dust], air, water [quality and quantity], animal habitat)? Please briefly describe all earth-disturbing work and any work that will affect the air, water, or animal habitat in the project area. Please also explain the impacts of such work on the surrounding environment and any steps that could be taken to minimize the impacts.*

The proposed project will consist of analyzing meter performance using advanced analytics and may require replacing some existing meters, which will not result in earth-disturbing work. As a result, the proposed project will not impact the surrounding environment.

2. *Are you aware of any species listed or proposed to be listed as a Federal threatened or endangered species, or designated critical habitat in the project area? If so, would they be affected by any activities associated with the proposed project?*

The proposed project will not impact sensitive species or their habitat.

3. *Are there wetlands or other surface waters inside the project boundaries that potentially fall under CWA jurisdiction as “waters of the United States?” If so, please describe and estimate any impacts the project may have.*

No.

4. *When was the water delivery system constructed?*

The City of Riverside water delivery system was constructed initially for irrigation purpose in early 1874. By 1959 and due to urbanization, most of the delivery system has been shifted for to domestic, municipal, and industrial application. Average meters age is 10 years with about 65% of all 65,345 meters are older than 5 years and the rest are less than 5 years old. All of Riverside customers are metered.

5. *Will the proposed project result in any modification of or effects to, individual features of an irrigation system (e.g., headgates, canals, or flumes)? If so, state when those features were constructed and describe the nature and timing of any extensive alterations or modifications to those features completed previously.*

No.

6. *Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places? A cultural resources specialist at your local Reclamation office or the State Historic Preservation Office can assist in answering this question.*

Yes, buildings and features listed on the National Register for Historic Places are found within Riverside Public Utilities service area boundaries. However, the proposed project will not impact these sites.

7. *Are there any known archeological sites in the proposed project area?*

Based on a review of the California Office of Historic Preservation list of historical resources, there are no known archaeological sites within the proposed project area. Additionally, the proposed project will occur within already developed areas and would not affect potential archeological sites.

8. *Will the proposed project have a disproportionately high and adverse effect on low income or minority populations?*

The project will not have a disproportionately high or adverse effect on low income or minority populations. In fact, the project may provide financial benefits to customers receiving upgrades through timely leak detection and water conservation and reduced water bills.

9. *Will the proposed project limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands?*

No, the project will not limit access to or ceremonial use of Indian sacred sites or result in other impacts on tribal lands. The project may involve meter replacements of existing meters which would not result in adverse impacts on tribal lands.

10. *Will the project contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area?*

No.

SECTION 3 – Required Permits and Approvals

No permits will be needed for implementation of the proposed project. Project work will be conducted at existing meter locations and on RPU property.

SECTION 4 – Official Resolution

On May 22, 2017, the RPU's Board will have a hearing to recommend to City Council to approve the attached resolution (Attachment 2) authorizing a WaterSMART grant application from the Bureau of Reclamation.

SECTION 5 – Project Budget

5.1 Funding Plan

The total cost of the proposed project is **\$148,665**. The City of Riverside is providing \$74,333 in funds. \$4,465 of the fund provided by the City will be in a form of in-kind contribution, and \$69,868 of the City of Riverside provided fund will be in monetary contribution to the consultant fees. Sufficient funds are available in the Public Utility Water Engineering Professional Services Account to match the grant fund. As shown in Table 4, the City of Riverside is seeking \$74,332 in federal funds so that we can complete our proposed project.

The City of Riverside is providing in kind matching funds to cover a portion of Task 1 costs, and vendor procurement (Task 2) to be performed in part by City staff engineer and in part by a consultant who will be the acting Program Manager. Consultant cost details are described in the following paragraph. It is anticipated that the city staff will contribute a onetime 30 hours at

the beginning and on average 2 hours per month over the 12-month project period, as shown below (see Table 5).

No costs will be incurred before the project/grant start date.

Table 4 – Summary of Non-Federal and Federal Funding Sources

FUNDING SOURCES	AMOUNT
Non Federal Entities	
City of Riverside Public Utilities	\$74,333
Non Federal Subtotal	\$74,333
Other Federal Entities	
NA	
Other Federal Subtotal	\$0
REQUESTED RECLAMATION FUNDING	\$74,332

5.2 Budget Proposal

The budget proposal is shown below and a narrative provided in the next section.

Table 5 – Budget Proposal

BUDGET ITEM DESCRIPTION	COMPUTATION		Quantity Type	TOTAL COST
	\$/Unit	Quantity		
SALARIES AND WAGES				
Staff Engineer	\$ 83.00	54.0	hour	\$4,482
FRINGE BENEFITS				
NA				
EQUIPMENT				
NA			0	0
SUPPLIES/MATERIALS				
NA				
CONTRACTUAL/ CONSTRUCTION				
Analytics Consultant				\$144,200
OTHER				
NA				
TOTAL DIRECT COSTS				\$148,665
Indirect Costs				
NA				
TOTAL ESTIMATED PROJECT COSTS				\$148,665

5.3 Budget Narrative

Salaries and Wages

Program Manager: Associate Engineer, Dr. Farid Ishak Boushaki will oversee the project. As shown in Table 5, it is estimated that the staff engineer will spend approximately 83 hours in project administration and vendor procurement.

Fringe Benefits

Agency staff costs shown above are based on hourly rates. Fringe Benefits are assumed in labor rates provided in the salaries and wages and therefore are not provided separately in the overall project budget.

Travel, Equipment, Materials and Supplies

These cost categories are not applicable to the project.

Contractual

Contractual/Implementation work to be performed by contractors includes work related to Tasks 1 and 3 through 5 as described in Section 1.2.3 of this application. Cost estimates for contractors are based on estimates of services provided by consultant. The City of Riverside is providing \$69,868 in monetary contribution to cover the remainder of the matching fund.

Environmental and Regulatory Compliance Costs

No environmental and regulatory compliance are anticipated for this project.

Other Expenses

No other expenses except those identified above are anticipated.

Indirect Costs

RPU will not seek indirect costs for this project.

Total Costs

As shown in Table 5, the total project costs are anticipated to be \$148,665.

SECTION 6 - Unique Entity Identifier and System for Award Management (SAM)

RPU is registered in the System for Award Management and will continue to maintain an active SAM registration with current information during which RPU has an active Federal award or application or plan under consideration by a Federal awarding agency.