PROJECT DEFINITION REPORT

RS – STA WATER AND PHOSPHORUS BUDGET IMPROVEMENTS

(SP CHILD PROJECT TO 100801)

PS ID 100857

DATE SEPTEMBER 26, 2013

REVISION #2

Table of Contents

Approvals

The signatures in this section of the project definition report should be revised to represent the various areas providing significant resources to the project.

Linda Lindstrom, Bureau Chief, Applied Sciences — Date: 10/2/13

Terrie Bates, division director, Water Resources — Date: 10-2-13

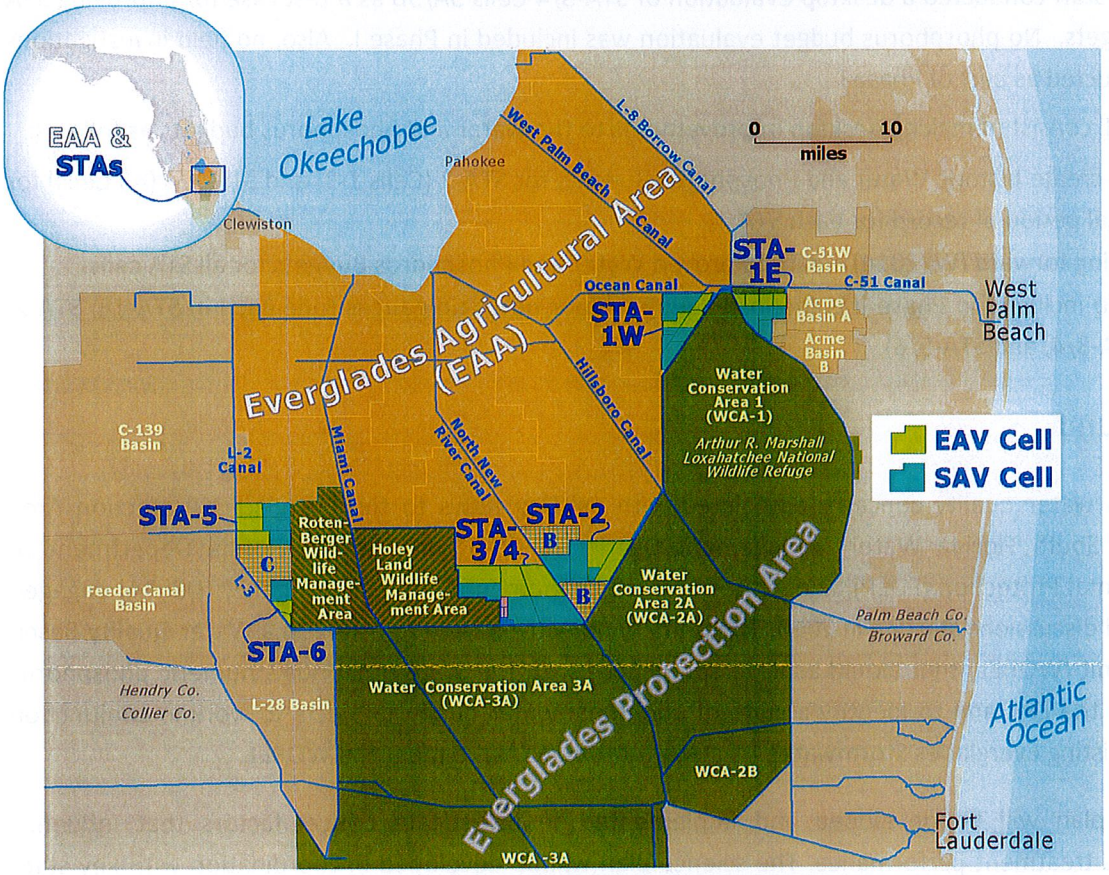
Temperince Morgan, Division director, Office of Everglades Policy and Coordination — Date: 10-7-13

Marcia Kivett, Section Administrator, Budget Support — Date: 10.8.13

Joel Arrieta, Field Operations (South) — Date: 10-10-13

Jennifer Leeds, Restoration Strategies Program Manager, OPC — Date: 10/11/2013

Project Location



Location Map for the STAs

Project Description

The STA Water and Phosphorus Budget Improvements Study is being implemented in a phased approach. The Phase I effort includes evaluation of the sources of error associated with each of the STA-3/4 Cells 3A/3B water budget components and the use of simplified methods to reduce the errors to the maximum extent possible. The sources of error and improvements in the water budgets for Cells 3A/3B may not apply to all treatment cells. Upon completion of Phase I, a report will be prepared summarizing the improvements that were made to the water budgets for Cells 3A and 3B, and recommendations including cost estimates for Phase II. If the results of Phase II indicate the need for further improvements to flow estimates or other components of STA Water Budgets, Phase III may include additional items such as structural retrofits, seepage studies and operational modifications. Phase III details and costs can be provided in the future if any of these items are determined to be necessary.

Project Scope

In Phase I, staff conducted a desktop evaluation of STA-3/4 Cells 3A/3B as a test case for improving STA water budgets. No phosphorus budget evaluation was included in Phase I. Also, no field investigations were conducted as part of Phase I.

Phase II will consist of making desktop improvements to the water and phosphorus budgets as follows:

- Re-create historic Water and Phosphorus Budgets for STA-2 (Cells 1-3) and STA-3/4 (All Cells) for total period of record for each STA.
- Going forward (WY2014) create improved Water and Phosphorus Budgets for all STA cells.
- Also included in Phase II is the installation of four new rain gauges (one each in STA-1E, STA-2, STA-3/4, and STA-5/6).

Background

To address water quality concerns associated with existing flows to the Everglades Protection Area (EPA), the South Florida Water Management District (SFWMD or District), Florida Department of Environmental Protection (FDEP), and United States Environmental Protection Agency (USEPA) engaged in technical discussions starting in 2010. The primary objectives were to establish a Water Quality Based Effluent Limit (WQBEL) that would achieve compliance with the State of Florida's numeric phosphorus criterion in the EPA and to identify a suite of additional water quality projects to work in conjunction with the existing Everglades Stormwater Treatment Areas (STAs) to meet the WQBEL.

A science plan will be developed and implemented to investigate critical factors that influence phosphorus treatment performance. The science plan will be developed in coordination with key state and federal agencies and experts and will be designed to increase the understanding of factors that affect treatment performance; in particular factors that affect performance at low phosphorus concentrations (<20 ppb TP). These investigations could include, but are not limited to: effects of microbial activity, phosphorus flux, inflow volumes and timing, inflow phosphorus loading rate and concentrations on phosphorus outflow, phosphorus removal by specific vegetation speciation, and the stability of accreted phosphorus. Results from these studies will be used to inform design and operations of treatment projects which will ultimately improve capabilities to manage for achievement of the WQBEL. Results from these studies will be summarized and reported as part of the annual report (South Florida Environmental Report).

Water budget analysis is an important tool used to understand the treatment performance of STAs. STA water budgets are comprised of structure flows (inflows and outflows), rainfall, ET, seepage, change in storage and residual (error). Developing a closed water budget is not a simple task due to the physical characteristics of wetland systems and errors associated with the measurement and estimation of each of the water budget components. Staff conducted a desktop evaluation of STA-3/4 Cells 3A/3B (See Figure 1) as a test case for improving STA water budgets. The goals of the Phase I effort were to evaluate the sources of error associated with each of the Cells 3A/3B water budget components and to reduce the errors to the maximum extent possible. No field investigations were conducted for Phase I. The

sources of error and improvements in water budgets for Cells 3A/3B may not apply to all treatment cells. STA phosphorus budget evaluation was included in Phase I, but is proposed to occur in Phase II.

Permitting

Not applicable.

Right of Way

Not applicable.

Real Estate

Not applicable.

Public Use

Not applicable.

Stakeholder Considerations

The Science Plan participants and stakeholders are the customer for this project.

Public Outreach

Not applicable.

Operations

The Phase I and Phase II water budget and phosphorus budget improvements can be implemented without any impact on operations. Furthermore, the four proposed rain gauges can be installed without interrupting operations.

Operations and Maintenance

Per Garnett Ritchie, the rain gauges would be installed by vendors that the SCADA group contracts. In the process of developing the SOW, SCADA would inform the appropriate Field Station(s) so that they are aware of the pending work and equipment, in addition to getting their input regarding potential placement.

SCADA, Instrumentation, Telemetry

Per Garnett Ritchie, SCADA, instrumentation or telemetry is required for each rain gauge. No commercial power is needed. Each rain gauge unit is powered by a Remote Terminal Unit (RTU). All four

rain gauges are within an existing tower service area: STA-1E is S-319, STA-2 is S-6, STA-3/4 is G-370, and STA-5/6 is FAN. The nearest tower for each rain gauge has available capacity.

Information Technology

Per Garnett Ritchie, the normal SCADA process will be used to install and certify the rain gauge sites.

Environmental

Not applicable.

Monitoring

The Hydro Data Management group will monitor and manage the rainfall data.

Commissioning

According to Garnett Ritchie, the installation of a rain gauge follows the normal SCADA site certification process. The total time to install each gauge depends on the funding and contractor availability. Usually, the entire process takes around three (3) months; from SOW to completion.

Lessons Learned

Following are the results of Phase I of the study:

1. Low head differentials across large culverts in mid-levees were found to be the main source of error in the Cells 3A & 3B annual water budgets.

2. Annual water budgets greatly improved by revising mid-levee structure flow data using several simplified methods; overall error terms reduced from as high as 100% to as low as 10% or less.

3. *Rainfall*, *ET* and *Change in Storage* terms were minor contributors to the test case annual water budgets. The current estimation methods for these components were found to be acceptable. No changes were made for the Cells 3A & 3B annual water budgets.

4. STA rain gauge network was reviewed including previous studies recommending additional rain gauges. Rainfall is a relatively small component of annual water budgets, however improved rainfall estimates could potentially reduce annual water budget errors by 3-5% at relatively small cost.

5. Seepage estimates were developed for Cells 3A & 3B based on values obtained from ENR and were added to annual water budgets as an improvement to previous SFER reporting. Water Budget Tool needs to be updated to include seepage estimates for all STA cells (similar to Phase I work for Cells 3A & 3B). No seepage studies are planned for Phase II; they may be part of Phase III on a case by case basis.

6. Overall annual water budget results are considered acceptable for use in characterizing TP performance, and for preliminary hydraulic and TP modeling efforts.

7. One or more Technical Publications are expected as result of Phase I effort. These technical publications will provide the details of the analyses conducted in support of the results and recommendations that resulted from the Phase 1 effort.

8. Note that the test case results may not translate to all STA cells. Different methods and potentially more intensive and costly efforts may be required to produce acceptable improvements to the water and phosphorus budgets for some cells. Such Phase III work would be investigated on an as needed basis.

9. Ongoing streamgauging, structure ratings, re-surveys, and flow data improvement efforts for the STA structures are assumed to continue by the HDM section.

8. It is important to note that the test case results may not translate to all STA cells. Different methods and potentially more intensive and costly efforts may be required to produce acceptable improvements to the water and phosphorus budgets for some cells. Such Phase III work would be investigated on an as needed basis.

9. Ongoing streamgauging, structure ratings, re-surveys, and flow data improvement efforts for the STA structures are assumed to continue by the HDM section.

Conceptual Alternative Options

More expensive and resource intensive options were initially considered, however, based on the Phase I results, it was determined that the simplified methods used to improve flow data were adequate for developing improved water and phosphorus budgets. More costly and resource intensive options should only be considered if the water and phosphorus budgets developed using the simplified methods are found to be unsuitable for the needs of the modelers and Science Plan participants.

Cost Estimates

Phase II - Estimated Costs

	Flow Estimates	Water Budgets	Phosphorus budgets	Rain gauges	Rainfall Dbkeys	Total
FY2013	$ -	$ -	$ -	$ -	$ -	$ -
FY2014	$ 243,100	$ -	$ -	$ 22,000	$ -	$ 265,100
FY2015	$ 121,550	$ 139,700	$ 139,700	$ 1,473	$ 22,000	$ 424,423
FY2016	$ 121,550	$ 69,850	$ 69,850	$ 1,473	$ 22,000	$ 284,723
FY2017	$ 121,550	$ 69,850	$ 69,850	$ 1,473	$ 22,000	$ 284,723
FY2018	$ 121,550	$ 69,850	$ 69,850	$ 1,473	$ 22,000	$ 284,723
FY2019	$ 121,550	$ 69,850	$ 69,850	$ 1,473	$ 22,000	$ 284,723
FY2020	$ 121,550	$ 69,850	$ 69,850	$ 1,473	$ 22,000	$ 284,723
total	$ 972,400	$ 488,950	$ 488,950	$ 30,839	$ 132,000	$ 2,113,139

Notes: 1. Costs shown in FY2013 dollars. No escalation included in FY2014-FY2020.
2. Costs in table above include 10% contingency added to costs in text above.
3. All contractor cost estimates based on 1,920 hours per year.

Recommendations

1. Develop improved flow estimates for STA-2 and STA-3/4 structures using one or more of the simplified methods investigated during Phase I to develop more accurate water budgets for all STA cells.

- One-year effort (FY2014) to revise flow data for STA-2 and STA-3/4 structures and enter revised flow data in new Mod Dbkeys in Dbhydro.
  - Resource need is 1 FTE Senior Engineers or 1 contractor for $221,000 ($115/hr) in Hydro Data Management's (HDM's) FY2014 budget.
- Prioritization of order of work on the structures to be coordinated with the Modeling team and the Science Plan study leads.
- Once modelers start using improved flow data, its suitability can be determined and further refinements to the flow data may occur through the modelers' efforts. In cases where significant data inadequacies still exist, further improvements can be considered on a case by case basis (see Phase III - Potential Items below).
- Once new Mod Dbkeys are populated with historic data, staff or contractors will continue to populate these Mod Dbkeys with new flow data for all structures for the life of the modeling project (FY2015 - FY2020).
  - Resource need is 0.5 FTE Senior Engineer or contractor for $110,500 in HDM's FY2015-FY2020 budget.

2. Develop improved water budgets using the revised historic flow data in new Mod Dbkeys and the Water Budget Tool.

- Initial effort is estimated to occur over the first half of FY2015, then annually thereafter at a reduced level of effort.
  - Initial effort resource need is 0.5 FTE Staff Scientist or contractor for $127,000 ($132/hr) in Water Quality Treatment Technologies' (WQTT's) FY2015 budget.
  - Annually thereafter, resource need is 0.25 FTE Staff Scientist or contractor for $63,500 in WQTT's FY2016-FY2020 budget.
- Will require support from Operations, HDM, Water Quality, and Water Supply to help WQTT update Water Budget Tool to include seepage estimates for all STA cells. Work should occur in FY2014 in parallel with creation of improved flow data in Mod Dbkeys.
- Results replace cell by cell historic water budget tables previously reported in the SFER (Vol. I Appendix 5-2 of 2013 SFER).
- Forgo publishing STA water and Phosphorus budgets in 2014 SFER and instead provide summary of STA Water and Phosphorus Budget Improvements Study.
- Future Water and Phosphorus Budget reporting to include appropriate data usability caveats and documentation of assumptions.

3. Develop improved phosphorus budgets, loading rates and settling rates using the improved flow estimates and water budgets.

- Initial effort is estimated to occur over second half of FY2015; then annually thereafter at a reduced level of effort.

- Initial effort resource need is 0.5 FTE Staff Scientist or contractor for $127,000 ($132/hr) in WQTT's FY2015 budget.
- Annually thereafter, resource need is 0.25 FTE Staff Scientist or contractor for $63,500 in WQTT's FY2016-FY2020 budget.

- Seepage estimates will rely upon best available information and will be clearly documented.
- Results replace cell by cell historic phosphorus budget tables previously reported in the SFER.
- Forgo publishing STA water and Phosphorus budgets in 2014 SFER and instead provide summary of STA Water and Phosphorus Budget Improvements Study.
- Future Water and Phosphorus Budget reporting to include appropriate data usability caveats and documentation of assumptions.

4. Install four (4) new rain gauges, collect rainfall data, maintain rainfall data in Dbhydro

- 1 each rain gauge for STA-1E, STA-2, STA-3/4 and STA-5/6.
- Capital cost to install 4 rain gauges: $5,000 x 4 = $20,000 in SCADA's FY2014 budget.
- Annual O&M and parts for 4 rain gauges: $243.50 x 4 = $974 in SCADA's FY2015-FY2020 budget.
- Electricity costs for 4 rain gauges: $0.25/day x 365 days x 4 gauges = $365 in SCADA's FY2015-FY2020 budget.
- Maintain 4 new Source rainfall Dbkeys and 4 new PREF rainfall Dbkeys
  - Resource need is 0.02 FTE Technician or contractor for $2,300 ($58/hr) for data processing and archiving rainfall data in 4 new rain gauge Source Dbkeys in HDM's FY2015-FY2020 budget.
  - Resource need is 0.08 FTE Senior Engineer or contractor for $17,700 ($115/hr) for post-processing QA/QC rainfall data in 4 new PREF Dbkeys in HDM's FY2015-FY2020 budget.

Project Milestones

Initiate Phase I: February 2013 Q2
Complete Phase I including summary report: approximately June 2013 Q3
Initiate Phase II: November 2013 OK
Complete Phase II: approximately September 2020 Q4
Initiate Phase III: To be determined; only if needed.

Resource Requirements

List Functions	Skill of Functional Employees	Identify Employees	Total FTEs Required for Complete Project
Study Lead	Chief Engineer	Tracey Piccone	0.3
Co-Study Lead	Lead Engineer	Ceyda Polatel	0.1
Lead Engineer	Lead Engineer	Hongying Zhao	0.1
Rainfall Analysis	Principal Engineer	Wossenu Abtew	0.1
HDM Contractor oversight	Lead Engineer	TBD	0.1
Seepage Analysis	Seepage Expert	Steve Krupa	0.1
Water Budget Tool Advisor	Principal Engineer	Scott Huebner	<0.1
Business Lead	PS/SAP Support	Kim O'Dell	<0.1
Total Resource Requirements			**1.0**

Project Deliverable and Schedule

Fiscal Year	Deliverable	Schedule
Rain Gauge Installation		
FY2014	Bid Process	Uses existing Work Order contracts in SCADA
FY2014	Construction	Start January 2014
FY2014	Construction	Complete May 2014
FY2013	Phase I Report	Start May 2013
FY2013	Phase I Report	Complete June 2013
FY2014	Revised Flow Data STA-2 and STA-3/4	Complete September 2014
FY2015	Updated Water and Phosphorous Budget Table STA-2 and STA-3/4	Complete September 2015
FY2016	Updated Water and Phosphorous Budget Table	Complete September 2016
FY2017	Updated Water and Phosphorous Budget Table	Complete September 2017
FY2018	Updated Water and Phosphorous Budget Table	Complete September 2018
FY2019	Updated Water and Phosphorous Budget Table	Complete September 2019
FY2020	Updated Water and Phosphorous Budget Table	Complete September 2020

Project Funding Sources

Funding source for this project will be from the Restoration Strategies Science Plan budget within the B199 functional area and multiple fund types.

References

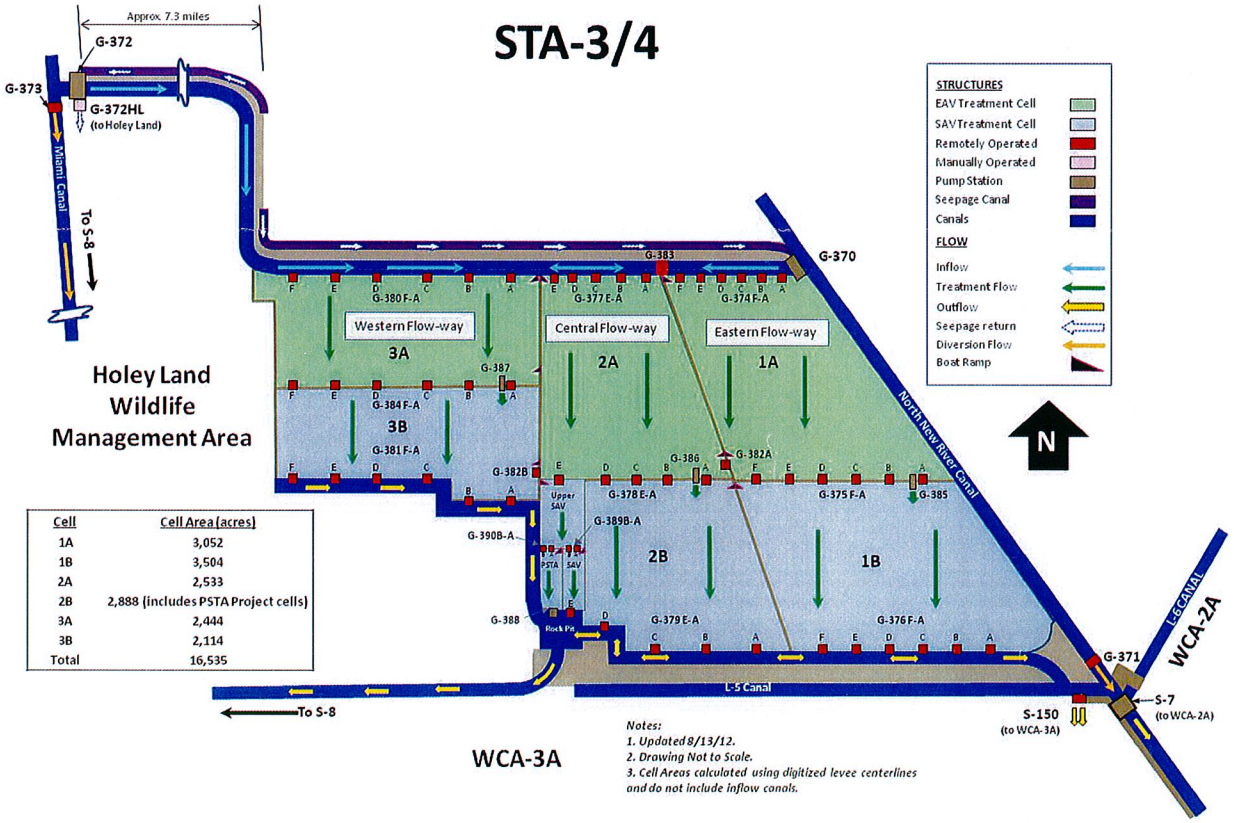
Technical publications resulting from Phase I of this study are currently being drafted and can be added as references upon completion.

Photographs

Project Schematic Diagram

Phase I - Project Location Map

Note: Phase II project location maps with exact locations for proposed rain gauges to be added in subsequent version.



Cell	Cell Area (acres)
1A	3,052
1B	3,504
2A	2,533
2B	2,888 (includes PSTA Project cells)
3A	2,444
3B	2,114
Total	16,535

Appendix A

Cost Estimate

Phase II - Estimated Costs

	Flow Estimates	Water Budgets	Phosphorus budgets	Rain gauges	Rainfall Dbkeys	Total
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2. Costs in table above include 10% contingency added to costs in text above.

3. All contractor cost estimates based on 1,920 hours per year.

PROJECT CLASSIFICATION CHECKLIST

The purpose of this checklist is to document the appropriate accounting treatment/classification for projects (capital vs. expense).

(This completed checklist is required to be attached to the Project Definition and Long Text within Project Systems. A revised checklist will be required to be completed and attached, should the nature of the project or District ownership % subsequently change.)

Project Definition Number: #100857

Project Name: STA Water and Phosphorus Budget Improvements

Functional Area: B199

Division: Water Resources

Total Estimated Project Cost: $ 2,113,139

Total Estimated Capital Cost: ~~$22,000~~ $26,000. (include 10% contingency)

Project Manager or Supervisor: Tracey Piccone

Signature: Tracy Piccone

Date: 9-27-13

Project Description (If a replacement or refurbishment of an existing asset, please indicate below and within the Project Name. If a building replacement, please also indicate below the existing building number): In

In Phase I of this effort, staff conducted a desktop evaluation of STA-3/4 Cells 3A/3B as a test case for improving STA water budgets. Phase II will consist of making desktop improvements to the water and phosphorus budgets for select STA treatment cells. Also included in Phase II is the installation of four new rain gauges (one each in STA-1E, STA-2, STA-3/4, and STA-5/6). The focus of this Project Classification Checklist is the rain gauge installation component of the STA Water and Phosphorus Budget Improvements Study.

To be completed by Project Manager/Supervisor:

1. **Is this project part of an inter-agency agreement which results only in pass-thru funding to the other agency?**

   Yes ☐

   If yes, this project is expense – please proceed to conclusion.

   No X

2. **Does this project have elements of both repair and improvement?**

   Yes X

   If yes, please indicate the estimated amount/description of each:

- **Repair: $_____/_____**
- **Improvement: $26,000 to install 4 rain gauges ~~(includes 30% contingency)~~**

  (Please also attach supporting documentation (ie. bid, etc.).

No ☐

3. **Is this project considered an improvement (ie. Provides additional value either by**

   (a) **Lengthening the existing capital asset's estimated useful life:**

   Yes ☐

   If yes, please indicate the estimated useful life: _____yrs. (please also attach supporting documentation (ie. engineering study, etc.))

   No X ☒

   OR:

   (b) **Increasing the existing capital asset's ability to provide service (ie. Greater effectiveness or efficiency)?**

   Yes ☐

   If yes, please provide explanation:_____

   _____

   _____

   (please also attach supporting documentation (ie. engineering study, etc.)

   No X ☒

4. **If this project is related to a canal/levee repair or refurbishment, please indicate if this project:**

   a. **Is to re-design the canal/levee beyond the original design capacity (resulting in increased efficiency or productive capacity of the canal/levee):**

   Yes ☐

   No X ☒

   N/A ☐

5. **If this project is related to software upgrades or enhancements, please indicate if:**

   a. **Is it reasonably assured that the expenditures will result in additional capacity/functionality/efficiency/or increase the useful life of the existing asset (ie. Is the computer software able to perform tasks that it was previously incapable of performing or does it increase the level of service provided by the software without the ability to perform additional tasks?):**

Yes ☐

No X ☒

N/A ☐

b. If internal or external costs to develop internal use software, has the design of the chosen path of the software configuration already been determined or does evaluation of alternatives still need to occur?

Software configuration has already been determined ☐

Evaluation of alternatives still needs to occur ☐

N/A X ☒

6. Is this a parent project?

Yes ☐

If yes, please indicate the children project numbers:_____

No X ☒

7. If an asset results, will the District's ownership be 100%?

Yes X ☒

No ☐

If no, please provide explanation:_____

_____

_____

_____

N/A ☐

8. If this project is related to construction of monitoring wells, will the wells be torn down at the end of the study?

Yes ☐

No ☐

N/A X ☒

9. Is this project an initial feasibility study?

Yes ☐

No X ☒

10. **Please indicate <u>all</u> applicable fund numbers for this project (Note: if all applicable funds are not yet known, please indicate this fact):**

    a. **For capital project phases or direct asset purchases, if applicable:**
    <u>406</u> (Note: this (these) fund number (s) should begin with a "4" and the related commitment items for each network activity and wbs element should begin with a "58")

    b. **For expense project phases, if applicable:**
    <u>217</u> (Note: this (these) fund number (s) should begin with a "2" and the related commitment items for each network activity and wbs element should begin with a "51" – "57")

<u>To be completed by Fixed Asset Accounting</u>:

1. **If this project is a replacement or refurbishment of an existing asset:**

   Is the existing asset separately recorded on the books?

   Yes ☐

   No ☐

   Please indicate:

   - **Asset No.: _____**
   - **Net Book Value: $_____**
   - **Remaining Useful Life: _____yrs.**

CONCLUSION:

Based on the above information (and information contained in the PMP, Long Text, etc.), this project should be classified as:

CAPITAL ☑

EXPENSE ☑

COMMENTS: CAPITAL FOR 4 RAIN GAUGES. ONLY THE MAIN PART OF PROJECT IS EXPENSE.

COMPLETED BY: Meryl S. Pasion — **DATE:** 10/16/13

Fixed Asset Accountant

APPROVED BY: — **DATE:**

Lynda Anderson — 10/2/13

Bureau Chief

[signature] — 10-2-13

Section Administrator – Budget Support

marcia kuett — 10.10.13

Section Administrator – Metrics

S. Verbitrum — 10-16-13

Accounting Manager – Fixed Assets

Richard Sands — 18 OCT 2013

(LAST UPDATE: 3/6/13)