

**Bayside Improvement and Bay Creek
Community Development Districts
9220 Bonita Beach Road, Suite 214 • Bonita Springs, Florida 34135
Phone (239) 464-7114**

Cover Letter and Description of Bayside Improvement and Bay Creek CDDs

Pelican Landing is a ~2,160 acre development located in the Village of Estero and City of Bonita Springs, Lee County, Florida (see Attachment 1). The development is encompassed by two Community Development Districts; Bayside Improvement and Bay Creek, at 1,840 acres and 320 acres, respectively. The development is bordered by Coconut Road to the north, U.S. 41 to the east, Spring Creek to the south, and Estero Bay to the west. Development began in Pelican Landing in the mid-1980s. The majority of Pelican Landing is developed which includes single family, multi family, supporting infrastructure, golf courses, and commercial. Through the development of Pelican Landing, a surface water management system has been permitted and constructed, which includes approximately 137,280 LF of drainage pipe, 1,498 associated drainage structures, perimeter berms, 76 control structures, and 91 lakes (approximately 217 ac.). There is also approximately 330 acres of preserve area within the District. Stormwater over the entirety of the District is captured, treated, and attenuated by the stormwater management system prior to discharging into the Lee County MS4 or waters of the State.

The Districts own several tracts of land; primarily lake, preserve, and open space tracts. The District has easement rights over infrastructure and features which they maintain; primarily the storm water management system and irrigation distribution system. The Districts owns a very limited portion of roadway, ~880 LF, the remaining roadway is owned by the master, homeowners, or condo associations within their respective areas.

The District owns a vacuum truck and performs street sweeping within the community on a regular basis. The vacuum truck is maintained on District owned land outside of the development and is emptied into dumpsters which are emptied regularly by Lee County Solid Waste.

The Districts have very active Boards which have a high level of interest in the appearance and health of their storm water management system. The District has lake subcontractors perform monthly inspections with reports provided at each Board of Supervisors meeting. The District has open lines of communication with the neighboring Associations and golf courses in which they share information regarding the lakes, coordinate maintenance responsibilities, and verify best management practices are being followed. The District has also allowed FGCU professors and students to perform studies on the lakes which included sampling and lab work to determine the health of the various water bodies.

Some of the notable improvements within the District include but are not limited to:

- Fountains and aerators to assist in circulation and destratification of lakes
- Nanobubble generators added to six lakes to increase DO levels and nutrient adsorption
- Monthly lake observations by subcontractors
- Routine maintenance of lakes in regards to harmful growth
- Routine maintenance of drainage pipes (desilting and observations)
- Routine observation and maintenance of littoral areas

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- Doggy waste collection stations located throughout District
- Routine street sweeping
- Bonita Springs Utilities owns, monitors, and maintains sanitary sewer system which serves entire District
- Utilization of storm drain medallions to remind and educate citizens of the storm drains' effluent locations and prevent potential pollution
- Residents and Supervisors are in the process of establishing the Pelican Landing Water Quality Task Force comprised of representatives from several communities, clubs, and committees within the Bayside Improvement and Bay Creek Community Development District. Support members include South Florida Water Management District, City of Bonita Springs, and Village of Estero representatives. This task force is intended to connect the various entities within the District with the sole purpose of improving the water quality within, and discharging from, the District.



Annual Report Form For Individual NPDES Permits For Municipal Separate Storm Sewer Systems (RULE 62-624.600(2), F.A.C.)

- This Annual Report Form must be completed and submitted to the Department to satisfy the annual reporting requirements established in Rule 62-624.600, F.A.C.
- Submit this fully completed and signed form and any REQUIRED attachments by email to the NPDES Stormwater Program Administrator or to the MS4 coordinator (<http://www.dep.state.fl.us/water/stormwater/npdes/contacts.htm>). Files larger than 10MB may be placed on the FTP site at: ftp://ftp.dep.state.fl.us/pub/NPDES_Stormwater/. After uploading files, email the MS4 coordinator or NPDES Program Administrator to notify them the report is ready for downloading; or by mail to the address in the box at right.
- Refer to the Form Instructions for guidance on completing each section.
- **Please print or type information in the appropriate areas below.**

Submit the form and attachments to:
 Florida Department of Environmental
 Protection
 Mail Station 3585
 2600 Blair Stone Road
 Tallahassee, Florida 32399-2400

SECTION I. BACKGROUND INFORMATION

A.	Permittee Name: Bayside Improvement and Bay Creek Community Development District		
B.	Permit Name: Lee County Municipal Separate Storm Sewer System		
C.	Permit Number: FLS000035-004 (Cycle 4)		
D.	Annual Report Year: ☐ Year 1 ☐ Year 2 ☒ Year 3 ☐ Year 4 ☐ Year 5 ☐ Other, specify Year:		
E.	Reporting Time Period (month/year): May / 2019 through April / 2020		
F.	Name of the Responsible Authority: Walter McCarthy		
	Title: Chairman		
	Mailing Address: 9220 Bonita Beach Road, Suite 214		
	City: Bonita Springs	Zip Code: 34135	County: Lee
	Telephone Number: 239-464-7114		Fax Number: N/A
G.	Name of the Designated Stormwater Management Program Contact (if different from Section I.F above): Chesley E. Adams, Jr.		
	Title: District Manager		
	Department:		
	Mailing Address: 9220 Bonita Beach Road, Suite 214		
	City: Bonita Springs	Zip Code: 34135	County: Lee
	Telephone Number: 239-464-7114		Fax Number: N/A
H.	E-mail Address:		
	E-mail Address: Adamsc@whhassociates.com		

SECTION II. MS4 MAJOR OUTFALL INVENTORY (Not Applicable In Year 1)

A.	Number of outfalls ADDED to the outfall inventory in the current reporting year (insert "0" if none): 0 (Does this number include non-major outfalls? ☐ Yes ☐ No ☒ Not Applicable)
B.	Number of outfalls REMOVED from the outfall inventory in the current reporting year (insert "0" if none): 0 (Does this number include non-major outfalls? ☐ Yes ☐ No ☒ Not Applicable)
C.	Is the change in the total number of outfalls due to lands annexed or vacated? ☐ Yes ☐ No ☒ Not Applicable

SECTION III. PART V.B. ASSESSMENT PROGRAM

A.	Provide a brief statement as to the status of water quality monitoring plan implementation. Status may include sampling frequency changes, monitoring location changes, or sampling waiver conditions. <i>DEP Note: If permittee participates in a collaborative monitoring plan, permittee may refer to a joint response as defined by the interlocal agreement.</i> Water quality monitoring for the Bayside Improvement and Bay Creek Community Development District uses data from the Lee County Water Monitoring Program. The Lee County's 48-10GR water quality monitoring station on Spring Creek (See attachment 1) is used to monitor the water quality from Bayside Improvement and Bay Creek CDD to U.S. Waters. Monitoring typically occurs monthly for the following constituents: Oxygen Dissolved, Percent Saturation; Aluminum; Arsenic; Barium; Beryllium; Biochemical Oxygen Demand 5 day; Calcium; Cadmium; Chloride; Chromium; Copper; Enterococci; Fecal Coliform; Iron; Magnesium; E. coli; Manganese; Molybdenum; Ammonia; Nickel; Nitrate; Nitrite; Nitrous Oxide; Phosphorus; Nitrogen; Lead; Antimony; Selenium; Silica; Hardness; Thallium; Total Organic Carbon; Turbidity; Total Suspended Solids; Vanadium; Zinc.
B.	Provide a brief discussion of the monitoring and loading results to date which includes a summary of the water quality monitoring data and / or stormwater pollutant loading changes from the reporting year. <i>DEP Note: Results must be specific to the permittee's SWMP.</i> The stormwater pollutant loadings for Bayside Improvement and Bay Creek CDDs (District) are based on the monitoring results provided by the Lee County Spring Creek (48-10GR) station. The biochemical oxygen demand (BOD) concentrations during the dry season illustrate a slightly increased trendline over 28 years. From 2018 to 2019, the BOD concentrations during the dry season are approximately the same. The BOD concentrations for the 2020 dry season have minimally increased since 2019. During the wet season, the BOD concentrations have continually decreased since 2016. The linear trend for the wet season BOD concentrations illustrate a decrease from 1992 to 2020. The overall copper concentrations during wet and dry season have shown a significant linear decrease over the past 11 years. The copper concentrations during the 2019 wet season have decreased approximately 67% since 2018. There is a minute increase of copper concentrations during the 2019 dry season in comparison to 2018. The 2020 dry season copper concentrations are 96% lower than the previous year. The total nitrogen (TN) concentrations during the dry season have decreased from 2019 to 2018 and are currently lower than 2019's concentrations. The TN concentrations during wet and dry season show a slight increase from 1992 to 2020. The total phosphorus (TP) concentrations during dry season show a stable trend from 2017 to 2019. The current dry season TP concentrations are lower than 2019's. The TP concentrations since 1992 illustrate a declining linear trend for the overall dry seasons. Since 1992, the linear trend for TP concentration during wet season show a stable, plateau trend. The TP concentrations during wet season have slightly increased approximately 14% from 2018 to 2019. The total suspended solids (TSS) during wet and dry season has significantly declined over the last 28 years. Since 2017, the TSS results during the wet and dry season have shown to continually decline. The zinc concentrations during the dry season have decreased approximately 40% from 2018 to 2019. The current dry season zinc concentrations are significantly lower than 2019. The zinc concentrations during the wet season illustrate a decreasing linear trend over the past 11 years. The data is limited for all constituents during the current partial year which may skew the averages. In addition, March and April of 2020 were not recorded due to COVID-19 shutdowns. The stormwater management system functioning properly with appropriate maintenance intervals attributes the steady and/or decreasing pollutant loadings.
C.	Attach a monitoring data summary as required by the permit. An analysis of the data discussing changes in water quality and/or stormwater pollutant loading from previous reporting years. <i>DEP Note: Analysis must be specific to the permittee's SWMP.</i> Please find monitoring data summary attached.

SECTION IV. FISCAL ANALYSIS

A.	Total expenditures for the NPDES stormwater management program for the current reporting year: \$487,330
B.	Total budget for the NPDES stormwater management program for the subsequent reporting year: \$486,564
C.	Did subsequent program resources decrease from the current reporting period? Y X / N If program resources decreased, provide a discussion of the impacts on the implementation of the SWMP. No changes in programming we are simply experiencing slight reduction in over all expenses year over year.

SECTION V. MATERIALS TO BE SUBMITTED WITH THIS ANNUAL REPORT FORM

Only the following materials are to be submitted to the Department along with this fully completed and signed Annual Report Form (check the appropriate box to indicate whether the item is attached or is not applicable):

<u>Attached</u>	<u>N/A</u>	Required Attachments	Permit Citation	Attachment Number/Title
☒	☐	Any additional information required to be submitted in this current annual reporting year in accordance with Part III.A of your permit that is not otherwise included in Section VII below.	Part III.A	1 - Water Quality Monitoring Graphs
☐	☒	If program resources have decreased from the previous year, a discussion of the impacts on the implementation of the SWMP.	Part II.F	
☐	☒	An explanation of why the minimum inspection frequency in Table II.A.1.a. was not met, if applicable.	Part II.A.1	
☐	☒	A list of the flood control projects that did not include stormwater treatment and an explanation for each of why it did not (if applicable).	Part III.A.4	
☒	☐	A monitoring data summary as directed in Section III.C above and in accordance with Rule 62-624.600(2)(c), F.A.C.	Part VI.B.2.	2 - Assessment Results
☐	☒	YEAR 1 ONLY: An inventory of all known major outfalls and a map depicting the location of the major outfalls (hard copy or CD-ROM) in accordance with Rule 62-624.600(2)(a), F.A.C.	Part III.A.1	
☐	☒	YEAR 2: A summary review of codes and regulations to reduce the stormwater impact from development.	Part III.A.2	
☒	☐	Year 3 ONLY: The estimates of pollutant loadings and event mean concentrations for each major outfall or each major watershed in accordance with Rule 62-624.600(2)(b), F.A.C.	Part V.A	3 - Annual Pollutant Loading Estimate
☐	☒	YEAR 3: Summary of TMDL Monitoring Results (if applicable).	Part VIII.B.2	No TMDL established
☐	☒	YEAR 3: Bacteria Pollution Control Plan (if applicable).	Part VIII.B.3	
☐	☒	YEAR 4: A follow-up report on plan implementation of changes to codes and regulations to reduce the stormwater impact from development.	Part III.A.2	
☐	☒	YEAR 4: A report on any amendments to the applicable legal authority (if applicable).	Part III.A.7.a	
☐	☒	YEAR 4: Permit re-application information in accordance with Rule 62-624.420(2), F.A.C. - The monitoring plan (with revisions, if applicable). - If the total annual pollutant loadings have not decreased over the past two permit cycles, revisions to the SWMP, as appropriate.	Part V.B.3 Part V.A.3	
☐	☒	YEAR 4: TMDL Supplemental SWMP (if applicable).	Part VIII.B.3	

DO NOT SUBMIT ANY OTHER MATERIALS

(such as records and logs of activities, monitoring raw data, public outreach materials, etc.)

SECTION VI. CERTIFICATION STATEMENT AND SIGNATURE

The Responsible Authority listed in Section I.F above must sign the following certification statement, as per Rule 62-620.305, F.A.C.:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based upon my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name of Responsible Authority (type or print): Walter McCarthy

Title: Chairman

Signature: _____ Date: ____ / ____ / ____

SECTION VII. STORMWATER MANAGEMENT PROGRAM (SWMP) SUMMARY TABLE									
A.	B.					C.	D.	E.	F.
Permit Citation/ SWMP Element	Permit Requirement/Quantifiable SWMP Activity					Number of Activities Performed	Documentation / Record	Entity Performing the Activity	Comments
Part III.A.1	Structural Controls and Stormwater Collection Systems Operation								
	Report the current known inventory.								
	Report the number of inspection and maintenance activities conducted for each applicable type of structure included in Table II.A.1.a, and the percentage of the total inventory of each type of structure inspected and maintained.								
	<i>Note: Delete structures that are not in your MS4's inventory. The permittee may choose its own unit of measurement for each structural control to be consistent with the unit of measurement in the documentation. Unit options include: miles, linear feet, acres, etc.</i>								
	Type of Structure	Number of Structures	Number of Inspections	Percent Inspected	Number of Maintenance Activities	Percent Maintained			
	Dry retention systems	0							
	Underdrain filter systems	0							
	Exfiltration trench / French drains (lf)	0							
	Grass treatment swales (miles)	0							
	Dry detention systems	0							
	Wet detention systems	91	91	100	91	100	Treatment Reports	Solitude	
	Detention with filtration systems	0							
	Alum Injection systems	0							
	Pollution control boxes	0							
	pump stations	0							
	Major outfalls	5	0	0	0	0			Inspected YR 1
	Weirs or other control structures	76	0	0	0	0			Inspected YR 1
	Pipes / culverts (miles)	26	1	90	24	28	Inspection Reports/DVD Maintenance Contract	MRI	Selected cleaning
	Canals	0							
	Inlets / catch basins / grates	1,498	1	100	16	26	Inspection Reports/DVD Maintenance Contract	MRI	Selected cleaning
	Ditches / conveyance swales (miles)	0.16	1	100	5	100	District Management Report	Management	No maintenance required
If the minimum inspection frequencies set forth in									

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	Table II.A.1.a. were not met, provide as an attachment an explanation of why they were not and a description of the actions that will be taken to ensure that they will be met.					
Part III.A.1 Summary	Provide an evaluation of the Stormwater Management Program according to Part VI.B.3 of the permit.					
	Strengths: Active stormwater lake maintenance program with newly added nanobubbler generator to six lakes to increase DO levels and nutrient adsorption.					
	Limitations: None at this time.					
	SWMP revisions implemented to address limitations: None at this time.					
Part III.A.2	Areas of New Development and Significant Redevelopment					
	Report the number of significant development projects, including new and redevelopment, reviewed and approved by the permittee for post-development stormwater considerations. <i>Not applicable to CDDs, WCDs, and DD</i>					
Part III.A.2 Summary	Provide an evaluation of the Stormwater Management Program according to Part VI.B.3 of the permit. <i>Not applicable to CDDs, WCDs, and DD</i>					
Part III.A.3	Roadways					
	Report on the litter control program, including the frequency of litter collection, an estimate of the total number of road miles cleaned or amount of area covered by the activities, and an estimate of the quantity of litter collected. <i>Note: If the permittee does not contract activities, delete CONTRACTOR activities.</i>					
	PERMITTEE Litter Control: Frequency of litter collection		Weekly	Maintenance Specifications	District Staff	
	PERMITTEE Litter Control: Estimated amount of area maintained (lf)		28,400	District Map	District Engineer/Staff	
	PERMITTEE Litter Control: Estimated amount of litter collected (cy)		7.7	Dumpster Receipts	District Staff	
	CONTRACTOR Litter Control: Frequency of litter collection		0			
	CONTRACTOR Litter Control: Estimated amount of area maintained (lf)		0			
	CONTRACTOR Litter Control: Estimated amount of litter collected (cy)		0			
	OPTIONAL: If an Adopt-A-Road or similar program is implemented, report the total number of road miles cleaned and an estimate of the quantity of litter collected. If you do not participate in an Adopt-A-Road program, report "0".					
	Trash Pick-up Events: Total miles cleaned		0			No program within District
	Trash Pick-up Events: Estimated amount of litter collected (cy)		0			
Adopt-A-Road: Total miles cleaned		0				

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Permit Citation/ SWMP Element	Permit Requirement/Quantifiable SWMP Activity	Number of Activities Performed	Documentation / Record	Entity Performing the Activity	Comments
	Adopt-A-Road: Estimated amount of litter collected (cy)	0			
	Report on the street sweeping program, including the frequency of the sweeping, total miles swept, an estimate of the quantity of sweepings collected, and the total nitrogen and total phosphorus loadings that were removed by the collection of sweepings. If no street sweeping program is implemented, provide the explanation of why not in column F.				
	Frequency of street sweeping	Weekly	Sweeping Log	District Staff	
	Total miles swept	1,560	Map	District Staff	
	Estimated quantity of sweeping material collected (cy / tons)	6.5	Dumpster Receipts	District Staff	
	Total phosphorous loadings removed (pounds)	8			FSA Calculator
	Total nitrogen loadings removed (pounds)	5			
	Report the equipment yards and maintenances shops that support road maintenance activities, and the number of inspections conducted for each facility.				
	Name of Facility	Number of Inspections			
		0			None in District
	0				
Part III.A.3 Summary	Provide an evaluation of the Stormwater Management Program according to Part VI.B.3 of the permit.				
	Strengths: Private roads actively maintained by HOAs.				
	Limitations: None at this time.				
	SWMP revisions implemented to address limitations: None at this time.				
Part III.A.4	Flood Control Projects				
	Report the total number of flood control projects that were constructed by the permittee during the reporting period and the number of those projects that did NOT include stormwater treatment. The permittee shall provide a list of the projects where stormwater treatment was not included with an explanation for each of why it was not.				
	Report on any stormwater retrofit planning activities and the associated implementation of retrofitting projects to reduce stormwater pollutant loads from existing drainage systems that do not have treatment BMPs.				
	Flood control projects completed during the reporting period	0			No such projects completed during current reporting period or planned within District.
	Flood control projects completed that did <u>not</u> include stormwater treatment	0			
	Stormwater retrofit projects planned/under construction	0			
	Stormwater retrofit projects completed	0			
	If there were projects that did not include stormwater treatment, provide as an attachment a list of the projects and an explanation for each of why it did not.	☐			
Part III.A.4 Summary	Provide an evaluation of the Stormwater Management Program according to Part VI.B.3 of the permit.				
	Strengths: Entire stormwater system permitted and constructed to SFWMD ERP criteria with finished floor elevation above 100 Yr, 3 Day storm event.				
	Limitations: None at this time.				
	SWMP revisions implemented to address limitations: None at this time.				

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Permit Citation/ SWMP Element	Permit Requirement/Quantifiable SWMP Activity	Number of Activities Performed	Documentation / Record	Entity Performing the Activity	Comments
Part III.A.5	Municipal Waste Treatment, Storage, and Disposal Facilities Not Covered by an NPDES Stormwater Permit				
	Report the facilities and the number of the inspections conducted for each facility.				
	Name of Facility	Number of Inspections			
		0			None within District
		0			
Part III.A.5 Summary	Provide an evaluation of the Stormwater Management Program according to Part VI.B.3 of the permit.				
	Strengths: There are no such facilities located within the District.				
	Limitations: There are no such facilities located within the District.				
	SWMP revisions implemented to address limitations: There are no such facilities located within the District.				
Part III.A.6	Pesticides, Herbicides, and Fertilizer Application				
	Report the number of permittee personnel applicators and contracted commercial applicators of pesticides and herbicides who are FDACS certified / licensed.				
	Report the number of permittee personnel who have been trained through the Green Industry BMP Program and the number of contracted commercial applicators of fertilizer who are FDACS certified / licensed.				
	PERSONNEL: FDACS public applicators of pesticides/herbicides	2	Copy licenses/ certificates	District Staff	
	CONTRACTORS: FDACS commercial applicators of pesticides/ herbicides	6	Copy licenses/ certifications	Solitude	
	PERSONNEL: Green Industry BMP Program training completed	2	Copy licenses/ certifications	District Staff	
	PERSONNEL: FDACS certified / licensed applicators of fertilizer	2	Copy licenses/ certifications	District Staff	
	Provide a copy of the adopted ordinance with the Year 2 Annual Report. If this provision is not applicable because the permittee is not within the watershed of a nutrient-impaired water body, indicate that in Column F.				
	Year 2 ONLY: Attach copy of adopted Florida-friendly ordinance	<u>Not applicable to CDDs, WCDs, and DD</u>			
	Report on the public education and outreach activities that are performed or sponsored by the permittee within the permittee's jurisdiction to encourage citizens to reduce their use of pesticides, herbicides and fertilizers including the type and number of activities conducted, the type and number of materials distributed, and the number of Web site visits (if applicable). FYN Funding provided by Lee County: \$90,000.00				
	Brochures/Flyers/Fact sheets distributed	208,732	S:\NPDES\Annual Reports\Cycle 4, Year 3, 2019- 2020\Public Education\201 9 Fertilize Smart Campaign	DNR, Kurt Harcle rode KHarcle rode @leeg ov.co m	Fertilize Smart Campaign (Billboards,T V spots, direct mail)

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Permit Citation/ SWMP Element	Permit Requirement/Quantifiable SWMP Activity	Number of Activities Performed	Documentation / Record	Entity Performing the Activity	Comments
	Neighborhood presentations: Number conducted	0			
	Neighborhood presentations: Number of participants	0			
	Newspapers & newsletters: Number of articles/notices published	0			
	Newsletters: Number of newsletters distributed	0			
	Public displays (e.g., kiosks, storyboards, posters, etc.)	3			
	Radio or television Public Service Announcements (PSAs)				
		812	S:\NPDES\Annual Reports\Cycle 4, Year 3, 2019-2020\Public Education\2019 Fertilize Smart Campaign	DNR, Kurt Harclerode, kharcclerode@lee.gov	
	School presentations: Number conducted	0			
	School presentations: Number of participants	0			
	Seminars/Workshops: Number conducted	0			
	Seminars/Workshops: Number of participants	0			
	Special events: Number conducted	0			
	Special events: Number of participants	0			
	Number of visitors to stormwater-related pages				
		88,638	Jeff Bristow JBristow@lee.gov 7/14/20; Kurt Harclerode, KHarcclerode@leegov.com 9/13/8; Stephen Brown BROWNSH@leegov.com 7/28/20		Fertilizesmart.com, YouTube-UF extension services, Lee County Home and Yard Care
	FYN: Brochure/Flyers/Fact sheets distributed	4,257	S:\Natural Resources\NPDES\Annual Reports\Cycle 4, Year 3, 2019-2020	FYN, Stephen Brown	
	FYN: Newspapers & newsletters: Number of articles/notices published	10,667	Resources\NPDES\Annual Reports\Cycle 4, Year 3, 2019-2020	FYN, Stephen Brown	
	FYN: Newsletters: Number of newsletters distributed	30,000	Lee County Extension Services.docx	FYN, Stephen Brown	

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Permit Citation/ SWMP Element	Permit Requirement/Quantifiable SWMP Activity	Number of Activities Performed	Documentation / Record	Entity Performing the Activity	Comments
	FYN: Public displays (e.g., kiosks, storyboards, posters, etc.)	0			
	FYN: Radio or television Public Service Announcements (PSAs)	0			
	FYN: School presentations: Number conducted	0			
	FYN: School presentations: Number of participants	0			
	FYN: Seminars/Workshops: Number conducted	75		FYN, Stephen Brown	
	FYN: Seminars/Workshops: Number of participants	2,272	S:\Natural Resources\N PDES\Annual Reports\Cycle 4, Year 3, 2019-2020Lee County Extensio Services.docx	FYN, Stephen Brown	
	FYN: Special events: Number conducted	2,047		FYN, Stephen Brown	
	FYN: Special events: Number of participants	2,047		FYN, Stephen Brown	Consultations
Part III.A.6 Summary	Provide an evaluation of the Stormwater Management Program according to Part VI.B.3 of the permit.				
	Strengths: Contractors operating within District boundaries need Lee County license, including fertilizer.				
	Limitations: None at this time.				
	SWMP revisions implemented to address limitations: None at this time.				
Part III.A.7.a	Illicit Discharges and Improper Disposal — Inspections, Ordinances, and Enforcement Measures				
	Report amendments in Year 4.				
	Year 4 ONLY: Attach a report on amendments to applicable legal authority	☐			
Part III.A.7.c	Illicit Discharges and Improper Disposal — Investigation of Suspected Illicit Discharges and/or Improper Disposal				
	Report on the proactive inspection program, including the number of inspections conducted by the permittee, the number of illicit activities found, and the number and type of enforcement actions taken.				
	Proactive inspections for suspected illicit discharges	91	Lake Reports	Solitude	Performed during lake treatment inspections
	Inspections performed by Lee County SQG Program	0			None requested
	Illicit discharges found during a proactive inspection	0			No suspected illicit discharges
	NOV/WL/citation/fines issued for illicit discharges found during proactive inspection	0			No fines, notices, or citations
	Report on the reactive investigation program as it relates to responding to reports of suspected illicit discharges, including the number of reports received, the				

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Permit Citation/ SWMP Element	Permit Requirement/Quantifiable SWMP Activity	Number of Activities Performed	Documentation / Record	Entity Performing the Activity	Comments
	number of investigations conducted, the number of illicit activities found, and the number and type of enforcement actions taken.				
	Reports of suspected illicit discharges received	0			No reports
	Reactive investigations of reports of suspected illicit discharges etc.	0			No reactive investigations
	Illicit discharges etc. found during reactive investigation	0			No illicit discharges
	NOV/WL/citation/fines issued for illicit discharges etc. found during reactive investigation	0			No notices, fines, or citations
	Report the type of training activities, and the number of permittee personnel and contractors trained (both in-house and outside training) within the reporting year.				
	Personnel trained	4	Copies of certifications	Lee County-DNR	District Engineer has inspectors on staff if needed.
	Contractors trained	4	Copies of certifications	Lee County-DNR	Lake contractor certified at Lee County training
Part III.A.7.d	Illicit Discharges and Improper Disposal — Spill Prevention and Response				
	Report on the spill prevention and response activities, including the number of spills addressed.				
	Hazardous and non-hazardous material spills responded to	0			None reported
	Report the type of training activities, and the number of permittee personnel and contractors trained (both in-house and outside training) within the reporting year.				
	Personnel trained	0	The District relies on the training activities of Lee County as identified within the ILA. Spill response is performed by Estero Fire District and Bonita Springs Fire District based on location within District.		
	Contractors trained	0			
Part III.A.7.e	Illicit Discharges and Improper Disposal — Public Reporting				
	Report on the public education and outreach activities that are performed or sponsored by the permittee within the permittee's jurisdiction to encourage the public reporting of suspected illicit discharges and improper disposal of materials, including the type and number of activities conducted, the type and number of materials distributed, and the number of Web site visits (if applicable).				
	Brochures/Flyers/Fact sheets distributed	0			The District relies on the public education activities of Lee County as identified within the ILA. This District is only
	Neighborhood presentations: Number conducted	0			
	Neighborhood presentations: Number of participants	0			
	Newspapers & newsletters: Number of articles/notices published	0			
	Newsletters: Number of newsletters distributed	0			
	Public displays (e.g., kiosks, storyboards, posters, etc.)	0			
	Radio or television Public Service Announcements (PSAs)	0			
	School presentations: Number conducted	0			
	School presentations: Number of participants	0			

SECTION VII. STORMWATER MANAGEMENT PROGRAM (SWMP) SUMMARY TABLE					
A.	B.	C.	D.	E.	F.
Permit Citation/ SWMP Element	Permit Requirement/Quantifiable SWMP Activity	Number of Activities Performed	Documentation / Record	Entity Performing the Activity	Comments
	Seminars/Workshops: Number conducted	0			to report on the activities it conducted.
	Seminars/Workshops: Number of participants	0			
	Special events: Number conducted	0			
	Special events: Number of participants	0			
	Number of visitors to stormwater-related pages	0			
Part III.A.7.f	Illicit Discharges and Improper Disposal — Oils, Toxics, and Household Hazardous Waste Control				
	Report on the public education and outreach activities that are performed or sponsored by the permittee within the permittee's jurisdiction to encourage the proper use and disposal of oils, toxics, and household hazardous waste, including the type and number of activities conducted, the type and number of materials distributed, the amount of waste collected / recycled / properly disposed, and the number of Web site visits (if applicable).				
	Brochures/Flyers/Fact sheets distributed	0			The District relies on the public education activities of Lee County as identified within the ILA. This District is only to report on the activities it conducted.
	Neighborhood presentations: Number conducted	0			
	Neighborhood presentations: Number of participants	0			
	Newspapers & newsletters: Number of articles/notices published	0			
	Newsletters: Number of newsletters distributed	0			
	Public displays (e.g., kiosks, storyboards, posters, etc.)	0			
	Radio or television Public Service Announcements (PSAs)	0			
	School presentations: Number conducted	0			
	School presentations: Number of participants	0			
	Seminars/Workshops: Number conducted	0			
	Seminars/Workshops: Number of participants	0			
	Special events: Number conducted	0			
	Special events: Number of participants	0			
	Storm sewer inlets newly marked/replaced	0			
	Number of visitors to stormwater-related pages	0			
Part III.A.7.g	Illicit Discharges and Improper Disposal — Limitation of Sanitary Sewer Seepage				
	Report on the type and number of activities undertaken to reduce or eliminate SSOs and inflow/ infiltration, the number of SSOs or inflow / infiltration incidents found and the number resolved, and the name of the owner of the sanitary sewer system within the permittee's jurisdiction. Report only the SSOs and inflow / infiltration incidents into the MS4.				
	Owner of the sanitary sewer system	Bonita Springs Utilities (BSU)			
	Activity to reduce/eliminate SSOs and I&I: (description)	0			None reported or discovered by District. BSU owns, monitors, and maintains wastewater infrastructure and flows.
	Activity to reduce/eliminate SSOs and I&I: (description)	0			
	SSO incidents discovered	0			
	SSO incidents resolved	0			
	Inflow / infiltration incidents discovered	0			
	Inflow / infiltration incidents resolved	0			

SECTION VII. STORMWATER MANAGEMENT PROGRAM (SWMP) SUMMARY TABLE						
A.	B.		C.	D.	E.	F.
Permit Citation/ SWMP Element	Permit Requirement/Quantifiable SWMP Activity		Number of Activities Performed	Documentation / Record	Entity Performing the Activity	Comments
Part III.A.7 Summary	For activities required by Part III.A.7: Provide an evaluation of the Stormwater Management Program according to Part VI.B.3 of the permit.					
	Strengths: The District has a well-established, proactive inspection program; in addition to the gated entrances which reduce external risks.					
	Limitations: None at this time.					
	SWMP Revisions implemented to address limitations: None at this time.					
Part III.A.8.a	Industrial and High-Risk Runoff — Identification of Priorities and Procedures for Inspections					
	Report on the high risk facilities inventory, including the type and total number of high risk facilities and the number of facilities newly added each year.					
	Report on the high risk facilities inspection program, including the number of inspections conducted and the number and type of enforcement actions taken.					
	Type of Facility	Number of Facilities	Number of Inspections	Enforcement Actions		
	Operating municipal landfills	0				No such facilities exist within the boundaries of this co- permittees MS4.
	Hazardous waste treatment, storage, disposal and recovery (HWTSDR) facilities	0				
	EPCRA Title III, Section 313 facilities (TRI)	0				
	Facilities determined as high risk by the permittee	0				
Part III.A.8.b	Industrial and High-Risk Runoff — Monitoring for High Risk Industries					
	Report the number of high risk facilities sampled.					
	High risk facilities sampled		0			No such facilities exist within the boundaries of this co- permittees MS4.

SECTION VII. STORMWATER MANAGEMENT PROGRAM (SWMP) SUMMARY TABLE						
A.	B.		C.	D.	E.	F.
Permit Citation/ SWMP Element	Permit Requirement/Quantifiable SWMP Activity		Number of Activities Performed	Documentation / Record	Entity Performing the Activity	Comments
Part III.A.8 Summary	For activities required by Part III.A.8: Provide an evaluation of the Stormwater Management Program according to Part VI.B.3 of the permit.					
	Strengths: There are no such facilities located within the District.					
	Limitations: There are no such facilities located within the District.					
	SWMP revisions implemented to address limitations: There are no such facilities located within the District.					
Part III.A.9.a	Construction Site Runoff — Site Planning and Non-Structural and Structural Best Management Practices <i>Not applicable to CDDs, WCDs, and DD</i>					
Part III.A.9.b	Construction Site Runoff — Inspection and Enforcement Report on the inspection program for privately-operated and permittee-operated construction sites, including the number of active construction sites during the reporting year, the number of inspections of active construction sites, the percentage of active construction sites inspected, and the number and type of enforcement actions / referrals taken.					
	PERMITTEE SITES: Active construction sites PERMITTEE SITES: Pre-, During, and Post inspections of active construction sites for E&S and waste control BMPs PERMITTEE SITES: Percentage of active construction sites inspected		0			No active District owned or maintained construction sites during reporting year.
			0			
			0			
	PRIVATE SITES: Active construction sites PRIVATE SITES: Pre-, During, and Post inspections of active construction sites for E&S and waste control BMPs PRIVATE SITES: Percentage of active construction sites inspected		0	The co-permittee is a Chapter 190 District. As such it does not have the authority to inspect or provide enforcement of privately owned lands. The District's authority extends only over property which it owns or has easements rights over.		
			0			
			0			
	Enforcement Action		0			
Part III.A.9.c	Construction Site Runoff — Site Operator Training Report the type of training activities, the number of inspectors, site plan reviewers and site operators trained (both in-house and outside training).					
		DEP Certification	Annual Training			
	Permittee construction site inspectors	0	2	Certificate	District Staff	2 previously certified; refresher completed
	Permittee construction site plan reviewers		0	The District has limited authority to review site plans for activities not directly associated with District lands and relies on Lee County, the City of Bonita Springs, and the Village of Estero for this review.		
	Permittee construction site operators		0	The District does not have construction site operators or related facilities.		

SECTION VII. STORMWATER MANAGEMENT PROGRAM (SWMP) SUMMARY TABLE					
A.	B.	C.	D.	E.	F.
Permit Citation/ SWMP Element	Permit Requirement/Quantifiable SWMP Activity	Number of Activities Performed	Documentation / Record	Entity Performing the Activity	Comments
Part III.A.9 Summary	For activities required by Part III.A.9: Provide an evaluation of the Stormwater Management Program according to Part VI.B.3 of the permit.				
	Strengths: Residential lot areas are nearly completely built out.				
	Limitations: The District does not have the legal authority to inspect or pursue construction on private sites.				
	SWMP revisions implemented to address limitations: The co-permittee is a Chapter 190 District and does not have legal authority to pursue this requirement. The District relies on Lee County, City of Bonita Springs, and the Village of Estero for related inspections and enforcement on private properties. This issue is addressed in the interlocal agreement.				

SECTION VIII. CHANGES TO THE STORMWATER MANAGEMENT PROGRAM (SWMP) ACTIVITIES (Not Applicable In Year 4)		
A.	Permit Citation/ SWMP Element	Proposed Changes to the Stormwater Management Program Activities Established as Specific Requirements Under Part III.A of the Permit (Including the Rationale for the Change) — REQUIRES DEP APPROVAL PRIOR TO CHANGE IF PROPOSING TO REPLACE OR DELETE AN ACTIVITY.
	None	None at this time.
B.	Permit Citation/ SWMP Element	Changes to the Stormwater Management Program Activities NOT Established as Specific Requirements Under Part III.A of the Permit (Including the Rationale for the Change)
	None	None at this time.

SECTION IX. TMDL Status Report

A.	YEAR 1 Provide a table summarizing the status of the TMDL process. Include a list of prioritized TMDLs and their monitoring and implementation schedule; and include the Identification number of the outfall prioritized for TMDL monitoring.								
	WBID Number	Segment/ Waterbody/ Basin	Pollutant of Concern	TMDL DEP / EPA	Percent Reduction (WLA)	Priority Rank	Priority Outfall	Monitoring Summary / BPCP Due Date	Supplemental SWMP Due Date
				☐ / ☐		1		(Year 3 AR)	(Year 4 AR; N/A) if BPCP)
				☐ / ☐					
B.	YEAR 3 and annually thereafter, provide a summary of the estimated load reductions that have occurred for the pollutant(s) of concern being discharged from the MS4 to the TMDL water body during the reporting period and cumulatively since the date the Supplemental SWMP was implemented. Year 3: Submit a Monitoring data summary or BPCP (if applicable). Year 4: Submit a Supplemental SWMP (if applicable).								
	WBID Number	Pollutant of Concern	Monitoring Summary / BPCP Submitted	Supplemental SWMP Submitted	Projected load reductions OR Actual load reductions to date				
			(Year 3 AR)	(Year 4 AR; N/A if BPCP)					
C.	Provide a brief statement as to the status of TMDL implementation according to Part VIII.B. of the permit (e.g. status of monitoring to validate WLA):								

Attachment 1

Location Map and Aerial Photograph

Barraco and Associates, Inc.

CIVIL ENGINEERING - LAND SURVEYING
LAND PLANNING - LANDSCAPE DESIGN

www.barraco.net

2271 MCGREGOR BLVD., SUITE 100
POST OFFICE DRAWER 2800
FORT MYERS, FLORIDA 33902-2800
PHONE (239) 461-3170
FAX (239) 461-3169

FLORIDA CERTIFICATES OF AUTHORIZATION
ENGINEERING 7995 - SURVEYING LB-6940

PREPARED FOR

BAYSIDE & BAY CREEK COMMUNITY DEVELOPMENT DISTRICTS

6131 LYONS ROAD, SUITE 100
COCONUT CREEK, FL 33073

PROJECT DESCRIPTION



THIS PLAN IS PRELIMINARY AND
INTENDED FOR CONCEPTUAL
PLANNING PURPOSES ONLY.

SITE LAYOUT AND LAND USE
INTENSITIES OR DENSITIES MAY
CHANGE SIGNIFICANTLY BASED
UPON SURVEY, ENGINEERING,
ENVIRONMENTAL AND / OR
REGULATORY CONSTRAINTS

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PLOT BY: WES KAYNE

DESIGN BY:

XREF1

XREF2

XREF3

XREF4

XREF5

XREF6

PLAN REVISIONS

PLAN STATUS

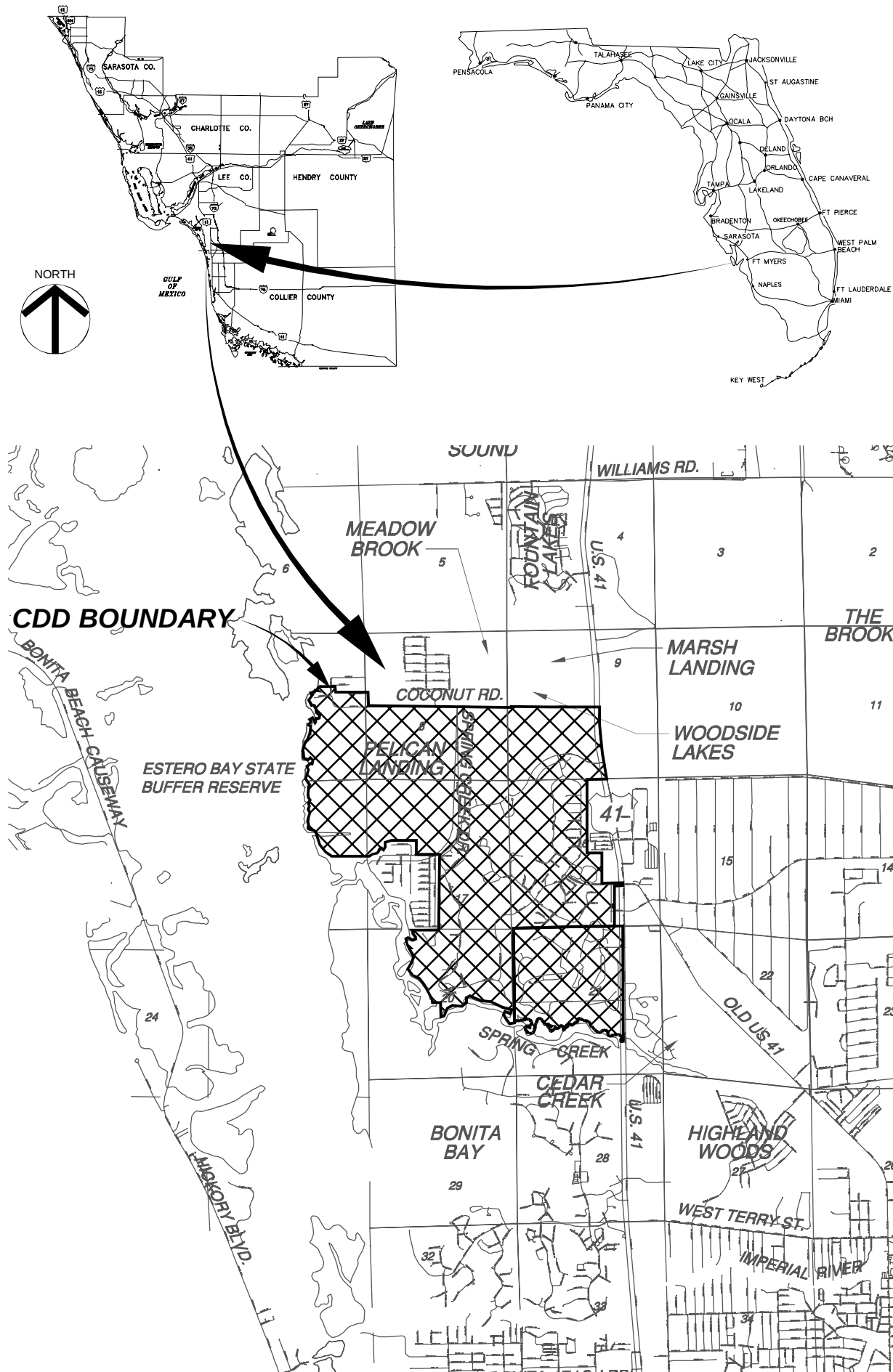
FOR EXHIBIT PURPOSES ONLY
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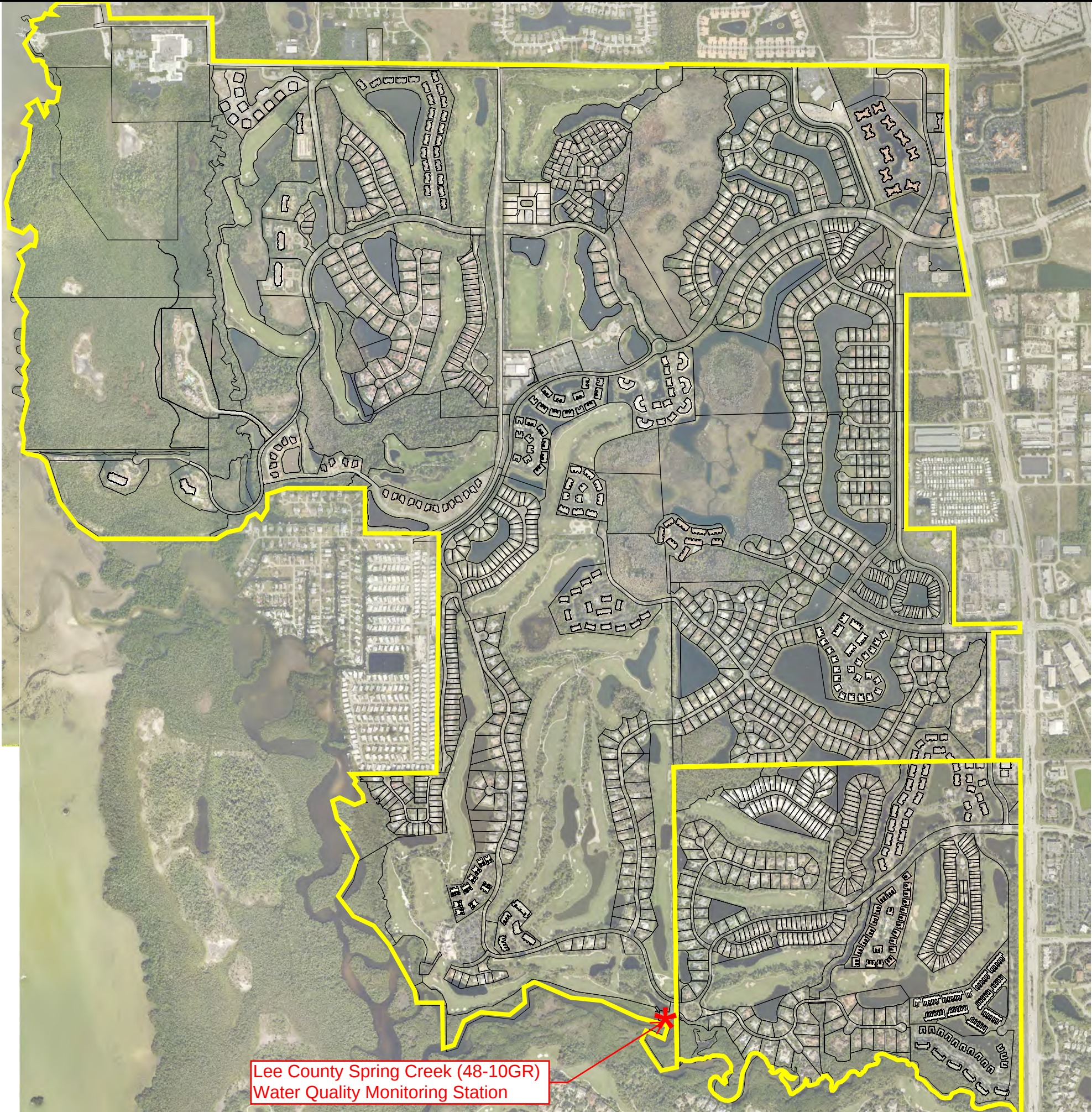
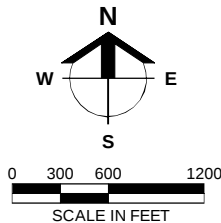
LOCATION MAP

PROJECT / FILE NO. SHEET NUMBER

22786

EX





Lee County Spring Creek (48-10GR)
Water Quality Monitoring Station

Barraco
and Associates, Inc.

CIVIL ENGINEERING - LAND SURVEYING
LAND PLANNING - LANDSCAPE DESIGN

www.barraco.net

2271 MCGREGOR BLVD., SUITE 100
POST OFFICE DRAWER 2800
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PHONE (239) 461-3170
FAX (239) 461-3169

FLORIDA CERTIFICATES OF AUTHORIZATION
ENGINEERING 7995 - SURVEYING LB-6940

PREPARED FOR

**BAYSIDE
&
BAY CREEK
COMMUNITY
DEVELOPMENT
DISTRICTS**

6131 LYONS ROAD, SUITE 100
COCONUT CREEK, FL 33073

PROJECT DESCRIPTION



**PELICAN
LANDING**

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INTENSITIES OR DENSITIES MAY
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AND / OR OPPORTUNITIES.

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PLOT BY:	WES KAYNE

CROSS REFERENCED DRAWINGS

PLAN REVISIONS

PLAN STATUS

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AERIAL EXHIBIT

PROJECT / FILE NO.	SHEET NUMBER
22786	

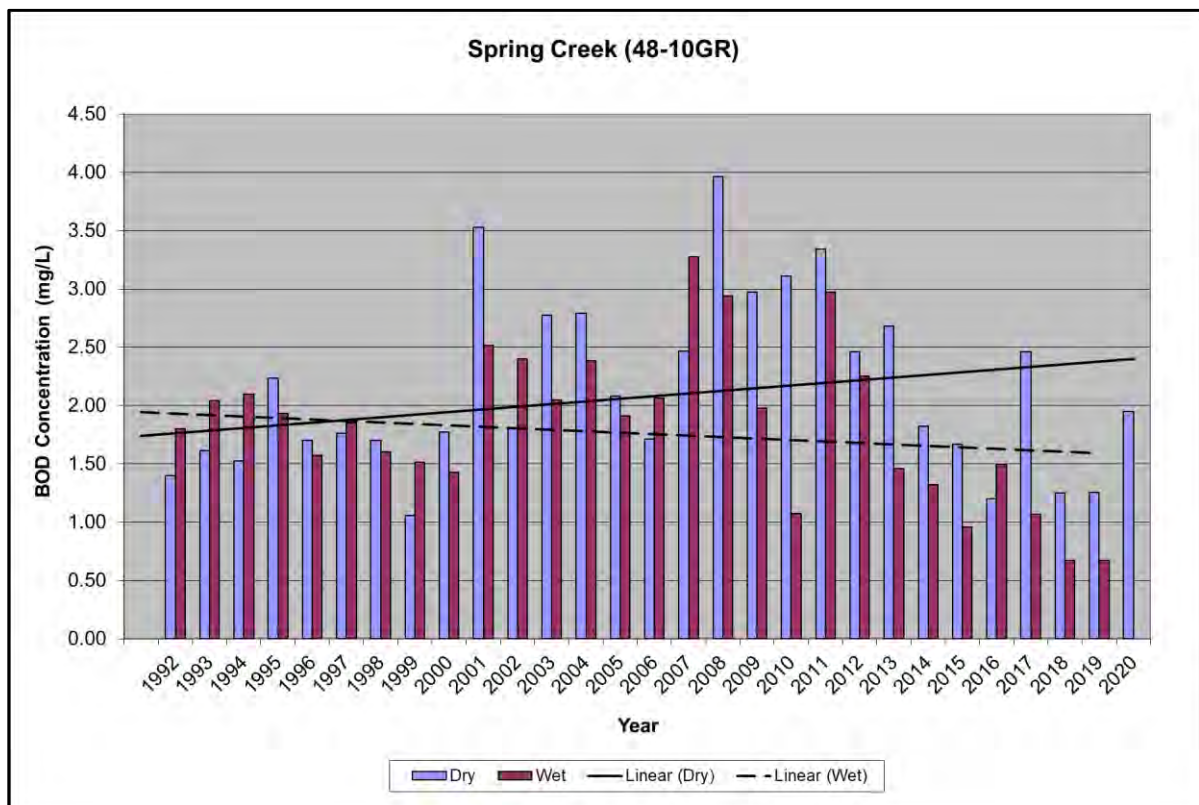
Attachment 2
Assessment Results

BAYSIDE IMPROVEMENT AND BAY CREEK COMMUNITY DEVELOPMENT DISTRICT

DISTRICT OFFICE · 9220 BONITA BEACH ROAD · SUITE 214 · BONITA SPRINGS, FLORIDA 34135

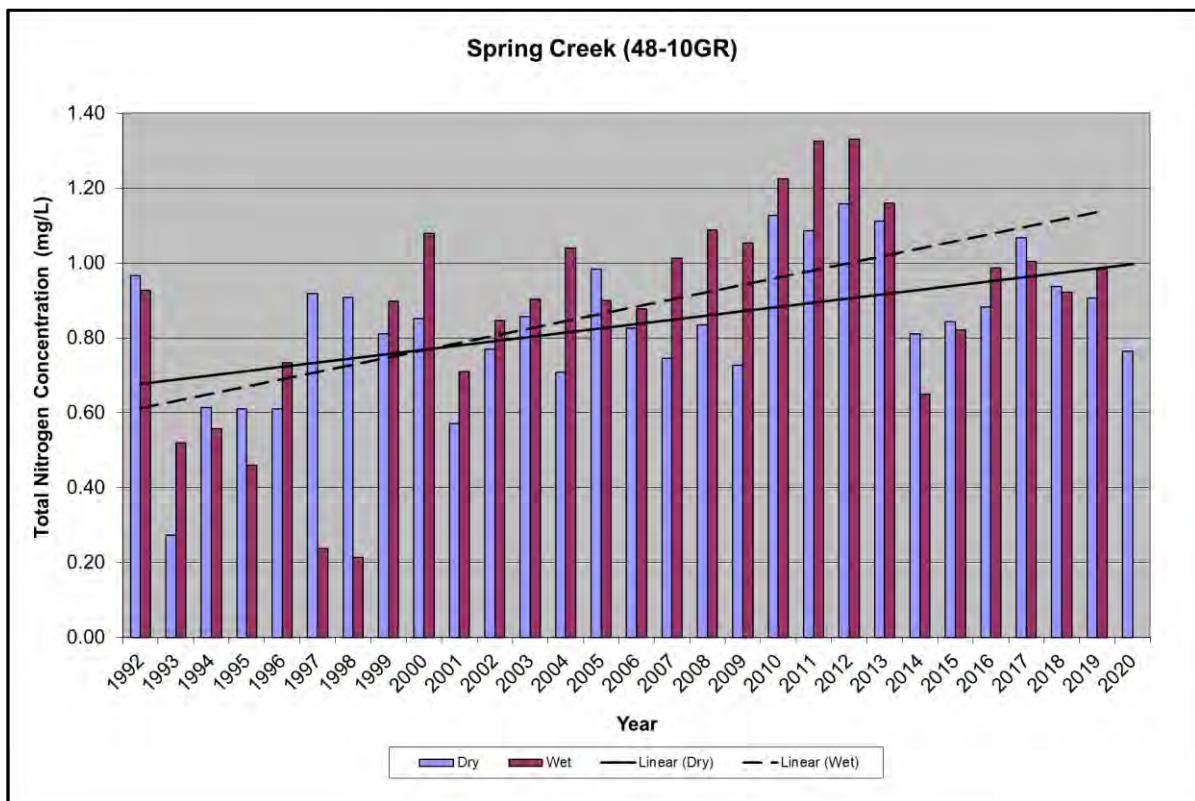
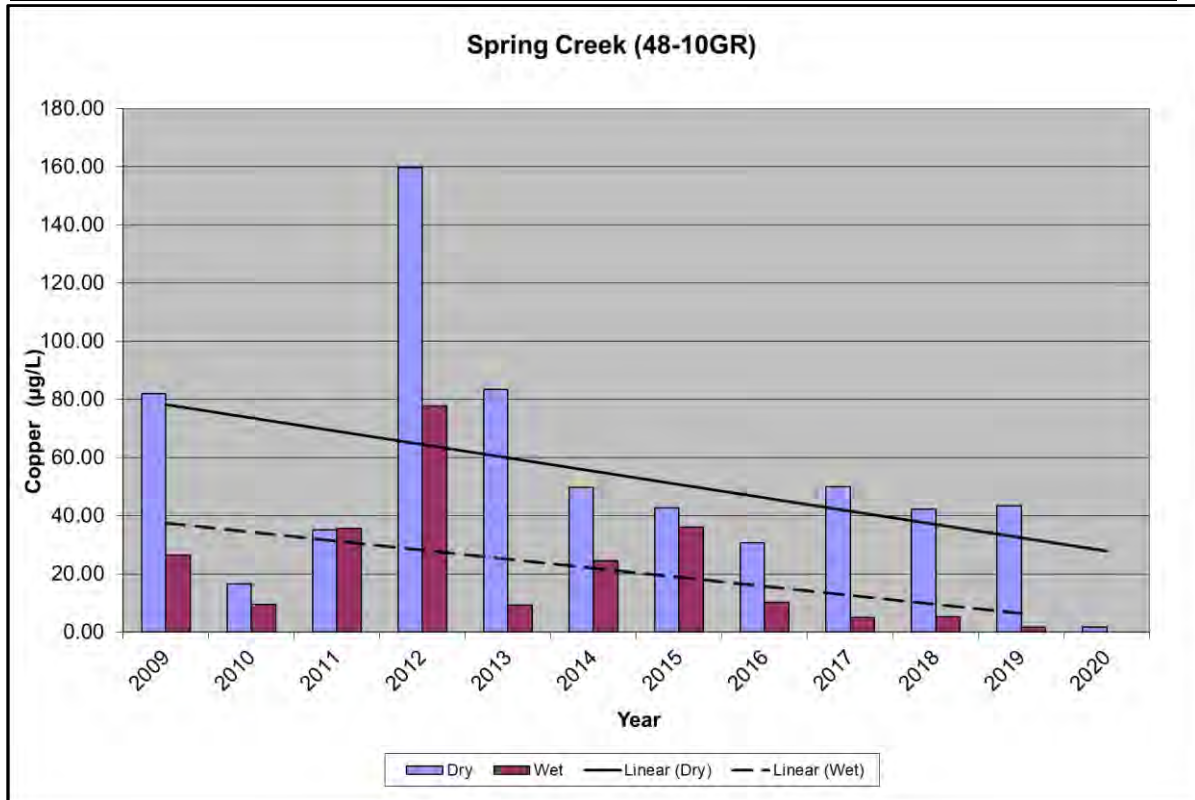
Assessment Results

- The sampling frequency, monitoring location, sampling waiver conditions, and any other related water quality monitoring plan implementations shall to continue the same for the subsequent year.
- The stormwater pollutant loadings for Bayside Improvement and Bay Creek CDD (District) are based on the monitoring results provided by the Lee County Spring Creek (48-10GR) station (See attachment 1). The following graphs are a summary of the average annual pollutant loadings for the required parameters in Spring Creek:



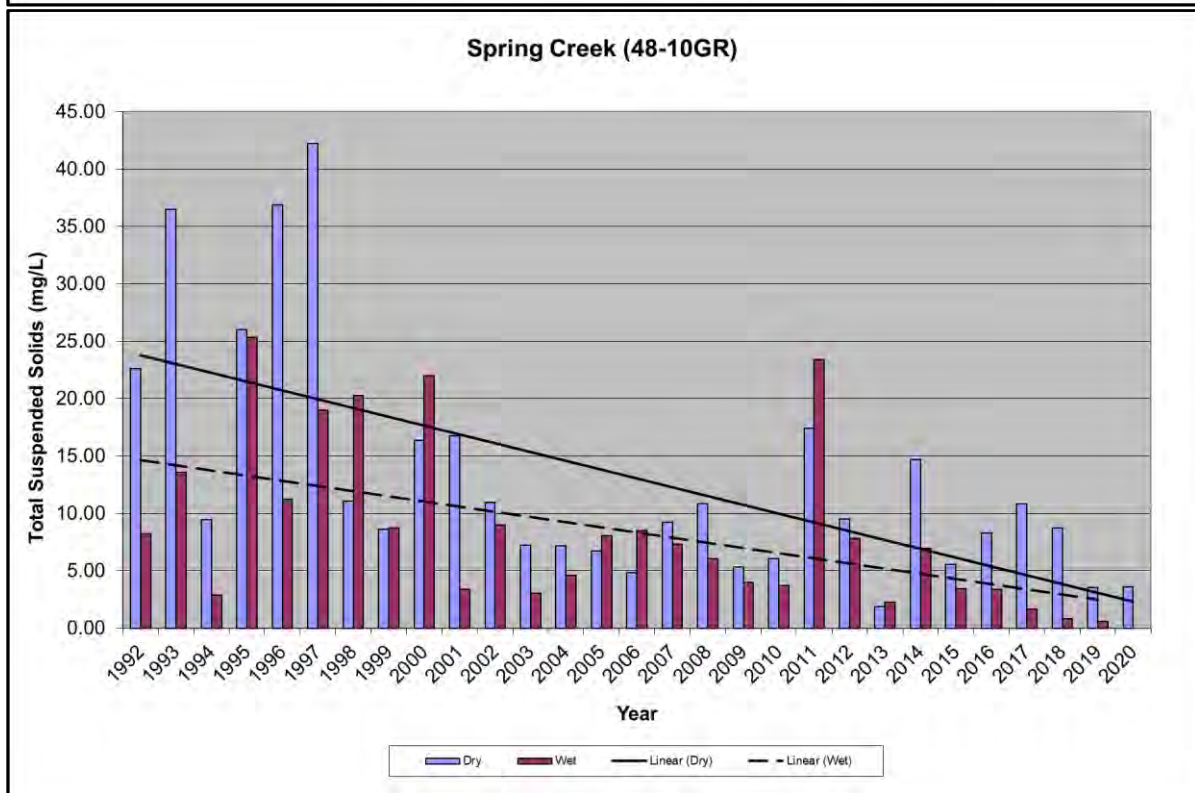
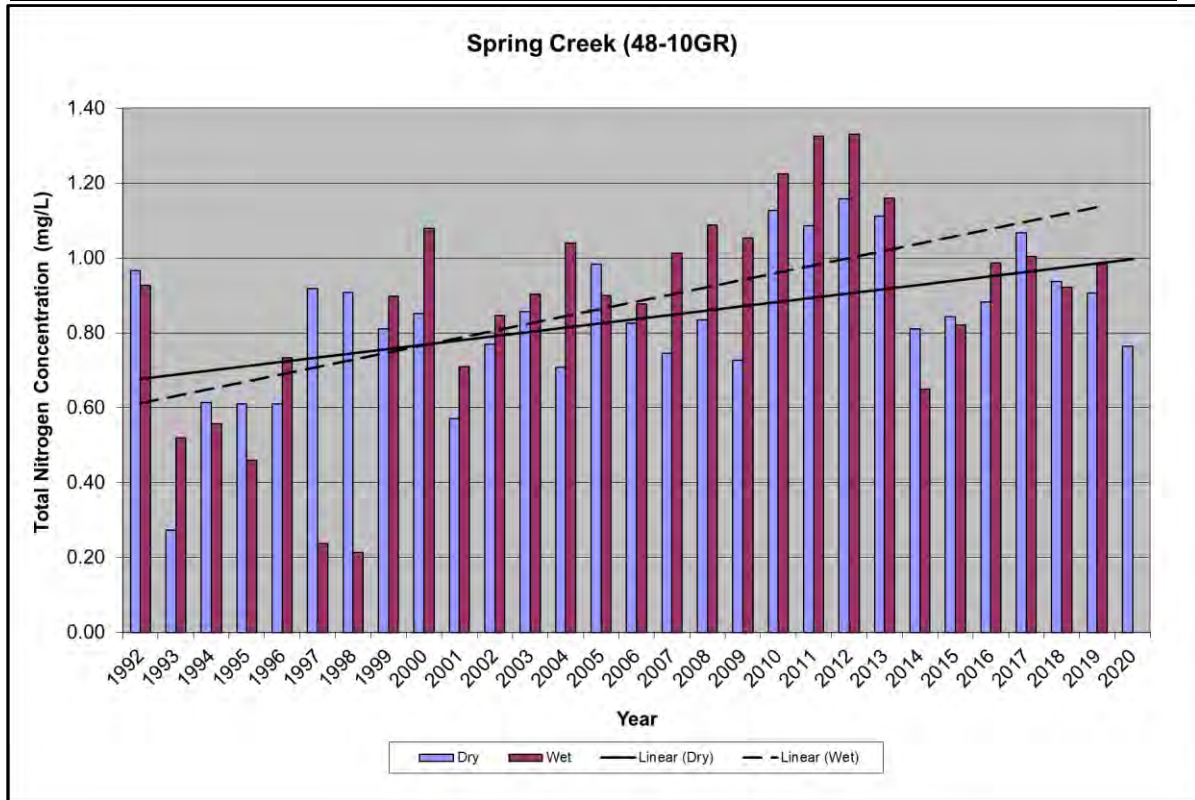
BAYSIDE IMPROVEMENT AND BAY CREEK COMMUNITY DEVELOPMENT DISTRICT

DISTRICT OFFICE · 9220 BONITA BEACH ROAD · SUITE 214 · BONITA SPRINGS, FLORIDA 34135



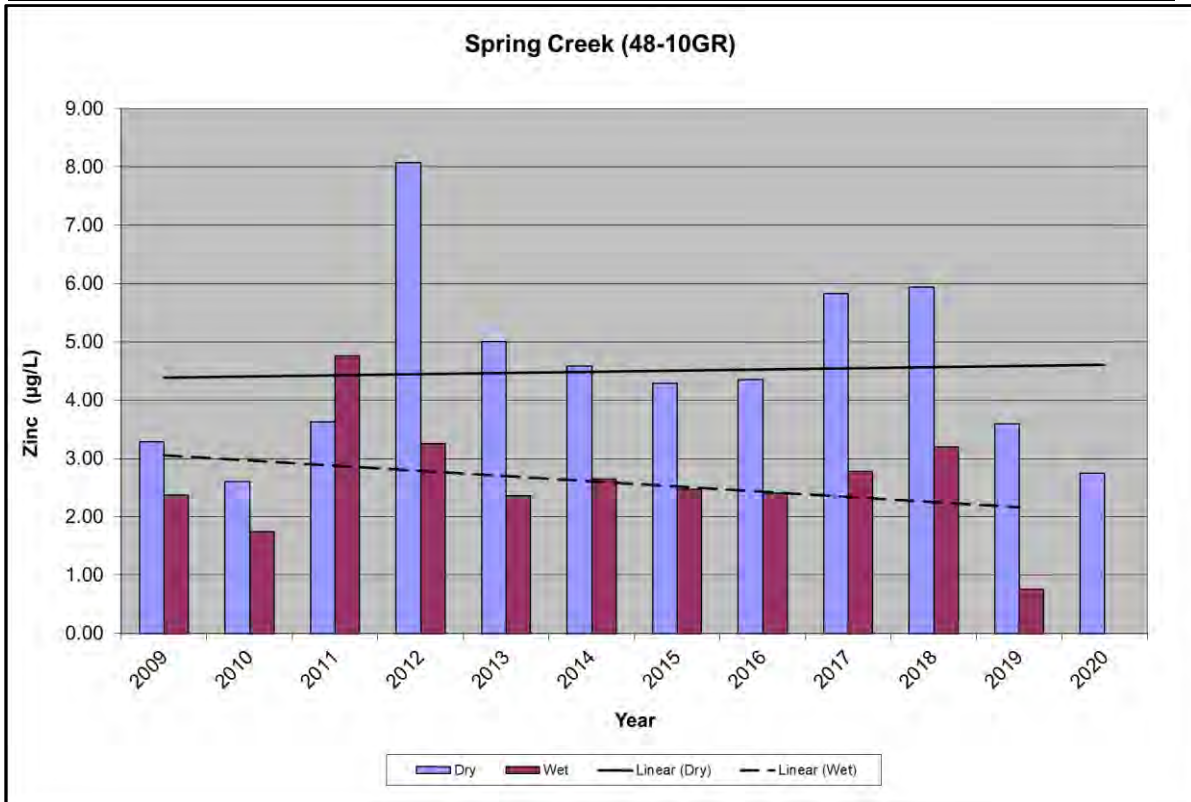
BAYSIDE IMPROVEMENT AND BAY CREEK COMMUNITY DEVELOPMENT DISTRICT

DISTRICT OFFICE · 9220 BONITA BEACH ROAD · SUITE 214 · BONITA SPRINGS, FLORIDA 34135



BAYSIDE IMPROVEMENT AND BAY CREEK COMMUNITY DEVELOPMENT DISTRICT

DISTRICT OFFICE · 9220 BONITA BEACH ROAD · SUITE 214 · BONITA SPRINGS, FLORIDA 34135



- c. The biochemical oxygen demand (BOD) concentrations during the dry season illustrate a slightly increased trendline over 28 years. From 2018 to 2019, the BOD concentrations during the dry season are approximately the same. The BOD concentrations for the 2020 dry season have minimally increased since 2019. During the wet season, the BOD concentrations have continually decreased since 2016. The linear trend for the wet season BOD concentrations illustrate a decrease from 1992 to 2020. The overall copper concentrations during wet and dry season have shown a significant linear decrease over the past 11 years. The copper concentrations during the 2019 wet season have decreased approximately 67% since 2018. There is a minute increase of copper concentrations during the 2019 dry season in comparison to 2018. The 2020 dry season copper concentrations are 96% lower than the previous year. The total nitrogen (TN) concentrations during the dry season have decreased from 2019 to 2018 and are currently lower than 2019's concentrations. The TN concentrations during wet and dry season show a slight increase from 1992 to 2020. The total phosphorus (TP) concentrations during dry season show a stable trend from 2017 to 2019. The current dry season TP concentrations are lower than 2019's. The TP concentrations since 1992 illustrate a declining linear trend for the overall dry seasons. Since 1992, the linear trend for TP concentration during wet season show a stable, plateau trend. The TP concentrations during wet season have slightly increased approximately 14% from 2018 to 2019. The total suspended solids (TSS) during wet and dry season has significantly declined over the last 28 years. Since 2017, the TSS results during the wet and dry season have shown to continually decline. The zinc concentrations during the dry season have decreased approximately 40% from 2018 to 2019. The current dry season zinc concentrations are significantly lower than 2019. The zinc concentrations during the wet season illustrate a decreasing linear trend over the past 11 years. The data is limited for all constituents during the current partial year which may skew the averages. In addition, March and April of 2020 were not recorded due to COVID-19 shutdowns. The stormwater management system functioning properly with appropriate maintenance intervals attributes the steady and/or decreasing pollutant loadings.

Attachment 3

Annual Pollutant Loading Estimate

ANALYSIS OF POLLUTANT LOADING IN STORMWATER RUNOFF

Project Information:

Bayside Improvement and Bay Creek CDD

Part of Sections: 7, 8, 9, 16, 17, 20 & 21

Township 47 S

Range 25 E

Bonita Springs & Village of Estero

Lee County

Florida

October 14, 2020

BAI # 22786

Barraco
and Associates, Inc.

2271 McGregor Boulevard

P.O. Drawer 2800

Fort Myers, FL 33902-2800

Certificate of Authorization No. 7995



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October 14, 2020

Analysis of Pollutant Loading in Stormwater Runoff

Re: **Bayside Improvement and Bay Creek CDD**

The purpose of this summary is to estimate the pollutant loading in the stormwater runoff for the Bayside Improvement and Bay Creek Community Development Districts to support the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Cycle 4 Year 3 requirements.

- I. Scope
 - a. The development consists of single family homes, multi-family homes, golf course, amenity areas, and preserves.
 - b. A surface water management system was established to treat runoff from the development as outlined by the South Florida Water Management District (SFWMD).
 - c. Beyond providing treatment to meet the SFWMD requirements, the system has been evaluated to determine its estimated effectiveness in pollutant removal as outlined in various publications (see references below).
- II. Methodology / Process
 - a. The constituents analyzed within this report are specifically: Nitrogen, Phosphorus, Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), Copper, and Zinc.
 - b. Basin areas and land use coverage are estimated based upon aerial photograph interpretation and best available information from SFWMD permits and other records.
 - c. Pollutant loadings are derived from the interpreted land uses described above and the Event Mean Concentrations (Appendix A) from the references listed below for each basin.
 - d. Cascading basins were evaluated for each outfall to more accurately analyze the post treatment loading effectiveness in regards to the residence time and removal efficiency.
 - e. Due to the volume of documents produced by the inputs for each of the several individual basins this report was abridged to contain the Overall System Analysis for each cascading system/final outfall with removal calculations for each constituent.
- III. Results
 - a. A compilation of the results for each constituent at each outfall is provided on the Pollutant Loading Basin Exhibit (Appendix B) which depicts the approximate basin boundaries, conveyance path for the cascading system, and resulting pollutant loadings for the total contributing area at each outfall.

THIS DOCUMENT IS NOT INTENDED TO REPLACE NOR IS IT INTENDED TO AMEND ANY DATA CONTAINED WITHIN THE LITERATURE REFERENCED BELOW. ANY DISCREPANCIES BETWEEN THIS DOCUMENT AND THOSE LISTED BELOW SHALL BE SUPERSEDED BY THE DATA CONTAINED WITHIN THOSE REFERENCES SHOWN. THIS REPORT CONTAINS ONLY A LIMITED AMOUNT OF INFORMATION PERTAINING TO THE STUDIES PERFORMED AND DATA COLLECTED BY OTHERS. ANY QUESTIONS ABOUT THE MATERIAL CONTAINED THEREIN SHOULD BE DIRECTED TO THE RESPECTIVE AUTHOR OF EACH PUBLICATION. THE THEORIES DESCRIBED HEREIN WERE NOT DEVELOPED BY THE ENGINEER SIGNING THIS DOCUMENT, AND THIS DOCUMENT IS NOT MEANT TO IMPLY ANY DIRECT INVOLVMENT WITH THE FORMATION OF THE THEORIES DESCRIBED.

References:

NPDES Phase I Municipal Separate Storm Sewer System Permitting Resource Manual: FDEP, 2013.
Evaluation of Current Stormwater Design Criteria within the State of Florida: Harper / Baker, 2007.
Evaluation of Alternative Stormwater Regulations for Southwest Florida: Environmental Research & Design, Inc., 2003.

ANALYSIS OF POLLUTANT LOADING

EVALUATION OF POND RESIDENCE TIME AND OVERALL POLLUTANT REMOVAL EFFICIENCIES

OVERALL SYSTEM ANALYSIS

SYSTEM CONFIGURATION AND CUMULATIVE RESIDENCE TIME CALCULATIONS:

BASIN	PPV	INCREMENTAL RUNOFF VOLUME	CUMULATIVE RUNOFF VOLUME	CUMULATIVE CASCADING RESIDENCE TIME (Td)				
				BASIN 5	BASIN 4	BASIN 3	BASIN 2	1A
5	13.50 ac-ft	6.48 ac-ft / yr	6.48 ac-ft/yr					
4	59.44 ac-ft	7.11 ac-ft / yr	13.59 ac-ft/yr					
3	18.55 ac-ft	12.81 ac-ft / yr	26.41 ac-ft/yr					
2	15.72 ac-ft	9.73 ac-ft / yr	36.13 ac-ft/yr					
1A	11.93 ac-ft	5.07 ac-ft / yr	41.20 ac-ft/yr					

TOTAL RESIDENCE TIME (Td)	2253.2 days	2116.8 days	520.9 days	264.5 days	105.7 days
	→ 100 max	100 max	100 max	100 max	100 max

Nitrogen Removal Efficiency	=	$(43.75 \times Td) / (4.38 + Td)$	41.9%	41.9%	41.9%	41.9%	41.9%
Phosphorus Removal Efficiency	=	$44.53 + 6.146 \times \ln(Td) + 0.145 \times (\ln(Td))^2$	75.9%	75.9%	75.9%	75.9%	75.9%
BOD Removal Efficiency	=	$1 - e^{-0.1 \times Td}$	100.0%	100.0%	100.0%	100.0%	100.0%
TSS Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%	85.0%	85.0%	85.0%	85.0%
Copper Removal Efficiency	=	Harper Harvey Report to FDEP June 07	65.0%	65.0%	65.0%	65.0%	65.0%
Zinc Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%	85.0%	85.0%	85.0%	85.0%

POLLUTANT LOAD REMOVAL CALCULATIONS:

NITROGEN REMOVAL CALCULATIONS

BASIN	BASIN Nitrogen Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Nitrogen Load
1A	13.12 kg / yr	0.0%	41.9%	7.62 kg / yr
2	25.20 kg / yr	0.0%	41.9%	14.64 kg / yr
3	25.27 kg / yr	0.0%	41.9%	14.68 kg / yr
4	18.42 kg / yr	0.0%	41.9%	10.70 kg / yr
5	16.79 kg / yr	0.0%	41.9%	9.75 kg / yr

Total BASIN Nitrogen Load	=	57.39 kg / yr
---------------------------	---	---------------

PHOSPHORUS REMOVAL CALCULATIONS

BASIN	BASIN Phosphorus Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Phosphorus Load
1A	3.11 kg / yr	0.0%	75.9%	0.75 kg / yr
2	5.96 kg / yr	0.0%	75.9%	1.44 kg / yr
3	3.71 kg / yr	0.0%	75.9%	0.89 kg / yr
4	4.36 kg / yr	0.0%	75.9%	1.05 kg / yr
5	3.97 kg / yr	0.0%	75.9%	0.96 kg / yr

Total BASIN Phosphorus Load	=	5.09 kg / yr
-----------------------------	---	--------------

BOD REMOVAL CALCULATIONS

BASIN
1A
2
3
4
5



BASIN BOD Load
67.49 kg / yr
129.58 kg / yr
84.55 kg / yr
94.71 kg / yr
67.49 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%
0.0%
0.0%
0.0%

Wet Detention Removal Efficiency
100.0%
100.0%
100.0%
100.0%
100.0%

Post-Treatment BOD Load
0.00 kg / yr
0.00 kg / yr
0.00 kg / yr
0.00 kg / yr
0.00 kg / yr

Total BASIN BOD Load

=

0.00 kg / yr

TSS REMOVAL CALCULATIONS

BASIN
1A
2
3
4
5



BASIN TSS Load
434.31 kg / yr
833.88 kg / yr
372.98 kg / yr
609.45 kg / yr
555.74 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%
0.0%
0.0%
0.0%

Wet Detention Removal Efficiency
85.0%
85.0%
85.0%
85.0%
85.0%

Post-Treatment TSS Load
65.15 kg / yr
125.08 kg / yr
55.95 kg / yr
91.42 kg / yr
83.36 kg / yr

Total BASIN TSS Load

=

420.96 kg / yr

COPPER REMOVAL CALCULATIONS

BASIN
1A
2
3
4
5



BASIN Copper Load
0.01 kg / yr
0.01 kg / yr
0.16 kg / yr
0.01 kg / yr
0.01 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%
0.0%
0.0%
0.0%

Wet Detention Removal Efficiency
65.0%
65.0%
65.0%
65.0%
65.0%

Post-Treatment Copper Load
0.00 kg / yr
0.00 kg / yr
0.05 kg / yr
0.00 kg / yr
0.00 kg / yr

Total BASIN Copper Load

=

0.07 kg / yr

ZINC REMOVAL CALCULATIONS

BASIN
1A
2
3
4
5



BASIN Zinc Load
0.49 kg / yr
0.95 kg / yr
0.59 kg / yr
0.69 kg / yr
0.63 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%
0.0%
0.0%
0.0%

Wet Detention Removal Efficiency
85.0%
85.0%
85.0%
85.0%
85.0%

Post-Treatment Zinc Load
0.07 kg / yr
0.14 kg / yr
0.09 kg / yr
0.10 kg / yr
0.09 kg / yr

Total BASIN Zinc Load

=

0.50 kg / yr

ANALYSIS OF POLLUTANT LOADING

EVALUATION OF POND RESIDENCE TIME AND OVERALL POLLUTANT REMOVAL EFFICIENCIES

OVERALL SYSTEM ANALYSIS

SYSTEM CONFIGURATION AND CUMULATIVE RESIDENCE TIME CALCULATIONS:

BASIN	PPV	INCREMENTAL RUNOFF VOLUME	CUMULATIVE RUNOFF VOLUME	CUMULATIVE CASCADING RESIDENCE TIME (Td)				
8	38.68 ac-ft	13.24 ac-ft / yr	13.24 ac-ft/yr	BASIN 8	BASIN 7	BASIN 6	BASIN 1	
7	41.30 ac-ft	8.80 ac-ft / yr	22.04 ac-ft/yr	305.7 days				
6	23.80 ac-ft	5.95 ac-ft / yr	28.00 ac-ft/yr	989.5 days	683.9 days			
1	56.46 ac-ft	18.19 ac-ft / yr	46.19 ac-ft/yr	1299.8 days	994.1 days	310.3 days		
				1746.0 days	1440.3 days	756.4 days	446.2 days	

TOTAL RESIDENCE TIME (Td)		1746.0 days	1440.3 days	756.4 days	446.2 days
	→	100 max	100 max	100 max	100 max

Nitrogen Removal Efficiency	=	$(43.75 \times Td) / (4.38 + Td)$	41.9%	41.9%	41.9%	41.9%
Phosphorus Removal Efficiency	=	$44.53 + 6.146 \times \ln(Td) + 0.145 \times (\ln(Td))^2$	75.9%	75.9%	75.9%	75.9%
BOD Removal Efficiency	=	$1 - e^{-0.1 \times Td}$	100.0%	100.0%	100.0%	100.0%
TSS Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%	85.0%	85.0%	85.0%
Copper Removal Efficiency	=	Harper Harvey Report to FDEP June 07	65.0%	65.0%	65.0%	65.0%
Zinc Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%	85.0%	85.0%	85.0%

POLLUTANT LOAD REMOVAL CALCULATIONS:

NITROGEN REMOVAL CALCULATIONS

BASIN		BASIN Nitrogen Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Nitrogen Load
1		38.61 kg / yr	0.0%	41.9%	22.43 kg / yr
6		13.73 kg / yr	0.0%	41.9%	7.98 kg / yr
7		18.34 kg / yr	0.0%	41.9%	10.65 kg / yr
8		30.54 kg / yr	0.0%	41.9%	17.74 kg / yr
Total BASIN Nitrogen Load					= 58.80 kg / yr

PHOSPHORUS REMOVAL CALCULATIONS

BASIN		BASIN Phosphorus Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Phosphorus Load
1		7.98 kg / yr	0.0%	75.9%	1.92 kg / yr
6		2.21 kg / yr	0.0%	75.9%	0.53 kg / yr
7		2.79 kg / yr	0.0%	75.9%	0.67 kg / yr
8		4.92 kg / yr	0.0%	75.9%	1.18 kg / yr
Total BASIN Phosphorus Load					= 4.31 kg / yr

BOD REMOVAL CALCULATIONS

BASIN
1
6
7
8

BASIN BOD Load
178.60 kg / yr
48.47 kg / yr
62.60 kg / yr
107.78 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%
0.0%
0.0%

Wet Detention Removal Efficiency
100.0%
100.0%
100.0%
100.0%

Post-Treatment BOD Load
0.00 kg / yr
0.00 kg / yr
0.00 kg / yr
0.00 kg / yr

Total BASIN BOD Load

=

0.00 kg / yr

TSS REMOVAL CALCULATIONS

BASIN
1
6
7
8

BASIN TSS Load
1104.75 kg / yr
215.16 kg / yr
276.80 kg / yr
478.49 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%
0.0%
0.0%

Wet Detention Removal Efficiency
85.0%
85.0%
85.0%
85.0%

Post-Treatment TSS Load
165.71 kg / yr
32.27 kg / yr
41.52 kg / yr
71.77 kg / yr

Total BASIN TSS Load

=

311.28 kg / yr

COPPER REMOVAL CALCULATIONS

BASIN
1
6
7
8

BASIN Copper Load
0.02 kg / yr
0.10 kg / yr
0.12 kg / yr
0.23 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%
0.0%
0.0%

Wet Detention Removal Efficiency
65.0%
65.0%
65.0%
65.0%

Post-Treatment Copper Load
0.01 kg / yr
0.04 kg / yr
0.04 kg / yr
0.08 kg / yr

Total BASIN Copper Load

=

0.17 kg / yr

ZINC REMOVAL CALCULATIONS

BASIN
1
6
7
8

BASIN Zinc Load
1.20 kg / yr
0.38 kg / yr
0.46 kg / yr
0.85 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%
0.0%
0.0%

Wet Detention Removal Efficiency
85.0%
85.0%
85.0%
85.0%

Post-Treatment Zinc Load
0.18 kg / yr
0.06 kg / yr
0.07 kg / yr
0.13 kg / yr

Total BASIN Zinc Load

=

0.43 kg / yr

ANALYSIS OF POLLUTANT LOADING

EVALUATION OF POND RESIDENCE TIME AND OVERALL POLLUTANT REMOVAL EFFICIENCIES

OVERALL SYSTEM ANALYSIS

SYSTEM CONFIGURATION AND CUMULATIVE RESIDENCE TIME CALCULATIONS:

BASIN	PPV	INCREMENTAL RUNOFF VOLUME	CUMULATIVE RUNOFF VOLUME	CUMULATIVE CASCADING RESIDENCE TIME (Td)				
10A	18.95 ac-ft	4.27 ac-ft / yr	4.27 ac-ft/yr	10A	BASIN 10	BASIN 9	BASIN 11	11A
10	8.90 ac-ft	7.03 ac-ft / yr	11.30 ac-ft/yr					
9	0.12 ac-ft	26.89 ac-ft / yr	38.19 ac-ft/yr					
11	0.94 ac-ft	0.05 ac-ft / yr	38.23 ac-ft/yr					
11A	9.38 ac-ft	5.36 ac-ft / yr	43.59 ac-ft/yr					

TOTAL RESIDENCE TIME (Td)	1996.3 days	376.1 days	88.7 days	87.5 days	78.6 days
	→ 100 max	100 max			

Nitrogen Removal Efficiency	=	$(43.75 \times Td) / (4.38 + Td)$	41.9%	41.9%	41.7%	41.7%	41.4%
Phosphorus Removal Efficiency	=	$44.53 + 6.146 \cdot \ln(Td) + 0.145 \cdot (\ln(Td))^2$	75.9%	75.9%	75.0%	74.9%	74.1%
BOD Removal Efficiency	=	$1 - e^{-0.1 \times Td}$	100.0%	100.0%	100.0%	100.0%	100.0%
TSS Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%	85.0%	85.0%	85.0%	85.0%
Copper Removal Efficiency	=	Harper Harvey Report to FDEP June 07	65.0%	65.0%	65.0%	65.0%	65.0%
Zinc Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%	85.0%	85.0%	85.0%	85.0%

POLLUTANT LOAD REMOVAL CALCULATIONS:

NITROGEN REMOVAL CALCULATIONS

BASIN	BASIN Nitrogen Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Nitrogen Load
11A	13.89 kg / yr	0.0%	41.4%	8.13 kg / yr
11	0.12 kg / yr	0.0%	41.7%	0.07 kg / yr
9	34.11 kg / yr	0.0%	41.7%	19.89 kg / yr
10	14.72 kg / yr	0.0%	41.9%	8.55 kg / yr
10A	11.06 kg / yr	0.0%	41.9%	6.42 kg / yr

Total BASIN Nitrogen Load	=	43.07 kg / yr
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PHOSPHORUS REMOVAL CALCULATIONS

BASIN	BASIN Phosphorus Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Phosphorus Load
11A	3.29 kg / yr	0.0%	74.1%	0.85 kg / yr
11	0.03 kg / yr	0.0%	74.9%	0.01 kg / yr
9	3.14 kg / yr	0.0%	75.0%	0.78 kg / yr
10	2.24 kg / yr	0.0%	75.9%	0.54 kg / yr
10A	2.62 kg / yr	0.0%	75.9%	0.63 kg / yr

Total BASIN Phosphorus Load	=	2.81 kg / yr
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BOD REMOVAL CALCULATIONS

BASIN		BASIN BOD Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment BOD Load
11A		71.43 kg / yr	0.0%	100.0%	0.00 kg / yr
11		0.62 kg / yr	0.0%	100.0%	0.00 kg / yr
9		90.07 kg / yr	0.0%	100.0%	0.00 kg / yr
10		50.34 kg / yr	0.0%	100.0%	0.00 kg / yr
10A		56.87 kg / yr	0.0%	100.0%	0.00 kg / yr
Total BASIN BOD Load					= 0.00 kg / yr

TSS REMOVAL CALCULATIONS

BASIN		BASIN TSS Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment TSS Load
11A		459.65 kg / yr	0.0%	85.0%	68.95 kg / yr
11		4.01 kg / yr	0.0%	85.0%	0.60 kg / yr
9		384.44 kg / yr	0.0%	85.0%	57.67 kg / yr
10		222.67 kg / yr	0.0%	85.0%	33.40 kg / yr
10A		365.94 kg / yr	0.0%	85.0%	54.89 kg / yr
Total BASIN TSS Load					= 215.51 kg / yr

COPPER REMOVAL CALCULATIONS

BASIN		BASIN Copper Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Copper Load
11A		0.01 kg / yr	0.0%	65.0%	0.00 kg / yr
11		0.00 kg / yr	0.0%	65.0%	0.00 kg / yr
9		0.04 kg / yr	0.0%	65.0%	0.01 kg / yr
10		0.10 kg / yr	0.0%	65.0%	0.03 kg / yr
10A		0.00 kg / yr	0.0%	65.0%	0.00 kg / yr
Total BASIN Copper Load					= 0.05 kg / yr

ZINC REMOVAL CALCULATIONS

BASIN		BASIN Zinc Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Zinc Load
11A		0.52 kg / yr	0.0%	85.0%	0.08 kg / yr
11		0.00 kg / yr	0.0%	85.0%	0.00 kg / yr
9		0.23 kg / yr	0.0%	85.0%	0.03 kg / yr
10		0.37 kg / yr	0.0%	85.0%	0.06 kg / yr
10A		0.42 kg / yr	0.0%	85.0%	0.06 kg / yr
Total BASIN Zinc Load					= 0.23 kg / yr

ANALYSIS OF POLLUTANT LOADING

EVALUATION OF POND RESIDENCE TIME AND OVERALL POLLUTANT REMOVAL EFFICIENCIES

OVERALL SYSTEM ANALYSIS

SYSTEM CONFIGURATION AND CUMULATIVE RESIDENCE TIME CALCULATIONS:

BASIN	PPV	INCREMENTAL RUNOFF VOLUME	CUMULATIVE RUNOFF VOLUME	CUMULATIVE CASCADING RESIDENCE TIME (Td)				
				BASIN 26	BASIN 32	BASIN 33	BASIN 38	
26	46.88 ac-ft	15.05 ac-ft / yr	15.05 ac-ft/yr	1136.6 days				
32	50.07 ac-ft	1.95 ac-ft / yr	17.00 ac-ft/yr	2211.7 days	1075.1 days			
33	52.31 ac-ft	12.55 ac-ft / yr	29.55 ac-ft/yr	2857.9 days	1721.3 days	646.2 days		
38	8.77 ac-ft	7.76 ac-ft / yr	37.31 ac-ft/yr	2943.7 days	1807.1 days	732.0 days	85.8 days	

TOTAL RESIDENCE TIME (Td)		2943.7 days	1807.1 days	732.0 days	85.8 days
	→	100 max	100 max	100 max	

Nitrogen Removal Efficiency	=	$(43.75 \times Td) / (4.38 + Td)$	41.9%	41.9%	41.9%	41.6%
Phosphorus Removal Efficiency	=	$44.53 + 6.146 \times \ln(Td) + 0.145 \times (\ln(Td))^2$	75.9%	74.0%	74.0%	72.7%
BOD Removal Efficiency	=	$1 - e^{(-0.1 \times Td)}$	100.0%	100.0%	100.0%	100.0%
TSS Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%	85.0%	85.0%	85.0%
Copper Removal Efficiency	=	Harper Harvey Report to FDEP June 07	65.0%	65.0%	65.0%	65.0%
Zinc Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%	85.0%	85.0%	85.0%

POLLUTANT LOAD REMOVAL CALCULATIONS:

NITROGEN REMOVAL CALCULATIONS

BASIN		Basin Nitrogen Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Nitrogen Load
38		15.61 kg / yr	0.0%	41.6%	9.11 kg / yr
26		30.59 kg / yr	0.0%	41.9%	17.77 kg / yr
33		28.43 kg / yr	0.0%	41.9%	16.51 kg / yr
32		5.04 kg / yr	0.0%	41.9%	2.93 kg / yr

Total Basin Nitrogen Load	=	46.31 kg / yr
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PHOSPHORUS REMOVAL CALCULATIONS

BASIN		Basin Phosphorus Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Phosphorus Load
38		2.32 kg / yr	0.0%	74.8%	0.58 kg / yr
26		6.09 kg / yr	0.0%	75.9%	1.47 kg / yr
33		4.53 kg / yr	0.0%	75.9%	1.09 kg / yr
32		1.19 kg / yr	0.0%	75.9%	0.29 kg / yr

Total Basin Phosphorus Load	=	3.43 kg / yr
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BOD REMOVAL CALCULATIONS

BASIN		Basin BOD Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment BOD Load
38		52.59 kg / yr	0.0%	100.0%	0.00 kg / yr
26		137.56 kg / yr	0.0%	100.0%	0.00 kg / yr
33		99.77 kg / yr	0.0%	100.0%	0.00 kg / yr
32		25.91 kg / yr	0.0%	100.0%	0.00 kg / yr
Total Basin BOD Load					= 0.00 kg / yr

TSS REMOVAL CALCULATIONS

BASIN		Basin TSS Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment TSS Load
38		233.78 kg / yr	0.0%	85.0%	35.07 kg / yr
26		841.10 kg / yr	0.0%	85.0%	126.16 kg / yr
33		442.65 kg / yr	0.0%	85.0%	66.40 kg / yr
32		166.71 kg / yr	0.0%	85.0%	25.01 kg / yr
Total Basin TSS Load					= 252.64 kg / yr

COPPER REMOVAL CALCULATIONS

BASIN		Basin Copper Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Copper Load
38		0.10 kg / yr	0.0%	65.0%	0.04 kg / yr
26		0.11 kg / yr	0.0%	65.0%	0.04 kg / yr
33		0.21 kg / yr	0.0%	65.0%	0.07 kg / yr
32		0.02 kg / yr	0.0%	65.0%	0.01 kg / yr
Total Basin Copper Load					= 0.15 kg / yr

ZINC REMOVAL CALCULATIONS

BASIN		Basin Zinc Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Zinc Load
38		0.38 kg / yr	0.0%	85.0%	0.06 kg / yr
26		0.90 kg / yr	0.0%	85.0%	0.14 kg / yr
33		0.78 kg / yr	0.0%	85.0%	0.12 kg / yr
32		0.19 kg / yr	0.0%	85.0%	0.03 kg / yr
Total Basin Zinc Load					= 0.34 kg / yr

ANALYSIS OF POLLUTANT LOADING

EVALUATION OF POND RESIDENCE TIME AND OVERALL POLLUTANT REMOVAL EFFICIENCIES

OVERALL SYSTEM ANALYSIS

SYSTEM CONFIGURATION AND CUMULATIVE RESIDENCE TIME CALCULATIONS:

BASIN	PPV	INCREMENTAL RUNOFF VOLUME	CUMULATIVE RUNOFF VOLUME	CUMULATIVE CASCADING RESIDENCE TIME (Td)				
15	105.77 ac-ft	89.45 ac-ft / yr	89.45 ac-ft/yr	BASIN 15	BASIN 18	BASIN 22	BASIN 16	
18	282.12 ac-ft	140.02 ac-ft / yr	229.47 ac-ft/yr	431.6 days				
22	355.42 ac-ft	155.73 ac-ft / yr	519.90 ac-ft/yr	880.3 days	448.7 days			
				1129.9 days	698.3 days	249.5 days		
16	271.20 ac-ft	134.70 ac-ft / yr	134.70 ac-ft/yr					734.9 days
22	355.42 ac-ft	155.73 ac-ft / yr	519.90 ac-ft/yr					984.4 days

TOTAL RESIDENCE TIME (Td)		1129.9 days	698.3 days	249.5 days	984.4 days
	→	100 max	100 max	100 max	100 max

Nitrogen Removal Efficiency	=	$(43.75 \times Td) / (4.38 + Td)$	41.9%	41.9%	41.9%	41.9%
Phosphorus Removal Efficiency	=	$44.53 + 6.146 \times \ln(Td) + 0.145 \times (\ln(Td))^2$	75.9%	74.0%	74.0%	74.0%
BOD Removal Efficiency	=	$1 - e^{(-0.1 \times Td)}$	100.0%	100.0%	100.0%	100.0%
TSS Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%	85.0%	85.0%	85.0%
Copper Removal Efficiency	=	Harper Harvey Report to FDEP June 07	65.0%	65.0%	65.0%	65.0%
Zinc Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%	85.0%	85.0%	85.0%

POLLUTANT LOAD REMOVAL CALCULATIONS:

NITROGEN REMOVAL CALCULATIONS

BASIN		Basin Nitrogen Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Nitrogen Load
15		147.16 kg / yr	0.0%	41.9%	85.48 kg / yr
18		258.65 kg / yr	0.0%	41.9%	150.24 kg / yr
22		345.79 kg / yr	0.0%	41.9%	200.86 kg / yr
16		344.16 kg / yr	0.0%	41.9%	199.91 kg / yr
Total Basin Nitrogen Load					= 636.48 kg / yr

PHOSPHORUS REMOVAL CALCULATIONS

BASIN		Basin Phosphorus Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Phosphorus Load
15		18.70 kg / yr	0.0%	75.9%	4.50 kg / yr
18		47.00 kg / yr	0.0%	75.9%	11.32 kg / yr
22		73.97 kg / yr	0.0%	75.9%	17.82 kg / yr
16		80.81 kg / yr	0.0%	75.9%	19.47 kg / yr
Total Basin Phosphorus Load					= 53.12 kg / yr

BOD REMOVAL CALCULATIONS

BASIN		Basin BOD Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment BOD Load
15		455.10 kg / yr	0.0%	100.0%	0.00 kg / yr
18		1085.56 kg / yr	0.0%	100.0%	0.00 kg / yr
22		1643.06 kg / yr	0.0%	100.0%	0.00 kg / yr
16		1758.92 kg / yr	0.0%	100.0%	0.00 kg / yr
		Total Basin BOD Load = 0.00 kg / yr			

TSS REMOVAL CALCULATIONS

BASIN		Basin TSS Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment TSS Load
15		1987.66 kg / yr	0.0%	85.0%	298.15 kg / yr
18		6439.67 kg / yr	0.0%	85.0%	965.95 kg / yr
22		10271.29 kg / yr	0.0%	85.0%	1540.69 kg / yr
16		11294.32 kg / yr	0.0%	85.0%	1694.15 kg / yr
		Total Basin TSS Load = 4498.94 kg / yr			

COPPER REMOVAL CALCULATIONS

BASIN		Basin Copper Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Copper Load
15		0.65 kg / yr	0.0%	65.0%	0.23 kg / yr
18		0.79 kg / yr	0.0%	65.0%	0.28 kg / yr
22		1.31 kg / yr	0.0%	65.0%	0.46 kg / yr
16		1.46 kg / yr	0.0%	65.0%	0.51 kg / yr
		Total Basin Copper Load = 1.47 kg / yr			

ZINC REMOVAL CALCULATIONS

BASIN		Basin Zinc Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Zinc Load
15		2.57 kg / yr	0.0%	85.0%	0.39 kg / yr
18		6.68 kg / yr	0.0%	85.0%	1.00 kg / yr
22		11.32 kg / yr	0.0%	85.0%	1.70 kg / yr
16		12.81 kg / yr	0.0%	85.0%	1.92 kg / yr
		Total Basin Zinc Load = 5.01 kg / yr			

ANALYSIS OF POLLUTANT LOADING

EVALUATION OF POND RESIDENCE TIME AND OVERALL POLLUTANT REMOVAL EFFICIENCIES

OVERALL SYSTEM ANALYSIS

SYSTEM CONFIGURATION AND CUMULATIVE RESIDENCE TIME CALCULATIONS:

BASIN	PPV	INCREMENTAL RUNOFF VOLUME	CUMULATIVE RUNOFF VOLUME	CUMULATIVE CASCADING RESIDENCE TIME (Td)				
21	20.75 ac-ft	11.12 ac-ft / yr	11.12 ac-ft/yr	BASIN 21	BASIN 25	BASIN 31		
25	61.29 ac-ft	18.92 ac-ft / yr	30.04 ac-ft/yr	680.9 days				
31	8.98 ac-ft	9.05 ac-ft / yr	39.09 ac-ft/yr	1425.6 days	744.7 days			
				1509.5 days	828.5 days	83.8 days		

TOTAL RESIDENCE TIME (Td)		1509.5 days	828.5 days	83.8 days
	→	100 max	100 max	

Nitrogen Removal Efficiency	=	$(43.75 \times Td) / (4.38 + Td)$	41.9%	41.9%	41.6%
Phosphorus Removal Efficiency	=	$44.53 + 6.146 \times \ln(Td) + 0.145 \times (\ln(Td))^2$	75.9%	74.0%	72.5%
BOD Removal Efficiency	=	$1 - e^{(-0.1 \times Td)}$	100.0%	100.0%	100.0%
TSS Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%	85.0%	85.0%
Copper Removal Efficiency	=	Harper Harvey Report to FDEP June 07	65.0%	65.0%	65.0%
Zinc Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%	85.0%	85.0%

POLLUTANT LOAD REMOVAL CALCULATIONS:

NITROGEN REMOVAL CALCULATIONS

BASIN		Basin Nitrogen Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Nitrogen Load
21		25.65 kg / yr	0.0%	41.9%	14.90 kg / yr
25		43.63 kg / yr	0.0%	41.9%	25.34 kg / yr
31		23.11 kg / yr	0.0%	41.6%	13.50 kg / yr

Total Basin Nitrogen Load	=	53.74 kg / yr
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PHOSPHORUS REMOVAL CALCULATIONS

BASIN		Basin Phosphorus Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Phosphorus Load
21		4.13 kg / yr	0.0%	75.9%	0.99 kg / yr
25		7.02 kg / yr	0.0%	75.9%	1.69 kg / yr
31		5.42 kg / yr	0.0%	74.6%	1.38 kg / yr

Total Basin Phosphorus Load	=	4.06 kg / yr
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BOD REMOVAL CALCULATIONS

BASIN
21
25
31



Basin BOD Load
90.52 kg / yr
153.98 kg / yr
118.06 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%
0.0%

Wet Detention Removal Efficiency
100.0%
100.0%
100.0%

Post-Treatment BOD Load
0.00 kg / yr
0.00 kg / yr
0.00 kg / yr

Total Basin BOD Load

=

0.00 kg / yr

TSS REMOVAL CALCULATIONS

BASIN
21
25
31



Basin TSS Load
401.86 kg / yr
683.56 kg / yr
758.02 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%
0.0%

Wet Detention Removal Efficiency
85.0%
85.0%
85.0%

Post-Treatment TSS Load
60.28 kg / yr
102.53 kg / yr
113.70 kg / yr

Total Basin TSS Load

=

276.52 kg / yr

COPPER REMOVAL CALCULATIONS

BASIN
21
25
31



Basin Copper Load
0.19 kg / yr
0.33 kg / yr
0.10 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%
0.0%

Wet Detention Removal Efficiency
65.0%
65.0%
65.0%

Post-Treatment Copper Load
0.07 kg / yr
0.11 kg / yr
0.03 kg / yr

Total Basin Copper Load

=

0.22 kg / yr

ZINC REMOVAL CALCULATIONS

BASIN
21
25
31



Basin Zinc Load
0.71 kg / yr
1.21 kg / yr
0.86 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%
0.0%

Wet Detention Removal Efficiency
85.0%
85.0%
85.0%

Post-Treatment Zinc Load
0.11 kg / yr
0.18 kg / yr
0.13 kg / yr

Total Basin Zinc Load

=

0.42 kg / yr

ANALYSIS OF POLLUTANT LOADING

EVALUATION OF POND RESIDENCE TIME AND OVERALL POLLUTANT REMOVAL EFFICIENCIES

OVERALL SYSTEM ANALYSIS

SYSTEM CONFIGURATION AND CUMULATIVE RESIDENCE TIME CALCULATIONS:

BASIN	PPV	INCREMENTAL RUNOFF VOLUME	CUMULATIVE RUNOFF VOLUME	CUMULATIVE CASCADING RESIDENCE TIME (Td)				
30	3.83 ac-ft	10.14 ac-ft / yr	10.14 ac-ft/yr	BASIN 30				
				137.8 days				

TOTAL RESIDENCE TIME (Td)	137.8 days
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→ 100 max

Nitrogen Removal Efficiency	=	$(43.75 \times Td) / (4.38 + Td)$	41.9%
Phosphorus Removal Efficiency	=	$44.53 + 6.146 \times \ln(Td) + 0.145 \times (\ln(Td))^2$	75.9%
BOD Removal Efficiency	=	$1 - e^{(-0.1 \times Td)}$	100.0%
TSS Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%
Copper Removal Efficiency	=	Harper Harvey Report to FDEP June 07	65.0%
Zinc Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%

POLLUTANT LOAD REMOVAL CALCULATIONS:

NITROGEN REMOVAL CALCULATIONS

BASIN		Basin Nitrogen Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Nitrogen Load
30		25.13 kg / yr	0.0%	41.9%	14.60 kg / yr

Total Basin Nitrogen Load = 14.60 kg / yr

PHOSPHORUS REMOVAL CALCULATIONS

BASIN		Basin Phosphorus Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Phosphorus Load
30		5.79 kg / yr	0.0%	75.9%	1.40 kg / yr

Total Basin Phosphorus Load = 1.40 kg / yr

BOD REMOVAL CALCULATIONS

BASIN
30



Basin BOD Load
90.52 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
100.0%

Post-Treatment BOD Load
0.00 kg / yr

Total Basin BOD Load	=	0.00 kg / yr
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TSS REMOVAL CALCULATIONS

BASIN
30



Basin TSS Load
808.60 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
85.0%

Post-Treatment TSS Load
121.29 kg / yr

Total Basin TSS Load	=	121.29 kg / yr
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COPPER REMOVAL CALCULATIONS

BASIN
30



Basin Copper Load
0.10 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
65.0%

Post-Treatment Copper Load
0.04 kg / yr

Total Basin Copper Load	=	0.04 kg / yr
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ZINC REMOVAL CALCULATIONS

BASIN
30



Basin Zinc Load
0.91 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
85.0%

Post-Treatment Zinc Load
0.14 kg / yr

Total Basin Zinc Load	=	0.14 kg / yr
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ANALYSIS OF POLLUTANT LOADING

EVALUATION OF POND RESIDENCE TIME AND OVERALL POLLUTANT REMOVAL EFFICIENCIES

OVERALL SYSTEM ANALYSIS

SYSTEM CONFIGURATION AND CUMULATIVE RESIDENCE TIME CALCULATIONS:

BASIN	PPV	INCREMENTAL RUNOFF VOLUME	CUMULATIVE RUNOFF VOLUME	CUMULATIVE CASCADING RESIDENCE TIME (Td)				
35	40.43 ac-ft	18.32 ac-ft / yr	18.32 ac-ft/yr	BASIN 35	BASIN 36			
36	36.33 ac-ft	13.77 ac-ft / yr	32.08 ac-ft/yr	805.5 days				
				1218.8 days	413.3 days			

TOTAL RESIDENCE TIME (Td)		1218.8 days	413.3 days
	→	100 max	100 max

Nitrogen Removal Efficiency	=	$(43.75 \times Td) / (4.38 + Td)$	41.9%	41.9%
Phosphorus Removal Efficiency	=	$44.53 + 6.146 \ln(Td) + 0.145 (\ln(Td))^2$	75.9%	74.0%
BOD Removal Efficiency	=	$1 - e^{(-0.1 \times Td)}$	100.0%	100.0%
TSS Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%	85.0%
Copper Removal Efficiency	=	Harper Harvey Report to FDEP June 07	65.0%	65.0%
Zinc Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%	85.0%

POLLUTANT LOAD REMOVAL CALCULATIONS:

NITROGEN REMOVAL CALCULATIONS

BASIN		Basin Nitrogen Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Nitrogen Load
35		46.56 kg / yr	0.0%	41.9%	27.05 kg / yr
36		34.83 kg / yr	0.0%	41.9%	20.23 kg / yr

Total Basin Nitrogen Load	=	47.28 kg / yr
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PHOSPHORUS REMOVAL CALCULATIONS

BASIN		Basin Phosphorus Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Phosphorus Load
35		10.90 kg / yr	0.0%	75.9%	2.63 kg / yr
36		8.13 kg / yr	0.0%	75.9%	1.96 kg / yr

Total Basin Phosphorus Load	=	4.58 kg / yr
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BOD REMOVAL CALCULATIONS

BASIN
35
36



Basin BOD Load
237.40 kg / yr
177.18 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%

Wet Detention Removal Efficiency
100.0%
100.0%

Post-Treatment BOD Load
0.00 kg / yr
0.00 kg / yr

Total Basin BOD Load

=

0.00 kg / yr

TSS REMOVAL CALCULATIONS

BASIN
35
36



Basin TSS Load
1523.13 kg / yr
1138.47 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%

Wet Detention Removal Efficiency
85.0%
85.0%

Post-Treatment TSS Load
228.47 kg / yr
170.77 kg / yr

Total Basin TSS Load

=

399.24 kg / yr

COPPER REMOVAL CALCULATIONS

BASIN
35
36



Basin Copper Load
0.20 kg / yr
0.15 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%

Wet Detention Removal Efficiency
65.0%
65.0%

Post-Treatment Copper Load
0.07 kg / yr
0.05 kg / yr

Total Basin Copper Load

=

0.12 kg / yr

ZINC REMOVAL CALCULATIONS

BASIN
35
36



Basin Zinc Load
1.73 kg / yr
1.29 kg / yr

Dry Retention Removal Efficiency
0.0%
0.0%

Wet Detention Removal Efficiency
85.0%
85.0%

Post-Treatment Zinc Load
0.26 kg / yr
0.19 kg / yr

Total Basin Zinc Load

=

0.45 kg / yr

ANALYSIS OF POLLUTANT LOADING

EVALUATION OF POND RESIDENCE TIME AND OVERALL POLLUTANT REMOVAL EFFICIENCIES

OVERALL SYSTEM ANALYSIS

SYSTEM CONFIGURATION AND CUMULATIVE RESIDENCE TIME CALCULATIONS:

BASIN	PPV	INCREMENTAL RUNOFF VOLUME	CUMULATIVE RUNOFF VOLUME	CUMULATIVE CASCADING RESIDENCE TIME (Td)				
37	8.77 ac-ft	19.63 ac-ft / yr	19.63 ac-ft/yr	BASIN 37				
				163.2 days				

TOTAL RESIDENCE TIME (Td)	163.2 days
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→ 100 max

Nitrogen Removal Efficiency	=	$(43.75 \times Td) / (4.38 + Td)$	41.9%
Phosphorus Removal Efficiency	=	$44.53 + 6.146 \times \ln(Td) + 0.145 \times (\ln(Td))^2$	75.9%
BOD Removal Efficiency	=	$1 - e^{(-0.1 \times Td)}$	100.0%
TSS Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%
Copper Removal Efficiency	=	Harper Harvey Report to FDEP June 07	65.0%
Zinc Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%

POLLUTANT LOAD REMOVAL CALCULATIONS:

NITROGEN REMOVAL CALCULATIONS

BASIN		Basin Nitrogen Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Nitrogen Load
37		50.58 kg / yr	0.0%	41.9%	29.38 kg / yr

Total Basin Nitrogen Load	=	29.38 kg / yr
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PHOSPHORUS REMOVAL CALCULATIONS

BASIN		Basin Phosphorus Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Phosphorus Load
37		11.94 kg / yr	0.0%	75.9%	2.88 kg / yr

Total Basin Phosphorus Load	=	2.88 kg / yr
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BOD REMOVAL CALCULATIONS

BASIN
37



Basin BOD Load
259.57 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
100.0%

Post-Treatment BOD Load
0.00 kg / yr

Total Basin BOD Load	=	0.00 kg / yr
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TSS REMOVAL CALCULATIONS

BASIN
37



Basin TSS Load
1676.76 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
85.0%

Post-Treatment TSS Load
251.51 kg / yr

Total Basin TSS Load	=	251.51 kg / yr
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COPPER REMOVAL CALCULATIONS

BASIN
37



Basin Copper Load
0.22 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
65.0%

Post-Treatment Copper Load
0.08 kg / yr

Total Basin Copper Load	=	0.08 kg / yr
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ZINC REMOVAL CALCULATIONS

BASIN
37



Basin Zinc Load
1.90 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
85.0%

Post-Treatment Zinc Load
0.29 kg / yr

Total Basin Zinc Load	=	0.29 kg / yr
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ANALYSIS OF POLLUTANT LOADING

EVALUATION OF POND RESIDENCE TIME AND OVERALL POLLUTANT REMOVAL EFFICIENCIES

OVERALL SYSTEM ANALYSIS

SYSTEM CONFIGURATION AND CUMULATIVE RESIDENCE TIME CALCULATIONS:

BASIN	PPV	INCREMENTAL RUNOFF VOLUME	CUMULATIVE RUNOFF VOLUME	CUMULATIVE CASCADING RESIDENCE TIME (Td)				
41	44.67 ac-ft	22.60 ac-ft / yr	22.60 ac-ft/yr	BASIN 41				
				721.5 days				

TOTAL RESIDENCE TIME (Td)	721.5 days
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→ 100 max

Nitrogen Removal Efficiency	=	$(43.75 \times Td) / (4.38 + Td)$	41.9%
Phosphorus Removal Efficiency	=	$44.53 + 6.146 \times \ln(Td) + 0.145 \times (\ln(Td))^2$	75.9%
BOD Removal Efficiency	=	$1 - e^{(-0.1 \times Td)}$	100.0%
TSS Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%
Copper Removal Efficiency	=	Harper Harvey Report to FDEP June 07	65.0%
Zinc Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%

POLLUTANT LOAD REMOVAL CALCULATIONS:

NITROGEN REMOVAL CALCULATIONS

BASIN		Basin Nitrogen Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Nitrogen Load
41		51.47 kg / yr	0.0%	41.9%	29.89 kg / yr

Total Basin Nitrogen Load = 29.89 kg / yr

PHOSPHORUS REMOVAL CALCULATIONS

BASIN		Basin Phosphorus Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Phosphorus Load
41		8.23 kg / yr	0.0%	75.9%	1.98 kg / yr

Total Basin Phosphorus Load = 1.98 kg / yr

BOD REMOVAL CALCULATIONS

BASIN
41



Basin BOD Load
180.94 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
100.0%

Post-Treatment BOD Load
0.00 kg / yr

Total Basin BOD Load	=	0.00 kg / yr
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TSS REMOVAL CALCULATIONS

BASIN
41



Basin TSS Load
813.94 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
85.0%

Post-Treatment TSS Load
122.09 kg / yr

Total Basin TSS Load	=	122.09 kg / yr
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COPPER REMOVAL CALCULATIONS

BASIN
41



Basin Copper Load
0.39 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
65.0%

Post-Treatment Copper Load
0.13 kg / yr

Total Basin Copper Load	=	0.13 kg / yr
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ZINC REMOVAL CALCULATIONS

BASIN
41



Basin Zinc Load
1.43 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
85.0%

Post-Treatment Zinc Load
0.22 kg / yr

Total Basin Zinc Load	=	0.22 kg / yr
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ANALYSIS OF POLLUTANT LOADING

EVALUATION OF POND RESIDENCE TIME AND OVERALL POLLUTANT REMOVAL EFFICIENCIES

OVERALL SYSTEM ANALYSIS

SYSTEM CONFIGURATION AND CUMULATIVE RESIDENCE TIME CALCULATIONS:

BASIN	PPV	INCREMENTAL RUNOFF VOLUME	CUMULATIVE RUNOFF VOLUME	CUMULATIVE CASCADING RESIDENCE TIME (Td)				
44	30.20 ac-ft	13.29 ac-ft / yr	13.29 ac-ft/yr	BASIN 44				
				829.6 days				

TOTAL RESIDENCE TIME (Td)	829.6 days
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→ 100 max

Nitrogen Removal Efficiency	=	$(43.75 \times Td) / (4.38 + Td)$	41.9%
Phosphorus Removal Efficiency	=	$44.53 + 6.146 \times \ln(Td) + 0.145 \times (\ln(Td))^2$	75.9%
BOD Removal Efficiency	=	$1 - e^{(-0.1 \times Td)}$	100.0%
TSS Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%
Copper Removal Efficiency	=	Harper Harvey Report to FDEP June 07	65.0%
Zinc Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%

POLLUTANT LOAD REMOVAL CALCULATIONS:

NITROGEN REMOVAL CALCULATIONS

BASIN		Basin Nitrogen Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Nitrogen Load
44		34.07 kg / yr	0.0%	41.9%	19.79 kg / yr

Total Basin Nitrogen Load = 19.79 kg / yr

PHOSPHORUS REMOVAL CALCULATIONS

BASIN		Basin Phosphorus Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Phosphorus Load
44		8.02 kg / yr	0.0%	75.9%	1.93 kg / yr

Total Basin Phosphorus Load = 1.93 kg / yr

BOD REMOVAL CALCULATIONS

BASIN
44



Basin BOD Load
174.42 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
100.0%

Post-Treatment BOD Load
0.00 kg / yr

Total Basin BOD Load	=	0.00 kg / yr
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TSS REMOVAL CALCULATIONS

BASIN
44



Basin TSS Load
1143.83 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
85.0%

Post-Treatment TSS Load
171.57 kg / yr

Total Basin TSS Load	=	171.57 kg / yr
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COPPER REMOVAL CALCULATIONS

BASIN
44



Basin Copper Load
0.15 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
65.0%

Post-Treatment Copper Load
0.05 kg / yr

Total Basin Copper Load	=	0.05 kg / yr
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ZINC REMOVAL CALCULATIONS

BASIN
44



Basin Zinc Load
1.30 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
85.0%

Post-Treatment Zinc Load
0.19 kg / yr

Total Basin Zinc Load	=	0.19 kg / yr
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ANALYSIS OF POLLUTANT LOADING

EVALUATION OF POND RESIDENCE TIME AND OVERALL POLLUTANT REMOVAL EFFICIENCIES

OVERALL SYSTEM ANALYSIS

SYSTEM CONFIGURATION AND CUMULATIVE RESIDENCE TIME CALCULATIONS:

BASIN	PPV	INCREMENTAL RUNOFF VOLUME	CUMULATIVE RUNOFF VOLUME	CUMULATIVE CASCADING RESIDENCE TIME (Td)				
45	29.21 ac-ft	16.35 ac-ft / yr	16.35 ac-ft/yr	BASIN 45				
				652.3 days				

TOTAL RESIDENCE TIME (Td)	652.3 days
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→ 100 max

Nitrogen Removal Efficiency	=	$(43.75 \times Td) / (4.38 + Td)$	41.9%
Phosphorus Removal Efficiency	=	$44.53 + 6.146 \times \ln(Td) + 0.145 \times (\ln(Td))^2$	75.9%
BOD Removal Efficiency	=	$1 - e^{(-0.1 \times Td)}$	100.0%
TSS Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%
Copper Removal Efficiency	=	Harper Harvey Report to FDEP June 07	65.0%
Zinc Removal Efficiency	=	Harper Harvey Report to FDEP June 07	85.0%

POLLUTANT LOAD REMOVAL CALCULATIONS:

NITROGEN REMOVAL CALCULATIONS

BASIN		Basin Nitrogen Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Nitrogen Load
45		41.96 kg / yr	0.0%	41.9%	24.37 kg / yr

Total Basin Nitrogen Load	=	24.37 kg / yr
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PHOSPHORUS REMOVAL CALCULATIONS

BASIN		Basin Phosphorus Load	Dry Retention Removal Efficiency	Wet Detention Removal Efficiency	Post-Treatment Phosphorus Load
45		9.88 kg / yr	0.0%	75.9%	2.38 kg / yr

Total Basin Phosphorus Load	=	2.38 kg / yr
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BOD REMOVAL CALCULATIONS

BASIN
45



Basin BOD Load
214.88 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
100.0%

Post-Treatment BOD Load
0.00 kg / yr

Total Basin BOD Load	=	0.00 kg / yr
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TSS REMOVAL CALCULATIONS

BASIN
45



Basin TSS Load
1441.02 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
85.0%

Post-Treatment TSS Load
216.15 kg / yr

Total Basin TSS Load	=	216.15 kg / yr
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COPPER REMOVAL CALCULATIONS

BASIN
45



Basin Copper Load
0.19 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
65.0%

Post-Treatment Copper Load
0.07 kg / yr

Total Basin Copper Load	=	0.07 kg / yr
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ZINC REMOVAL CALCULATIONS

BASIN
45



Basin Zinc Load
1.64 kg / yr

Dry Retention Removal Efficiency
0.0%

Wet Detention Removal Efficiency
85.0%

Post-Treatment Zinc Load
0.25 kg / yr

Total Basin Zinc Load	=	0.25 kg / yr
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Appendix A
Event Mean Concentrations
and
Rainfall Input Referenced

ANALYSIS OF POLLUTANT LOADING
POST-DEVELOPMENT CONDITIONS

GENERAL PROJECT LOCATION:

Naples

TOTAL ANNUAL RAINFALL FOR THIS LOCATION:

51.90 in / yr

ANNUAL RAINFALL BASED UPON LONG-TERM CLIMATIC RECORDS AND DATA OBTAINED FROM THE NATIONAL CLIMATIC DATA CENTER FOR THE FT. MYERS METEOROLOGICAL STATION FROM 1971-2000.

**FLORIDA-BASED EVENT MEAN CONCENTRATIONS FOR USE IN ESTIMATING
STORMWATER LOADINGS JULY 2011**

Land Use Category	Total N mg/L	Total P mg/L	BOD mg/L	TSS mg/L	Total Copper mg/L	Total Zinc mg/L
Low Density Residential ¹	1.50	0.200				
Single Family	1.87	0.301	6.6	29.3	0.014	0.052
Multi-Family	2.10	0.497	10.8	69.5	0.009	0.079
Low Intensity Commercial	1.07	0.179	7.0	47.5	0.015	0.067
High Intensity Commercial	2.20	0.248	9.6	65.1	0.015	0.158
Light Industrial	1.19	0.213	7.4	42.8	0.003	0.057
Highway	1.37	0.167	4.6	38.1	0.017	0.087
General Agricultural						
Pasture	3.30	0.621	5.1	12.7	NA	NA
Citrus	2.07	0.152	2.6	20.1	0.003	0.012
Row Crops	2.46	0.489	NA	14.9	0.073	0.096
Undeveloped Natural Community	1.125	0.100				
Mining/Extractive	1.18	0.150				

1. Average of single-family and undeveloped values

Source: NPDES Phase I Municipal Separate Storm Sewer System Permitting Resource Manual, FDEP , 2013

Appendix B
Pollutant Loading Basin Exhibit

1A OUTFALL

N = 57.39 Kg/YR
P = 5.09 Kg/YR
BOD = 0.00 Kg/YR
TSS = 420.96 Kg/YR
Cu = 0.07 Kg/YR
Zn = 0.50 Kg/YR
TOTAL AREA = 113.51 AC.

1 OUTFALL

N = 58.80 Kg/YR
P = 4.31 Kg/YR
BOD = 0.00 Kg/YR
TSS = 311.28 Kg/YR
Cu = 0.17 Kg/YR
Zn = 0.43 Kg/YR
TOTAL AREA = 146.48 AC.

11A OUTFALL

N = 43.07 Kg/YR
P = 2.81 Kg/YR
BOD = 0.00 Kg/YR
TSS = 215.51 Kg/YR
Cu = 0.05 Kg/YR
Zn = 0.23 Kg/YR
TOTAL AREA = 85.40 AC.

31 OUTFALL

N = 53.74 Kg/YR
P = 4.06 Kg/YR
BOD = 0.00 Kg/YR
TSS = 276.52 Kg/YR
Cu = 0.22 Kg/YR
Zn = 0.42 Kg/YR
TOTAL AREA = 113.69 AC.

37 OUTFALL

N = 29.38 Kg/YR
P = 2.88 Kg/YR
BOD = 0.00 Kg/YR
TSS = 251.51 Kg/YR
Cu = 0.08 Kg/YR
Zn = 0.29 Kg/YR
TOTAL AREA = 12.00 AC.

38 OUTFALL

N = 46.31 Kg/YR
P = 3.43 Kg/YR
BOD = 0.00 Kg/YR
TSS = 252.64 Kg/YR
Cu = 0.15 Kg/YR
Zn = 0.34 Kg/YR
TOTAL AREA = 215.38 AC.

22 OUTFALL

N = 636.48 Kg/YR
P = 53.12 Kg/YR
BOD = 0.00 Kg/YR
TSS = 4,498.94 Kg/YR
Cu = 1.47 Kg/YR
Zn = 5.01 Kg/YR
TOTAL AREA = 857.89 AC.

30 OUTFALL

N = 14.60 Kg/YR
P = 1.40 Kg/YR
BOD = 0.00 Kg/YR
TSS = 121.29 Kg/YR
Cu = 0.04 Kg/YR
Zn = 0.14 Kg/YR
TOTAL AREA = 10.02 AC.

35 OUTFALL

N = 47.28 Kg/YR
P = 4.58 Kg/YR
BOD = 0.00 Kg/YR
TSS = 399.24 Kg/YR
Cu = 0.12 Kg/YR
Zn = 0.45 Kg/YR
TOTAL AREA = 64.36 AC.

41 OUTFALL

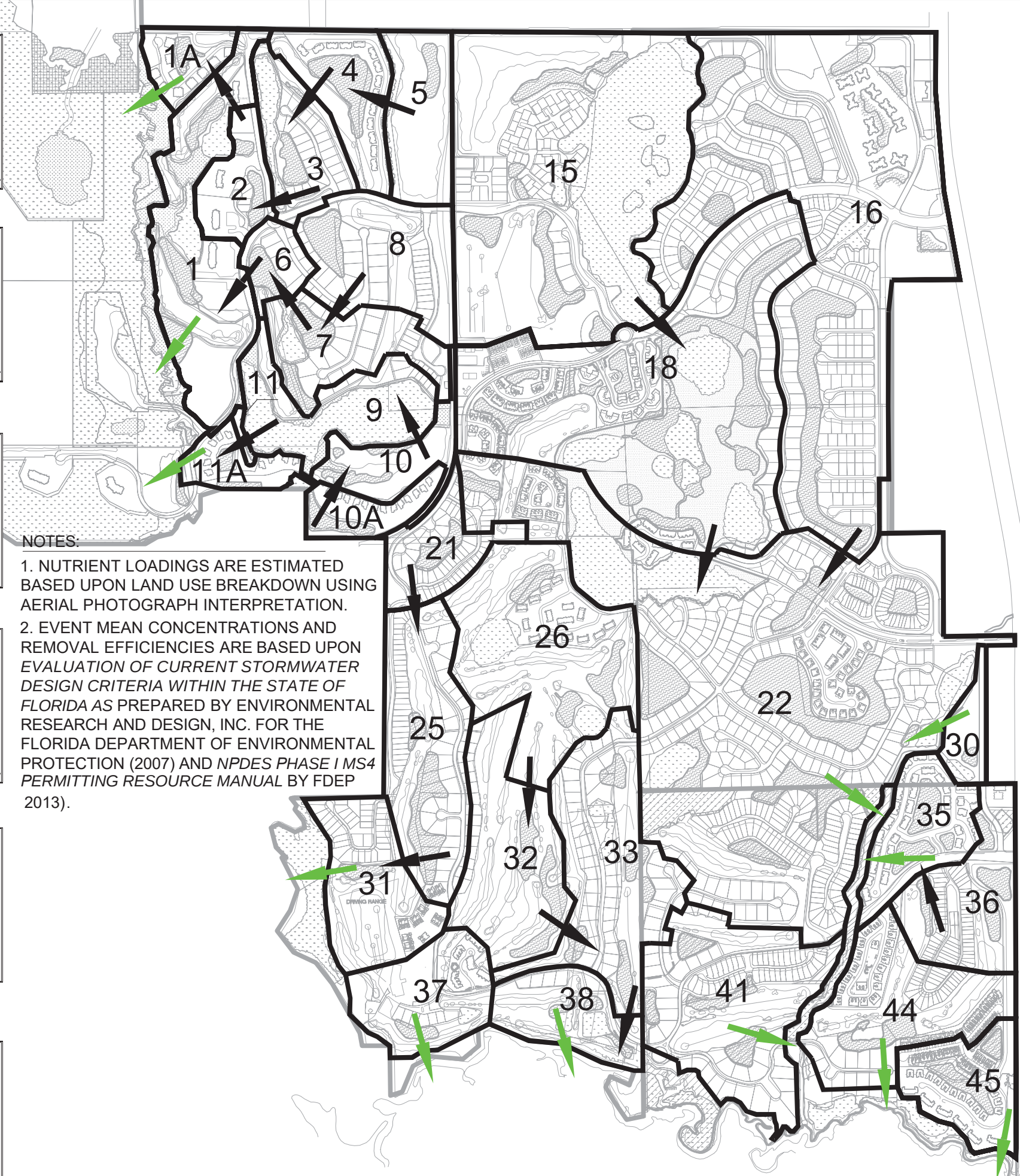
N = 29.89 Kg/YR
P = 1.98 Kg/YR
BOD = 0.00 Kg/YR
TSS = 122.09 Kg/YR
Cu = 0.13 Kg/YR
Zn = 0.22 Kg/YR
TOTAL AREA = 69.26 AC.

44 OUTFALL

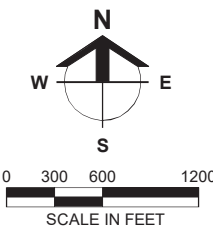
N = 19.79 Kg/YR
P = 1.93 Kg/YR
BOD = 0.00 Kg/YR
TSS = 171.57 Kg/YR
Cu = 0.05 Kg/YR
Zn = 0.19 Kg/YR
TOTAL AREA = 50.91 AC.

45 OUTFALL

N = 24.37 Kg/YR
P = 2.38 Kg/YR
BOD = 0.00 Kg/YR
TSS = 216.15 Kg/YR
Cu = 0.07 Kg/YR
Zn = 0.25 Kg/YR
TOTAL AREA = 27.63 AC.



NOTES:
1. NUTRIENT LOADINGS ARE ESTIMATED BASED UPON LAND USE BREAKDOWN USING AERIAL PHOTOGRAPH INTERPRETATION.
2. EVENT MEAN CONCENTRATIONS AND REMOVAL EFFICIENCIES ARE BASED UPON EVALUATION OF CURRENT STORMWATER DESIGN CRITERIA WITHIN THE STATE OF FLORIDA AS PREPARED BY ENVIRONMENTAL RESEARCH AND DESIGN, INC. FOR THE FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (2007) AND NPDES PHASE I MS4 PERMITTING RESOURCE MANUAL BY FDEP (2013).



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PREPARED FOR
BAYSIDE & BAY CREEK
COMMUNITY DEVELOPMENT DISTRICTS
6131 LYONS ROAD, SUITE 100
COCONUT CREEK, FL 33073

PROJECT DESCRIPTION

PELICAN LANDING

THIS PLAN IS PRELIMINARY AND INTENDED FOR CONCEPTUAL PLANNING PURPOSES ONLY.
SITE LAYOUT AND LAND USE INTENSITIES OR DENSITIES MAY CHANGE SIGNIFICANTLY BASED UPON SURVEY, ENGINEERING, ENVIRONMENTAL AND / OR REGULATORY CONSTRAINTS AND / OR OPPORTUNITIES.

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FILE NAME:	22786_LOAD_ANALYSIS_EXH.DWG
LOCATION:	J:\22786\DWG\CDD\
PLOT DATE:	WED. 10-14-2020 - 3:40 PM
PLOT BY:	JAMIE TODD

CROSS REFERENCED DRAWINGS

PLAN REVISIONS	

PLAN STATUS
FOR EXHIBIT PURPOSES ONLY
NOT FOR CONSTRUCTION

POLLUTANT
LOADING BASIN
EXHIBIT

PROJECT / FILE NO.	SHEET NUMBER
22786	EXH