Agenda Report

2725 Judge Fran Jamieson Way
Viera, FL 32940

New Business - Development and Environmental Services Group

J.1. 2/11/2025

Subject:

Adoption of the Save Our Indian River Lagoon Project Plan 2025 Update, as recommended by the Save Our Indian River Lagoon Citizens Oversight Committee

Fiscal Impact:

The recommended plan update recognizes a $20,444 increase in total revenues to be generated by the Save Our Indian River Lagoon Surtax over its 10-year life (increased from $585.71 million to $585.73 million) with $9.245 million re-allocated for new projects as follows: 3 wastewater projects; 11 stormwater treatment projects; 4 restoration projects; and 1 aquatic vegetation harvesting project.

Dept/Office:

Natural Resources Management

Requested Action:

It is requested the Board of County Commissioners adopt (or modify and adopt) the Save Our Indian River Lagoon Project Plan 2025 Update, as recommended unanimously by the Save Our Indian River Lagoon Citizen Oversight Committee on January 17, 2025; and maintain the following administrative authorities provided by past Board actions with the inclusion of grants agreements in number 2 below:

1) authorize associated budget change requests;

2) approve continued signature authority to the Chairman (or authorized representative, in accordance with the threshold limits provided for in Brevard County policies and administrative orders) to execute contracts, agreements, task orders, change orders, contract renewals, amendments, other contract-related documents and grant agreements, subject to review and approval by the County Attorney, Risk Management and Purchasing, as appropriate, for projects and programs approved in the Save Our Indian River Lagoon Project Plan;

3) approve authority for the Director of Natural Resources Management to execute no-cost time extensions up to one year total and approve the County Manager to execute no-cost time extensions up to two years total;

4) grant permission to advertise and competitively procure goods and services needed to implement projects and programs approved in the Save Our Indian River Lagoon Project Plan, subject to available funding; and

5) authorize staff to submit grant applications for leveraging cost share for projects and programs approved in the Save Our Indian River Lagoon Project Plan.

Summary Explanation and Background:

Each year, to account for new information and opportunities, the Save Our Indian River Lagoon Citizen Oversight Committee is tasked with recommending an Update to the Save Our Indian River Lagoon (SOIRL) Project Plan. The Committee has held monthly public meetings throughout the year to keep informed, gather ideas from the community, review potential changes, and recommend an annual plan update to the County Commission. Pursuant to Brevard County Ordinance 2016-15, the Committee's annually recommended SOIRL Project Plan Update is posted on the Committee's webpage for public access at least 15 days prior to being brought to the County Commission for consideration. The County Commission may adopt or modify the Committee's recommended Plan Update.

An intergovernmental coordination meeting was held on July 11th, 2024, to review the process for submitting project requests to be considered for addition to the 2025 SOIRL Project Plan Update. Project requests for the 2025 Update were due September 27th. Project submissions are listed in the summary table and the detailed applications (attached) were reviewed by the Committee during a November 15th public meeting. The Citizen Oversight Committee voted unanimously to recommended funding nineteen (19) of the twenty-one (21) requests, and also stipulated that for the South Beaches Wastewater Treatment Plan Upgrade and the Port Saint John Wastewater Treatment Plant Replacement, staff are to conduct a review and enter into an agreement only up to that amount that is demonstrated to be the cost-share for nitrogen load reduction benefits exceeding regulatory requirements, and confirm that the Port Saint John Replacement project will indeed be needed, based upon plans for a regional facility.

The draft 2025 SOIRL Project Plan Update (attached) allocates funding for a total of 428 projects over the 10-year life of the Plan, including the nineteen (19) new projects plus 942 individual quick connections to sewer and 1,469 septic upgrades. The draft 2025 plan also includes performance updates and refinements on multiple project types. To help readers find all areas of the SOIRL Project Plan that contain proposed updates or modifications, the attached Draft 2025 Update uses yellow highlighted text, table, and figure captions to indicate additions and revisions.

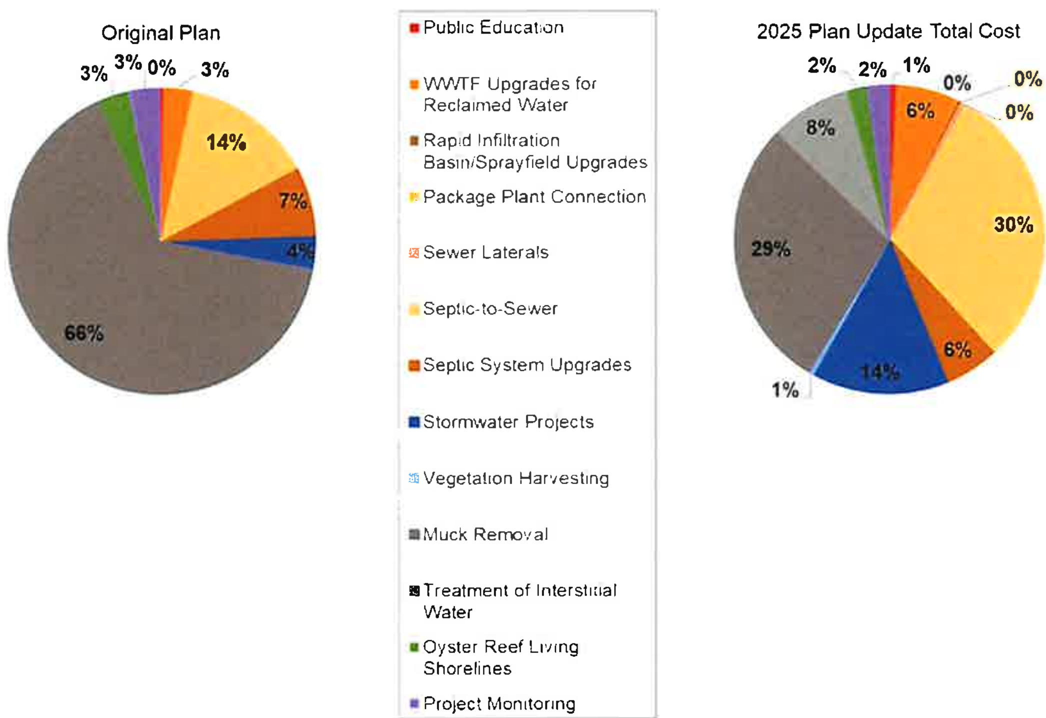
Inflation is compounded from the year funds were approved for a project to the year the project is anticipated to be complete, up to a maximum of 5-years, based on the following inflation rates for each year: 2.6% for Plan Years 0-4, 7.8% for Year 5, 17.3% for Year 6, 6.5% for Year 7, and 3.5% for Years 8-10. (Construction inflation rates are based on local bids and national construction industry statistics for infrastructure construction costs.)

Significant changes in the draft 2025 Update include:

- Revising the revenue projection up $20,443 in response to economic fluctuations;
- Adding 19 new projects (9 local government, 6 county, and 4 non-profit) at $9.245M;
- Updating inflation reserves for each project in the plan that is not yet complete;
- Increasing the maximum homeowner cost share for septic upgrades to $20,000;
- Reporting on the costs, benefits, successes, and lessons learned from completed projects.

During fiscal year 23/24, actual tax collections were $68.3 million, which was $413,162 less than the $68.7 million estimated in the prior plan update. Using actual revenues collected in 2016 through September 2024, 2.761% for projecting revenue growth during the remainder of the 2024 calendar year, and 2.4% revenue growth in 2025 through 2026, the estimated 10-year collections increased by $20,443 from $585.71 million to $585.73 million.

In the 2025 Update, $238 million (42% of the Trust Fund) is directed to projects that improve the treatment of human wastewater through upgraded treatment of reclaimed water, connection of package treatment plants to central sewer, nutrient removal from treatment plant spray-fields and rapid infiltration basins, smoke testing to identify leaky sewer infrastructure coupled with funding to incentivize repairs, conversion of septic neighborhoods to sewer service, connection of septic homes to adjacent sewer lines, and upgrade of high-risk conventional septic to advanced septic systems. The 2025 Update allocates $212 million (37%) for muck removal, including stripping nutrients from the dredge outflow water. The 2025 Update allocates $87 million (15%) for stormwater treatment and vegetation harvesting, $12 million (2%) for restoration and $10 million (2%) for measuring project performance, and $4 million (1%) for public outreach, as illustrated in the cost allocation pie charts (below). The recommended changes are consistent with the County Commission's 2019 shift in emphasis that reduced muck dredging down from 66% of the original allocation and increased human wastewater related projects up from 24% of the original allocation.



Clerk to the Board Instructions:

Send Clerk's memo of Board action to Natural Resources

BREVARD County
BOARD OF COUNTY COMMISSIONERS
FLORIDA'S SPACE COAST

Kimberly Powell, Clerk to the Board, 400 South Street • P.O. Box 999, Titusville, Florida 32781-0999
Telephone: (321) 637-2001
Fax: (321) 264-6972
Kimberly.Powell@brevardclerk.us

February 12, 2025

MEMORANDUM

TO: Virginia Barker, Natural Resources Management Director

RE: Item J.1., Adoption of Save Our Indian River Lagoon (SOIRL) Project Plan 2025 Update, as Recommended by the SOIRL Citizens Oversight Committee (COC)

The Board of County Commissioners, in regular session on February 11, 2025, adopted the SOIRL Project Plan 2025 Update, as recommended by SOIRL COC on January 17, 2025; and authorized maintaining the following administrative authorities provided by past Board actions, with the inclusion of grant agreements as listed in Item 2:

1) authorize associated Budget Change Requests;

2) approve continued signature authority to the Chairman (or authorized representative, in accordance with the threshold limits provided for in Brevard County Policies and Administrative Orders) to execute contracts, agreements, task orders, change orders, contract renewals, amendments, other contract-related documents, and grant agreements, subject to review and approval by the County Attorney, Risk Management, and Purchasing, as appropriate, for projects and programs approved in the SOIRL Project Plan;

3) authorize you to execute no-cost time extensions up to one year total and approve the County Manager to execute no-cost time extensions up to two years total;

4) grant permission to advertise and competitively procure goods and services needed to implement projects and programs approved in the SOIRL Project Plan, subject to available funding; and

5) authorize staff to submit grant applications for leveraging cost share for projects and programs approved in the SOIRL Project Plan.

Your continued cooperation is always appreciated.

Sincerely,

BOARD OF COUNTY COMMISSIONERS
RACHEL M. SADOFF, CLERK

Kimberly Powell

Kimberly Powell, Clerk to the Board

cc: County Manager
County Attorney
Finance
Budget

Draft Save Our Indian River Lagoon Project Plan 2025 Update for Brevard County, Florida

Prepared by:
Tetra Tech, Inc.
TETRA TECH

Prepared for:
Brevard County, Natural Resources Management Department
Brevard County

January 2025

Table of Contents

Draft Save Our Indian River Lagoon Project Plan 2025 Update for Brevard County, Florida 1
Acknowledgements ix
Executive Summary iii
Section 1. Background 1
1.1. Return on Investment and Economic Value 3
1.1.1. Areas of Economic Value at Risk 4
1.2. Maximizing Benefits and Managing Risk 6
1.2.1. Project Selection to Maximize Return on Investment 6
Section 2. Approach, Outputs, and Outcomes 9
2.1. Plan Focus Area 9
2.2. Plan Outputs and Outcomes 11
2.3. Additional Project Benefits 11
Section 3. Pollutant Sources in the IRL Watershed 15
Section 4. Project Options 18
4.1. Projects to Reduce Pollutants 18
4.1.1. Public Outreach and Education 19
4.1.2. Wastewater Treatment Facility Upgrades 29
4.1.3. Sprayfield and Rapid Infiltration Basin Upgrades 32
4.1.4. Package Plant Connections 32
4.1.5. Sewer Laterals Rehabilitation 33
4.1.6. Septic-to-Sewer and Septic System Upgrades 37
4.1.7. Stormwater Treatment 68
4.1.8. Vegetation Harvesting 89
4.2. Projects to Remove Pollutants 91
4.2.1. Muck Removal 91
4.2.2. Treatment of Muck Interstitial Water 99
4.2.3. Spoil Management Areas 102
4.2.4. Surface Water Remediation System 103
4.2.5. Enhanced Circulation 104
4.3. Projects to Restore the Lagoon 110
4.3.1. Oyster Restoration 110
4.3.2. Planted Shorelines 116
4.3.3. Clam Restoration and Aquaculture 120
4.3.4. Seagrass Planting 121
4.4. Projects to Respond to New Information 124

4.4.1. Adaptive Management to Report, Reassess, and Respond 124
4.4.2. Cost-share for Substitute Projects 126
4.4.3. Responding to Implemented Projects 127
4.4.4. Research Needs 167
Section 5. Project Funding 170
5.1. Project Funding, Schedule, and Scope Adjustments 170
5.1.1. Contingency Fund Reserve 170
5.1.2. Schedule Acceleration 171
5.1.3. Scope Reduction 171
5.1.4. Inflation 171
5.1.5. Contract Amendments 171
5.2. Revenue Projection Update 172
5.3. Project Funding Allocations 172
Section 6. Summary of the Plan through the 2025 Update 174
6.1. Progress Toward the Local Targets for Maximum Total Loads 174
6.2. Plan Summary 178
Appendix A: Funding Needs and Leveraging Opportunities 209
Appendix B: References 212
Appendix C: Seagrasses 237
Loss of Seagrass 237
Nutrient Content of Seagrass 239
Draft Evaluation Criteria for Planting Seagrass 240
References 240
Appendix D: Unfunded Projects 243
Appendix E: Withdrawn Projects 289
Appendix F. Loading Estimates from Stormwater Basins on Federal Lands 302
Appendix G. Long Descriptions of Figures 325
Figure 1-1. Decline of Commercial Fishing in Brevard County 325
Figure 2-2. Summary of the Save Our Indian River Lagoon Outputs and Outcomes 325
Figure 4-1. Grass Clippings Example for a Typical Lot 326
Figure 4-2. Septic-to-Sewer Projects in Banana River Lagoon 326
Figure 4-3. Septic-to-Sewer Projects in Banana River Lagoon, continued 326
Figure 4-4. Septic-to-Sewer Projects in Banana River Lagoon, continued 327
Figure 4-5. Septic-to-Sewer Projects in North IRL 327
Figure 4-6. Septic-to-Sewer Projects in North IRL, continued 327
Figure 4-7. Septic-to-Sewer Projects in North IRL, continued 327

Figure 4-8. Septic-to-Sewer Projects in North IRL, continued 328
Figure 4-9. Septic-to-Sewer Projects in North IRL, continued 328
Figure 4-10. Septic-to-Sewer Projects in North IRL, continued 328
Figure 4-11. Septic-to-Sewer Projects in Central IRL....................329
Figure 4-12. Septic-to-Sewer Projects in Central IRL, continued 329
Figure 4-13. Septic-to-Sewer Projects in Central IRL, continued 329
Figure 4-14. Septic-to-Sewer Projects in Central IRL, continued 330
Figure 4-15. Quick Connection Septic-to-Sewer Locations in North Brevard County 330
Figure 4-16. Quick Connection Septic-to-Sewer Locations in Central Brevard County 330
Figure 4-17. Quick Connection Septic-to-Sewer Locations in South Brevard County....................330
Figure 4-18. Example In-Ground Nitrogen-Reducing Biofilter Septic System....................331
Figure 4-19. Septic System Upgrades in North Brevard County 331
Figure 4-20. Septic System Upgrades in Central Brevard County....................331
Figure 4-21. Septic System Upgrades in South Brevard County....................331
Figure 4-22. Stormwater Projects in North Brevard County 332
Figure 4-23. Stormwater Projects in Central Brevard County....................332
Figure 4-24. Stormwater Projects in South Brevard County....................332
Figure 4-25. Location of Muck Removal Projects in the Northern Banana River Lagoon 332
Figure 4-26. Location of Muck Removal Projects in the Southern Banana River Lagoon....................332
Figure 4-27. Location of Muck Removal Projects in North IRL....................333
Figure 4-28. Location of Muck Removal Projects in Central IRL 333
Figure 4-29. Phase I Potential Enhanced Circulation Project Locations....................333
Figure 4-30. Shoreline Survey to Identify Locations Appropriate for Oyster Bars and Planted Shorelines 333
Figure 4-31. Estimated Economic Value of Some Seagrass Services 334
Figure 4-32. Completed Projects in North Brevard County 334
Figure 4-33. Completed Projects in North Central Brevard County 334
Figure 4-34. Completed Projects in Central Brevard County....................335
Figure 4-35. Completed Projects in South Central Brevard County 335
Figure 4-36. Completed Projects in South Brevard County....................335
Figure 4-37. Countywide Groundwater Nutrient Concentrations for TN (top) and TP (bottom) 336
Figure 4-38. Monitoring Sensor Locations at the Grand Canal Dredge Material Management Area from May 1 – 31, 2024 336
Figure 4-39. Effluent Concentrations from Interstitial Water Treatment at Grand Canal....................336
Figure 4-40. Effluent Concentrations from Interstitial Water Treatment at Sykes Creek....................344
Figure 4-41. Distribution of Oyster Sizes, Age, and Average Number of Measured Oysters Per Sample Unit....................347

Figure 4-42. Average Oyster Density Per Square Foot 348
Figure 4-43. Average Dry Total Weight Per Square Foot 348
Figure 4-44. Average Number of Measured Oysters in Each Size Class for Ultraviolet Stabilized Plastic Mesh Bags (left) and Galvanized After Welding Steel Gabions (right) 349
Figure 4-45. Comparison of Corral Wall and Stacked Gabion Oyster Module Performance. 349
Figure 4-46. Comparison of Gabion Corral Wall and Coquina Corral Wall Performance 350
Figure 5-2. Evolution of Project Funding Allocations 350
Figure C-1. Mean Areal Extent of Seagrass, Mean Length of Transects, and Mean Transect Percent Cover 351
Figure C-2. Mean Chlorophyll-a Concentrations 352

List of Tables

Table ES-1. Summary of Project Types, Costs, and Nutrient Reductions in the 2025 Update of the Save Our Indian River Lagoon Project Plan vi
Table 1-1. Economic Impact Scenarios Based Upon the Conditions of the IRL 4
Table 2-1. Summary of Load Reductions and Projects in Central IRL Zone SEB 9
Table 2-2. Pollutants Removed by Different Project Types 12
Table 3-1. Loading from Different Sources in Each Sub-lagoon Within the County 16
Table 4-1. Estimated TN and TP Not Attenuated in Fiscal Year 2014–2015 20
Table 4-2. Reductions from Fertilizer Ordinance Compliance as of Fiscal Year 2014–2015 20
Table 4-3. Project for Additional Fertilizer Ordinance Compliance 21
Table 4-4. Project for Grass Clippings Campaign 23
Table 4-5. Project for Reducing Excess Irrigation Campaign 24
Table 4-6. Project for Stormwater Best Management Practice Maintenance Campaign 25
Table 4-7. Project for Septic System Maintenance Program 27
Table 4-8. Project for Oyster Gardening Program 28
Table 4-9. TN Concentrations in Wastewater Treatment Facility Reclaimed Water in 2016 30
Table 4-10. Projects for Wastewater Treatment Facility Upgrades to Improve Reclaimed Water 31
Table 4-11. Projects for Sprayfield or Rapid Infiltration Basin Upgrades for Public Facilities 32
Table 4-12. Projects for Sprayfield or Rapid Infiltration Basin Upgrades for Private Facilities 32
Table 4-13. Projects for Package Plant Connection 33
Table 4-14. Projects for Sewer Laterals Rehabilitation 36
Table 4-15. 2016 Estimate of TN Loading and Cost to Connect for Septic Systems 38
Table 4-16. 2018 Estimate of TN Loading based on ArcGIS-Based Nitrate Load Estimation Toolkit and Updated Cost to Connect for Septic Systems 38
Table 4-17. Septic Systems by Soil Hydraulic Conductance Class within 55 Yards of IRL 38
Table 4-18. Septic Systems in Very High and High Hydraulic Conductance Soils Distributed by Distance to Surface Waters 39
Table 4-19. Projects for Septic-to-Sewer 41
Table 4-20. Projects for Septic System Upgrades 63
Table 4-21. Total Nitrogen Removal for Different Types of Septic Systems 67
Table 4-22. Example Eligible Reimbursement for Different Septic System Upgrades 67
Table 4-23. Traditional Stormwater Best Management Practices with TN and TP Removal Efficiencies 70
Table 4-24. Low Impact Development and Green Infrastructure Best Management Practices and TN and TP Removal Efficiencies 72
Table 4-25. TN and TP Removal Efficiencies for Biosorption Activated Media 74
Table 4-26. Projects for Stormwater Treatment 75
Table 4-27. Estimated Costs and Nutrient Reductions for Vegetation Harvesting 89
Table 4-28. Projects for Vegetation Harvesting 90
Table 4-29. Muck Acreages and Flux Estimates in the IRL 92
Table 4-30. Estimated Volume, Area, and Nutrient Flux for Muck Removal Project Areas 93
Table 4-31. Projects for Muck Removal 94
Table 4-32. Projects for Treatment of Interstitial Water 101
Table 4-33. Summary of Annual Benefits and Ten-Year Costs of a Surface Water Remediation System 104
Table 4-34. Phase I Top Ranked Potential Enhanced Circulation Project Locations 105
Table 4-35. Computed Hydraulics for Connections at Select Locations 107
Table 4-36. Projects for Oyster Restoration 114

Table 4-37. Pollutant Load Reductions for Shoreline Management Practices 116
Table 4-38. Projects for Planted Shorelines 119
Table 4-39. Projects for Clam Restoration....121
Table 4-40. Average Nutrients in Seagrass from 1996–2009 122
Table 4-41. Average Seagrass Lost and Nutrients Made Available to Other Primary Producers in 2015....123
Table 4-42. Cost-share Offered for Project Requests Submitted for the 2025 Update....126
Table 4-43. Save Our Indian River Lagoon Trust Funds Expended on Completed Construction Projects (as of October 31, 2024)....128
Table 4-44. Save Our Indian River Lagoon Trust Funds Contracted or Expended on Projects Underway (as of October 31, 2024) 135
Table 4-45. Composition of Surface Sediments from the Florida Power and Light Project Area Before the Sand Cap, Two Months After, and Five Years After (Fox, 2020 and 2024) 154
Table 6-1. Banana River Lagoon Project Reductions to Meet Five-Month Total Maximum Daily Load....175
Table 6-2. Banana River Lagoon Project Reductions Compared to Full Year Loading 175
Table 6-3. North IRL Project Reductions to Meet Five-Month Total Maximum Daily Load....176
Table 6-4. North IRL Project Reductions Compared to Full Year Loading 176
Table 6-5. Central IRL Project Reductions to Meet Five-Month Total Maximum Daily Load 177
Table 6-6. Central IRL Project Reductions Compared to Full Year Loading 177
Table 6-7. Annual Muck Flux, Muck Interstitial Water, Oyster Bar, and Planted Shoreline Project Benefits by Sub-lagoon Compared to Annual Nutrient Loadings from Muck Flux 178
Table 6-8. Summary of Projects, Estimated TN and TP Reductions, and Costs....180
Table 6-9. Projects Cost-effectiveness....189
Table 6-10. Timeline for Funding Needs (Table 46 in the Original Save Our Indian River Lagoon Project Plan) 200
Table C-1. Estimates of Biomass for *Halodule* Species....239
Table C-2. Total Biomass in Seagrasses Along Brevard County 239
Table C-3. Estimates of Nutrient Content for *Halodule wrightii* (percentage of dry weight) 240
Table C-4. Average Amount of Nutrients Contained in Seagrass from 1996–2009 240
Table C-5. Guide for Ranking Potential Seagrass Restoration Sites 242
Table D-1. Unfunded Wastewater Treatment Facility Reclaimed Water Upgrade Projects....243
Table D-2. Unfunded Sprayfield or Rapid Infiltration Basin Upgrade Projects 243
Table D-3. Unfunded Package Plant Connection Projects 244
Table D-4. Unfunded Septic-to Sewer-Projects....244
Table D-5. Unfunded Stormwater Projects....245
Table D-6. Unfunded Muck Dredging and Interstitial Treatment Projects 287
Table E-1: Summary of Project Withdrawals from the Plan 289
Table F-1: Summary of Stormwater Basins on Federal Lands 302

List of Figures

Figure 1-1. Decline of Commercial Fishing in Brevard County 5
Figure 1-2. Likelihood of a Healthy IRL as Nutrients are Removed 8
Figure 2-1. Locations of the Banana River Lagoon (BRL), North IRL (NIRL), and Central IRL (CIRL) Sub-lagoons 10
Figure 2-2. Summary of the Save Our Indian River Lagoon Outputs and Outcomes 13
Figure 3-1. Banana River Lagoon TN (left) and TP (right) Annual Average Loads by Source 16
Figure 3-2. North IRL TN (left) and TP (right) Annual Average Loads by Source 17
Figure 3-3. Central IRL Zone A TN (left) and TP (right) Annual Average Loads by Source 17
Figure 4-1. Grass Clippings Example for a Typical Lot 22
Figure 4-2. Septic-to-Sewer Projects in Banana River Lagoon 45
Figure 4-3. Septic-to-Sewer Projects in Banana River Lagoon, continued 46
Figure 4-4. Septic-to-Sewer Projects in Banana River Lagoon, continued 47
Figure 4-5. Septic-to-Sewer Projects in North IRL 48
Figure 4-6. Septic-to-Sewer Projects in North IRL, continued 49
Figure 4-7. Septic-to-Sewer Projects in North IRL, continued 50
Figure 4-8. Septic-to-Sewer Projects in North IRL, continued 51
Figure 4-9. Septic-to-Sewer Projects in North IRL, continued 52
Figure 4-10. Septic-to-Sewer Projects in North IRL, continued 53
Figure 4-11. Septic-to-Sewer Projects in Central IRL 54
Figure 4-12. Septic-to-Sewer Projects in Central IRL, continued 55
Figure 4-13. Septic-to-Sewer Projects in Central IRL, continued 56
Figure 4-14. Septic-to-Sewer Projects in Central IRL, continued 57
Figure 4-15. Quick Connection Septic-to-Sewer Locations in North Brevard County 58
Figure 4-16. Quick Connection Septic-to-Sewer Locations in Central Brevard County 59
Figure 4-17. Quick Connection Septic-to-Sewer Locations in South Brevard County 60
Figure 4-18. Example In-Ground Nitrogen-Reducing Biofilter Septic System 61
Figure 4-19. Septic System Upgrades in North Brevard County 64
Figure 4-20. Septic System Upgrades in Central Brevard County 65
Figure 4-21. Septic System Upgrades in South Brevard County 66
Figure 4-22. Stormwater Projects in North Brevard County 86
Figure 4-23. Stormwater Projects in Central Brevard County 87
Figure 4-24. Stormwater Projects in South Brevard County 88
Figure 4-25. Location of Muck Removal Projects in the Northern Banana River Lagoon 95
Figure 4-26. Location of Muck Removal Projects in the Southern Banana River Lagoon 96
Figure 4-27. Location of Muck Removal Projects in North IRL 97
Figure 4-28. Location of Muck Removal Projects in Central IRL 98
Figure 4-29. Phase I Potential Enhanced Circulation Project Locations 106
Figure 4-30. Shoreline Survey to Identify Locations Appropriate for Oyster Bars and Planted Shorelines 118
Figure 4-31. Estimated Economic Value of Some Seagrass Services 122
Figure 4-32. Completed Projects in North Brevard County 139
Figure 4-33. Completed Projects in North Central Brevard County 140
Figure 4-34. Completed Projects in Central Brevard County 141
Figure 4-35. Completed Projects in South Central Brevard County 142
Figure 4-36. Completed Projects in South Brevard County 143
Figure 4-37. Countywide Groundwater Nutrient Concentrations for TN (top) and TP (bottom) 146
Figure 4-38. Monitoring Sensor Locations at the Grand Canal Dredge Material Management Area from May 1 – 31, 2024 153

Figure 4-39. Effluent Concentrations from Interstitial Water Treatment at Grand Canal 156
Figure 4-40. Effluent Concentrations from Interstitial Water Treatment at Sykes Creek 156
Figure 4-41. Distribution of Oyster Sizes, Age, and Average Number of Measured Oysters Per Sample Unit 160
Figure 4-42. Average Oyster Density Per Square Foot 161
Figure 4-43. Average Dry Total Weight Per Square Foot 162
Figure 4-44. Average Number of Measured Oysters in Each Size Class for Ultraviolet Stabilized Plastic Mesh Bags (left) and Galvanized After Welding Steel Gabions (right) 163
Figure 4-45. Comparison of Corral Wall and Stacked Gabion Oyster Module Performance 164
Figure 4-46. Comparison of Gabion Corral Wall and Coquina Corral Wall Performance 165
Figure 5-1. Funding for Reduce, Remove, Restore, and Respond Projects 172
Figure 5-2. Evolution of Project Funding Allocations 173
Figure C-1. Mean Areal Extent of Seagrass, Mean Length of Transects, and Mean Transect Percent Cover 237
Figure C-2. Mean Chlorophyll-a Concentrations..........238
Figure C-3. Conceptual Model Illustrating a Shift in Biomass Among Major Primary Producers with Increasing Nutrient Enrichment..........238

Acknowledgements

We would like to thank the following people who provided input in the development and update of this plan:

2024 Citizen Oversight Committee:

- Vinnie Taranto (2021 Chair, 2022 Chair, 2023 Vice Chair, 2024 Chair), Technology Member
- Don Deis, Technology Alternate
- Barbara Wall-Scanlon (2024 Vice Chair), Real Estate Member
- Eric Mannes, Real Estate Alternate
- Todd Swingle (2023 Chair), Finance Member
- Curt Smith, Finance Alternate
- Stephany Eley (2018 Chair, 2021 Vice Chair), Education/Outreach Member
- Kimberly Newton, Education/Outreach Alternate
- John Windsor (2019 Vice Chair, 2020 Chair), Lagoon Advocacy Member
- Terry Casto, Lagoon Advocacy Alternate
- Bobby Putnam, Tourism Member
- Laurilee Thompson, Tourism Alternate
- Lorraine Koss (2017 Chair), Science Member
- Charles Venuto, Science Alternate

Citizen Oversight Committee Past Members:

- Gene Artusa, Real Estate Member, First Term
- Courtney Barker (2020 Vice Chair), Finance Member, First Term, Second Term, Third Term
- Dennis Basile, Real Estate Alternate, Second Term, Partial Third Term
- Danielle Bowden, Real Estate Member, First Term, Partial Second Term
- John Byron (2017 Vice Chair), Technology Member, First Term
- John Durkee, Education/Outreach Alternate, First Term
- Susan Hodgers, Real Estate Member, Third Term
- David Lane (2018 Vice Chair, 2019 Chair, 2022 Vice Chair), Tourism Member, Firm Term, Second Term, Third Term
- John Luznar, Technology Member, Second Term
- Melissa Martin, Education/Outreach Alternate, Partial Second Term
- Karen McLaughlin, Tourism Alternate, First Term
- Jay Moynahan, Real Estate Member, Second Term
- David Sherrer, Technology Alternate, Second Term, Third Term

Guest Speakers at Citizen Oversight Committee Meetings:

- Holly Abeels, Florida Sea Grant
- Felicity Appel, Kimley-Horn
- Hannah Atsma, Ocean Research Conservation Association
- Scott Barber, City of Cocoa Beach
- Jaime Bardee, RSM US
- Courtney Barker, City of Satellite Beach
- Drew Bartlett, Florida Department of Environmental Protection

- Jeff Beal, Florida Fish and Wildlife Conservation Commission
- Steve Beeman, Beemats Floating Wetlands
- Alix Bernard, City of Rockledge
- Raleigh Berry, Brevard County
- Stephen Berry, Jones Edmunds & Associates
- Chris Bogdan, Ferguson Waterworks, Urban Green Infrastructure Division
- Robert Bolton, City of Vero Beach
- Rob Broline, CRI
- Bill Buckman, ASAP Septic
- Randy Burden, EcoSense
- Jody Cassell, Brevard Zoo
- Captain Frank Catino, City of Satellite Beach Mayor
- Becky Clarkson, Brevard County contract employee
- Anne Conroy-Baiter, Junior Achievement of the Space Coast
- Michelle Coppola, RSM US
- Dave Coulter, City of Cape Canaveral
- Borja Crane-Amores, Florida Department of Environmental Protection
- Dr. Duane De Freese, Indian River Lagoon National Estuary Program and Council
- Stacy Delano, Tourist Development Council
- Dr. Nancy Denslow, University of Florida College of Veterinary Medicine
- Martine de Wit, Fish and Wildlife Institute, Florida Fish and Wildlife Conservation Commission
- Dr. Melinda Donnelly, University of Central Florida
- Rich Dunkel, Irrigreen
- Dr. Jeff Eble, Florida Institute of Technology
- Zach Eichholz, City of Cape Canaveral
- Olivia Escandell, Brevard Zoo
- Joe Faella, Brevard County Mosquito Control
- Dr. Beth Falls, Ocean Research Conservation Association
- Dr. Mark S. Fonseca, CSA Ocean Sciences Inc.
- Edward Fontanin, Brevard County Utility Services
- Dr. Austin Fox, Florida Institute of Technology
- Dr. Xueqing Gao, Florida Department of Health
- Lisa Good, Blue Life
- Roxanne Groover, Florida Onsite Wastewater Association
- Frank Gidus, Coastal Conservation Association
- Lauren Hall, St. Johns River Water Management District
- Dr. Dennis Hanisak, Florida Atlantic University Harbor Branch Oceanographic Institute
- Carter Henne, Sea & Shoreline
- Hannah V. Herrero, Ph.D.
- Andrea Hill, Brevard Zoo
- Kathy Hill, Indian River Lagoon National Estuary Program
- David Jackson, Director of Community Relations for U.S. Representative Bill Posey
- Dr. Chuck Jacoby, St. Johns River Water Management District
- Dr. Mingshun Jiang, Harbor Branch Oceanographic Institute, Florida Atlantic University
- Dr. Kevin Johnson, Tarleton State University
- Andrew Kamerosky, Applied Ecology
- Brenda Kennan, Tetra Tech

- Daniel Kolodny, Indian River Lagoon National Estuary Program
- Steve Krzyston, Rockledge Gardens
- Jim Langenbach, P.E., B.C.E.E., Geosyntec Consultants
- Dr. Ernesto Lasso De La Vega, Lee County Hyacinth Control District
- Beth Lemke, Planning Solutions
- Hope Leonard, Brevard Zoo
- Dr. Claudia Listopad, Applied Ecology, Inc.
- Chris Little, City of Palm Bay Utilities
- Jake Little, Gator Aquatic Technologies
- Laura Manlove, RSM US LPP
- Cole Mannes, Cocoa Beach Junior/Senior High School
- Adam Marrara, Florida Home Inspection Bureau
- Morgan Maslow, Florida Fish and Wildlife Conservation Commission
- Senator Debbie Mayfield, District 17
- Bach McClure, Brevard County Stormwater Administrator
- Tara McCue, East Coast Regional Planning Council
- Guy "Harley" Means, Florida Geological Survey
- Benjamin Melnick, Florida Department of Environmental Protection
- Dr. Jennifer Mitchell, St. Johns River Water Management District
- Julie Mitchell, Florida Fish & Wildlife Conservation Commission
- Dr. Martha Monroe, University of Florida
- Lori Morris, St. Johns River Water Management District
- Jennifer Murtha, RSM US
- Robert Musser, Canaveral Port Authority
- Mark Nelson, Jones Edmunds
- Dr. Todd Osborne, University of Florida
- Dr. Drew Palmer, Florida Institute of Technology
- Dr. Randall W. Parkinson, RW Parkinson Consulting, Inc.
- Bo Platt, Brevard Indian River Lagoon Coalition
- Jeff Rapolti, Brevard County Stormwater Utility
- Ashley Rearden, Brevard Zoo
- Ralph Reigelsperger, City of Melbourne
- Sandra Reller, City of Titusville
- Jill Reyes, RSM US LLP
- Antony Rios, Environmental Conservation Solutions LLC
- Annie Roddenberry, Florida Fish and Wildlife Conservation Commission
- Stephen Rowe, Anchor Plumbing
- Dr. Paul Sacks, University of Central Florida
- Tony Sasso, Keep Brevard Beautiful
- Sally Scalera, University of Florida's Institute of Food and Agricultural Sciences
- Doug Scheidt, Herndon Solutions Group, LLC
- Linda Seals, Brevard County Extension Services
- Amy Durham Shea, Brevard Zoo and Oregon State University
- Dr. Ann Shortelle, St. Johns River Water Management District
- Morris Smith, Jr., Morris Smith Engineering
- Marty Smithson, Sebastian inlet
- Dr. Leesa Souto, Applied Ecology (previously presented for Marine Resources Council)
- Susan Sperling, Marketing Talent Network Advertising

- Danielle Straub, City of Melbourne
- Megan Stolen, Hubbs SeaWorld Research Institute
- Dr. James Sullivan, Florida Atlantic University Harbor Branch Oceanographic Institute
- Joshua Surprenant, City of Cape Canaveral
- Todd Swingle, Toho Water Authority
- Johanna Switzer, Atkins North America, Inc.
- Jennifer Thompson, Brevard County Stormwater Utility
- Laura Thompson, Applied Ecology
- Cynthia Thurman, Brevard County
- Rebecca Thibert, City of Melbourne
- Bill Tredik, St. Johns River Water Management District
- Dr. John Trefry, Florida Institute of Technology
- Al Vazquez, CloseWaters LLC
- Dr. Tom Waite, Florida Institute of Technology
- Dr. Linda Walters, University of Central Florida
- Barry Walton, Endless Media, LLC
- Dr. Marty Wanielista, University of Central Florida
- Aaron Watkins, Florida Department of Environmental Protection Central District
- Dr. Robert Weaver, Florida Institute of Technology
- Missy Weiss, S.E.A. a Difference Environmental Services
- Zanielle Wells, University of Central Florida
- Terry Williamson, Brevard County Natural Resources, Stormwater
- Dr. John Windsor, Florida Institute of Technology
- Keith Winsten, Brevard Zoo
- Walter C. Wood, Marketing Talent Network Advertising
- Chris Zambito, Atkins North America, Inc.
- Dr. Gary Zarillo, Florida Institute of Technology
- Jake Zehnder, Brevard Zoo

Current and Previous Brevard County Staff Who Contributed to the Plan:

- Jeanne Allen
- Aleah Ataman
- Matt Badolato
- Virginia Barker
- Terri Breeden
- Molly Bryan
- Matt Culver
- Walker Dawson
- Dominic Dudai
- Abbey Gering
- Carol Gerundo
- Anthony Gubler
- Jenny Hansen
- Jane Hart
- Joshua Hibbard
- Melanie Howarter
- Cindy Lieberman
- Courtney Maier
- Bach McClure
- Crystal Melton
- Ashley Postlewait
- Beb Sebastian
- Brandon Smith
- Cole Stubbe
- Jaculin Watkins

Scientist Subject Matter Experts Consulted during Original Plan Development:

- Dr. Duane De Freese, Indian River Lagoon National Estuary Program and Indian River Lagoon Council Executive Director
- Dr. Richard (Grant) Gilmore, expert in Indian River Lagoon fisheries and ecology

- Dr. Charles Jacoby, St. Johns River Water Management District Supervising Environmental Scientist
- Dr. Kevin Johnson, Florida Institute of Technology Associate Professor, Marine and Environmental Systems
- Dr. Mitchell A Roffer, Florida Institute of Technology Adjunct Professor, President Roffer's Ocean Fishing Forecasting Service, Inc.
- Dr. Jonathan Shenker, Florida Institute of Technology Associate Professor of Marine Biology
- Dr. John Trefry, Florida Institute of Technology Professor of Marine and Environmental Systems
- Martin S. Smithson, Sebastian Inlet District Administrator
- Joel Steward, St. Johns River Water Management District Supervising Environmental Scientist (Retired)
- Dr. John Windsor, Florida Institute of Technology Oceanography and Environmental Science Professor Emeritus and Program Chair

Economic Impacts Subject Matter Experts Consulted during Original Plan Development:

- Jim Brandenburg, Brevard County Property Appraiser Information Technology
- Eric Garvey, Brevard County Tourism Development Council Executive Director
- Herb Hiller, Brevard County Tourism Development Council Consultant on Ecotourism
- Vince Lamb, Indian River Lagoon Council Management Board, Florida Master Naturalist, Entrepreneur
- Dr. Michael H. Slotkin, Florida Institute of Technology Associate Professor, Nathan M. Bisk School of Business
- Laurilee Thompson, Brevard County Tourism Development Council, Commercial Fisheries Expert, Entrepreneur
- Dr. Alexander Vamosi, Florida Institute of Technology Associate Professor, Nathan M. Bisk School of Business

Agencies and Local Governments Consulted during Original Plan Development:

- Florida Department of Environmental Protection
- Florida Department of Health
- Space Coast Association of REALTORS®
- Space Coast Tourism Development Council
- St. Johns River Water Management District
- Brevard County Budget Office
- Brevard County Natural Resources Management Department
- Brevard County Property Appraiser Information Technology
- Brevard County Utility Services Department
- City of Melbourne
- City of Palm Bay
- City of Titusville
- City of West Melbourne

Photographs on cover:
Top from http://spacecoastdaily.com/2013/09/hands-across-lagoon-set-for-sept-28/
Bottom left from the Central Boulevard baffle box upgrade in the City of Cape Canaveral
Bottom middle from the muck dredging project in the City of Cocoa Beach
Bottom right from the Bomalaski oyster bar project in Merritt Island

Executive Summary

The Indian River Lagoon system (IRL or lagoon) includes Mosquito Lagoon, Banana River, Indian River, and Halifax River. This is a unique and diverse system that connects Volusia, Brevard, Indian River, St. Lucie, Martin, and Palm Beach counties. The IRL is part of the National Estuary Program, one of 28 estuaries of National Significance, and has one of the greatest diversity of plants and animals in the nation. A large portion of the IRL, 71% of its area and nearly half its length, is within Brevard County (County) and provides County residents and visitors many opportunities and economic benefits.

However, the balance of this delicate ecosystem has been disturbed as development in the area has led to harmful impacts. Stormwater runoff from urban and agricultural areas, wastewater treatment facility discharges, septic systems, and excess fertilizer applications have led to harmful levels of nutrients and sediments entering the IRL. These pollutants create cloudy conditions in the lagoon and feed algal blooms, both of which negatively affect the seagrass community that provides habitat for much of the lagoon's marine life. In addition, these pollutants lead to muck accumulations, which release (flux) nutrients and hydrogen sulfide, deplete oxygen, and create a bottom that is not hospitable to seagrass, shellfish, or other marine life.

Efforts have been ongoing for decades to address these sources of pollution. Despite significant load reductions, in recent years signs of human impact to the IRL have been magnified. In 2011, the "superbloom" occurred, an intense algal bloom in the Mosquito Lagoon, Banana River Lagoon, and North IRL, as well as a secondary, less intense bloom in the Central IRL. There have also been recurring brown tides; unusual mortalities of dolphins, manatees, and shorebirds; and large fish kills due to low dissolved oxygen from decomposing algae.

Local governments and the St. Johns River Water Management District have been proactive in implementing projects over the last several decades. However, to restore the IRL to health and prosperity, additional funds were needed to eliminate current excess nutrient loading and remove the legacy of previous excess loading. Therefore, Brevard County placed a Save Our Indian River Lagoon 0.5 cent sales tax referendum on the ballot in November 2016, which passed and is providing a funding stream for the types of projects listed in this plan for the County and its municipalities.

The Save Our Indian River Lagoon Project Plan outlines local projects planned to meet water quality targets and improve the health, productivity, aesthetic appeal, and economic value of the IRL. Implementation of these projects is contingent upon funding raised through the 0.5 cent sales tax. This sales tax funding also allows the County to leverage additional dollars in match funding from state and federal grant programs because the IRL ecosystem is valued not only at the local level, but also at both the state and national levels. Funding implementation of this plan would help to restore this national treasure. Lagoon ecosystem response may lag several years behind completion of nutrient reductions; however, major steps must begin now to advance progress on the long road to recovery.

In the development of this plan, Subject Matter Experts were consulted to provide feedback on the plan elements. The experts all agreed that a "critical mass" of excess nutrient reductions must be achieved to see a beneficial result in the IRL. This critical level of reduction will be achieved through the implementation of the projects in this plan. During plan development in 2016, it was estimated that the benefit of restoring the IRL had a present value of $6 billion with an expense of $300 million from the tax. Therefore, implementing this plan to restore the IRL was an excellent investment in the future of Brevard County's community and economy with a benefit to cost ratio of 20:1.

To restore the lagoon's balance, Brevard County seeks to accelerate implementation of a multi-pronged approach to **Reduce** pollutant and nutrient inputs to the IRL from fertilizer and grass clippings, reclaimed water from wastewater treatment facilities, sprayfields and rapid infiltration basins, package plants, sewer laterals, septic systems, and stormwater; **Remove** the accumulation of muck from the lagoon bottom; **Restore** water-filtering oysters and clams and related IRL ecosystem services; and monitor progress to **Respond** to changing conditions, technologies, and new information by amending the plan to include actions that will be most successful and cost-effective for significantly improving IRL health, productivity, and natural resilience.

The portfolio of projects in this plan were selected as the most cost-effective suite of options to achieve water quality and biological targets for the IRL. Investment has been distributed among a set of project types with complementary benefits to reduce future risk of failure. Approximately 59% (originally one-third) of the effort and expense is split among multiple projects to reduce incoming load to healthy levels. Approximately 37% (originally two-thirds) of the effort and expense is directed toward muck removal to address decades of past excess nutrient loading. Nitrogen and phosphorus released each year as muck decays are now larger than any current source of nutrient pollution to IRL waters. Less than 5% of tax revenues go towards restoring natural filtration systems; measuring the success of different project types; and responding to new information, technologies, and opportunities with annual plan updates.

The projects in the plan have been prioritized and ordered to deliver improvements to the lagoon in the most beneficial spatial and temporal sequence so that the implementation of this plan is expected to result in a healthier IRL. If a future project is ready to move forward earlier than scheduled in the plan, if such advancement is consistent with temporal sequencing goals in the plan and is recommended by the Citizen Oversight Committee, and if sufficient Trust Fund dollars are available, the County Manager (for budget changes less than $200,000) or Brevard County Commission have the authority to adjust the project schedule at any time to ensure that approved projects funded in the plan move forward as soon as feasible.

This 2025 Update to the Save Our Indian River Lagoon Project Plan contains the ninth set of project updates, new approved projects, and schedule modifications to the plan. Local stakeholders submitted projects annually to Brevard County for inclusion in the plan. The appointed Citizen Oversight Committee reviewed the submitted projects and made a recommendation to the Board of County Commissioners on which projects should be added, removed, and/or replaced to the Save Our Indian River Lagoon Project Plan. This update includes those projects that were reviewed by the Citizen Oversight Committee and approved for inclusion by the Board of County Commissioners.

The timing of the projects is shown in **Figure ES-1**. A summary of the types of projects included in the plan, as well as the associated costs and total nitrogen (TN) and total phosphorus (TP) reductions in pounds per year are shown in **Table ES-1**. Despite the considerable cost of restoration, analysis demonstrates that the economic cost of inaction is double the cost of action. Furthermore, although many tangible and intangible benefits exist for saving the IRL, the readily estimated return on investment for three benefits – tourism, waterfront property values, and commercial fisheries – is approximately 10% to 26%.

Figure ES-1. Save Our Indian River Lagoon Project Implementation Schedule

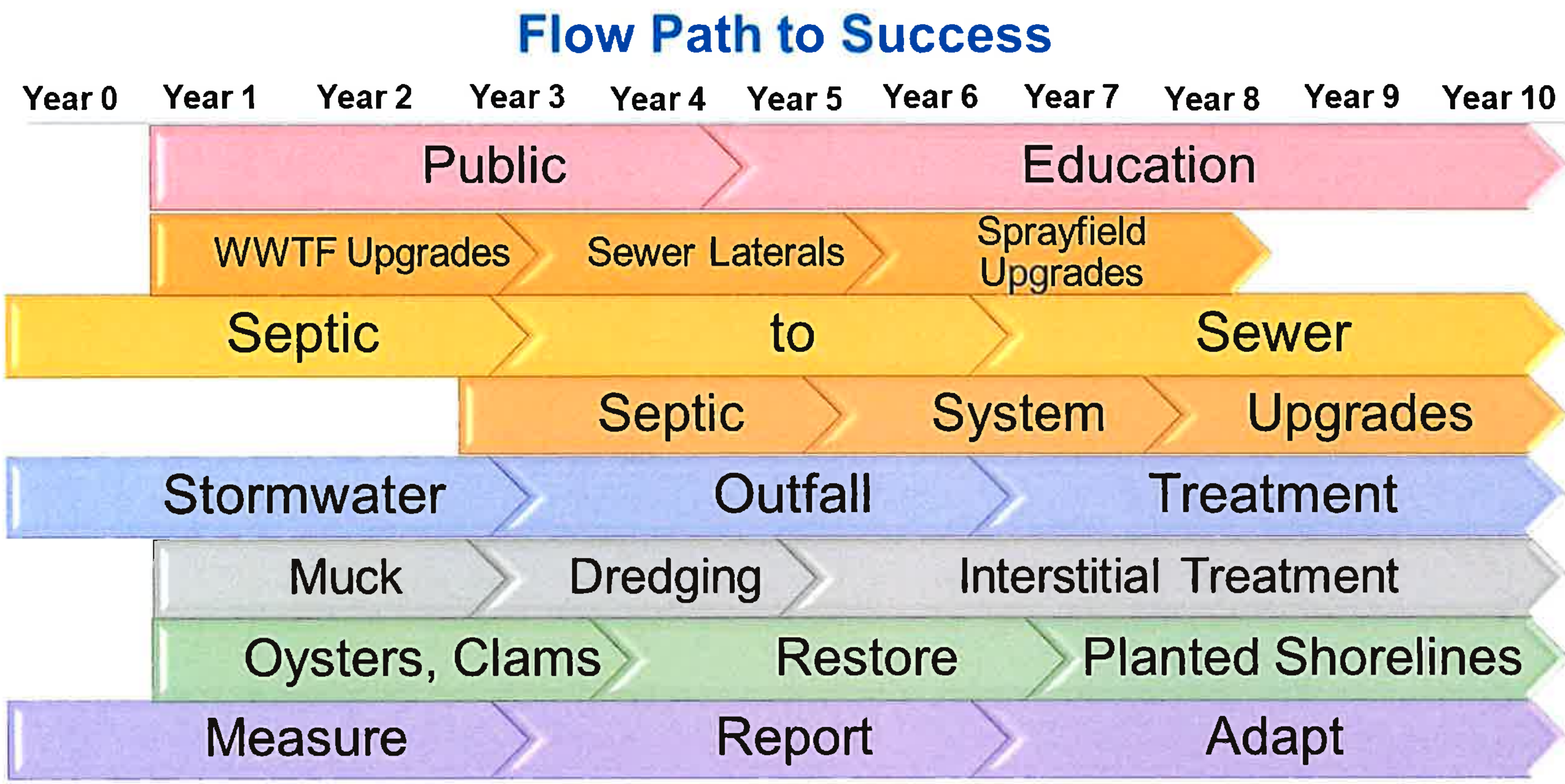


Table ES-1. Summary of Project Types, Costs, and Nutrient Reductions in the 2025 Update of the Save Our Indian River Lagoon Project Plan

Project Category	Project Type	Inflated/Final Save Our Lagoon Project Cost	Approved Save Our Indian River Lagoon Project Cost	TN Reductions (pounds per year)	Average Cost per Pound per Year of TN	TP Reductions (pounds per year)	Average Cost per Pound per Year of TP
Reduce	Public Education	$4,017,807	$3,530,000	33,709	$105	2,413	$1,463
Reduce	WWTF Upgrades for Reclaimed Water	$36,471,408	$30,990,221	82,151	$377	18,048	$1,717
Reduce	Rapid Infiltration Basin/Sprayfield Upgrades	$90,658	$82,207	317	$259	To be determined	To be determined
Reduce	Package Plant Connection	$1,574,111	$1,488,000	992	$1,500	To be determined	To be determined
Reduce	Sewer Lateral Rehabilitation	$1,700,205	$1,399,825	6,196	$226	188	$7,446
Reduce	Septic-to-Sewer	$167,717,793	$140,097,074	113,243	$1,237	To be determined	To be determined
Reduce	Septic System Upgrades	$30,731,280	$26,442,000	34,294	$771	To be determined	To be determined
Reduce	Stormwater Projects	$84,330,877	$66,118,563	239,381	$276	32,475	$2,036
Reduce	Vegetation Harvesting	$2,373,008	$2,367,384	42,913	$55	4,368	$542
Remove	Muck Removal	$161,978,464	$133,749,381	235,134	$569	18,738	$7,138
Remove	Treatment of Muck Interstitial Water	$50,860,669	$38,761,200	500,032	$78	29,897	$1,296
Restore	Oyster Bars	$11,361,634	$9,495,162	23,057	$412	644	$14,744
Restore	Planted Shorelines	$116,000	$108,000	450	$240	154	$701
Restore	Clam Restoration	$510,117	$502,000	3,574	$140	858	$585
Respond	Projects Monitoring	$10,000,000	$10,000,000	-	-	-	-
Respond	Contingency	$21,900,738	$21,900,738	-	-	-	-
Total	***Total***	***$585,734,769***	***$487,031,755***	***1,315,443***	***$370 (average)***	***107,783***	***$4,519 (average)***

Section 1. Background

The Indian River Lagoon system (IRL or lagoon) includes Mosquito Lagoon, Banana River, Indian River, and Halifax River. A large portion of the IRL, 71% of its area and nearly half its length, is within Brevard County (County) and provides County residents and visitors many opportunities.

However, the balance of this delicate ecosystem has been disturbed as development in the area has led to harmful impacts. Stormwater runoff from urban and agricultural areas, wastewater treatment facility discharges, septic systems, and excess fertilizer applications have led to harmful levels of excess nutrients and sediments entering the IRL. In addition, these pollutants lead to muck accumulation on the lagoon bottom, which fluxes nutrients and creates a lagoon bottom that is not conducive to seagrass, shellfish, or benthic invertebrate growth.

Efforts have been ongoing to address these sources of pollution. The Indian River Lagoon System and Basin Act of 1990 (Chapter 90-262, Laws of Florida) was enacted to protect the IRL from wastewater treatment facility discharges and the improper use of septic systems. The act includes three objectives: elimination of surface water discharges, investigation of feasibility of reuse, and centralization of wastewater collection and treatment facilities (Florida Department of Environmental Protection, 2016). This act led to the removal of effluent discharges to the IRL from more than 40 wastewater treatment facilities (St. Johns River Water Management District, 2016a).

Stormwater regulations were adopted in unincorporated Brevard County in 1978 and adopted statewide in 1989. Due to stormwater regulations, stormwater treatment systems were constructed along with all new development exceeding size thresholds. Privately owned and operated stormwater treatment systems have prevented more than a million pounds of sediments from entering the IRL since 1989 (St. Johns River Water Management District, 2016a). Stormwater treatment projects also reduce excess nutrient inputs to the lagoon. In addition, dredging projects have been ongoing since 1998 to remove muck from the IRL and major tributaries, including Crane Creek, Turkey Creek, Eau Gallie River, and St. Sebastian River (St. Johns River Water Management District, 2016a). These stormwater treatment and muck removal projects contributed to significant improvements in IRL water quality and water clarity, which allowed for a great expansion of seagrass from 2000–2010.

However, recently, human impacts on the IRL have been magnified. In 2011, the “superbloom” occurred, an intense algal bloom in the Mosquito Lagoon, Banana River Lagoon, and North IRL, as well as a secondary, less intense bloom in Central IRL. The extent and longevity of the bloom had a detrimental impact on seagrass, with a 75% reduction in areal extent and 89% reduction in seagrass cover. There have also been recurring brown tides; unusual mortalities of dolphins, manatees, and shorebirds; and large fish kills due to low dissolved oxygen from decomposing algae.

In 2009, to improve water quality and restore seagrass, the Florida Department of Environmental Protection adopted total maximum daily loads for total nitrogen (TN) and total phosphorus (TP) allowed to discharge to the Banana River Lagoon, North IRL, and Central IRL. The purpose of these total maximum daily loads is to reduce excess nutrients that lead to algae growth, which block sunlight from seagrass and create low dissolved oxygen conditions that affect fish in the IRL. To implement these total maximum daily loads, the Florida Department of Environmental Protection adopted three basin management action plans that outline responsibilities for reductions by the local stakeholders, list projects, and stipulate a timeline for implementation. The intent of the excess nutrient reductions is to provide water quality conditions that should result in seagrass growth in the lagoon at historical levels. Brevard County has a major responsibility in all three basin management action plans along with its 16 municipalities, Florida Department of Transportation District 5, Patrick Space Force Base, National Aeronautics and Space Administration – Kennedy Space Center, and agriculture. The Florida Department of Environmental Protection updated all three basin management action plans in 2020.

From 2012 to 2015, Brevard County led an effort with its municipalities, Florida Department of Transportation District 5, and Patrick Space Force Base to update the estimates of nutrient loadings to the IRL. The County and its partners teamed with several consultants to develop the Spatial Watershed Iterative Loading model that revised the estimates of loading by source to the lagoon (refer to **Section 2** for more details). The revised loading estimates for each year were compared to seagrass areas for each respective year to recommend refinement of state and federal approved total maximum daily loads. The loading estimates and total maximum daily load targets referenced in this plan are from these local efforts, as they are based on the most up-to-date data and analyses even though the state and federal total maximum daily loads have not been officially updated.

Damage to the IRL has been occurring for decades and will require time and money to reverse. An important example is the accumulation of muck on the bottom of 10% of the IRL. This muck kills marine life and releases stored pollutants into the IRL. To address the damage to the IRL, in 1990, Brevard County implemented a stormwater utility assessment, which established an annual assessment rate of $36 per year per equivalent residential unit that stayed at this level until 2014. The rate increased to $52 per equivalent residential unit for 2014 and 2015 and increased to $64 per equivalent residential unit in 2016. This raised collections from $3.4 million (in 2014) to $6.0 million (in 2016). Of the funding raised, a portion is available for capital improvement programs or other stormwater best management practices and is split between water quality improvement programs and flood control and mitigation programs. In addition, funding is spent on annual program operating expenses. Operation and maintenance includes National Pollutant Discharge Elimination System permit compliance activities (street sweeping, trap and box cleaning, and aquatic weed harvesting), outfall/ditch treatments, small-scale oyster restoration, as well as harvesting and replanting of floating vegetative islands.

While revenues from this unincorporated county stormwater assessment as well as stormwater assessments in the cities have funded many projects, a significant portion of projects have also been partially funded by grants. When applicable, federal water quality grants provide up to 60% matching funds, state total maximum daily load grants provide up to 50% match, and St. Johns River Water Management District cost-share grants have funded up to 33% of construction. All these grant programs are highly competitive and subject to variable state and federal appropriations, as well as changing priorities.

In addition to the stormwater utility fees, the County and city wastewater utilities charge set rates to maintain their wastewater collection systems and treatment facilities. In 2012, the Brevard County Utility Services Department engaged engineering firms to evaluate the condition of the sewage infrastructure assets. This investigation identified $134 million in capital improvement needs over a ten-year period to bring County-owned sewer system assets up to a fully functional, reliable, affordable, efficient, and maintainable condition (Brevard County Utility Services, 2013). The Brevard County Commission approved financing the identified projects and increased the County's sewer service rates to repay the debt. In 2022, the County conducted another assessment of the sewage infrastructure, which identified additional capital improvement needs. The Brevard County Commission approved an increase in the sewer service rates and $460 million in bonding for the identified projects. It is important to note that the funding raised through the utility rates goes towards required operation and maintenance of the existing system and facilities but does not pay for extending sewer service or upgrading the treatment levels beyond permit requirements.

Due to funding limitations and the continuing degradation of key indicators of health in the IRL, such as seagrass and fish, Brevard County identified a need for additional funding to implement projects identified as critical to IRL restoration. Therefore, the County placed a Save Our Indian River Lagoon 0.5 cent sales tax referendum on the ballot in November 2016. This referendum passed by more than 60% of the votes, provides a funding mechanism for the projects listed in this plan and annual updates. Revenue collection from the sales tax began in January 2017.

This Save Our Indian River Lagoon Project Plan outlines projects planned to meet updated total maximum daily load targets and improve the health, productivity, aesthetic appeal, and economic value of the IRL. Almost all these projects require sales tax funding to be implemented. Furthermore, the local sales tax funding is being used to leverage more in match funding from state and federal grant programs. Finally, a significant amount of tax dollars collected are from out of county visitors. The IRL ecosystem is an asset both on the state and national levels; therefore, implementation of this plan will help to restore this national treasure. If additional funding is provided through matching funds from other sources, additional projects may be implemented, which would increase the overall plan cost, and/or project timelines may be moved up to allow the benefits of those projects to occur earlier than planned. Response of the IRL ecosystem may lag for several years behind completion of excess nutrient reduction implementation; however, action must be accelerated now to ensure restoration succeeds over time.

1.1. Return on Investment and Economic Value

The economic value of the Indian River Lagoon system (IRL or lagoon) was evaluated during development of this plan. It was estimated that at least a total present value of $6 billion is tied to restoration of the IRL. Approximately $2 billion in benefits occurs from restoration and an estimated $4 billion in damages if the IRL is not brought back to health during the next decade. If viewing this project plan purely as a financial investment that pays the $2 billion in benefits alone (i.e., not counting the avoidance of the $4 billion loss), the projected pretax internal rate of return is 10%, if the plan takes 10 years to implement (CloseWaters LLC, 2016).

Table 1-1 documents projections of three economic engines likely to have significant economic impacts on Brevard County residents with positive impacts if the IRL is restored versus negative impacts if the IRL is not restored. Additional detail on each of these impacts is provided in **Section 1.1.1**. The upper part of the table lists the economic benefits for restoring a healthy IRL while the lower part of the table lists the economic costs of declining IRL health in the absence of restoration through plan implementation.

Economic impacts in the table are expressed both as annual cash flows and as the discounted expected present value of those cash flows over a 30-year financial plan period. Expected present value is an economic indicator used in business to express the present monetary value of a future stream of cash flows. This expected monetary value discounts the future stream by an interest rate and discounts it further by a probability factor to account for the uncertainty of future events. Therefore, the expected present value of IRL economic benefits shown in **Table 1-1** is much less than the sum of those future cash flows.

Table 1-1. Economic Impact Scenarios Based Upon the Conditions of the IRL

Economic Benefits for Restoring a Healthy IRL and Costs of Declining IRL Health	Annual Cash Flow	Expected Present Value
Tourism and Recreation Growth Benefits	$95 million	$997 million
Property Value Growth Benefits	$81 million	$852 million
Rebirth of Commercial Fishing Benefits (excludes indirect benefits)	$15 million	$159 million
Healthy Residents and Tourists Benefits	Not quantified	Not quantified
Total Benefits	***$191 million***	***$2.01 billion***
Tourism and Recreation at Risk Damages	-$237 million	-$3 billion
Property Value at Risk Damages	-$92 million	-$1.2 billion
Decline of Commercial Fishing (excludes indirect impacts)	-$6 million	-$87 million
Potential Pathogen Impacts to Residents and Tourists	Not quantified	Not quantified
Total Damages	***-$335***	***-$4.29 billion***

Note: Developed by CloseWaters LLC for the original Save Our Indian River Lagoon Project Plan.

In 2016, Brevard County faced a $6 billion decision point for the IRL. Despite unprecedented algae blooms and fish kills, conditions could have become worse. If large-scale fish kills continued with increasing frequency, algae blooms continued or became toxic, or there was a pathogen outbreak, then real estate, tourism, and the quality of life and health for Brevard County residents would likely suffer more.

1.1.1. Areas of Economic Value at Risk

The information in this section was developed by CloseWaters LLC for the original Save Our Indian River Lagoon Project Plan in 2016.

Tourism and Recreation

In 2016, tourism revenue in Brevard County (County) came primarily from the beaches. To diversify the tourism base and increase revenue, Brevard County developed a plan to increase ecotourism, a globally growing and high value sector of tourism that depends on restoration and maintenance of a healthy Indian River Lagoon (IRL). High value ecotourism relies on exceptional natural experiences including fishing, bird watching, kayaking, paddle boarding, camping, hiking, and nature tours. In the short-term, opportunities exist for tourists to participate in restoration experiences, such as collecting mangrove seeds by kayak or canoe, planting mangrove seedlings, or establishing colonies of clams, oysters, or mussels. A successful example of Brevard County's ecotourism is the world famous annual Space Coast Birding and Wildlife Festival that brings $1.2 million annually to the County and attracts approximately 5,000 visitors.

Property Value

While the economic benefits of IRL restoration are likely to increase property value throughout the County, to be conservative this plan assessed the exposure only to properties with frontage on Mosquito Lagoon, IRL, Banana River Lagoon, Sykes Creek, and connected waterways. Approximately 11.2% of the County's $27 billion in taxable property value is directly on the IRL. Therefore, more than $3 billion in taxable property value is directly at risk with ongoing IRL issues, such as algal blooms and fish kills. Furthermore, a weighted-average millage rate of 18.58 results in an estimated annual tax revenue of $56 million that is also at risk in the absence of IRL restoration. The $852 million of incremental expected present value assumes a 20% improvement in IRL frontage property value, which would be 90% likely after 10 years with the IRL restored.

Consultants for the County surveyed the Space Coast Association of REALTORS® to assess the likely impacts of IRL health on the waterfront property value. Approximately 170 REALTORS® most familiar with the waterfront market replied to the survey. These professionals assessed that waterfront IRL property values would increase 22% on average over five years if the IRL were healthy and would decrease by 25% over five years if the IRL were not restored.

Commercial Fishing

IRL restoration is critical to the recovery of a once thriving, valuable, and world-class fishery, both commercial and recreational. In 1995, the commercial fish harvest in Brevard County was $22 million annually. While a 1995 ban on commercial net fishing marked economic decline, the degradation of the lagoon contributed considerably to a severe reduction in value of only $6.7 million annually in 2015, based on Florida Fish and Wildlife Conservation Commission data (see **Figure 1-1**). These numbers do not include the many indirect benefits of a robust commercial fishing industry including fresh local fish for restaurants, employment, commerce of supplies and services for the industry, and benefits of local fresh fish for residents and visitors.

Figure 1-1. Decline of Commercial Fishing in Brevard County

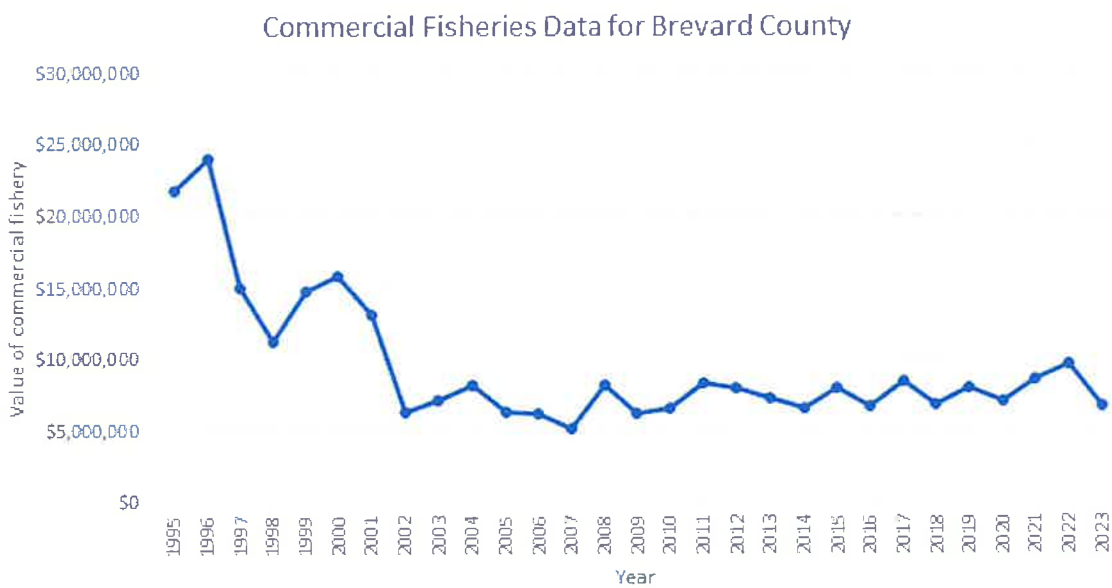


Figure 1-1 Long Description

In addition, a healthy fish population is critical to the brand of any coastal community. Historically Brevard County was once home to a world-class abundance and diversity of rare and widespread species of fish, crabs, shrimp, and clams that made the IRL a global brand. That brand can be restored along with IRL fish and shellfish.

Healthy Residents and Tourists

Septic systems within the County can pollute groundwater that migrates to the IRL. This groundwater moves slowly toward the IRL through soils that attenuate some but not all these pollutants. It would cost billions to convert all septic systems to central sewage treatment. While total conversion is cost prohibitive, this plan targets the septic systems with the highest potential impacts to the lagoon. Targeted action includes connection to the central sewer system or upgrade to advanced treatment systems that remove significantly more nutrients and pathogens than traditional septic systems.

Although studies have identified pathogens migrating from septic systems into waterways, it is not possible to estimate the economic impact of potential disease from these waterborne pathogens. The conversion of septic systems is expensive relative to other types of nutrient reduction projects; however, the additional health benefits associated with septic system upgrades make this option a priority beyond only the abatement of nutrients.

1.2. Maximizing Benefits and Managing Risk

Much is at stake with regard to both economic outcomes and the incremental funding critical to restoration; therefore, Brevard County (County) chose to address the unavoidable risks inherent in a multi-year, large-scale restoration plan in a transparent and objective manner. To help ensure objectivity, the County retained outside consultants to assess risk and to estimate potential positive or negative outcomes.

The approach for this plan to evaluate the different project options included using expected monetary value models; a decision science tool used in business to improve decision-making and planning in a context of unavoidable uncertainty. Expected monetary value is a financial model of probability-weighted outcomes expressed in quantified financial terms that are comparable across multi-year planning periods. To compare outcomes, expected present value was used as a key metric. Expected present value has the benefit of valuing future financial costs and benefits in common present day terms to take into account the value of time and to facilitate comparisons of initiatives spanning long periods of time.

As part of this methodology, consultants engaged Subject Matter Experts to assess the uncertainties of project scenarios. Subject Matter Experts included scientists, property value experts, tourism experts, Indian River Lagoon (IRL) advocates, and agency staff. Subject Matter Experts brought expertise in IRL science, nutrient reduction technologies, waterborne pathogens, and relevant law or county financial and accounting parameters needed for the expected monetary value models. Information gathered during these assessments was used to document the key interdependence of initiatives, minimize risk, and maximize the likely return on investment (CloseWaters LLC, 2016).

1.2.1. Project Selection to Maximize Return on Investment

Assessment of risk by Subject Matter Experts determined that the amount and speed of nutrient reductions are the two most critical factors affecting the success of restoring Indian River Lagoon (IRL) health. Therefore, those projects with the greatest nutrient reduction benefit for the least cost are recommended for funding and, of those, the projects with the greatest benefits are planned for implementation first. Three other key criteria drove this plan:

1. Achieving sufficient nutrient abatement through a blend of options was a key success factor for restoration.
2. No one type of project alone could achieve an adequate nutrient abatement.
3. The target for nutrient reduction must be sufficient to minimize the need for recurring expensive muck removal, which is important for future cost avoidance.

The plan sequences a diversity of project types, implementing the highest nutrient reduction impact early and implementing other projects concurrently to achieve a multi-pronged blend of total nutrient abatement as quickly as possible with minimal risk. Another important consideration for project sequencing was how quickly projects could produce significant nutrient pollution reduction. For decades, man-made nutrient pollution from fertilizers, septic systems, and stormwater runoff have been introduced at varying distances from the IRL. The soils are still saturated with those nutrients. Therefore, if all sources of nutrient pollution ended today, groundwater would continue to transport nutrients accumulated in the soil into the IRL with every rain event for decades in the future. However, soils next to the IRL will purge themselves quickly, in days or weeks. Septic system conversions near the lagoon or near drainage conduits into the lagoon are likely to produce water quality and reduced pathogen benefits in weeks or months whereas septic conversions more distant from waterways are not anticipated to generate IRL benefits for several decades. Therefore, whenever possible, project selection and sequencing scheduled nutrient abatements closest to the IRL first.

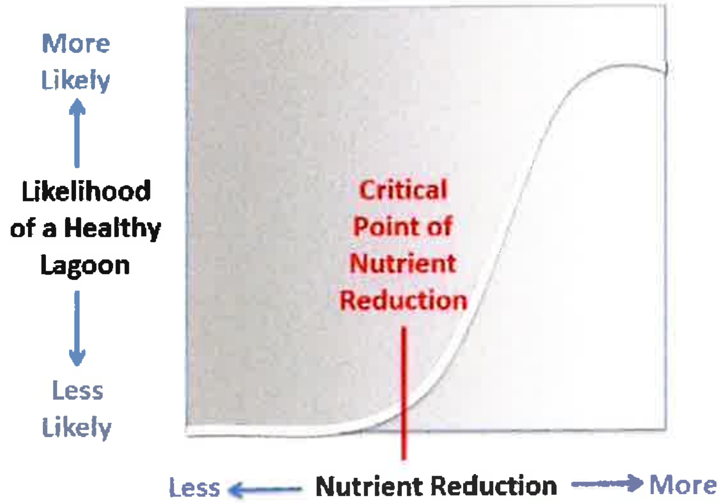
Undoing the damage to a unique and complex biological system as large as the IRL carries inherent risk. The County made the decision to be open and transparent about that risk. Assessing that risk diligently has allowed the County to mitigate and manage risk proactively in the development of this plan.

Two subjective risk assessments were conducted by an independent consultant working with top science Subject Matter Experts most knowledgeable about the IRL. The first assessment was conducted with individual Subject Matter Experts and occurred before plan projects were defined. These experts assessed that the likelihood of a healthy fish population in the IRL would begin to rise faster after reaching a critical point of nutrient reduction. Therefore, a "critical mass" of nutrient reduction is needed to achieve significant and sustainable IRL health benefits. The Subject Matter Experts also assessed that the likelihood of recovery would continue to improve as more nutrients are removed from the IRL and then begin to decline if too many nutrients were removed. The result of that first risk assessment reinforced the objective of reducing nutrients in the IRL as quickly as possible through the definition and sequencing of the projects in this plan (CloseWaters LLC, 2016).

A second uncertainty assessment was conducted in a meeting at the Florida Institute of Technology with a group of water quality, toxicity, muck, fish, algae, invertebrates, and seagrass Subject Matter Experts. First, the experts were briefed about the projects proposed in this plan. The experts were then asked their subjective assessment of the likelihood of a healthy IRL after this plan was implemented in each sub-lagoon. Sub-lagoons were assessed because the experts had commented previously that each sub-lagoon functioned differently. This group assessment indicated higher likelihoods of success than the first assessment. However, the scientists continued to voice concern about the restoration of the IRL in the absence of regulatory reform needed to prevent new development from adding more septic system and stormwater pollution to the IRL. Therefore, updated regulations are needed as a complement to this plan to ensure timely and sustained success in restoring health to the IRL (CloseWaters LLC, 2016).

Figure 1-2 represents the input from the Subject Matter Experts.

Figure 1-2. Likelihood of a Healthy IRL as Nutrients are Removed



Other large-scale aquatic system restoration efforts have been successful in achieving restoration. Some of these systems were damaged even more so than the IRL, but they have recovered through the implementation of extensive, multi-year, and multi-pronged restoration plans. These include the Chesapeake Bay, Cuyahoga River, Lake Erie, and Tampa Bay. These areas have reaped enormous economic and quality of life benefits as a result of dedicated investments in their restoration.

Section 2. Approach, Outputs, and Outcomes

The amount and distribution of nutrient loading from the sources described in **Section 3** were examined to determine the key locations where nutrient reduction projects are needed and the extent of reductions required from each source to achieve Brevard County's proposed total maximum daily loads for each sub-lagoon. For each source, a reduction goal is set and projects are proposed to meet the goal. The estimated cost for each project is also included. Information on expected project efficiencies and project costs were gathered from data collected by Brevard County in implementation of similar projects, as well as literature results from studies in Florida, where available, and across the country. The most cost-effective projects are selected and prioritized to maximize the nutrient reductions that can be achieved.

2.1. Plan Focus Area

This plan focuses on projects implemented in three sub-lagoons in the Indian River Lagoon (IRL) system: Banana River Lagoon, North IRL, and Central IRL. **Figure 2-1** shows the locations of these sub-lagoons and associated watersheds. All the Banana River Lagoon watershed and the majority of the North IRL watershed are located within Brevard County (County). However, only a portion of the Central IRL watershed is located within the County. As shown in **Figure 2-1**, Central IRL Zone A is located entirely in Brevard County, whereas Zone SEB straddles Brevard and Indian River counties. For Zone SEB, the County has completed several projects in this area and the St. Johns River Water Management District is completing projects along the C-54 Canal and on the Wheeler property to treat the Sottile Canal. The reductions from these projects for total nitrogen and total phosphorus should be sufficient to meet the estimated need for reductions in the County portion of Zone SEB, as shown in **Table 2-1**. This plan includes some additional beneficial projects located in Zone SEB to help ensure that the necessary reductions are achieved throughout the County; however, most of the projects proposed in this plan for the Central IRL fall within Central IRL Zone A.

Table 2-1. Summary of Load Reductions and Projects in Central IRL Zone SEB

Category	Annual Total Nitrogen Load (pounds per year)	Five-Month Total Nitrogen Load (pounds per year)	Annual Total Phosphorus Load (pounds per year)	Five-Month Total Phosphorus Load (pound per year)
Stormwater and Baseflow Loading	248,233	79,956	34,901	11,242
Atmospheric Deposition Loading	22,371	7,206	404	130
Point Sources Loading	0	0	0	0
Total Loading	270,604	87,162	35,305	11,372
Target Percent Reductions	18.0%	38.0%	16.0%	35.0%
Targeted Reductions	***48,709***	***33,121***	***5,649***	***3,980***
Completed County Projects (2010-February 2016)	29,890	12,454	9,643	4,018
C-54 Project	65,974	27,489	10,558	4,399
Wheeler Property Project	27,223	11,343	16,753	6,980
Total Project Reductions	***123,087***	***51,286***	***36,954***	***15,397***
% of Targeted Reductions Achieved	***252.7%***	***154.8%***	***654.2%***	***386.9%***

In addition, a small portion of Brevard County is located within the Mosquito Lagoon. The County does not have stormwater outfalls, septic systems, or point sources in this sub-lagoon.

Figure 2-1. Locations of the Banana River Lagoon (BRL), North IRL (NIRL), and Central IRL (CIRL) Sub-lagoons

2.2. Plan Outputs and Outcomes

Vision Statement

An Indian River Lagoon teeming with fish, birds, and wildlife that provides recreation, economic vitality, and pride in our community.

Mission Statement

Restoring the Indian River Lagoon through collaborative, science-based projects which Reduce and Remove pollution to benefit our community, economy, and natural resources.

Several outcomes are expected from implementation of the plan. The plan outputs represent the project types included to **Reduce** external loads to the Indian River Lagoon (IRL), **Remove** internal sources from the IRL, **Restore** the natural filtration systems, and **Respond** to the changing conditions and opportunities. The outcomes from these outputs are the results, impacts, and accomplishments that will occur due to plan implementation (**Figure 2-2**). The timeframes for reaching various outcomes may be impacted by many factors outside Brevard County control, including federal and state legislation and weather; however, division of outcomes into short-term, mid-term, and long-term categories is meant to illustrate the sequence and approximate schedule of anticipated natural recovery.

2.3. Additional Project Benefits

The health of the Indian River Lagoon system (IRL or lagoon) is affected by a variety of pollutants, physical conditions, and climate factors. The focus of this Save Our Indian River Lagoon Project Plan is on addressing nutrients to be consistent with the Florida Department of Environmental Protection's total maximum daily load and basin management action plan requirements, which are based on scientific studies showing the relationship between nutrients and phytoplankton algae blooms, which limit light availability for seagrass. However, while the Plan is focused on nutrients and the eligible Save Our Indian River Lagoon Trust Fund contribution to new projects is determined based on the amount of total nitrogen removed, the benefits of implementing these projects include reductions in other pollutant sources, as well. These projects will reduce a multitude of different contaminates to meet water quality targets and improve the health, productivity, aesthetic appeal, and economic value of the IRL. These additional benefits vary according to project design and site-specific conditions but often include significant reduction of pathogenic bacteria, viruses, human and animal wastes, chemicals, metals, plastics, and sediments (see **Table 2-2**).

This Save Our Indian River Lagoon Project Plan is an adaptable document informed by science and under supervision of the community. As monitoring updates our understanding of Indian River Lagoon pollutants, the plan projects will target funds to the most successful and cost-effective projects.

Table 2-2. Pollutants Removed by Different Project Types

Wastewater Treatment Facility Upgrades	Septic-to-Sewer	Septic System Upgrade	Stormwater	Vegetation Harvesting	Muck Removal	Surface Water Remediation
Nitrogen Phosphorus Escherichia coli Viruses Fecal coliform Pharmaceuticals Chemicals of emerging concern Forever chemicals	Nitrogen Phosphorus Escherichia coli Viruses Fecal coliform Pharmaceuticals Biochemical oxygen demand Chemicals of emerging concern Forever chemicals	Nitrogen Phosphorus Escherichia coli Viruses Fecal coliform Biochemical oxygen demand Chemicals of emerging concern Forever chemicals	Nitrogen Phosphorus Sediments Escherichia coli Viruses Fecal coliform Herbicides Pesticides Metals Oil Litter Chemicals of emerging concern Forever chemicals Turbidity	Nitrogen Phosphorus Sediments Herbicides Pesticides Organic matter	Nitrogen Phosphorus Clay sediments Hydrogen sulfide Biochemical oxygen demand Chemicals of emerging concern Forever chemicals Turbidity	Nitrogen Phosphorus Organic matter Algal bloom toxins Turbidity

Figure 2-2. Summary of the Save Our Indian River Lagoon Outputs and Outcomes

Figure 2-2 Long Description

In response to concerns about the potential impacts of herbicide applications on Indian River Lagoon (IRL) seagrass, the Florida Institute of Technology conducted a study in 2023, which was funded by the IRL National Estuary Program, to evaluate the impacts of glyphosate on seagrass growth and nutrient cycling. Glyphosate is the most widely used herbicide globally, as well as within the IRL watershed. Mesocosm experiments were conducted using *Ruppia maritima* (widgeon grass) and *Halodule wrightii* (shoal grass) seagrass species, which were exposed to concentrations of 1, 100, and 1,000 parts per million of glyphosate. There was no significant decrease in leaf chlorophyll for either seagrass species at 1 part per million; however, significant decreases were observed at higher concentrations. In all except the 1,000 parts per million mesocosms, water column chlorophyll increased, with a seven-fold increase at 100 parts per million. These data demonstrate that at very high glyphosate concentrations, acute toxicity and light limitation from enhanced phytoplankton algal biomass may have adverse impacts to seagrasses. However, there were no statistically significant adverse impacts of acute toxicity at 1 part per million, which is more than 1,000 times higher than concentrations measured in the IRL (Fox et. al, 2023; Fox et. al, 2024). It is important to note the duration for this glyphosate study was short and the parameters measured were limited.

While the Florida Institute of Technology study did not find a statistically significant correlation between glyphosate and seagrass loss, Brevard County and its municipalities have been exploring options to reduce herbicide applications. A discussion on lessons learned from several municipalities was conducted during the July 2023 Citizen Oversight Committee meeting to help inform future management decisions.

As scientists study the impacts of other pollutants on the IRL, this plan can be adjusted to better focus the funds on necessary projects. The information gathered will also help the local governments, agencies, and other stakeholders improve their management of pollutants to assist in IRL restoration.

Section 3. Pollutant Sources in the IRL Watershed

Pollutant loads in the Indian River Lagoon (IRL) watershed are generated from multiple external sources that discharge to the lagoon. Excess loads also accumulate in nutrient sinks within the lagoon, which release nutrients to the water column during certain conditions.

External sources fall into four major categories: stormwater, baseflow, atmospheric deposition, and point sources.

Stormwater runoff occurs when rainfall hits the land and cannot soak into the ground. Urban stormwater runoff is generated by rainfall and excess irrigation on impervious areas associated with urban development. Urban runoff picks up and transports nutrient loading from fertilizers, grass clippings, and pet waste, as well as other pollutants including sediments, pesticides, oil, and grease. Stormwater ponds and baffle boxes reduce the nutrient loading in stormwater; however, consistent proper maintenance of these systems is necessary to maintain their performance. Agricultural stormwater runoff occurs on agricultural land and this runoff also carries nutrients from fertilizers, as well as livestock waste, pesticides, and herbicides. This source of stormwater runoff is not addressed in this plan as the County does not have jurisdiction over agricultural use. The Florida Department of Agriculture and Consumer Services has an agricultural best management practice program, and they work with agricultural producers to control the loading from this source. Natural stormwater runoff comes from the natural lands in the basin. This source is not addressed by this plan as natural loading does not need to be controlled, although it has the potential to convey pollutants to the IRL system.

Baseflow is the groundwater flow that contributes loading to the IRL. Due to the sandy soils in the basin and excess irrigation, nutrients can soak quickly into the groundwater with little removal. This groundwater can seep into surface water in ditches, canals, tributaries, or the IRL. Excess fertilizer soaks into the ground past the root zones. Septic systems, both functioning and failing, contribute nutrient loading to the groundwater. Leaking sewer pipes located above the water table can also contribute nutrient loading to the groundwater.

Atmospheric deposition falls on both the land and the IRL itself. Nutrients in the atmosphere fall into the basin largely during rainfall events. The sources of these nutrients are from power plants, cars, and other sources that burn fossil fuels. However, because of atmospheric conditions and weather patterns, not all the nutrients from atmospheric deposition are generated within the watershed. Atmospheric loading is not directly addressed by this plan as air quality and air emission standards are regulated by the United States Environmental Protection Agency through the Clean Air Act and are not within the County's control. However, the stormwater projects and in-lagoon projects will treat some of the nutrient loading from atmospheric deposition that falls on the land and lagoon surface.

For decades, point sources were permitted to discharge industrial wastewater or treated sewage to the IRL. Most of the wastewater treatment facilities in the basin have been modified to use the treated effluent for reclaimed water irrigation instead of discharging treated effluent to the lagoon. However, depending on the level of treatment at the wastewater treatment facility, the reclaimed water can have an excessive concentration of nutrients that may contribute loading to stormwater runoff and groundwater baseflow (see **Figure 4-37**). There have been issues with inflow and infiltration into the sanitary sewer collection system. Large rain events can result in large amounts of water entering the sewer collection system, and this additional water can cause sewer overflows that contribute nutrients and bacteria to local waterbodies.

In addition to these external sources of loading, nutrients released from muck (muck flux) are an internal source of loading within the IRL itself. Muck is made up of organic materials from soil erosion on the land and from decay of organic matter (leaves, grass clippings, algae, and aquatic vegetation) in the IRL. As these organic materials decay, they constantly flux nutrients into the water column above, where they add to the surplus of nutrients coming from external sources.

Table 3-1 summarizes the estimated total nitrogen (TN) and total phosphorus (TP) loading from these major sources in the Banana River Lagoon (including canals), North IRL, and Zone A of the Central IRL. The stormwater runoff and baseflow/septic systems loading estimates are from the Spatial Watershed Iterative Loading model, the point source loading estimates were based on the facility monthly operating reports and discharge monitoring reports, and the atmospheric deposition loads are from measured data at two stations along the northern lagoon. The muck flux load estimates are calculated based on the muck area in each portion of the lagoon and flux estimates from recent IRL studies (refer to **Section 4.2.1** for more details). The loading from these sources is also shown graphically in **Figure 3-1**, **Figure 3-2**, and **Figure 3-3**.

Table 3-1. Loading from Different Sources in Each Sub-lagoon Within the County

Source	Banana River Lagoon Total Nitrogen (pounds per year)	Banana River Lagoon Total Phosphorus (pounds per year)	North IRL Total Nitrogen (pounds per year)	North IRL Total Phosphorus (pounds per year)	Central IRL Zone A Total Nitrogen (pounds per year)	Central IRL Zone A Total Phosphorus (pounds per year)
Stormwater Runoff	119,923	15,064	328,047	45,423	279,351	43,193
Baseflow/Septic, Leaking Sewer, Reclaimed Water	164,225	22,613	344,111	47,383	370,129	50,966
Atmospheric Deposition	175,388	3,222	301,977	5,505	49,456	892
Point Sources	17,484	3,370	14,711	1,029	0	0
Muck Flux	799,482	50,778	313,294	31,007	53,280	13,050

Figure 3-1. Banana River Lagoon TN (left) and TP (right) Annual Average Loads by Source

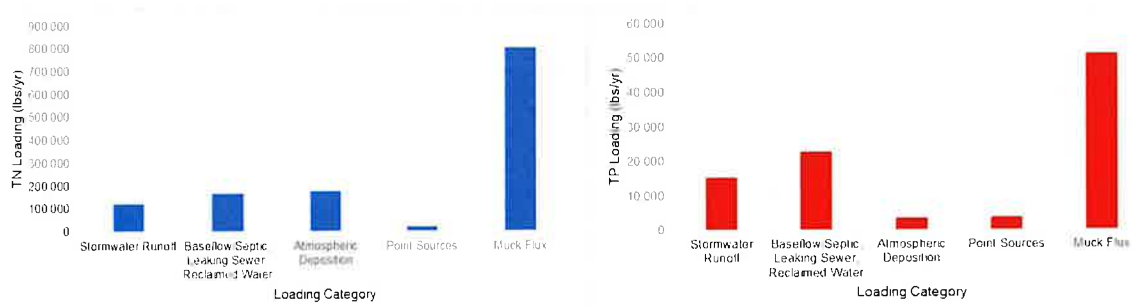


Figure 3-2. North IRL TN (left) and TP (right) Annual Average Loads by Source

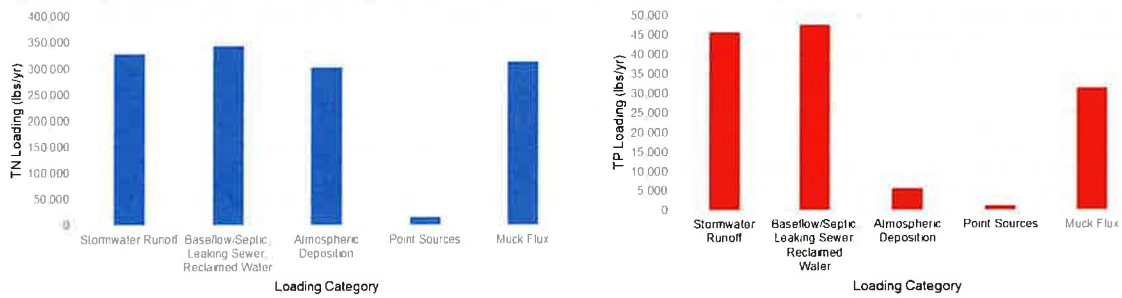
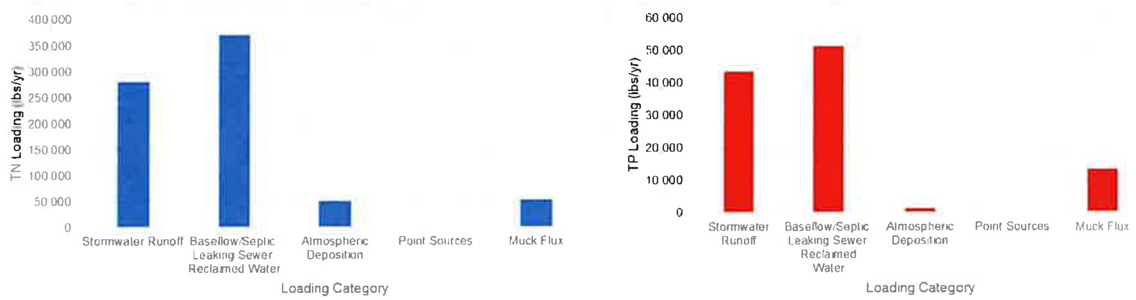


Figure 3-3. Central IRL Zone A TN (left) and TP (right) Annual Average Loads by Source



Section 4. Project Options

To restore the Indian River Lagoon's (IRL) balance, Brevard County has been implementing a multi-pronged approach to **Reduce** pollutant and nutrient inputs to the lagoon, **Remove** the accumulation of muck from the lagoon bottom, and **Restore** water-filtering oysters, clams, and related IRL ecosystem services. This plan also recommends funding for project monitoring, needed for accountability and to **Respond** to changing conditions and opportunities. **Respond** funds will be used to track progress, measure cost effectiveness, and report on performance. Each year, the Citizen Oversight Committee (additional details are included in **Section 4.4.1**) will review monitoring reports and make recommendations to the Brevard County Board of County Commissioners to redirect remaining plan funds to those efforts that will be most successful and cost-effective. Although research is important to better understand factors that significantly impact the health, productivity, and natural resilience of the Indian River Lagoon, funding for research is not included in this project plan.

Several goals were set to help select the projects for this plan. The goal for the **Reduce** projects is to achieve the locally proposed total maximum daily load for each sub-lagoon (refer to **Section 6** for additional details on the total maximum daily loads). The goal for the **Remove** projects is to achieve about a 25% reduction in estimated recycling of internal loads. The goals for the **Restore** projects are to filter the entire volume of the IRL annually and to reduce shoreline erosion. The most cost-effective projects in each category were selected to maximize nutrient reductions, minimize lag time in lagoon response, reduce risk, and optimize the return on investment.

Section 4.1 through **Section 4.5** provide information on the proposed projects, estimated nutrient reduction benefits, and costs, as well as the ongoing studies needed to measure and assess the project efficiencies and benefits to the lagoon.

4.1. Projects to Reduce Pollutants

An important step in restoring the Indian River Lagoon (IRL) system is reducing the pollutants that enter the IRL through stormwater runoff and groundwater. Reduction efforts include source control (such as fertilizer reductions, wastewater treatment facility upgrades, and septic-to-sewer conversions) to reduce the pollutants generated, as well as treatment to reduce pollutants that have already been discharged before they are washed into the lagoon by stormwater runoff or migrate to the lagoon through groundwater. Monitoring of these projects will be performed to verify the estimated effectiveness of each project type implemented (refer to **Section 4.4**).

The benefits from fertilizer management and public education, wastewater treatment facility upgrades for reclaimed water, and stormwater treatment are seen fairly quickly in the IRL. Public education about fertilizer and other sources of pollution addresses nutrients at their source and prevents these nutrients from entering the system. Wastewater treatment facility upgrades result in reduced nutrients in the treated effluent, which is then used throughout the basin for reclaimed water irrigation. The stormwater projects will capture and treat runoff, which is currently untreated or inadequately treated, before it reaches the lagoon.

While greatly beneficial, septic-to-sewer or upgrade projects may take longer to result in a nutrient reduction to the lagoon. The septic systems in key areas must be removed or upgraded to see the full benefits. In addition, septic systems contribute nutrient loading to the IRL through groundwater, and the travel time of the nutrient plumes through the groundwater to a waterbody vary throughout the basin depending on watershed conditions.

Florida's Clean Waterways Act of 2020 and House Bill 1379 of 2023 have placed new requirements on local governments. Under the Clean Waterways Act enacted by Senate Bill 712, local governments are required to develop wastewater and septic system remediation plans to be incorporated into all nutrient basin management action plans. The Florida Department of Environmental Protection issued a final order in 2023 setting a timeline for plan submittal. House Bill 1379 created the IRL Protection Program, which included major implications for wastewater. As of January 2024, new construction within the IRL watershed is required to connect to sewer or use enhanced nutrient reducing septic systems. All existing conventional septic systems in the IRL watershed must connect to central sewer or upgrade to enhanced nutrient reducing septic systems by July 1, 2030. By 2033, all wastewater facilities discharging to the IRL will be required to meet advanced wastewater treatment standards. The Save Our Indian River Lagoon Project Plan identifies, prioritizes, and allocates funding to many projects needed to comply with the State's new rules.

The following subsections summarize (1) public education and outreach efforts; (2) infrastructure improvements for wastewater treatment facilities; (3) sprayfield and rapid infiltration basin upgrades; (4) package plant connections; (5) sewer laterals rehabilitation; (6) septic-to-sewer and septic system upgrades; (7) stormwater treatment projects; and (8) vegetation harvesting projects.

4.1.1. Public Outreach and Education

Approximately 81,600 pounds per year of TN and 3,250 pounds per year of TP enter the Indian River Lagoon watershed from excess fertilizer application.

The education and outreach campaigns are summarized in the sections below.

Fertilizer Management

It is a common practice to apply fertilizer on urban and agricultural land uses. However, excessive and inappropriately applied fertilizer pollutes surrounding waters and stormwater. To help address fertilizer as a source of nutrient loading, local governments located within the watershed of a waterbody or water segment that is listed as impaired by nutrients are required to adopt, at a minimum, the Florida Department of Environmental Protection's Model Ordinance for Florida-Friendly Fertilizer Use on Urban Landscapes (Section 403.067, Florida Statutes). Brevard County (County) and its municipalities adopted fertilizer ordinances that included the required items from the Model Ordinance in December 2012, as well as additional provisions in 2013 and 2014. Local fertilizer ordinances are posted online at the Brevard County Extension website. These ordinances require zero phosphorus year-round, nitrogen to be at least 50% slow release, no nitrogen use during the rainy season (June – September), and surface water protection buffers adjacent to shorelines.

Florida Department of Agriculture and Consumer Services compiled information on the fertilizer sales by county, as well as the estimated nutrients from those fertilizers. It is important to note that all fertilizer sold in a county may not be applied within that county because a portion of that fertilizer may be transported to another county. However, details on the amount of fertilizer transported between counties is not tracked. Therefore, the information in the Florida Department of Agriculture and Consumer Services reports is simply the best estimate of the amount of fertilizer used, and the associated nutrient content, in a county.

Based on the Florida Department of Agriculture and Consumer Services information, the lawn fertilizer sold in Brevard County in fiscal year 2014–2015 contained 408,220 pounds of nitrogen and 32,520 pounds of phosphorus. The fertilizer applied is attenuated through several naturally occurring physical, chemical, and biological processes including uptake by grass. The environmental attenuation/uptake for urban fertilizer is 80% for nitrogen (Florida Department of Environmental Protection, 2017) and 90% for phosphorus. The estimated total nitrogen (TN) and total phosphorus (TP) that is applied but is not naturally attenuated is shown in **Table 4-1**. It is important to note that not all the un-attenuated nutrients will migrate to the Indian River Lagoon (IRL), either through runoff or baseflow (groundwater that enters ditches, canals, and tributaries), but these numbers provide an idea of the excess nutrients that could be reduced as a result of public education and changes in fertilizer use.

Table 4-1. Estimated TN and TP Not Attenuated in Fiscal Year 2014–2015

Parameter	Pounds Sold Fiscal Year 2014-15 (Lawn Only)	Environmental Attenuation (%)	Fiscal Year 2014-15 Pounds (Lawn Only) after Attenuation
Total Nitrogen	408,220	80%	81,644
Total Phosphorus	32,520	90%	3,252

When recent sales data are compared to the fertilizer sold in fiscal year 2013–2014, which is before adoption of the more protective amendments to the ordinance, significant reductions are observed. These reductions from the implementation of the ordinance are shown in **Table 4-2**.

Table 4-2. Reductions from Fertilizer Ordinance Compliance as of Fiscal Year 2014–2015

Parameter	Fiscal Year 2013-14 Pounds (Lawn Only) after Attenuation: Pre-Ordinance (pounds per year)	Fiscal Year 2014-15 Pounds (Lawn Only) after Attenuation: Post-Ordinance (pounds per year)	Reductions from Ordinance to Date (pounds per year)
Total Nitrogen	127,540	81,644	45,896
Total Phosphorus	12,640	3,252	9,388

Based on studies by the University of Florida, approximately 0.03% of applied nitrogen ends up in runoff during establishment of sodded Bermudagrass on a 10% slope. Nitrogen leaching into groundwater ranged from 8% to 12% of the amount applied (Trenholm and Sartain, 2010). Therefore, nitrogen leaching from fertilizer into the groundwater is 300 to 400 times as much as the nitrogen running off in stormwater. To help address the leaching issue, the Brevard County fertilizer ordinance encourages the use of slow release nitrogen fertilizer. Slow release fertilizer decreases nitrogen leaching by about 30% (University of Florida-Institute of Food and Agricultural Sciences, 2012). In addition, the ordinance requires that fertilizer with zero phosphorus is used.

The public education and outreach campaign was expanded to include focus on slow release and zero phosphorus fertilizers. An important component of this is to reach out to stores within Brevard County to ensure they are making slow release and zero phosphorus fertilizers more visible and to add signage to let buyers know which fertilizers are compliant with all local ordinances. This would cost approximately $125,000 per year for a period of five years. If an additional 25% of fertilizer users switch to 50% slow release nitrogen and zero phosphorus formulations, compliant with the ordinance, this would result in a reduction of 6,123 pounds per year of TN and 813 pounds per year of TP.

In 2018, the Citizen Oversight Committee recommended extending the fertilizer education and outreach beyond the original plan recommendation of five years to all ten years of the plan. As part of the 2023 Update, the Citizen Oversight Committee recommended expanding the fertilizer outreach efforts with an additional $50,000 per year for the remaining five years of the plan, which adds $250,000 to the expanded fertilizer education outreach program. The $881,000 for this project was redistributed as follows: (1) $125,000 in Year 1 to create the education campaign and begin implementation, (2) $50,000 per year to continue implementation in Years 2–5, (3) $100,000 per year in Years 6–10, (4) an additional $50,000 in Year 6 (for a total of $150,000 in this year) to evaluate program success and update the outreach materials as needed, and (5) $1,200 in Years 6–10 for digital messaging with action items for further reach and evaluation of that reach after Year 6.

In 2019, the University of Florida Institute of Food and Agricultural Sciences and MTN Marketing conducted a survey that was concentrated on fertilizer awareness questions. The results from the 2019 survey were compared to similar questions from the 2015 Blue Life survey to evaluate changes in fertilizer use. Based on the survey results, 33.33% of respondents in 2019 stated that they use slow release nitrogen fertilizer compared to only 6.30% in 2015, which is a 27% increase in the usage of slow release fertilizer. Therefore, as part of the 2021 Update, the estimated nitrogen reductions from the expanded fertilizer education was updated to 27%, which results in an estimated reduction of 6,613 pounds per year of TN. The TP reductions were kept at 25% compliance because, the way the survey was setup, participants were only able to select one option for the type of fertilizer used. Therefore, an update on the use of zero phosphorus formulas could not be obtained.

The updated plan costs and estimated reductions from this outreach are shown in **Table 4-3**.

Table 4-3. Project for Additional Fertilizer Ordinance Compliance

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
Original	58a	Expanded Fertilizer Education*	Brevard County	All	6,613	$133	813	$1,084	$881,000

Note: The projects highlighted in green and marked with an asterisk were identified in the original plan.

Grass Clippings

Grass clippings contain nutrients and those nutrients are released in stormwater or the IRL as they decompose (Brevard County Natural Resources Management Department, 2017). St. Augustine grass contains 2.5% nitrogen and 0.2–0.5% (average of 0.5%) phosphorus and Bahia grass contains 2% nitrogen (University of Florida-Institute of Food and Agricultural Sciences, 2015). According to Okaloosa County Extension (2017), a 7,500-square foot lawn produces about 3,000 pounds of clippings per year. Unfortunately, the percentage of those total clippings that end up in stormwater is not known.

To estimate the potential nutrient reduction impact of a grass clippings campaign, it was assumed that the average home lot size is 10,000 square feet with a 100-foot by 100-foot boundary, with 2,500 square feet of built space and 7,500 square feet of lawn (**Figure 4-1**). The University of Florida-Institute of Food and Agricultural Sciences estimated that 3,000 pounds of grass clippings are produced annually from a healthy lawn of this size. It was assumed that most of the grass clippings in Brevard County are from St. Augustine grass, which means that 3,000 pounds of clippings contains approximately 75 pounds of TN and 10.5 pounds of TP.

It was also assumed that the standard mower size is two feet wide. From one roadside pass along 100 feet of the average lawn with a two-foot wide mower, 200 square feet or 2.6% of the total lawn clippings could be cast into the road. This equals 0.02 pounds of TN and 0.0027 pounds of TP per foot per year left in the road. With about 3,800 miles of roads in the IRL watershed within the County, of which approximately 1,250 miles are paved with curb and gutter and are most likely to allow the ready transport of grass clippings to the IRL in stormwater, the potential nutrient release from those grass clippings could be up to 260,000 pounds per year of TN and 35,640 pounds per year of TP from mowing along both sides of the road.

If Brevard County expects a similar rate of awareness of 24% as Alachua County (2012), then a potential 200,000 pounds per year of TN and 27,000 pounds per year of TP may be entering the stormwater. If a successful grass clippings campaign in the County can capture an increase of awareness similar to Alachua County (from 24% to 69%), then the potential reduction is 88,920 pounds per year of TN and 12,189 pounds per year of TP. In addition, assuming the environmental attenuation/uptake for grass clippings is similar to the urban fertilizer uptake of 80% for nitrogen and 90% for phosphorus, the estimated reductions would be 17,800 pounds per year of TN and 1,200 pounds per year of TP.

This estimate assumes a simplified worst-case scenario in which everyone leaves a portion of their clippings in the road; however, it does not take into account the number of driveways, sidewalks, medians, and other impervious surfaces that grass clippings could be falling or the grass clippings being directly cast into the IRL, canals, and other waterways. Using the available information, this provides an order of magnitude estimate of the potential benefits of a grass clippings campaign for the IRL.

Figure 4-1. Grass Clippings Example for a Typical Lot

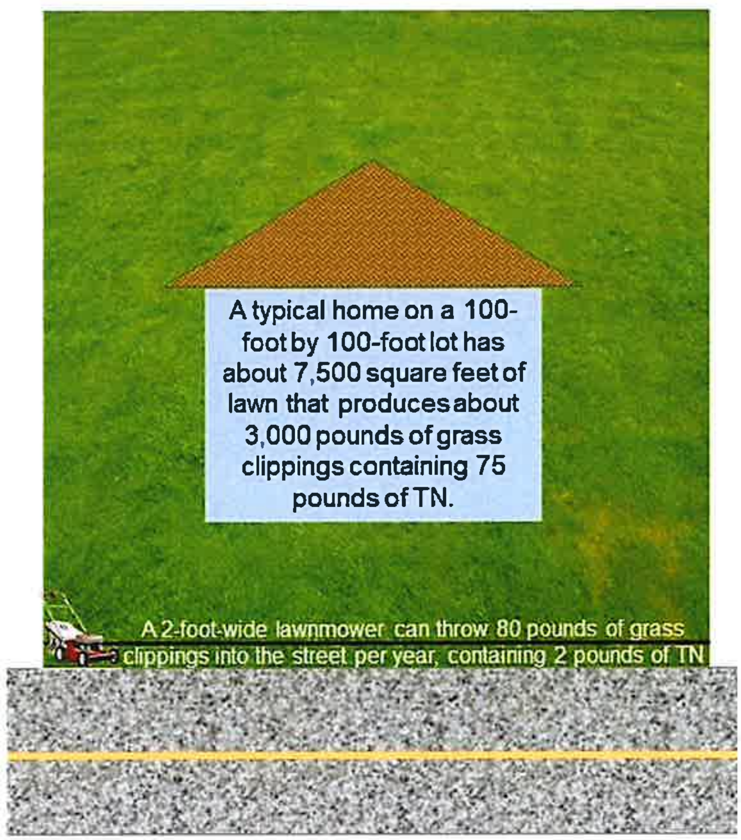


Figure 4-1 Long Description

The Marine Resources Council proposed a partnership between the IRL watershed counties to pursue a grass clippings campaign similar to the Alachua County campaign. The Citizen Oversight Committee recommended contributing $20,000 in Year 1 of the plan towards the research and marketing to develop the campaign. This was followed by an annual investment of $20,000 per year for Years 2 through 10 for media and promotional materials targeting Brevard County. As part of the 2023 Update, the Citizen Oversight Committee recommended expanding the grass clippings campaign with an additional $20,000 per year for the remaining five years of the plan, which adds $100,000 to the campaign. In addition, they recommended adding $1,200 per year in Years 6–10 for digital messaging with action items for further reach and evaluation of that reach after Year 6. Therefore, the total project cost is $306,000.

Table 4-4 summarizes the costs and benefits of implementing the grass clippings campaign.

Table 4-4. Project for Grass Clippings Campaign

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2018	58b	Grass Clippings Campaign+	Brevard County	All	17,800	$17	1,200	$255	$306,000

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

Market research needed to guide development of a grass clipping campaign was contracted through the Marine Resources Council to a community-based social marketing firm, Uppercase Inc. Survey results from 2018 and 2022 are reported in **Section 4.4.3**.

Excess Irrigation

Fertilizer nutrients are more susceptible to leaching if turfgrass is overwatered, carrying nutrients beyond the reach of the turf roots. During excess watering, soluble nutrients, such as highly mobile nitrate, wash through the soil from the root zone too quickly. Excess irrigation is easy to accomplish in Florida's sandy soils as these soils typically hold no more than 0.75 inches of water per foot of soil depth (Hochmuth et al., 2016). This excess irrigation is part of the baseflow contributing nutrient loading to the IRL. Additionally, some residents use reclaimed water for irrigation, which already contains nitrogen and phosphorus, some at levels exceeding the nutrient needs of turf grass. Overirrigation with reclaimed water, especially if combined with fertilizer, can further compound the excess nutrients leaching into the groundwater baseflow.

From June 2015 to May 2016, 470,737 pounds of TN in fertilizer were sold within Brevard County. Florida Department of Agriculture and Consumer Services Urban Turf Fertilizer Rule (RE-1.003[2], Florida Administrative Code) does not specify a percentage of slow-released nitrogen in fertilizer or separately track slow-release nitrogen from all nitrogen sources. However, if it is assumed that 50% of fertilizer was soluble nitrogen (compliant with local fertilizer ordinances), then the total soluble nitrogen sold in the County could be as high as 235,368 pounds per year. If 13% of soluble nitrogen were leached, up to 30,597 pounds per year of TN could potentially enter the groundwater. If, like South Florida survey respondents, 50% of irrigation users in the County are not over-irrigating and if an outreach campaign can impact half of those who do over-irrigate, fertilizer leaching could be reduced by 7,649 pounds per year of TN. As noted above, the environmental attenuation/uptake for urban fertilizer is 80% for nitrogen (Florida Department of Environmental Protection, 2017). Therefore, the total amount of TN that could be reduced by reducing excess irrigation is 1,530 pounds per year.

Conducting an outreach campaign with an initial $50,000 social marketing research and development investment and $25,000 in annual implementation, the total 10-year budget would be $300,000. This results in an average of $196 per pound of TN reduced per year.

This education campaign was originally proposed in 2018 but was not funded at that time. However, as part of the 2023 Update, the Citizen Oversight Committee recommended funding the campaign with $50,000 per year for the remaining five years of the plan, with an additional $50,000 in the first year to create the education campaign and begin implementation (a total of $100,000 in the first year). In addition, they recommended adding $1,200 per year in Years 6–10 for digital messaging with action items for further reach and evaluation of that reach after Year 6. The five-year total budget would be $306,000. **Table 4-5** summarizes the costs and estimated reductions for this campaign.

Table 4-5. Project for Reducing Excess Irrigation Campaign

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reductions (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2023	245	Irrigation Education Campaign+	Brevard County	All	1,530	$200	Not applicable	Not applicable	$306,000

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

Stormwater Pond Maintenance

Wet detention ponds, also known as stormwater ponds, are one method used to remove nutrients from stormwater as mandated by Florida Statutes 403.0891. Retention/detention time of water in the pond accommodates the removal of accumulated nutrients by allowing material to settle and be absorbed. By itself, an optimally sized and properly maintained stormwater pond typically provides a 35–40% removal of nitrogen and 65% removal of phosphorus through settling (Florida Department of Environmental Protection and Water Management Districts, 2010 and 2021). Additional behaviors and technologies can be combined with ponds to increase removal rates. On the other hand, poor pond maintenance practices can decrease nutrient removal rates or worse yet, release nutrients to downstream waterbodies.

A stormwater pond maintenance program would initially focus on vegetative buffers and their appropriate maintenance to reduce stormwater pollution. The Indian River Lagoon watershed in Brevard County contains 4,175 stormwater ponds covering 13,276 acres with 6,976,338 linear feet of shoreline. The average size of a pond is 3.2 acres with 1,671 linear feet of shoreline. These numbers include ponds affiliated with both residential and commercial areas. The average load to stormwater ponds is 11.4 pounds of TN per acre of land surrounding the pond annually according to the Florida Department of Environmental Protection's Spreadsheet Tool for Estimating Pollutant Loads. Assuming that a 50-foot perimeter directly impacts the pond, 8,008 acres contribute 91,288 pounds of TN annually to the ponds. Of this, up to 40% of the TN is removed through retention in the pond leaving a potential 54,773 pounds per year of TN to enter the lagoon. For TP, approximately 18,836 pounds per year is entering the stormwater pond. Of this, up to 65% of the TP is removed through retention in the pond leaving a potential of 6,593 pounds per year TP to enter the lagoon.

Creating a 10-foot-wide low-maintenance buffer zone of un-mowed ornamental grasses has the potential to remove about 25% of the TN and TP entering the pond (United States Environmental Protection Agency, 2005). This amount increases with the width of the buffer and the addition of woody vegetation. For the plan calculations, the assumption was made that convincing homeowners to not mow a 10-foot buffer is the easiest practice to achieve. The pond will remove up to 40% of the remaining TN. Assuming that the education campaign can reach at least half of the 48% of people unaware of what stormwater is, the reduction could be 3,286 pounds per year of TN and 396 pounds per year of TP.

Conducting an outreach campaign with an initial $50,000 social marketing research and development investment plus $25,000 in annual implementation, would require a 10-year total budget of $300,000. This would result in reductions at $91 per pound of TN and $750 per pound of TP. Additionally, during focus group research in the first year, it may be possible to identify other best management practices that homeowners' associations are willing to adopt that would further improve the performance of their stormwater pond. This would improve the cost effectiveness of this campaign.

This education campaign was originally proposed in 2018 but was not funded at that time. However, as part of the 2023 Update, the Citizen Oversight Committee recommended funding the campaign with $50,000 per year for the remaining five years of the plan, with an additional $50,000 in the first year to create the education campaign and begin implementation (a total of $100,000 in the first year). In addition, they recommended adding $1,200 per year in Years 6–10 for digital messaging with action items for further reach and evaluation of that reach after Year 6. The five-year total budget would be $306,000. **Table 4-6** summarizes the costs and estimated reductions for this campaign.

Planning is underway in 2024–2025 to develop and implement a Citizen Science Stormwater Pond Monitoring and Maintenance Pilot Program. A primary goal of the pilot program is to educate and engage homeowners' associations in efforts to reduce neighborhood stormwater pollution inputs to the Indian River Lagoon (IRL). The pilot program will run for one year, with the goal of improving and expanding the program to include additional homeowners' associations and stakeholder groups in the future. The citizen science portion of the pilot program will focus on training homeowners' association volunteers to collect monthly water samples from their stormwater ponds. Water samples will be analyzed for total nitrogen, total phosphorus, and chlorophyll a. These data will be used to educate homeowners' associations about the water quality conditions in their pond and establish baseline data, detect trends, and quantify changes in nutrient levels. The education/outreach portion of the pilot program will focus on developing a curriculum to help homeowners' associations improve stormwater pond maintenance and identify and implement best management practices to reduce stormwater pollution in their neighborhood. Pre- and post-pilot program surveys will be used to measure learning outcomes and adoption of pollution prevention measures. Grant funding from the IRL National Estuary Program was secured to help fund this pilot program.

Table 4-6. Project for Stormwater Best Management Practice Maintenance Campaign

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reductions (pounds per year)	Total Nitrogen Cost per Pound Per Year	Total Phosphorus Reductions (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2023	246	Stormwater Best Management Practice Maintenance Education+	Brevard County	All	3,300	$93	400	$765	$306,000

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

Septic Systems and Sewer Laterals Maintenance
Nationwide, 10–20% of septic systems are failing from overuse, improper maintenance, unsuitable drainfield conditions, and high-water tables. When septic systems are older and failing or are installed over poor soils close to the groundwater table or open water, they can be a major contributor of nutrients and bacterial and viral pathogens to ground and surface waters (De and Toor, 2017; United States Environmental Protection Agency, 2002).

A properly functioning septic tank and drainfield system reduces TN by 30–40%. However, the reduction has been measured at 0–20% in adverse conditions. The best available studies estimate a 10% reduction in nitrogen within a properly maintained tank versus an improperly maintained tank. The remaining 20–30% of nitrogen removal occurs in a properly functioning drainfield (Anderson 2006). If 15% of systems are failing and failing systems attenuate 30% less of the nitrogen load, these systems may pose far greater impacts to the groundwater, tributaries, and IRL than the average impact reported for properly functioning septic systems. Without the 30% reduction, the potential load to the IRL and its tributaries is estimated to be 27.2 pounds per year of TN for properties within 55 yards (instead of 19 pounds per year of TN for functioning septic systems), 5.2 pounds per year of TN for properties between 55 and 219 yards away (instead of 3.6 pounds per year of TN for functioning septic systems), and 1.1 pounds per year of TN for properties more than 219 yards away (instead of 0.8 pounds per year of TN for functioning septic systems).

An estimated 62,226 septic systems are in Brevard County within the IRL watershed. As noted in **Section 4.1.6**, the total loading of septic systems within 55 yards of the IRL and its tributaries is calculated at 299,590 pounds per year of TN, the total loading of septic systems between 55 and 219 yards is 86,575 pounds per year of TN, and the total loading of septic systems further than 219 yards is 10,805 pounds per year of TN. If the failure rate in the County is about 15%, and if failing septic systems receive 30% less attenuation, then failing septic systems within 55 yards of open water are contributing 13,481 pounds per year of TN, failing septic systems between 55 and 219 yards of open water are contributing 3,896 pounds per year of TN, and failing septic systems further than 219 yards are contributing 486 pounds per year of TN. By factoring in this failure rate, the total additional loading to the IRL from failing septic systems is approximately 17,863 pounds per year of TN.

A 10-year outreach campaign budget of $300,000, which includes $50,000 for research and campaign development and $25,000 per year for implementation to improve septic system maintenance, reduce excess use, and prevent harmful additives, would strive to reduce the number of failing systems countywide by 25%, thereby reducing the excess loading from failing systems by 4,466 pounds per year of TN. As part of the 2023 Update, the Citizen Oversight Committee recommended expanding the septic system maintenance campaign with an additional $25,000 per year for the remaining five years of the plan, which adds $125,000 to the campaign. In addition, they recommended adding $1,200 per year in Years 6–10 for digital messaging with action items for further reach and evaluation of that reach after Year 6. The updated total budget is $431,000. **Table 4-7** summarizes the costs and benefits of implementing this campaign.

Table 4-7. Project for Septic System Maintenance Program

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2018	58c	Septic System Maintenance Education+	Brevard County	All	4,466	$97	Not applicable	Not applicable	$431,000

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

Market research needed to guide development of a septic maintenance campaign was contracted with state grant funding through the Marine Resources Council to the University of Central Florida. Survey results from 2018 are reported in **Section 4.4.3**. In reaching out to citizens to participate in the survey, it was found that many people are unsure of whether they are on central sewer or a septic system. When developing the septic system maintenance education program, Brevard County will identify opportunities to educate people who are on central sewer about proper maintenance of their sewer laterals. Adding this education component to the septic system maintenance education campaign is not anticipated to require additional funding.

Lagoon Loyal Program

Using funding from the fertilizer education and septic system maintenance education programs, the marketing company MTN Advertising was contracted in 2019 to create an outreach campaign to engage Brevard County citizens in IRL restoration efforts. In 2024, the community-based social marketing company, SparkTide, was contracted to evaluate, update, and expand the outreach campaigns to include programs addressing grass clippings, excess irrigation, and stormwater pond maintenance education programs. The Lagoon Loyal campaign uses an incentive program to motivate positive actions that benefit the IRL (website). Citizens can create an online Lagoon Loyal profile that keeps track of participation in suggested activities that benefit the IRL and then provides rewards. Completing each activity earns points, which can accumulate and be redeemed for discounts to local area businesses.

Lagoon Loyal businesses providing discounts are given display materials that indicate support for the IRL and program participation. These display materials also advertise the program to their customers. Citizens who complete Lagoon Loyal actions receive coupons that encourage them to patronize Lagoon Loyal businesses, providing a positive feedback loop for local citizens and businesses. Combined with social media marketing and traditional media advertising, the program uses the slogan "Let's Be Clear…" to share easy actions that citizens can take to reduce their contribution to IRL pollution. Message selection is guided by focus groups and survey responses from citizens who either care for a yard or maintain a septic system.

The Lagoon Loyal program has also developed and distributed outreach materials targeted for greatest impact with the public. Fertilizer ordinance signs, educating the public on proper use of fertilizer, were distributed to all fertilizer retail locations in Brevard County. These signs must remain posted anywhere fertilizer is sold. A pilot program was conducted with stickers marking ordinance compliant fertilizer bags to help direct the public in making the right choice when purchasing fertilizer. Three fertilizer best management practices videos (Fertilizer Timing, Fertilizer Buffer Zone, and Fertilizer Buying Guide) were developed and distributed through various media outlets. Two fertilizer ban radio ads were created to air on several local radio stations during the ban period. One ad is for homeowners who manage their own lawn, and one is for homeowners who hire professional lawn care services. Additionally, fertilizer best management practices bookmarks were created and handed out at libraries with each book checked out.

For the septic system outreach program, a best management practices magnet was created and provided to septic contractors to distribute to clients when making service calls. An educational flyer on septic system best management practices, which also encourages septic system inspections during home purchases, was created to be distributed by realtors, title agencies, and home inspectors to buyers of homes with septic systems. Four septic maintenance videos (Think at the Sink, Don't Overload the Commode, Inspect It, and Protect It) were created and distributed through various media outlets. The Lagoon Loyal Program website also maintains landing pages to help interested homeowners find links to the applications for septic system upgrade and septic-to-sewer grants available to eligible locations.

Oyster Gardening Program and Restore Our Shores

Much of the IRL in Brevard County no longer has a sufficient oyster population to allow for natural recruitment of oysters to suitable substrate (Futch, 1967). Therefore, to create the oyster bars where recruitment is limited, the oysters must be grown and then carefully placed on appropriate substrate in the selected locations. To help grow the oyster population, in fiscal year 2013–2014, the Board of County Commissioners approved $150,000 of stormwater funds to launch the Oyster Gardening Program. This program is a citizen-based oyster propagation program where juvenile oysters are raised under lagoon-front homeowners' docks for about six months before being used to populate constructed oyster bar sites. Oyster Gardening participants receive spat-on-shell oysters plus all supplies needed to care for their oysters. The Oyster Gardening Program is executed in partnership with the Brevard Zoo. The project continued during fiscal year 2014–2015 with funding from the state and has continued since with annual County funding.

In 2020, at the request of the County Commission, the Citizen Oversight Committee recommended a total of $300,000 from the Save Our Indian River Lagoon Trust Fund to fund two years of the Oyster Gardening Program through September 2021 (**Table 4-8**).

Table 4-8. Project for Oyster Gardening Program

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2020	193	Oyster Gardening Program+	Brevard County	All	Not applicable	Not applicable	Not applicable	Not applicable	$300,000
2022	227	Restore Our Shores: Community Collaborative+	Brevard County and Brevard Zoo	All	Not applicable	Not applicable	Not applicable	Not applicable	$1,000,000

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

As the IRL restoration needs continue to grow, the Brevard Zoo Restore Our Shores Program that leads Oyster Gardening is poised to diversify restoration efforts, as needed. Through independent grants and the County funded Community Collaborative Project, Brevard Zoo Restore Our Shores team maintains contact with community members and conducts workshops to educate and train volunteers in resource propagation and care, living shorelines, and issues facing the lagoon. Brevard Zoo Restore Our Shores now leads oyster, living shoreline, seagrass and clam restoration efforts. The Oyster Gardening Program has diversified to connect waterfront homeowners with other community members to tend oyster habitats and grow *Mercenaria mercenaria* clams to repopulate the IRL. Clams are important filter feeders that can live within seagrass meadows directly benefiting the habitat through local water quality improvements (Wall et al., 2008).

Seagrass restoration needs are increasing and, as IRL water quality conditions become suitable, it will be necessary to raise more seagrass to plant in the lagoon. The establishment of seagrass nurseries can provide opportunities for the public to engage in seagrass grow-out. Brevard Zoo has built two seagrass nurseries: one in Rockledge and one in Melbourne Beach, which is part of a new network of nurseries initially supported by the IRL National Estuary Program. Sea and Shoreline, LLC has completed a third seagrass nursery in Melbourne Beach that was also supported by the IRL National Estuary Program. The existing network of community participants in the Oyster Gardening Program will be invaluable to support these additional restoration efforts.

4.1.2. Wastewater Treatment Facility Upgrades

88% of reclaimed water in the County is used in public access areas and for landscape irrigation.

The direct wastewater treatment facility discharges to the Indian River Lagoon (IRL) have been largely removed, and the majority of facilities in the basin use the treated effluent for reclaimed water irrigation. While the use of reclaimed water for irrigation is an excellent approach to conserving potable water, if the reclaimed water is high in nutrient concentrations, the application of the reclaimed water for irrigation can result in nutrients leaching into the groundwater. It is important to note that no regulations exist for the concentration of nutrients in reclaimed water that is used for irrigation. However, University of Florida-Institute of Food and Agricultural Sciences studies indicate that a nitrogen concentration of 5 to 9 milligrams per liter is optimal for turfgrass growth, and each year a maximum amount of 1 pound of nitrogen can be applied per 1,000 square feet of turf (University of Florida-Institute of Food and Agricultural Sciences, 2013a and 2013b). Nitrogen leaching increases significantly when irrigation is greater than 2 centimeters per week (0.75 inches per week), even if the nitrogen concentrations are half of the maximum Institute of Food and Agricultural Sciences recommendation of 9 milligrams per liter.

In Brevard County (County), 88% of the reclaimed water is used in public access areas and for landscape irrigation. The total reclaimed water used countywide is approximately 18.5 million gallons per day, which is applied over 7,340 acres. The unincorporated County and city wastewater treatment facilities with the reclaimed water flows and total nitrogen (TN) concentrations based on permit data and loads in pounds per year are shown in **Table 4-9**. This table also summarizes the excess TN in the reclaimed water after environmental attenuation/uptake (75% for TN [Florida Department of Environmental Protection, 2017]), for both the current TN effluent concentration and if the facility were upgraded to achieve a TN effluent concentration of 6 milligrams per liter (the City of Palm Bay Water Reclamation Facility update will achieve a TN effluent concentration of 7.5 milligrams per liter and the City of Melbourne Grant Street Wastewater Treatment Facility will achieve a TN effluent concentration of 5 milligrams per liter).

Table 4-9. TN Concentrations in Wastewater Treatment Facility Reclaimed Water in 2016

Facility	Permitted Capacity (million gallons per day)	Reclaimed Water Flow (million gallons per day)	Total Nitrogen Concentration (milligrams per liter)	Total Nitrogen After Attenuation (pounds per year)	Total Nitrogen After Attenuation and Upgrade (pounds per year)
City of Palm Bay Water Reclamation Facility	4.0	1.20	29.4	27,305	6,966
City of Melbourne Grant Street	5.5	2.08	21.0	33,806	8,049
City of Titusville Osprey	2.75	1.67	12.7	16,415	7,755
Brevard County Port St. John	0.5	0.35	12.6	3,413	1,625
Cape Canaveral Air Force Station	0.8	0.80	11.9	7,368	3,714
City of West Melbourne Ray Bullard Water Reclamation Facility	2.5	0.85	11.1	7,302	3,947
Brevard County Barefoot Bay Water Reclamation Facility	0.9	0.48	10.3	3,826	2,229
Brevard County South Beaches	8.0	1.12	9.3	8,061	5,201
Brevard County North Regional	0.9	0.26	8.9	1,791	1,207
Rockledge Wastewater Treatment Facility	4.5	1.40	7.0	7,584	6,501
Brevard County South Central Regional	5.5	3.79	6.7	19,653	17,600
City of Titusville Blue Heron	4.0	0.84	4.8	4,993	Not applicable
City of Cape Canaveral Water Reclamation Facility	1.8	0.88	3.8	4,141	Not applicable
City of Cocoa Jerry Sellers Water Reclamation Facility	3.5	1.44	3.5	6,241	Not applicable
Brevard County Sykes Creek	6.0	1.48	3.4	3,895	Not applicable
City of Cocoa Beach Water Reclamation Facility	6.0	3.66	2.5	11,331	Not applicable

Based on a 2007 study by United States Environmental Protection Agency, the cost to upgrade wastewater treatment facilities to meet advanced wastewater treatment standards is approximately $4,200,000 per plant. This cost is in 2006 dollars, which, when inflated to 2016 dollars and costs are included for design and permitting, is approximately $6,000,000 per facility. Where cost estimates were available for facility upgrades, these costs were used instead of the inflated estimated costs. Due to the high cost per pound of TN and total phosphorus (TP) removed to upgrade some of these facilities compared to other projects in this plan, only those facilities in **Table 4-10** are recommended for upgrades as part of this plan. This table also includes the wastewater treatment facility upgrade projects submitted as part of an annual update to the plan. As part of the public education and outreach efforts, customers who use reclaimed water for irrigation should be informed of the nutrient content in the reuse water because they can and should eliminate or reduce the amount of fertilizer added to their lawn and landscaping. This information can be provided to the customers through their utility bill.

Table 4-10. Projects for Wastewater Treatment Facility Upgrades to Improve Reclaimed Water

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed	Plan Funding
Original	2016-17	City of Palm Bay Water Reclamation Facility*	City of Palm Bay	Central IRL	20,240	$180	102	$35,636	$3,634,900
Original	2016-02a	City of Titusville Osprey Wastewater Treatment Facility*	City of Titusville	North IRL	8,660	$1,016	Not applicable	Not applicable	$8,800,000
2018	59	Grant Street Water Reclamation Facility Nutrient Removal Improvements+	City of Melbourne	Central IRL	18,052	$375	9,671	$700	$6,769,500
2019	99	Cocoa Beach Water Reclamation Facility Upgrade+	City of Cocoa Beach	Banana	2,520	$375	685	$1,380	$945,000
2020	2016-2b	City of Titusville Osprey Nutrient Removal Upgrade Phase 2+	City of Titusville	North IRL	3,626	$83	Not applicable	Not applicable	$300,000
2020	138	Ray Bullard Water Reclamation Facility Biological Nutrient Removal Upgrade+	City of West Melbourne	Central IRL	11,360	$375	3,302	$1,290	$4,260,000
2022	216	City of Rockledge Flow Equalization Basin Project+	City of Rockledge	North IRL	5,365	$383	Not applicable	Not applicable	$2,054,795
2023	234	South Brevard Water Reclamation Facility+	Brevard County Utilities	Central IRL	4,316	$383	863	$1,915	$1,653,028
2025	282	South Beaches Wastewater Treatment Plant Upgrade+*	Brevard County Utility Services Department	Central IRL	5,734	$431	1,147	$2,152	$2,471,354
2025	283	Port Saint John Wastewater Treatment Plant Replacement+*	Brevard County Utility Services Department	North IRL	2,278	$431	2,278	$431	$981,818
-	-	***Total***	-	-	***82,151***	***$388 (average)***	***18,048***	***$1,766 (average)***	***$31,870,395***

Note: The projects highlighted in green and marked with an asterisk were identified in the original plan. The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

*Approved with the stipulation to review and contract up to an amount exceeding regulatory requirements.

4.1.3. Sprayfield and Rapid Infiltration Basin Upgrades

Another opportunity to reduce the nutrient loading from the wastewater treatment facilities is to upgrade the disposal locations, either sprayfields or rapid infiltration basins, for the treated effluent. The sprayfields and rapid infiltration basins could be modified to include biosorption activated media to provide additional nutrient removal. Examples of biosorption activated media include mixes of soil, sawdust, zeolites, tire crumb, vegetation, sulfur, and spodosols (Wanielista et al., 2011). Based on a pilot project in the City of DeLand, the potential removal of adding biosorption activated media to a sprayfield or rapid infiltration basin is 83% for total nitrogen (TN) and 66% for total phosphorus (TP) (City of DeLand and University of Central Florida, 2018). The loads for the facilities in Brevard County that dispose of reclaimed water to a sprayfield or rapid infiltration basin were estimated based on permit and discharge monitoring report information (where available). Attenuation rates used were based on Florida Department of Environmental Protection (2017) estimates of 60% for sprayfields and 25% for rapid infiltration basins. Then the biosorption activated media efficiency rate was applied to determine the TN that could be removed. Costs were estimated for each upgrade and the upgrades that could be made for the least cost per pound of TN are recommended for pilot project funding as part of this plan (see **Table 4-11** and **Table 4-12**). Information on nutrient concentrations or the size of the sprayfield/rapid infiltration basin were missing from several facilities. As this information is gathered, additional upgrades may be found to be cost-effective.

Table 4-11. Projects for Sprayfield or Rapid Infiltration Basin Upgrades for Public Facilities

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2017	6	Long Point Park Upgrade+	Brevard County Parks Department	Central IRL	163	$625	Not applicable	Not applicable	$101,854
-	-	***Total***	-	-	***163***	***$625***	***Not applicable***	***Not applicable***	***$101,854***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

Table 4-12. Projects for Sprayfield or Rapid Infiltration Basin Upgrades for Private Facilities

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2022	196	Sterling House Condominium Sprayfield+^	Property Owner	Central IRL	154	$390	To be determined	To be determined	$60,000
-	-	***Total***	-	-	***154***	***$390***	***To be determined***	***To be determined***	***$60,000***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.
^ This is the most cost-effective location that is not likely to become eligible to connect to sewer in the near future.

4.1.4. Package Plant Connections

Package plants are miniature wastewater treatment facilities that serve small communities producing more than 2,000 gallons of effluent per day. The most common package plant treatment methods are extended aeration, sequencing batch reactors, and oxidation ditches; the same biological treatment methods used in larger wastewater treatment plants. The smallest package plants often use the same technology as advanced septic systems. Following this treatment, the effluent is disposed of in rapid infiltration basins (ponds), sprayfields, or drainfields (United States Environmental Protection Agency, 2000).

Most package plants were removed in the 1990s following the Indian River Lagoon System and Basin Act of 1990. However, opportunities still exist to address some of the worst remaining package plants by upgrading the existing plant, adding nutrient scrubbing technology, or preferably connecting them to central sewer where the wastewater will receive further treatment and disposal far from the Indian River Lagoon (IRL). A few of these package plants are located along the IRL and, therefore, pose a substantial nutrient risk due to their effluent concentration and disposal methods. **Table 4-13** lists the estimated total nitrogen (TN) reductions and costs to connect the package plants to the sewer system. The estimated TN load from each package plant accounts for attenuation rates that were based on Florida Department of Environmental Protection (2017) estimates of 60% for sprayfields and 25% for rapid infiltration basins.

Table 4-13. Projects for Package Plant Connection

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2021	192	Oak Point Wastewater Treatment Facility Improvements+	Oak Point Mobile Home Park	North IRL	186	$1,500	To be determined	To be determined	$279,000
2023	237	Willow Lakes Recreational Vehicle Park+	Willow Lakes Homeowners Association	North IRL	725	$1,500	To be determined	To be determined	$1,087,500
2023	239	The Cove at South Beaches Package Plant Connection+	The Cove Homeowners Association	Central IRL	81	$1,500	To be determined	To be determined	$121,500
-	-	***Total***	-	-	**992**	***$1,500 (average)***	***To be determined***	***To be determined***	***$1,488,000***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

4.1.5. Sewer Laterals Rehabilitation

Sewage overflows following heavy rainfall events are an indicator of illegal connections or inadequate sewer asset conditions. Three major components of wastewater flow in a sanitary sewer system: (1) base sanitary (or wastewater) flow, (2) groundwater infiltration, and (3) rainfall inflow. Virtually every sewer system has some infiltration and/or inflow. Historically, small amounts of infiltration and/or inflow are expected and tolerated. However, infiltration and/or inflow becomes excessive when it causes overflows, health, and/or environmental risks. There were recurring overflows from the South Beaches Wastewater Treatment Facility sewer system, including significant overflows following Hurricane Matthew in 2016 and Hurricane Irma in 2017. Less frequent overflows and line breaks have occurred in other sewer service areas.

In 2012, in recognition of aging infrastructure and increasingly frequent issues, the Brevard County (County) Utility Services Department engaged seven professional engineering firms to perform independent field evaluations of the condition of the sewage infrastructure assets located in each of the County's seven independent sewer service areas. The output of this investigation was the identification of $134 million in specific capital improvement needs required over a ten-year period to bring County-owned sewer system assets up to a fully functional, reliable, affordable, efficient, and maintainable condition (Brevard County Utility Services, 2013). The field evaluation results and corresponding 10-year Capital Improvement Program Plan were presented to the Brevard County Commission in 2013. In response, the Commission approved financing the entire Capital Improvement Program Plan and increased the County's sewer service rates to repay the debt. Plan implementation began in 2014 and projects progressed quickly. In 2022, the County conducted another assessment of the sewage infrastructure, which identified additional capital improvement needs. The County Commission approved an increase in the sewer service rates to fund $460 million in bonding for the identified projects. Many of those projects are underway.

Because a capital improvement plan and funding mechanism for updating the County's aging sewer system infrastructure already existed, the original Save Our Indian River Lagoon Project Plan did not include analysis or funding for sewer infrastructure repairs. Unfortunately, even in areas where capital improvements were made, infiltration and/or inflow continued to be a problem contributing to overflows that discharge untreated wastewater into the Indian River Lagoon (IRL). This indicated the probability of issues outside the County-owned assets, such as illegal connections and/or leaks in the privately owned lateral connections of homes and businesses to the County sewer system.

Identifying problems on the customer side of the connection required smoke testing each building or private residence to detect leaks or illegal connections. The extent of infiltration and/or inflow on the customer side of the connections was unknown and, therefore, the nutrient loading associated with these issues was also unknown. As a first step to determine the extent of infiltration and/or inflow problems with the sewer laterals, the County partnered with the City of Satellite Beach on a pilot project to perform smoke testing of more than 12,000 buildings and residences within an area of concern in March through July of 2018. Smoke testing results are included in **Section 4.4.3**.

Repair of privately-owned portions of the sewer system is not funded in the County's adopted Capital Improvement Program Plan for the Wastewater Utility; therefore, use of the Save Our Indian River Lagoon Trust Fund was considered. The Brevard County Utility Services Department estimated that infiltration and/or inflow due to rainfall and flooding associated with Hurricane Irma, caused 1,835 pounds of total nitrogen (TN) and 350 pounds of total phosphorus (TP) to enter the lagoon from sewer overflowing from the South Beaches Regional Wastewater Treatment Facility sewer system. Staff reviewed 13 years of storm-related release data (2004–2017) to estimate the average annual nutrient load to the IRL from emergency sewage overflows. If repairing private connections could prevent similar overflows in the future, then the average annual nitrogen reduction benefit of such repairs would be approximately 988 pounds per year of TN. The average cost effectiveness of sewer expansion projects funded in the 2017 Plan Supplement was $852 per pound of nitrogen removed, thus the cost to reduce 988 pounds per year of TN loading by implementing septic-to-sewer projects would have been $841,842. Therefore, the 2018 Update allocated $840,000 for smoke testing and to assist property owners with the cost to repair detected leaks.

After smoke testing was complete in the pilot area, the cost to repair the leaks that were detected was estimated at $646,200. These results supported expansion of this program from the Satellite Beach pilot area to other city and county sewer service areas. A second pilot area for smoke testing was added in 2019 and three more areas were added in 2020, and the Citizen Oversight Committee and Brevard County Board of County Commissioners decided to make the $840,000 of funding available to offer grants county-wide for the repair of leaky laterals within the watershed of the IRL. Based on the costs reported so far for the replacement of missing caps and repair of broken pipes, current funding levels are expected to be sufficient to fund the repair of all leaks detected in the currently approved smoke testing areas. **Table 4-14** summarizes the sewer laterals rehabilitation projects. It should be noted that smoke testing alone does not result in nutrient load reductions; identified issues must be repaired to achieve a nutrient load reduction benefit. Therefore, the funding for sewer laterals includes leak detection and repair costs to achieve pollutant load reductions.

The Save Our Indian River Lagoon Respond funds were used to measure the nutrient pollution in groundwater near leaks detected by smoke testing. These results supported the decision to require that privately-owned leaky lateral connections be repaired. After the leaks are repaired, flow volumes in the sewer collection system will be compared following storms to document reductions of groundwater leaking into pipes and overwhelming the sewer infrastructure.

Table 4-14. Projects for Sewer Laterals Rehabilitation

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per year of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed	Plan Funding
2018	63a	Countywide Repair/Replacement+	Brevard County	All	6,196	$102	188	$3,371	$633,808
2021	63b	Satellite Beach Lateral Smoke Testing+	Brevard County	Banana	Not applicable	Not applicable	Not applicable	Not applicable	$206,192
2019	100	Osprey Basin Lateral Smoke Testing+	City of Titusville	North IRL	Not applicable	Not applicable	Not applicable	Not applicable	$200,000
2020	114	Barefoot Bay Lateral Smoke Testing+	Brevard County Utility Services Department	Central IRL	Not applicable	Not applicable	Not applicable	Not applicable	$90,000
2020	115	South Beaches Lateral Smoke Testing+	Brevard County Utility Services Department	Central IRL	Not applicable	Not applicable	Not applicable	Not applicable	$200,000
2020	116	Merritt Island Lateral Smoke Testing+	Brevard County Utility Services Department	North IRL	Not applicable	Not applicable	Not applicable	Not applicable	$250,000
-	-	***Total***	-	-	***6,196***	***$1,230 (average)***	***188***	***$8,404 (average)***	***$1,580,000***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

4.1.6. Septic-to-Sewer and Septic System Upgrades

Septic systems are commonly used where central sewer does not exist. When properly sited, designed, constructed, maintained, and operated, septic systems are often a safe means of disposing of domestic waste but still add nutrients to ground and surface waters. However, when septic systems are older and failing or are installed over poor soils close to the groundwater table or open water, they can be a major contributor of nutrients and bacterial and viral pathogens to the Indian River Lagoon (IRL) system. To address this source, options for both septic-to-sewer and septic system upgrades were evaluated. It is important to note that although Brevard County (County) is taking the lead on these retrofits, the state is responsible for the regulation and permitting of septic systems. The County coordinates with Florida Department of Health and the Florida Department of Environmental Protection on the septic system projects recommended in this plan. Additionally, in 2018, Brevard County adopted a County-wide septic overlay ordinance, stopping development in sensitive areas of the lagoon watershed from installing conventional septic systems.

Septic-to-Sewer

In 2018, Brevard County conducted a more detailed evaluation of septic system impacts to surface waters through both groundwater monitoring and modeling using the Florida Department of Environmental Protection-approved ArcGIS-Based Nitrate Load Estimation Toolkit (Rios et al., 2013). This evaluation found that groundwater conductance and soil types were more important for nitrogen transport from septic systems than was previously accounted for in the approach used for ranking in the original Save Our Indian River Lagoon Plan. Therefore, for the 2019 Update, the approach to prioritize areas for septic system connection to the sewer system was modified. The updated approach and recommended projects are summarized below.

The updated approach to rank areas for septic system impacts used information on the potential nutrient contribution from the ArcGIS-Based Nitrate Load Estimation Toolkit (Rios et al., 2013). Potential nutrient contributions were determined based on numerous factors, but after testing model sensitivity to these factors, a simplified approach was developed for Brevard County that was based primarily on the spatial location of the septic system (i.e., Barrier Island, Merritt Island, Mainland, or Melbourne Tillman Water Control District), soil type (soil hydraulic conductance), and the minimum distance to waterbodies (Applied Ecology, 2018).

A direct comparison between the previous model that adapted studies from Martin and St. Lucie counties (**Table 4-15**) and the new model tailored to Brevard County's soil and water (**Table 4-16**) is difficult. For loading in pounds per year, the 2016 study estimated total nitrogen (TN), which is the sum of nitrate, nitrite, ammonia, and organic nitrogen, whereas the 2018 approach using the ArcGIS-Based Nitrate Load Estimation Toolkit estimated only nitrate and ammonia.

In 2024, the ArcGIS-Based Nitrate Load Estimation Toolkit model was calibrated with groundwater well data, specifically groundwater elevation, ammonia, and nitrate-nitrate concentrations, collected from 2018 to 2021 across four priority septic communities (Melbourne Beach, Merritt Island, Suntree, and Turkey Creek) to improve estimations of nitrogen loads reaching the Indian River Lagoon (Applied Ecology, 2024). The ArcGIS-Based Nitrate Load Estimation Toolkit model only allows for the prediction of ammonia and nitrate. Other forms of nitrogen, such as urea or total Kjeldahl nitrogen, often included in septic system effluent, are not included in the ArcGIS-Based Nitrate Load Estimation Toolkit model estimates. This local calibration effort provides a more accurate estimate of TN loading from septic systems to the Indian River Lagoon.

Table 4-15. 2016 Estimate of TN Loading and Cost to Connect for Septic Systems

Septic System Distance from Surface Water (yards)	Number of Septic Systems	Total Nitrogen Load Per System (pounds per year)	Total Nitrogen Load (pounds per year)	Cost per System to Connect	Total Cost	Cost per Pound per Year of Total Nitrogen
0–55	15,090	27.095	408,863	$20,000	$301,800,000	$738
55–219	25,987	6.865	178,395	$20,000	$519,740,000	$2,913
Greater than 219	18,361	0.001	10	$20,000	$367,220,000	$37,624,010
Total	***59,438***	***9.880 (average)***	***587,268***	***$20,000***	***$1,188,760,000***	***$2,024 (average)***

Table 4-16. 2018 Estimate of TN Loading based on ArcGIS-Based Nitrate Load Estimation Toolkit and Updated Cost to Connect for Septic Systems

Septic System Distance from IRL (yards)	Number of Septic Systems	Total Nitrogen Load per System (pounds per year)	Total Nitrogen Load (pounds per year)	2022 Cost per System to Connect	Total Cost	Cost per Pound per Year of Total Nitrogen
0–55	15,737	19.037	299,590	$60,618	$953,945,466	$3,184
55–219	23,969	3.612	86,575	$60,618	$1,452,952,842	$16,782
Greater than 219	13,472	0.802	10,805	$60,618	$816,645,696	$75,584
Total	***53,178***	***Not applicable***	***396,970***	***$60,618***	***$3,223,544,004***	***$8,120 (average)***

Those septic systems within 55 yards of surface waters were further analyzed by soil hydraulic conductivity since it was found to be a highly influential variable in nutrient loading from septic systems. Hydraulic conductance is the ability of water to move through pore space in the soil with sandy soils having a higher conductance compared to loamy and clay soils. As shown in **Table 4-17**, nitrogen loading is much higher in the very high and high conductivity soils compared to the average for all soils within 55 yards. Although only half of the septic systems are in very high and high conductance soils, these account for 76% of the nitrogen loading.

Table 4-17. Septic Systems by Soil Hydraulic Conductance Class within 55 Yards of IRL

Hydraulic Conductivity of Septic Systems Within 55 Yards of IRL	Number of Septic Systems	Total Nitrogen Load per System (pounds per year)	Total Nitrogen Load (pounds per year)	Cost per System to Connect	Total Cost	Cost per Pound per Year of Total Nitrogen
Very High	1,899	34.926	66,324	$60,618	$115,113,582	$1,736
High	6,304	26.021	164,039	$60,618	$382,135,872	$2,330
Medium	3,230	12.198	39,401	$60,618	$195,796,140	$4,970
Low	3,396	5.930	20,141	$60,618	$205,858,728	$10,222
Very Low	908	10.664	9,683	$60,618	$55,041,144	$5,684
Total	***15,737***	***Not applicable***	***299,588***	***$60,618***	***$953,945,466***	***$3,184 (average)***

Table 4-18 shows those properties with septic systems in very high and high hydraulic conductance soils distributed by distance to surface waterbodies. Waterfront properties served by septic systems, including those properties adjacent to the IRL, tributary rivers and creeks, or on canals or drainage ditches that discharge to the lagoon contribute 48% of all septic system loading in the IRL watershed in Brevard County. Changes in the 2019 Update shifted septic-to-sewer and septic upgrade projects as much as feasible to areas of high conductivity soils located adjacent to waterways that contribute the greatest loading to the IRL.

Table 4-18. Septic Systems in Very High and High Hydraulic Conductance Soils Distributed by Distance to Surface Waters

Septic System Distance from Surface Water (yards)	Number of Septic Systems	Total Nitrogen Load per System (pounds per year)	Total Nitrogen Load (pounds per year)	Cost per System to Connect	Total Cost	Cost per Pound per Year of Total Nitrogen
0–11	5,584	33.838	188,956	$60,618	$338,490,912	$1,791
11–22	1,207	16.404	19,799	$60,618	$73,165,926	$3,695
22–33	465	17.466	8,121	$60,618	$28,187,370	$3,471
33–44	384	12.458	4,784	$60,618	$23,277,312	$4,866
44–55	563	15.456	8,702	$60,618	$34,127,934	$3,922
Total	***8,203***	***28.083***	***230,362***	***$60,618***	***$497,249,454***	***$2,159 (average)***

For the funded opportunities that were identified using the 2018 ranking method, the number of lots that could be connected, associated cost of the connection, and estimated TN reductions are shown in **Table 4-19**. **Figure 4-2** through **Figure 4-14** show the location of each of these areas. These funded opportunities, including the quick connection projects described below, represent the connection of approximately 9% of the septic systems in Brevard County within the IRL watershed but reduce 29% of the nutrient load contribution attributed to existing septic systems in the County. Funding for sewer extension projects is used for the engineering, permitting, and construction of the underground infrastructure within the right-of-way, and the construction or reimbursement to property owners for private sewer lateral connections to the new sewer line. Connections within Septic-to-Sewer Extension Projects will be funded on a prorated basis of up to $1,600 of Save Our Indian River Lagoon Program funds per pound of nitrogen loading reduced. Loading for each non-residential property within a sewer project area is determined by multiplying the ArcGIS-Based Nitrate Load Estimation Toolkit nitrogen loading value for a single-family home by the property's equivalent residential unit water usage.

Several types of sewer systems are designed to transport wastewater from residential, commercial, and industrial properties. The choice of what type of sewer system to construct depends on factors such as population density, topography, and available space. Gravity sewer is the most commonly used system as it efficiently transports wastewater using the network of pipes with a consistent downward slope towards a lift station. Lift stations then pump the wastewater to the wastewater treatment facility. Vacuum sewer systems are another type of conveyance method that uses a vacuum to draw wastewater from the property to a pump station. This system acts like a gravity system to the user as wastewater flows from each property to a vacuum pit in the right-of-way. Wastewater collected in the vacuum pits are sucked out to the pump station. Lift stations then pump the wastewater from the pump station to the wastewater treatment facility. Low-pressure force main sewer systems use individual pumps on each property to push wastewater into the sewer system. Vacuum and low-pressure force main sewer systems are particularly useful in areas with challenging topography, where gravity-based wastewater flow is impractical. They can also be constructed in tighter areas that may not have the space for gravity lines between existing utilities and built-out properties.

Another opportunity for removing septic systems is to use a hybrid septic tank effluent pumping system. In this system, effluent from the septic tank is connected to sewer pressure lines. Small-diameter pipes, which can be installed relatively quickly, are used instead of the gravity sewer system. A high pressure ½ horsepower pump (115 volt) pumps the effluent from the septic system to a force main or gravity sewer system. The City of Vero Beach is installing these systems, maintaining the septic tank effluent pumping system, and pumping out the septic tanks when needed. The customer pays the electrical costs to operate the pump for this system.

For highly ranked properties located within the vicinity of a pressure line or gravity sewer system, the septic tank effluent pumping system may be a good option instead of the septic system upgrades described below. If septic tank effluent pumping systems are selected as a preferred option anywhere in Brevard County, specific locations for septic tank effluent pumping system installation can be submitted for funding consideration through the annual project funding request and plan update process.

The detailed septic analysis also identified 4,496 properties located within 30 feet of existing sewer infrastructure. The highest loading "Quick Connect" opportunities are included in **Table 4-19** based on their ability to connect to gravity or force main sewer and are shown in **Figure 4-15** through **Figure 4-17**.

Quick Connects to sewer will be funded on a prorated basis of $1,600 per pound of nitrogen loading to the IRL reduced, up to a maximum of $24,000 for connection to force main sewer or gravity connections that require pumps, and a maximum of $12,000 for connection to gravity sewer without a private pump. Loading for each non-residential Quick Connect is determined by multiplying the ArcGIS-Based Nitrate Load Estimation Toolkit nitrogen loading value for a single-family home by the property's equivalent residential unit water usage. Funding allocation for this grant program is based on the number of highest priority connection opportunities within each sub-lagoon as reported in **Table 4-19**.

However, when cost-share grants are secured, the County can offer Quick Connect grants to all property owners within the IRL watershed on a first-come, first-served basis. This is cost-effective because the average nitrogen loading per septic system within the IRL watershed is 7.5 pounds. At the pro-rated basis of $1,600 per pound, the average cost-share for preventing 7.5 pounds of nitrogen loading would be $12,000 from program funds. While grant funds last, these program funds will be matched with up to $12,000 of state grant funding to cost-share up to $24,000 per connection.

Table 4-19. Projects for Septic-to-Sewer

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Number of Lots	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
Original	2016-47	Sykes Creek - Zone N*	Brevard County	Banana	91	2,784	$1,500	Not applicable	Not applicable	$4,176,000
Original	2016-48	Sykes Creek - Zone M*	Brevard County	Banana	56	1,798	$1,500	Not applicable	Not applicable	$2,697,000
Original	2016-49	Sykes Creek - Zone T*	Brevard County	Banana	148	3,360	$1,500	Not applicable	Not applicable	$5,040,000
Original	2016-30	City of Rockledge*	City of Rockledge	North IRL	15	712	$703	Not applicable	Not applicable	$500,580
Original	2016-31/32	City of Cocoa – Zones J and K*	City of Cocoa	North IRL	92	3,748	$1,646	Not applicable	Not applicable	$6,167,373
Original	2016-35	South Beaches - Zone A*	Brevard County	North IRL	37	1,306	$1,500	Not applicable	Not applicable	$1,959,000
Original	2016-39	City of Palm Bay – Zone A*	City of Palm Bay	Central IRL	77	2,136	$1,319	Not applicable	Not applicable	$2,817,256
Original	2016-46	City of Palm Bay – Zone B*	City of Palm Bay	Central IRL	249	6,809	$1,220	Not applicable	Not applicable	$8,309,628
Original	109	City of Titusville - Zones A-G*	City of Titusville	North IRL	18	1,563	$769	Not applicable	Not applicable	$1,201,392
Original	203	South Central - Zone A*	Brevard County	North IRL	101	3,655	$1,500	Not applicable	Not applicable	$5,482,500
2017	1	Breeze Swept Septic-to-Sewer Connection+	City of Rockledge	North IRL	143	2,002	$440	Not applicable	Not applicable	$880,530
2017	2a	Merritt Island Septic Phase Out Project+	Merritt Island Redevelopment Agency	North IRL	74	2,501	$128	Not applicable	Not applicable	$320,268
2017	4	Hoag Sewer Conversion+	City of Melbourne	Central IRL	5	101	$852	Not applicable	Not applicable	$86,031
2017	5	Pennwood Sewer Conversion	City of Melbourne	Central IRL	5	103	$786	Not applicable	Not applicable	$81,000
2018	60	Sylvan Estates Septic-to-Sewer Conversion+	City of West Melbourne	Central IRL	59	1,073	$1,455	Not applicable	Not applicable	$1,561,215
2018	61	Riverside Drive Septic-to-Sewer Conversion+	City of Melbourne	North IRL	12	305	$872	Not applicable	Not applicable	$265,960

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Number of Lots	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2018	62	Roxy Avenue Septic-to-Sewer Conversion+	City of Melbourne	North IRL	6	102	$872	Not applicable	Not applicable	$88,944
2019	2019-27	Sharpes - Zone A+	Brevard County	North IRL	186	5,248	$1,500	Not applicable	Not applicable	$7,872,000
2019	2019-29	South Banana - Zone B+	Brevard County	Banana	41	915	$1,500	Not applicable	Not applicable	$1,372,500
2019	2020-34	South Central - Zone F+	City of Melbourne	North IRL	61	1,688	$1,008	Not applicable	Not applicable	$1,701,972
2019	2019-36	South Beaches - Zone O+	Brevard County	North IRL	2	54	$2,472	Not applicable	Not applicable	$133,488
2019	2019-37	South Beaches - Zone P+	Brevard County	North IRL	11	242	$1,241	Not applicable	Not applicable	$300,348
2019	2019-40	Rockledge - Zone B+	City of Rockledge	North IRL	160	4,037	$1,323	Not applicable	Not applicable	$5,339,520
2019	2016-16	Banana Quick Connects+	Brevard County	Banana	144	3,224	Average of $592 Maximum of $1,600	Not applicable	Not applicable	$1,908,000
2019	2016-18	North IRL Quick Connects+	Brevard County	North IRL	463	11,339	Average of $531 Maximum of $1,600	Not applicable	Not applicable	$6,018,000
2019	2016-19	Central IRL Quick Connects+	Brevard County	Central IRL	335	7,378	Average of $510 Maximum of $1,600	Not applicable	Not applicable	$3,765,881
2020	145	Merritt Island - Zone F+	Brevard County Utility Services Department	Banana	71	1,292	$851	Not applicable	Not applicable	$1,100,000
2020	50b	South Central - Zone C+	Brevard County Utility Services Department	North IRL	140	5,146	$1,283	Not applicable	Not applicable	$6,600,000
2020	136	Micco - Zone B+	Brevard County Utility Services Department	Central IRL	229	6,484	$1,553	Not applicable	Not applicable	$10,069,652
2020	146	Merritt Island - Zone C+	Brevard County Utility Services Department	Banana	43	1,419	$1,113	Not applicable	Not applicable	$1,580,000

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Number of Lots	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2020	147	Sykes Creek - Zone R+	Brevard County Utility Services Department	Banana	221	5,040	$1,553	Not applicable	Not applicable	$7,827,120
2020	150	South Central - Zone D+	Brevard County Utility Services Department	North IRL	94	3,387	$1,410	Not applicable	Not applicable	$4,774,500
2020	148	North Merritt Island - Zone E+	Brevard County Utility Services Department	North IRL	223	3,287	$1,553	Not applicable	Not applicable	$5,104,711
2020	151	Merritt Island - Zone G+	Brevard County Utility Services Department	Banana	785	7,588	$1,553	Not applicable	Not applicable	$11,784,164
2020	152	Sharpes - Zone B+	Brevard County Utility Services Department	North IRL	136	2,692	$1,500	Not applicable	Not applicable	$4,038,000
2020	153	Cocoa - Zone C+	Brevard County Utility Services Department	North IRL	61	2,550	$1,553	Not applicable	Not applicable	$3,960,150
2021	3	Micco Sewer Line Extension (Phase I and II)+	Brevard County	Central IRL	29	1,493	$1,500	Not applicable	Not applicable	$2,239,500
2021	189	Avendia del Rio Septic-to-Sewer+	City of Melbourne	Central IRL	3	71	$986	Not applicable	Not applicable	$70,000
2021	190	Bowers Septic-to-Sewer+	City of Melbourne	North IRL	6	120	$1,225	Not applicable	Not applicable	$147,000
2021	191	Kent and Villa Espana Septic-to-Sewer Conversion+	City of Melbourne	North IRL	37	542	$1,310	Not applicable	Not applicable	$710,000
2022	222	Hedgecock/ Grabowsky and Desoto Fields+	City of Satellite Beach	Banana	2	81	$1,500	Not applicable	Not applicable	$121,500
2022	224	Lake Ashley Circle+	City of West Melbourne	Central IRL	46	1,136	$1,500	Not applicable	Not applicable	$1,704,000
2022	225	Dundee Circle and Manor Place+	City of West Melbourne	Central IRL	60	1,499	$1,500	Not applicable	Not applicable	$2,248,500

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Number of Lots	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound per Year	Total Phosphorus Reduction (pounds per year)	Total Phosphorus Cost per Pound per Year	Plan Funding
2023	238	Kelly Park+	Brevard County Parks and Recreation	Banana	1	90	$1,500	Not applicable	Not applicable	$135,000
2023	240	Rotary Park+	Brevard County Parks and Recreation	Banana	1	104	$1,500	Not applicable	Not applicable	$156,000
2023	241	Manatee Cove+	Brevard County Parks and Recreation	North IRL	1	24	$1,500	Not applicable	Not applicable	$36,000
2023	242	Riverwalk+	Brevard County Parks and Recreation	North IRL	1	4	$1,500	Not applicable	Not applicable	$6,000
2025	284	Sewer Available Not Connected Phase 2+	City of Palm Bay	Central IRL	416	1,011	$1,600	Not applicable	Not applicable	$1,616,992
-	-	***Total***	-	-	***5,197***	***113,243***	***$1,202 (average)***	***Not applicable***	***Not applicable***	***$136,075,175***

Note: The projects highlighted in green and marked with an asterisk were identified in the original plan. The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

Figure 4-2. Septic-to-Sewer Projects in Banana River Lagoon

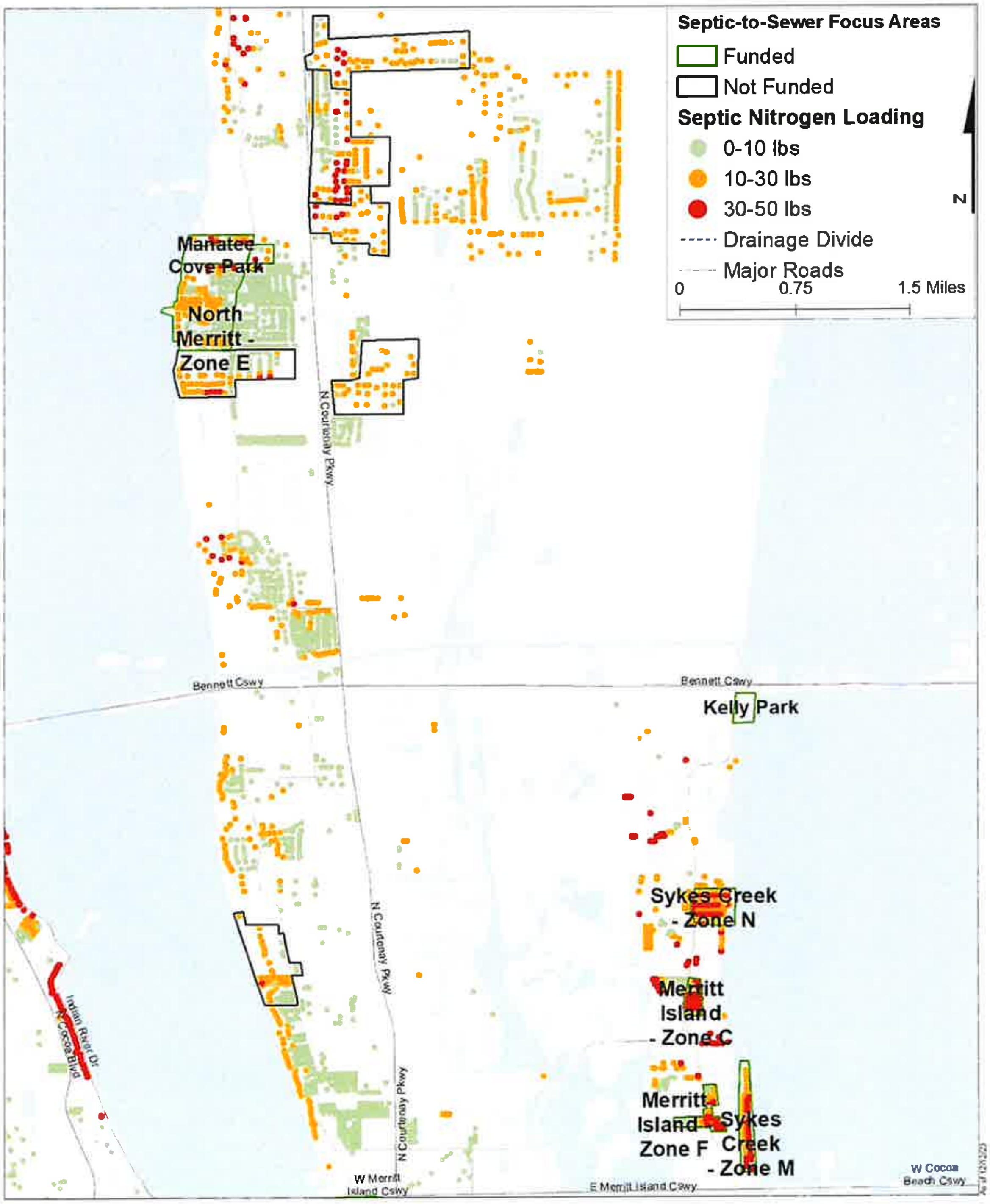


Figure 4-2 Long Description

Figure 4-3. Septic-to-Sewer Projects in Banana River Lagoon, continued

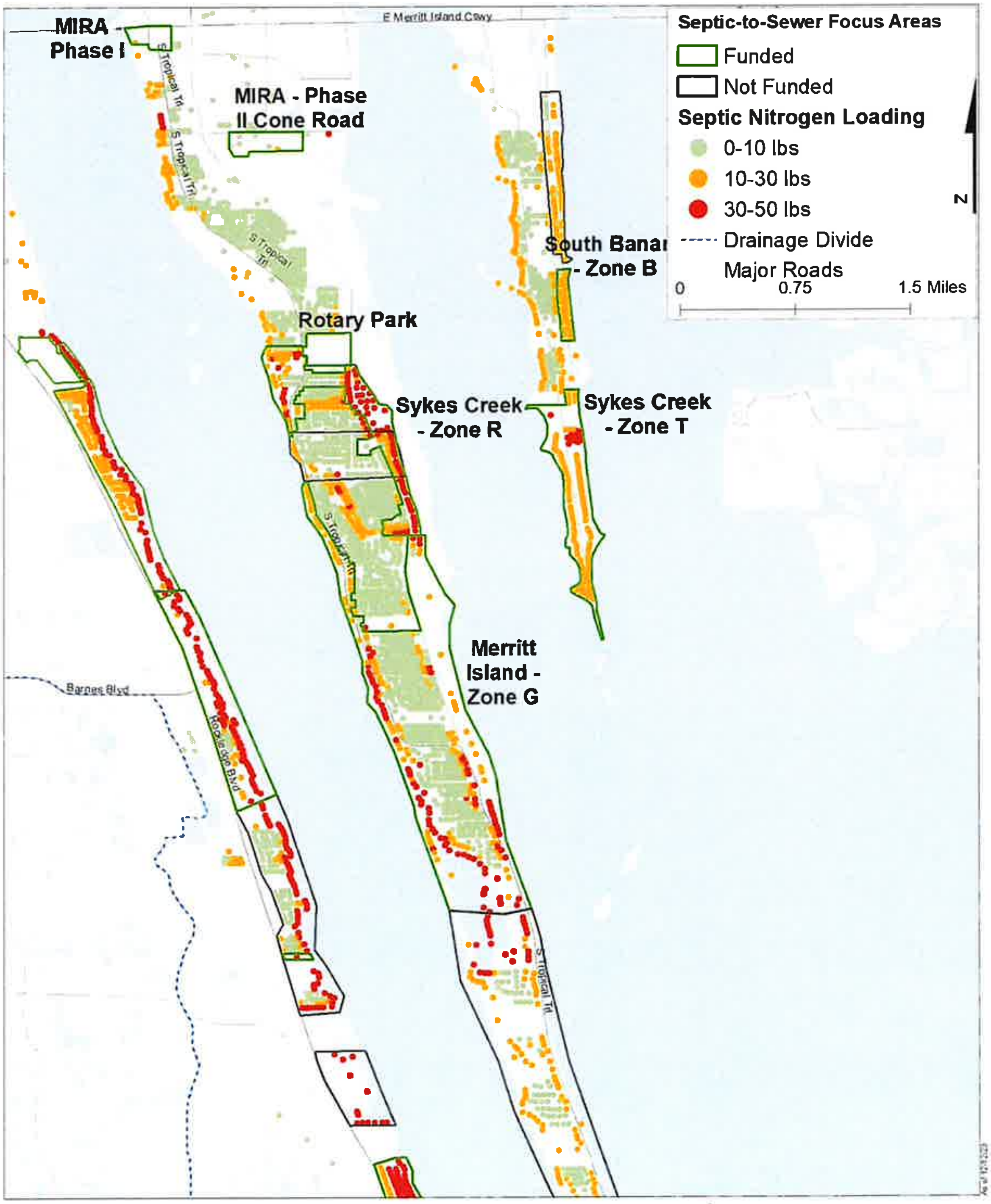


Figure 4-3 Long Description

Figure 4-4. Septic-to-Sewer Projects in Banana River Lagoon, continued

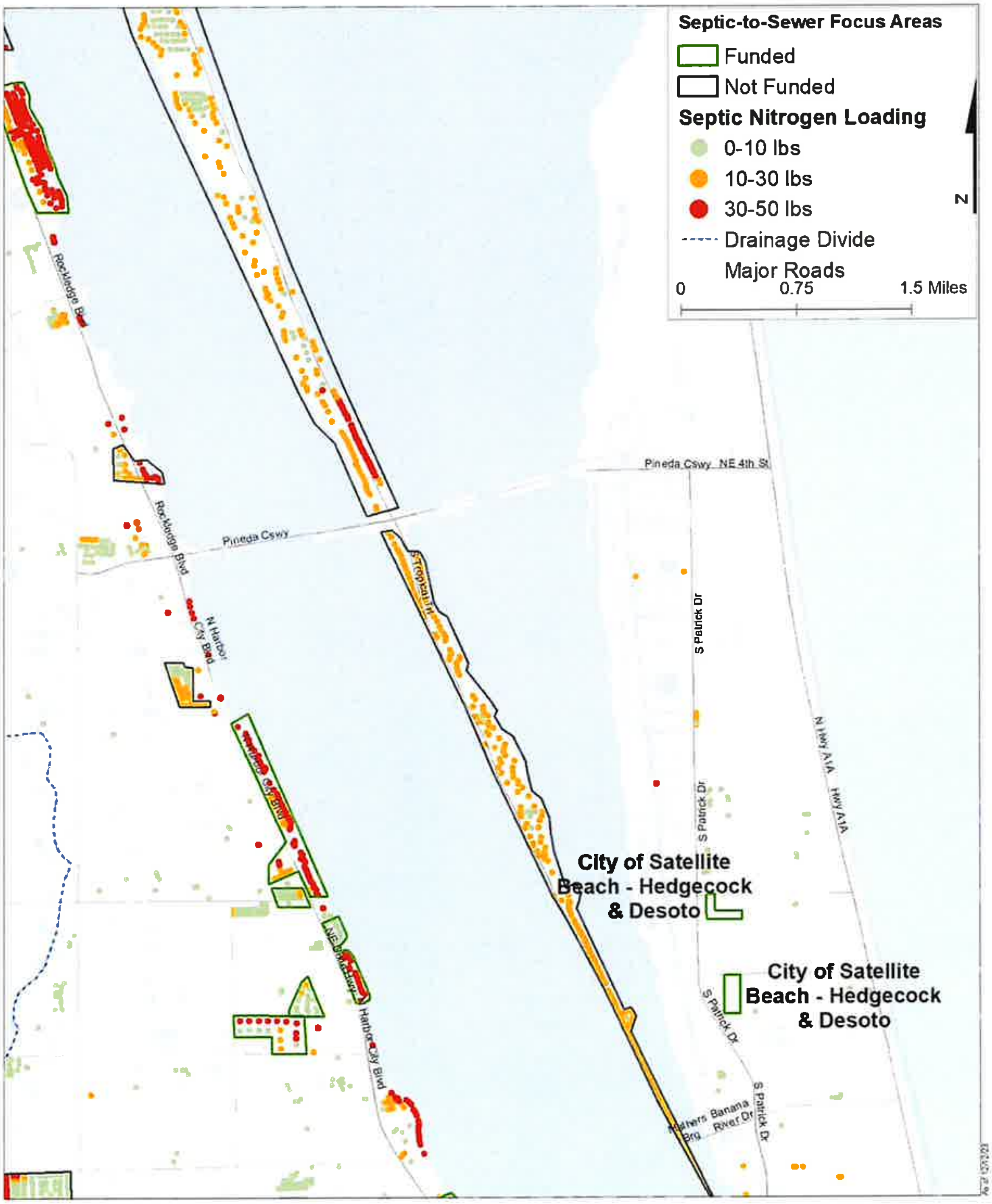


Figure 4-4 Long Description

Figure 4-5. Septic-to-Sewer Projects in North IRL

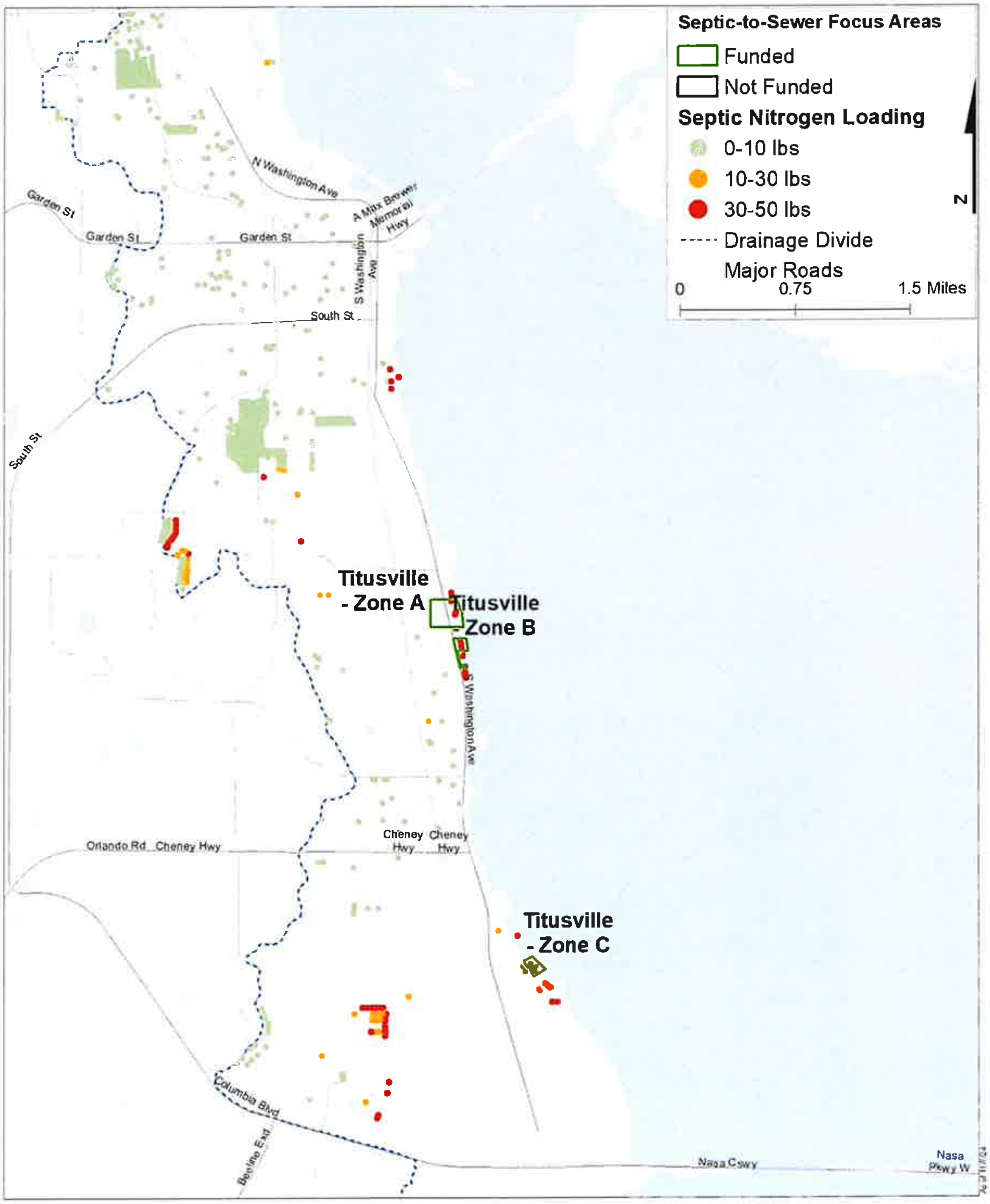


Figure 4-5 Long Description

Figure 4-6. Septic-to-Sewer Projects in North IRL, continued

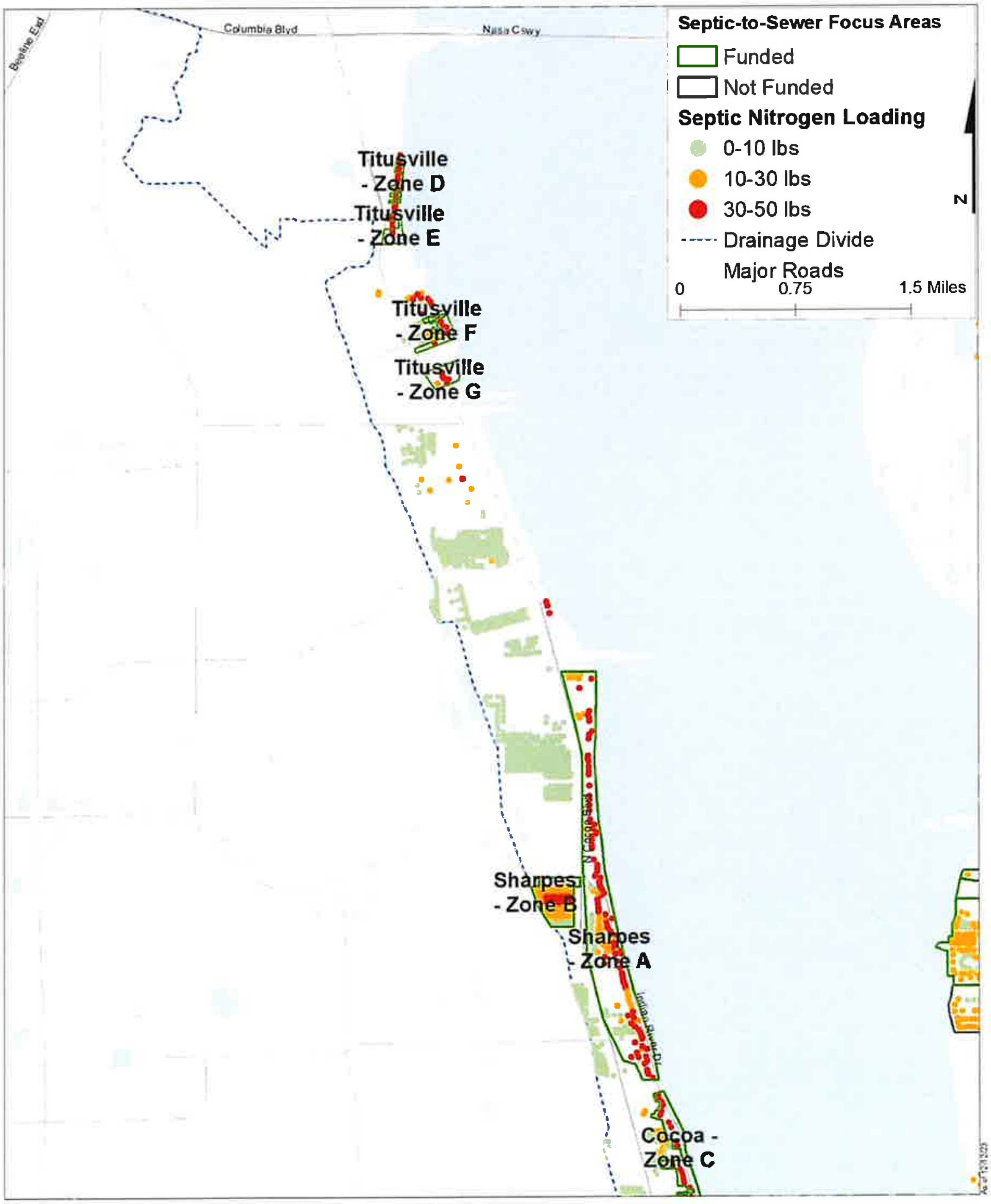


Figure 4-6 Long Description

Figure 4-7. Septic-to-Sewer Projects in North IRL, continued

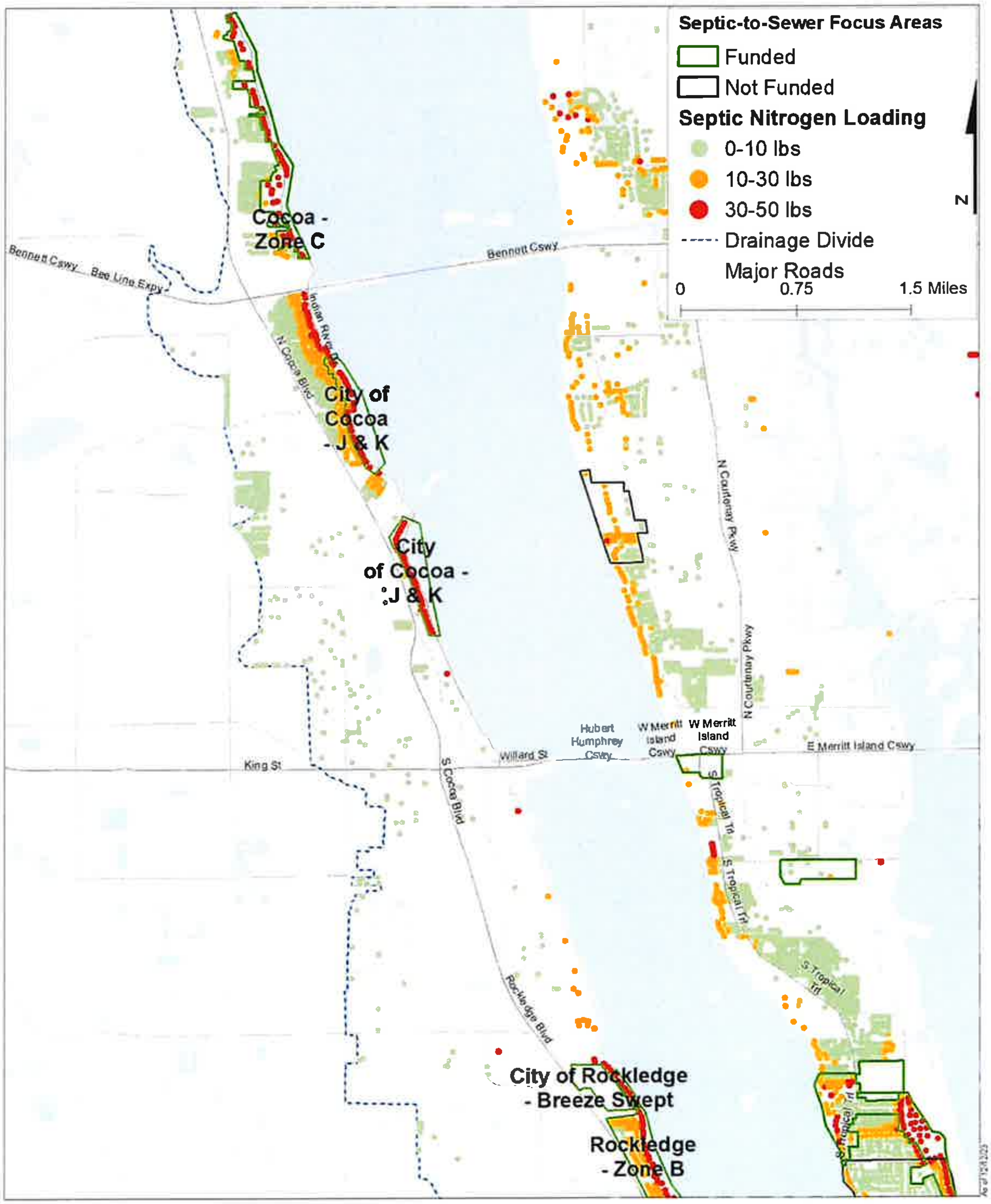


Figure 4-7 Long Description

Figure 4-8. Septic-to-Sewer Projects in North IRL, continued

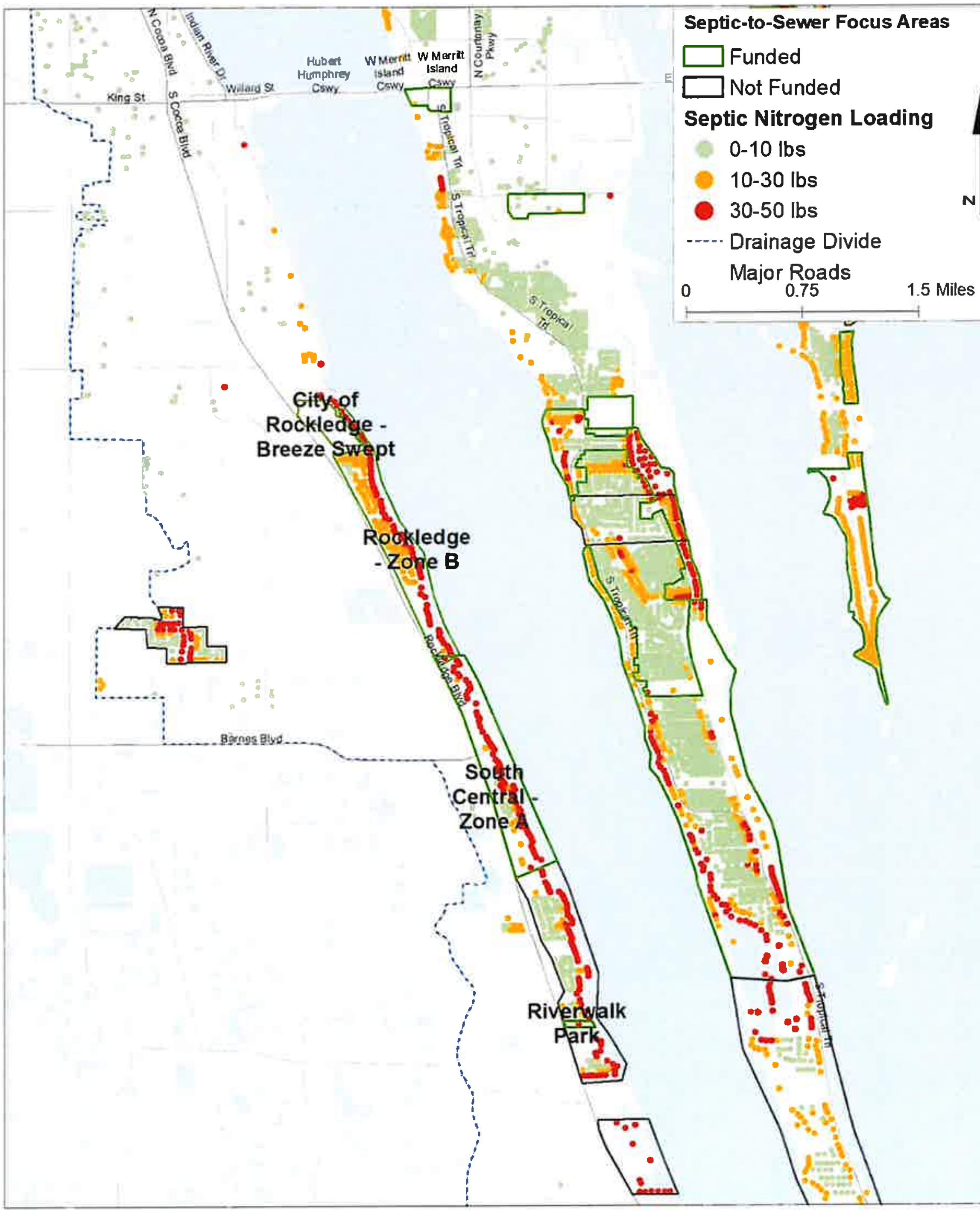


Figure 4-8 Long Description

Figure 4-9. Septic-to-Sewer Projects in North IRL, continued

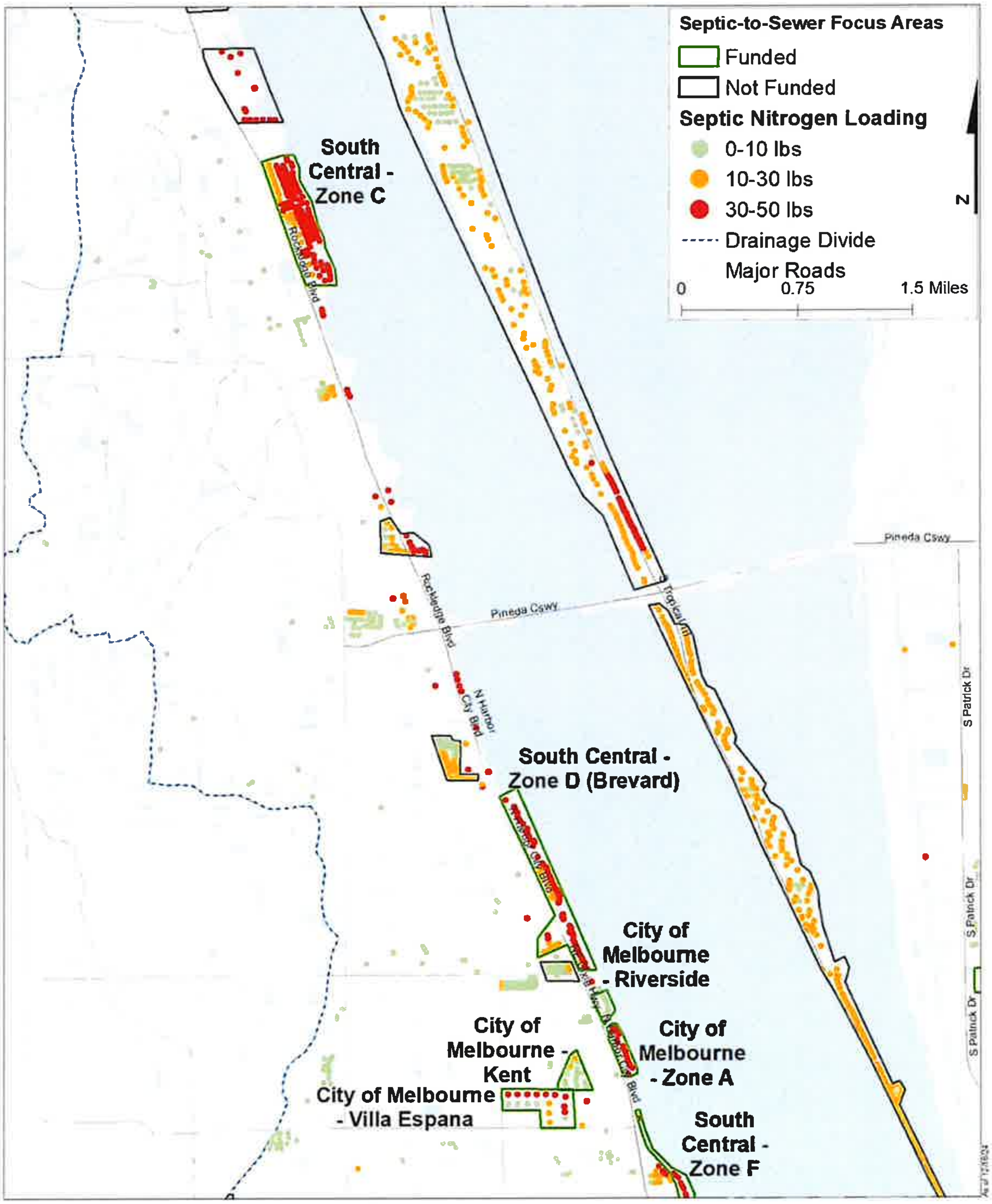


Figure 4-9 Long Description

Figure 4-10. Septic-to-Sewer Projects in North IRL, continued

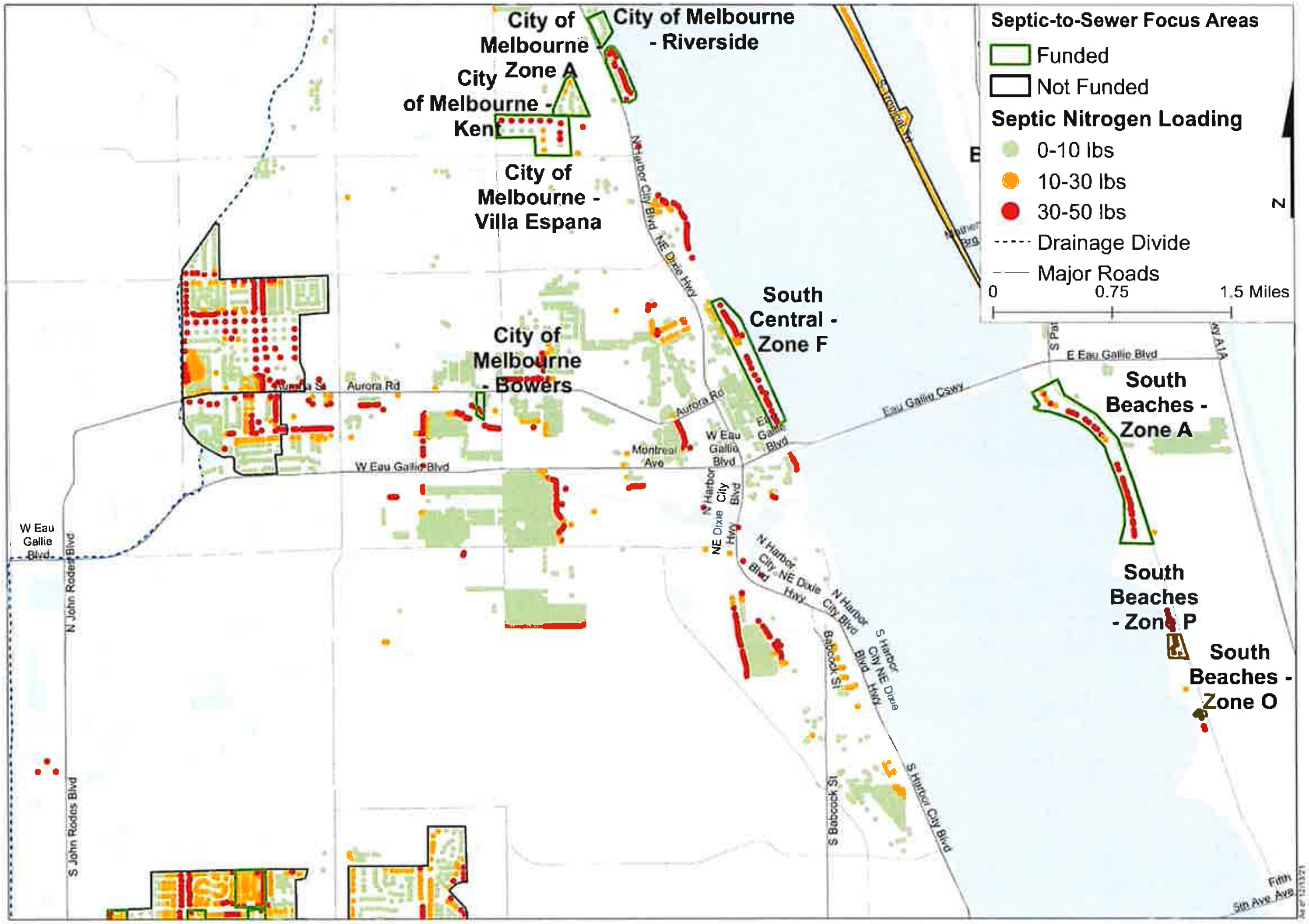


Figure 4-10 Long Description

Figure 4-11. Septic-to-Sewer Projects in Central IRL

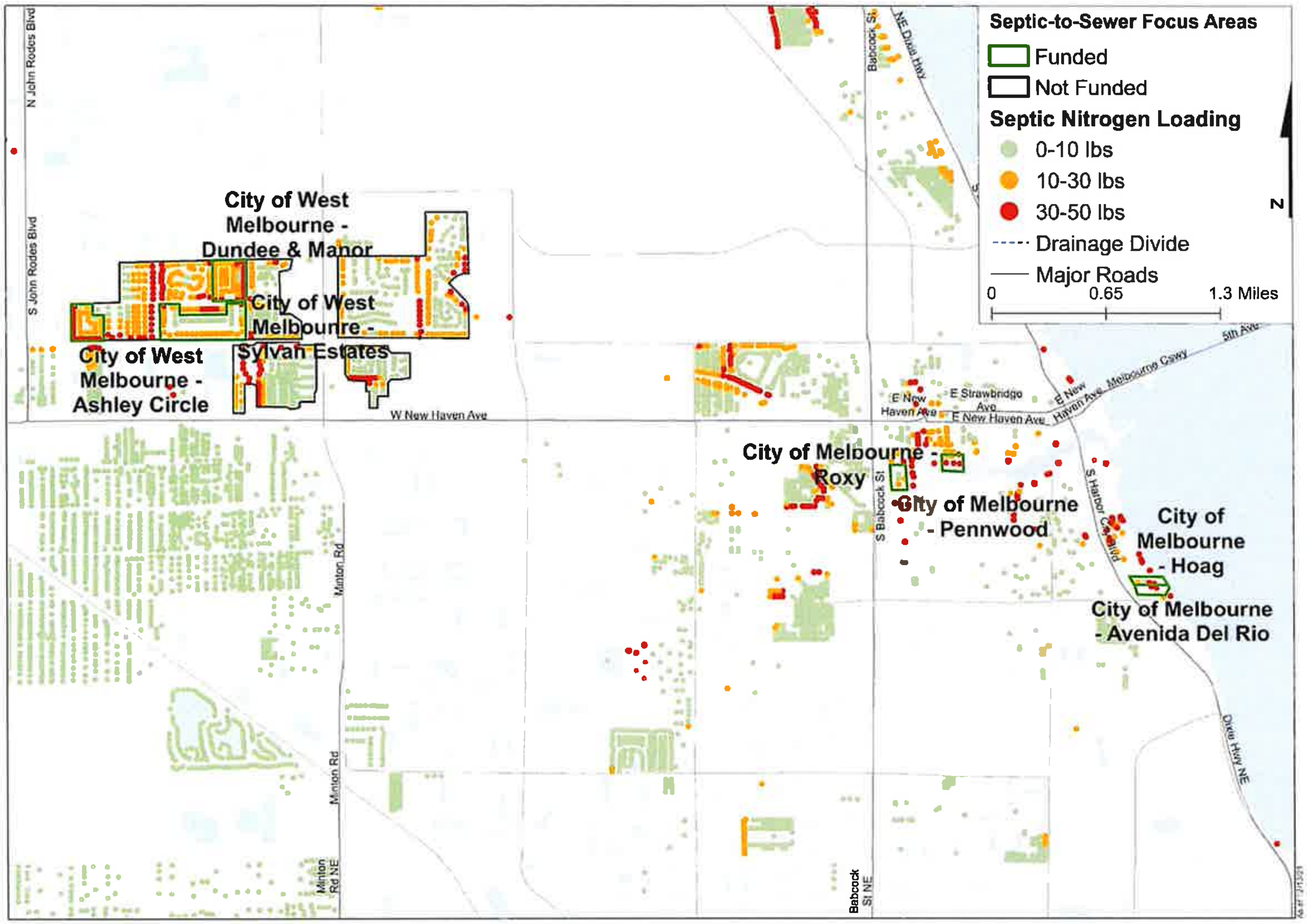


Figure 4-11 Long Description

Figure 4-12. Septic-to-Sewer Projects in Central IRL, continued

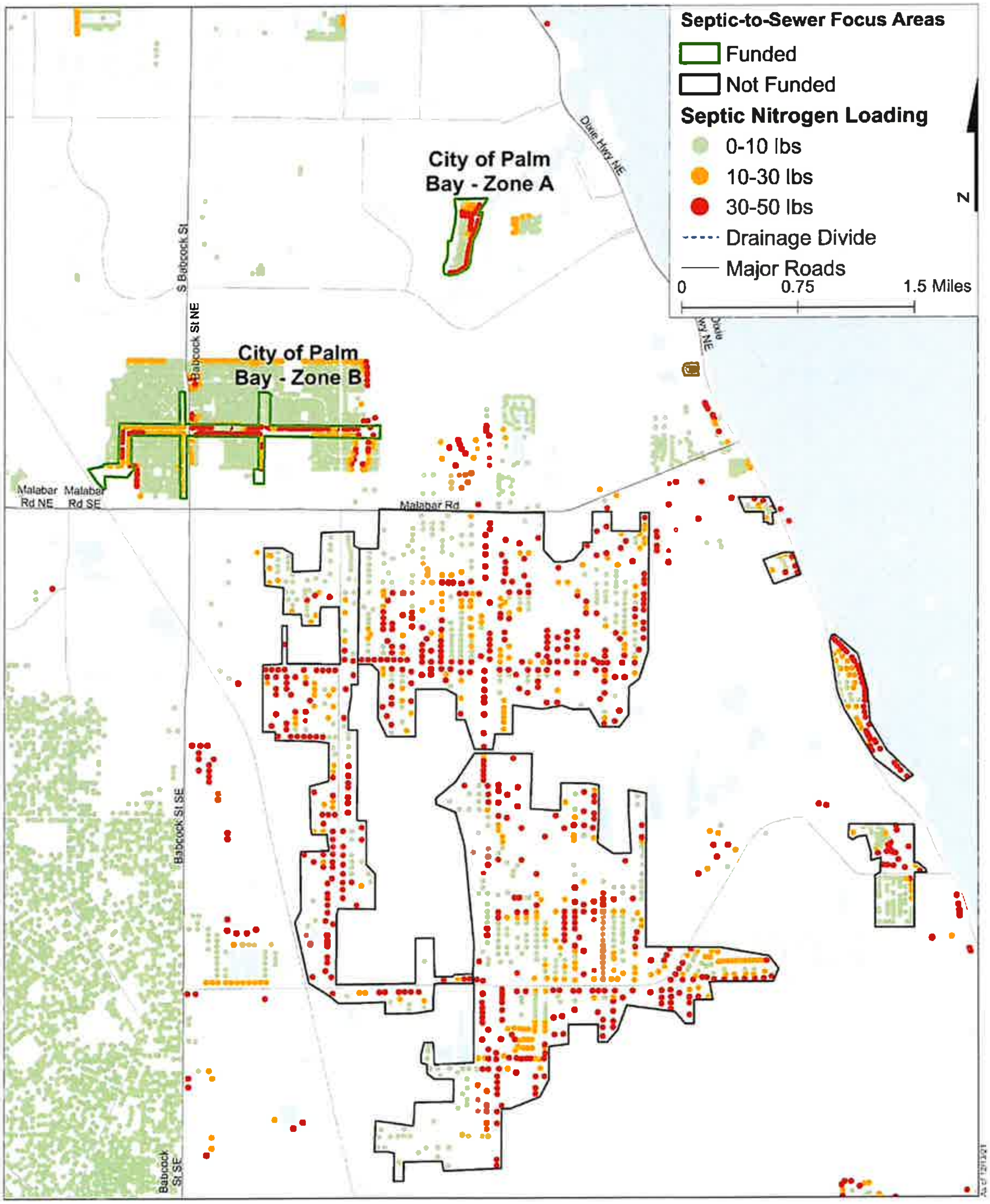


Figure 4-12 Long Description

Figure 4-13. Septic-to-Sewer Projects in Central IRL, continued

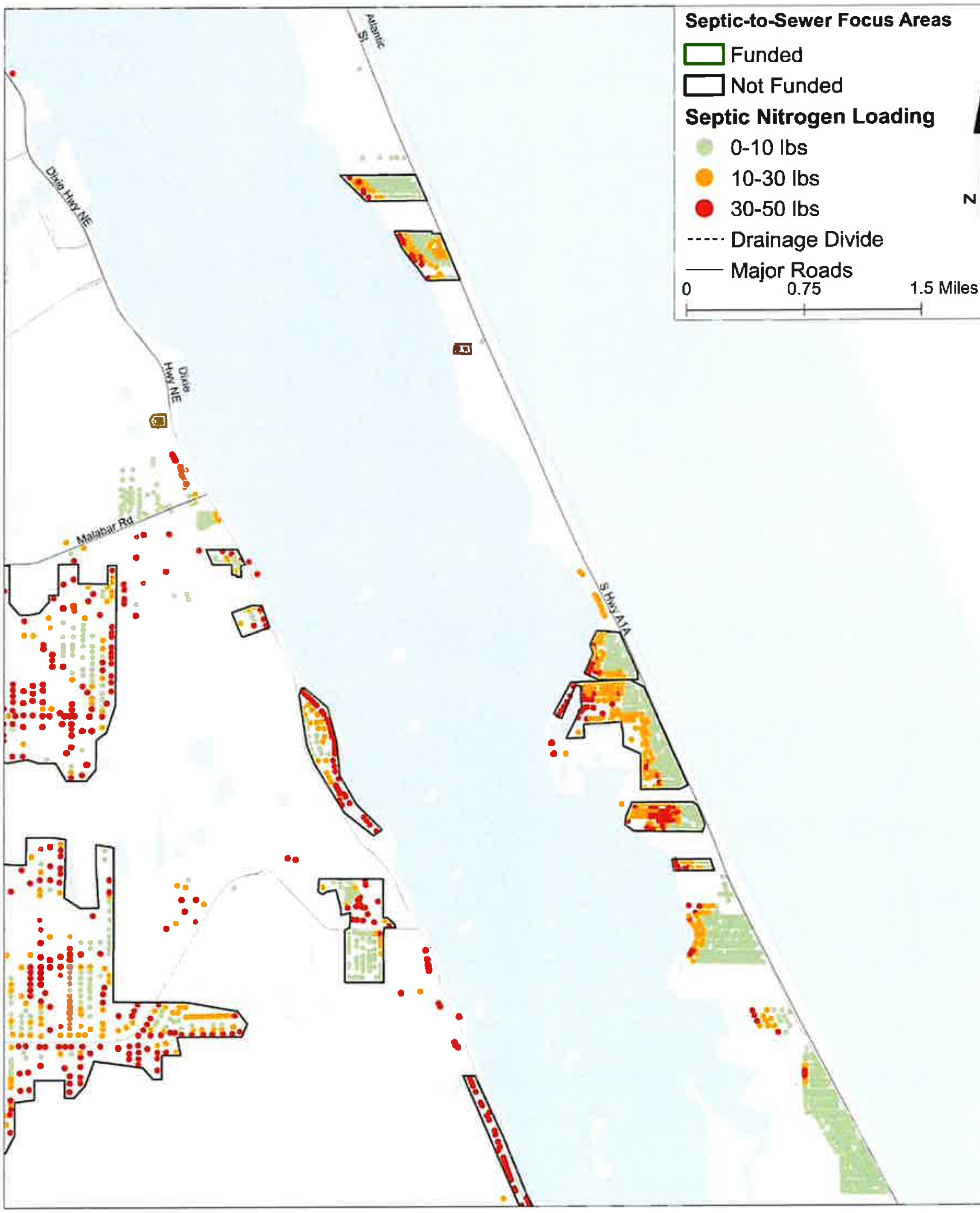


Figure 4-13 [Long Description]

Figure 4-14. Septic-to-Sewer Projects in Central IRL, continued

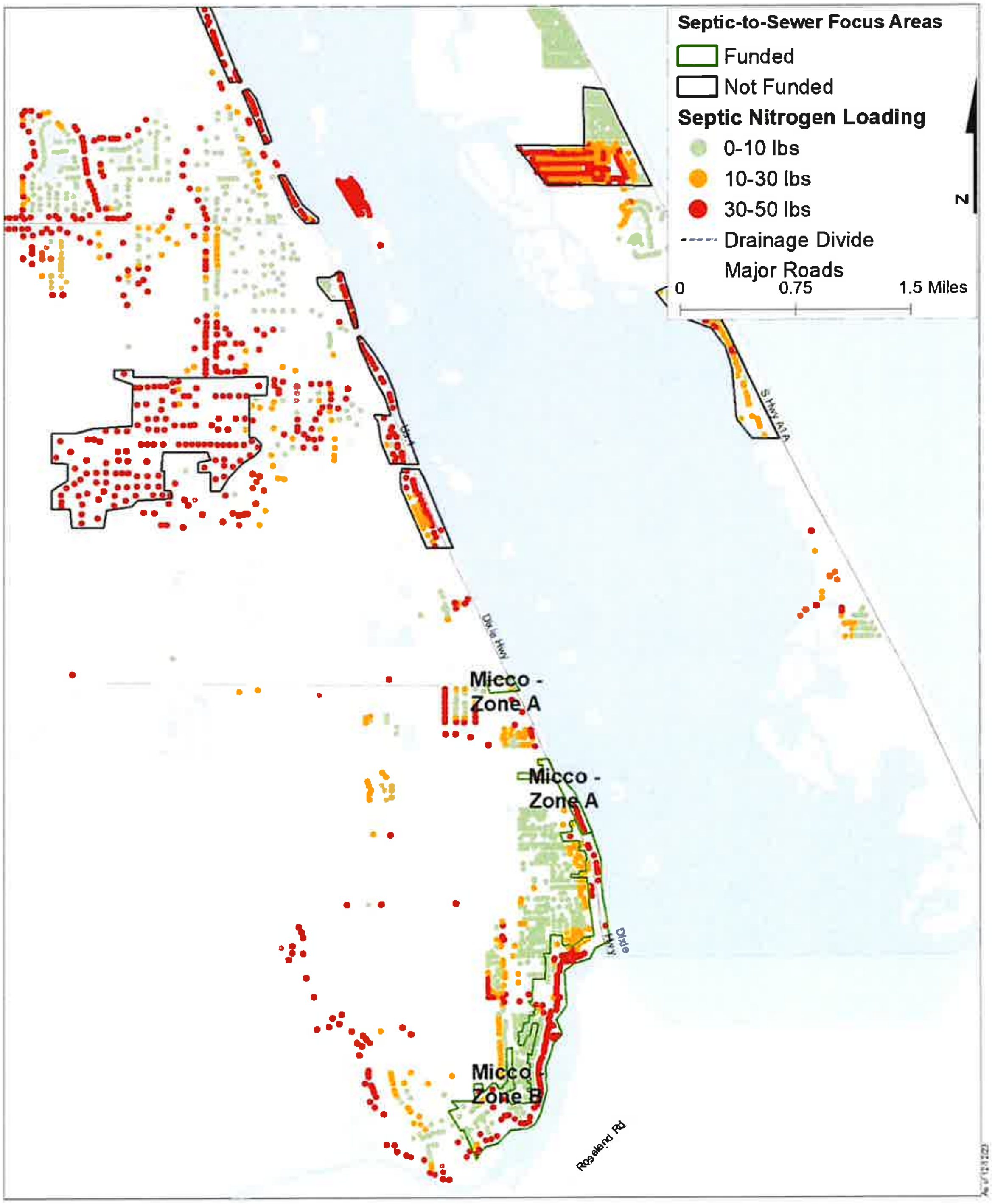


Figure 4-14 Long Description

Figure 4-15. Quick Connection Septic-to-Sewer Locations in North Brevard County

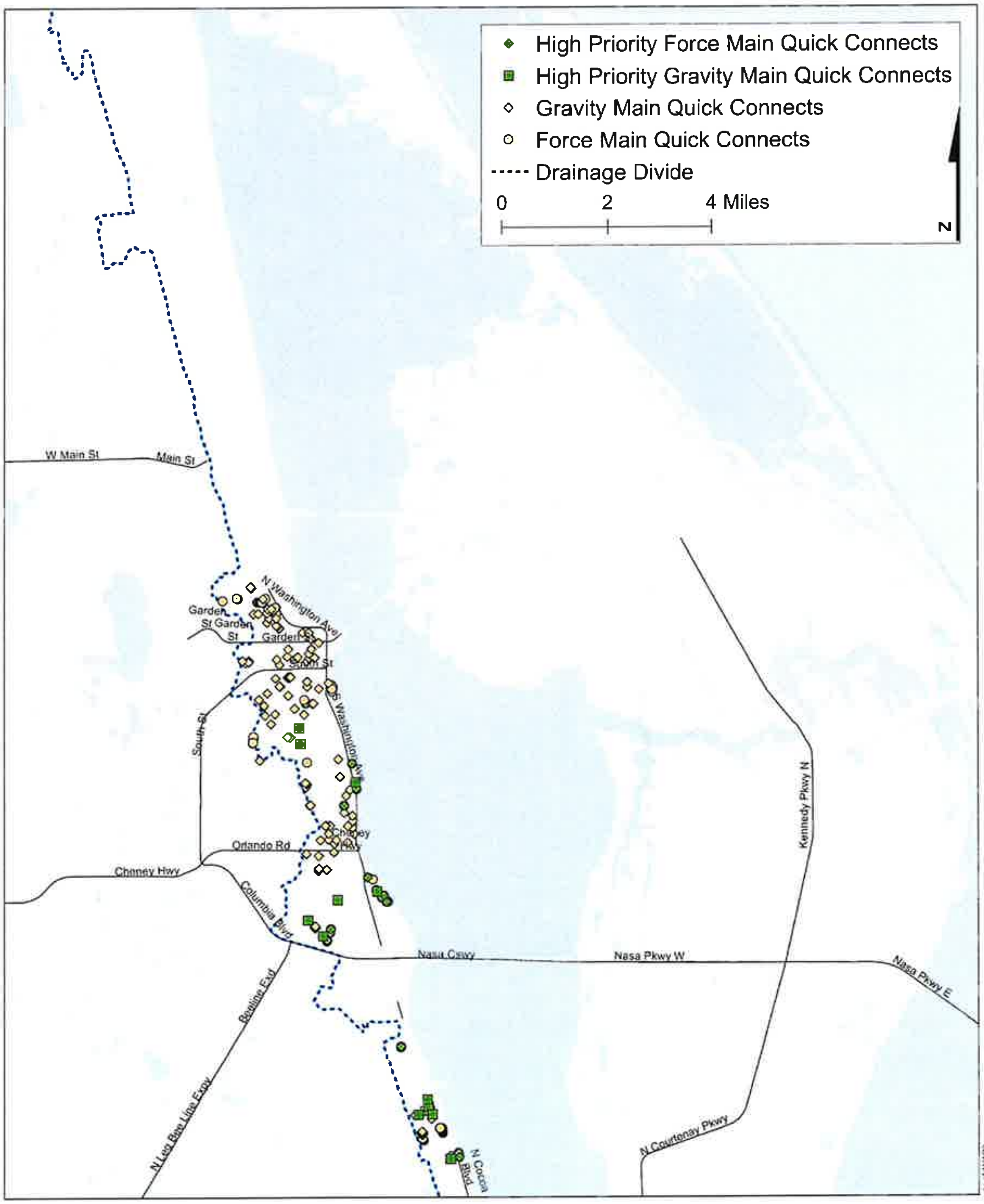


Figure 4-15 Long Description

Figure 4-16. Quick Connection Septic-to-Sewer Locations in Central Brevard County

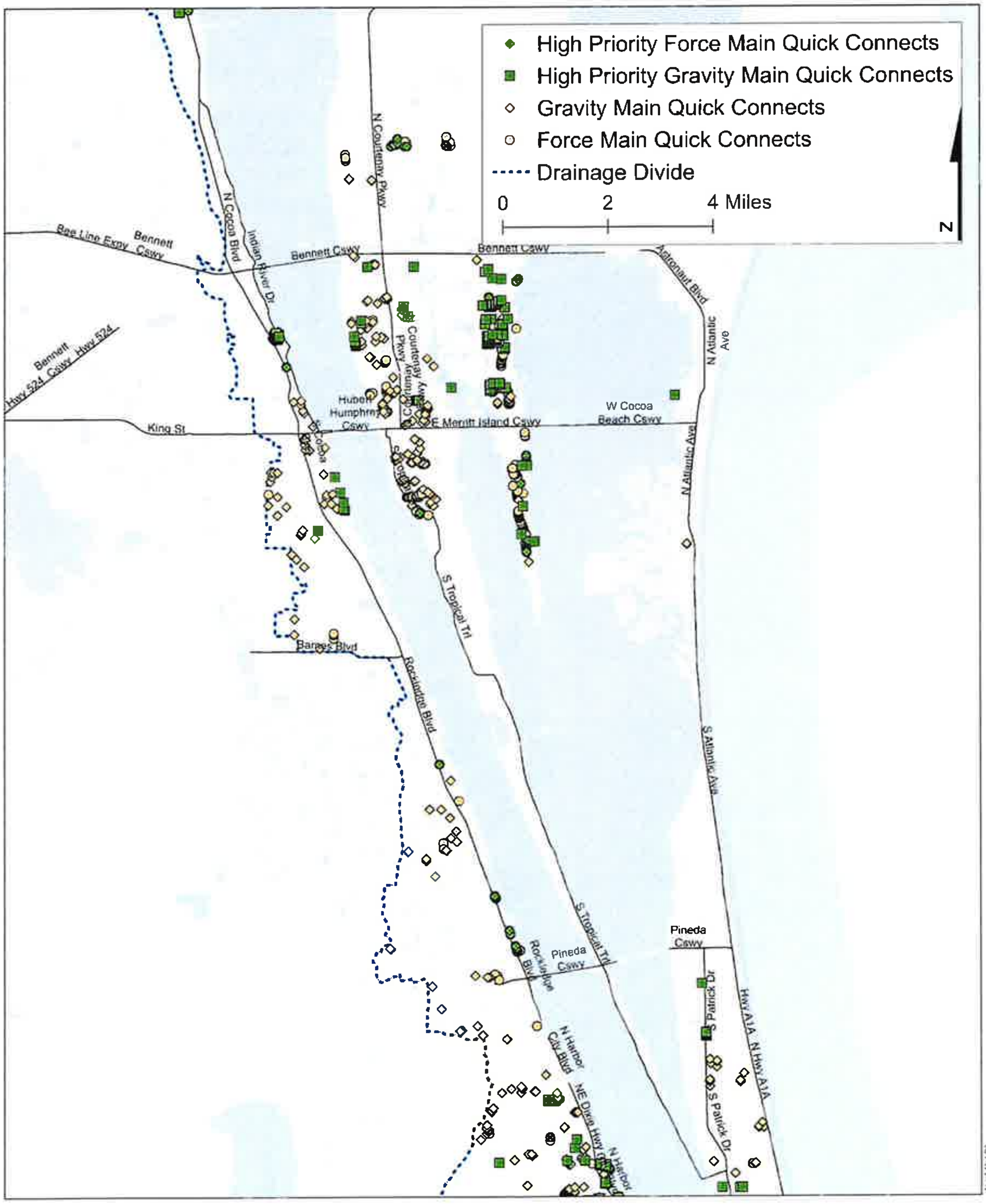


Figure 4-16 Long Description

Figure 4-17. Quick Connection Septic-to-Sewer Locations in South Brevard County

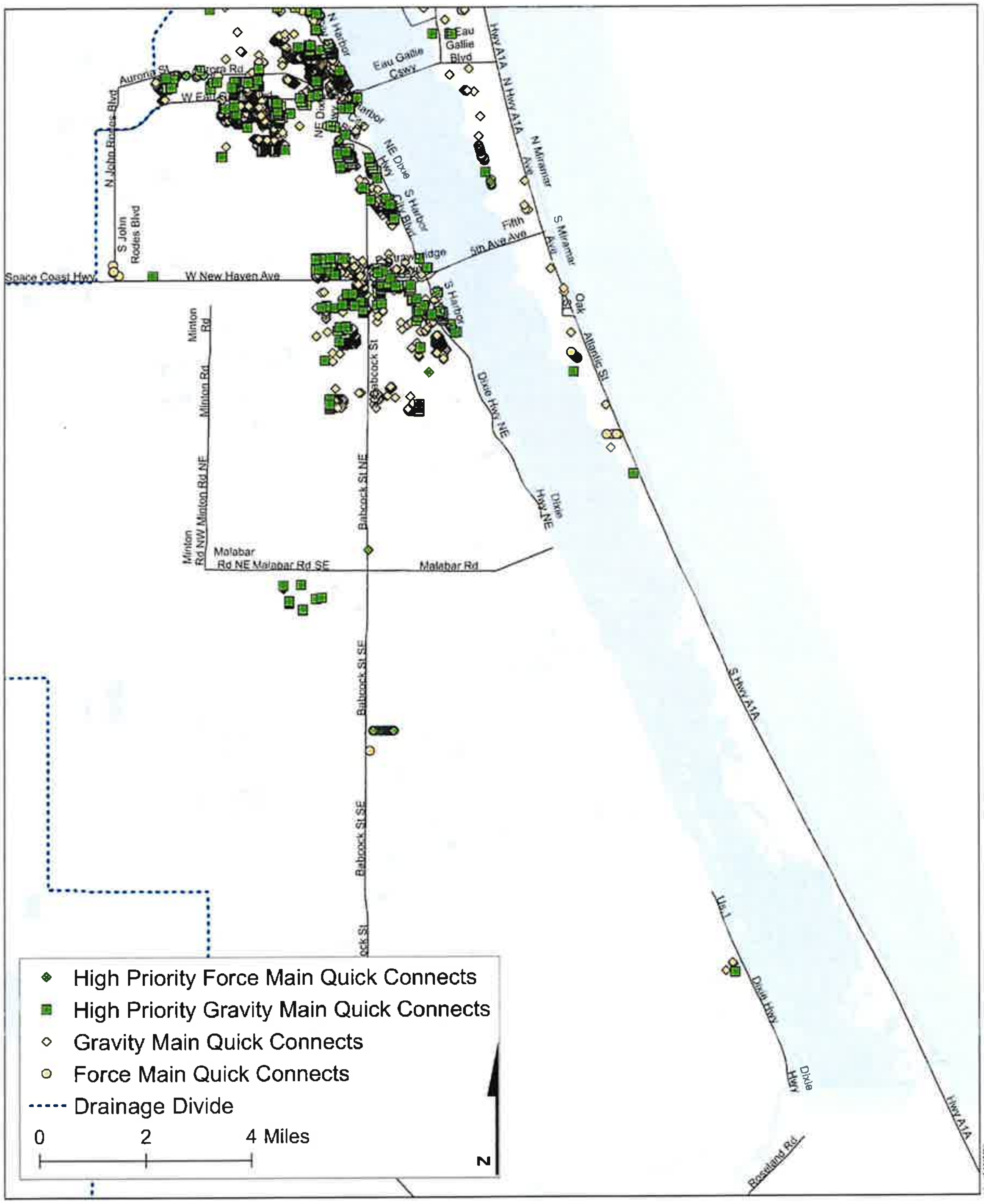


Figure 4-17 Long Description

Septic System Upgrades

In locations where providing sewer service is not feasible due to distance from sewer infrastructure, facility capacity, or insufficient density of high-risk systems, options exist to upgrade the highest risk septic systems to increase the nutrient and pathogen removal efficiency. In addition to nutrient reducing aerobic septic systems, research has been conducted on passive treatment systems, which provide significant treatment efficiencies without monthly sewer fees or highly complex maintenance needs for mechanical features.

In July 2018, the Florida Department of Health adopted new rules that allow for In-Ground Nitrogen-Reducing Biofilters under the drainfield of septic systems (**Figure 4-18**). This passive nitrogen-reducing technology is a result of the Florida Onsite Sewage Nitrogen Reduction Strategies project and the Springs and Aquifer Protection Act. Pilot projects to measure the performance of this new system are currently in progress throughout the state and Brevard County is a participating partner in these initial installations. This passive In-Ground Nitrogen-Reducing Biofilter system is expected to remove 65% of nitrogen from the effluent and cost an extra $4,000 above the typical costs of a conventional septic system. This system requires 51" of soil above the groundwater and, therefore, may not be appropriate in areas with shallow depth to groundwater.

Figure 4-18. Example In-Ground Nitrogen-Reducing Biofilter Septic System

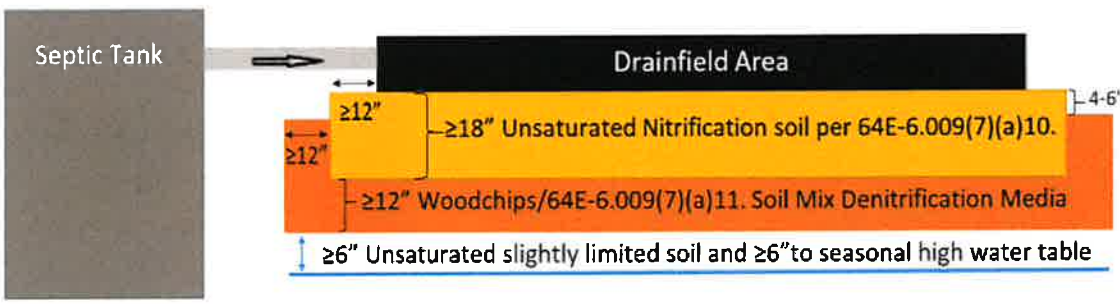


Figure 4-18 Long Description

In 2021, the responsibility of implementing the Florida Statutes and regulations applicable to septic systems moved from the Florida Department of Health to the Florida Department of Environmental Protection. The current ruling by the Florida Department of Environmental Protection only allows woodchips within the denitrification layer of this system; however, other biosorption activated media can also enhance nutrient and bacterial removal before the effluent reaches the drainfield or groundwater, potentially removing more than 65% of nitrogen from effluent, and lasting longer than woodchips. A test of the biosorption activated media removal capacity was conducted at Florida's Showcase Green Envirohome in Indialantic, Florida. This test location is a residential site built with stormwater, graywater, and wastewater treatment in a compact footprint onsite (Wanielista et al., 2011). The media used was Bold & Gold®, which is a patented blend of mineral materials, sand, and clay. For the residential site study, the effluent from the septic tank was evenly divided between an innovative biosorption filter media bed and a conventional drainfield. the study found that the TN and TP removal efficiencies were 76.9% and 73.6%, respectively, for the Bold & Gold® media drainfield system, which was significantly higher than the 45.5% TN removal and 32.1% TP removal from the conventional drainfield.

In 2019, Brevard County entered into an agreement with the Florida Department of Health to test In-Ground Nitrogen Reducing Biofilter septic systems with known nitrogen-reducing media.

The first six septic systems under this agreement were installed in the summer of 2020 using Bold & Gold® wastewater filtration media. The agreement was accepted by the Florida Department of Environmental Protection when the septic system program transferred to them from the Florida Department of Health. To measure effectiveness of the alternative media, nutrient concentration of septic tank effluent was measured before and after passage through a layer of filtration media. Five of the study sites were monitored quarterly from June 2021 to April 2022. A final report showing the nitrogen removal efficiency of the system was completed by Environmental Consulting and Technology, Inc. and submitted to the Florida Department of Environmental Protection in 2023. The report shows that each of the five properties monitored met the 65% TN removal efficiency target before using chloride concentrations to attempt to account for dilution. Environmental Consulting and Technology, Inc. recommended against using chloride concentration in calculations due to the high variability in the chloride concentrations and the significant percentage of samples missing chloride concentration values. Meetings with the Florida Department of Environmental Protection to review data and discuss results are ongoing, through 2024. Following a comprehensive review, the Florida Department of Environmental Protection will make a final decision on approving the use of Bold & Gold® as a denitrification layer in In-Ground Nitrogen-Reducing Biofilter Septic Systems. The agreement also allows for testing of other nitrogen-reducing media as they become available.

In areas where septic systems are in close proximity to a surface waterbody but are not in a location where connection to the sewer system is feasible, adding biosorption activated media to the drainfield or upgrading to the passive nitrogen removing systems could be used to retrofit the existing septic systems. The estimated cost for these retrofits was increased from $16,000 per septic system in the original plan to $18,000 each in the 2019 Update. Using the best available ArcGIS-Based Nitrate Load Estimation Toolkit model, septic system upgrades will be funded on a prorated basis of $1,600 per pound of reduced TN loading to the Indian River Lagoon (IRL), up to a maximum of $20,000 per septic parcel. In 2022, the average cost to install an advanced treatment septic system was $20,845, in 2023 the average cost was $20,517, and in 2024 the average cost was $21,346. Any operations and maintenance costs associated with these upgrades, once installed, will be the responsibility of the owner. To be conservative and to match the Florida Department of Environmental Protection rule, the estimates of the TN reductions that could be achieved are based on an efficiency of 65% removal, which is the average efficiency from the two state studies described above that tested biosorption activated media in the drainfield.

In areas where the In-Ground Nitrogen-Reducing Biofilters system or biosorption activated media retrofits are not appropriate, National Sanitation Foundation 245 certified aerobic treatment units are another alternative. National Sanitation Foundation 245 certification verifies that these advanced septic systems remove at least 50% of nitrogen within the septic tank, although some systems have been shown to remove up to 80% of nitrogen. The drainfield is credited with removing another 15% of nitrogen, which brings the total nitrogen removed by the advanced septic system to 65%. Due to the electrical plumbing requirements of aerobic treatment units, the owner is required to have a maintenance agreement with a septic company and an operating permit from the Florida Department of Environmental Protection. Individually engineered performance-based septic systems, some of which use the septic system effluent for drip irrigation, provide another septic system option for meeting 65% nitrogen load reduction onsite.

Options for distributed onsite sewage treatment systems are approved by the Florida Department of Environmental Protection as miniature sewage treatment plants sized for residential and commercial use. These systems provide additional opportunities to improve nutrient removal from sites where connection to central sewer is not feasible and are eligible options for septic system upgrades as part of this plan. Both the Save Our Indian River Lagoon Project Plan and Springs and Aquifer Protection Act have highlighted the need for other wastewater options that have less impact on surface water and groundwater. Brevard County will continue to vet these options as they become available in Florida.

To prioritize the septic systems for upgrade, the scoring matrix used in the original Save Our Indian River Lagoon Project Plan was replaced in the 2019 Update using ArcGIS-Based Nitrate Load Estimation Toolkit modeling performed during determination of the Nitrogen Reduction Overlay area adopted in the Countywide Septic Ordinance, as noted above.

The septic systems with the highest loading in each sub-lagoon are recommended for retrofit upgrades to reduce the impacts of these septic systems on the waterbodies. The costs and nutrient reductions by sub-lagoon are shown in **Table 4-20**. The locations of the highest priority sites for septic system upgrades are shown in **Figure 4-19**, **Figure 4-20**, and **Figure 4-21**. This upgrade opportunity alone addresses at least 3% of the septic systems in the IRL drainage basin and nearly 10% of the nitrogen load contributed by existing septic systems.

Septic system retrofit upgrades will be funded on a prorated basis of $1,600 per pound of reduced nitrogen loading to the IRL, up to a maximum of $20,000 per septic system parcel. Funding allocation for this grant program is based on the number of highest priority upgrade opportunities within each sub-lagoon as reported in **Table 4-20**. However, recently secured funding from state cost-share grants allows the County to offer these grants to more locations than the priority lots identified for Save Our Indian River Lagoon Trust funds listed in **Table 4-20**. Combined state and local funding is currently offered to all property owners within the IRL watershed (excluding those within a funded septic-to-sewer project area) on a first-come, first-served basis, prorated based on a property's estimated nitrogen loading.

In some circumstances, properties qualified for septic system upgrade funding may be near a sewer line. Quick Connect funds can be used to connect the qualified property to sewer as this option results in a greater reduction in nitrogen, phosphorus, pathogen, and pharmaceutical loading to the lagoon compared to upgrading the septic system.

Table 4-20. Projects for Septic System Upgrades

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus	Plan Funding
Original	51	Banana River Lagoon – at least 100 lots*	Brevard County	Banana	1,934	Average of $931 Maximum of $1,200	Not applicable	Not applicable	$1,800,000
Original	52	North IRL – 586 lots*	Brevard County	North IRL	13,857	Average of $761 Maximum of $1,200	Not applicable	Not applicable	$10,548,000
Original	53	Central IRL – 783 lots*	Brevard County	Central IRL	18,503	Average of $762 Maximum of $1,200	Not applicable	Not applicable	$14,094,000
-	-	***Total***	-	-	***34,294***	***$771 (average)***	***Not applicable***	***Not applicable***	***$26,442,000***

Note: The projects highlighted in green and marked with an asterisk were identified in the original plan.

Figure 4-19. Septic System Upgrades in North Brevard County

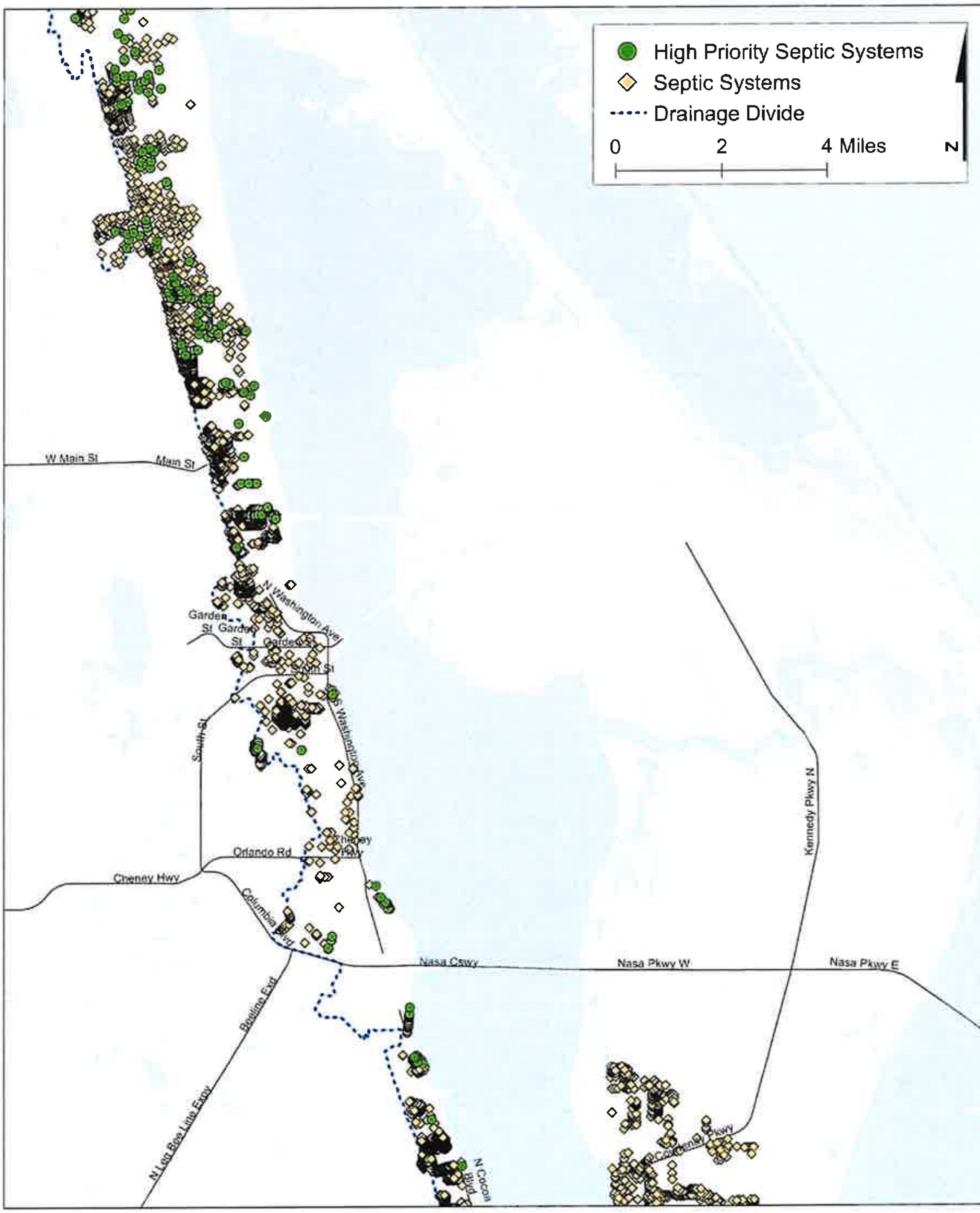


Figure 4-19 Long Description

Figure 4-20. Septic System Upgrades in Central Brevard County

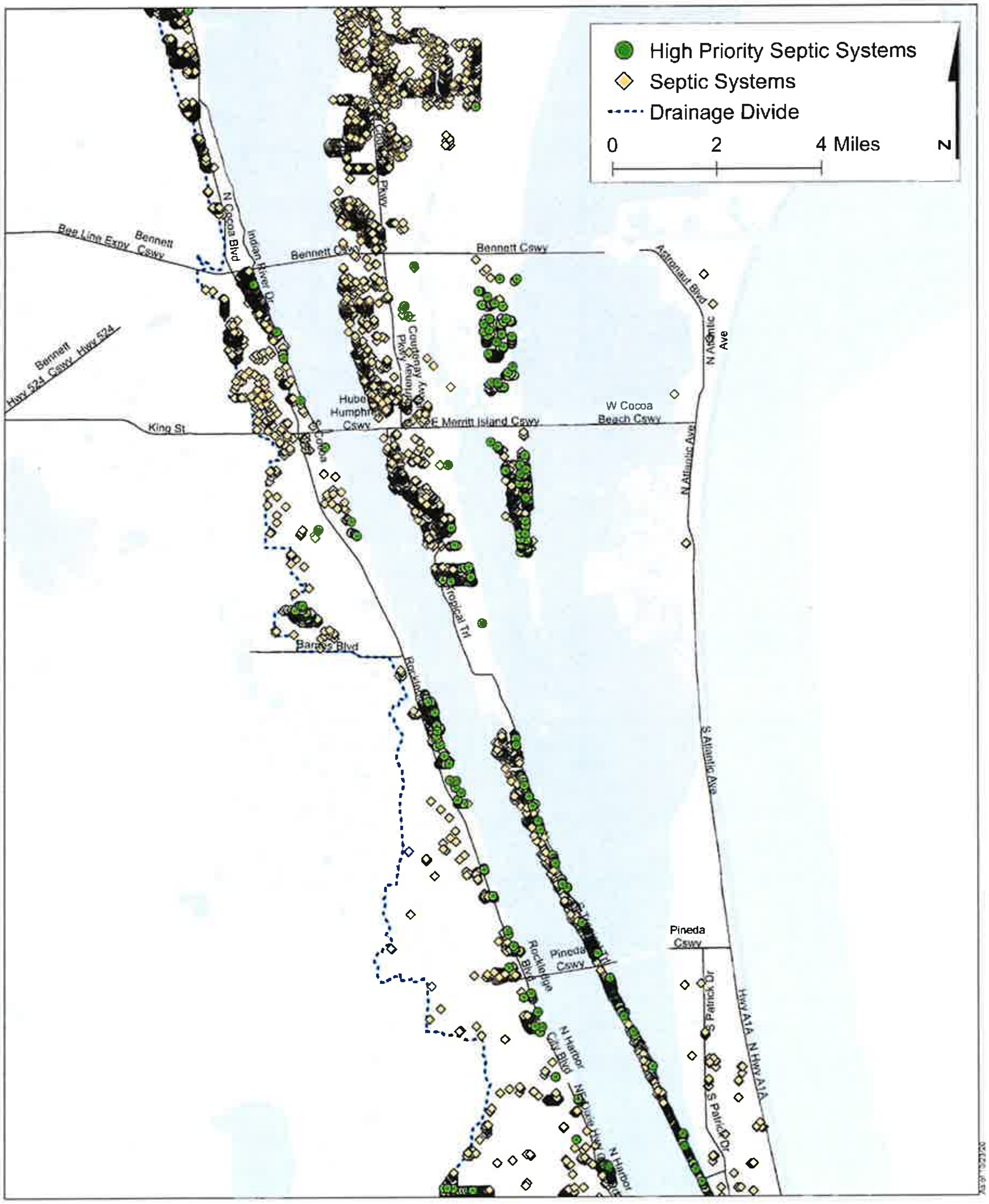


Figure 4-20 Long Description

Figure 4-21. Septic System Upgrades in South Brevard County

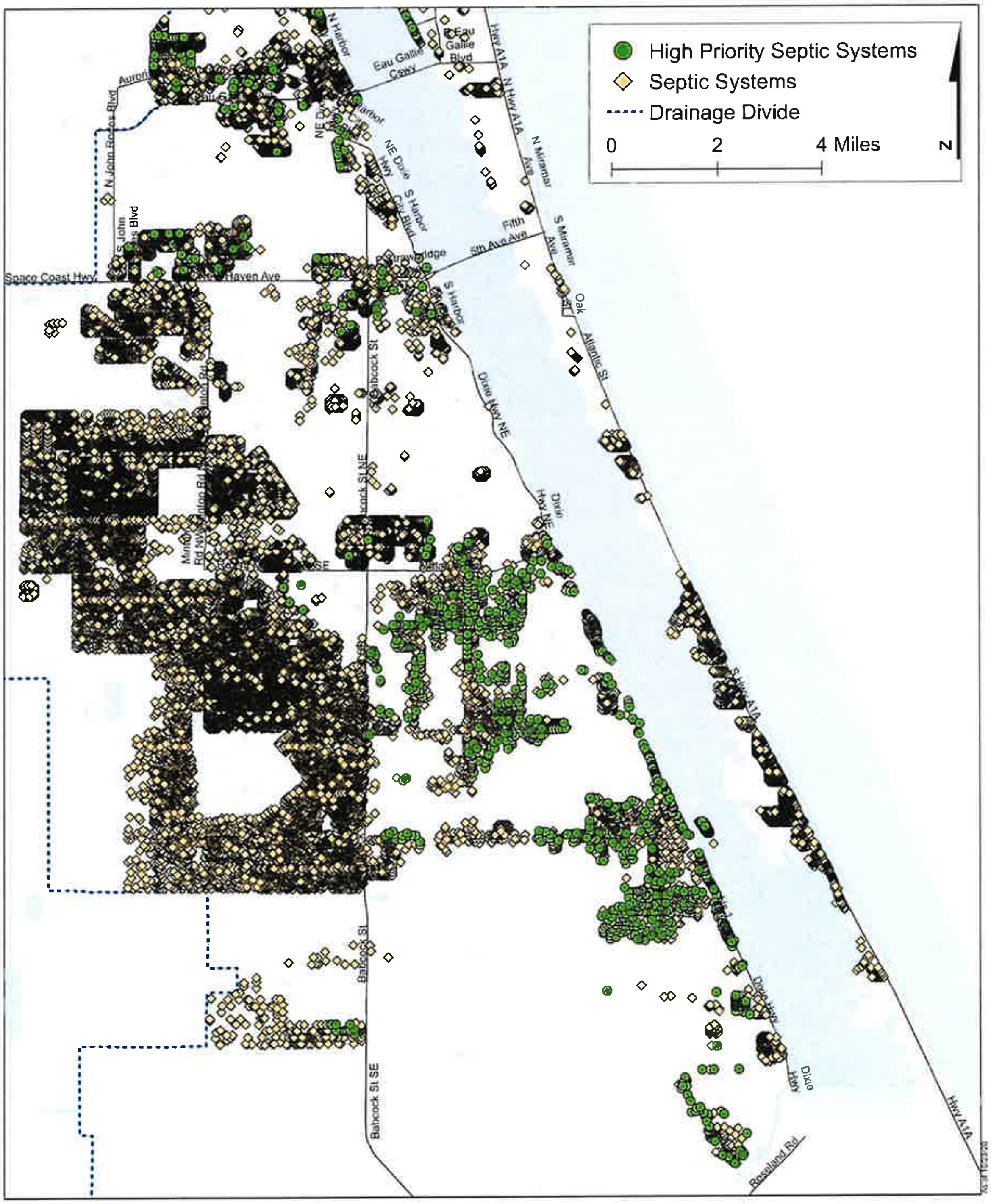


Figure 4-21 Long Description

Reimbursement Incentives for Best Available Nitrogen-Reducing Systems

Starting in 2023, as an incentive for homeowners to consider best available technology, reimbursements are scaled according to the percentage of total nitrogen (TN) reduction reported for the installed technology rather than the minimum standard of 65% achieved by all National Sanitation Foundation 245 certified systems. The National Sanitation Foundation 245 minimum standard is based on a requirement of at least 50% TN reduction in the tank combined with an assumption of 15% more TN removal (30% of the remaining 50%) in the drainfield. Currently, TN removal rates for National Sanitation Foundation 245 certified systems range from a low of 53% to a high of 79% in the tank and 67% to 85% TN reduction when including the drainfield (**Table 4-21**). Furthermore, new technologies with higher removal rates may be added to the list of National Sanitation Foundation 245 systems approved for use in Florida. The list of Florida National Sanitation Foundation 245 Certified Aerobic Treatment Units and their average TN removal efficiencies is available at the following website.

Table 4-21. Total Nitrogen Removal for Different Types of Septic Systems

System Type	Total Nitrogen Removal in Tank*	Total Nitrogen Removal in Drainfield	Total Nitrogen Removal of Total System
Conventional	10%	20%	30%
Basic National Sanitation Foundation 245, 50% Reduction	50%	15%	65%
National Sanitation Foundation 245, 60% Reduction	60%	12%	72%
National Sanitation Foundation 245, 70% Reduction	70%	9%	79%
National Sanitation Foundation 245, 75% Reduction	75%	7.5%	83%
National Sanitation Foundation 245, 80% Reduction	80%	6%	86%

* Total nitrogen removal in the tank is from the average TN reduction published in the National Sanitation Foundation 245 Completion Report for use in Florida.

Table 4-22 is a sample table of scaled eligible reimbursement amounts for systems with different TN reduction capabilities. Each row assumes the home currently has a conventional system that is loading 30 pounds of TN per year to the IRL. This table illustrates how the eligible reimbursement increases for higher performing systems and provides an incentive for homeowners to consider best available technology instead of the least expensive, lowest performing National Sanitation Foundation 245 certified system.

Table 4-22. Example Eligible Reimbursement for Different Septic System Upgrades

System Type	Load to the IRL for a 30-Pounds Per Year Home	Increased Reduction Over Conventional (pounds)	Cost-share Rate per Pound of Reduction	Eligible Reimbursement
Conventional	21.0	0.0	$1,200	$0
Basic National Sanitation Foundation 245, 50% Reduction	10.5	10.5	$1,200	$12,600
National Sanitation Foundation 245, 60% Reduction	8.4	12.6	$1,200	$15,120
National Sanitation Foundation 245, 70% Reduction	6.3	14.7	$1,200	$17,640
National Sanitation Foundation 245, 75% Reduction	5.3	15.8	$1,200	$18,900
National Sanitation Foundation 245, 80% Reduction	4.2	16.8	$1,200	$20,160 ($20,000 cap)

Due to basic National Sanitation Foundation 245 systems achieving 50% load reduction in the tank, scaling the load reduction and eligible reimbursement amount up from the basic eligible reimbursement is a simple calculation. The Scaled Reimbursement Eligibility is calculated by doubling the percent TN removal in the tank for the chosen system multiplied by the Eligible Reimbursement Amount of the Basic National Sanitation Foundation 245 system. The Eligible Reimbursement Amount of a Basic National Sanitation Foundation 245 system is posted online for each home in the Septic Upgrade Story Map. For example, to calculate the Scaled Reimbursement Eligibility of a system that reduces TN by 70% in the tank, the eligible amount for a basic National Sanitation Foundation 245 system is multiplied by 140%.

In 2022, retroactive reimbursement payments were approved for Brevard County property owners who upgraded existing conventional septic systems to advanced treatment septic systems before applying for grant funds. These retroactive reimbursements are capped at $6,000 and the upgrade must meet the following conditions:

1. Upgrade must have been voluntary, not required by local or state code.
2. Upgrade must have followed all Save Our Indian River Lagoon Program guidelines other than grant approval prior to construction.
3. Upgrade must have been properly permitted and certified by the Florida Department of Health/Florida Department of Environmental Protection.
4. Operation and maintenance permits must be current, with no gaps in the owner's compliance.
5. Retroactive payment amount shall not exceed the sum of costs documented with proof of payment.
6. Work must have been completed after program inception.
7. Work had to be completed before June 1, 2022 (when the last notifications were mailed to owners of priority sites).
8. Eligible funding is pro-rated at $1200 per pound of TN based on septic loading estimated in the 2018 county-wide septic system loading model for conventional septic systems at the site.
9. Retroactive payment amount shall be up to $6,000, representing the typical difference in cost between conventional ($12,000) and advanced systems ($18,000) and equal to the typical cost-share of $1,200 per pound times 5 pounds of TN load reduction.
10. The sum of retroactive payments to be processed by staff shall not exceed $100,000 without specific authorization by the County Commission.

4.1.7. Stormwater Treatment

Stormwater runoff contributes 33.6% of the external TN loading and 43.4% of the external TP loading to the Indian River Lagoon annually.

Stormwater runoff from urban areas carries pollutants that affect surface waters and groundwater. These pollutants include nutrients, pesticides, pet waste, oil and grease, debris and litter, and sediments. In Brevard County (County), more than 1,500 stormwater outfalls go to the Indian River Lagoon (IRL).

A variety of best management practices can be used to capture and treat stormwater to remove or reduce these pollutants before the stormwater runoff reaches a waterbody or infiltrates to the groundwater. Potential stormwater best management practices that could help restore the IRL include:

Traditional best management practices. These are the typical practices used to treat stormwater runoff and include wet detention ponds, retention, swales, dry detention, baffle boxes, stormwater reuse, alum injection, street sweeping, catch basin inserts/inlet filters, and floating islands/managed aquatic plant systems. Descriptions of these traditional best management practices and expected total nitrogen (TN) and total phosphorus (TP) efficiencies are shown in **Table 4-23**.

Low impact development/green infrastructure. These practices use natural stormwater management techniques to minimize runoff and help prevent pollutants from getting into stormwater runoff. These best management practices address the pollutants at the source so implementing them can help decrease the size of traditional retention and detention basins and can be less costly than traditional best management practices (University of Florida Institute of Food and Agricultural Sciences, 2016). Descriptions of low impact development and green infrastructure best management practices and estimated efficiencies are shown in **Table 4-24**.

Denitrification best management practices. These practices use a soil media, known as biosorption activated media, to increase the amount of denitrification and absorb more phosphorus, which increases the amount of TN and TP removed. Biosorption activated media includes mixes of soil, sawdust, zeolites, tire crumb, vegetation, sulfur, and spodosols. Biosorption activated media comes in different material blends with varying lifecycles depending on the materials used and the conditions where the media is applied. The media may need to be replaced periodically according to the manufacturer's specifications or monitoring that shows reductions in nutrient removal capacity. Additional details about denitrification best management practices are included below.

Best management practices to reduce baseflow intrusion. These practices are modifications to existing best management practices that help reduce intrusion of captured groundwater baseflow into stormwater drainage systems. These best management practices include backfilling canals so that they do not cut through the baseflow, modifying canal cross-sections to maintain the same storage capacity while limiting the depth, installing weirs to control the water levels in the best management practice or adding a cutoff wall to prevent movement into the baseflow.

Re-diversion to the St. Johns River. Portions of the current IRL watershed historically flowed towards the St. Johns River. By re-diverting these flows back to the St. Johns River, the excess stormwater runoff, as well as the additional freshwater inputs, to the IRL would be removed. The re-diversion projects would include a treatment component so that the runoff is treated before being discharged to the St. Johns River. The County has re-diverted more than 400 acres in the Crane Creek basin and partnered with the St. Johns River Water Management District to increase re-diversion from the Melbourne-Tillman Water Control District canal system and Crane Creek/M-1 Canal.

Table 4-23. Traditional Stormwater Best Management Practices with TN and TP Removal Efficiencies

Best Management Practice	Definition	Total Nitrogen Removal Efficiency	Total Phosphorus Removal Efficiency	Source
Wet detention ponds	Permanent wet ponds that are designed to slowly release a portion of the collected stormwater runoff through an outlet structure. Recommended for sites with moderate to high water table conditions. Provide removal of both dissolved and suspended pollutants through physical, chemical, and biological processes.	8%-44%	45%-75%	Florida Department of Environmental Protection et al., 2010
Off-line retention	Recessed area that is designed to store and retain a defined quantity of runoff, allowing it to percolate through permeable soils into the groundwater aquifer. Runoff in excess of the specified volume of stormwater does not flow into the retention system storing the initial volume of stormwater.	40%-84%	40%-84%	Harper et al., 2007
On-line retention and swales	Recessed area that is designed to store and retain a defined quantity of runoff, allowing it to percolate through permeable soils into the groundwater aquifer. Runoff in excess of the specified volume of stormwater does flow through the retention system that stores the initial volume of stormwater.	30%-74%	30%-74%	Harper et al., 2007
Dry detention	Designed to store a defined quantity of runoff and slowly release it through an outlet structure to adjacent surface waters. After drawdown of the stored runoff is completed, the storage basin does not hold any water. Used in areas where the soil infiltration properties or seasonal high-water table elevation will not allow the use of a retention basin.	10%	10%	Harper et al., 2007
2nd generation baffle box	Box chambers with partitions connected to a storm drain. Water flows into the first section of the box where most pollutants settle out. Water overflows into the next section to allow further settling. The water ultimately overflows to the stormwater pipe. Floating trays capture leaves, grass clippings, and litter to prevent them from dissolving in the stormwater.	19.05%	15.5%	GPI, 2010

Best Management Practice	Definition	Total Nitrogen Removal Efficiency	Total Phosphorus Removal Efficiency	Source
2nd generation baffle box plus media filter (3rd generation baffle box)	Box chambers with partitions connected to a storm drain. Water flows into the first section of the box where most pollutants settle out. Water overflows into the next section to allow further settling. The water ultimately overflows to the stormwater pipe. Floating trays capture leaves, grass clippings, and litter to prevent them from dissolving in the stormwater. Inclusion of the media filter enhances the nutrient removal of the stormwater.	BMP Trains model	BMP Trains model	City of Casselberry, 2014
Stormwater reuse	Reuse of stormwater from wet ponds for irrigation. Compare volume going to reuse to total volume of annual runoff to pond.	Amount of water not discharged annually	Amount of water not discharged annually	Florida Department of Environmental Protection et al., 2018
Alum injection	Chemical treatment systems that inject aluminum sulfate into stormwater systems to cause coagulation of pollutants.	50%	90%	Harper et al., 2007
Street sweeping	Cleaning of pavement surfaces to remove sediments, debris, and trash deposited by vehicle traffic. Prevents these materials from being introduced into the stormwater system.	Total nitrogen content in dry weight of material collected annually	Total phosphorus content in dry weight of material collected annually	University of Florida, 2011
Catch basin inserts/inlet filters	Devices installed in storm drain inlets to provide water quality treatment through filtration of organic debris and litter, settling of sediment, and adsorption of hydrocarbon by replaceable filters.	Total nitrogen content in dry weight of material collected annually	Total phosphorus content in dry weight of material collected annually	University of Florida, 2011
Managed Aquatic Plant System	Aquatic plant-based best management practices that remove nutrients through a variety of processes related to nutrient uptake, transformation, and microbial activities.	10% with 5% pond coverage	10% with 5% pond coverage	Florida Department of Environmental Protection, 2018

Best Management Practice	Definition	Total Nitrogen Removal Efficiency	Total Phosphorus Removal Efficiency	Source
Managed Aquatic Plant System Plus Pond Circulation	Circulation in stormwater ponds enhances mixing of the water column, which increases the nutrient uptake of Managed Aquatic Plant System by bringing nutrients up from the bottom layer of the pond to the root zone of the floating plants. Two pilot studies conducted in Brevard County, using the SolarBee Circulator (IXOM Watercare SB10000), showed an increase of total nitrogen and total phosphorus removals compared to standalone Managed Aquatic Plant System. The cost share eligibility is based on the average removal efficiencies between the two pilot studies. The nutrient removal efficiency is for the combined benefit of Managed Aquatic Plant System plus enhanced Pond Circulation	11%	11%	Brevard County SolarBee Pilot Study presentation, March 2024 Citizen Oversight Committee Meeting
Pond Circulation (added to a pond that separately received Save Our Indian River Lagoon cost-share for Managed Aquatic Plant System)	Circulation in stormwater ponds enhances mixing of the water column, which increases the nutrient uptake of Managed Aquatic Plant System by bringing nutrients up from the bottom layer of the pond to the root zone of the floating plants. Two pilot studies conducted in Brevard County, using the SolarBee Circulator (IXOM Watercare SB10000), showed an increase of Total Nitrogen and Total Phosphorus removals compared to standalone Managed Aquatic Plant System. The cost share eligibility is based on the average removal efficiencies between the two pilot studies. The nutrient removal efficiency is for the benefit of adding circulation to a pond with existing Managed Aquatic Plant System.	1%	1%	Brevard County SolarBee Pilot Study presentation, March 2024 Citizen Oversight Committee Meeting

Table 4-24. Low Impact Development and Green Infrastructure Best Management Practices and TN and TP Removal Efficiencies

Best Management Practice	Definition	Total Nitrogen Removal Efficiency	Total Phosphorus Removal Efficiency	Source
Permeable pavement	Hard, yet penetrable, surfaces reduce runoff by allowing water to move through them into groundwater below (University of Florida Institute of Food and Agricultural Sciences, 2016).	30%-74%	30%-74%	Harper et al., 2007

Best Management Practice	Definition	Total Nitrogen Removal Efficiency	Total Phosphorus Removal Efficiency	Source
Bioswales	An alternative to curb and gutter systems, bioswales convey water, slow runoff, and promote infiltration. Swales may be installed along residential streets, highways, or parking lot medians (University of Florida Institute of Food and Agricultural Sciences, 2016). Must be designed for conveyance, greater in length than width, have shallow slopes, and include proper landscaping.	38%-89%	9%-80%	Florida Department of Environmental Protection, 2014
Green roofs	These systems can significantly reduce the rate and quantity of runoff from a roof and provide buildings with thermal insulation and improved aesthetics (University of Florida Institute of Food and Agricultural Sciences, 2016). Retention best management practice covered with growing media and vegetation that enables rainfall infiltration and evapotranspiration of stored water. Including a cistern capture, retain, and reuse water adds to effectiveness.	45% (without cistern) 60%-85% (with cistern)	Not applicable	Florida Department of Environmental Protection, 2014
Bioretention basins/rain gardens	Small, vegetated depressions in the landscape collect and filter stormwater into the soil (University of Florida Institute of Food and Agricultural Sciences, 2016). Constructed adjacent to roof runoff and impervious areas.	30%-50%	30%-90%	Florida Department of Environmental Protection, 2014
Tree boxes	Bioretention systems with vertical concrete walls designed to collect/retain specified volume of stormwater runoff from sidewalks, parking lots and/or streets. Consists of a container filled with a soil mixture, a mulch layer, under-drain system, and shrub or tree (Florida Department of Environmental Protection, 2014).	38%-65%	50%-80%	Florida Department of Environmental Protection, 2014

Multiple studies found that treating dry season baseflow to the IRL is particularly important for controlling blooms and protecting seagrass; therefore, ditch denitrification is a preferred best management practice. Biosorption activated media can be added in existing or new best management practices to improve the nutrient removal efficiency. The removal efficiencies of using biosorption activated media in various stormwater treatment projects (Wanielista, 2015) are summarized in **Table 4-25**. While the efficiencies in **Table 4-25** are only for Bold & Gold®, other types of biosorption activated media may be used in a project, if Florida-specific information is available on the removal efficiencies for that media.

Table 4-25. TN and TP Removal Efficiencies for Biosorption Activated Media

Location in Best Management Practice Treatment Train	Material	Total Nitrogen Removal Efficiency	Total Phosphorus Removal Efficiency
Bold & Gold® as a first practice, example up-flow filter in baffle box and a constructed wetland	Expanded clay, tire chips	55%	65%
Bold & Gold® in up-flow filter at wet pond and dry basin outflow	Organics, tire chips, expanded clay	45%	45%
Bold & Gold® in inter-event flow using up-flow filter at wet pond and down-flow filter at dry basin	expanded clay, tire chips	25%	25%
Bold & Gold® down-flow filters 12-inch depth at wet pond or dry basin pervious pavement, tree well, rain garden, swale, and strips	Clay, tire crumb, sand and topsoil	60%	90%

Note: From Wanielista, 2015

The County's proposed total maximum daily loads include two components: (1) a total maximum daily load for the five-month period (January–May) that is critical for seagrass growth, and (2) a total maximum daily load for the remaining seven months of the year to avoid algal blooms and protect healthy dissolved oxygen levels. In 2019, Brevard County updated the estimates for nutrient loading entering the lagoon through each stormwater ditch and outfall. The update incorporated more recent land use data, more recent rainfall and evapotranspiration data, and improved stormwater infrastructure mapping and topography. More than 2,000 hydrologically distinct catchment basin areas are within the IRL watershed countywide. These connect to the IRL through more than 1,500 stormwater ditches and outfall structures. To maximize seagrass response to stormwater treatment, these new loading estimates for catchment basins were prioritized based on the amount of nutrients migrating into the stormwater system as groundwater baseflow during a five-month season found to be most critical to annual seagrass expansion or loss.

The stormwater project benefits were estimated, as follows, to ensure both components of the total maximum daily load are adequately addressed. The five-month total maximum daily load covers the local dry season when minimal rainfall and stormwater runoff occur; therefore, the benefits of stormwater biosorption activated media projects during this period were based only on January–May baseflow loading estimates from the Spatial Watershed Iterative Loading model. The estimated project treatment efficiencies used for January to May baseflow only are 55% for TN and 65% for TP. To estimate annual load reduction benefits, the annual baseflow and stormwater loading estimates from the Spatial Watershed Iterative Loading model were used with a project efficiency of 45% for TN and 45% for TP. The estimated TN and TP reductions in pounds per year accomplished by using biosorption activated media upstream of these priority outfalls are summarized in **Table 4-26**. The locations of the basins to be treated are shown in **Figure 4-22**, **Figure 4-23**, and **Figure 4-24**. Projects approved as part of an annual update to the plan are also included in **Table 4-26**.

Table 4-26. Projects for Stormwater Treatment

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
Original	-	951	Brevard County	Banana	1,562	$241	154	$2,446	$376,697
Original	-	984	Brevard County	Banana	1,413	$260	143	$2,572	$367,856
Original	-	CCB-E	Brevard County	Banana	1,335	$269	210	$1,709	$358,816
Original	-	1002	Brevard County	Banana	903	$305	126	$2,185	$275,367
Original	-	979A	Brevard County	Banana	1,162	$308	173	$2,072	$358,417
Original	-	CCB-G	Brevard County	Banana	956	$314	147	$2,041	$300,044
Original	-	1037	Brevard County	Banana	708	$319	97	$2,330	$225,983
Original	-	CCB-B	Brevard County	Banana	760	$340	111	$2,330	$258,615
Original	-	CC-B2A	Brevard County	Banana	774	$343	125	$2,125	$265,590
Original	-	1222	Brevard County	Banana	931	$350	135	$2,412	$325,634
Original	-	1024	Brevard County	Banana	668	$358	104	$2,302	$239,360
Original	-	1172	Brevard County	Banana	919	$370	133	$2,555	$339,784
Original	-	CCB-I	Brevard County	Banana	1,337	$372	188	$2,647	$497,711
Original	-	1067	Brevard County	Banana	811	$374	114	$2,657	$302,940
Original	-	CCB-D	Brevard County	Banana	628	$378	103	$2,302	$237,072
Original	-	CCB-C	Brevard County	Banana	525	$380	83	$2,406	$199,669
Original	-	CCB-H	Brevard County	Banana	629	$394	103	$2,404	$247,633
Original	-	1309	Brevard County	Banana	593	$398	90	$2,619	$235,737
Original	-	997	Brevard County	Banana	545	$405	83	$2,657	$220,513
Original	-	1037A	Brevard County	Banana	540	$410	80	$2,770	$221,616
Original	-	1187	Brevard County	Banana	644	$415	85	$3,141	$266,956
Original	-	940B	Brevard County	Banana	523	$444	75	$3,097	$232,248
Original	-	CC-B4B	Brevard County	Banana	411	$469	67	$2,874	$192,554
Original	-	SB-SH-2	Brevard County	Banana	561	$475	76	$3,505	$266,356
Original	-	CC-B10A	Brevard County	Banana	364	$489	58	$3,071	$178,112
Original	-	SB-SH-1	Brevard County	Banana	385	$508	67	$2,917	$195,424
Original	-	1071A	Brevard County	Banana	354	$509	39	$4,618	$180,103
Original	-	1039A	Brevard County	Banana	354	$516	47	$3,885	$182,587
Original	-	1071	Brevard County	Banana	439	$520	60	$3,807	$228,417
Original	-	1308	Brevard County	Banana	366	$521	56	$3,407	$190,771
Original	-	961	Brevard County	Banana	404	$522	52	$4,055	$210,872
Original	-	SB-SD-2	Brevard County	Banana	359	$531	54	$3,529	$190,553
Original	-	CCB-A	Brevard County	Banana	357	$538	51	$3,766	$192,089
Original	-	CC-B1	Brevard County	Banana	337	$548	55	$3,360	$184,808
Original	-	1327	Brevard County	Banana	317	$563	47	$3,794	$178,321
Original	-	934	Brevard County	Banana	263	$574	29	$5,205	$150,955
Original	-	1039	Brevard County	Banana	366	$575	47	$4,474	$210,291

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
Original	-	1317	Brevard County	Banana	301	$579	45	$3,874	$174,332
Original	-	1120	Brevard County	Banana	301	$586	46	$3,834	$176,377
Original	-	IHB-13	Brevard County	Banana	299	$592	44	$4,022	$176,949
Original	-	1062	Brevard County	Banana	291	$595	32	$5,411	$173,162
Original	-	979C	Brevard County	Banana	292	$600	43	$4,075	$175,219
Original	-	1175	Brevard County	Banana	274	$601	28	$5,878	$164,593
Original	-	1125	Brevard County	Banana	279	$606	43	$3,933	$169,115
Original	-	1183	Brevard County	Banana	268	$629	38	$4,437	$168,588
Original	-	970E	Brevard County	Banana	263	$640	39	$4,318	$168,395
Original	-	1310	Brevard County	Banana	258	$648	41	$4,078	$167,183
Original	-	944A	Brevard County	Banana	286	$666	40	$4,763	$190,538
Original	-	SB-D-1	Brevard County	Banana	248	$673	36	$4,634	$166,826
Original	-	CC-B11	Brevard County	Banana	243	$678	30	$5,491	$164,728
Original	-	975	Brevard County	Banana	239	$688	35	$4,699	$164,460
Original	-	1010	Brevard County	Banana	219	$700	30	$5,110	$153,298
Original	-	1223	Brevard County	Banana	225	$715	33	$4,877	$160,925
Original	-	1223A	Brevard County	Banana	202	$754	32	$4,757	$152,227
Original	-	SB-D-6	Brevard County	Banana	211	$755	31	$5,136	$159,219
Original	-	970C	Brevard County	Banana	203	$761	29	$5,330	$154,556
Original	-	IHB-FDOT	Brevard County	Banana	203	$762	30	$5,155	$154,663
Original	-	997A	Brevard County	Banana	187	$776	30	$4,835	$145,047
Original	-	IHB-79	Brevard County	Banana	188	$782	35	$4,201	$147,019
Original	-	SB-D-4	Brevard County	Banana	190	$814	28	$5,521	$154,601
Original	-	CC-B13A	Brevard County	Banana	183	$826	29	$5,215	$151,223
Original	-	969	Brevard County	Banana	194	$831	28	$5,761	$161,298
Original	-	1000	Brevard County	Banana	195	$831	28	$5,784	$161,958
Original	-	1302	Brevard County	Banana	210	$833	30	$5,831	$174,922
Original	-	SB-N-1	Brevard County	Banana	205	$851	28	$6,228	$174,374
Original	-	CC-B5A	Brevard County	Banana	180	$858	27	$5,721	$154,474
Original	-	958	Brevard County	Banana	181	$858	27	$5,753	$155,326
Original	-	IHB-33	Brevard County	Banana	197	$860	29	$5,843	$169,450
Original	-	1250	Brevard County	Banana	184	$865	26	$6,119	$159,084
Original	-	770A	Brevard County	Banana	171	$877	25	$5,999	$149,966
Original	-	SB-D-2	Brevard County	Banana	177	$909	25	$6,439	$160,980
Original	-	1314	Brevard County	Banana	162	$917	24	$6,192	$148,609
Original	-	SB-D-3	Brevard County	Banana	162	$920	24	$6,209	$149,014
Original	-	IHB-7A	Brevard County	Banana	156	$924	28	$5,146	$144,089
Original	-	1308A	Brevard County	Banana	158	$932	23	$6,403	$147,279

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
Original	-	IHB-6	Brevard County	Banana	159	$934	24	$6,185	$148,439
Original	-	955	Brevard County	Banana	167	$944	25	$6,308	$157,691
Original	-	1270	Brevard County	Banana	156	$953	22	$6,755	$148,600
Original	-	1303	Brevard County	Banana	154	$954	22	$6,677	$146,900
Original	-	969A	Brevard County	Banana	152	$968	22	$6,690	$147,180
Original	-	1152	Brevard County	Banana	159	$977	19	$8,173	$155,279
Original	-	964	Brevard County	Banana	143	$977	19	$7,352	$139,679
Original	-	1315A	Brevard County	Banana	148	$990	22	$6,657	$146,448
Original	-	1038	Brevard County	Banana	143	$1,003	21	$6,830	$143,423
Original	-	SB-SI-1	Brevard County	Banana	159	$1,017	21	$7,698	$161,656
Original	-	990	Brevard County	Banana	143	$1,047	20	$7,489	$149,788
Original	-	1372	Brevard County	Banana	135	$1,048	20	$7,073	$141,464
Original	-	IHB-48A	Brevard County	Banana	129	$1,081	23	$6,062	$139,432
Original	-	IHB-52	Brevard County	Banana	144	$1,083	20	$7,801	$156,016
Original	-	TV-Addison Canal Basin	Brevard County	North IRL	7,070	$251	914	$1,944	$1,776,359
Original	-	16	Brevard County	North IRL	1,095	$258	176	$1,603	$282,132
Original	-	1419	Brevard County	North IRL	1,735	$264	249	$1,841	$458,458
Original	-	973	Brevard County	North IRL	2,134	$264	307	$1,836	$563,514
Original	-	1430	Brevard County	North IRL	2,361	$269	347	$1,831	$635,330
Original	-	1399	Brevard County	North IRL	1,499	$271	232	$1,751	$406,207
Original	-	SJR-90	Brevard County	North IRL	3,021	$272	438	$1,878	$822,676
Original	-	CO-2QA	Brevard County	North IRL	1,354	$275	199	$1,872	$372,458
Original	-	895	Brevard County	North IRL	1,130	$278	135	$2,330	$314,596
Original	-	TV-South Marine Basin	Brevard County	North IRL	1,252	$279	176	$1,984	$349,141
Original	-	RL-2A	Brevard County	North IRL	1,715	$280	246	$1,949	$479,417
Original	-	RL-3I	Brevard County	North IRL	3,009	$283	423	$2,015	$852,434
Original	-	RL-3B	Brevard County	North IRL	2,158	$283	306	$1,998	$611,433
Original	-	TV-Main Street Basin	Brevard County	North IRL	1,298	$284	189	$1,950	$368,643
Original	-	94	Brevard County	North IRL	1,141	$288	178	$1,844	$328,190
Original	-	992	Brevard County	North IRL	1,241	$290	186	$1,938	$360,409
Original	-	19	Brevard County	North IRL	818	$291	128	$1,860	$238,037
Original	-	1377	Brevard County	North IRL	1,324	$293	200	$1,940	$388,003
Original	-	TV-Parrish Basin	Brevard County	North IRL	1,070	$296	163	$1,940	$316,191
Original	-	865	Brevard County	North IRL	879	$296	109	$2,384	$259,812
Original	-	TV-Sycamore Basin	Brevard County	North IRL	1,246	$298	184	$2,020	$371,746
Original	-	1392	Brevard County	North IRL	1,050	$298	159	$1,965	$312,440

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
Original	-	72	Brevard County	North IRL	1,039	$299	150	$2,073	$310,968
Original	-	SJR-57	Brevard County	North IRL	1,740	$305	226	$2,346	$530,232
Original	-	833	Brevard County	North IRL	1,083	$307	183	$1,819	$332,889
Original	-	901	Brevard County	North IRL	1,895	$308	233	$2,505	$583,778
Original	-	1256	Brevard County	North IRL	1,580	$310	236	$2,079	$490,539
Original	-	CO-2I	Brevard County	North IRL	979	$311	145	$2,096	$303,988
Original	-	824	Brevard County	North IRL	721	$311	104	$2,158	$224,416
Original	-	1368	Brevard County	North IRL	1,125	$312	162	$2,166	$350,856
Original	-	1464	Brevard County	North IRL	362	$236	29	$2,943	$85,335
Original	-	1409	Brevard County	North IRL	1,375	$314	209	$2,067	$431,930
Original	-	829	Brevard County	North IRL	812	$323	161	$1,627	$262,007
Original	-	1263	Brevard County	North IRL	640	$311	92	$2,160	$198,727
Original	-	835	Brevard County	North IRL	1,134	$325	159	$2,318	$368,604
Original	-	6	Brevard County	North IRL	716	$326	84	$2,775	$233,058
Original	-	1078	Brevard County	North IRL	1,017	$328	150	$2,226	$333,896
Original	-	1342	Brevard County	North IRL	1,034	$332	157	$2,188	$343,533
Original	-	TV-Royal Palm Basin	Brevard County	North IRL	878	$332	127	$2,298	$291,899
Original	-	831	Brevard County	North IRL	733	$332	105	$2,320	$243,650
Original	-	1324	Brevard County	North IRL	1,373	$335	179	$2,568	$459,675
Original	-	RL-3A	Brevard County	North IRL	796	$338	113	$2,384	$269,351
Original	-	1331	Brevard County	North IRL	839	$341	131	$2,181	$285,723
Original	-	112	Brevard County	North IRL	734	$341	108	$2,314	$249,931
Original	-	105	Brevard County	North IRL	749	$342	108	$2,372	$256,160
Original	-	1016	Brevard County	North IRL	686	$342	97	$2,416	$234,350
Original	-	838	Brevard County	North IRL	802	$342	117	$2,344	$274,232
Original	-	827	Brevard County	North IRL	792	$344	107	$2,546	$272,377
Original	-	1401	Brevard County	North IRL	881	$345	127	$2,392	$303,736
Original	-	894	Brevard County	North IRL	845	$346	125	$2,342	$292,712
Original	-	159	Brevard County	North IRL	647	$348	118	$1,909	$225,280
Original	-	RL-3E	Brevard County	North IRL	960	$353	138	$2,452	$338,403
Original	-	1389	Brevard County	North IRL	736	$354	111	$2,347	$260,471
Original	-	980	Brevard County	North IRL	816	$354	119	$2,429	$289,106
Original	-	CO-2M	Brevard County	North IRL	867	$362	119	$2,638	$313,864
Original	-	95	Brevard County	North IRL	683	$364	99	$2,514	$248,927
Original	-	46	Brevard County	North IRL	635	$364	100	$2,310	$231,043
Original	-	796	Brevard County	North IRL	726	$365	106	$2,501	$265,089
Original	-	1367	Brevard County	North IRL	850	$366	128	$2,433	$311,432

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
Original	-	TV-Ponce De Leon Basin-B	Brevard County	North IRL	603	$366	86	$2,565	$220,626
Original	-	1318	Brevard County	North IRL	902	$367	125	$2,647	$330,841
Original	-	TV-SR 50 Basin	Brevard County	North IRL	576	$373	86	$2,499	$214,896
Original	-	RL-1Q	Brevard County	North IRL	758	$374	113	$2,507	$283,340
Original	-	1032	Brevard County	North IRL	657	$375	95	$2,593	$246,382
Original	-	840	Brevard County	North IRL	828	$375	131	$2,368	$310,245
Original	-	1395	Brevard County	North IRL	675	$376	96	$2,642	$253,646
Original	-	1295	Brevard County	North IRL	743	$379	112	$2,513	$281,492
Original	-	RL-4B	Brevard County	North IRL	836	$379	105	$3,016	$316,683
Original	-	1384	Brevard County	North IRL	925	$380	136	$2,586	$351,743
Original	-	896	Brevard County	North IRL	643	$380	90	$2,718	$244,635
Original	-	76	Brevard County	North IRL	556	$381	82	$2,580	$211,590
Original	-	805	Brevard County	North IRL	674	$382	98	$2,626	$257,338
Original	-	1359	Brevard County	North IRL	791	$387	127	$2,412	$306,358
Original	-	759	Brevard County	North IRL	643	$387	94	$2,645	$248,619
Original	-	1076	Brevard County	North IRL	647	$387	94	$2,667	$250,664
Original	-	SJR-14	Brevard County	North IRL	554	$388	88	$2,440	$214,748
Original	-	1439	Brevard County	North IRL	1,447	$389	196	$2,873	$563,017
Original	-	1363	Brevard County	North IRL	561	$391	90	$2,435	$219,117
2017	13	Central Boulevard Baffle Box+	City of Cape Canaveral	Banana	481	$72	14	$2,479	$34,700
2017	14	Church Street Type II Baffle Box+	City of Cocoa	North IRL	937	$94	135	$652	$88,045
2017	15	Bayfront Stormwater Project+	City of Palm Bay	Central IRL	348	$88	83	$369	$30,624
2017	16	Gleason Park Reuse+	City of Indian Harbour Beach	Banana	48	$88	9	$469	$4,224
2017	18	Denitrification Retrofit of Johns Road Pond+	Brevard County	North IRL	1,199	$88	Not applicable	Not applicable	$105,512
2017	19	St. Teresa Basin Treatment+	City of Titusville	North IRL	3,100	$88	459	$594	$272,800
2017	20	South Street Basin Treatment+	City of Titusville	North IRL	987	$88	156	$557	$86,856
2017	21	La Paloma Basin Treatment+	City of Titusville	North IRL	2,367	$88	346	$602	$208,296
2017	22	Kingsmill-Aurora Phase Two+	Brevard County	North IRL	4,176	$88	814	$451	$367,488

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
2017	23	Denitrification Retrofit of Huntington Pond+	Brevard County	North IRL	1,190	$88	Not applicable	Not applicable	$104,720
2017	24	Denitrification Retrofit of Flounder Creek Pond+	Brevard County	North IRL	856	$88	Not applicable	Not applicable	$75,328
2017	34	Cliff Creek Baffle Box+	City of Melbourne	North IRL	3,952	$88	797	$436	$347,781
2017	35	Thrush Drive Baffle Box+	City of Melbourne	North IRL	3,661	$88	773	$417	$322,200
2018	64	Stormwater Low Impact Development Convair Cove 1 – Blakey Boulevard+	City of Cocoa Beach	Banana	30	$155	3	$1,550	$4,650
2018	65	Stormwater Low Impact Development Convair Cove 2 – Dempsey Drive+	City of Cocoa Beach	Banana	29	$155	3	$1,498	$4,495
2018	66	Big Muddy at Cynthia Baffle Box+	City of Indian Harbour Beach	Banana	269	$155	48	$869	$41,695
2018	67	Grant Place Baffle Box+	City of Melbourne	Central IRL	937	$88	193	$427	$82,481
2018	68	Crane Creek/M-1 Canal Flow Restoration+	St. Johns River Water Management District	Central IRL	24,000	$85	2,719	$748	$2,033,944
2018	69	Apollo/GA Baffle Box+	City of Melbourne	North IRL	3,381	$88	479	$621	$297,522
2019	66b	Big Muddy at Cynthia Baffle Box Expansion+	City of Indian Harbour Beach	Banana	167	$155	10	$2,584	$25,837
2019	85	Basin 1304 Bioreactor+	Brevard County	Banana	958	$94	127	$709	$90,000
2019	87	Fleming Grant Biosorption Activated Media+	Brevard County	Central IRL	602	$94	91	$622	$56,588
2019	88	Espanola Baffle Box+	City of Melbourne	Central IRL	1,119	$94	148	$711	$105,186
2019	89	Basin 1298 Bioreactor+	Brevard County	North IRL	917	$94	116	$743	$86,198

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
2019	90	Johns Road Pond Biosorption Activated Media+	Brevard County	North IRL	245	$94	37	$622	$23,030
2019	91	Burkholm Road Biosorption Activated Media+	Brevard County	North IRL	685	$94	104	$619	$64,390
2019	92	Basin 115 Carter Road Biosorption Activated Media+	Brevard County	North IRL	665	$94	101	$619	$62,510
2019	93	Basin 193 Wiley Avenue Biosorption Activated Media+	Brevard County	North IRL	954	$87	144	$575	$82,735
2019	94	Basin 832 Broadway Pond Biosorption Activated Media+	Brevard County	North IRL	456	$94	69	$621	$42,864
2019	96	Spring Creek Baffle Box+	City of Melbourne	North IRL	1,057	$313	232	$1,426	$330,841
2019	97	Titusville High School Baffle Box+	City of Titusville	North IRL	1,190	$94	166	$674	$111,813
2019	98	Coleman Pond Managed Aquatic Plant System+	City of Titusville	North IRL	1,240	$28	198	$177	$35,000
2020	110	Osprey Plant Pond Managed Aquatic Plant Systems+	City of Titusville	North IRL	606	$99	88	$682	$60,000
2020	117	Basin 10 County Line Road Woodchip Bioreactor+	Brevard County Stormwater	North IRL	597	$122	90	$809	$72,773
2020	118	Basin 26 Sunset Avenue Serenity Park Woodchip Bioreactor+	Brevard County Stormwater	North IRL	605	$122	92	$802	$73,810
2020	119	Basin 141 Irwin Avenue Woodchip Bioreactor+	Brevard County Stormwater	North IRL	567	$122	86	$804	$69,174
2020	120	Draa Field Pond Managed Aquatic Plant Systems+	City of Titusville	North IRL	256	$122	38	$823	$31,281

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
2020	121	Basin 2258 Babcock Road Woodchip Bioreactor+	Brevard County Stormwater	Central IRL	412	$122	62	$810	$50,203
2020	122	Basin 22 Hunting Road Serenity Park Woodchip Bioreactor+	Brevard County Stormwater	North IRL	329	$122	50	$802	$40,077
2020	124	Floating Wetlands to Existing Stormwater Ponds+	City of Cocoa	North IRL	12	$125	3	$499	$1,497
2020	127	Basin 5 Dry Retention+	Town of Indialantic	North IRL	113	$148	18	$927	$16,680
2020	128	Jackson Court Stormwater Treatment Facility+	City of Satellite Beach	Banana	56	$148	8	$1,033	$8,266
2020	129	Forrest Avenue 72-inch Outfall Baseflow Capture/Treatment+	City of Cocoa	North IRL	94	$148	12	$1,163	$13,956
2021	169	Basin 1335 Sherwood Park Stormwater Quality+	City of Melbourne	North IRL	3,214	$122	879	$446	$392,108
2021	174	St. Johns 2 Baffle Box+	City of Titusville	North IRL	1,992	$122	611	$398	$243,070
2021	123	Ray Bullard Water Reclamation Facility Stormwater Management Area+	City of West Melbourne	Central IRL	1,317	$122	400	$402	$160,674
2021	175	High School Baffle Box+	City of Melbourne	North IRL	1,183	$122	319	$452	$144,326
2021	176	Funeral Home Baffle Box+	City of Melbourne	North IRL	481	$122	129	$455	$58,682
2021	177	North and South Lakemont Ponds Floating Wetlands+	City of Cocoa	North IRL	107	$122	25	$522	$13,054
2021	178	Marina B Managed Aquatic Plant Systems+	City of Titusville	North IRL	55	$122	7	$953	$6,670
2021	179	Lori Laine Basin Pipe Improvement Project+	City of Satellite Beach	Banana	117	$150	21	$835	$17,525

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
2022	213	Johnson Junior High Denitrification Media Chamber Modification+	Brevard County Natural Resources	North IRL	206	$313	Not applicable	Not applicable	$64,478
2022	214	Sand Point Park Baffle Box+	City of Titusville	North IRL	438	$313	71	$1,931	$137,135
2022	215	Basin 960 Pioneer Road Denitrification+	Brevard County Natural Resources	Banana	105	$370	3	$12,950	$38,850
2022	219	McNabb Outfall Bioretention+	City of Cocoa Beach	Banana	44	$441	7	$2,775	$19,423
2022	220	Basin 1398 Sand Dollar Canal Bioreactor+	Brevard County Natural Resources	North IRL	444	$446	70	$2,829	$198,024
2023	205	Basin 998 Hampton Homes+	Brevard County Natural Resources	Banana	312	$204	47	$1,354	$63,618
2023	206	Basin 1066 Angel Avenue+	Brevard County Natural Resources	Banana	1,150	$202	173	$1,342	$232,200
2023	207	Basin 1124 Elliot Drive+	Brevard County Natural Resources	Banana	533	$278	78	$1,899	$148,100
2023	235	Woodland Business Center Stormwater Retention+	Woodland Business Center	Banana	11	$446	2	$2,453	$4,906
2023	247	Basin 998 Richland Avenue Canal+	Brevard County Natural Resources	Banana	641	$204	97	$1,348	$130,782
2023	250	Basin 1280B Flamingo Road+	Brevard County Natural Resources	Banana	161	$445	31	$2,311	$71,645
2023	251	Basin 1304 West Arlington Road+	Brevard County Natural Resources	Banana	216	$446	To be determined	To be determined	$96,425
2023	231	North Fiske Stormwater Pond Floating Wetlands+	City of Cocoa	North IRL	200	$250	32	$1,563	$50,000

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
2023	232	Riverfront Center Nutrient Removing Filtrations Boxes+	City of Titusville	North IRL	679	$313	160	$1,327	$212,257
2023	233	Commons and City Hall Tree Boxes+	City of Titusville	North IRL	80	$313	15	$1,669	$25,040
2023	252	Basin 89 Scottsmoor I Aurantia+	Brevard County Natural Resources	North IRL	1,706	$144	292	$839	$245,100
2024	254	Maritime Hammock Preserve Floating Vegetative Islands+	City of Cocoa Beach	Banana	174	$49	36	$236	$8,500
2024	256	C-10 Water Management Area+	St. Johns River Water Management District	Central IRL	29,300	$357	1,300	$8,046	$10,460,100
2024	257	Riverview Park Baffle Box+	City of Melbourne	Central IRL	863	$357	168	$1,834	$308,091
2024	258	Cocoa Beach Golf Course Floating Vegetative Islands+	City of Cocoa Beach	Banana	90	$409	14	$2,629	$36,810
2024	259	Ramp Road Park - Stormwater Improvements+	City of Cocoa Beach	Banana	41	$410	8	$2,100	$16,796
2025	269	Coleman Pond Circulator+	City of Titusville	North IRL	353	$357	55	$2,291	$126,021
2025	270	Tennessee Street Baffle Box+	City of Titusville	North IRL	1,442	$357	191	$2,695	$514,794
2025	271	Osprey Pond Circulator+	City of Titusville	North IRL	242	$357	35	$2,468	$86,394
2025	274	Waelti Drive Pond Retrofit+	Brevard County Natural Resources	North IRL	274	$357	40	$2,445	$97,818
2025	275	Lake Washington & Croton Road Pond Retrofit+	Brevard County Natural Resources	North IRL	158	$357	24	$2,350	$56,406
2025	276	North Wickham & Conservation Place Wet Pond Retrofit+	Brevard County Natural Resources	North IRL	261	$357	38	$2,452	$93,177

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Plan Funding
2025	277	Darrow Baffle Box+	City of Melbourne	Central IRL	536	$357	87	$2,199	$191,352
2025	278	Line Street Cemetery Baffle Box+	City of Melbourne	Central IRL	770	$357	122	$2,253	$274,890
2025	279	Melbourne Cemetery Baffle Box+	City of Melbourne	North IRL	606	$357	105	$2,060	$216,342
2025	280	Westside Basin Water Quality Improvements+	City of Satellite Beach	Banana	137	$409	24	$2,335	$56,033
2025	281	Cocoa Isles Boulevard Dry Pond+	City of Cocoa Beach	Banana	14	$409	2	$2,863	$5,726
-	-	***Total***	-	-	***239,381***	***$278 (average)***	***32,475***	***$2,045 (average)***	***$66,399,717***

Note: The projects highlighted in green and marked with an asterisk were identified in the original plan. The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

Figure 4-22. Stormwater Projects in North Brevard County

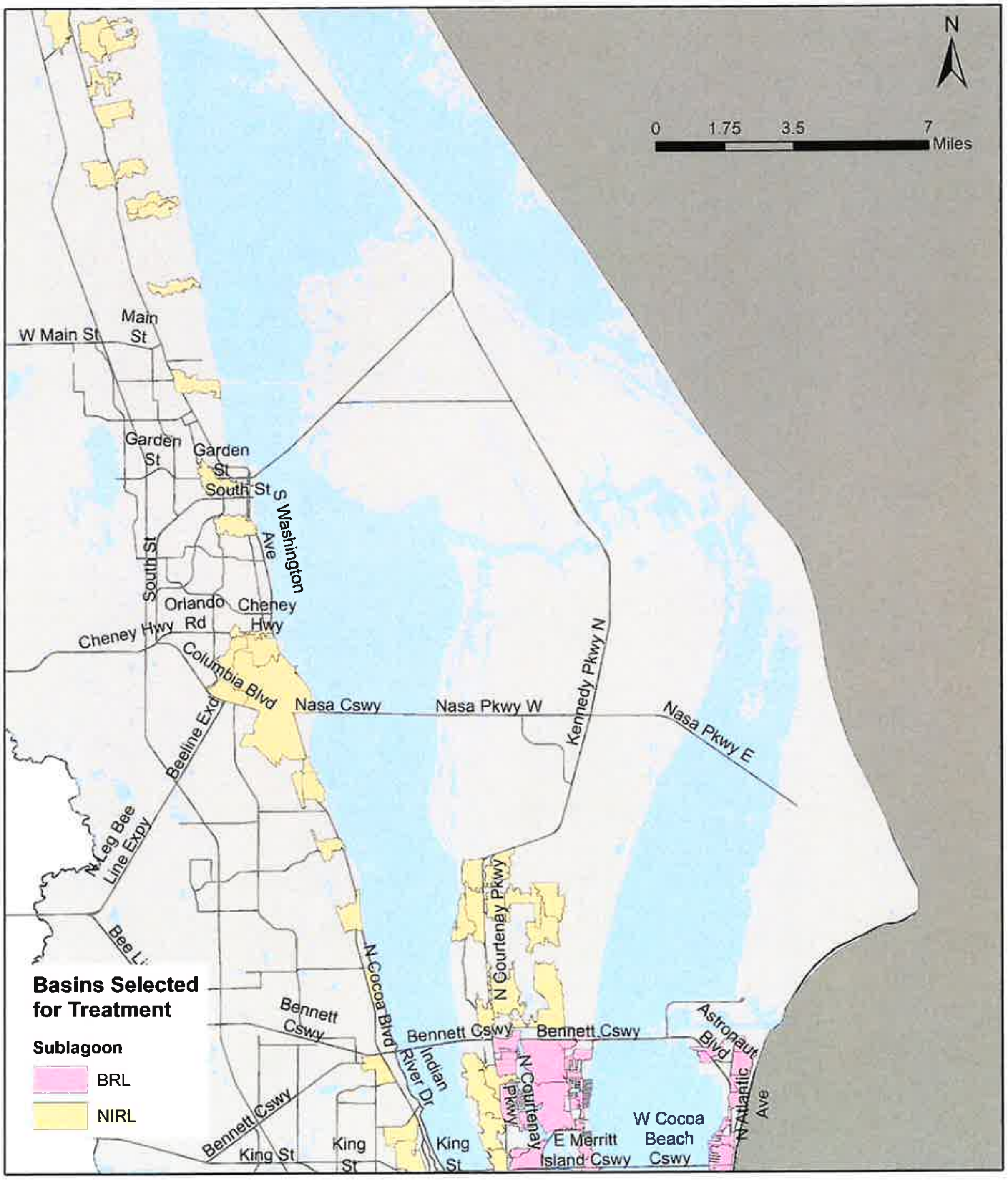


Figure 4-22 Long Description

Figure 4-23. Stormwater Projects in Central Brevard County

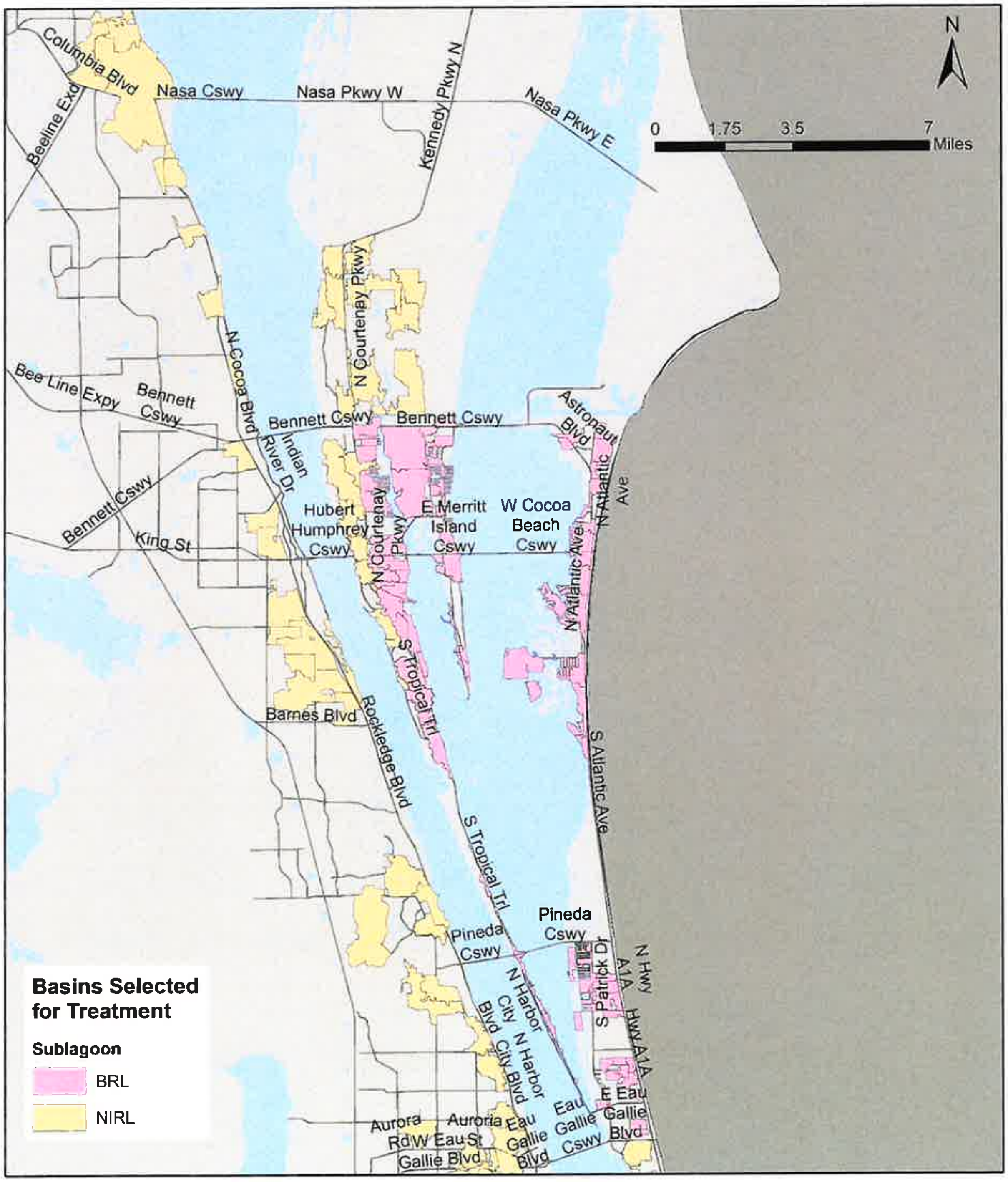


Figure 4-23 Long Description

Figure 4-24. Stormwater Projects in South Brevard County

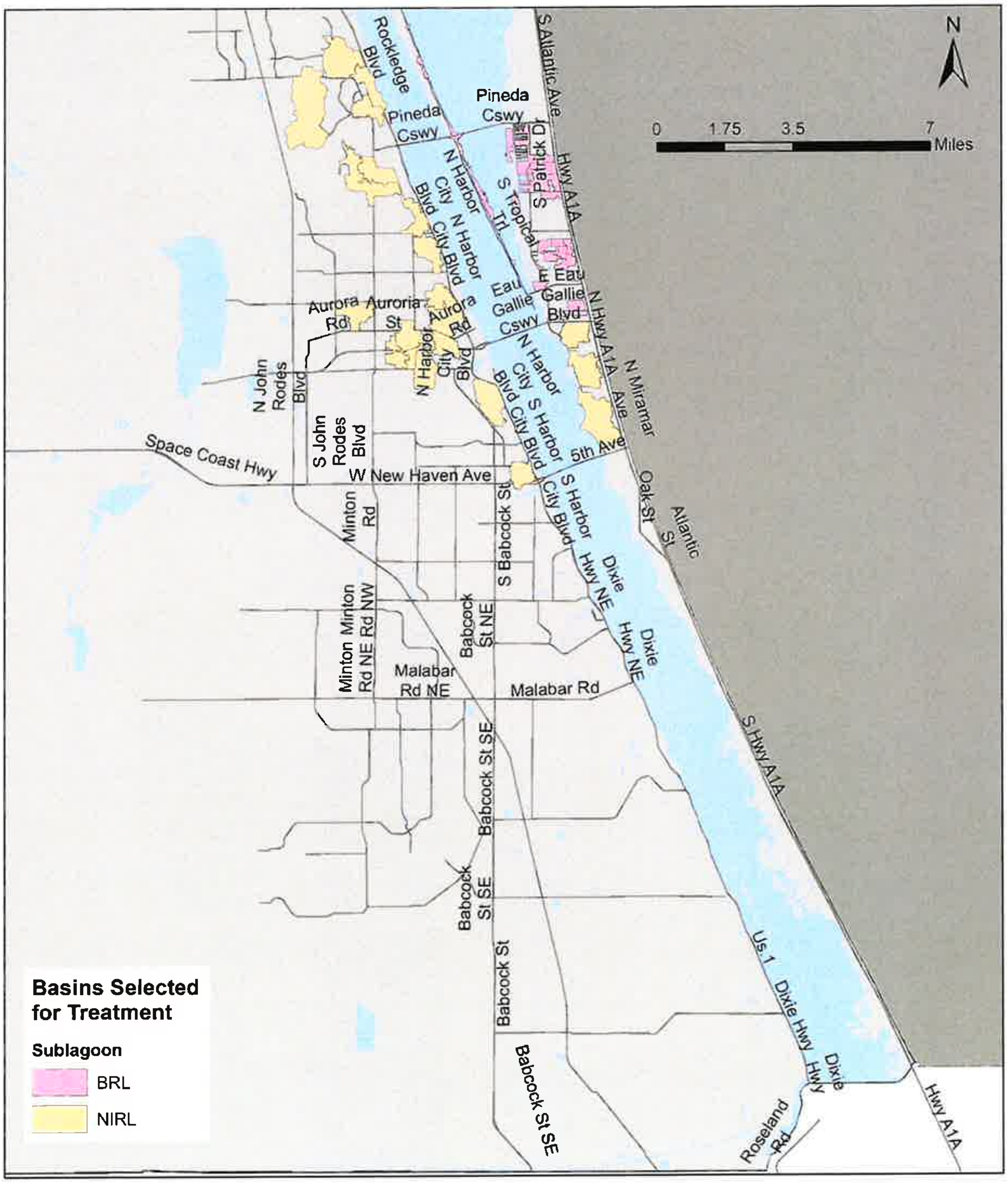


Figure 4-24 Long Description

4.1.8. Vegetation Harvesting

Mechanical removal or harvest of aquatic vegetation rather than treatment with herbicides or other control mechanisms can also reduce nutrient loads to the Indian River Lagoon (IRL) and its tributaries. The use of aquatic plants for nutrient management has been considered since at least the 1960s (Boyd, 1969). The harvest of aquatic vegetation removes nutrients from the waterbody rather than recycling them through decomposition and settlement of the plant material into the sediment. Most freshwater plants do not tolerate the salinity of the IRL and, upon release (such as floating plants washed out of canals) to the IRL, will die and decompose adding a nutrient load directly to the IRL.

Aquatic vegetation can occur either in mixed stands or as large monocultures. It is not uncommon for invasive plants to form largely monotypic stands. The plant material can form dense floating mats that prevent light diffusion into the water column, thus shading the bottom and limiting benthic habitat. The dense layer of vegetation also limits exchange of gases across the water surface and can cause depletion of dissolved oxygen under the mat. At greater densities, vegetation may also form floating islands or tussocks and incorporate woody plants.

Common invasive plants present in waterways that connect to the IRL are hydrilla, water lettuce, duck weed, and water hyacinth, and these plants present the greatest opportunity for harvest and removal of nutrients through plant biomass. However, native vegetation can be intermixed with exotics. Examples of common native aquatic vegetation that may also be removed includes cattails, fanwort, contrail, bladderwort, and water lilies.

The removal of aquatic vegetation may be accomplished in several ways. For canals or waterbodies with small surface area, booms laid across the water surface can divert flow to screening and sorting facilities for removal of floating vegetation. Also, in canals, drag lines or back hoes can be used for removal of submerged vegetation or modified front end loaders with baskets can collect floating plant material. Harvesters and shredders are also specifically designed to move through the water and cut and remove vegetation (Florida Department of Environmental Protection, 2012).

The cost-share for vegetation harvesting was initially based on actual annualized costs and laboratory analyses of the total nitrogen (TN) and total phosphorus (TP) content of plant material removed from floating vegetative islands in eight Brevard County stormwater ponds (see **Table 4-27**). Cost-share reimbursement of approved projects will be based on laboratory analysis of plant material to determine true nutrient removal. Eligible cost-share is adjusted annually as additional cost and nutrient removal benefit data are collected.

Table 4-27. Estimated Costs and Nutrient Reductions for Vegetation Harvesting

Project	Annualized Cost	Annualized Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen Reduction	Annualized Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Reduction
Vegetation Harvesting	$198,868	1,812	$110	191	$1,041

Table 4-28 summarizes the approved projects for vegetation harvesting.

Table 4-28. Projects for Vegetation Harvesting

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Reduction	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Reduction	Plan Funding
2020	111	Draa Field Vegetation Harvesting+	City of Titusville	North IRL	786	$110	99	$873	$86,413
2020	112	County Wide Stormwater Pond Harvesting+^	Brevard County Stormwater	North IRL	931	$15	327	$43	$14,000
2021	171	Mechanical Aquatic Vegetation Harvesting+	Melbourne-Tillman Water Control District	Central IRL	20,538	$49	1,664	$608	$1,011,976
2021	172	Horseshoe Pond Vegetative Harvesting+^	Brevard County Stormwater	North IRL	4,536	$2	242	$34	$8,140
2022	208	Maritime Hammock Preserve Stormwater Pond Aquatic Vegetation Harvesting+^	City of Cocoa Beach	Banana	143	$101	5	$2,896	$14,480
2022	209	Basin 1398 Sand Dollar Canal Harvesting+	Brevard County Natural Resources	North IRL	222	$110	21	$1,163	$24,420
2022	210	Basin 958 Pioneer Road Vegetation Harvesting+	Brevard County Natural Resources	Banana	363	$110	47	$850	$39,930
2022	211	Cocoa Beach Golf Course Stormwater Ponds Aquatic Vegetation Harvesting+	City of Cocoa Beach	Banana	1,984	$110	377	$579	$592,350
2023	228	Unincorporated Countywide Vegetation Harvesting+	Brevard County Natural Resources	All	9,263	$51	993	$453	$450,000
2025	264	Unincorporated Countywide Vegetation Harvesting 2+	Brevard County Stormwater Management	Banana	4,147	$114	593	$797	$472,758
-	-	***Total***	-	-	***42,913***	***$63 (average)***	***4,368***	***$621 (average)***	***$2,714,467***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.
^ Total nitrogen and total phosphorus reductions adjusted after project completion and certified laboratory analysis.

4.2. Projects to Remove Pollutants

The purpose of the projects in this section is to remove pollutants that have accumulated in the Indian River Lagoon (IRL). Eligible project types include dredging to remove accumulations of muck from the lagoon bottom, muck capping to reduce or prevent nutrient flux to the water column, as well as treatment of the interstitial water when feasible. These muck projects have more immediate benefits on the IRL water quality than external reduction projects because the nutrient flux is reduced as soon as muck is removed from the system whereas it takes time for the external load reduction benefits to reach the lagoon. The County is using state innovative technology grants to evaluate new treatment technologies to provide surface water remediation. In addition, the St. Johns River Water Management District, Indian River Lagoon National Estuary Program, Florida Institute of Technology, and the University of Central Florida are evaluating opportunities for enhanced circulation projects, which will allow additional ocean water to flow into the IRL to improve dissolved oxygen levels and reduce the flux of nutrients from IRL sediments and muck. The following sections describe the proposed muck removal and capping projects, scrubbing of muck interstitial water, and spoil management areas as well as potential surface water remediation and potential circulation enhancement projects.

4.2.1. Muck Removal

Muck flux contributes 63% of the TN and 53% of TP load to the Banana River Lagoon each year.

The muck in the Indian River Lagoon (IRL) increases turbidity, inhibits seagrass growth, promotes oxygen depletion in sediments and the water above, produces hydrogen sulfide, stores and releases nutrients, covers the natural bottom, and destroys healthy communities of benthic organisms (Trefry, 2013). When muck is suspended within the water column due to wind or human activities such as boating, these suspended solids limit light availability and suppress seagrass growth. Even for deeper water areas without seagrass growth, muck remains a nutrient source that potentially affects a broader area of the lagoon through nutrient flux and resuspension of fine sediments and their subsequent transport. As shown in **Table 3-1**, in the Banana River Lagoon, the annual release of nutrients from decaying muck is greater than the annual external loading delivered by stormwater and groundwater baseflow combined. The muck deposits cover an estimated 5,916 acres of the IRL bottom in Brevard County (County) (Fox and Trefry, 2023).

The muck deposits in the IRL flux nutrients that enter the water column and contribute to algal blooms and growth of macroalgae. Removal of the muck solids removes over 70 years of accumulated nitrogen and phosphorus sequestered in the IRL that has the potential to release nutrients. Muck flux rates for nitrogen and phosphorus have been estimated through studies in the IRL and continue to be updated as new data are collected. In 2016, muck sediments were assumed to have an average organic matter content of 10%. This equated to 150 pounds per acre per year nitrogen flux and the phosphorus flux was estimated to be 20 pounds per acre per year, except where specific measurements indicated otherwise. These original estimates were more conservative and based on a relatively limited data set.

Researchers at the Florida Institute of Technology have continued to track nutrient fluxes from the muck and analyzed approximately 100 samples from the open lagoon and about 140 samples from the canals over the span of four years and provided updated nutrient fluxes (Fox and Trefry, 2023). Sample sites were generally categorized as discrete, continuous, or in canals. Discrete and canal muck deposits had high organic matter content, high flux rates, and were relatively contained. The median nitrogen and phosphorus flux for the canal samples are approximately 480 pounds of total nitrogen (TN) per acre per year and 30 pounds of total phosphorus (TP) per acre per year. The median nitrogen and phosphorus flux for the discrete samples are approximately 329 pounds of TN per acre per year and 18 pounds of TP per acre per year. Continuous muck deposits had lower organic matter content, lower flux rates, and were a mixture of muck and sand. The median nitrogen and phosphorus flux for the continuous samples are 89 pounds of TN per acre per year and 6 pounds of TP per acre per year. For estimating project benefits and cost effectiveness, the appropriate median fluxes are used unless site-specific measurements indicate otherwise. Due to the relatively low organic content and flux rates from the continuous areas, these sites were not included in the plan tables.

The focus of the muck removal projects for this plan is on large discrete deposits of muck in big, open-water sites within the lagoon itself. Several of the canal systems that directly connect to the IRL are also included for muck removal. The goal of the muck removal is to reduce TN and TP muck flux loads by 25%, which should result in a significant improvement in water quality and seagrass extent, as well as a reduced risk of massive algal blooms and fish kills. A 70% efficiency for muck removal projects was applied. This efficiency accounts for two factors: (1) each target dredge area has less than 100% muck cover, and (2) some pockets of muck within dredged areas will inevitably be left behind regardless of the dredge technology used. Funded primarily by legislative appropriations, the Florida Institute of Technology conducted extensive evaluations of the muck deposits throughout the lagoon for Brevard County (Fox and Trefry, 2018; Fox and Trefry, 2019; Shenker, 2018; Souto, 2018; Trefry et al., 2019a and 2019b; Zarillo and Listopad, 2019; Fox, 2022; Fox and Trefry, 2023). The updated muck acreage and flux estimates are shown in **Table 4-29**. **Table 4-29** reflects data collected through 2023 by researchers at the Florida Institute of Technology.

Table 4-29. Muck Acreages and Flux Estimates in the IRL

Muck Reduction Targets	Open Banana	Banana Canals	North IRL	North IRL Canals	Central IRL	Central IRL Canals	Mosquito Lagoon
Muck area (acres)	1,067	752	1,260	51	59	52	398
Muck flux (pounds of total nitrogen per year)	438,522	360,960	288,814	24,480	28,320	24,960	113,032
Funded dredging sites (acres)	258	534	306	1.5	25	15	0
Flux from funded dredging sites (pounds of total nitrogen per year)	149,210	217,267	125,178	1,056	15,350	10,800	0
Flux reduction from funded sites (pounds of total nitrogen per year)	104,447	152,087	87,625	739.2	10,745	7,560	0
Percent of total flux reduced by dredging the funded sites	24%	42%	30%	3%	38%	30%	0%

Using the information from the Florida Institute of Technology, Brevard County reevaluated the priority muck locations for dredging. The estimated area and nutrient flux using average flux rates for the County or site-specific data collected by the Florida Institute of Technology are shown in **Table 4-30** for the recommended projects. **Table 4-31** provides a summary of the recommended projects and the projects submitted as part of an annual plan update. Load reductions and cost efficiencies are updated annually to reflect the best available data to date. The locations of these projects are shown in **Figure 4-25** through **Figure 4-28**.

In addition to muck removal, upland input of muck components must be reduced to prevent new muck accumulation. Therefore, land-based source control measures for nutrients, organic waste, and erosion are needed. Without source controls, muck removal will need to be frequently repeated, which is neither cost-effective nor beneficial to the lagoon's health. Public awareness and commitment are needed to control future muck accumulation. Activities that contribute organic debris and sediment to stormwater and open water must be curtailed.

Table 4-30. Estimated Volume, Area, and Nutrient Flux for Muck Removal Project Areas

Location	Sub-Lagoon	Cubic Yards	Acres	Total Nitrogen Flux* (pounds per acre per year)	Total Phosphorus Flux (pounds per acre per year)
Canaveral South	Banana	738,000+	65+	917	50
Pineda Banana River Lagoon	Banana	467,000+	25+	765	35
Patrick Space Force Base	Banana	342,000+	24+	650	21
Cocoa Beach Golf	Banana	975,000	140	392	21
Titusville Railroad West	North IRL	339,000+	29+	285	12
National Aeronautics and Space Administration Causeway East	North IRL	415,000+	67+	917	44
Rockledge A	North IRL	115,000+	46+	142	31
Titusville Railroad East	North IRL	562,000+	39+	294	9
Eau Gallie Northeast	North IRL	390,000+	86+	128	15
Grand Canal Muck Dredging+	Banana	647,000+	97	390	25
Sykes Creek Muck Dredging+	Banana	506,000+	118+	470	26
Cocoa Beach Muck Dredging – Phase III+	Banana	44,040	39	480^	30
Merritt Island Muck Removal – Phase 1+	Banana	312,540	78	480^	30
Muck Removal of Indian Harbour Beach Canals+	Banana	183,295	36	480^	30
Muck Re-dredging in Turkey Creek+	Central IRL	143,875	25	614	30
Cocoa Beach Muck Dredging Phase II-B+	Banana	110,999	60	480^	30
Satellite Beach Muck Dredging+	Banana	203,772	37	480^	30
Spring Creek Dredging+	North IRL	10,876	1.5	480^	30
Sunnyland Canals Muck Removal+	Central IRL	104,000	15	480^	30
Shore View Lane	North IRL	18,645+	0.7+	480^	20
Mims Rim Ditch	North IRL	167,000+	37+	641*	20

*Flux rates from Fox, 2022.
^Flux rates from Fox and Trefry, 2023.
+Based on updated field survey measurements.

Table 4-31. Projects for Muck Removal

Year Added	Project Number	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed	Plan Funding
Original	2016-10a	Canaveral South*	Brevard County	Banana	35,382	$415	1,925	$7,636	$14,700,000
Original	2016-5a	Pineda Banana River Lagoon*	Brevard County	Banana	15,033	$454	686	$9,949	$6,825,000
Original	2016-11a	Patrick Space Force Base*	Brevard County	Banana	6,497	$1,104	382	$18,783	$7,175,000
Original	168a	Cocoa Beach Golf*	Brevard County	Banana	29,694	$719	2,058	$10,374	$21,350,000
Original	2016-06a	Titusville Railroad West*	Brevard County	North IRL	14,406	$219	588	$5,357	$3,150,000
Original	2016-07a	National Aeronautics and Space Administration Causeway East*	Brevard County	North IRL	21,872	$456	1,047	$9,527	$9,975,000
Original	2016-04a	Rockledge A*	Brevard County	North IRL	7,581	$577	825	$5,303	$4,375,000
Original	2016-08a	Titusville Railroad East*	Brevard County	North IRL	5,393	$746	227	$17,731	$4,025,000
Original	54a	Eau Gallie Northeast*	Brevard County	North IRL	10,476	$835	1,482	$5,904	$8,750,000
2017	41a	Grand Canal Muck Dredging+#	Brevard County	Banana	10,469	$1,206	1,396	$9,045	$12,626,600
2017	42a	Sykes Creek Muck Dredging+	Brevard County	Banana	19,635	$240	2,618	$1,797	$4,705,428
2018	70a	Cocoa Beach Muck Dredging – Phase III+	City of Cocoa Beach	Banana	4,095	$336	780	$1,764	$1,376,305
2018	71	Merritt Island Muck Removal – Phase 1+	Brevard County	Banana	8,085	$957	1,540	$5,022	$7,733,517
2018	72a	Muck Removal of Indian Harbour Beach Canals+	City of Indian Harbour Beach	Banana	3,780	$961	720	$5,044	$3,631,815
2018	2016-3a	Muck Re-dredging in Turkey Creek+	Brevard County	Central IRL	5,691	$38	221	$973	$215,000
2019	101	Cocoa Beach Muck Dredging Phase II-B+	City of Cocoa Beach	Banana	6,300	$939	840	$7,045	$5,917,650
2020	144	Satellite Beach Muck Dredging+	City of Satellite Beach	Banana	3,885	$485	518	$3,638	$1,884,225
2022	223	Spring Creek Dredging+	City of Melbourne	North IRL	154	$520	21	$3,813	$80,080
2023	236	Sunnyland Canals Muck Removal+	Sunnyland Beach Property Owners Association	Central IRL	10,030	$520	336	$15,523	$5,215,600
2024	260	Mims Rim Ditch Muck Removal Project+	Brevard County	North IRL	16,602	$607	518	$19,454	$10,077,414
2024	262	Shore View Lane Dredging+	Resident	Central IRL	74	$607	10	$4,492	$44,918
-	-	***Total***	-	-	***235,124***	***$569 (average)***	***18,738***	***$7,142 (average)***	***$133,833,552***

Note: The projects highlighted in green and marked with an asterisk were identified in the original plan. The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

[#] In 2021, contingency funding was approved to add Berkeley Canal to the Grand Canal project.

Figure 4-25. Location of Muck Removal Projects in the Northern Banana River Lagoon

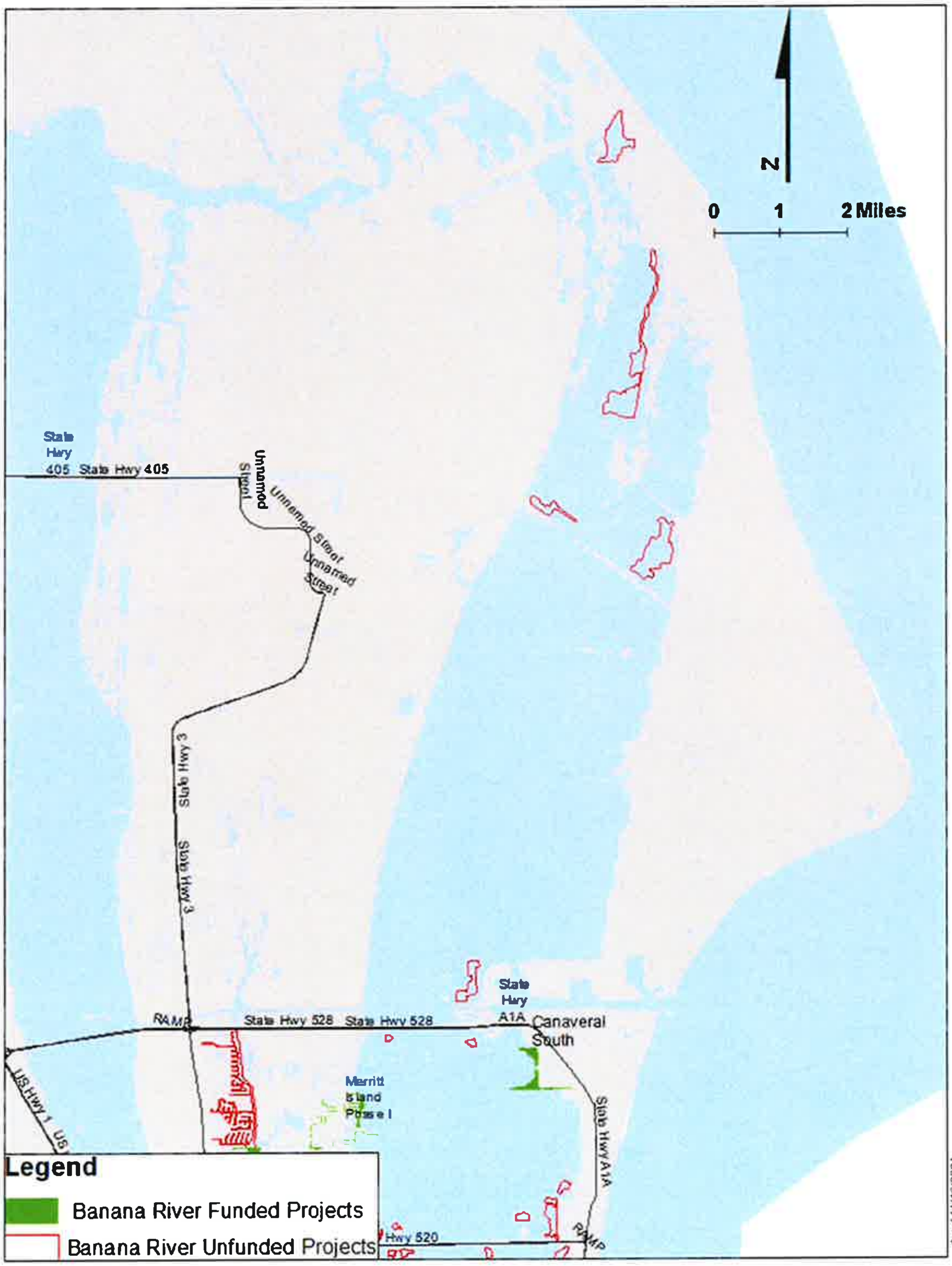


Figure 4-25 Long Description

Figure 4-26. Location of Muck Removal Projects in the Southern Banana River Lagoon

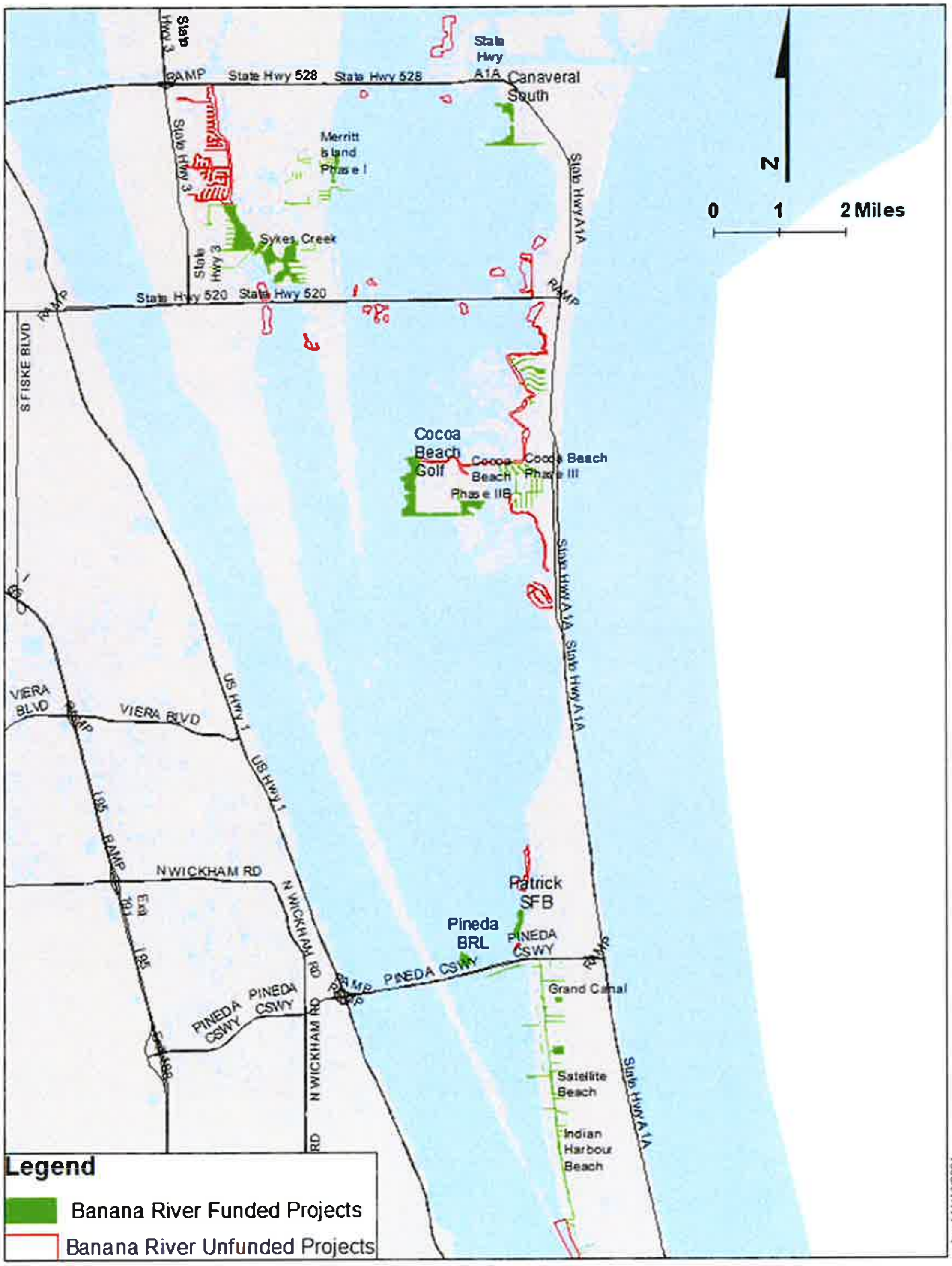


Figure 4-26 Long Description

Figure 4-27. Location of Muck Removal Projects in North IRL

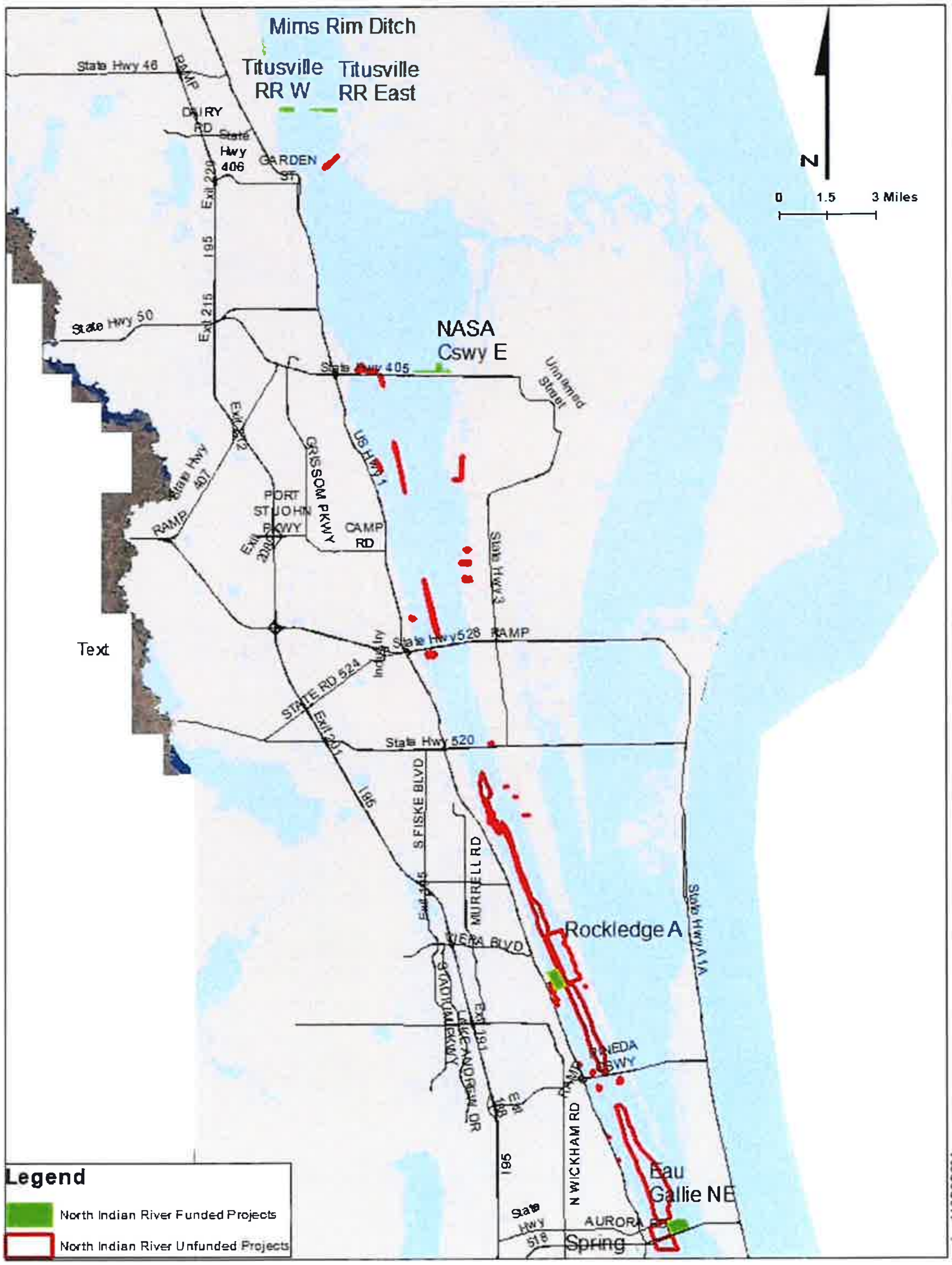


Figure 4-27 Long Description

Figure 4-28. Location of Muck Removal Projects in Central IRL

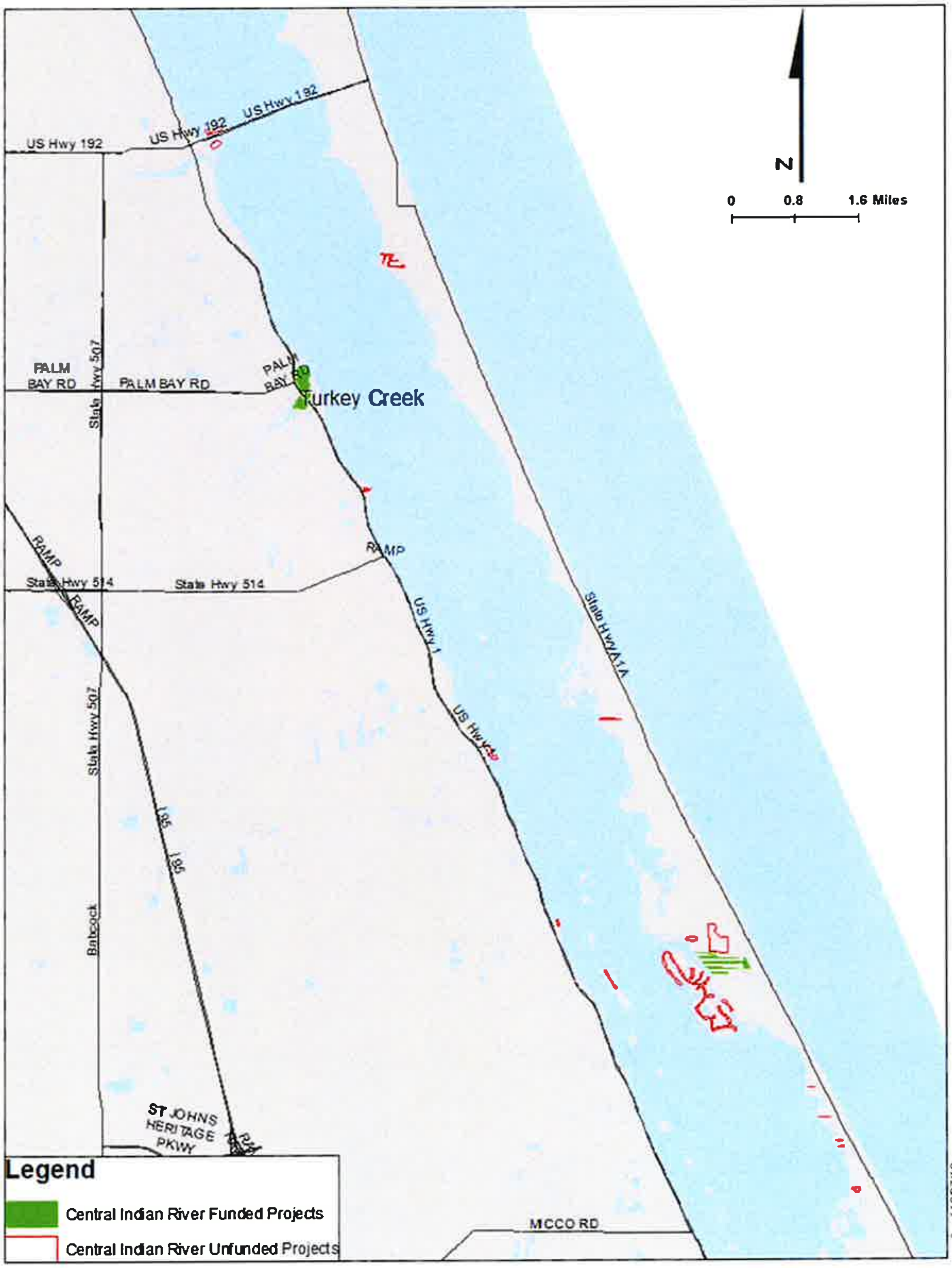


Figure 4-28 Long Description

4.2.2. Treatment of Muck Interstitial Water

Interstitial water refers to the water content that is present within the muck material. Sampling and testing conducted by Florida Institute of Technology researchers has shown that the majority of nutrients are bound to solid particles in the muck; however, the interstitial water also contains a significant amount of dissolved nutrients. When the muck material is dredged, interstitial water nutrients are pumped with the muck and Indian River Lagoon (IRL) water in a slurry to the dredged material management area. At the dredged material management area, the muck slurry is processed in a settling pond where sediments settle out and overflow water is returned to the IRL. Treatment of this overflow water represents a significant opportunity to prevent return of these nutrients to the IRL.

Working with the dredging industry, sewage treatment industry, stormwater treatment entrepreneurs, and industrial waste treatment engineers, feasible and reasonably cost-effective concentration targets for return water to the IRL were initially identified as 2,000–3,000 parts per billion for total nitrogen (TN) and 75–100 parts per billion for total phosphorus (TP). Treatment options for TP were demonstrated during the state-funded initial dredging of Turkey Creek, with Florida Institute of Technology researchers providing independent third-party verification of performance levels. These targets can be achieved through a variety of technologies including, but not limited to, coagulants, polymers, biosorption activated media, or a combination of these technologies. Costs vary by technology, target nutrient reduction levels, and interstitial nutrient concentrations. Open market costs were initially collected through three bid solicitations: (1) Mims Boat Ramp muck removal project, (2) Sykes Creek muck removal project, and (3) Grand Canal muck removal project. More recent dredging experience indicates that concentration targets for TN may need to be adjustable and procured as bid options or alternates to allow market conditions to identify what targets are most cost-effective.

To encourage partnering entities and applicants for Save Our Indian River Lagoon Trust Fund dollars to enhance the performance of muck removal projects by removing interstitial water nutrients from the dredge slurry during muck dredging operations whenever project configuration allows, a separate cost-share was developed to account for this added cost and associated nutrient reduction benefit. Using available cost information from Turkey Creek, Mims, and Sykes Creek, Brevard County (County) staff considered how to incentivize the addition of this processing step as soon as possible into permitted muck removal projects, as well as future projects. When the substitute project request form was distributed to the public in 2018, staff estimated that a cost-share of $200 per pound of TN removed would be sufficient to entice most partners to agree to stipulate a specific condition in their bids and dredging contracts that return water not exceed 3,000 parts per billion of TN nor 100 parts per billion of TP. However, based on bids for nutrient mitigation alternatives for sediment dewatering for Sykes Creek (Tetra Tech, 2015), Grand Canal, and Mims, the cost-share used for the County's projects has been adjusted to reflect average costs and inflation.

The recommended locations for interstitial water treatment and load reductions are shown in **Table 4-32**. Load reductions and cost effectiveness are updated annually to reflect the best available data to date. As part of the 2024 Plan Update, funding for interstitial water treatment at Grand Canal was reevaluated based on recent Pay Applications. The funds not utilized for interstitial water treatment were re-allocated to the dredging funds. As part of this 2025 Plan Update, the Citizen Oversight Committee and the Board of County Commissioners approved a scope amendment for the Eau Gallie Northeast Muck Removal Project, prioritizing muck removal from those portions of the project areas with the highest nutrient flux. Board direction also allows Save Our Indian River Lagoon Trust Funds to be used to bid dredging operations without including interstitial water treatment initially. If negotiated costs are reasonable and sufficient funds are available or become available, staff may negotiate costs and the County Manager may execute change orders to increase muck removal or incorporate interstitial treatment into the contract. This flexible approach will be extended to all Save Our Indian River Lagoon-approved muck removal projects, ensuring continued progress within allocated budgets while focusing on zones with the highest nutrient flux.

Table 4-32. Projects for Treatment of Interstitial Water

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduced (pounds)	Cost per Pound of Total Phosphorus Removed	Plan Funding
2017	40	Mims Muck Removal: Outflow Water Nutrient Removal+*	Brevard County	North IRL	2,803	$143	244	$1,639	$400,000
2018	2016-10b	Canaveral South+	Brevard County	Banana	42,688	$50	3,887	$549	$2,134,419
2018	2016-5b	Pineda Banana River Lagoon+	Brevard County	Banana	19,820	$50	1,804	$549	$990,980
2018	2016-11b	Patrick Space Force Base+	Brevard County	Banana	20,836	$50	1,897	$549	$1,041,800
2018	168b	Cocoa Beach Golf+	Brevard County	Banana	99,098	$30	9,022	$334	$3,013,100
2018	41b	Grand Canal+#	Brevard County	Banana	89,495	$63	To be determined	To be determined	$5,610,821
2018	42b	Sykes Creek+	Brevard County	Banana	64,278	$175	To be determined	To be determined	$11,248,704
2018	2016-06b	Titusville Railroad West+	Brevard County	North IRL	9,148	$50	833	$549	$457,375
2018	2016-07b	National Aeronautics and Space Administration Causeway East+	Brevard County	North IRL	28,967	$50	2,637	$549	$1,448,355
2018	2016-04b	Rockledge A+	Brevard County	North IRL	12,705	$50	1,157	$549	$635,244
2018	2016-08b	Titusville Railroad East+	Brevard County	North IRL	11,688	$50	1,064	$549	$584,424
2018	54b	Eau Gallie Northeast+	Brevard County	North IRL	25,410	$50	2,313	$549	$1,270,487
2018	2016-3b	Muck Interstitial Water Treatment for Turkey Creek+	Brevard County	Central IRL	Not applicable	Not applicable	688	Not applicable	Part of dredging cost
2018	72b	Muck Interstitial Water Treatment for Indian Harbour Beach Canals+	City of Indian Harbour Beach	Banana	27,418	$200	To be determined	To be determined	$5,483,600
2020	113	Satellite Beach Interstitial Water Treatment+	City of Satellite Beach	Banana	29,978	$102	3,059	$1,000	$3,057,756
2024	261	Mims Rim Ditch Interstitial Treatment+	Brevard County	North IRL	15,700	$114	1,292	$1,381	$1,784,135
-	-	***Total***	-	-	***500,032***	***$78 (average)***	***29,897***	***$1,310 (average)***	***$39,161,200***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

* Outflow Water Nutrient Removal for the Mims Muck Removal project was funded, bid, and awarded to the lowest successful bidder; however, the contractor was unsuccessful at reducing outflow water nutrient concentrations as much as required by the contract. Therefore, only partial reductions were achieved and the Save Our Indian River Lagoon Trust Fund was not used.

\# In 2021, contingency funding was approved to add Berkeley Canal to the Grand Canal project.

4.2.3. Spoil Management Areas

As Brevard County (County) seeks to execute muck dredging projects, the availability of upland processing areas for the treatment of dredge spoils is a limiting factor. These working sites, referred to as temporary spoil management areas or in the industry as dredged material management areas, are upland parcels of land that can be used as needed for the temporary processing of dredge spoils until such time as the materials can be moved offsite to a permanent beneficial use or disposal location.

To move muck dredging projects forward in a timely manner, initial project locations were selected to make use of existing dredged material management areas through the County's long-standing partnership with the Florida Inland Navigation District. The Florida Inland Navigation District manages Florida's Intracoastal Waterway for which it has acquired eight dredged material management area sites distributed from north to south along the 72 miles of the Indian River Lagoon (IRL), not the Banana River, in Brevard County. Only three of these Florida Inland Navigation District dredged material management areas are presently developed.

The eight Florida Inland Navigation District sites are insufficient to meet the volume and timing of muck dredging projects included in this plan. As the distance between dredging sites and dredged material management areas increase, more booster pumps are required. Booster pumps can complicate project operations and increase cost, particularly as multiple boosters become necessary. Booster pumps are required as project pump distances approach one-mile and are required at one-mile intervals thereafter. Each booster pump adds approximately $1 per cubic yard of material dredged. Pump distances for the Eau Gallie and Sykes Creek projects have five- to seven-mile pump distances to the Florida Inland Navigation District sites and project amounts in excess of 400,000 cubic yards each.

As a supplement to the Florida Inland Navigation District sites, County staff investigated lease and purchase options for the development of additional multi-use spoil management areas. Lease options for parcels of interest resulted in unfavorable cost-benefit ratios on these short-term investments due to the up-front costs of site development including design, permitting, mitigation, and construction. Similar cost effectiveness issues arise from depending on private sector contractors to provide a temporary dredged material management area as part of construction costs. The contractor passes along most or all the costs of providing a dredged material management area, but the County does not have the benefit of using the site multiple times.

Fee simple purchase and development of spoil management areas, designed with multi-use options for the implementation of regional surface water or stormwater treatment projects, emerges as the most cost-effective long-term option. Through fee simple site acquisition and a prescribed site use and management plan, investments in acquisition and development costs, including required mitigation, can be recovered. For example, the acquisition of a spoil management site four miles closer than the nearest Florida Inland Navigation District site could reduce booster pump costs by $1.6 million on a single 400,000 cubic yard muck removal project. This savings can offset site acquisition and development costs associated with the parcel.

Publicly owned dredged material management area sites could be used for stormwater or surface water treatment, when not being used for dredging. These additional uses can be factored into site selection and design to provide supplementary lagoon benefits. Therefore, land acquisition shall be considered an eligible muck management project cost, particularly when the site can be designed to provide multi-use regional surface water or stormwater treatment alongside or intermittently between usages for muck management. A preliminary project design and construction layout with cost evaluation (comparison to an existing, more distant dredged material management area) shall be part of the site selection and land acquisition decision process.

Another factor to consider when evaluating long-term operations and the feasibility of muck dredging projects is the strategy for final disposal and the development of permanent beneficial use or disposal locations. Often left to the contractor as part of their construction and implementation plan, a final disposition strategy is in many cases not part of the dredging project plan. The dependency on private sector contractors to provide a final disposition strategy and permanent material disposal site can have consequences that a managed permanent disposal site can avoid. These consequences can increase the contractor's risk and drive up project costs.

A managed disposal site would consider the fiscal, environmental, and social implications of the site. A final disposition strategy evaluates the appropriateness of the disposal site in terms of the local community and future development, the environmental proximity to surface waters and runoff potential, groundwater protection, hauling costs, and minimizing risk by providing a defined disposal site. A defined material disposal site, laid-out in the project design, provides a level of security at the time of project bidding that reduces risk to the contractor and potentially lowers the project cost. Staff investigation into the purchase, use and reclamation of existing borrow pits are an example of final disposal areas that are being considered. Similar to what is seen with the development of temporary spoil management areas, the most cost-effective long-term option for the disposal of muck material should include the evaluation of fee simple purchase options and the development of spoil disposal areas.

4.2.4. Surface Water Remediation System

In 2016, surface water remediation technologies had not yet been tested in estuarine systems; therefore, these remediation systems were not recommended at the time. However, these types of treatment technologies were being demonstrated in freshwater and shown to offer additional benefits that should be more thoroughly explored to better assess their total value to restoring and maintaining Indian River Lagoon (IRL) health. Estimated costs and benefits for a large-scale project are provided for information on the potential for surface water remediation.

Aqua Fiber Technologies Corporation had a technology that was proposed to treat up to 25 cubic feet per second (16 million gallons per day) of water from Turkey Creek, which is a major tributary to the Central IRL. This project proposed at Turkey Creek had the potential to reduce total suspended solids by more than 90%, remove algal blooms and cyanobacteria to improve the lagoon's color and clarity, improve the dissolved oxygen concentration by returning water with near 100% oxygen saturation, and produce a biomass that could be processed into fertilizer pellets or used as a feedstock for waste-to-energy utilities to produce electricity.

This project proposed to remove an estimated 35,633 pounds per year of total nitrogen (TN) and 2,132 pounds per year of total phosphorus (TP) from the watershed. The facility would have cost $19,720,760 for design, permitting, construction, and use of a technology to destroy the biomass onsite. The cost to operate and maintain the remediation facility was estimated to be $6,271,200 per year. **Table 4-33** summarizes the benefits and costs of nutrient removal for this project for a 10-year period. On an annual basis, the yearly costs would be $8,243,276, which would result in an annual cost per pound per year of TN removed of $231 and cost per pound per year of TP removed of $3,867.

Brevard County (County) also received information from Phosphorus Free Water Solutions, which has a pay for performance treatment technology to reduce phosphorus, nitrogen, color, and turbidity in surface waters. Phosphorus Free evaluated a project to treat 50 cubic feet per second of water from Turkey Creek. Based on the measured concentrations in Turkey Creek, Phosphorus Free Water Solutions provided two options for treating nitrogen. The measured phosphorus concentration in Turkey Creek is very low and it would not be cost-effective to remove additional phosphorus from the system through this technology. The first option would use the basic nitrogen removal process, which would remove a portion of the dissolved organic nitrogen. This option would reduce TN by 53% or 50,353 pounds per year at a cost of $6,797,000 or $135 per pound of TN removed. The second option would include an additional treatment step to increase the removal of dissolved organic nitrogen. This option would reduce TN by 86% or 81,469 pounds per year at a cost of $13,035,000 or $160 per pound of TN removed (**Table 4-33**). The costs for each scenario do not include the capital costs to construct the treatment facility, only the annual pay for performance cost estimates for a ten-year contract for treatment.

Table 4-33. Summary of Annual Benefits and Ten-Year Costs of a Surface Water Remediation System

Project	Ten-Year Project Cost	Total Nitrogen Reduction (pounds per year)	Cost per pound per Year of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
Aqua Fiber	$82,432,760	35,633	$2,313	2,132	$38,665
Phosphorus Free Option 1	$67,970,000	50,353	$1,350	To be determined	To be determined
Phosphorus Free Option 2	$130,350,000	81,469	$1,600	To be determined	To be determined

In 2020, Brevard County received a grant to collaborate with Aqua Fiber Technologies Corporation to pilot test their surface water remediation technologies. Unfortunately, Aqua Fiber had to cancel the project due to COVID-19 related economic hardships. In 2022, the County received a grant to collaborate with AECOM to pilot test their system in the IRL. Testing was performed in Titusville, Melbourne, Palm Bay, and the South Beaches. Although successful at harvesting turbidity and algae, the cost effectiveness was relatively low (see Section 4.4.3 for more details).

In 2023, the County received an Innovative Technology Grant to collaborate with HydroBioscience to test their ultrasonic transducer's effectiveness in mitigating harmful algal blooms in the canals of Sykes Creek. Project design is underway and performance testing will run for one year. The County continues to investigate potential surface water remediation technologies and a portion of the Respond funding may be used to incentivize pilot testing. As feasible technologies are proven, projects may be added to future plan updates.

4.2.5. Enhanced Circulation

The 2011 superbloom occurred in the Banana River Lagoon, North Indian River Lagoon (IRL), and southern Mosquito Lagoon. These areas have long residence times, which means that water in these areas stagnates and nutrients can build up leading to additional algal blooms.

Options to address this condition are to increase circulation by replacing causeways with bridges, installing culverts under causeways, or increasing ocean exchange by adding culverts, pump stations, or inlets to provide new connections to the ocean. Addressing manmade causeways that interfere with natural circulation should be beneficial without unintended consequences and modeling can help prioritize actions, but implementation is costly and requires participation by the Florida Department of Transportation. The United States Army Corps of Engineers is a potential funding partner for feasible causeway retrofits.

New artificial ocean exchange projects introduce a lot of unknowns. While the residence time of water in the IRL would decrease, the input ocean water with its complement of marine life has the potential to alter the IRL ecosystem. Whether the amount of ocean exchange needed to have a beneficial impact on the system can be achieved without causing unintended harm to the IRL is unknown. Artificial ocean exchange projects are costly with significant social implications and permitting hurdles to overcome. For these reasons, causeway replacements are encouraged while ocean exchange projects are not a recommended component of this plan. Other entities have been evaluating options. The results of evaluations by the St. Johns River Water Management District and the IRL National Estuary Program are summarized below.

The St. Johns River Water Management District contracted with CDM Smith and Taylor Engineering to identify potential locations where enhanced circulation projects would be beneficial. The first phase of the project (CDM Smith et al., 2014) involved a literature review and geographic information system desktop analysis. All the locations considered in Phase I, including the top ranked locations, are shown in **Figure 4-29**. From this first phase, ten locations were identified for future evaluation as shown in **Table 4-34**. The external projects are those that could potentially connect the IRL with the Atlantic Ocean whereas internal projects would improve circulation within the IRL (CDM Smith et al., 2015).

Table 4-34. Phase I Top Ranked Potential Enhanced Circulation Project Locations

Project Site	Project Description	Zone	Project Type	Rank
D	Canaveral Lock*	Banana River Lagoon	External	1
C	Port Canaveral*	Banana River Lagoon	External	2
15	Sykes Creek/Merritt Island Causeway*	Banana River Lagoon	Internal	3
B	Pad 39-A*	Banana River Lagoon	External	4
16	Cocoa Beach Causeway	Banana River Lagoon	Internal	5
23	South Banana River	Banana River Lagoon	Internal	6
E	Patrick Air (Space) Force Base *	Banana River Lagoon	External	7
20	Minuteman Causeway	Banana River Lagoon	Internal	8
1	Port Canaveral (East)	Banana River Lagoon	External	9
8	Coconut Point Park*	Central and Southern Portion of IRL Study Area	External	10

Source: CDM Smith et al., 2015.
* Sites evaluated in Phase 2 of the CDM Smith and Taylor Engineering project for the St. Johns River Water Management District.

As part of the second phase of the project, six of the top ranked sites were further evaluated to assess the water volumes. These sites are noted in **Table 4-34**. Based on the initial evaluation of the sites, CDM Smith and Taylor Engineering determined that a project at the Sykes Creek/Merritt Island Causeway was not feasible. This location had a relatively new bridge crossing with built-up abutment protection that precludes construction of culverts and the increase of bridge openings. In addition, this connection would only provide an internal connection in the IRL and would not increase the tidal exchange. The five remaining sites were evaluated for the following types of connections (additional information in **Table 4-35**):

- Port Canaveral (Project Site C) – Culvert connection
- Pad 39-A (Project Site B) – Culvert connection
- Patrick Air (Space) Force Base (Project Site E) – Culvert connection
- Canaveral Lock (Project Site D) – Open channel flow by keeping the Canaveral Lock open over extended periods, which may require additional maintenance dredging to remove sediment deposition near the gates.
- Coconut Point Park (Project Site 8) – Culvert connection
- Coconut Point Park (Project Site 8) – Inlet connection with an inlet that is at least 1,350-feet long, with an average depth of about 25 feet below mean sea level.

Figure 4-29. Phase I Potential Enhanced Circulation Project Locations

Source: CDM Smith et al., 2015.

Figure 4-29 Long Description

Table 4-35. Computed Hydraulics for Connections at Select Locations

Site/Potential Project	Flood Prism (million cubic feet)	Ebb Prism (million cubic feet)	Maximum Flow (cubic feet per second)	Estimated Impacted Area for 0.27 Foot Tide Range (acres)
Port Canaveral Culvert (Project Site C)	1.51	-1.08	89	92 to 128
Pad 39-A Culvert (Project Site B) (estimated)	1.38 to 1.51	-1.08 to -1.59	Not applicable	92 to 135
Patrick Air (Space) Force Base Culvert (Project Site E) (estimated)	1.38 to 1.51	-1.08 to -1.59	Not applicable	92 to 135
Canaveral Lock Open Channel Flow (Project Site D)	68.67	-83.03	-4,670	5,839 to 7,060
Coconut Point Park Culvert (Project Site 8)	1.38	-1.59	-94	117 to 135
Coconut Point Park Inlet (Project Site 8)	1,890	Not applicable	111,000	160,698

Source: CDM Smith et al., 2015.
Note: Positive flow is towards the IRL.

A screening matrix was used to evaluate the costs and benefits of the project based on the criteria for the tidal prism, area affected, land acquisition, relative costs, ease of construction, seagrass loss, and benefit to cost ratio. The top ranked project from this evaluation is the Port Canaveral culvert (CDM et al., 2015). It is important to note that a culvert will likely not provide the amount of exchange needed to provide a significant benefit to the lagoon. The size of the IRL in Brevard County (County) is more than 150,000 acres. The second ranked project is the Canaveral Lock open channel. This option may have challenges moving forward based on past experience with sediment blocking submarines from using the port after the lock was held open for an extended period of time. In addition, limited data are available for estimating the water quality benefits and unintended ecological consequences that could result from keeping the lock open.

In 2019, the Florida Institute of Technology received $800,000 in funding from the Florida Legislature, which was administered by the Florida Department of Education, to plan and perform studies at sites within the IRL and along the coast to restore lagoon inflow. The first phase of the study gathered baseline data and performed modeling on existing water quality, biological parameters, and hydrologic conditions at potential locations for future temporary permitted inflow test structures. The Phase 1 modeling and engineering project research was conducted in parallel with the biological and water quality monitoring to gather data for an enhanced circulation pilot project. The first phase of the project was completed in September 2020. Phase 1 provided baseline biological and geochemical data near the three proposed inflow locations: Port Canaveral and south Cocoa Beach in Brevard County and Bethel Creek in Indian River County. Modeling results were provided for different flow rates in each location based on preliminary engineering concepts for three structure options: pipe with no pump, pump and pipe, and weir (Florida Institute of Technology, 2020).

In 2020, the Florida Institute of Technology received another $752,000 in funding from the Florida Legislature, which was also administered by the Florida Department of Education, for Phase 2 of the study. Phase 2 identified the most feasible and cost-effective location for a temporary inflow pilot system in the Banana River Lagoon within a cove that would receive inflow from the ocean side of the Port Canaveral lock system. Engineering design for a 0.5 cubic meter per second pumping system was completed, and pre-application meetings were held with the permitting agencies. This phase also included additional water quality, geochemical, and biological monitoring to build a baseline conditions database, and updated models to predict changes due to the pilot inflow. Phase 2 was completed in September 2021 (Florida Institute of Technology, 2021).

In 2022, the Florida Institute of Technology received another $921,500 in funding from the Florida Legislature, also administered by the Florida Department of Education, for Phase 3 of the study. Phase 3 focused on the design and permitting of a temporary inflow pilot system and additional research and modeling. The United States Army Corps of Engineers Section 404 and Section 408 permits and Florida Department of Environmental Protection Environmental Resources Permit were obtained and additional design of the pilot system was completed. Biogeochemical research and modeling efforts proceeded in parallel with permitting and design. Phase 3 was completed in September 2023 (Florida Institute of Technology, 2023). In 2024, the University of Central Florida received $4.9 million to construct the pilot project designed by Florida Institute of Technology. A construction timeline has not yet been announced.

Temporary Inlet: Another potential option for ocean exchange is when a large storm creates an opening. Instead of immediately filling in the new opening, an evaluation should be completed using available models to determine the potential benefits of temporarily stabilizing the opening long enough to provide significant ocean exchange for short-term water quality benefits, but not long enough to excessively alter beach erosion and sand transport into the IRL.

Causeway Modification: In 2018, the IRL National Estuary Program, in partnership with the Canaveral Port Authority, worked with the Florida Institute of Technology to assess the potential for modifications of the State Road 528 and State Road 520 causeways and bridge structures to enhance circulation in the northern portion of the Banana River Lagoon and adjacent North IRL. The Florida Institute of Technology used the United States Army Corps of Engineers Coastal Modeling System for this evaluation (Zarillo, 2018).

The model was set up to reproduce the physical conditions of 2015 to ensure the model was well calibrated. Measured data, including water levels, freshwater inflows, wind velocity, and topography, were used to drive the model. Nine model tests were performed to represent current conditions and scenarios with hypothetical bridge spans over the Banana River Lagoon and North IRL. Three of the model tests included flow relief structures embedded in the State Road 528 and State Road 520 causeways. The tests were run using numerical tracer dye concentration throughout the model domain to track the dye concentration reduction throughout the model simulation. Circulation in the model occurred through ocean exchanges through the Sebastian Inlet, freshwater inflows, and wind (Zarillo, 2018).

The model results indicated that modifying the bridge and causeway structures would have a detectible influence on exchange rates within the Banana River Lagoon and North IRL. Longer bridge spans over the Banana River Lagoon along State Road 528 combined with longer bridge spans over State Road 520 resulted in a 10% net reduction in the dye concentration in the Banana River Lagoon between State Road 528 and State Road 520 at the end of the 340-day model run. The net improvement in exchange in the Banana River Lagoon immediately to the north of State Road 528 was predicted to be 5% if bridge spans are present on both state roads. The study concluded that a significant improvement in exchange in the Banana River Lagoon study area and adjacent North IRL would require bridge spans on both State Road 520 and State Road 528 (Zarillo, 2018).

In 2019, Dr. Zarillo expanded his circulation model to include Mosquito Lagoon and the ocean inlet at New Smyrna instead of a closed boundary at Haulover Canal. This expanded model was run again to estimate the impact of causeways on residence time in various compartments of the IRL. From the modeling, longer bridge spans over the Banana River Lagoon along State Road 528 and State Road 520 resulted in a 17% net reduction in the dye concentration in the Banana River Lagoon between State Road 528 and State Road 520 at the end of the 340-day model run. The net improvement in exchange in the Banana River Lagoon immediately to the north of State Road 528 was predicted to be 8% and exchange within Sykes Creek improved by 20% (Zarillo, 2019).

In response to the 2019 model results, the St. Johns River Water Management District offered to use their state-of-the-art ecological modeling tools to quantify water quality improvements and algal bloom reductions anticipated from the proposed causeway modifications. At the request of Brevard County, Port Canaveral, and IRL National Estuary Program, the Florida Department of Transportation agreed to pause their causeway widening project for six months until the ecological impacts could be estimated and evaluated. The modeling results confirmed the improvement in residence time identified in Dr. Zarillo's modeling but predicted little corresponding change in chlorophyll-a concentrations (St. Johns River Water Management District, 2020).

As part of the State Road 528 widening project from Industry Road to State Road 401/Port Canaveral, the Florida Department of Transportation will be replacing all bridges except the newest bridge over the IRL. Due to input from various stakeholders and environmental agencies, the Florida Department of Transportation committed to bridging and elevating the causeway over the Banana River Lagoon to improve transportation resiliency. This design option will allow other stakeholders to analyze future causeway removal for better water flow in the Banana River Lagoon in an effort to improve water quality. The Florida Department of Transportation will be pursuing a design/build option to update the current design and move directly into construction. It is unknown when funding will become available.

The United States Army Corps of Engineers is authorized by Congress to initiate investigations and implement projects for aquatic ecosystem restoration that improve the quality of the environment, are in the public interest, and are cost effective. After the Florida Department of Transportation agreed to replace the roadway with bridges, the Brevard County Commission sent a letter asking the United States Army Corps of Engineers to consider an ecosystem restoration project that would reduce or remove the earthen causeway crossing the Banana River Lagoon. A Federal Interest Determination completed in 2023 indicates that compartmentalization of IRL waters by earthen causeways impedes natural hydrology and the associated movement of flora and fauna and contributes to habitat degradation in the Banana River Lagoon.

The next step is to conduct a Feasibility Study to develop a range of structural change alternatives and determine the best one. The estimated cost of the Feasibility Study is $700,000 and requires 50% non-federal funding. The best, cost-effective alternative will be eligible for federal implementation at 65% federal cost-share up to $10 million. Construction costs are not yet known but are expected to be within the $10 million federal cost-share limit. Modeling to compare the benefits of structural alternatives to the earthen causeway could also be useful for evaluating the performance of other IRL projects.

State cost-share for the Feasibility Study was requested through a grant from the $100 million Indian River Lagoon Protection Program and the 2024 Legislative Appropriations process. To get the Feasibility Study started, the Citizen Oversight Committee unanimously recommended using Save Our Indian River Lagoon Respond funds to front the local cost-share, but this has not yet been approved by the County Commission. State grants could partially or fully reimburse the fronted local cost-share.

4.3. Projects to Restore the Lagoon

Another component of this plan is to implement projects that will restore important, filtering ecosystem services within and adjacent to the Indian River Lagoon (IRL) to improve water quality and resilience. Oyster reefs provide ecosystem services including improved water quality, shoreline stabilization, carbon burial, and habitat provision for more than 300 different species (Grabowski et al., 2012). Clams filter water, sequester nutrients, and bury carbon. Planting shorelines with natural vegetation helps to filter excess nutrients and suspended solids from the IRL (Grizzle et al., 2008; Reidenbach et al., 2013). Restoring natural filtration processes will improve water quality, allowing for seagrass growth (Newell and Koch, 2004) and may reduce the number and severity of algal blooms in the IRL. These types of projects take years before the full benefits are seen in the IRL as it takes some time for oyster and clam populations to recover to self-sustaining levels and for vegetation to grow and become established.

The sections below summarize the oyster restoration, planted shoreline, and clam restoration and aquaculture projects that are proposed, as well as considerations for seagrass planting.

4.3.1. Oyster Restoration

Oysters remove nitrogen from the water via assimilation into the shell and tissue, burial into the sediments, and microbe-related denitrification.

In addition to the fisheries value, oysters provide a variety of nonmarket ecosystem services, with a combined estimated economic value between $5,500 and $99,000 per hectare per year (Grabowski et al., 2012). Restored oyster bars have been shown to result in a positive net effect on the removal and sequestration of nitrogen compared to unrestored sites. As nitrogen is a major contributor to algal blooms and resulting increased turbidity, removal of nitrogen from the system often yields water quality benefits. The nitrogen is removed through three pathways: (1) assimilation of the nitrogen in the shell and tissues of the oysters, (2) enhanced burial of nitrogen into the sediments surrounding oyster bars, and (3) conversion of nitrogen to a gaseous form that returns to the atmosphere through microbe-related denitrification (zu Ermgassen, 2016).

Oyster bars can function as natural breakwaters, in addition to providing nutrient removal benefits through denitrification. The rate of vertical oyster bar growth on unharvested bars (2–6.7 centimeters per year) is greater than predicted sea-level rise rate (2–6 millimeters per year); therefore, bars could serve as natural protection against shoreline erosion, shoreline habitat loss, and property damage and loss along many estuarine shorelines (Ridge et al., 2017). Oyster bars reduce erosion of other estuarine habitats such as salt marshes and submerged aquatic vegetation by serving as a living breakwater that attenuates wave energy and stabilizes sediments (Grabowski et al., 2012).

Some studies indicate that the primary mechanism by which oysters remove nitrogen from the system is by increasing local denitrification rates (Grabowski et al., 2012). While the impacts of oyster bars may be localized, they also influence the larger ecosystem. For example, a study by Sharma et al. (2016) found that even with limited bio-filtration and nonsignificant reef effects on water velocity, there was a "shadow" effect on seagrass beds between the reef and shoreline, which resulted in higher localized seagrass area five years after deployment relative to other nearby areas. Further, in a study by Kroeger (2012), it was noted that the eastern section of Mobile Bay had experienced harmful algal blooms that caused fish kills. These conditions occur in the summer months when denitrification by restored oysters would be highest. Therefore, the nitrogen removal associated with the oyster bar project in the bay may make a noticeable contribution to the local water quality by avoiding peak nitrogen concentrations that may trigger algal blooms.

Water quality improvement by target-driven nutrient reduction is required in many coastal areas of the United States as well as Asia, Australia, and Europe (Boesch, 2019; Ayvazian et al., 2021). To help meet nutrient reduction targets, there has been interest by governmental bodies to restore oyster populations promoting oyster-mediated denitrification (Ayvazian et al., 2021). Recent studies have investigated the best methods for quantifying denitrification of oyster systems and the current consensus points toward the dissolved nitrogen to argon gas ratio or nitrogen-15 isotope tracer methods (Caretti et al., 2023; Ray and Fulweiler, 2020; Ray et al., 2021) because the acetylene block technique can disrupt microbial community function (Ray and Fulweiler, 2020; Ray et al., 2021). Additional recommendations include incorporating areal estimates of oyster biomass, extrapolating denitrification values only from systems with similar characteristics, and considering light levels and whether the reef is intertidal or subtidal (Ray et al., 2021).

Oysters also promote denitrification by directly recycling and removing nitrogen through the microbiome on their shells and in their digestive tracks, by increasing deposition of organic matter to the sediments, and as habitat for other filter-feeding organisms (Ayvazian et al., 2021). For denitrification credits in Chesapeake Bay, reefs must be subtidal, have an increased live oyster tissue biomass, and utilize small substrates (90% or more of substrate material by volume is 12 inches or less). Enhanced denitrification is defined by subtracting baseline denitrification from post-restoration denitrification rates based on oyster tissue biomass (Caretti et al., 2023). Since these data are from Chesapeake Bay, they estimated no net denitrification in the winter. Seasonal patterns were related to oyster biomass and a table of annual enhanced nitrogen removal was generated (Caretti et al., 2023).

Scaling denitrification values requires accurate seasonal data and extrapolation as denitrification values can vary with season (Kellogg et al., 2014). It is also important to note that denitrification has been found to increase with oyster density; however, when ambient nitrate concentrations are elevated denitrification decreases with increasing oyster density above approximately 2,400 individuals per square meter (Smyth et al., 2015).

The focus for oyster restoration in the Indian River Lagoon (IRL) system is to provide filtration, sequestration, denitrification, and scour protection along the shoreline (see **Section 4.3.2** for details on scour protection). The goal is not to restore historical oysters in the system because limited information is available on where oysters were historically located. In addition, seagrasses are a more critical component of the system, so restoration efforts aim to use the beneficial aspects of oysters in protecting seagrass from waves and increasing light availability (Newell and Koch, 2004) while minimizing the competition for space. Therefore, sites are evaluated for relative seagrass and oyster habitat requirements such as salinity, depth, and bottom type. In October 2021, Brevard County (County) adopted an Oyster Habitat Suitability and Rehabilitation Success Plan, which details environmental and biological targets to guide site selection for oyster bar projects, outlines adaptive management strategies, and defines related success criteria. Oyster bars may be constructed in submerged areas deeper than seagrass, in areas without an historic persistence of seagrass presence, or as narrow bars along the shoreline to act as a living wave break to reduce erosion.

The oysters from the Oyster Gardening Program were used to develop several pilot bars and demonstration sites in the IRL. In fiscal year 2014–2015, Brevard County received a $410,000 appropriation from the Florida Legislature for the Indian River Lagoon Oyster Restoration Project. This pilot study was completed in fall 2016. Initial design of oyster wave breaks funded by the Save Our Indian River Lagoon Trust Fund was based on monitoring results from the pilot bars and wave tank studies at Florida Institute of Technology that tested the oyster bar stability and wave attenuation of different designs. From these studies the importance of reef location and seasonal water depth (Anderson, 2016) as well as the ability of the reef to act as a wave break (Weaver et al., 2017) were highlighted. Monitoring of oyster bar projects continues to inform their design and placement. Design tests include increasing the project width, utilizing galvanized after welding stainless steel gabions, constructing oyster corrals, coquina corral walls, larger project footprints, and different seeding methods and densities.

Oyster filtration rates depend, at least in part, on the oyster size (Riisgard, 1988). Assuming oysters of 2.24 inches in length, which have an hourly filtration rate of approximately 1 gallon per hour per individual, and a population density of 51 oysters per square foot, approximately 14.5 acres would be needed to filter an equivalent volume of water as that contained in the North IRL, Central IRL, and Banana River Lagoon each year. This is roughly equivalent to 20 miles (105,600 feet) of oyster bars at a width of six feet. These bars will be placed throughout the IRL, at sites that meet Habitat Suitability selection criteria, along mosquito impoundments, parks, and private properties where owners want to participate. Based on the pilot project costs and knowing that larger bars will be constructed more efficiently (using information from the pilot projects), in 2016, it was estimated that the 20 miles of oyster bars could be constructed at a cost of $10 million.

Recently, the Chesapeake Bay Program Partnership began evaluating best management practices and has given interim nutrient reduction credits for oyster-mediated denitrification through restoration practices (Cornwell et al., 2019; Reichert-Nguyen and Slacum, 2019). Current recommendations in the 2023 Expert Panel Second Report include oyster restoration through substrate addition and/or using hatchery-produced oysters (Caretti et al., 2023). Only the increase in biomass over the baseline plus any previous maximum biomass for a site receives credit (Caretti et al., 2023; Rose et al., 2021). Nitrogen assimilated into oyster reefs is constantly stored through cycles of new growth and mortality and subsequent assimilation and burial; therefore, the increase in biomass above baseline reflects measurable reduction in nitrogen and phosphorus (Reichert-Nguyen and Slacum, 2019).

For the Chesapeake Bay area, oyster tissue and shell dry weight can be calculated based on the shell length via the equations $W_t=0.00037 * L^{1.83359}$ and $W_s=0.00147 * L^{2.3964}$ where W is the dry weight in grams of tissues (t) or shells (s) and L is the shell height in millimeters (Reichert-Nguyen and Slacum, 2019). Nutrient storage can be estimated based on these values with mean nitrogen content in tissue dry weight and shell dry weight at 8.2% and 0.2%, respectively, and mean phosphorus content in oyster tissue dry weight and shell dry weight at 0.9% and 0.04%, respectively (Caretti et al., 2023). These values are appropriate for the mid-Atlantic and northeast coastal regions of the United States (Kellogg et al., 2013a). Local tissue dry weight equations from the Mosquito Lagoon yield approximately 25% lower biomass estimates (summarized in zu Ermgassen et al., 2016).

In a study by Kellogg et al. (2014), the annual denitrification enhancement rates associated with oyster bars in North Carolina were documented, ranging from 0.00055 to 0.011 pounds per square foot per year (2.7–55.6 grams per square meter per year). In Maryland, subtidal oyster reefs were found to assimilate 0.013 and 0.002 pounds per square foot (61.759 and 10.1241 grams per square meter) of nitrogen and phosphorus, respectively, into the tissue and shell standing stock biomass. Additionally, the oysters enhance annual denitrification by 0.011 pounds per square foot per year (55.6 grams per meter squared per year) (Kellogg et al., 2013b). Similar values were reported by Sisson et al. (2011) for intertidal and subtidal reefs in Virginia. A 2017 study was also conducted for Brevard County in Mosquito Lagoon to determine the local benefits from oyster bed restoration. This local study found that the net denitrification rate of 7 year-old reefs was 0.009 pounds per square foot per year (450 kilograms per hectare per year) and scaled nitrogen sequestration in oyster tissues and shells is 0.109 pounds per square foot (531 grams per square meter) (Schmidt and Gallagher, 2017).

Based on the Mosquito Lagoon study, 14.5 acres of oyster reef could sequester an estimated 69,695 pounds of nitrogen and remove 5,821 pounds of nitrogen per year through denitrification (based on Schmidt and Gallagher, 2017). However, these denitrification values were obtained with the acetylene block method. Scaling nutrient sequestration and removal from values provided in Kellogg et al. (2013) using the dissolved nitrogen to argon method, 14.5 acres could assimilate an estimated 8,507 pounds of nitrogen, 1,310 pounds of phosphorus, and remove 7,193 pounds of nitrogen per year through enhanced denitrification. Considering the recent recommendations and advances in methods for quantifying oyster reef denitrification and crediting nutrient removal, additional studies in the IRL are needed.

The projects for oyster bar restoration are summarized in **Table 4-36**.

Table 4-36. Projects for Oyster Restoration

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Reduction	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Reduction	Plan Funding
Original	2016-55	Banana River Lagoon Oyster Bars*	Brevard County	Banana	4,569	$395	114	$15,814	$1,802,798
Original	2016-56	North IRL Oyster Bars*	Brevard County	North IRL	5,976	$395	149	$15,826	$2,358,111
2018	75	Marina Isles Oyster Bar+	Brevard Zoo	Banana	60	$445	20	$1,335	$26,700
2018	76	Bettinger Oyster Bar+	Brevard Zoo	Banana	24	$445	8	$1,335	$10,680
2018	78a	McNabb Park Oyster Bar+	City of Cocoa Beach	Banana	47	$200	1	$9,422	$9,422
2018	79	Gitlin Oyster Bar+	Brevard Zoo	Banana	36	$445	12	$1,335	$16,020
2018	80	Coconut Point/Environmentally Endangered Lands Oyster Bar+	Brevard Zoo	Central IRL	96	$470	2	$22,560	$45,120
2018	81	Wexford Oyster Bar+	Brevard Zoo	Central IRL	70	$445	24	$1,298	$31,150
2018	83	Bomalaski Oyster Bar+	Brevard Zoo	North IRL	20	$445	7	$1,271	$8,900
2018	73	Riverview Senior Resort Oyster Bar+	Brevard County	Central IRL	77	$394	2	$15,152	$30,304
2019	104	Brevard Zoo Banana River Oyster Project+	Brevard Zoo	Banana	1,476	$395	37	$15,757	$583,020
2019	105	Brevard Zoo Central IRL Oyster Project+	Brevard Zoo	Central IRL	408	$395	10	$16,116	$161,160
2019	106	Brevard Zoo North IRL Oyster Project+	Brevard Zoo	North IRL	864	$395	22	$15,513	$341,280
2020	139	Brevard Zoo North IRL Oyster Project 2+	Brevard Zoo	North IRL	841	$400	21	$16,019	$336,400
2020	140	Brevard Zoo Central IRL Oyster Project 2+	Brevard Zoo	Central IRL	677	$400	17	$15,929	$270,800
2020	141	Brevard Zoo Banana River Oyster Project 2+	Brevard Zoo	Banana	662	$400	17	$15,576	$264,800
2020	142	Brevard Zoo Oyster Reef Adjustments North IRL+	Brevard Zoo	North IRL	68	$400	2	$13,600	$27,200
2020	143	Brevard Zoo Oyster Reef Adjustments Banana River+	Brevard Zoo	Banana	32	$400	1	$12,800	$12,800
2021	184	Brevard Zoo North Indian River Lagoon Oyster Project 3+	Brevard Zoo	North IRL	1,056	$397	26	$16,124	$419,232

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Reduction	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Reduction	Plan Funding
2021	185	Brevard Zoo Central Indian River Lagoon Tributary Pilot Oyster Project+	Brevard Zoo	Central IRL	581	$397	15	$15,377	$230,657
2021	186	Brevard Zoo North Indian River Lagoon Individual Oyster Project+	Brevard Zoo	North IRL	436	$397	11	$15,736	$173,092
2021	187	Brevard Zoo Central Indian River Lagoon Oyster Project 3+	Brevard Zoo	Central IRL	218	$397	5	$17,309	$86,546
2021	188	Brevard Zoo Banana River Oyster Project 3+	Brevard Zoo	Banana	143	$397	4	$14,193	$56,771
2022	217	Central IRL Oyster Project 4+	Brevard Zoo	Central IRL	348	$397	9	$15,351	$138,156
2022	218	Central Oyster Project Offshore Reefs+	Brevard Zoo	Central IRL	900	$397	23	$15,535	$357,300
2022	226	Hog Point Offshore Oyster Bar+	Brevard County	Central IRL	126	$397	3	$16,674	$50,022
2025	272	Brevard Zoo North Indian River Lagoon Oyster Project 4+	Brevard Zoo	North IRL	1,742	$475	44	$18,806	$827,450
2025	273	Brevard Zoo Central Indian River Lagoon Oyster Project 5+	Brevard Zoo	Central IRL	1,504	$475	38	$18,800	$714,400
-	-	***Total***	-	-	***23,057***	***$407 (average)***	***644***	***$14,581 (average)***	***$9,390,291***

Note: The projects highlighted in green and marked with an asterisk were identified in the original plan. The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update. As specific project locations are added each year, the amount of funding for the original projects is reduced accordingly to keep the total funding allocation constant for projects that restore natural filtration processes (including oyster, clam, and planted shoreline projects).

4.3.2. Planted Shorelines

Typically, efforts to protect shorelines have involved hardened structures, such as seawalls, rock revetments, or bulkheads, to dampen or reflect wave energy. Although these types of structures may mitigate shoreline retreat, they accelerate scour and the ecological damages that result can be great (Scyphers et al., 2011). The planted shoreline approach incorporates natural habitats into a shoreline stabilization design; maintains the connectivity between aquatic, intertidal, and terrestrial habitats; and minimizes the adverse impacts of shoreline stabilization on the estuarine system. These efforts range from maintaining or transplanting natural shoreline vegetation without additional structural components to incorporating shoreline vegetation with hardened features, such as rock sills or oyster bars, in settings with higher wave energy (Currin et al., 2010). Selection of the most appropriate management system begins with a site analysis to evaluate the type of shoreline, amount of energy that a shoreline experiences, sediment transport forces, type and location of ecological resources, and adjacent land uses (Restore America's Estuaries, 2015).

As part of a study for the Chesapeake Bay, Forand et al. (2014) evaluated the pollutant load reductions from planted shoreline projects in the area. The results of this evaluation are shown in **Table 4-37**, and were used to update the United States Environmental Protection Agency Chesapeake Bay Program Office estimate of the total nitrogen (TN) and total phosphorus (TP) reductions per foot of planted shoreline. The estimated nutrient reductions from planted shorelines can be calculated using Chesapeake Bay Program Office recommended rates of 0.2 pounds of TN per linear foot and 0.068 pounds of TP per linear foot (Forand et al., 2014.), which is for an average planting width of 24 feet. These values were adjusted for the proposed average planting width of eight feet in Brevard County, which results in a reduction of 0.067 pounds of TN per linear foot and 0.023 pounds of TP per linear foot.

Table 4-37. Pollutant Load Reductions for Shoreline Management Practices

Source	Total Nitrogen (pounds per foot per year)	Total Phosphorus (pounds per foot per year)	Study Location
Ibison, 1990	1.65	1.27	Virginia
Ibison, 1992	0.81	0.66	Virginia
Proctor, 2012	Not applicable	0.38 or 0.29	Virginia
Maryland Department of the Environment, 2011	0.16	0.11	Maryland
Baltimore County mean (Forand, 2013)	0.27	0.18	Maryland
Chesapeake Bay Program Office Scenario Builder, 2012	0.02	0.0025	Chesapeake Bay Program policy threshold from one restoration site
New Interim Chesapeake Bay Program Office Rate (Expert Panel, 2013)	***0.20***	***0.068***	***Chesapeake Bay Program Office policy thresholds that come from six stream restoration sites***

Note: Table is from Forand et al., 2014.

To promote success, mangroves incorporated into planted shorelines will be at least three years old with fully woody trunks, which have been found to increase successful establishment by 1,087% compared to seedlings based on studies conducted in Mosquito Lagoon (Fillya, 2021).

A capstone project with students at the United States Naval Academy aimed to further investigate methods to increase the successful establishment of planted shorelines. The students chose the Fisherman's Landing shoreline to collect initial data on water level and waves and tested potential natural solutions in a wave tank at the United States Naval

Academy. The final design considered mangroves planted shoreward of cordgrass within 10 feet of mean high water level. The mangroves would be planted at a density of 1 per 5.4 square feet for a total of 30 mangroves within a 50 by 3.25 foot area. Cordgrass would be planted at 48 stems per square foot with 5,400 plugs per 50 by 3 foot area. Most waves on site had a period of about 2 seconds. In the wave tank, an incoming 2-inch wave with wave periods of 0.75, 1.57, and 2.38 seconds were tested. Wave energy attenuation for cordgrass or mangroves alone was about 30% to 40%. However, the configuration with both mangroves and cordgrass together yielded a 46% wave height attenuation and a 60% wave energy attenuation (Freitas et al., 2022).

At this time, the plan does not recommend a total length of planted shoreline. Planted shoreline projects will be considered for funding annually as partners submit projects for the plan. A cost-share of $16 per linear foot of shoreline, planted in eight-foot wide swaths, was established by using typical nursery installation costs and standard canopy dimensions for native shoreline species found in Brevard County. This equates to $240 per pound of nitrogen reduced by shoreline plantings.

Brevard County conducted a survey of the shorelines, in conjunction with the University of Central Florida, to determine if the shoreline included a bulkhead/seawall, hardened slope/riprap, or no structure to help identify potential locations for future oyster bars and planted shorelines (Donnelly et al., 2018) (**Figure 4-30**). In 2024, a Living Shoreline Site Selection and Design Decision Support Tool was published for the Indian River Lagoon that incorporates future conditions induced by sea level rise (Parkinson et al, 2024). This tool helps to locate shorelines with slopes that will allow the living shoreline to perform as intended and migrate upslope as sea levels rise.

Table 4-38 summarizes the approved projects for planted shorelines and the estimated load reductions.

Figure 4-30. Shoreline Survey to Identify Locations Appropriate for Oyster Bars and Planted Shorelines

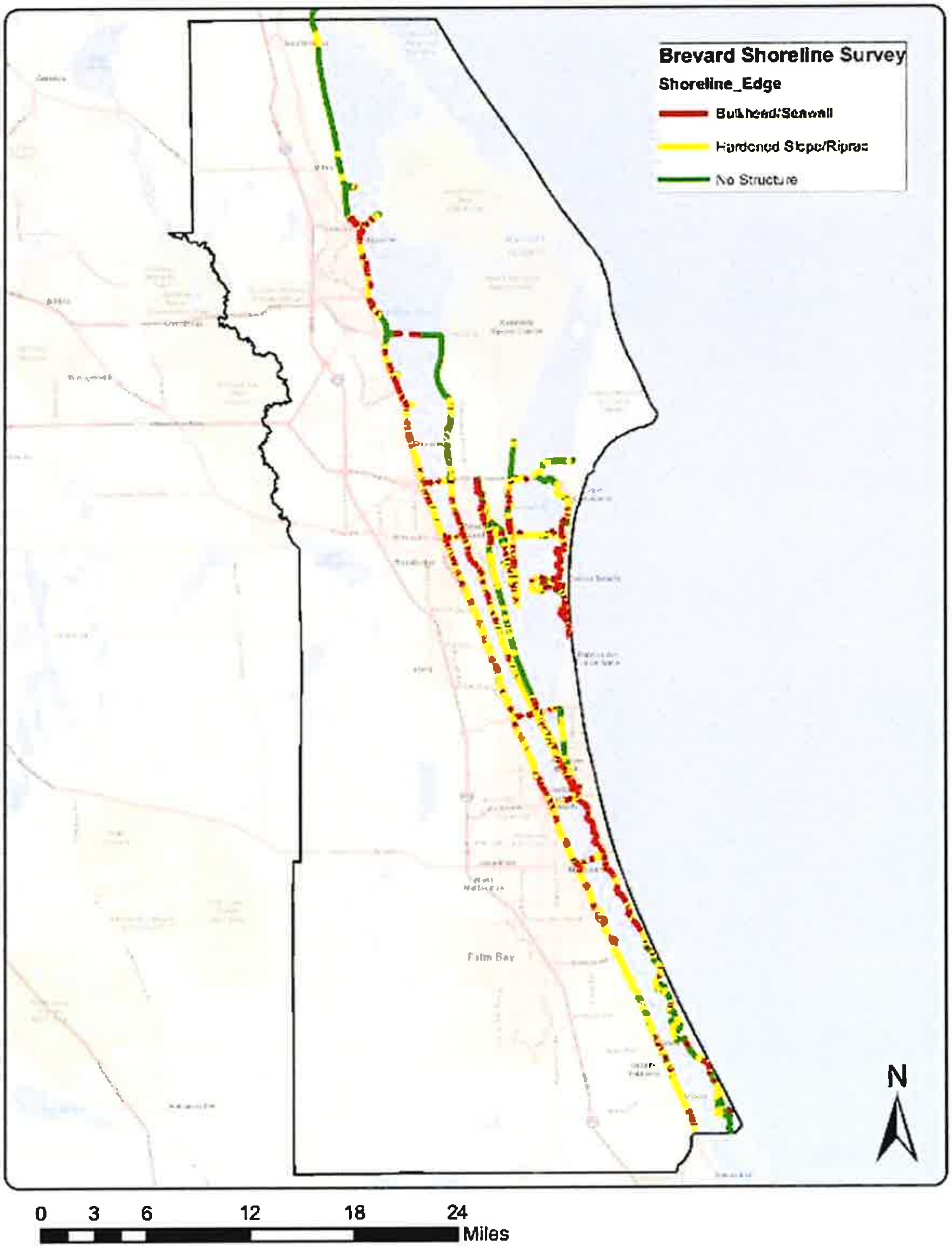


Figure 4-30 Long Description

Table 4-38. Projects for Planted Shorelines

Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Reduction	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Reduction	Plan Funding
2018	77a	Cocoa Beach Country Club Planted Shoreline+	Marine Resources Council	Banana	67	$240	23	$699	$16,080
2018	77b	Lagoon House Shoreline Restoration Planting+	Marine Resources Council	Central IRL	100	$240	34	$706	$24,000
2018	78b	McNabb Park Planted Shoreline+	City of Cocoa Beach	Banana	7	$240	2	$840	$1,680
2019	103	Brevard Zoo North IRL Plant Project+	Brevard Zoo	North IRL	3	$240	1	$720	$720
2020	130	Brevard Zoo North IRL Plant Project 2+	Brevard Zoo	North IRL	41	$240	14	$703	$9,840
2020	133	Fisherman's Landing+	Marine Resources Council	Central IRL	20	$240	7	$686	$4,800
2020	135	Rotary Park+	Marine Resources Council	Central IRL	20	$240	7	$686	$4,800
2021	180	Scottsmoor Impoundment+	Marine Resources Council	North IRL	44	$240	15	$704	$10,560
2021	181	Riveredge+	Marine Resources Council	North IRL	17	$240	6	$680	$4,080
2022	212	Titusville Causeway Multi-Trophic Restoration and Living Shoreline Resiliency Action Project+	Brevard County Natural Resources	North IRL	131	$240	45	$699	$31,440
-	-	***Total***	-	-	***450***	***$240 (average)***	***154***	***$701 (average)***	***$108,000***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

4.3.3. Clam Restoration and Aquaculture

Another potential tool for nutrient extraction, scour prevention, and water filtration in the Indian River Lagoon (IRL) is through clam aquaculture and restoration. Like oysters, clams can remove nitrogen from a system by burying it in sediments and enhancing the denitrification process through increased microbial activity in biodeposits (Clements and Comeau, 2019). The harvesting of clam shells and tissues can also extract nitrogen, as bivalves directly incorporate nitrogen (i.e., from consumption of phytoplankton and detritus; not dissolved nitrogen in the water) into their tissues and shells (Clements and Comeau, 2019).

Studies suggest that bivalve aquaculture has the potential to stimulate rates of denitrification equal to that of wild oyster beds and that the impacts of biodeposition from aquaculture are minimal (Clements and Comeau, 2019). The culture gear (bags, cover netting) used by growers creates a favorable environment for a myriad of plants and animals, such as juvenile fish and crabs, by providing habitat, substrate, and protection. This is especially significant since shellfish aquaculture leases can only be located in areas of the IRL that undergo a resource survey to ensure the site is devoid of seagrasses and other marine life.

The exploration of clam aquaculture in Brevard County as a mitigation tool to extract excess nutrients from the IRL is warranted. According to the University of Florida Clam Farm Benefits Calculator, a single littleneck clam can filter 4.5 gallons of seawater per day and remove 0.09 grams of nitrogen when harvested. Therefore, in 2020, the Citizen Oversight Committee approved allocating $60,000 in funds to stimulate bivalve aquaculture in Brevard County. This funding would be used to sponsor 10 farms with up to $6,000 per farmer to plant up to 500,000 clams each. The funding would help to offset licensure, lease, and/or material costs. It is estimated that the clams from this stimulus project would remove 1,000 pounds of total nitrogen (TN) at a cost of $60 per pound of TN (**Table 4-39**). This program will also help promote education directed toward awareness of local aquaculture industries and their dependence on water quality to create mindfulness of the effects of eutrophication in a visceral, practical way. Clam aquaculture sponsorship grants create opportunities for successful partnerships with local clam farmers. Public sentiment toward clam restoration has been positive and the nutrient-removal aspects of shellfish aquaculture align with the Plan's goals.

In addition, a statewide partnership aims to restore clams in the IRL using genetic stock able to withstand the unfavorable condition of an algae bloom-ridden lagoon. The IRL Clam Restoration Project is a cooperative venture between the Coastal Conservation Association, Florida Fish and Wildlife Conservation Commission, University of Florida Whitney Lab, Brevard Zoo, and Florida Oceanographic Society. They collected broodstock living in the IRL, spawned them, and have begun outplanting these "super clams" in bags or under cover-netting at strategic locations in the IRL (based upon historical sites and current water quality trends) including existing partner habitat restoration and commercial lease areas. Survivorship and growth data are collected to inform next steps for the program. Another goal is to establish brood stock that will serve as the optimized variety (phenotype) lines for further stock enhancement. In 2023, the IRL Clam Restoration Project began repatriating clams to the IRL using drones. Clam seed was dispersed at a density of 10, 20, and 30 clams per square foot at authorized permitted locations. This method had a mean survival of 33.6% over the eight months of monitoring from October 2023 to May 2024, and negated the time and costs associated with maintaining nets and other protective gear (Hale and Osborne, 2024).

In 2020, grant funding was requested to outplant super clam progeny at 100 sites throughout the lagoon. Funding was secured and a combination of private properties and public locations were chosen so that volunteers could assist with restoration. These locations were spread throughout the IRL to help obtain information on survival rates in different areas to improve restoration efforts. All clams were deployed and monitoring for one-year post-deployed has been completed. The Brevard Zoo Clam Restoration Final Report (2023) concludes that clam survival was significantly, positively related to salinity. Survival was also higher at locations where predation protection nets remained secured for the length of the project, highlighting the importance of predation protection when planting restoration sites at high density. Finally, the highest average growth rates occurred in the Central IRL, followed by the Mosquito Lagoon, North IRL, and Banana River Lagoon.

Table 4-39. Projects for Clam Restoration

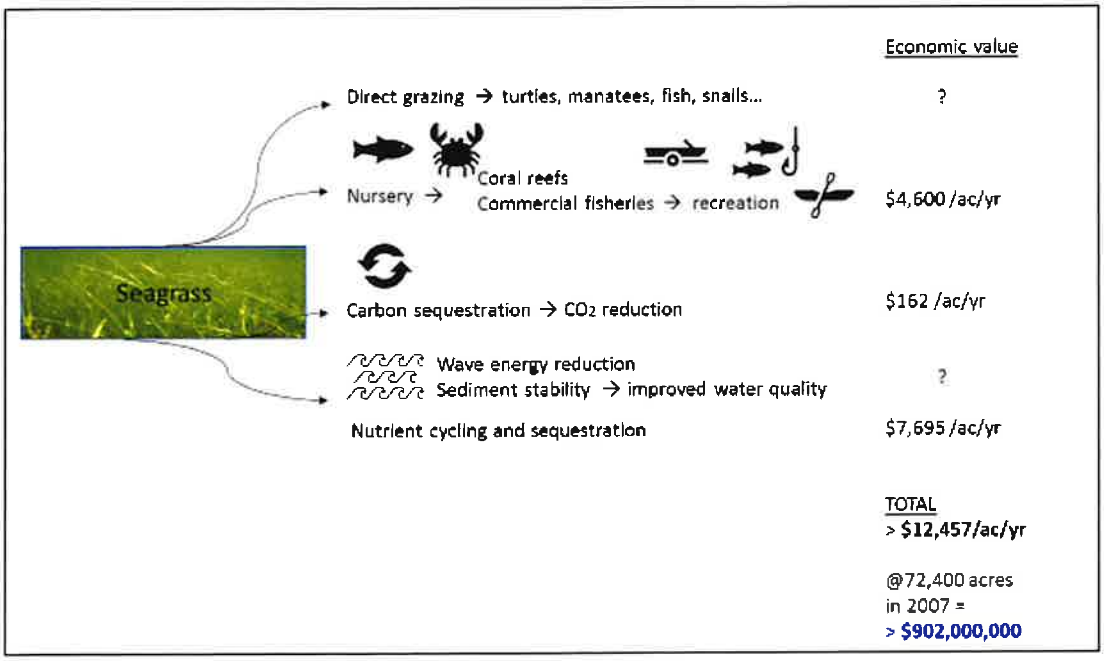
Year Added	Project Number	Project Name	Responsible Entity	Sub-lagoon	Total Nitrogen Reduction (pounds per year)	Cost per Pound per Year of Total Nitrogen Reduction	Total Phosphorus Reduction (pounds per year)	Cost per Pound per Year of Total Phosphorus Reduction	Plan Funding
2021	194	Aquaculture Stimulus Project+	Brevard County	All	1,000	$60	Not applicable	Not applicable	$60,000
2025	265	Restoration of Native Clams in the IRL – Titusville+	Indian River Lagoon Clam Restoration Project	North IRL	1,584	$172	528	$515	$272,000
2025	267	Restoration of Native Clams in the IRL - Grant Island+	Indian River Lagoon Clam Restoration Project	Central IRL	990	$172	330	$515	$170,000
-	-	***Total***	-	-	***3,574***	***$140 (average)***	***858***	***$585 (average)***	***$502,000***

Note: The projects highlighted in tan and marked with a plus sign were added to the plan as part of an annual update.

4.3.4. Seagrass Planting

The original Indian River Lagoon (IRL) Surface Water Improvement and Management Plan of 1989, as well as subsequent management plans up to and including the current basin management action plans, target a healthy, estuarine ecosystem populated by seagrasses. Seagrasses provide crucial benefits to Florida's estuaries by providing food and shelter to a variety of animals, improving water quality, and preventing erosion of sediment (Orth et al., 2006). In total, the lagoon's 72,000 acres of seagrass could provide an economic benefit of more than $900 million per year (**Figure 4-31**; Dewsbury et al., 2016).

Figure 4-31. Estimated Economic Value of Some Seagrass Services



Note: Adapted from Dewsbury et al., 2016

Figure 4-31 Long Description

One key ecological role for seagrasses is to absorb and cycle nitrogen and phosphorus (Romero et al., 2006). Seagrasses do not remove these nutrients permanently, but they compete for them against phytoplankton and macroalgae and hold them longer (Banta et al., 2004). By stabilizing the cycling of nutrients, seagrasses can increase a system's ability to absorb nutrient loads without the initiation of detrimental blooms of phytoplankton or macroalgae (Schmidt et al., 2012). Seagrasses can filter nitrogen inputs via photosynthesis and nutrient uptake, acting as a sink seasonally (McGlathery, 2008). However, when systems become eutrophic, this function can be lost (McGlathery, 2008). The contribution of seagrasses can be evaluated by examining the quantity of nutrients bound in its aboveground and belowground structures (its mass of biological material or biomass), with this approach treating uptake and release of nutrients as offsetting components of the nutrient cycle (**Table 4-40**).

Table 4-40. Average Nutrients in Seagrass from 1996–2009

Sub-lagoon	Acres	Seagrass (pounds per 100 acres)	Nitrogen (pounds per 100 acres)	Phosphorus (pounds per 100 acres)
Southern Mosquito Lagoon	14,000	45,000	1,000	100
Banana River Lagoon	21,000	45,000	1,000	100
North IRL	19,000	37,000	900	90
Central IRL	7,000	36,000	900	90

Seagrass restoration may be necessary because more than 30,000 acres of seagrasses were lost due to shading during the superbloom in 2011, recovery has been limited, and the brown tide in 2016 exacerbated the situation. In fact, the Banana River Lagoon in Brevard County (County) experienced the largest initial losses of seagrass (**Appendix C**). Throughout the northern IRL, decreases in the extent and cover of seagrass between 2009 and 2019 meant that approximately 216,053 pounds (98 metric tons) of nitrogen and 22,046 pounds (10 metric tons) of phosphorus were no longer stored in seagrass. These quantities represent 11% and 40% of the mean concentrations of dissolved nitrogen and phosphorus in the northern IRL, respectively (Morris et al., 2022). After the loss of seagrass, nitrogen and phosphorus became available to phytoplankton, drift algae, and other primary producers (**Table 4-41**). Furthermore, the absence of seagrasses has made the sediments less stable, which hampers the colonization and spread of new seagrass.

Overall, seagrasses may need some help to recover in the short-term, with more rapid recovery helping to sequester nutrients and reduce the amounts available to phytoplankton. Measures that could help seagrasses recover include protecting existing seagrass to promote expansion or protecting areas from waves to reduce the movement of sediment and allow seagrasses to colonize. Planting pilot studies have begun with *Halodule wrightii* as the initial focus because it has been the most widespread species in the IRL (Dawes et al., 1995; Morris et al., 2022) and can act as a pioneer due to its rapid growth and wide tolerance thresholds.

Table 4-41. Average Seagrass Lost and Nutrients Made Available to Other Primary Producers in 2015

Sub-lagoon	Reduction in Acres	Seagrass Reduction* (pounds per 100 acres)	Nitrogen Reduction (pounds per 100 acres)	Phosphorus Reduction (pounds per 100 acres)
Southern Mosquito Lagoon	0	15,000	300	30
Banana River Lagoon	12,000	37,000	900	90
North IRL	1,000	8,000	200	20
Central IRL	4,000	20,000	500	50

* Changes in seagrass cover yield changes in biomass of seagrass within the same number of acres.

Planting seagrass is not a trivial undertaking; it requires considerable planning, resources, and time. For example, having suitable conditions is critical as shown in Tampa Bay where stakeholders invested more than $500 million in projects to reduce nutrient pollution before they saw any return from planting seagrass (Lewis et al., 1999). Costs documented during a workshop on seagrass restoration started at $1.4 million per acre for larger scale projects (Treat and Lewis, 2006). Seagrass meadows influence nutrient dynamics through storage, cycling, and promoting denitrification.

Scaled nitrogen storage and removal rates vary from 6 to 78 pounds per acre per year based on studies of various seagrass species conducted in Australia, Virginia, North Carolina, and IRL (Piehler and Smyth, 2011; Russel and Greening, 2015; Smyth et al., 2015; Aoki et al., 2019; Morris et al., 2022). With project costs ranging from approximately $2 to $7 per square foot of seagrass, this equates to $1,085 to $48,306 per pound of nitrogen sequestration.

Some of the lessons learned from past projects include selecting sites that will support seagrass growth, employing optimal methods for planting (e.g., type of planting units, use of chemicals to enhance growth, and density of initial planting), and protecting newly planted seagrass from disturbance (e.g., grazing, waves, exposure, and low salinity) until it is established. It may be best to tailor approaches to a specific location; therefore, one or more pilot studies prior to attempting full-scale restoration should prove valuable.

The Brevard County Natural Resources Management Department was awarded funding from the state's resiliency grants program and from the Tourism and Development Council Lagoon Tourism + Lagoon Grant Program to support a seagrass planting pilot project in the IRL. The project planted 1.66 acres of seagrass over two separate locations in June 2024. The project was designed to test different planting methods (e.g., type of unit to be planted and density of units) to better understand how to approach, most effectively and economically, future, larger-scale restoration. The area will be monitored for two years post-restoration to document growth and survival, with measures being density, percent cover, and canopy height, as well as water depth, dissolved oxygen concentration, light availability, and other environmental conditions. The bids for installing this seagrass ranged from approximately $120,000 to $194,000. Based on the cost of this pilot project and literature values for sequestrations rates, a planting cost of approximately $72,000 per acre ($1.65 per square foot), would equate to a cost-effectiveness of roughly $900 per pound of nitrogen sequestered.

Similar or more complex pilot studies could be designed to investigate other key components of restoration. Overall, successfully incorporating planting into the restoration of tens of thousands of acres of seagrass will benefit from strategic investment in optimizing techniques. For example, site selection and project scale may be critical to surviving chronic natural disturbance and increasing the potential for natural recolonization (Fonseca presentation to the Citizen's Oversight Committee on August 20, 2021). Brevard County supported the development of a decision tree that will help all interested groups with these issues. This tool is based on decades of research by St. Johns River Water Management District regarding abiotic factors and thresholds found to limit seagrasses in the IRL. Variables known to influence seagrass growth and persistence were weighed using an ArcGIS-based suitability model to help identify the relative risk of planting in the County's portion of the IRL. In this way, it does not predict outcomes, rather aims to identify current conditions that pose differing risk levels to seagrass survival. It also aims to provide a framework for a methodical approach to planting design, execution, and monitoring so that important questions can be addressed and lessons learned can inform future restoration efforts. By its design, as results from future pilot projects are gathered, the model can be updated to reflect changes in IRL conditions and incorporate new data and lessons learned. The St. Johns River Water Management District is currently in the process of obtaining updated bathymetry for the IRL and initial plans for the next phase of this project are to perform and incorporate wave modeling once updated bathymetry is available. The ArcGIS tool can be found at this link. **Appendix C** includes additional details about seagrass.

4.4. Projects to Respond to New Information

The majority of funding raised from the Save Our Indian River Lagoon sales tax goes toward the projects listed in the sections above that will reduce or remove pollutants and restore the Indian River Lagoon (IRL). In addition, $10 million of the funding, over a period of 10 years, will go towards monitoring efforts to measure the success, nutrient removal efficiency, and cost effectiveness of projects included in this plan and those potentially added in future updates of this plan. Measuring effectiveness is important for reporting progress toward total load reduction targets and for refining project designs to be more effective with each iteration. The monitoring data are used to determine which projects are providing the most benefit in the most cost-effective manner so that the plan can be updated, as needed. Respond funds can also be used to measure if the IRL is responding as anticipated to the reductions made so that changes to the plan can be implemented if the lagoon is not responding as expected.

4.4.1. Adaptive Management to Report, Reassess, and Respond

The Indian River Lagoon (IRL) is located along the Space Coast, which is also known as a global center for exploration, innovation, and development of cutting edge technology. With a dedicated funding source and a brilliant community dedicated to meeting the challenges of today and tomorrow, it is wise to have a process that allows this plan to be updated and revised as new opportunities and better solutions are developed. The intent of the proposed adaptive management strategy is to provide a process that not only allows but also fosters the development and implementation of better tools and techniques for IRL restoration.

Although this plan was initially developed with the best information available in 2016, identifying the sources of water quality pollution and pairing those problems with the most timely and cost-effective solutions is a rapidly changing field of knowledge. To respond to change and take advantage of future opportunities, monitoring is necessary. Even without change in the industry, monitoring will provide data to support and refine the application of existing technology. An adaptive management approach is used to provide a mechanism to make adjustments to the plan based on new information. As projects from this plan are implemented, the actual costs and nutrient reduction benefits will be tracked, and the plan will be modified, as needed, as project performance in the IRL watershed is better understood.

This plan will be updated approximately annually with information from implemented projects and adjustments to the remaining projects. A volunteer committee of diversely skilled citizens has been assembled to assist Brevard County (County) with the annual plan updates. From inception to 2024, the Citizen Oversight Committee consisted of seven representatives and seven alternates that represent the following fields of expertise: science, technology, economics/finance, real estate, education/outreach, tourism, and IRL advocacy. The League of Cities nominated representatives for three fields of expertise and nominated alternates for the remaining four fields of expertise. The Brevard County Board of County Commissioners nominated representatives for the other four fields of expertise and alternates for the remaining three fields of expertise. All Citizen Oversight Committee representatives and alternates were appointed by the Brevard County Board of County Commissioners. Appointees serve for two-year terms, after which time they may be considered for reappointment or replacement. The first term ended in February 2019, the second term ended in February 2021, and the third term ended in February 2023.

In 2024, the County Commission approved ordinance changes that were recommended by the Citizen Oversight Committee to combine IRL advocacy with education/outreach to make room for a "Lagoon Commerce" field of expertise. Lagoon Commerce appointees should be citizens who work on the lagoon and experience changing conditions. Ordinance changes also added two emeritus positions to address six of seven voting members being term-limited in 2025. The emeritus members will be non-voting but subject to Florida Sunshine Law. They will provide historical context for new committee members, especially regarding previous public comment and direction from the County Commission.

The Citizen Oversight Committee's recommendations for annual plan updates are posted at least 15 days before being presented to the Board of County Commissioners, who can adopt changes to the plan after public comments in a public meeting.

Brevard County staff provides project monitoring reports to the Citizen Oversight Committee and works with them to recommend adjusting the planned projects, as needed. The adaptive management process allows for alternative projects to be submitted by the county, municipalities, and other community partners to be reviewed by the Citizen Oversight Committee for inclusion in the next annual update to this plan. Projects that deliver comparable nutrient removal benefits may be approved for inclusion in the plan. If a new approved project costs more than the average cost per pound of total nitrogen for that project type listed in this plan at the time of project submittal, the requesting partner must provide the balance of the costs. Eligible project costs include reasonable overhead cost to manage the project from design and permitting through construction completion.

As projects are implemented, progress toward meeting the County's proposed revisions to the total maximum daily loads are being tracked. Adjustments to the types and locations of projects implemented will be made to ensure that the locally proposed total maximum daily loads can be achieved in all the County portions of the IRL.

4.4.2. Cost-share for Substitute Projects

For the 2025 Update, local municipalities and partners were once again invited to submit new projects for inclusion in the Save Our Indian River Lagoon Project Plan. The projects submitted were required to deliver comparable nutrient removal benefits as those projects listed in the most recently approved plan update for each sub-lagoon.

The requesting partners each submitted a "Save Our Indian River Lagoon Project Plan Project Submittal Request" to Brevard County for review of the proposed projects. The project requests were provided to the Citizen Oversight Committee to evaluate the potential for inclusion in the plan. The projects recommended by the Citizen Oversight Committee were included in the draft plan update presented to the Brevard County Board of County Commissioners for approval.

To determine the amount of funding that a project would be eligible to receive from the Save Our Indian River Lagoon Trust Fund, the estimated total nitrogen (TN) reductions from the project were multiplied by the allowable cost per pound per year of TN shown below in **Table 4-42** for that project type. The costs shown in **Table 4-42** were included in the application instructions provided to the partners in July 2024 and were an average of the actual or engineer's estimate of cost per pound of TN removed from the projects previously listed in the Save Our Indian River Lagoon Project Plan, as amended, or comparable projects recently planned or completed elsewhere in the Indian River Lagoon (IRL) watershed. A few extreme outliers were excluded when calculating average cost per pound per year of TN reduction. In addition, costs for the Plan projects were updated to reflect inflation between the year the project was added to the Plan and the year project construction is anticipated, capped at a maximum of five years of inflation when calculating these costs per pound of TN.

Table 4-42. Cost-share Offered for Project Requests Submitted for the 2025 Update

Project Type	Cost-share Offered per Pound per Year of Total Nitrogen
Wastewater Treatment Facility Upgrades for Reclaimed Water	$431
Package Plant Connections	$1,500
Sewer Lateral Rehabilitation	$289
Septic-to-Sewer by Extension	$1,553
Septic System Upgrades	$1,600
Stormwater Projects	-
Mainland	$357
Merritt Island	$380
Beaches	$409
Vegetation Harvesting	$114
Muck Removal	$607
Treatment of Muck Interstitial Water	$124
Oyster Bar	$475
Planted Shorelines	$259

4.4.3. Responding to Implemented Projects

As of the drafting of this plan update, 97 projects have been completed throughout the Indian River Lagoon (IRL) system as shown in **Figure 4-32** through **Figure 4-36**. The implementation of these projects provided new cost information and actual pollution reduction measurements used to update the project cost-effectiveness for the 2025 Update. The project costs and Save Our Indian River Lagoon Trust Fund money expended on completed projects are shown in **Table 4-43**. **Table 4-44** summarizes the Save Our Indian River Lagoon Trust Fund money that has been contracted and/or expended on projects that are currently underway.

Table 4-43. Save Our Indian River Lagoon Trust Funds Expended on Completed Construction Projects (as of October 31, 2024)

Project Number	Project	Project Type	Estimated Total Cost	Final Total Cost	Change in Total Cost	Eligible Save Our Indian River Lagoon Cost	Final Save Our Indian River Lagoon Cost	Change in Save Our Indian River Lagoon Cost
193	Oyster Gardening	Public Education	$300,000	$300,000	$0	$300,000	$300,000	$0
2016-2, 2016-2b	City of Titusville Osprey WWTF	Wastewater Treatment Facility Upgrades	$13,500,000	$11,926,910	-$1,573,090	$8,300,000 (plus $800,000 of contingency)	$8,219,826	-$880,174
99	Cocoa Beach Water Reclamation Facility Upgrades	Wastewater Treatment Facility Upgrades	$5,920,320	$6,554,233	$633,913	$945,000	$945,000	$0
2016-17	City of Palm Bay Water Reclamation Facility Upgrades	Wastewater Treatment Facility Upgrades	$3,634,900	$3,634,900	$0	$3,634,900	$3,634,900	$0
6	Long Point Park Denitrification	Package Plant Rapid Infiltration Basin Upgrade	$101,854	$22,207	-$79,647	$101,854	$22,207	-$79,647
192	Oak Point Wastewater Treatment Facility Improvements	Package Plant Connection	$629,000	$647,941	-$18,941	$279,000	$279,000	$0
63b	Satellite Beach Lateral Smoke Testing	Sewer Laterals	$206,192	$206,192	$0	$206,192	$202,210	-$3,982
114	Barefoot Bay Lateral Smoke Testing	Sewer Laterals	$100,000	$83,564	-$16,436	$90,000	$32,873	-$57,127
115	South Beaches Lateral Smoke Testing	Sewer Laterals	$200,000	$192,297	-$7,703	$200,000	$84,304	-$115,696
116	Merritt Island Lateral Smoke Testing	Sewer Laterals	$250,000	$246,630	-$3,370	$250,000	$246,630	-$3,370
1	Breeze Swept Septic-to-Sewer	Septic-to-Sewer	$3,400,000	$3,400,000	$0	$880,530	$880,530	$0

Project Number	Project	Project Type	Estimated Total Cost	Final Total Cost	Change in Total Cost	Eligible Save Our Indian River Lagoon Cost	Final Save Our Indian River Lagoon Cost	Change in Save Our Indian River Lagoon Cost
2	Merritt Island Redevelopment Agency Phase 1 and 2 Septic-to-Sewer	Septic-to-Sewer	$3,138,098	To be determined	To be determined	$320,000 (plus $268 of contingency)	$320,268	$0
222	Hedgecock/ Grabowsky & Desoto Fields Connections	Septic-to-Sewer	$271,668	$287,098	$15,430	$121,500	$121,500	$0
60	Sylvan Estates Septic-to-Sewer	Septic-to-Sewer	$1,720,430	$2,431,490	$711,060	$1,561,215	$1,561,215	$0
51	Banana River Lagoon 28 of 100 Septic System Upgrades	Septic System Upgrades	$470,382	$469,438	-$943	$470,382	$374,158	-$96,224
52	North IRL 99 of 586 Septic System Upgrades	Septic System Upgrades	$1,748,111	$1,725,331	-$22,779	$1,748,111	$1,202,424	-$545,686
53	Central IRL 195 of 939 Septic System Upgrades	Septic System Upgrades	$3,433,845	$3,421,116	-$12,729	$3,433,845	$2,819,444	-$614,401
2016-16	Banana Septic System 10 of 144 Quick Connections	Quick Connections	$127,960	$203,360	$75,400	$127,960	$54,094	-$73,866
2016-18	North IRL Septic System 50 of 463 Quick Connections	Quick Connections	$792,300	$1,206,156	$413,856	$792,300	$739,607	-$52,693
2016-19	Central IRL Septic System 330 of 269 Quick Connections	Quick Connections	$3,919,368	$4,068,853	$149,485	$3,919,368	$2,025,961	-$1,893,407
13	Central Boulevard Baffle Box	Stormwater	$41,700	$43,700	$2,000	$34,700	$34,700	$0
14	Church Street Baffle Box	Stormwater	$233,455	$233,455	$0	$88,045	$88,045	$0
15	Bayfront Stormwater Ponds	Stormwater	$630,956	$635,702	$4,746	$30,624	$30,624	$0
16	Gleason Park Reuse Expansion	Stormwater	$11,000	$7,193	-$3,807	$4,224	$4,224	$0

Project Number	Project	Project Type	Estimated Total Cost	Final Total Cost	Change in Total Cost	Eligible Save Our Indian River Lagoon Cost	Final Save Our Indian River Lagoon Cost	Change in Save Our Indian River Lagoon Cost
18	Basin 62 Denitrification Retrofit of Johns Road Pond	Stormwater	$116,905	$274,564	$157,659	$105,512	$105,512	$0
19	St. Teresa Basin Treatment	Stormwater	$375,250	$474,292	$99,042	$272,800	$272,800	$0
20	South Street Basin Treatment	Stormwater	$475,125	$683,969	$208,844	$86,856	$86,856	$0
21	La Paloma Basin Treatment	Stormwater	$375,250	$462,347	$87,097	$208,296	$208,296	$0
34	Cliff Creek Baffle Box	Stormwater	$350,000	$737,612	$387,612	$347,781	$347,781	$0
35	Thrush Drive Baffle Box	Stormwater	$350,000	$609,394	$259,394	$322,200	$322,200	$0
64	Stormwater Low Impact Development Convair Cove 1 – Blakey Boulevard	Stormwater	$218,263	$216,995	-$1,268	$4,650	$4,650	$0
65	Stormwater Low Impact Development Convair Cove 2 – Dempsey Drive	Stormwater	$218,263	$216,995	-$1,268	$4,495	$4,495	$0
66	Big Muddy at Cynthia Baffle Box	Stormwater	$288,640	$288,640	$0	$67,532	$59,631	-$7,901
67	Grant Place Baffle Box	Stormwater	$498,831	$498,831	$0	$82,841	$82,841	$0
85	Basin 1304 Bioreactor	Stormwater	$125,000	$141,988	$16,988	$90,000	$83,029	-$6,971
87	Basin 2134 Fleming Grant Biosorption Activated Media	Stormwater	$172,300	$169,300	-$3,000	$56,588	$56,588	$0
89	Basin 1298 Bioreactor	Stormwater	$125,000	$136,100	$11,100	$86,198	$85,829	-$369
90	Basin 51 Johns Road Biosorption Activated Media	Stormwater	$116,905	$154,000	$37,095	$23,030	$23,030	$0
91	Basin 100 Burkholm Road Biosorption Activated Media	Stormwater	$117,735	$141,457	$23,722	$64,390	$64,390	$0

Project Number	Project	Project Type	Estimated Total Cost	Final Total Cost	Change in Total Cost	Eligible Save Our Indian River Lagoon Cost	Final Save Our Indian River Lagoon Cost	Change in Save Our Indian River Lagoon Cost
92	Basin 115 Carter Road Biosorption Activated Media	Stormwater	$156,079	$146,950	-$9,129	$62,510	$62,510	$0
93	Basin 193 Wiley Ave Biosorption Activated Media	Stormwater	$117,735	$162,216	$44,481	$82,735	$82,735	$0
94	Basin 832 Broadway Pond Biosorption Activated Media	Stormwater	$269,751	$269,750	-$1	$42,864	$42,864	$0
97	Titusville High School Baffle Box	Stormwater	$485,250	$332,800	-$152,450	$111,813	$111,813	$0
98	Coleman Pond Managed Aquatic Plant System	Stormwater	$35,000	$11,438	-$23,563	$35,000	$11,438	-$23,563
110	Osprey Pond Managed Aquatic Plant System	Stormwater	$60,000	$37,500	-$22,500	$60,000	$37,500	-$22,500
117	Basin 10 County Line Road Woodchip Bioreactor	Stormwater	$180,116	$166,174	-$13,942	$72,773	$72,773	$0
118	Basin 26 Sunset Road Serenity Park Woodchip Bioreactor	Stormwater	$130,062	$242,532	$112,470	$73,810	$73,810	$0
119	Basin 141 Irwin Avenue Woodchip Bioreactor*	Stormwater	$124,626	$146,926	$22,300	$69,174	$69,174	$0
120	Draa Field Pond Managed Aquatic Plant Systems	Stormwater	$60,000	$48,750	-$11,250	$31,281	$31,281	$0
122	Basin 22 Huntington Road Serenity Park Woodchip Bioreactor*	Stormwater	$103,852	$99,334	-$4,518	$40,077	$40,077	$0
123	Ray Bullard Water Reclamation Facility Stormwater Management Area	Stormwater	$1,604,860	$1,604,860	$0	$160,674	$111,847	-$48,827

Project Number	Project	Project Type	Estimated Total Cost	Final Total Cost	Change in Total Cost	Eligible Save Our Indian River Lagoon Cost	Final Save Our Indian River Lagoon Cost	Change in Save Our Indian River Lagoon Cost
124	Floating Wetlands to Existing Stormwater Ponds	Stormwater	$50,000	$14,336	-$35,664	$1,497	$1,497	$0
127	Indialantic Basin 5 Dry Retention Pond	Stormwater	$74,700	$62,718	-$11,982	$16,680	$16,680	$0
128	Jackson Court Stormwater Treatment Facility	Stormwater	$391,633	$391,633	$0	$8,266	$8,266	$0
169	Sherwood Park Stormwater Quality Project	Stormwater	$1,696,489	$1,696,489	$0	$292,400 (plus $99,708 of contingency)	$392,108	$0
174	St. Johns 2 Baffle Box	Stormwater	$465,000	$370,224	-$94,776	$243,070	$243,070	$0
175, 176	High School Baffle Box & Funeral Home Baffle Box	Stormwater	$1,129,535	$1,161,997	$32,462	$203,008	$203,008	$0
177	North and South Lakemont Ponds Floating Wetlands	Stormwater	$43,250	$38,250	-$5,000	$13,054	$13,054	$0
178	Marina B Managed Aquatic Plant System	Stormwater	$14,531	$17,424	$2,893	$6,670	$6,670	$0
179	Lori Laine Basin Pipe Improvement Project	Stormwater	$3,294,803	$3,294,803	$0	$17,525	$17,525	$0
213	Johnson Junior High Denitrification Media Chamber Modification	Stormwater	$140,000	$51,675	$88,325	$64,478	$40,815	-$23,663
214	Sand Point Park Baffle Box	Stormwater	$420,000	$281,155	-$138,845	$154,085	$52,155	-$101,930
231	North Fiske Stormwater Pond Floating Wetlands	Stormwater	$50,000	$50,000	$0	$50,000	$50,000	$0
232	Riverfront Center Nutrient Removing Filtration Boxes	Stormwater	$888,145	$899,895	$11,750	$224,992 (plus $17,411 of contingency)	$242,403	$0
252	Basin 89 Scottsmoor I Aurantia Road Denitrification	Stormwater	$1,354,102	$1,675,262	$321,160	$245,100	$152,573	-$92,527

Project Number	Project	Project Type	Estimated Total Cost	Final Total Cost	Change in Total Cost	Eligible Save Our Indian River Lagoon Cost	Final Save Our Indian River Lagoon Cost	Change in Save Our Indian River Lagoon Cost
111	Draa Field Vegetation Harvesting	Vegetation Harvesting	$60,000	$115,261	$55,261	$57,360 (plus $29,053 of contingency)	$86,413	$0
112	County Stormwater Pond Harvesting	Vegetation Harvesting	$14,000	$14,777	$777	$14,000	$14,000	$0
171	Mechanical Aquatic Vegetation Harvesting	Vegetation Harvesting	$1,016,976	$1,016,976	$0	$1,011,976	$1,011,976	$0
172	Horseshoe Pond Vegetative Harvesting	Vegetation Harvesting	$14,000	$13,090	$910	$8,140	$8,140	$0
208	Maritime Hammock Preserve Stormwater Pond Vegetation Harvesting	Vegetation Harvesting	$14,500	$14,480	-$21	$7,700 (plus $6,780 of contingency)	$14,480	$0
209	Basin 1398 Sand Dollar Canal Harvesting	Vegetation Harvesting	To be determined	To be determined	To be determined	$24,420	To be determined	To be determined
211	Cocoa Beach Golf Course Stormwater Pond Harvesting	Vegetation Harvesting	$592,350	$449,890	-$142,460	$592,350	$218,267	-$374,083
228	Unincorporated Countywide Vegetation Harvesting	Vegetation Harvesting	$477,000	$477,000	$0	$477,000	$477,000	$0
2016-03ab	Turkey Creek Hurricane Dredge and Interstitial Treatment	Muck Removal & Interstitial Treatment	$1,545,522	$1,098,631	-$446,891	$215,000	$137,329	-$77,671
40	Mims Muck Dredging Interstitial Treatment*	Interstitial Treatment	$2,162,286	$1,546,187	-$616,099	$400,000	$0	-$400,000
70	Cocoa Beach Muck Dredging Phase III	Muck Removal	$3,109,818	$2,903,356	-$206,462	$1,376,305	$1,376,305	$0
101	Cocoa Beach Muck Dredging Phase II-B	Muck Removal	$7,417,650	$7,417,650	$0	$5,917,650	$5,911,150	-$6,500
73	Riverview Senior Oyster Bar	Oyster	$30,304	$30,304	$0	$30,304	$30,304	$0
75	Marina Isles Oyster Restoration	Oyster	$26,700	$26,700	$0	$26,700	$26,700	$0

Project Number	Project	Project Type	Estimated Total Cost	Final Total Cost	Change in Total Cost	Eligible Save Our Indian River Lagoon Cost	Final Save Our Indian River Lagoon Cost	Change in Save Our Indian River Lagoon Cost
76	Bettinger Oyster Bar	Oyster	$10,680	$10,680	$0	$10,680	$10,680	$0
78a	McNabb Park Oyster Bar	Oyster	$37,192	$37,192	$0	$9,422	$9,134	-$288
79	Gitlin Oyster Bar	Oyster	$16,020	$16,020	$0	$16,020	$16,020	$0
80	Brevard Zoo Coconut Point/Environmentally Endangered Lands Oyster Restoration	Oyster	$45,120	$45,120	$0	$45,120	$45,120	$0
81	Wexford Oyster Bar	Oyster	$31,150	$31,150	$0	$31,150	$31,150	$0
83	Bomalaksi Oyster Bar	Oyster	$8,900	$8,900	$0	$8,900	$8,900	$0
105	Brevard Zoo Central IRL Oyster Project	Oyster	$161,160	$161,160	$0	$161,160	$161,160	$0
106	Brevard Zoo North IRL Oyster Project	Oyster Bars	$475,438	$475,438	$0	$475,438	$475,438	$0
226	Hog Point Offshore Oyster Bar	Oyster Bars	$50,022	$73,560	$23,538	$64,755	$21,023	-$43,732
77a	Cocoa Beach Country Club Living Shoreline	Living Shoreline	$16,080	$16,080	$0	$16,080	$16,080	$0
77b	Lagoon House Living Shoreline	Living Shoreline	$24,000	$24,000	$0	$24,000	$24,000	$0
78b	McNabb Park Planted Shoreline	Living Shoreline	$8,177	$10,660	$2,482	$1,680	$1,680	$0
103	Brevard Zoo North Plant Project	Living Shoreline	$720	$720	$0	$720	$720	$0
130	Brevard Zoo Plant Project 2	Living Shoreline	$9,840	$9,840	$0	$9,840	$9,840	$0
133	Fisherman's Landing Living Shoreline	Living Shoreline	$4,800	$4,800	$0	$4,800	$4,800	$0
135	Rotary Park Living Shoreline	Living Shoreline	$4,800	$4,800	$0	$4,800	$4,800	$0
181	Riveredge	Living Shoreline	$4,080	$4,080	$0	$4,080	$4,080	$0
-	***Total***	-	***$79,433,809***	***$76,487,844***	***$192,133***	***$43,840,822***	***$38,412,007***	***-$5,646,798***

* Not paid due to the contractor not meeting nutrient scrubbing contract requirements.

Table 4-44. Save Our Indian River Lagoon Trust Funds Contracted or Expended on Projects Underway (as of October 31, 2024)

Project Number	Project	Project Type	Save Our Indian River Lagoon Plan Inflated Funding	Save Our Indian River Lagoon Funds Contracted	Save Our Indian River Lagoon Expenditures for Projects Underway
58a	Expanded Fertilizer Education	Public Education	$975,540	$443,320	$395,083
58b	Grass Clippings Campaign	Public Education	$419,176	$100,000	$35,000
58c	Septic System Maintenance Education	Public Education	$521,674	$266,660	$213,882
245	Irrigation Education Campaign	Public Education	$327,795	To be determined	$0
246	Stormwater Best Management Practices	Public Education	$349,101	To be determined	$0
227	Restore Our Shores: Community Collaborative	Public Education	$1,124,521	$1,000,000	$500,000
234	South Brevard Water Reclamation Facility	Wastewater Treatment Facility Upgrade	$1,770,765	$1,752,210	$0
59	City of Melbourne Grant Street Water Reclamation Facility	Wastewater Treatment Facility Upgrade	$9,596,607	$9,128,125	$0
138	Ray Bullard Water Reclamation Facility	Wastewater Treatment Facility Upgrade	$6,506,916	$4,260,000	$438,712
216	City of Rockledge Flow Equalization Basin Project	Wastewater Treatment Facility Upgrade	$2,344,222	$2,308,768	$1,762,425
237	Willow Lakes Recreational Vehicle Park	Package Plant Connection	$1,164,957	$1,152,750	$77,464
63a	County-wide Repair/Replacement	Sewer Laterals	$848,176	$540,678	$244,640
100	Osprey Basin Lateral Repair Project	Sewer Laterals	$286,012	$200,000	$0
2019-27	Sharpes – Zone A	Septic-to-Sewer	$11,257,428	$534,082	$338,139
2019-29	South Banana - Zone B	Septic-to-Sewer	$1,962,756	$132,960	$126,446
2020-34	South Central - Zone F	Septic-to-Sewer	$2,433,921	$1,701,972	$219,715
2016-35	South Beaches - Zone A	Septic-to-Sewer	$2,340,144	$259,160	$79,747
2019-36	South Beaches - Zone O	Septic-to-Sewer	$190,896	$18,800	$18,243
2019-37	South Beaches - Zone P	Septic-to-Sewer	$429,515	$101,440	$95,485
2016-47	Sykes Creek - Zone N	Septic-to-Sewer	$4,988,485	$348,392	$282,596
2016-48	Sykes Creek - Zone M	Septic-to-Sewer	$3,221,730	$978,306	$866,638
2016-49	Sykes Creek - Zone T	Septic-to-Sewer	$6,020,586	$638,749	$582,214
2016-50	South Central - Zone C	Septic-to-Sewer	$8,727,911	$6,600,000	$5,076,507
3	Micco Sewer Line Extension	Septic-to-Sewer	$2,996,949	$2,239,500	$1,816,003
4	Hoag Sewer Conversion	Septic-to-Sewer	$117,493	$112,285	$26,095

Project Number	Project	Project Type	Save Our Indian River Lagoon Plan Inflated Funding	Save Our Indian River Lagoon Funds Contracted	Save Our Indian River Lagoon Expenditures for Projects Underway
5	Pennwood Sewer Conversion	Septic-to-Sewer	$55,492	$40,632 (plus $40,368 of contingency)	$17,074
61	Riverside Drive Septic-to-Sewer Conversion	Septic-to-Sewer	$371,480	$353,345	$15,524
62	Roxy Avenue Septic-to-Sewer Conversion	Septic-to-Sewer	$126,089	$119,934	$50,391
109	City of Titusville - Zones A-G	Septic-to-Sewer	$1,435,136	$943,110	$190,960
136	Micco - Zone B	Septic-to-Sewer	$10,422,090	$2,282,220	$1,834,282
145	Merritt Island - Zone F	Septic-to-Sewer	$1,586,864	$177,532	$168,575
146	Merritt Island - Zone C	Septic-to-Sewer	$2,279,314	$231,151	$228,137
147	Sykes Creek - Zone R	Septic-to-Sewer	$8,101,069	$750,365	$454,200
148	North Merritt Island - Zone E	Septic-to-Sewer	$5,283,376	$704,072	$536,236
150	South Central - Zone D (Brevard County)	Septic-to-Sewer	$6,887,712	$651,403	$512,592
151	Merritt Island - Zone G	Septic-to-Sewer	$12,196,610	$2,762,275	$2,171,682
152	Sharpes - Zone B	Septic-to-Sewer	$5,825,234	$399,796	$315,296
153	Cocoa - Zone C	Septic-to-Sewer	$4,098,755	$781,661	$551,048
191	Kent & Villa Espana	Septic-to-Sewer	$950,138	$710,000	$103,300
203	South Central - Zone A	Septic-to-Sewer	$9,559,750	$707,437	$34,265
224	Lake Ashley Circle	Septic-to-Sewer	$1,944,016	$1,704,000	$130,220
225	Dundee Circle & Manor Place	Septic-to-Sewer	$2,565,212	$2,248,500	$59,172
238	Kelly Park	Septic-to-Sewer	$144,615	$143,100	$0
240	Rotary Park	Septic-to-Sewer	$167,111	$165,360	$0
241	Manatee Cove	Septic-to-Sewer	$38,564	$38,160	$0
242	Riverwalk	Septic-to-Sewer	$6,427	$6,360	$0
22	Basin 1387 Kingsmill-Aurora Phase Two	Stormwater	$501,882	$479,634	$0
23	Basin 41 Denitrification Retrofit of Huntington Pond	Stormwater	$143,017	$136,677	$9,074
24	Basin 71 Denitrification Retrofit of Flounder Creek Pond	Stormwater	$102,876	$98,316	$19,923
68	Crane Creek/M-1 Canal Flow Restoration	Stormwater	$2,883,368	$2,033,944	$100,000
96	Spring Creek Baffle Box	Stormwater	$473,122	$460,896	$0
121	Basin 2258 Babcock Street Woodchip Bioreactor	Stormwater	$72,423	$68,166	$0
129	Forrest Avenue 72-inch Outfall Baseflow Capture/Treatment	Stormwater	$20,133	$18,949	$0

Project Number	Project	Project Type	Save Our Indian River Lagoon Plan Inflated Funding	Save Our Indian River Lagoon Funds Contracted	Save Our Indian River Lagoon Expenditures for Projects Underway
205	Basin 998 Hampton Homes	Stormwater	$68,149	$67,435	$0
206	Basin 1066 Angel Avenue	Stormwater	$248,738	$246,132	$0
207	Basin 1124 Elliot Drive	Stormwater	$158,648	$156,986	$0
215	Basin 960 Pioneer Road Denitrification	Stormwater	$44,322	$43,652	$0
219	McNabb Outfall Bioretention	Stormwater	$22,159	$21,824	$0
220	Basin 1398 Sand Dollar Canal Bioreactor	Stormwater	$225,917	$222,500	$0
233	Commons and City Hall Tree Boxes	Stormwater	$26,823	$26,542	$0
235	Woodland Business Center	Stormwater	$5,255	$5,200	$0
247	Basin 998 Richland Avenue Canal	Stormwater	$140,097	$138,629	$0
250	Basin 1280B Flamingo Road Denitrification	Stormwater	$76,748	$75,944	$8,170
251	Basin 1304B West Arlington Road Denitrification	Stormwater	$103,293	$102,211	$1,225
210	Basin 958 Pioneer Road Vegetation Harvesting	Vegetation Harvesting	$45,554	$44,865	$0
2016-04a & b	Rockledge A Muck & Interstitial Treatment	Muck and Interstitial	$5,985,040	$175,340	$143,331
2016-05a & b	Pineda Banana River Lagoon & Interstitial Treatment	Muck and Interstitial	$9,336,662	$81,214	$73,891
2016-06a & b	Titusville Railroad West & Interstitial Treatment	Muck and Interstitial	$4,309,228	$146,361	$143,107
2016-07a & b	National Aeronautics and Space Administration Causeway East & Interstitial Treatment	Muck and Interstitial	$13,645,890	$209,255	$182,059
2016-08a & b	Titusville Railroad East & Interstitial Treatment	Muck and Interstitial	$5,506,238	$318,457	$268,499
2016-10a & b	Canaveral South & Interstitial Treatment	Muck and Interstitial	$20,109,734	$317,158	$323,527
2016-11a & b	Patrick Space Force Base & Interstitial Treatment	Muck and Interstitial	$9,815,466	$126,719	$104,462
41a & b	Grand Canal Muck & Interstitial Treatment	Muck and Interstitial	$24,610,618	$23,736,663	$5,293,826
42a & b	Sykes Creek Muck & Interstitial Treatment	Muck and Interstitial	$21,788,736	$13,517,914	$4,486,451
54a & b	Eau Gallie Northeast Muck & Interstitial Treatment	Muck and Interstitial	$11,970,079	$330,709	$276,741
71	Merritt Island Muck Removal – Phase 1	Muck and Interstitial	$10,963,220	To be determined	$0

Project Number	Project	Project Type	Save Our Indian River Lagoon Plan Inflated Funding	Save Our Indian River Lagoon Funds Contracted	Save Our Indian River Lagoon Expenditures for Projects Underway
72	Muck Removal of Indian Harbour Beach Canals & Interstitial Treatment	Muck and Interstitial	$12,922,232	$9,115,415	$0
144 & 113	Satellite Beach Muck Dredging & Interstitial Treatment	Muck and Interstitial	$7,129,321	$4,941,981	$0
168	Cocoa Beach Golf Muck & Interstitial Treatment	Muck and Interstitial	$29,103,198	$29,103,198	$1,376,415
223	Spring Creek Muck Dredging	Muck Dredging	$91,360	$80,080	$0
104	Brevard Zoo Banana River Oyster Project	Oyster Bars	$833,753	$812,207	$40,812
139	Brevard Zoo North IRL Oyster Project 2	Oyster Bars	$485,292	$456,764	$105,056
140	Brevard Zoo Central IRL Oyster Project 2	Oyster Bars	$390,657	$367,692	$89,364
184	Brevard Zoo North Indian River Lagoon Oyster Project 3	Oyster Bars	$561,026	$528,046	$56,730
185	Brevard Zoo Central Indian River Lagoon Tributary Pilot Oyster Project	Oyster Bars	$308,670	$290,525	$209,178
187	Brevard Zoo Central Indian River Lagoon Oyster Project 3	Oyster Bars	$115,818	$109,009	$0
217	Brevard Zoo Central Indian River Lagoon Oyster Project 4	Oyster Bars	$157,616	$155,232	$0
218	Central Oyster Project Offshore Reefs	Oyster Bars	$407,627	$401,462	$0
212	Titusville Causeway Multi-Trophic Restoration & Living Shoreline	Planted Shoreline	$35,868	$35,326	$0
194	Aquaculture Stimulus Program	Clam Restoration	$68,117	$42,000	$36,000
-	Respond and Monitoring	Respond	$10,000,000	$5,172,293	$4,109,194
-	***Total***	-	***$350,982,320***	***$145,810,860***	***$38,025,025***

Figure 4-32. Completed Projects in North Brevard County

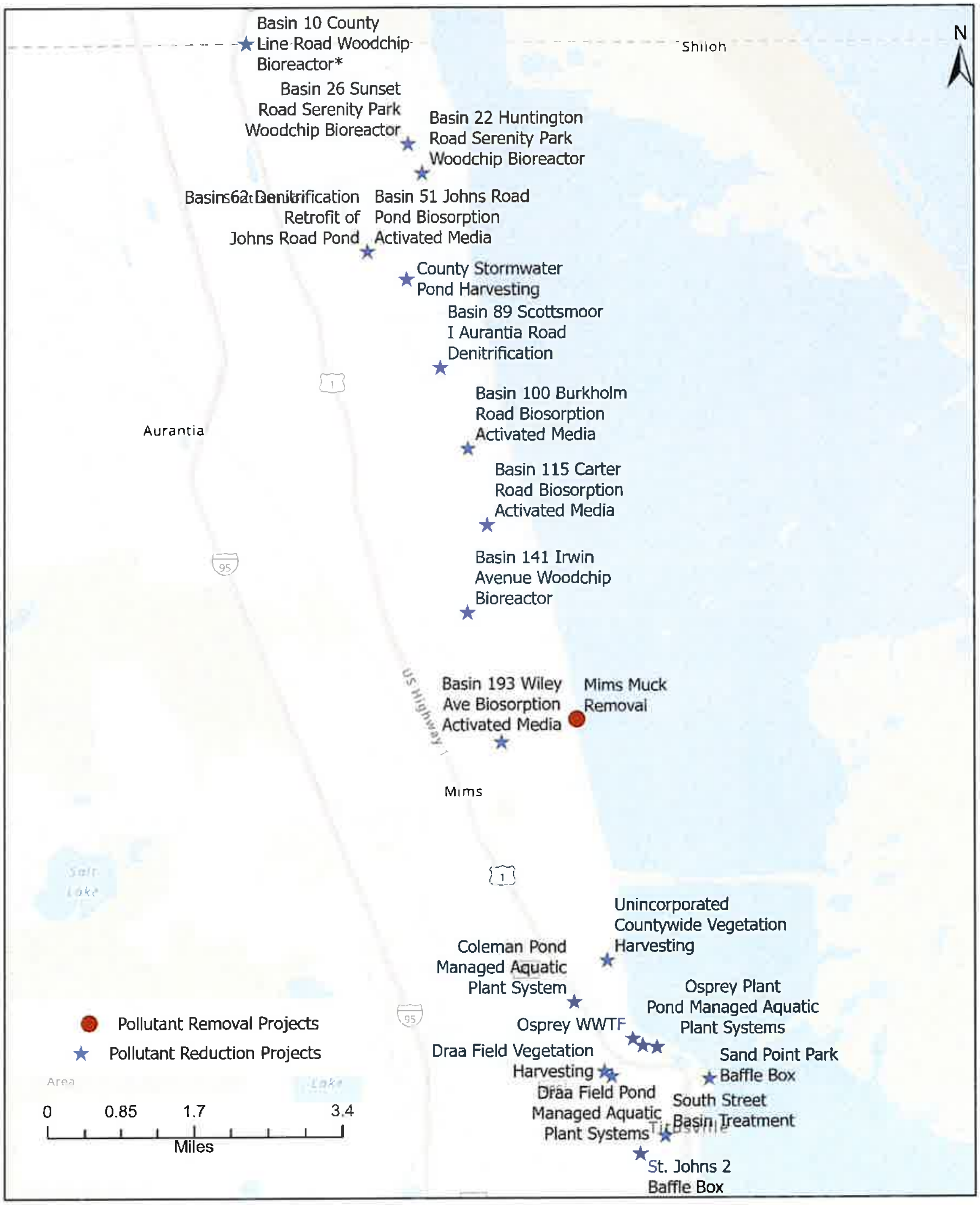


Figure 4-32 Long Description

Figure 4-33. Completed Projects in North Central Brevard County

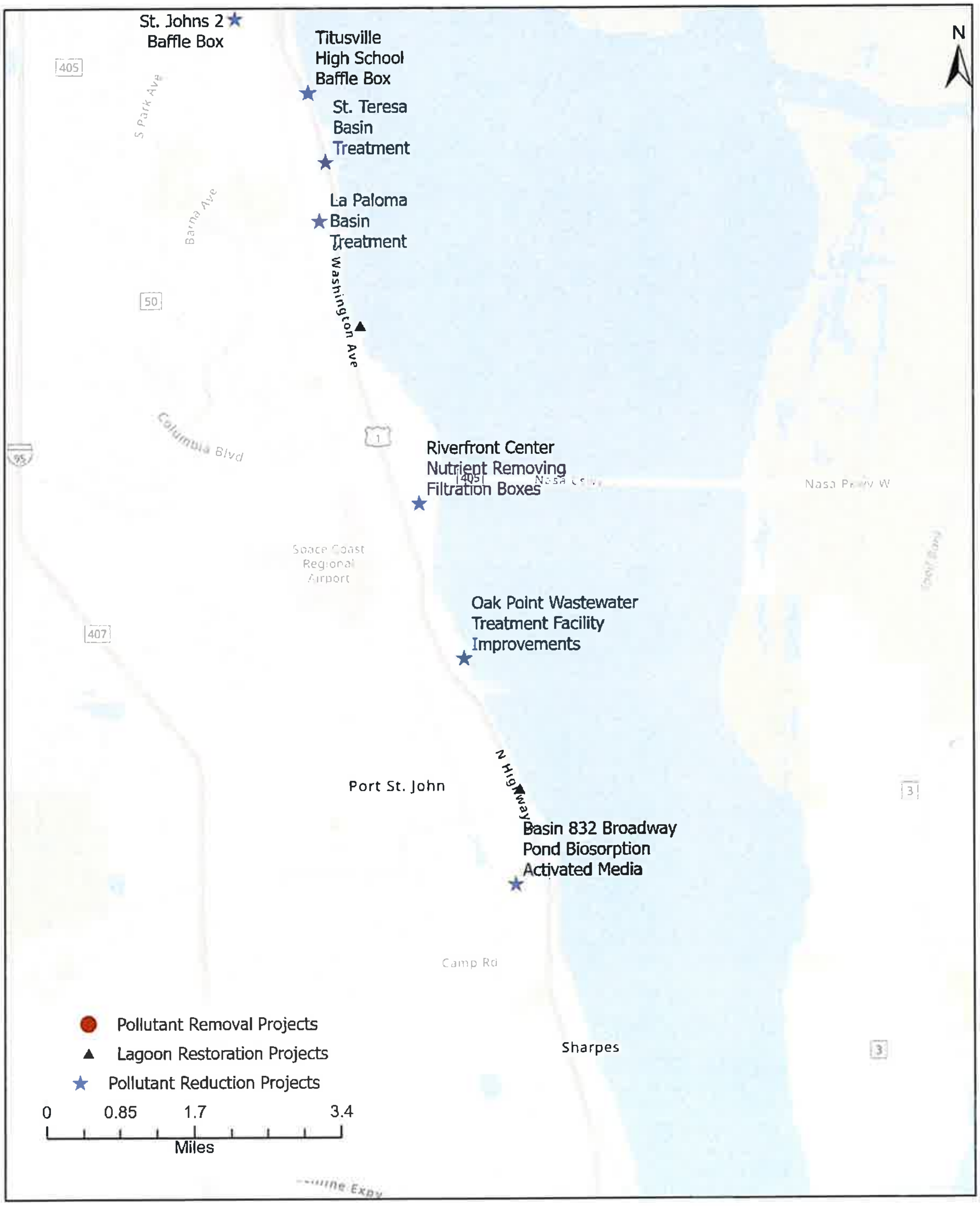


Figure 4-33 Long Description

Figure 4-34. Completed Projects in Central Brevard County

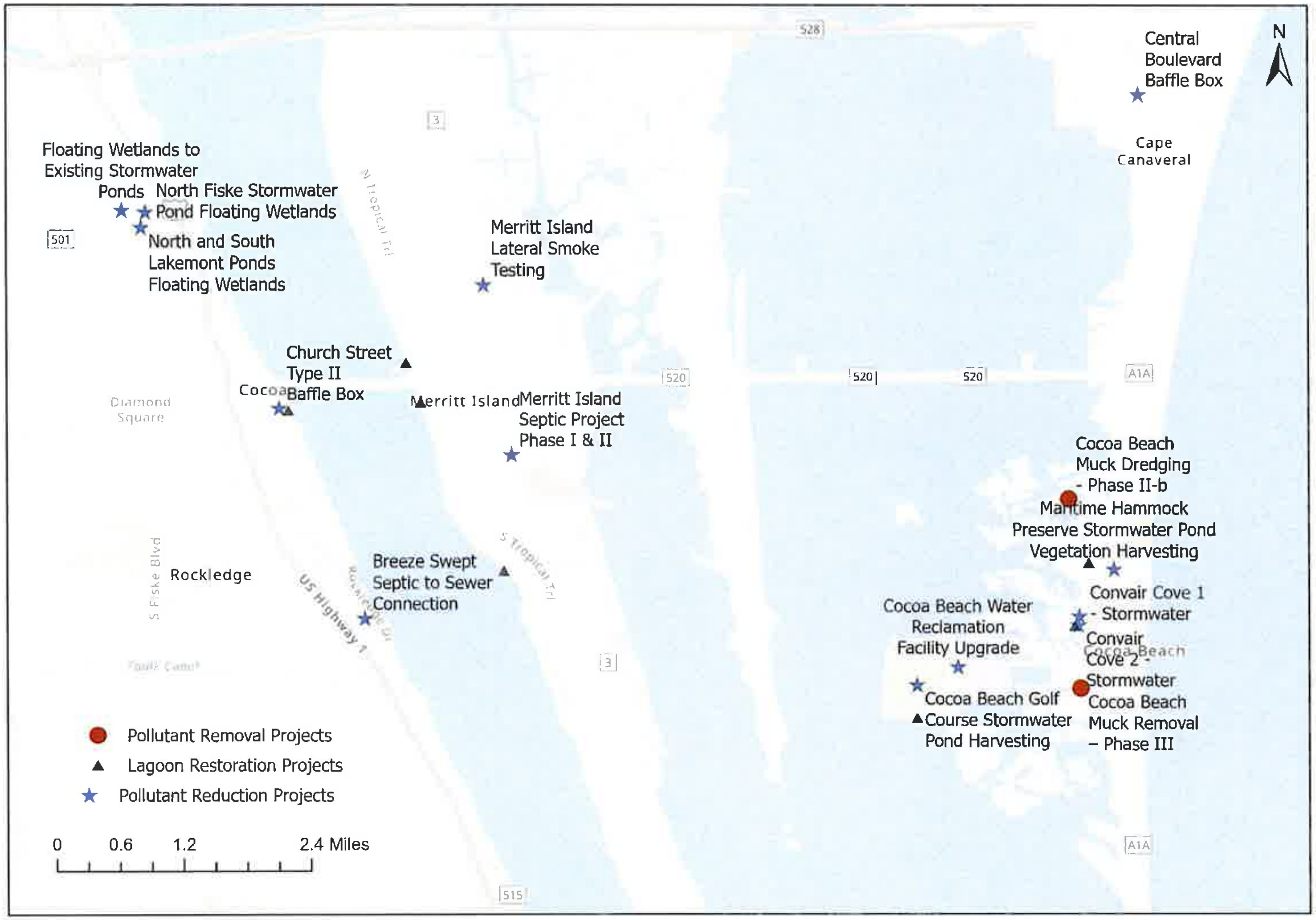


Figure 4-34 Long Description

Figure 4-35. Completed Projects in South Central Brevard County

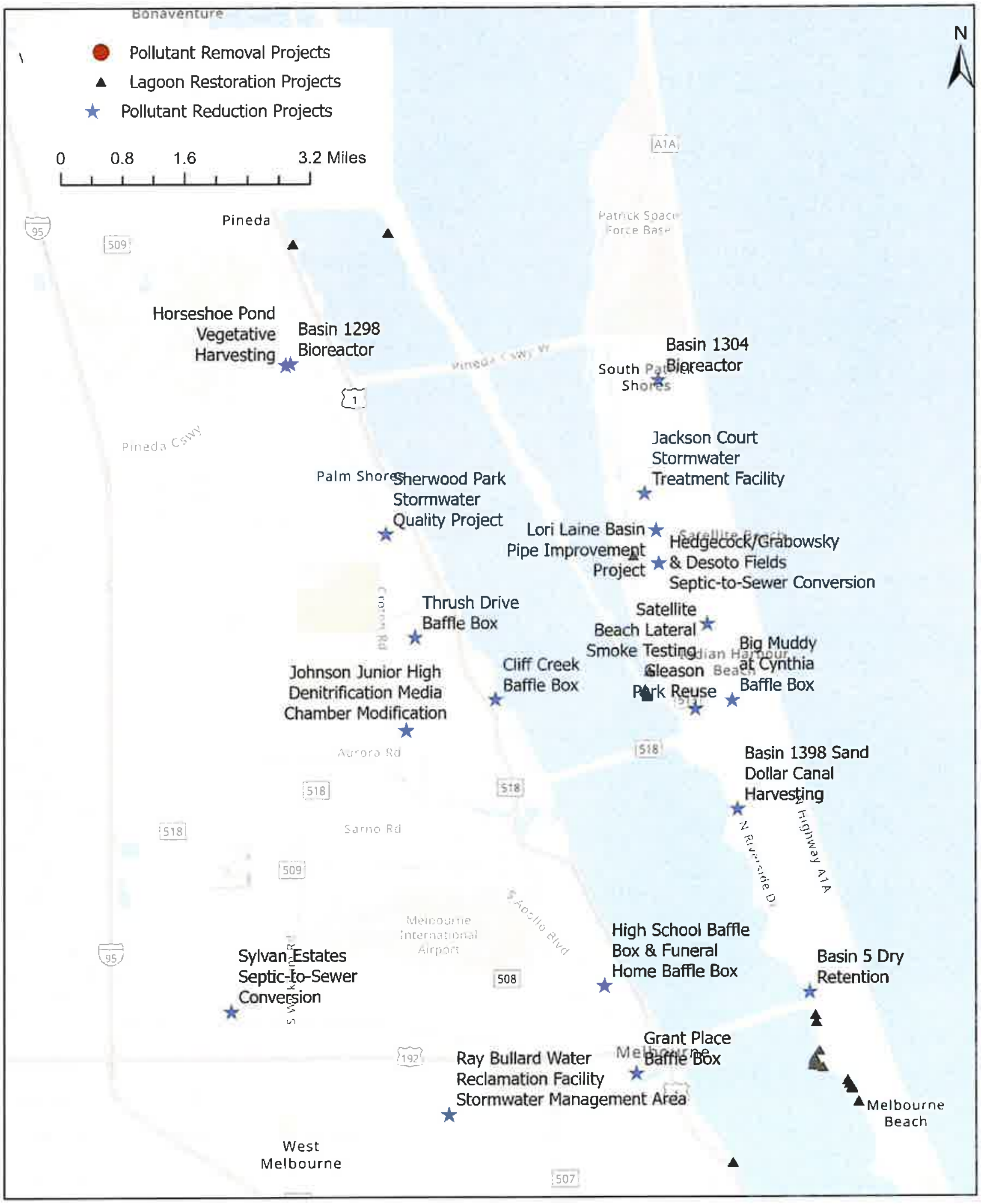


Figure 4-35 Long Description

Figure 4-36. Completed Projects in South Brevard County

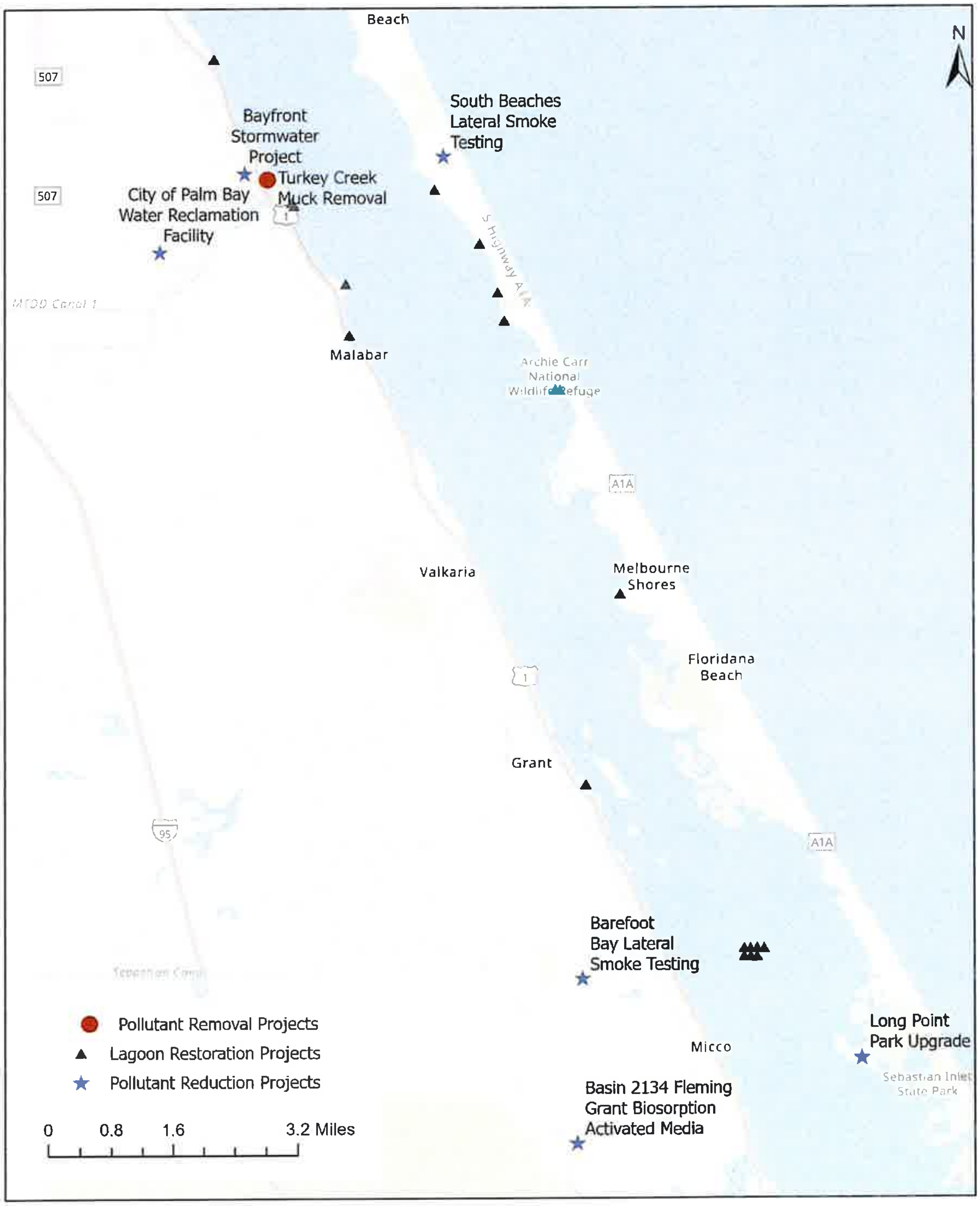


Figure 4-36 Long Description

Fertilizer Management Outreach

As noted in **Section 4.1.1**, in 2019, the University of Florida Institute of Food and Agricultural Sciences and MTN Marketing conducted a survey that was concentrated on fertilizer awareness questions. The results from the 2019 survey were compared to similar questions from the 2015 Blue Life survey to evaluate changes in fertilizer use. Based on the survey results, 33.33% of respondents in 2019 stated that they use slow release nitrogen fertilizer compared to only 6.30% in 2015, which is a 27% increase in the usage of slow release fertilizer. This resulted in better than anticipated cost effectiveness. The cost per pound of total nitrogen (TN) removed improved from an initial estimate of $102 to a revised estimate of $95. The total phosphorus (TP) reductions were kept at the original plan estimate of an additional 25% compliance because, the way the survey was setup, participants were only able to select one option for the type of fertilizer used. Therefore, an update on the use of zero phosphorus formulas could not be obtained.

Also in 2019, Brevard County (County) amended the fertilizer ordinance to require all fertilizer retail stores to display signage at the point of sale informing the public on the ordinance and best practices for fertilizer management. Focus groups were conducted to enhance the design of the sign. A total of 132 signs were distributed to 53 retails stores across the County. In summer 2020, the stores were surveyed for compliance with the ordinance. Only eight stores were out of compliance with no signage posted. Request for compliance letters were issued to the eight stores and additional signs were delivered to stores that could not locate the original signs. The stores were receptive of the letters and willing to come into compliance. In 2021, the stores were surveyed again and nearly half of the stores were out of compliance with missing signs. The signs were redesigned to add a sticker on the back noting that signs are legally required to be posted and provided contact information to request new signs if they were damaged. This information was already included with the letters provided to the managers when the signs were first delivered but the stickers on the signs will ensure this information is not lost with turnover in staff.

In 2021, five stores allowed stickers to be applied to fertilizer bags to indicate they met the fertilizer ordinance restrictions to test if marked bags would influence consumer choices when buying fertilizer. Issues with relabeling new stock and two of the stores not providing their post study sales data made for inconclusive results.

Grass Clipping Outreach

Uppercase, Inc. conducted a survey between September 9, 2018, and November 11, 2018, reaching out to citizens of Brevard, Martin, and Volusia counties through advertisements on social media sites, in popular mobile apps, on Google advertisements, in instant messenger, and other online and app platforms, as well as on the counties' social media pages. The survey received 733 responses from the three counties. When asked which items in the list provided are pollutants, 61% of respondents said grass clippings were a pollutant and 50% said leaves were a pollutant. Landscape professionals were more likely to say grass clippings were a pollutant (65%). About 48% of respondents maintained their own yards and 36% used a lawn care company. When asking those respondents who maintain their own yards what they do with grass clippings, 68% say they "seldom" or "never" leave the clippings where they land. 70% of respondents say they "always" or "usually" blow clippings back into their yard, 94% said they “never” or “seldom” blow clippings into the middle of the road, 97% said they “seldom” or “never” blow clippings toward a storm drain, and 97% say they “never” or “seldom” blow grass clippings toward a waterbody. The survey also tested taglines and images to encourage keeping grass clippings out of the street and waterbodies, and the best communication channels to provide this information (Uppercase, 2018). The results from this survey will be used to guide the grass clipping campaign.

In 2021 and 2022, the Marine Resources Council conducted focus groups to test messaging campaigns and find the best method of delivering the message to both homeowner and lawncare professionals. Recommendations on messaging were to focus on the barriers to correct management of grass clippings, as well as promote the existing University of Florida-Institute of Food and Agricultural Sciences Green Industries certification program. Messaging was found to have the best reach to both groups through social media and billboards. Social media ranked highest with homeowners and billboards ranked highest with lawncare professionals. The next highest-ranking methods for both groups was through television and radio advertisements with homeowners ranking both media relatively equal and lawn care professionals showing a slightly higher preference to television advertisement.

Septic System and Sewer Lateral Maintenance Outreach

The University of Central Florida conducted a survey of Brevard County residents to gather information on septic system-related topics. The survey was conducted between May 2018 and September 2018 through phone calls and door-to-door visits, resulting in a total of 404 completed surveys. Most respondents (70%) said that they have had their septic system pumped out, of which most (39.1%) had their system pumped out in the last 2–4 years or within the last 12 months (38%). Most respondents (51%) answered that they have had their current septic system inspected although many (42%) answered that they have not had their septic system inspected. Of those who responded that their septic systems had been inspected, most were inspected within the past 12 months (41.8%) followed by within the past 2–4 years (37.2%). Most residents (53%) did not receive any information regarding the home's septic system when they moved into the home. Of the total respondents, 55.8% strongly agreed with the statement "I restrict what I flush in toilets to prevent damage." The participants strongly agree (44.8%) and agree (42.8%) with the statement "I avoid pouring chemicals and solvents down the sink" (Olive et al., 2018). The results from this survey will be used to help guide the septic system maintenance education program.

Information based on the United States Environmental Protection Agency's best management practices to maintain a healthy septic system was dispersed through social media and online advertisements. Additionally, a refrigerator magnet with this information was developed and distributed to septic system companies to provide to homeowners during septic system service. A flyer and letter were developed and distributed to realtors, title companies, and home inspectors to give to potential home buyers considering homes with septic systems. The letter encourages homebuyers to have a septic system inspected during the purchase process and the flyer informs them how to maintain a septic system.

Lagoon Loyal Program

The full launch of the Lagoon Loyal website and incentive program was on July 1, 2020. To date, 4,440 citizens and 99 businesses participate in the Lagoon Loyal Program. They have reported a total of 15,486 actions taken to help the IRL. There have also been 165,612 educational sessions and 119,856 users on the Lagoon Loyal websites.

Measuring Performance

Groundwater monitoring wells have been installed to measure pre- and post-project pollution levels in multiple project areas. This includes two areas funded for wastewater treatment plant upgrades to reduce nutrients in the reclaimed water, five septic areas where homes are being converted from septic-to-sewer service, one sewer area to estimate pollution from leaky infrastructure, five septic system upgrade pilot projects, and three natural conservation areas for comparison.

This countywide groundwater monitoring effort has been ongoing since 2018. Differences have been observed in the forms and concentrations of nitrogen and phosphorus present in communities with different types of wastewater treatment. The monitoring demonstrates that septic systems and reclaimed water communities have significantly higher TN concentrations in comparison to sewer service areas and natural areas across all regions of the county. The areas with septic systems and reclaimed water had the highest average TN concentrations at 6.08 milligrams per liter and 5.93 milligrams per liter, respectively. Communities on septic systems had significantly higher TP concentrations compared to the other communities across all regions of the county. The average septic system TP concentration was 1.06 milligrams per liter compared to 0.12, 0.19, and 0.27 milligrams per liter for natural communities, sewer communities, and reclaimed water communities, respectively. Further, most of the TP in septic system communities (0.83 milligrams per liter) was in the highly bioavailable form of phosphate. Groundwater with only elevated nitrate plus nitrite concentrations is likely a good indicator of the use of reclaimed water for irrigation. Groundwater with elevated ammonia and phosphorus is likely a good indicator of the presence of septic systems (**Figure 4-37**) (Applied Ecology, 2024).

Figure 4-37. Countywide Groundwater Nutrient Concentrations for TN (top) and TP (bottom)

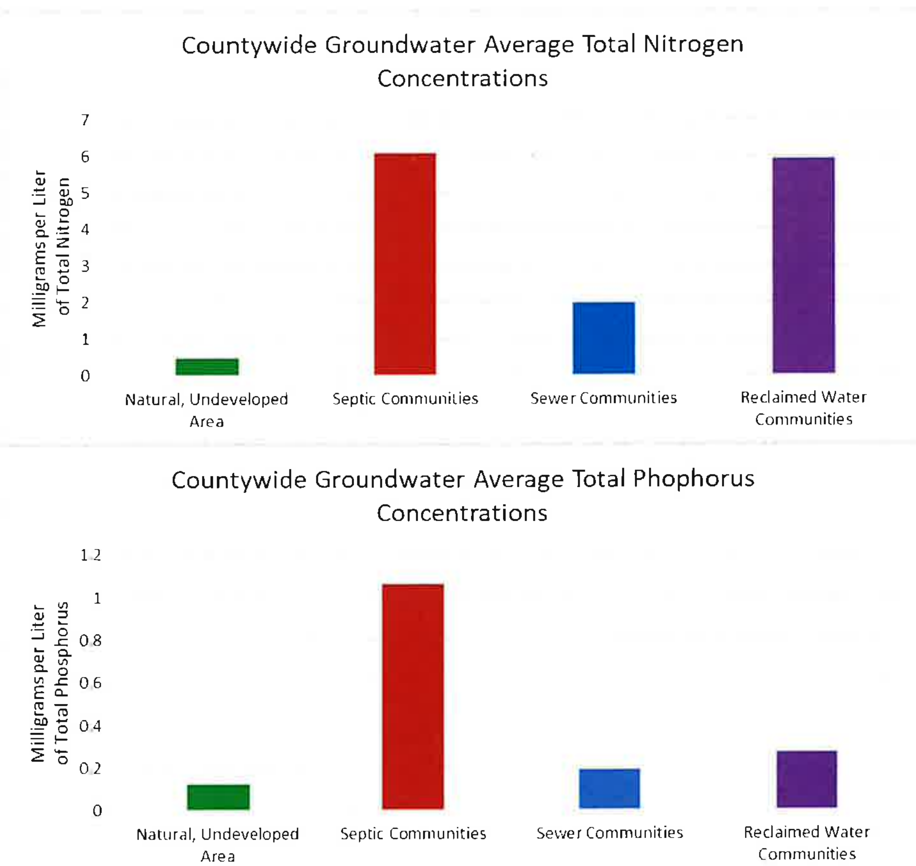


Figure 4-37 Long Description

Package Plant Rapid Infiltration Basin Upgrade

A denitrification wall was built surrounding a rapid infiltration basin approximately 120 feet from the IRL at Long Point Park in Melbourne Beach. Six monthly measurements of nitrogen and phosphorus from within the rapid infiltration basin were compared to nutrient measurements in the IRL versus in the groundwater at three locations between the basin and IRL. Average percent removals have been high when comparing concentrations in the rapid infiltration basin to the groundwater location closest to the IRL. Ammonia decreased by 62%, nitrite by 99%, nitrate by 82%, TN by 60%, total Kjeldahl nitrogen by 59%, orthophosphate by 72%, and TP by 66%. When comparing the basin concentrations to the groundwater inside the denitrification wall, the ammonia was reduced by 59%, nitrite by 98%, TN by 53%, total Kjeldahl nitrogen by 57%, orthophosphate by 78%, and TP by 61%; however, nitrate increased by 834%. Once the water passes through the denitrification wall, nitrate levels drop substantially (97% immediately). Overall, this project has been successful and no further monitoring is planned. Based on actual costs and current data on nitrogen removal, the cost effectiveness is $136 instead of $802 per pound of TN reduced.

Sewer Lateral Rehabilitation

In 2018, Brevard County Utilities conducted a sanitary sewer system smoke testing pilot study within the South Beaches Service Area between Pineda Causeway and Eau Gallie Boulevard. The study used smoke testing to identify major contributors of stormwater into the sanitary sewer system and identify the necessary repairs. A smoke-blowing machine that produces a non-toxic artificial "smoke" is used to pump smoke into the sewer system through an open manhole. As the smoke travels through the sanitary sewer system, it rises to the surface through any deficiencies in the lateral lines, such as cracks, leaks, and breaks. The South Beaches service area was selected because it had been experiencing elevated sanitary flow rates during storm events due to stormwater flow into the sanitary sewer through broken or missing infrastructure.

Smoke testing was performed for the Phase 1 area in April and May 2018 for 5,165 properties. The testing identified 99 deficiencies of which there were 87 broken/missing cleanout caps, 9 broken lateral pipes, 2 damaged gravity sewer pipes, and 1 damaged manhole. Smoke testing was performed for the Phase 2 area in May and July 2018 for 7,592 properties. The testing identified 190 deficiencies of which there were 163 broken or missing cleanout caps, 21 broken lateral pipes, 1 storm connection, and 5 damaged manholes/gravity mains. The County purchased cleanout caps and replaced the damaged or missing caps that were identified, accessible, and had no damage to the cleanout port (Kimley Horn, 2018a and 2018b). Based on the data collected during the pilot study, the Save Our Indian River Lagoon Trust Fund allocated funds to cover costs to replace missing caps, repair up to 250 broken cleanout ports, and replace up to 30 broken private lateral lines. The estimated cost for these repairs was $646,200, which was below the $840,000 budgeted for this project.

In 2022, Brevard County conducted additional smoke testing at over 30,000 homes in the Sykes Creek (Merritt Island), South Beaches, and Barefoot Bay Service Areas. The 2022 smoke tests resulted in 229 cleanout caps being replaced during the testing phase and 649 code enforcement letters being mailed out for sewer lateral deficiencies. Additional smoke testing is funded for Titusville.

This pilot study showed that smoke testing is an imperfect, but quick and affordable way to identify many sewer deficiencies over a large area. Brevard County also learned that the unknown costs of fixing private sewer laterals have disincentivized cash-limited homeowners from making repairs promptly. In response, the County has seven qualified plumbers that can be paid directly by the County to fix these repairs and the County is using code enforcement to require property owners fix known deficiencies to comply with County Code. The preliminary results from performance data for the pilot area noted that the groundwater sampled at seven of the eight leaky lateral sites had evidence of sewage leaking out of the lateral when the groundwater table was low. Multiple sites had high nitrogen concentration values at or near the break locations, likely directly caused by a sewer leak. Most of the elevated phosphorus was in the readily bioavailable form of ortho-phosphorus (Applied Ecology, 2019).

Septic-to-Sewer

The Breeze Swept septic-to-sewer project in the City of Rockledge removed 143 septic systems installed between 1958 and 1967. This was the first septic-to-sewer conversion project to be undertaken as a strategic measure to reduce the nutrient loading to the IRL. During construction, the contractor noticed that many septic systems were already failing, which posed an increased health and environmental risk. The City of Rockledge authorized Applied Ecology to install five shallow groundwater monitoring wells in June 2017, three within the Breeze Swept community and two additional reference (i.e., control) wells in an adjacent septic community. Post-construction monitoring continued through summer 2019. There were 18 sampling events with a total of 90 samples collected. All samples were sent to a certified lab and analyzed for ammonia, nitrate-nitrite, total Kjeldahl nitrogen, and fecal coliform. The median ammonia, nitrate-nitrite, total Kjeldahl nitrogen, and mean TN concentrations from the post-construction samples taken from wells within the Breeze Swept community decreased with a statistically significant difference while the control wells showed no significant differences in median concentrations of nitrate-nitrite, total Kjeldahl nitrogen, and TN concentrations during the sampling period. These data provide a better understanding of the impact of septic systems on local water quality and help inform future septic-to-sewer conversion projects.

Construction costs for septic-to-sewer projects have increased significantly since the original plan was developed in 2016. At that time, the estimated cost per lot for connection to gravity sewer was $20,000. This estimate included construction of the public and private side of the sewer, abandonment of the septic tank, connection fee, and restoration of the site. Based on 2018 actual and budgeted costs from within Brevard County and surrounding counties, the estimated cost per lot was increased to $33,372. Costs have continued to increase due to construction inflation and supply-chain issues. Challenges associated with constructing sewer within old, narrow rights-of-way filled with existing utilities also drive up costs. The average sewer cost calculated for this 2025 Update is $72,350 per lot.

The project in the Breeze Swept community in the City of Rockledge, completed in 2017, cost $23,800 per lot. The West Melbourne Sylvan Estates project increased from an engineer's estimate of $28,800 to an actual project cost of $41,212 per lot. Indian River County experienced a similar increase in costs for a sewer project in West Wabasso. Phase 1 of West Wabasso was approved in 2011 with an estimated cost of $20,348 per lot. Actual costs for construction in 2014 were $22,942 per lot. Cost estimates for phase 2 of West Wabasso are $46,269 per lot. The South Central C sewer project was contracted in 2021 at $73,748 per lot. The Micco Sewer Extension Project was contracted in 2022 at $143,484 per lot. In 2024, the first vacuum sewer construction bid was received for three projects: Sykes Creek Zone M, Sykes Creek Zone N, and Sykes Creek Zone T. These three projects were bid together for a total cost per lot of $136,167. State and federal cost-share grants have been secured by Brevard County and municipalities to bridge the gap between local funding and rising costs.

Many opportunities exist to remove septic systems in areas with existing sewer lines. The plan originally allocated $12,000 to these connection opportunities. Costs to connect to gravity lines were found to be consistent with this estimate; however, costs to connect to force main lines were higher. In the 2019 Update, connection costs to force main sewer were increased to $18,000. For the 2024 Update, the funding allocation was increased to $24,000 for each connection to force main sewer or gravity sewer when a pump is required to cover the cost of a grinder pump, the pump's electrical connection, directional drilling of the lateral line, abandonment of the septic tank, connection fee, and restoration of the site.

Septic System Upgrades

The eligible cost of an upgraded septic system was increased from $16,000 to $18,000 in 2019 and from $18,000 to $20,000 in this 2025 Plan Update to reflect the increasing cost to safely decommission the old tank and install the new tank and drainfield, electrical costs, and restoration of the site. Many of the oldest septic systems that are contributing the most loading to the lagoon do not comply with modern setbacks established by the Florida Department of Health. Bringing these septic systems to current standards in small lots is contributing to the higher average upgrade costs. The estimate of $16,000 is more accurate for new construction. For the 334 upgrades completed so far, the average cost was $20,768 (previously noted as $20,106 for the first 211, $19,480 for the first 103, $18,353 for the first 48, and $17,811 for the first eight completed upgrades).

Stormwater Treatment

Brevard County was awarded a grant to help upgrade multiple baffle boxes to second generation technology. Eight baffle boxes in Cocoa, Cape Canaveral, Melbourne, and Titusville were retrofitted with screens to collect larger items such as litter, leaves, and twigs from the stormwater entering the baffle box. Three of the baffle box projects were sampled twice each to estimate the pollutant removal effectiveness of the added screens. The baffle box projects chosen for sampling were Central Boulevard (City of Cape Canaveral), Church Street (City of Cocoa), and South Street (City of Titusville). By applying state-approved dry bulk density ratios to the volumes of material captured in the screens, nutrient removal was estimated to be 7.12 pounds of TN per year and 0.57 pounds of TP per year.

The Basin 26 (Sunset Avenue) denitrification project has been sampled 35 times since September 2022 with plans to continue monitoring for another 10 months. This project was designed to address nutrient loading by using groundwater and stormwater treatment technologies in a channel to intercept nutrient-laden waters before discharge into the Indian River Lagoon. Overall percent removal is 9% for TP and 85% for nitrate, which equates to 130 pounds of nitrate reduction per year. This yields a cost effectiveness of $1,865 for total costs and $568 for Save Our Lagoon Trust Fund costs for nitrate, which is a bioavailable form of nitrogen.

The Scottsmoor I Aurantia Road denitrification treatment train project was expected to begin monitoring in spring 2024. Due to groundwater conditions, modifications are being planned so the stormwater can flow without groundwater interference. Monitoring will begin once the modifications have been completed.

Although the monitoring was not funded by Save Our Indian River Lagoon Trust Fund dollars, the Johnson Junior High Denitrification Media Chamber Modification project has been monitored since 2019. In 2022, a Save Our Indian River Lagoon funded stormwater modification to the treatment system was made to add pea gravel for nitrogen reducing bacterial growth to act as a pre-treatment. The Johnson Junior High Stormwater project uses three different biosorption activated media to treat the stormwater in separate, parallel flow paths to evaluate the nutrient removal efficiency of each media. The three medias were Bold & Gold®, NutriGone™, and a woodchip mix. After the installation of the pea gravel, all three media showed a high reduction in inorganic nitrogen, with the woodchip mix the highest at 83%. The woodchip mix was also effective at treating the organic nitrogen with a removal rate of 25%. The Bold & Gold® and NutriGone™ mixes were not effective in treating the organic nitrogen. Brevard County is looking into methods to improve removal of organic nitrogen in future projects.

AECOM Algae Harvesting Pilot Project

In 2022, the Brevard County Department of Natural Resources secured an innovative technology grant from the Florida Department of Environmental Protection for $999,000 to pilot test emerging Hydronucleation Flotation Technology as a potential innovative solution for mitigating algae blooms and reducing nutrient concentrations in the IRL. Hydronucleation Flotation Technology is an advanced dissolved air flotation, liquid-solid separation process that efficiently removes algae cells and other suspended particles along with associated nutrients and algal metabolites from water. The technology has been tested extensively in freshwater systems in Florida and New York. The pilot project in the County tested the feasibility of using Hydronucleation Flotation Technology in brackish waters of the IRL.

Brevard County partnered with AECOM Technical Services, Inc. to implement this project. AECOM has a compact, mobile, and modular Hydronucleation Flotation Technology design that can be operated from land or on water, providing versatility and scalability to tackle nutrient enrichment and algal blooms in a variety of aquatic settings. If successful, Hydronucleation Flotation Technology could be used in brackish waters throughout Florida to treat algal blooms in-situ and help reduce nutrient loads to inhibit future occurrences of harmful algal blooms.

In September 2023, AECOM deployed a barge mounted Hydronucleation Flotation algal harvester in the IRL to respond to algal bloom "hot spots" as they occurred. The harvester was repositioned at four different locations in the IRL, one in the North IRL and three in the Central IRL, over a two-month period, operating for a total of five weeks. The system treated 4,026,970 gallons of water from the IRL, removing 255 gallons of algae slurry, to evaluate system performance and cost-effectiveness tracked by a comprehensive monitoring program. Final reporting for the project was delivered in May 2024. Fluctuations in water conditions, such as low dissolved oxygen, impacted overall performance. Algae harvesting had percent removal efficiencies of 21% for chlorophyll-a, 26% for TP, 0% for TN, and 75% for turbidity. Another benefit from the treatment was a 26% increase in mean dissolved oxygen. Unlike past algae harvesting projects, there were higher levels of total suspended solids in the effluent compared to the influent. This may have been due to waves and boat wakes rocking the vessel and causing floc to enter into the effluent stream (AECOM, 2024). Although successful at reducing turbidity and harvesting algae, TN removal was minimal and the overall cost effectiveness was relatively low.

Muck Removal

As each project progresses, the lessons learned and new data are being used to improve designs and strengthen bid specifications and contract terms for upcoming projects. Pre-project muck flux data have been collected by researchers at Florida Institute of Technology for more than 20 potential muck dredging sites. These data were considered with other available data to reprioritize muck dredging areas in the 2019 Update. As researchers at the Florida Institute of Technology continue to move forward with muck-related research, data used in the plan will continue to be updated.

The goal of the muck removal program is to improve water quality and ecosystem health within the IRL. Muck removal benefits include reducing nitrogen, phosphorus, hydrogen sulfide, turbidity, pathogens, and contaminants; improving dissolved oxygen and pH; as well as uncovering clean, sandy sediments for recolonization by seagrass, shellfish, and a diversity of benthic marine life to support an abundant and productive food web. The St. Johns River Water Management District maintains several long-term water quality monitoring stations in the IRL, including one northeast of Brevard County's Turkey Creek muck removal project and one east of the St. Johns River Water Management District's Eau Gallie River and Elbow Creek restoration dredging project. Median turbidity values, measured monthly for 18.5 years at the St. Johns River Water Management District monitoring station near Turkey Creek, were 3.59 nephelometric turbidity units before dredging, 3.52 nephelometric turbidity units during dredging, and 2.70 nephelometric turbidity units for the five years of monthly data available after dredging. Median turbidity values, measured monthly for over 26 years at the St. Johns River Water Management District monitoring station near Eau Gallie River and Elbow Creek, were 5.69 nephelometric turbidity units before dredging, 6.88 nephelometric turbidity units during dredging, and 3.50 nephelometric turbidity units for the four years of monthly data available after dredging. Although the median turbidity values are lower after dredging compared with before dredging, too much monthly variability exists in the data to determine if the water quality improvements are statistically significant. However, the data indicate no significant increase in turbidity during dredging and a record low turbidity value of 1.99 nephelometric turbidity units was recorded in May 2021 after dredging, and marked the lowest reading in over 10 years at the Eau Gallie River station.

In 2020, Tetra Tech prepared a document with lessons learned for the muck dredging projects implemented between 2014 and 2019. One lesson learned is that the thickness and extent of muck deposits is generally difficult to determine. Therefore, a combination of sediment probes to plan an optimum density and pattern of sediment cores can improve the accuracy of muck sediment isopach mapping. Another lesson learned was related to the use of polymers and flocculants. The contractor methods used at the Mims Boat Ramp did not work for performance-based specifications for nutrient removal. For future projects, more than just bench testing of the chemicals is needed and enhanced contract standards, developed by Brevard County, should be included in future project specifications. Muck sediments with high clay contents can be difficult to dewater. Design efforts should include bench testing of polymer additives to improve flocculation of the suspended sediments and the geotechnical testing of the dredged material slurry to help optimize the dewatering of the dredged material. Significant benefits to TP removal can be realized through the appropriate use of polymers (Tetra Tech, 2020).

Predicting IRL response to muck removal could be useful for scaling the level of effort and investment that should be directed to dredging. Of the 21 funded muck removal project locations, four have been completed and one is in progress. Two additional projects are going out to bid in late 2024 or early 2025. While the results from completed projects are encouraging, they can also inform modeling that can predict the overall IRL response to the current level of proposed dredging. Dr. Gary Zarillo of the Florida Institute of Technology has simulated the impacts of muck dredging on the IRL by conducting three-dimensional modeling using observed and predicted hydrodynamic and water quality data. Results are presented in his July 2022 report entitled Impacts of Environmental Muck Dredging. Model results indicate that muck dredging benefits IRL water quality and has the potential to substantially reduce nitrogen and phosphorus concentrations in the water well beyond the immediate site of dredging operations.

Model inputs included observed data from the completed Turkey Creek muck removal project and sampling stations located throughout the IRL operated by several agencies and institutions. The model was calibrated using observed data and used to predict water quality response if another 14 muck sites in Brevard County were dredged as planned. Model results found that the relative level of improvement in water quality constituents, such as reductions in TN and TP and increases in dissolved oxygen, ranged from about 15% to 50% near areas of muck removal projects. Furthermore, when looking at water quality constituents throughout the entire County portion of the IRL, even areas most distant from dredging indicated measurable improvements of 2% to 4%.

The estimated costs per cubic yard for muck removal have more than doubled compared to initial projections, while the allocated funding for each project has remained unchanged. To ensure continued progress within the existing budget, project areas are being refined to focus on sections with the highest nutrient flux. This approach aims to maximize nutrient removal effectiveness while staying within financial constraints, prioritizing areas that will yield the greatest improvements to water quality.

Air Quality Monitoring at the Grand Canal Dredge Material Management Area

To ensure the successful completion of the Grand Canal project, Brevard County sought approval from the Board of County Commissioners for a new Temporary Use Agreement to extend the use of the Dredge Material Management Area beyond the original expiration date of July 2024. In April 2024, the County hosted a community open house to provide project updates and address questions or concerns for property owners within 1,000 feet of the Dredge Material Management Area. In response to concerns voiced during the meeting, the County engaged a third-party consultant to conduct air quality monitoring, specifically measuring hydrogen sulfide levels during active construction. Hydrogen sulfide is naturally produced in muck under low-oxygen conditions. Additionally, the County's Fire Rescue Hazard Mitigation team visited the construction site and neighborhood in question and did not detect any air quality concerns.

At the May 2024 Board of County Commissioners meeting, the Temporary Use Agreement extension for the Grand Canal Dredge Material Management Area was approved with a directive to continue hydrogen sulfide air quality monitoring throughout the month of May. **Figure 4-38** illustrates the locations of the air quality sensors positioned around the Dredge Material Management Area. Initially, one sensor was placed adjacent to the muck slurry inflow point on day one of monitoring. Following that, the sensor was repositioned daily within the construction site, ensuring it was consistently located downwind of active odor-producing areas to capture emissions data. A second sensor was installed in the construction area closest to residential homes.

Hydrogen sulfide concentrations were presented in graph form weekly, comparing the results against various regulatory and guideline thresholds. The Occupational Safety and Health Administration's Permissible Exposure Limit for construction workers is 10 parts per million averaged over eight hours. In comparison, the United States Environmental Protection Agency's most protective Acute Exposure Guideline for the public is 0.75 parts per million for ten minutes.

The Occupational Safety and Health Administration's Exposure Limits for construction sites were never exceeded. To address concerns raised by the community about potential air quality impacts on nearby homes, the monitoring results onsite were compared to the more protective United States Environmental Protection Agency residential guidelines. While one monitoring location on the construction site did exceed a residential guideline for a six-minute period during May, a vegetated buffer and canal in the area that provide natural diffusion and separation between the site and the nearest residences, further mitigating any potential impact.

Figure 4-38. Monitoring Sensor Locations at the Grand Canal Dredge Material Management Area from May 1 – 31, 2024

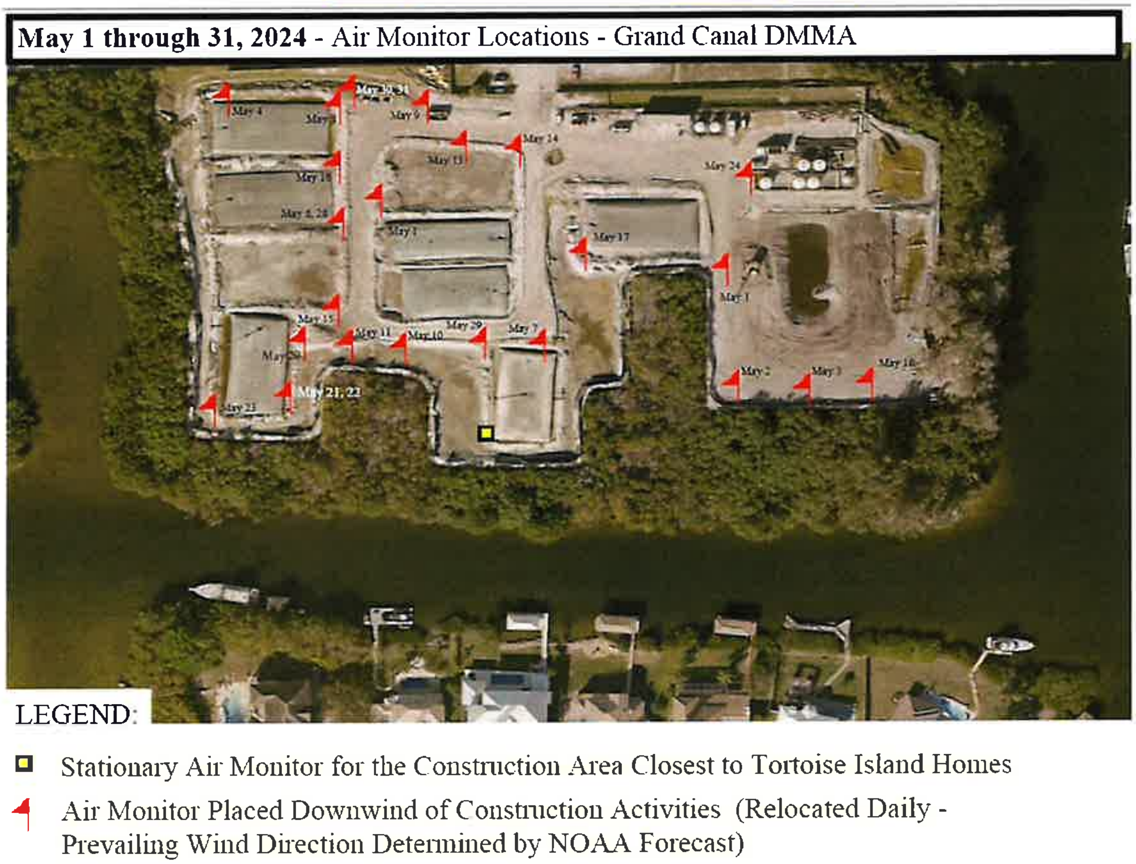


Figure 4-38 Long Description

Evaluating Sand Capping for Sediment Nutrient Reduction

Sand capping has been identified as a potential method to contain muck in place while reducing water depths, sediment oxygen demand, and the release/flux of dissolved nitrogen and phosphorus from the sediment into the water column. During or shortly after capping, the added weight of the capping material can drive a short-term release of porewater and associated nutrients. However, after short-term equilibration to the weight of the sand cap, nutrient releases are much slower. These slow releases can be reduced further or fully overcome by natural processes like coupled nitrification-denitrification and sorption of phosphate to inorganic particles in the sand cap over the muck.

Brevard County had interest in evaluating alternative cost-effective means for muck management in the IRL and sand capping has been successfully implemented in other locations. In 2018, Florida Power and Light carried out a sand filling remediation project to reduce the water depth and promote seagrass growth in the IRL just north of the National Aeronautics and Space Administration Causeway. The County and researchers at the Florida Institute of Technology used the project as an opportunity to evaluate the effectiveness of sand capping to mitigate muck nutrient fluxes in the IRL. Five years later, researchers at the Florida Institute of Technology returned to assess the long-term effectiveness of the sand cap. Surface sediment characteristics remain improved over time as shown in **Table 4-45**.

Table 4-45. Composition of Surface Sediments from the Florida Power and Light Project Area Before the Sand Cap, Two Months After, and Five Years After (Fox, 2020 and 2024)

Time	Percent Water by Volume	Percent Organic Matter by Mass	Percent Calcium Carbonate by Mass	Solids Characterization
Before the Sand Cap	91	20.4	9.7	93% silt + clay
2 Months After the Sand Cap	47	0.80	4.8	1.3% silt + clay, 94.2% sand, 4.5% gravel
5 Years After the Sand Cap	50	0.95	1.9	Less than 2% silt + clay

Five years after capping, fluxes of dissolved nutrients remain reduced by more than 80% for nitrogen and 90% for phosphorus. This coincides with decreased porosity of surface sediments and the presence of oxygen in the surface sediments. The lower sediment oxygen demand after capping promotes sorption of phosphorus and coupled nitrification-denitrification, reducing the concentration gradients for nitrogen and phosphorus in porewater after capping (Fox, 2024). Overall, the sand cap continues to perform after five years, limiting the release of phosphorus and nitrogen by creating a less permeable barrier between muck and overlying water. The long-term reduction in sediment oxygen demand and nutrient fluxes has shown benefits for the lagoon's oxygen levels and overall ecosystem resilience.

The City of Cocoa Beach is planning a sand capping project to contain muck sediments in the Banana River Lagoon adjacent to the municipal golf course with funding from the Save Our Indian River Lagoon program and Florida Department of Environmental Protection. Given the project's scale and site-specific conditions, sand capping was identified as the most feasible and cost-effective option for nutrient management and habitat restoration for this specific project area. The proposed sand cap will cover about 140 acres of muck deposits, which currently contribute over 55,000 pounds of nitrogen and 3,000 pounds of phosphorus annually to the lagoon. Reducing nutrient fluxes of nitrogen and phosphorus, the sand cap will create beneficial benthic habitat and help to enhance ecosystem resilience.

General Performance of Interstitial Water Treatment

Data collected by researchers at the Florida Institute of Technology indicated the interstitial water, or the water that is "squeezed" out of the dredged muck material, contains relatively high concentrations of dissolved nitrogen and phosphorus. Treatment of this interstitial water can help to prevent a significant amount of nutrients from being returned to the lagoon; although numerous challenges must be overcome and adapted to when treating brackish water with variable characteristics. The various ions present in brackish IRL water (a mix of saltwater and freshwater) interact with other ions used in more traditional methods for treatment of stormwater and wastewater (freshwater). When collaborating with the dredging industry, stormwater treatment engineers, and wastewater treatment engineers to treat the interstitial water, different approaches were tested first in jars, then on a larger laboratory scale, followed by a pilot scale, and finally improved upon at full scale where the challenges of variable field conditions were experienced.

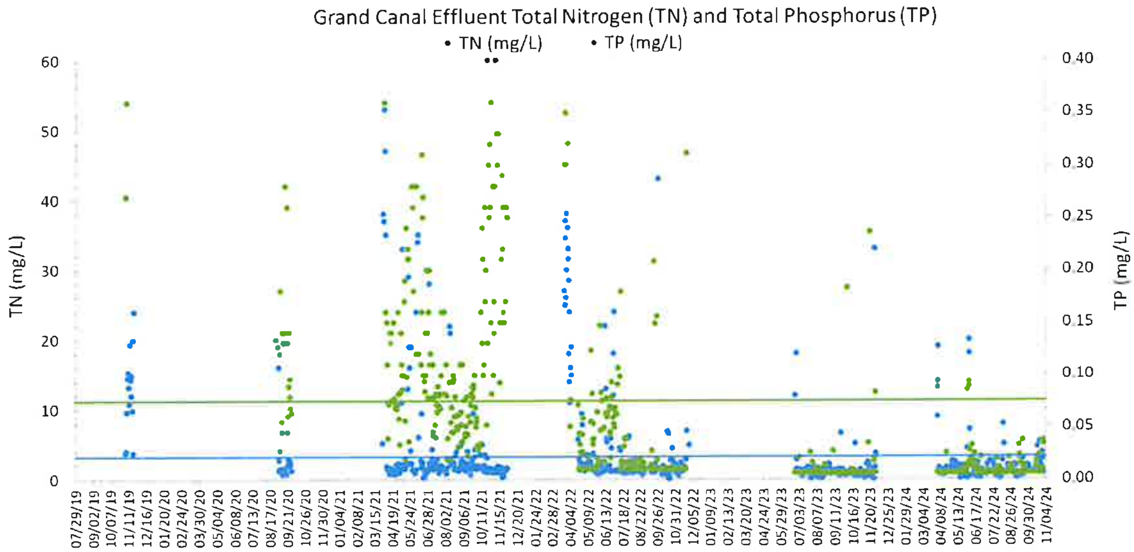
Treatment of the interstitial water first began with the Turkey Creek dredging project where contractors began removing phosphorus through sorption methods and found that large amounts of nitrogen could be removed as well. Therefore, to further reduce the amount of nutrients entering the IRL, when bid requests were advertised for the Mims dredging project, interstitial treatment was included as pay-for-performance bid options in addition to muck removal. For Mims, bid options were requested for several effluent concentration targets ranging from 1,000–3,000 parts per billion (1–3 milligrams per liter) for nitrogen and 75–100 parts per billion (0.075–0.1 milligrams per liter) for phosphorus. The target for nitrogen is equivalent to advanced wastewater treatment targets for sewage, and the phosphorus target is more than ten times cleaner than the advanced wastewater treatment target. Both dredging and interstitial treatment were contracted, and the contractor was able to reduce interstitial nutrient concentrations but was unable to meet the contracted targets measured by seven-calendar day rolling averages; therefore, they were only paid for dredging and not paid for interstitial treatment.

Learning how complex it was to treat brackish water of highly variable quality and character, but still wanting to incentivize meeting the effluent concentration targets, Brevard County strengthened the contract terms in the bid for the Grand Canal dredging and interstitial water treatment project. A start-up grace period of 21 days was granted to the contractor to ramp up to meeting the established effluent discharge targets of 3,000 parts per billion (3 milligrams per liter) for nitrogen and 75 parts per billion (0.075 milligrams per liter) for phosphorus. If the contractor was not able to meet the targets after the grace period, the new contract language allowed the County to stop work and require a new treatment proposal from the contractor.

Challenges for interstitial treatment include variable organic decomposition rates as the sun heats the de-watering tubes used to separate muck solids from the interstitial water, differences in sediment characteristics as the dredge moves, rainfall, etc. These can result in fluctuating influent nutrient concentrations that may lead to instances where the discharge targets are not met. One bad day could devastate the seven-day rolling average; therefore, the Grand Canal dredging contract was revised to use daily data for performance pay calculations. Two interstitial treatment subcontractors were only able to meet the targets some of the time; therefore, the prime contractor brought in replacements. The current subcontractor is meeting nitrogen and phosphorus targets greater than 85% of the time, excluding the initial 21-day grace period for starting up the treatment process (**Figure 4-39**). Using the best available data to date, environmental dredging at Grand Canal will decrease the annual nitrogen flux by approximately 26,400 pounds per year and the phosphorus flux by approximately 1,700 pounds per year. The removal of the muck solids removes 2,100,000 pounds of nitrogen and 490,000 pounds of phosphorus from the IRL. Additionally, treatment of the interstitial water removes an extra 44,000 pounds of nitrogen and 4,000 pounds of phosphorus.

With the contractor consistently meeting nutrient effluent discharge targets at Grand Canal, the same treatment process was applied to Phase 1 of the Sykes Creek dredging and interstitial water treatment project. Perfection is not expected due to confounding factors that influence treatment although, the efficacy of the treatment methods continues to improve with practice. At Sykes Creek Phase 1, treatment of interstitial water was successful with targets met greater than 80% of the time for nitrogen and 97% of the time for phosphorus (**Figure 4-40**). Removal of the organic-rich, decaying muck in Phase 1 will reduce annual nitrogen fluxes by approximately 6,970 pounds per year of nitrogen and approximately 617 pounds per year of phosphorus. Dredging of Phase 1 removed approximately 341,100 pounds of total nitrogen and about 75,000 pounds of total phosphorus in the solids, plus about 7,000 pounds of total nitrogen and 620 pounds of total phosphorus from the interstitial water treatment.

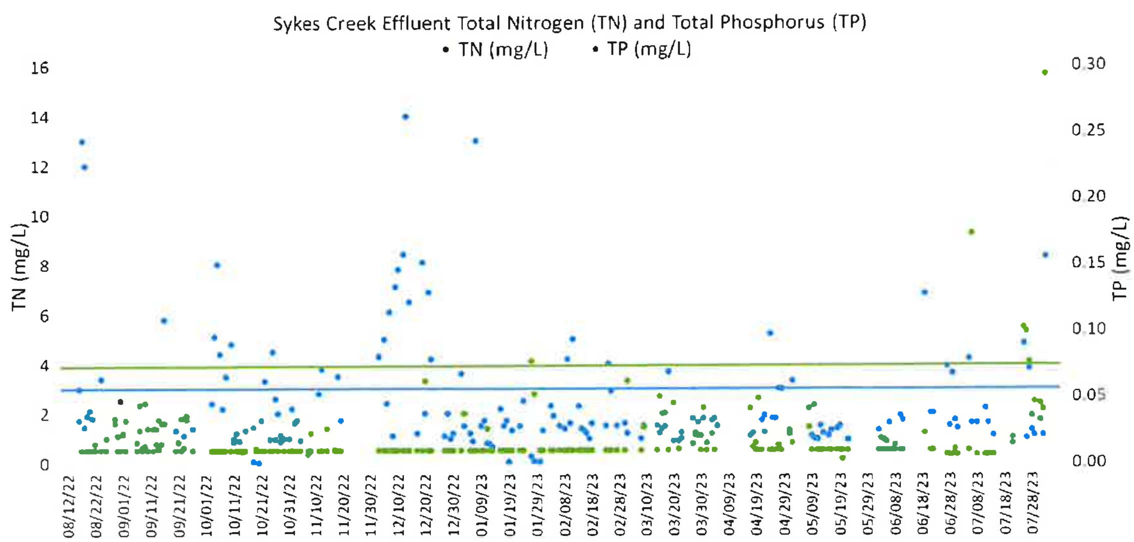
Figure 4-39. Effluent Concentrations from Interstitial Water Treatment at Grand Canal



Note: The blue horizontal line indicates the nitrogen effluent target (3 milligrams per liter) while the green line indicates the phosphorus effluent target (0.075 milligrams per liter). Gaps in the graph are representative of the mandatory manatee closure periods from December to March and other downtime.

Figure 4-39 Long Description

Figure 4-40. Effluent Concentrations from Interstitial Water Treatment at Sykes Creek



Note: The blue horizontal line indicates the nitrogen effluent target (3 milligrams per liter) while the green line indicates the phosphorus effluent target (0.075 milligrams per liter).

Figure 4-40 Long Description

Decreasing nutrient concentrations through treatment of the interstitial water prevents relatively high concentrations of dissolved nutrients from re-entering the IRL in the return water. Contract payment terms are used to incentivize private industry to meet targeted nutrient reductions. As both the treatment process and payment terms evolve, the timing and method for collecting performance metric data also change. Based on actual costs and performance data available for assessing the current process at the Grand Canal and Sykes Creek, the cost-effectiveness of interstitial treatment is on the order of $50 per pound of total nitrogen. For future bids, those costs can be compared to nutrient concentration data collected upstream and downstream of interstitial treatment to further update the cost-effectiveness of interstitial treatment.

In-lagoon Aeration Study

Dr. Austin Fox and Dr. John Trefry from the Florida Institute of Technology conducted two separate aeration studies in the IRL. The first studied microbubble aeration in two canals that were similar in bottom type and hydrology before aeration: (1) Anderson Canal (south of Anderson Court, Satellite Beach, Florida) was used as the control canal, and (2) Redwood Canal (south of Redwood Court, Satellite Beach, Florida) was used as the aeration canal. In the first study, from July 2017 to July 2018, microporous diffusers were installed at 50-meter intervals along the bottom of the aerated canal. An additional three diffusers were placed at the mouth the aerated canal, forming a bubble curtain to prevent any suspended material from being blown out of the canal. Water quality sampling was collected monthly for one year at the aeration and control sites. Microbubble aeration creates overturning vertical circulation of the water column, facilitating gas exchange at the water's surface and from the bubbles themselves. In a separate second study using a similar experiment setup, aeration using nanobubbles of highly concentrated dissolved oxygen was studied from February 2019 to March 2020 in the canal off Turkey Creek along the Florida Institute of Technology Rivers Edge property. During the second study, highly concentrated dissolved oxygen was injected directly into bottom water using six injection nozzles located at the bottom of the Rivers Edge Canal, with a control area adjacent to the aerated canal.

Results from the first study showed that aeration using microporous diffusers created a uniform concentration of dissolved oxygen vertically throughout the water column, whereas sites in the control (non-aerated) canal had high dissolved oxygen saturation at the surface and low to no dissolved oxygen saturation near the bottom. Nanobubble aeration used in the second study resulted in oversaturation of oxygen in bottom water without causing vertical mixing. Benthic fluxes of nitrogen and phosphorous showed similar seasonal variations between the aerated and control canals, except when the average nitrogen flux between February to April 2018 was 35% lower in the microbubble-aerated canal than in its control. It was also noted that the microbubble-aerated canal experienced recruitment of benthic infauna during winter months when oxygen was able to enter the sediment, but in the summer months when bacterial metabolism and oxygen demand was high, mortality of the recruits occurred. Muck thickness, volume, and dissolved nutrients did not significantly decrease and water clarity did not significantly improve using either the microbubble or nanobubble aeration techniques. Despite this, these two studies illustrated how aeration using microporous diffusers or highly concentrated dissolved oxygen can decrease benthic fluxes during cool months and how both types of aeration can increase bottom water dissolved oxygen in localized areas surrounding the aerators.

Brevard County conducted a separate aeration experiment in Sykes Creek (2576 Sykes Creek Drive, Merritt Island, Florida) from December 4–7, 2018. A commercial, floating, surface-pond aerator with no fountain was deployed in a fixed location. Dissolved oxygen levels were measured in 10-foot increments at a depth of two feet extending out from the aerator in both a northeast and southeast direction for 200 feet, before the aerator was turned on and after it was run continuously for three days (but before it was turned off and removed). The results showed dissolved oxygen concentrations near 100% saturation at 7.9–9.0 milligrams per liter before aeration began, and significantly higher ($p<0.001$), above 100% saturation, at 10.3–11.1

milligrams per liter at the end of the three-day experiment. Aeration using atmospheric air is only capable of bringing dissolved oxygen to 100% saturation. Therefore, although dissolved oxygen increased during aeration, the rise above 100% dissolved oxygen saturation suggests that aeration was not directly responsible for the significant increase in dissolved oxygen — it was likely due to increased photosynthetic activity in the area on the sunny December 7, relative to the overcast December 4. Wind direction in the area from December 4–7 (Time and Date, 2021) was consistently from the north, north-northwest, or northwest with similar low speeds (about 10 miles per hour), indicating similar physical parameters across the study days and that differences in weather conditions were mainly influenced by cloud cover before and during aeration.

Thus, both the Florida Institute of Technology studies and Brevard County experiment illustrated how aeration — whether from microbubbles, nanobubbles, or surface aeration — can help create small areas of refugia for benthic organisms against hypoxic events, although benefits are limited to localized areas surrounding the aerators.

Bottom-water Dissolved Oxygen Monitoring Network

Muck is organic-rich with high decomposition rates that consume dissolved oxygen from the water column, potentially resulting in overall lower oxygen concentrations. To further understand the relationship between bottom-water dissolved oxygen and nutrient cycling in the sediments, Dr. Austin Fox of the Florida Institute of Technology established a network of continuous monitoring stations in the IRL. Data from these sensors will be used to evaluate bottom water dissolved oxygen patterns and hypoxia in the IRL and its impacts to nutrient cycling, eutrophication, and loss of ecosystem services (Fox, 2023). These data will also be used as one of the tools to quantify success with measurable outcomes resulting from lower sediment oxygen demand and fewer hypoxic events following muck removal projects. Vertical profiles using the data retrieved by the network of sensors showed that bottom-water dissolved oxygen generally decreases in areas with either soft sediments (i.e., muck), restricted circulation, or both. The trends reflect the higher sediment oxygen demand of soft versus sandy sediments and less vertical mixing in areas with restricted circulation (Fox, 2023).

In January 2022, Dr. Austin Fox deployed bottom-water dissolved oxygen sensors in four canals in the Sykes Creek Phase 1 dredge template area to evaluate the impacts of muck removal via environmental dredging on bottom-water dissolved oxygen concentrations. To date, data from these sensors indicate higher dissolved oxygen in the recently dredged canals and generally less-stratified water columns, meaning dissolved oxygen remained relatively uniform throughout the water column down to the sediments (Fox, 2023). Many factors and differences can impact dissolved oxygen levels; nevertheless, the data being collected provide insights into benefits associated with these muck removal projects.

In early 2024, Dr. Austin Fox deployed five additional sensors throughout the Sykes Creek Phase 2 dredge template area to track water quality before, during and after dredging. Long-term monitoring, to date, shows that sites with restricted circulation or near muck deposits consistently have lower DO, averaging 4.1 milligrams per liter in 2024, compared to open areas with higher dissolved oxygen levels, averaging 7.15 milligrams per liter in 2024. These high-resolution data are valuable in detecting hypoxic areas that impact nutrient cycling and other ecosystem functions and data can help guide restoration efforts by identifying areas that would benefit from nutrient management efforts or are naturally more resilient.

Building upon the initial bottom water dissolved oxygen network and research, Florida Institute of Technology partnered with the Smithsonian Marine Station and Hubbs SeaWorld Research

Institute in a collaborative effort to better understand nutrient cycling, seagrass health, and biodiversity in the IRL. With funding support from the Florida Department of Environmental Protection, an additional 60 bottom water dissolved oxygen sensors were deployed throughout the Banana River Lagoon in 2024.

Oyster Restoration and Planted Shorelines

Brevard County oyster bars were initially built using mesh bags filled with oyster shell, known as cultch. They were typically two layers tall and, in some areas, seeded with approximately 100 young adult oysters per square yard of the top layer. Projects now include alternative materials and designs to minimize manmade materials and maximize project area while continuing to promote successful oyster recruitment. A University of Central Florida research team conducts independent monitoring of a subset of oyster bar projects, visually inspecting for oysters growing through the bags or gabions and cementing or "bridging" of adjacent oysters, and documenting the presence of predators, algal cover, and sedimentation. Additionally, a subsample of building units is emptied to quantify oyster survival, growth, recruitment, and the abundance as well as the diversity of fish and invertebrates living within the modules.

Monitoring results inform future decisions about oyster bar site selection, design, material type, and the need for seeding. Recruitment is necessary for oyster bars to sustain themselves without additional seeding. Adopted success metrics for the oyster bar projects are the presence of two distinct size classes and at least 46 oysters and 0.1014 pounds total dry weight per square yard (50 oysters and 50 grams total dry weight per square meter) (Brevard County Oyster Habitat Suitability and Rehabilitation Success Plan, 2021).

The first two years of monitoring at 12 of the 23 areas are reported in the University of Central Florida monitoring reports for permit reporting. Brevard Zoo also monitors the remaining oyster bar sites and continues monitoring the sites after the University of Central Florida concludes the first two years of monitoring. University of Central Florida monitors the Cocoa Beach McNabb Oysters reef, which is not a comparable design to the other sites. The latest available censused data for all monitoring areas are included in **Figure 4-41**, **Figure 4-42**, and **Figure 4-43**. Reefs that were not fully censused in the past year are shaded in a lighter color to differentiate that older data are presented and that the reef likely now has different size class distributions, oyster density, and total dry weight.

Figure 4-41 shows the average number of measured oysters in each size class per monitored unit at locations funded by the Save Our Indian River Lagoon Program. Project names represent the location of projects within the IRL and are presented in order by deployment date. Each name includes the date (in parentheses) and age of the project at the most recent full census monitoring event. These numbers reflect the average of the first 50 randomly encountered oysters per sample. The oyster density at each location is shown in **Figure 4-42** and the total dry weight is shown in **Figure 4-43**.

Eleven projects were fully censused between 2021 and 2022, with ages at that time ranging from 1 to 3.5 years. Of these reefs, 72% were meeting all sustaining success criteria. An additional 11 projects were fully censused in 2023 ranging in age from 6 months to 4.5 years. For these reefs, 72% were meeting all sustaining success criteria with an additional 18% meeting at least the minimum success criteria. Thirteen reefs were fully censused between late-2023 and 2024, with ages at that time ranging from 0.5 to 4.5 years. Of these reefs, eight (62%) were meeting all sustaining success criteria with an additional 4 (31%) meeting minimum success criteria. As reefs age and begin to accrete or degrade, the monitoring method may adapt to limit disturbance and expedite monitoring. In 2024, visual point-intercept transects were conducted at nine oyster reef projects, yielding a percent cover of live oyster, shell substrate, and fouling.

Figure 4-41. Distribution of Oyster Sizes, Age, and Average Number of Measured Oysters Per Sample Unit

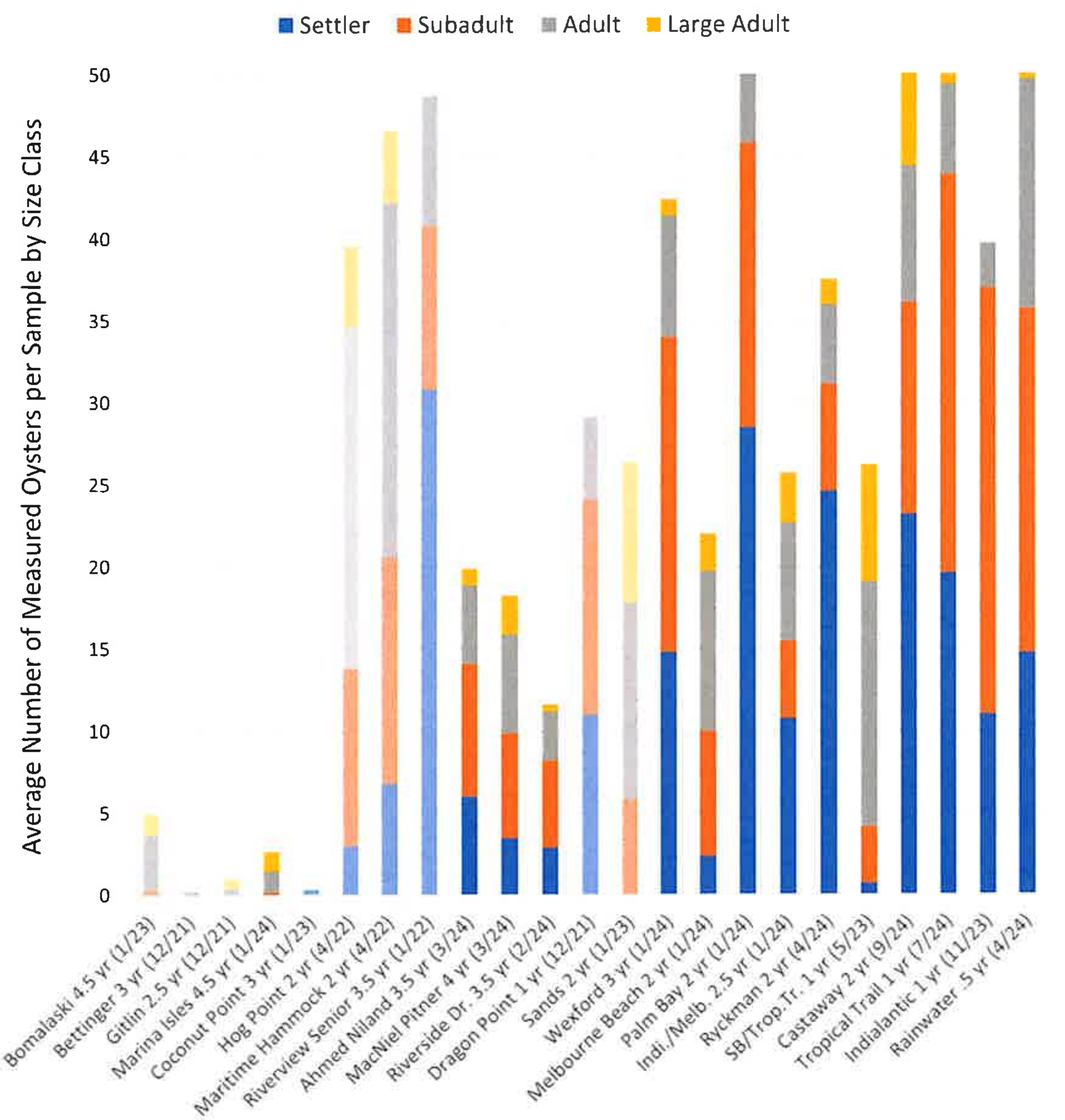


Figure 4-41 Long Description

Figure 4-42. Average Oyster Density Per Square Foot

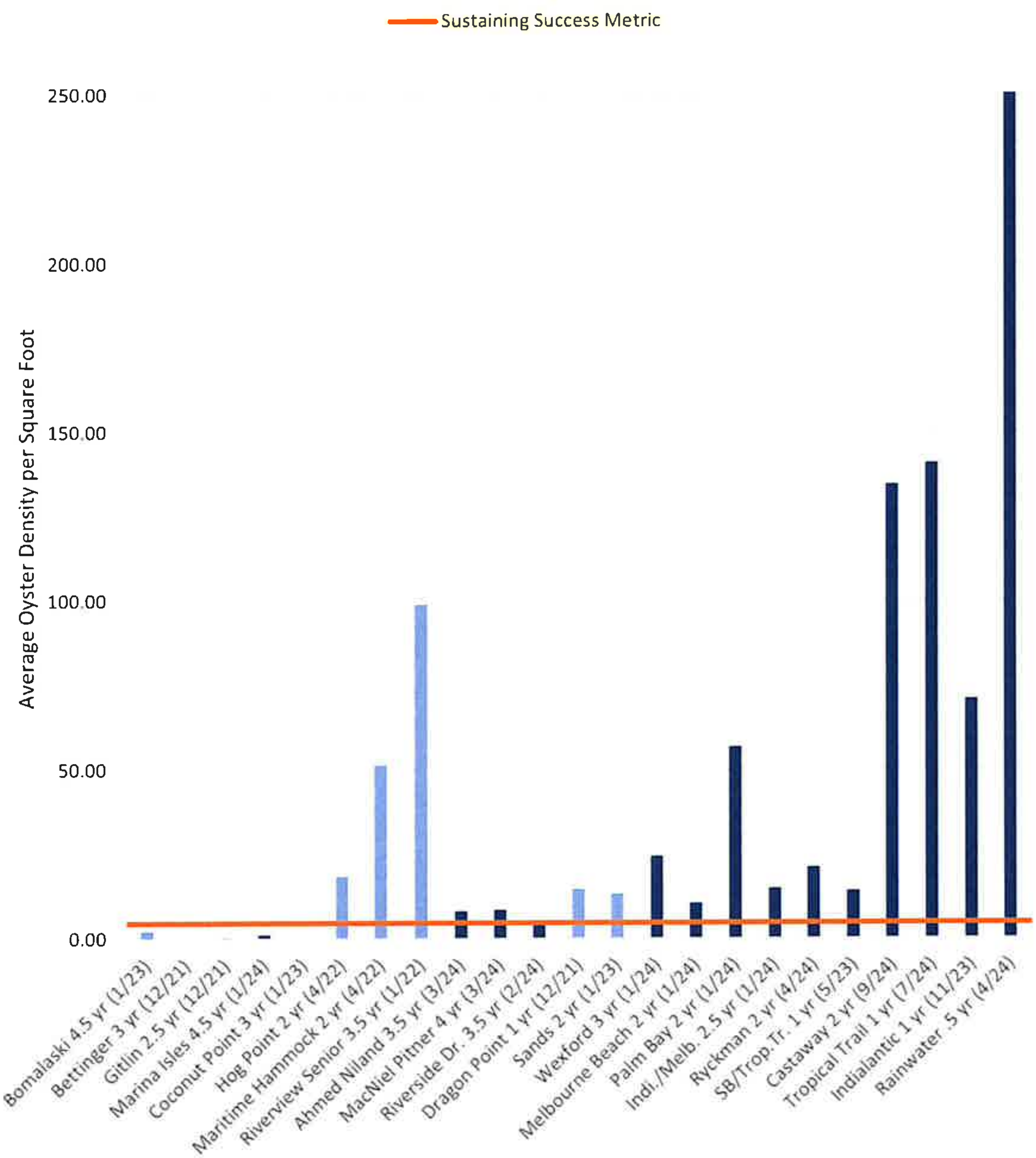


Figure 4-42 Long Description

Figure 4-43. Average Dry Total Weight Per Square Foot

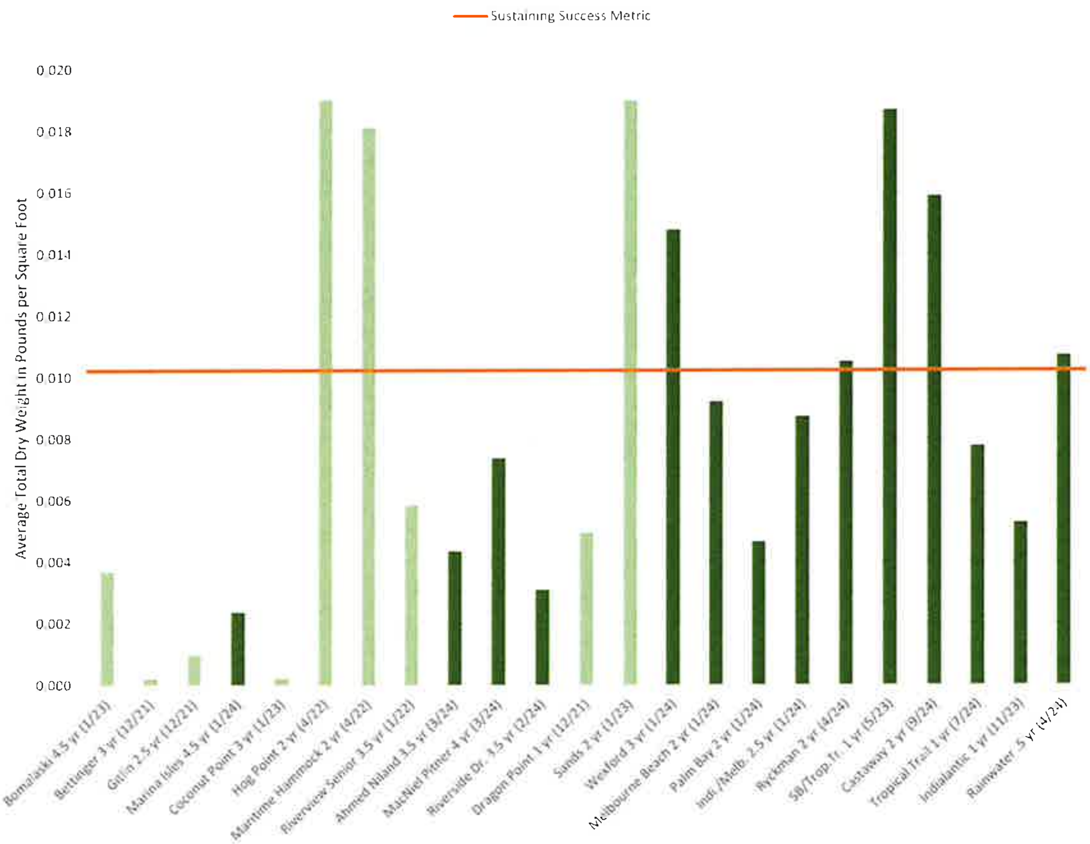


Figure 4-43 Long Description

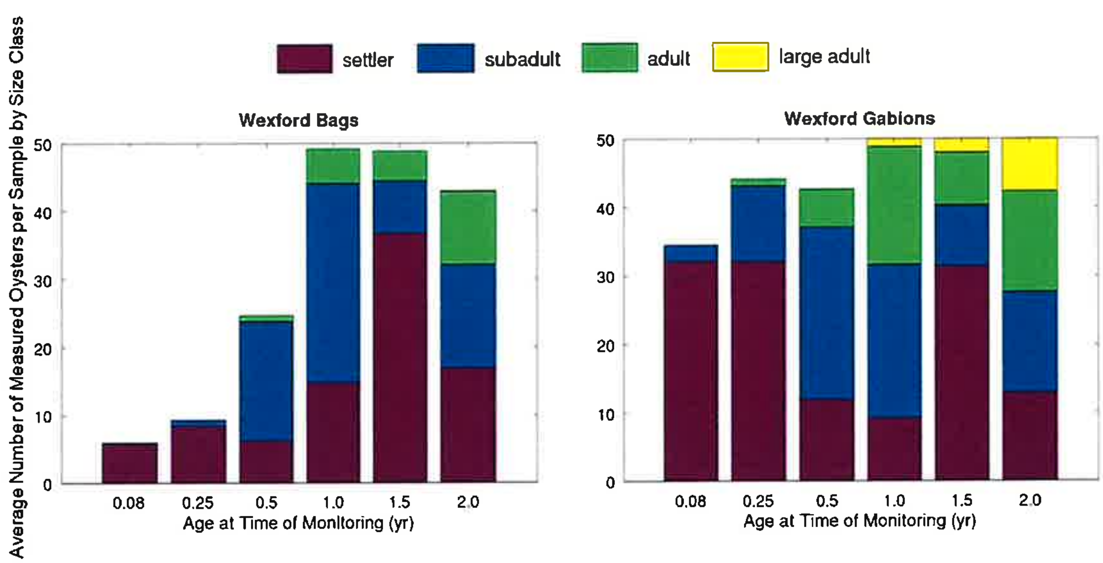
The formation of bridges between bags has been noted at Bomalaski, Marina Isles, Maritime Hammock, and MacNiell-Pitner. Comparison of data from multiple sites indicates that oyster bars located in narrow canals are exposed to more variable salinity and less recruitment and, although surviving oysters do grow, the numbers of live oysters decline over time (University of Central Florida, 2020a). In contrast, bars constructed in open waters of the IRL experience fluctuations in density but many have sufficient recruitment to maintain populations over time (University of Central Florida, 2022b).

Beginning in July 2020, two projects located within 500 feet of one another were deployed in the Central IRL and monitored to compare the influence of initial seeding. At one year of age, recruitment and oyster density were similar at both sites, 10 and 12 settlers and 28 and 26 oysters per bag at the two sites, respectively. After two years the populations remained similar, with an average 45 ± 5 oysters and 14 settlers per bag at the unseeded location and 63 ± 12 oysters and 26 settlers per bag at the seeded location. Therefore, in regions where recruitment is sufficient, oyster reefs do not need to be seeded.

In response to concerns related to the breakdown of plastics in the environment, six alternatives to using ultraviolet stabilized plastic mesh bags for securing loose oyster shell were tested at three locations in the IRL. With funding from the IRL National Estuary Program and collaborators from the University of Florida, Brevard County and the Brevard Zoo Restore Our Shores team built test structures that were monitored throughout an 18-month study. Modules were hung from docks and consisted of controls (ultraviolet stabilized plastic Naltex™ mesh bags); two gauges of galvanized steel gabions; and multiple configurations of cement, oyster shell, and several natural materials including Community Oyster Reef Enhancement modules, jute-reinforced calcium sulfoaluminate Plastic-free Restoration of Oyster Shorelines units, and oyster balls. Monitoring of degradation, fouling, and oyster recruitment and growth occurred quarterly. Results suggest that oyster gabions tended to maintain higher oyster densities and species richness without compromised structural integrity compared to the other materials' performance (Brevard County Natural Resources Management Department, 2022). Changes in trends over time and by location indicate that different materials may be best suited to different environments.

In 2020, alternative materials also began being tested on select oyster bar projects. Community Oyster Reef Enhancement modules were tested along-side ultraviolet stabilized plastic mesh bags at the Hog Point oyster bar. At two-years post-deployment, the average oyster density on Community Oyster Reef Enhancement modules was approximately 7.5% of that in the mesh bags when normalized by reef area (extrapolated from University of Central Florida, 2022a). In the alternative material test, these modules also tended to support much lower densities than mesh bags or gabions. Oyster gabions have also been tested along-side plastic mesh bags at the Wexford oyster bar. In the alternative material test, gabions tended to persist longer, support an equal or greater number of oysters, and oysters formed bridges earlier and more frequently (Brevard County Natural Resources Management Department, 2022). At Wexford, oyster densities remained consistently higher and oysters tended to grow more quickly and to larger size classes in the gabions than plastic mesh bags (**Figure 4-44**). This trend has also been observed on oyster reefs in Indialantic with 3.75 times greater oyster density in gabions versus plastic mesh bags and a greater proportion of the population growing to larger sizes.

Figure 4-44. Average Number of Measured Oysters in Each Size Class for Ultraviolet Stabilized Plastic Mesh Bags (left) and Galvanized After Welding Steel Gabions (right)



Note: Each bar represents the age of the project for each monitoring event.

Figure 4-44 Long Description

To continue minimizing the use of manmade materials and construct larger restoration projects, new designs are also being constructed by Brevard Zoo and monitored by the University of Central Florida. Recent projects have begun building wider footprints, contain larger areas of shell cultch rather than individual building units, and are using different materials. Castaway Cove, located north of the mouth of Turkey Creek, tested different widths (6 feet and 10 feet) modules of both gabion corrals and stacked gabions tested side-by-side to compare their success in recruiting and supporting oyster growth. After the first two years, modules at both 6- and 10-foot widths and with corral walls or stacked gabions have performed similarly (**Figure 4-45**). At Rainwater, located south of the mouth of the Eau Gallie River, 10 foot wide gabion corrals are being compared to 10 foot wide coquina rock corrals with a 10 foot wide gabion module control. At the six-month monitoring event, the gabion corrals and coquina rock corrals were performing similarly (**Figure 4-46**). The Turkey Creek Offshore Project that is under construction will be evaluating 20 foot wide gabion and coquina corral modules further offshore than previously constructed reefs.

Figure 4-45. Comparison of Corral Wall and Stacked Gabion Oyster Module Performance

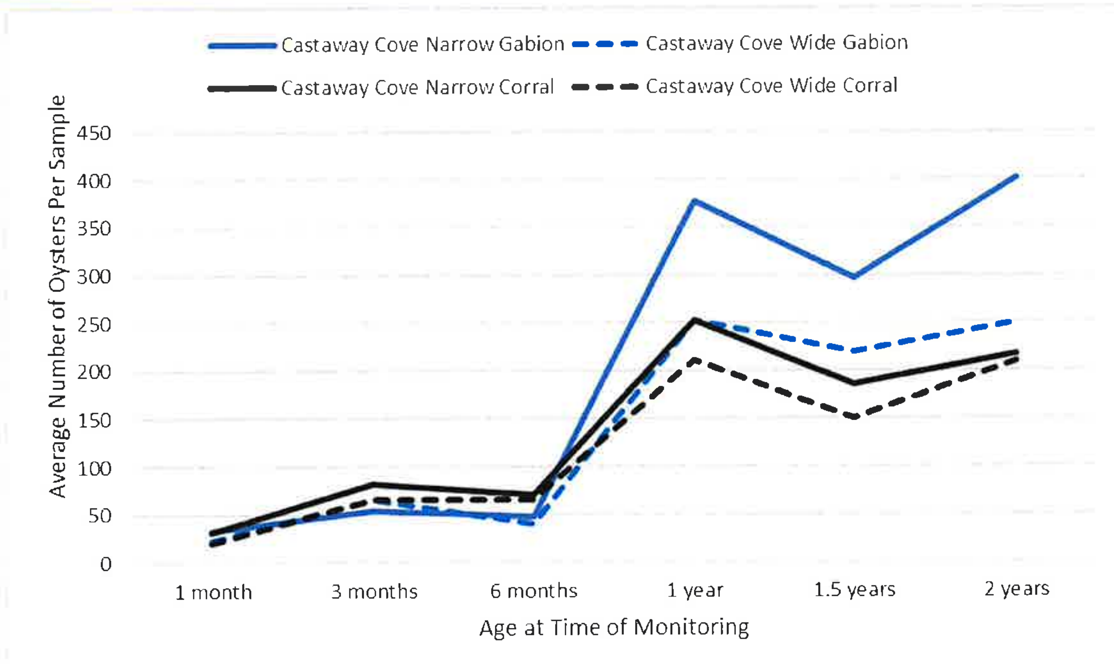


Figure 4-45 Long Description

Figure 4-46. Comparison of Gabion Corral Wall and Coquina Corral Wall Performance

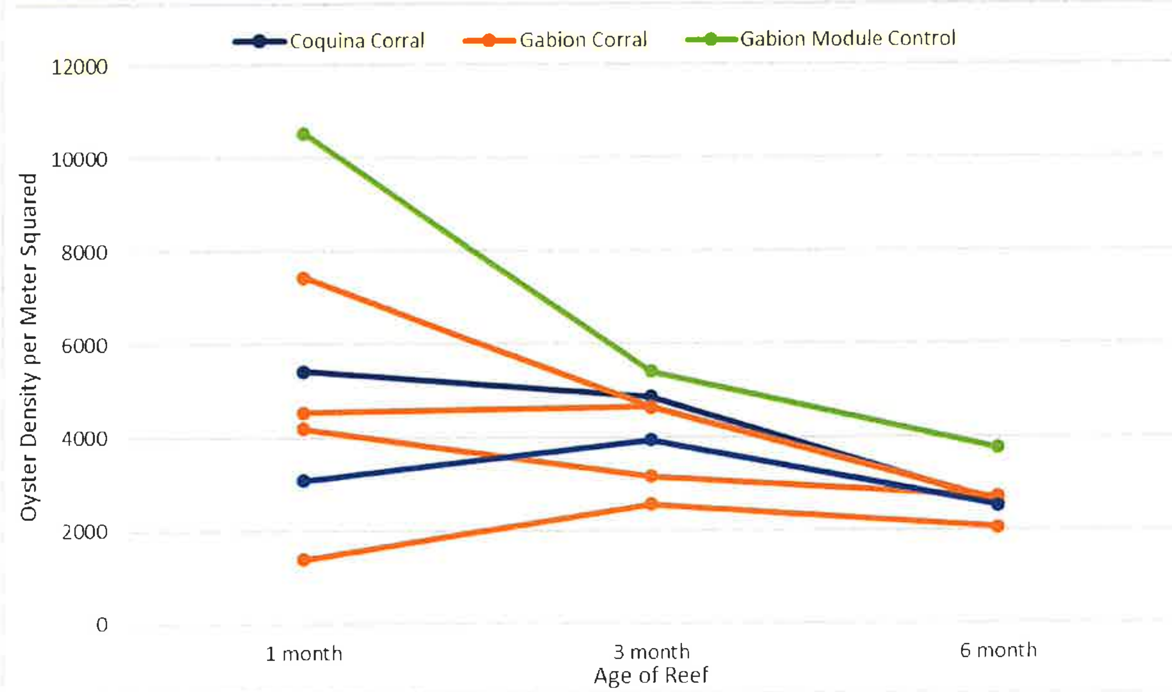


Figure 4-46 Long Description

The University of Central Florida has also monitored planted shorelines projects. Earlier projects (2018–2019) had higher success rates; 46–64% for red mangroves and 36–38% for sand cordgrass. In more recent projects, survival was initially similar to previous projects at equivalent ages. However, significant erosion was noted at two locations after fall 2020. Competition with terrestrial vegetation and erosion via waves and boat wakes are common causes of loss. In an effort to improve success and incorporate vegetation in hardened shorelines, variations of concrete-coated jute fiber mangrove planters are being tested. A pilot led by the Marine Resources Council had a mangrove survival rate of 57% after three months. At this location, *Spartina* spp. and muhly grasses were also planted in an upland area above a rip-rap shoreline, which had approximately 75% survival after three-months. Unfortunately, Hurricanes Ian and Nicole both significantly impacted this planted shoreline and significant mortality was observed. A new planter box is now being piloted by Cocoa Beach at the McNabb Park Oyster and Living Shoreline project. After 2 years, red mangrove survival is 73% to 87% and showing signs of growth and reproduction (prop roots and flowers). Smooth cordgrass was also planted and, after 19 months, the shoots have spread out to the point where individual transplant units are not identifiable. Soil erosion due to degradation of the cement-jute lining of the planter boxes is evident in the mangrove modules, but not the cordgrass modules. The oyster bar at this location is testing multiple materials and seeding methods. Populations on all three designs (gardened and spat deployed into gabions and gardened prisms) at this location declined in the first year post-deployment and there is no evidence of new oyster recruitment.

Data on oyster reef denitrification rates are very limited in Florida; therefore, a scientist with the University of Florida's Institute of Food and Agricultural Sciences was contracted to sample sediment from three oyster bar projects, one each from the North IRL, Central IRL, and Banana River Lagoon. This work builds on a previous study conducted for Brevard County on intertidal oyster reefs of different ages within the Mosquito Lagoon (Schmidt and Gallagher, 2017). Improved analysis techniques were employed on the subtidal oyster bars present in the County to obtain sediment denitrification, percent organic matter, oxygen demand, and nitrate, ammonium, and phosphate flux rates across the sediment-water interface. Oysters were also included in some incubations for each site, which tended to alter most of the response variables tested, highlighting the importance of live organisms for filtration, biodeposition, and contributions to the microbiome. The net denitrification varied across seasons and locations and were within range of those in the northeast and mid-Atlantic regions of the United States. Although oyster reef sediments were not significantly different than reference sediments, denitrification rates increased when oysters were present in the samples. It is likely that the young age of the oyster bars and high energy of these sites may have limited the accumulation of biodeposits, affecting net denitrification rates. However, denitrification efficiencies were greater than 50% for most sites and seasons suggesting efficient nitrogen removal (Smyth, 2022).

Remote Sensing of Harmful Algal Blooms in IRL and Connected Waterways in Brevard County

The identification of algae bloom triggers and behaviors is vital to local efforts to manage the watershed. In 2021, Brevard County was awarded $290,972 from a Florida Department of Environmental Protection Water Protection Grant for development of innovative technologies to address harmful algal blooms. So far, remote sensing technologies are providing a cost-effective and encompassing approach to provide rapid identification of harmful algal bloom formation. With more data collection and analysis, it is anticipated that satellite imagery may be used to determine the harmful algal bloom lifecycle and identify hotspots of harmful algal bloom occurrences.

The scope of work began with the development, implementation, and analysis of satellite and unmanned aerial vehicle remote sensing of harmful algal blooms in the IRL. The European Space Agency Sentinel-2 and Sentinel-3 satellites were the primary sources of remote sensing data that provided Brevard County with weekly harmful algal bloom updates. Applied Ecology, Inc. performed spatiotemporal statistical analysis of these harmful algal blooms and corresponding water quality parameters. Applied Ecology, Inc. also flew an unmanned aerial vehicle equipped with a hyperspectral camera, which provided high resolution imagery of calibration areas, as well as on-the-ground data to improve the analysis of the satellite imagery. An additional $65,000 from the Florida Department of Environmental Protection extended the weekly monitoring in 2023 for approximately one year to coincide with the AECOM Algae Harvesting Project. The weekly mapping, data collection, and analysis for this project continues to be made available to interested agencies and researchers through an ArcGIS Online webapp.

The scope of work for this grant also includes the development of a rapid harmful algal bloom identification and characterization process. This effort included a brief literature review of the recent research on IRL algae, summary of recent chlorophyll-a monitoring in the lagoon, assessment of satellite remote sensing for its suitability in estimating chlorophyll-a concentrations, and statistical analysis of how harmful algal blooms have varied within the IRL over space and time (2015–2021) as determined by satellite remote sensing.

As requested by Brevard County, a rapid assessment of the 2020 Titusville Sand Point Park sewage spill was performed. On December 19, 2020, the City of Titusville reported to the Florida Department of Environmental Protection that there was a release of over 7.2 million gallons of raw sewage into a stormwater pond at Sand Point Park along the IRL. The 2020 bloom event had reached its highest concentrations in the North IRL by September 2020, with concentrations of more than 150 micrograms per liter estimated chlorophyll-a throughout the North IRL. From September to December 2020, the estimated chlorophyll-a concentrations steadily decreased from a range of 90–154 micrograms per liter to 19–40 micrograms per liter. From January to February 2021, the variation in estimated chlorophyll-a peaked on February 3, 2021, at 56.1 micrograms per liter. The 2020 bloom in the North IRL was in decline prior to the sewage leak. There does not appear to be a corresponding increase in chlorophyll-a concentrations after the leak and the bloom concentrations in the Sand Point Park area of the IRL were not significantly different from other areas further from the leak.

One research objective was to evaluate the Sentinel derived data to determine the spatiotemporal variability of algal blooms harmful to the IRL. The first hypothesis of this objective was to determine if IRL harmful algal blooms were increasing in intensity, duration, and severity. A trio of novel harmful algal bloom metrics was created for use with Sentinel estimated chlorophyll-a: (1) Bloom Duration Index, which is a standard measure of the length of time a bloom lasts; (2) Bloom Intensity Index, which is a standard measure of bloom concentration; and (3) Bloom Severity Index, which is a combination of the first two indices and estimates the potential harm caused by long lasting, high concentration blooms at a given location. Using these indices, between 2017–2019 and 2020–2022, there appeared to be a decreasing trend in severity for the Northern-North IRL and Banana River Lagoon. However, there also appeared to be an increasing trend in the Bloom Severity Index for the Central-North IRL, Southern-North IRL, and North-Central IRL (Applied Ecology, 2023).

Additional analysis was performed using the indices to identify the relationship between blooms and their potential drivers. The influence of rainfall and septic system density was examined for segments of the North IRL between the cities of Cocoa and Melbourne. These segments were identified to have significantly higher Bloom Severity Index during months with very low rainfall, while there was no significant difference in Bloom Severity Index during wet months. A significantly higher Bloom Severity Index was identified in the northernmost North IRL both overall and during low rainfall periods. As the southern North IRL had a higher density of septic systems and modeled nutrient inputs from its drainage area, this may suggest that the elevated Bloom Severity Index in the north segment may be due to other factors than septic systems (Applied Ecology, 2023).

To assess the impact of muck sediments and their removal on bloom activity, the Bloom Severity Index for the area near the mouth of the Eau Gallie River was compared to the overall Bloom Severity Index of the nearby North IRL segment. Both prior to and during the dredging project, the Bloom Severity Index around the mouth of the Eau Gallie River was significantly higher than the overall segment. This suggests that for the Eau Gallie River, the presence of muck may have been leading to elevated Bloom Severity Index. Following the muck dredging completion in March 2019, the portion of the segment next to the mouth of the river had significantly lower Bloom Severity Index than the entire segment suggesting that the removal of the muck in the Eau Gallie River helped reduce bloom activity (Applied Ecology, 2023).

4.4.4. Research Needs

Although the Save Our Indian River Lagoon Project Plan does not fund research, it should be recognized that many important research questions need attention. Universities, state agencies, and non-profit organizations are currently leading Indian River Lagoon (IRL) research efforts. This plan acknowledges the research needs identified in the Florida Department of Environmental Protection basin management action plans, St. Johns River Water Management

District 2011 Superbloom Report, and IRL National Estuary Program Comprehensive Conservation and Management Plan, which are summarized below.

- Research needs identified in the basin management action plans (Florida Department of Environmental Protection 2021a, 2021b, and 2021c):
    - Collect data to update the bathymetry for the IRL watershed, which would be used in evaluations of seagrass depth limits.
    - Continue coordinated monitoring of phytoplankton, periphyton, drift algae, and macroalgae in the basin to gain insights into the cycling of nutrients as well as toxin production and release.
    - Analyze storm event monitoring data at the major outfalls.
    - Refine load estimates delivered by baseflows and modeling the contributions of baseflows.
    - Synthesize data on nutrient flux/internal recycling of legacy nutrient loads held within IRL sediments and exchanged with the water column.
    - Complete the development, calibration, and validation of a water quality model that can be used to design, site, and prioritize projects that reduce nutrient loads (e.g., Hydrologic Simulation Program FORTRAN or Spatial Watershed Iterative Loading model coupled with the Environmental Fluid Dynamics Code model, or another model that generates predictions of conditions that may be favorable for seagrass growth).

- Research needs identified in the Comprehensive Conservation and Management Plan revision (IRL National Estuary Program 2019):
    - Undertake further studies to quantify the impacts of septic systems on the IRL with a focus on identifying high priority “problem” and “potential problem” areas.
    - Develop, improve, and implement best management practices and education programs for stormwater management and freshwater discharges.
    - Determine the impacts of atmospheric deposition of nutrients and other pollutants on the nutrient budget, water quality, and resources of the IRL.
    - Support implementation, review, and update of IRL total maximum daily loads as needed and as best available science evolves.
    - Work to continue, expand, update, and improve the IRL species inventory.
    - Research and develop new and improved wetland best management practices with a focus on understanding wetland responses to sea level rise and climate change.
    - Continue to support and expand research initiatives and coordinated finfish and shellfish management strategies specific to the IRL.
    - Prepare a Risk-Based Vulnerability Assessment and Adaptation Plan for the IRL.
    - Develop a comprehensive IRL monitoring plan.
    - Advance the ten research priorities in the 2018 Looking Ahead – Science 2030 Report.
    - Update the IRL economic analysis produced by the Treasure Coast and East Central Florida Regional Planning Councils every five years.
    - Support advancements in hydrological model development, verification, and application.
    - Continue evaluation of options to enhance water flow through engineering solutions that have well defined water quality and ecological outcomes.
    - Complete muck mapping of the entire IRL, prioritize muck dredging projects and site selection for seagrass and filter feeder restoration projects, and reduce source contributions of sediment and biomass that result in muck formation.

- Track emerging technologies, innovative approaches or alternatives to dredging, muck capping, upstream controls of muck transport, more efficient approaches to dewatering, enhanced pollutant removal in post-dredge water, and enhanced muck management to improve process efficiency and identify beneficial uses of muck.
- Monitor and research to better understand contaminants of emerging concern within the IRL.
- Research spatially explicit data on the extent and condition of existing filter feeder habitat.
- Research and report on science-based siting, planning, design, and construction criteria for living shorelines.
- Support research and assessment to identify and map suitable habitats and spawning habitats for forage fishes and track population size and health.

- Research needs identified in 2011 Superbloom Report (St. Johns River Water Management District 2016b):
  - Garner an improved understanding of the ideal biological and physiological conditions and tolerances of picocyanobacteria (small cyanobacteria) and Pedinophyceae (green microflagellate), including their ability to use organic forms of nutrients, their ability to fix nitrogen, their nutrient uptake rates, their reproductive rates, and their defenses against grazers.
  - Maintain or expand water quality sampling to ensure spatiotemporal variations are captured adequately, which could include continuous monitoring of various parameters to fill gaps between monthly samples.
  - Develop an improved understanding of the physiological tolerances of drift algae and seagrasses, especially manmade conditions that could be mitigated to improve health or natural resilience.
  - Maintain or expand surveys of drift algae and seagrasses to improve the capacity to evaluate their role in nutrient cycles.
  - Improve the ability to model bottom-up influences from external and internal nutrient loads, including atmospheric deposition, surface water runoff, groundwater inputs, diffusive flux from muck, decomposition of drift algae, and cycling and transformation of nitrogen and phosphorus.
  - Enhance surveys of bacterioplankton to improve the understanding of nutrient cycling.
  - Improve surveys of potential zooplanktonic, infaunal, epifaunal, and fish grazers to enhance the understanding of spatiotemporal variation in top-down control of phytoplankton blooms.
  - Evaluate grazing pressure exerted by common species to enhance the understanding of top-down control of phytoplankton blooms.

Section 5. Project Funding

5.1. Project Funding, Schedule, and Scope Adjustments

5.1.1. Contingency Fund Reserve

The 2018 Update established a Contingency Fund Reserve (Reserve) that will be included with the development and adoption of the County's budget each fiscal year. The Reserve will amount to 5% of the total Trust Fund dollars that are budgeted for all approved projects scheduled to occur or move ahead in that fiscal year. This includes projects in the Save Our Indian River Lagoon Project Plan (Plan), including additions captured in annual updates or supplements. The purpose of the Reserve is to fund emergency response to harmful algal blooms and major fish kills; cover reasonable funding shortfalls that may occur during project implementation and would delay implementation or completion of that project unless a ready source of funds is on hand; provide funding for projects (whether during the term of the project or upon project completion) that remove additional nutrients beyond the amount originally planned or anticipated in the project cost-share agreement; or move projects forward ahead of schedule if ready to proceed.

If a cost increase for an individual project is less than 10% of the amount identified in the project's cost-share agreement or the estimated cost or eligible amount of Trust Fund cost-share stated in the Save Our Indian River Lagoon Project Plan, as updated, then additional funding from the Reserve may be allocated to the project, as needed, in accordance with Brevard County approvals, policies, and administrative orders. For projects that are contracted with government entities and other partners that encounter cost overruns, the cost-share agreement may be increased up to 10% over the eligible cost-share amount stated in Attachment E of the respective cost-share agreement. Such an amendment will be executed by the authorized County representative and the appropriate representative or authorized agent of the government entity or partnering organization.

For project cost increases that exceed inflation rates and are more than 10% above the amount identified in the project's cost-share agreement or the estimated cost or eligible amount of Trust Fund cost-share stated in the Save Our Indian River Lagoon Project Plan, as updated, County staff will evaluate the project circumstances and present findings to the Citizen Oversight Committee for review. The Citizen Oversight Committee will recommend rejection, modification, or approval of the funding request and provide such recommendation to the County representative authorized to sign the amendment. Staff will provide the Citizen Oversight Committee's recommendation to the County representative authorized to sign the request based on the authority granted by the County Commission.

The Reserve may also be used to increase funding for approved projects (whether during the term of the project or upon project completion) that provide greater nutrient reduction benefits than planned or anticipated if funding could be made available before the next Plan update. If a project can be or was expanded or altered to provide greater nutrient reduction benefits than planned, contingency funds can be allocated at the rate for that project type established in the most recently adopted Plan update in the table titled "Cost-share Offered for Project Requests Submitted for the 2025 Update" (**Table 4-42**), as adjusted for inflation. In no case shall the governmental entity or partnering organization request Reserve funds that result in the total cost-share award exceeding the actual project costs incurred by the recipient, minus other grants or donations for that project.

5.1.2. Schedule Acceleration

If a project has already been approved by the County Commission and is: (1) ready to move forward earlier than scheduled in the Plan; (2) consistent with temporal sequencing goals in the Plan; and (3) recommended by the Citizen Oversight Committee, and if sufficient Trust Fund dollars are available for the project, then the County Manager (for budget changes less than $200,000) or County Commission (in any circumstance) are authorized to adjust the project schedule to ensure that approved projects funded in the Plan move forward as soon as feasible. This authority allows projects to move forward as soon as they are ready and funding is available.

5.1.3. Scope Reduction

If a project is not able to be fully completed as initially approved in the Plan due to extenuating circumstances including, but not limited to, permitting restrictions, loss of additional funding, or other situations beyond the entity's control, then the project may be downsized, within the framework of the already-approved project, and upon recommendation by the Citizen Oversight Committee. This recommendation will then be brought to the authorized County representative for review and, if acceptable, approval of an amendment to the costs and scope of the project's cost-share agreement. The revised funding amount will be based on the pounds of nitrogen removal estimated for the reduced project multiplied by the eligible cost-share per pound of total nitrogen removed that is adopted for that project type in the most recent Save Our Indian River Lagoon Project Plan plus inflation. If a project is downsized between Plan updates, the revised Plan costs and nutrient load reductions will be reflected in the next annual Plan update.

5.1.4. Inflation

The Reserve includes an additional amount of funding to account for the impact of inflation on project delivery costs. Inflation is estimated by applying the Consumer Price Index to project costs, compounded for the number of years between the year the project cost was estimated and the year that the project is expected to be constructed. For both the 2024 Plan Update and the 2025 Plan Update, inflation is applied and compounded annually for the years between when a project was added to the plan and when its construction is now anticipated. Construction costs have increased more than the Consumer Price Index. For projects that are not yet completed, an inflation factor of 2.6% is applied for Years 0–4, 7.8% for Year 5, 17.3% for Year 6, 6.5% for Year 7, and 3.5% for Years 8–10.

5.1.5. Contract Amendments

Amendments to the project cost-share agreements shall follow one of the three approval processes identified below:

1. If a cost increase for an individual project is less than 10% of the cost identified in the project's cost-share agreement, then the authorized County representative is eligible to review and, if acceptable, approve an amendment to the project cost-share agreement.
2. If a cost increase for an individual project is equal to or less than the inflation allocated for that project, then the authorized County representative is eligible to review and, if acceptable, approve an amendment to the project cost-share agreement.
3. If a cost increase above inflation for an individual project is more than 10% of the cost identified in the project's cost-share agreement, then County staff will bring the item before the Citizen Oversight Committee for a recommendation to reject, modify, or approve the funding request, and this recommendation will then be brought to the

authorized County representative for review and, if acceptable, approval of an amendment to the project cost-share agreement.

5.2. Revenue Projection Update

Brevard County calculates a new estimate for total Save Our Indian River Lagoon Trust Fund revenues annually. The estimate for the 2025 Plan Update is based on the actual revenues for 2017, 2018, 2019, 2020, 2021, 2022, 2023, and the first nine months of 2024. The October, November, and December 2023 revenues were used to estimate the revenue for the remaining three months of 2024 by using a rate of growth of 2.761%. The 2025 and 2026 revenues assume 2.4% annual growth. The new estimate for the total tax revenue is $585,734,769, or an average of $58.6 million per year. This current estimate is $24.6 million per year more than the $34 million per year estimate in the original Save Our Indian River Lagoon Plan, which was based on 2016 dollars, and $20,444 more than the projection in the 2024 Plan Update.

5.3. Project Funding Allocations

Figure 5-1 summarizes the funding allocated by category (Reduce, Remove, Restore, and Respond) in this 2025 Plan Update. **Figure 5-2** shows the funding allocations by project type from the original plan through the 2025 Plan Update.

Figure 5-1. Funding for Reduce, Remove, Restore, and Respond Projects

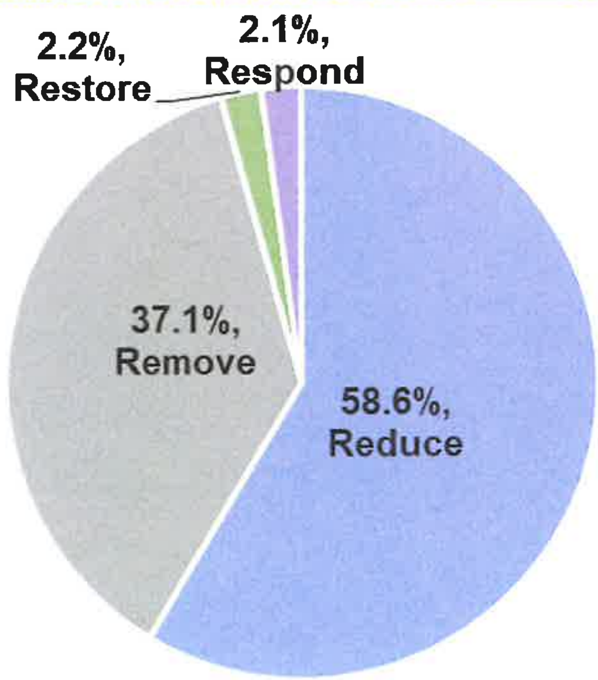


Figure 5-2. Evolution of Project Funding Allocations

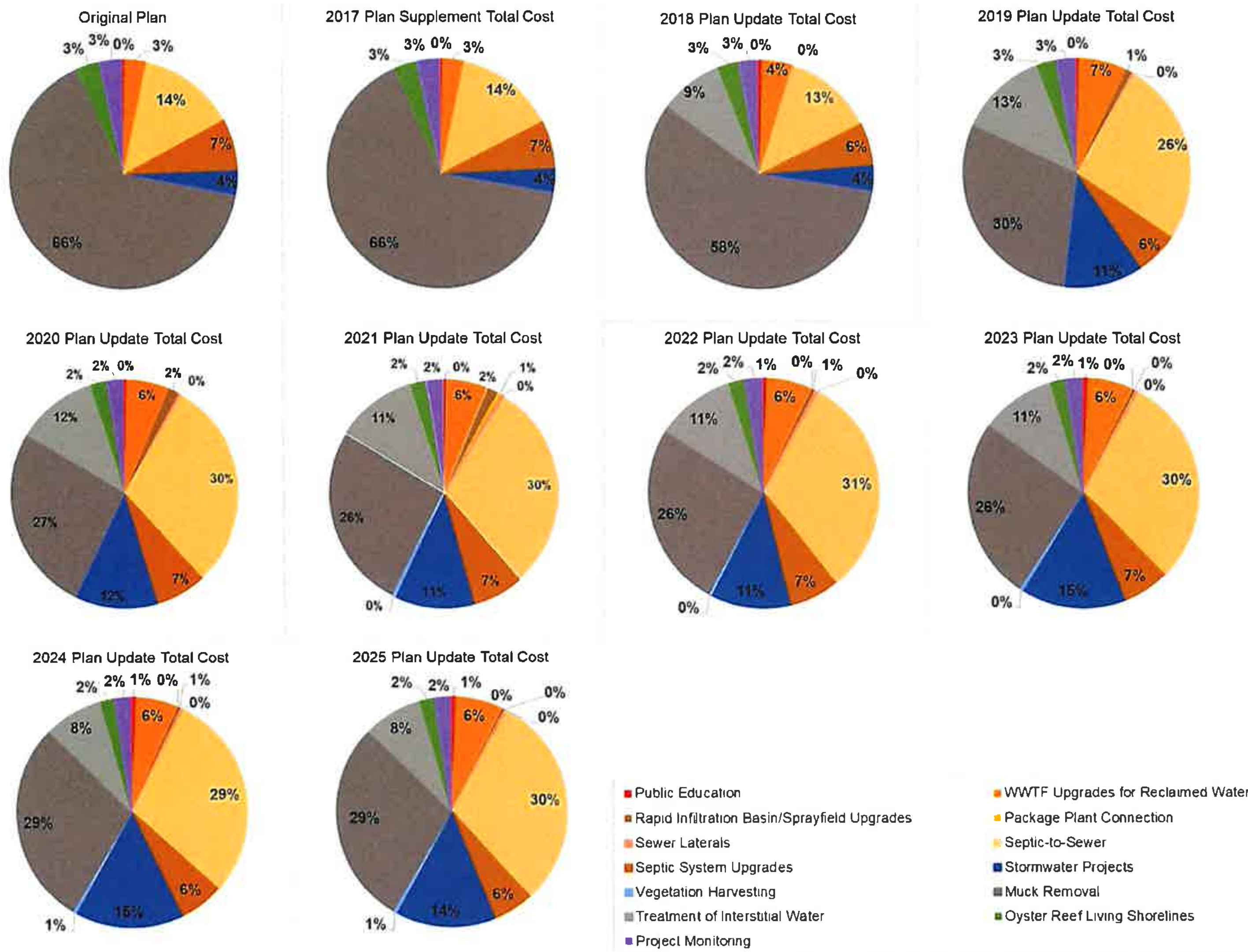


Figure 5-2 Long Description

Section 6. Summary of the Plan through the 2025 Update

6.1. Progress Toward the Local Targets for Maximum Total Loads

The County has been working with its municipalities, Florida Department of Transportation District 5, and Patrick Space Force Base to update total loading estimates to the Indian River Lagoon (IRL) and revise the total maximum daily loads for nitrogen and phosphorus using the best available data and more detailed modeling than previously available. Based on this process, five-month total maximum daily loads, which target the load reductions needed during the seagrass growing period (January – May), were proposed in addition to annual total maximum daily loads that protect water quality year-round. These load reductions specifically target water quality conditions needed for restoring IRL seagrass beds to provide crucial habitat for fish and other marine life. Therefore, as this Save Our Indian River Lagoon Project Plan was developed, the total nitrogen (TN) and total phosphorus (TP) reductions from the project types that **Reduce** incoming load were compared to the proposed five-month total maximum daily loads for each sub-lagoon. After satisfying the five-month total maximum daily loads, annual load reductions for each project were compared to the 12-month total maximum daily loads. In all cases, the projects identified to meet the five-month total maximum daily loads were sufficient to meet the proposed 12-month total maximum daily loads. As projects are implemented, progress toward meeting the five-month and full-year total maximum daily loads is being tracked.

Only the projects that reduce external loading to the lagoon, not muck removal or living shorelines, were used to meet the total maximum daily loads. Even though decades of treatment projects to reduce nutrient loads have been completed to date, only the reductions associated with basin management action plan projects that were completed between January 1, 2010 (the last year of the Spatial Watershed Iterative Loading model period) and February 29, 2016 (the end of the last basin management action plan reporting period when the Save Our Indian River Lagoon Project Plan was developed) were included in the load reduction calculations as these projects also provide nutrient load reductions that have occurred after the period of record used to develop the proposed total maximum daily load updates. In Zone A of the Central IRL, the reductions from the St. Johns River Water Management District's C-1 re-diversion project, which was implemented with cost-share funding from the Florida Department of Environmental Protection and Brevard County, were also included as this project results in significant load reductions that were not included in the February 29, 2016, basin management action plan annual progress report. As shown in **Table 6-1**, **Table 6-3**, and **Table 6-5**, the projects proposed in this plan plus the recently completed basin management action plan projects and C-1 re-diversion project exceed the five-month reductions called for by the proposed total maximum daily load updates.

The total project reductions were also compared to the full year estimated loading to the IRL from the Spatial Watershed Iterative Loading model. As shown in **Table 6-2**, **Table 6-4**, and **Table 6-6**, the proposed projects in this plan, as well as the recently completed basin management action plan projects and C-1 re-diversion project, achieve significant reductions of the overall loading to the lagoon and exceed the full year reductions called for by the proposed local total maximum daily loads.

Table 6-1. Banana River Lagoon Project Reductions to Meet Five-Month Total Maximum Daily Load

Project	Total Nitrogen Reductions (pounds per year)	Total Phosphorus Reductions (pounds per year)
Fertilizer Ordinance Implementation	2,945	603
Future Education	2,163	155
Wastewater Treatment Facility Upgrade for Reclaimed Water	1,050	285
Sewer Laterals	412	78
Septic-to-Sewer	12,909	0
Septic System Upgrade	806	0
Stormwater Projects	16,997	2,396
Vegetation Harvesting	2,765	426
Basin Management Action Plan Projects (2010-February 2016)	5,303	1,440
Total	***45,350***	***5,383***
Proposed Total Maximum Daily Load Reductions (five-month)	***30,337***	***2,737***
Percent of Proposed Total Maximum Daily Load Reductions Achieved	***149.5%***	***196.7%***

Table 6-2. Banana River Lagoon Project Reductions Compared to Full Year Loading

Project	Total Nitrogen Reductions (pounds per year)	Total Phosphorus Reductions (pounds per year)
Fertilizer Ordinance Implementation	7,068	1,446
Future Education	5,191	372
Wastewater Treatment Facility Upgrade for Reclaimed Water	2,520	685
Sewer Laterals	988	188
Septic-to-Sewer	30,982	0
Septic System Upgrade	1,934	0
Stormwater Projects	40,793	5,751
Vegetation Harvesting	6,637	1,022
Basin Management Action Plan Projects (2010-February 2016)	12,726	3,456
Total	***108,839***	***12,920***
Starting Load (full year)	***477,020***	***44,269***
Percent of Starting Load Reduced	***22.8%***	***29.2%***
Proposed Full-Year Total Maximum Daily Load Percent Reductions	***9.0%***	***9.6%***

Table 6-3. North IRL Project Reductions to Meet Five-Month Total Maximum Daily Load

Project	Total Nitrogen Reductions (pounds per year)	Total Phosphorus Reductions (pounds per year)
Fertilizer Ordinance Implementation	8,070	1,651
Future Education	5,927	424
Wastewater Treatment Facility Upgrade for Reclaimed Water	8,304	949
Sewer Laterals	1,118	To be determined
Package Plant Connection	380	To be determined
Septic-to-Sewer	22,070	0
Septic System Upgrade	5,774	0
Stormwater Projects	57,673	8,896
Vegetation Harvesting	2,698	287
Basin Management Action Plan Projects (2010-February 2016)	16,983	3,180
Total	***128,997***	***15,387***
Proposed Total Maximum Daily Load Reductions (five-month)	***61,447***	***7,410***
Percent of Proposed Total Maximum Daily Load Reductions Achieved	***209.9%***	***207.7%***

Table 6-4. North IRL Project Reductions Compared to Full Year Loading

Project	Total Nitrogen Reductions (pounds per year)	Total Phosphorus Reductions (pounds per year)
Fertilizer Ordinance Implementation	19,368	3,962
Future Education	14,225	1,018
Wastewater Treatment Facility Upgrade for Reclaimed Water	19,929	2,278
Sewer Laterals	2,682	To be determined
Package Plant Connection	911	To be determined
Septic-to-Sewer	52,967	0
Septic System Upgrade	13,857	0
Stormwater Projects	138,414	21,351
Vegetation Harvesting	6,475	689
Basin Management Action Plan Projects (2010-February 2016)	40,758	7,632
Total	***309,586***	***36,930***
Starting Load (full year)	***988,847***	***99,340***
Percent of Starting Load Reduced	***31.3%***	***37.2%***
Proposed Full-Year Total Maximum Daily Load Percent Reductions	***11.4%***	***11.4%***

Table 6-5. Central IRL Project Reductions to Meet Five-Month Total Maximum Daily Load

Project	Total Nitrogen Reductions (pounds per year)	Total Phosphorus Reductions (pounds per year)
Fertilizer Ordinance Implementation	8,108	1,659
Future Education	5,955	426
Wastewater Treatment Facility Upgrade for Reclaimed Water	24,876	6,285
Sewer Laterals	1,053	To be determined
Rapid Infiltration Basin/Sprayfield	132	To be determined
Package Plant Connection	34	To be determined
Septic-to-Sewer	11,785	0
Septic System Upgrade	7,710	0
Stormwater Projects	25,085	2,239
Vegetation Harvesting	8,558	693
C-1 Re-Diversion	61,667	5,417
Basin Management Action Plan Projects (2010-February 2016)	378	243
Total	***155,341***	***16,962***
Proposed Total Maximum Daily Load Reductions (five-month) *	***67,547***	***8,151***
Percent of Proposed Total Maximum Daily Load Reductions Achieved	***230.0%***	***208.1%***

* The total maximum daily load reductions are for Zone A only; however, some of the septic system projects are in Zone SEB. Sufficient projects exist to achieve the Zone A reductions without the Zone SEB projects (refer to **Section 2.1**).

Table 6-6. Central IRL Project Reductions Compared to Full Year Loading

Project	Total Nitrogen Reductions (pounds per year)	Total Phosphorus Reductions (pounds per year)
Fertilizer Ordinance Implementation	19,460	3,981
Future Education	14,293	1,023
Wastewater Treatment Facility Upgrade for Reclaimed Water	59,702	15,085
Sewer Laterals	2,526	To be determined
Rapid Infiltration Basin/Sprayfield	317	To be determined
Package Plant Connection	81	To be determined
Septic-to-Sewer	28,283	0
Septic System Upgrade	18,503	0
Stormwater Projects	60,204	5,373
Vegetation Harvesting	20,538	1,664
C-1 Re-Diversion	148,000	13,000
Basin Management Action Plan Projects (2010-February 2016)	908	582
Total	***372,815***	***40,708***
Starting Load (full year) *	***698,937***	***95,051***
Percent of Starting Load Reduced	***53.3%***	***42.8%***
Proposed Full-Year Total Maximum Daily Load Percent Reductions	***17.8%***	***16.3%***

* The total maximum daily load reductions are for Zone A only; however, some of the septic system projects are in Zone SEB. Sufficient projects exist to achieve the Zone A reductions without the Zone SEB projects (refer to **Section 2.1**).

In addition to the projects that address the external nutrient loading summarized above, the plan includes muck flux, interstitial water treatment, oyster bars, and planted shoreline projects that will significantly reduce internal nutrient loading within the IRL itself. The annual reductions from these projects are summarized in **Table 6-7**, along with the percentage of nutrients from 2023 estimates of muck flux that would be reduced by these projects.

Table 6-7. Annual Muck Flux, Muck Interstitial Water, Oyster Bar, and Planted Shoreline Project Benefits by Sub-lagoon Compared to Annual Nutrient Loadings from Muck Flux

Project Type	Banana River Lagoon Total Nitrogen (pounds per year)	Banana River Lagoon Total Phosphorus (pounds per year)	North IRL Total Nitrogen (pounds per year)	North IRL Total Phosphorus (pounds per year)	Central A Total Nitrogen (pounds per year)	Central A Total Phosphorus (pounds per year)
Muck Flux Reduction	142,855	13,463	76,484	4,708	15,795	567
Total Removal of Nutrients from Interstitial Water/10 Years	39,361	1,967	10,642	954	0	69
Oyster Bars	7,049	214	11,003	282	5,005	148
Clams	284	0	2,087	528	1,203	330
Planted Shorelines	74	25	236	81	140	48
Total Project Reductions	***189,623***	***15,669***	***100,452***	***6,553***	***22,143***	***1,162***
Estimated Muck Flux Loading	***799,482***	***50,778***	***313,294***	***31,007***	***53,280***	***13,050***
Percent of Muck Flux Reduced	***23.7%***	***30.9%***	***32.1%***	***21.1%***	***41.6%***	***8.9%***

6.2. Plan Summary

Table 6-8 summarizes all the project types, as well as their estimated costs, total nitrogen (TN) and total phosphorus (TP) reductions, and costs per pound of TN and TP removed. **Table 6-9** presents cost-effectiveness in three ways: (1) based on allocation of Save Our Indian River Lagoon Trust Fund dollars when the project was added to the plan; (2) based on allocation after amendments, including addition of inflation and contingency funds; and (3) based on total costs, including all other sources of funds for the project including grants and city match.

The information from **Table 6-8** on the project reductions and cost effectiveness was used to determine the schedule for implementing the projects (see **Table 6-10**). Projects that could achieve large reductions quickly, such as fertilizer reductions and wastewater treatment facility upgrades, as well as the most cost-effective septic-to-sewer, and stormwater projects were prioritized for earliest implementation. This prioritization allows for the reductions to occur as quickly as possible while best using available funding sources. Project scheduling also considered the timing of upstream reductions with downstream removals, where feasible.

The timeline in **Table 6-10** is shown in years after funding from the Save Our Indian River Lagoon sales tax became available. Each year corresponds to the County's fiscal year, which is October 1st through September 30th. Year 1 started on October 1, 2017, which was just before revenues would have begun to accrue if the funding source had been a property tax, as initially considered. When the referendum approved by the voters was a sales tax, collections began in January 2017 and the first revenue check was received by the County in March 2017. Therefore, a plan update was adopted in March 2017 to begin plan implementation in Year 0. **Table 6-10** includes the cost estimates developed as part of the original plan or provided in the year new or substitute projects were added to the plan, adjusted for inflation.

As noted in **Section 4.4.1**, an adaptive management approach is being used in the implementation of this plan. As projects are completed and information on the actual construction costs, timeline, and reductions are obtained, the plan will continue to be adjusted, as needed, to ensure that the most cost-effective projects are being used to meet the Indian River Lagoon (IRL) restoration goals.

Table 6-8. Summary of Projects, Estimated TN and TP Reductions, and Costs

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
-	**Public Education**	-	-	-	-	-
58a	Expanded Fertilizer Education	$881,000	6,613	$133	813	$1,084
58b	Grass Clippings Campaign	$306,000	17,800	$17	1,200	$255
58c	Septic System Maintenance Education	$431,000	4,466	$97	To be determined	To be determined
245	Irrigation Education Campaign	$306,000	1,530	$200	Not applicable	Not applicable
246	Stormwater Best Management Practice Maintenance Education	$306,000	3,300	$93	400	$765
193	Oyster Gardening Program	$300,000	Not applicable	Not applicable	Not applicable	Not applicable
227	Restore Our Shores: Community Collaborative	$1,000,000	Not applicable	Not applicable	Not applicable	Not applicable
-	**Wastewater Treatment Facility Upgrades for Reclaimed Water**	-	-	-	-	-
99	Cocoa Beach Water Reclamation Facility Upgrade	$945,000	2,520	$375	685	$1,380
2016-02a, 2016-2b	City of Titusville Osprey Wastewater Treatment Facility Phase 1 and 2	$8,219,826	12,286	$669	Not applicable	Not applicable
283	Port Saint John Wastewater Treatment Plant Replacement	$981,818	2,278	$431	2,278	$431
2016-17	City of Palm Bay Water Reclamation Facility	$3,634,900	20,240	$180	102	$35,636
59	City of Melbourne Grant Street Water Reclamation Facility	$6,769,500	18,052	$375	9,671	$700
138	Ray Bullard Water Reclamation Facility Biological Nutrient Removal Upgrades	$4,260,000	11,360	$375	3,302	$1,290
216	City of Rockledge Flow Equalization Basin Project	$2,054,795	5,365	$383	Not applicable	Not applicable
234	South Brevard Water Reclamation Facility	$1,653,028	4,316	$383	863	$1,915
282	South Beaches Wastewater Treatment Plant Upgrade	$2,471,354	5,734	$431	1,147	$2,155
-	**Rapid Infiltration Basin/Sprayfield Upgrades**	-	-	-	-	-
6	Long Point Park Upgrade	$22,207	163	$136	To be determined	To be determined
196	Sterling House Condominium Sprayfield	$60,000	154	$390	To be determined	To be determined
-	**Package Plant Connection**	-	-	-	-	-
192	Oak Point Wastewater Treatment Facility Improvements	$279,000	186	$1,500	0	Not applicable
237	Willow Lakes Recreational Vehicle Park	$1,087,500	725	$1,500	To be determined	To be determined
239	The Cove at South Beaches Package Plant Connection	$121,500	81	$1,500	To be determined	To be determined
-	**Sewer Laterals**	-	-	-	-	-
63a	Countywide Repair/Replacement	$633,808	6,196	$102	188	$3,371

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
63b	Satellite Beach Lateral Smoke Testing	$202,210	Not applicable	Not applicable	Not applicable	Not applicable
100	Osprey Basin Lateral Smoke Testing	$200,000	Not applicable	Not applicable	Not applicable	Not applicable
114	Barefoot Bay Lateral Smoke Testing	$32,873	Not applicable	Not applicable	Not applicable	Not applicable
115	South Beaches Lateral Smoke Testing	$84,304	Not applicable	Not applicable	Not applicable	Not applicable
116	Merritt Island Lateral Smoke Testing	$246,630	Not applicable	Not applicable	Not applicable	Not applicable
-	**Septic-to-Sewer**	-	-	-	-	-
2016-47	Sykes Creek - Zone N	$4,425,425	2,784	$1,590	To be determined	To be determined
2016-48	Sykes Creek - Zone M	$6,717,803	1,798	$3,736	To be determined	To be determined
2016-49	Sykes Creek - Zone T	$5,341,030	3,360	$1,590	To be determined	To be determined
2019-29	South Banana - Zone B	$1,372,500	915	$1,500	To be determined	To be determined
145	Merritt Island - Zone F	$1,100,000	1,292	$851	To be determined	To be determined
146	Merritt Island - Zone C	$1,580,000	1,419	$1,113	To be determined	To be determined
147	Sykes Creek - Zone R	$7,827,120	5,040	$1,553	To be determined	To be determined
151	Merritt Island - Zone G	$11,784,164	7,588	$1,553	To be determined	To be determined
222	Hedgecock/Grabowsky and Desoto Fields	$121,500	81	$1,500	To be determined	To be determined
238	Kelly Park	$135,000	90	$1,500	To be determined	To be determined
240	Rotary Park	$156,000	104	$1,500	To be determined	To be determined
2016-16	Banana Septic System 144 Quick Connections	$1,908,000	3,224	$592	To be determined	To be determined
2016-30	City of Rockledge	$500,580	712	$703	To be determined	To be determined
2016-31/32	City of Cocoa - Zones J and K	$5,622,000	3,748	$1,500	To be determined	To be determined
2016-35	South Beaches - Zone A	$1,959,000	1,306	$1,500	To be determined	To be determined
109	City of Titusville - Zones A-G	$1,201,392	1,563	$769	To be determined	To be determined
203	South Central - Zone A	$5,482,500	3,655	$1,500	To be determined	To be determined
150	South Central - Zone D (Brevard County)	$4,774,500	3,387	$1,410	To be determined	To be determined
50b	South Central - Zone C	$6,600,000	5,146	$1,283	To be determined	To be determined
2020-34	South Central - Zone F	$1,701,972	1,688	$1,008	To be determined	To be determined
2019-27	Sharpes - Zone A	$7,872,000	5,248	$1,500	To be determined	To be determined
2019-36	South Beaches - Zone O	$133,488	54	$2,472	To be determined	To be determined
2019-37	South Beaches - Zone P	$300,348	242	$1,241	To be determined	To be determined
2019-40	Rockledge - Zone B	$5,339,520	4,037	$1,323	To be determined	To be determined
1	Breeze Swept Septic-to-Sewer Connection	$880,530	2,002	$440	To be determined	To be determined
2a	Merritt Island Septic Phase Out Project	$320,268	2,501	$128	To be determined	To be determined
61	Riverside Drive Septic-to-Sewer Conversion	$262,044	305	$859	To be determined	To be determined

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
62	Roxy Avenue Septic-to-Sewer Conversion	$88,944	102	$872	To be determined	To be determined
148	North Merritt Island - Zone E	$5,104,711	3,287	$1,553	To be determined	To be determined
152	Sharpes - Zone B	$4,038,000	2,692	$1,500	To be determined	To be determined
153	Cocoa - Zone C	$3,960,150	2,550	$1,553	To be determined	To be determined
190	Bowers Septic-to-Sewer	$147,000	120	$1,225	To be determined	To be determined
191	Kent and Villa Espana Septic-to-Sewer Conversion	$710,000	542	$1,310	To be determined	To be determined
241	Manatee Cove	$36,000	24	$1,500	To be determined	To be determined
242	Riverwalk	$6,000	4	$1,500	To be determined	To be determined
2016-18	North IRL Septic System 463 Quick Connections	$6,018,000	11,339	$531	To be determined	To be determined
2016-39	City of Palm Bay – Zone A	$2,817,256	2,136	$1,319	To be determined	To be determined
4	Hoag Sewer Conversion	$86,031	101	$852	To be determined	To be determined
5	Pennwood Sewer Conversion	$81,000	103	$786	To be determined	To be determined
60	Sylvan Estates Septic-to-Sewer Conversion	$1,561,215	1,073	$1,455	To be determined	To be determined
136	Micco - Zone B	$10,069,652	6,484	$1,553	To be determined	To be determined
3	Micco Sewer Line Extension (Phase I and II)	$2,239,500	1,493	$1,500	To be determined	To be determined
189	Avendia del Rio Septic-to-Sewer	$70,000	71	$986	To be determined	To be determined
224	Lake Ashley Circle	$1,704,000	1,136	$1,500	To be determined	To be determined
225	Dundee Circle and Manor Place	$2,248,500	1,499	$1,500	To be determined	To be determined
284	Sewer Available Not Connected Phase 2	$1,616,992	1,011	$1,599	To be determined	To be determined
2016-19	Central IRL Septic System 335 Quick Connections	$3,765,811	7,378	$510	To be determined	To be determined
-	**Septic System Upgrades**	-	-	-	-	-
51	Banana River Lagoon 100 Septic System Upgrades	$1,800,000	1,934	$931	To be determined	To be determined
52	North IRL 586 Septic System Upgrades	$10,548,000	13,857	$761	To be determined	To be determined
53	Central IRL 783 Septic System Upgrades	$14,094,000	18,503	$762	To be determined	To be determined
-	**Stormwater Projects**	-	-	-	-	-
-	Banana River Lagoon 89 Basin Projects	$17,512,532	34,979	$501	4,986	$3,512
13	Central Boulevard Baffle Box	$34,700	481	$72	14	$2,479
16	Gleason Park Reuse	$4,224	48	$88	9	$469
64	Stormwater Low Impact Development Convair Cove 1 – Blakey Boulevard	$4,650	30	$155	3	$1,550
65	Stormwater Low Impact Development Convair Cove 2-Dempsey Drive	$4,495	29	$155	3	$1,498
66, 6b	Big Muddy at Cynthia Baffle Box	$59,631	436	$137	58	$1,028
85	Basin 1304 Bioreactor	$83,029	958	$87	127	$654

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
128	Jackson Court Stormwater Treatment Facility	$8,266	56	$148	8	$1,033
179	Lori Laine Basin Pipe Improvement Project	$17,525	117	$150	21	$835
215	Basin 960 Pioneer Road Denitrification	$38,850	105	$370	3	$12,950
219	McNabb Outfall Bioretention	$19,423	44	$441	7	$2,775
205	Basin 998 Hampton Homes	$63,618	312	$204	47	$1,354
206	Basin 1066 Angel Avenue	$232,200	1,150	$202	173	$1,342
207	Basin 1124 Elliot Drive	$148,100	533	$278	78	$1,899
235	Woodland Business Center Stormwater Retention	$4,906	11	$446	2	$2,453
247	Basin 998 Richland Avenue Canal	$130,782	641	$204	97	$1,348
250	Basin 1280B Flamingo Road	$71,645	161	$445	31	$2,311
251	Basin 1304 West Arlington Road	$96,425	216	$446	To be determined	To be determined
254	Maritime Hammock Preserve Floating Vegetative Islands	$8,500	174	$49	36	$236
258	Cocoa Beach Golf Course Floating Vegetative Islands	$36,810	90	$409	14	$2,629
259	Ramp Road Park - Stormwater Improvements	$16,796	41	$410	8	$2,100
280	Westside Basin Water Quality Improvements	$56,033	137	$409	24	$2,335
281	Cocoa Isles Boulevard Dry Pond	$5,726	14	$409	2	$2,863
-	North IRL 78 Basin Projects	$27,495,773	87,899	$313	12,650	$2,174
14	Church Street Type II Baffle Box	$88,045	937	$94	135	$652
18	Denitrification Retrofit of Johns Road Pond	$105,512	1,199	$88	To be determined	To be determined
19	St. Teresa Basin Treatment	$272,800	3,100	$88	459	$594
20	South Street Basin Treatment	$86,856	987	$88	156	$557
21	La Paloma Basin Treatment	$208,296	2,367	$88	346	$602
22	Kingsmill-Aurora Phase Two	$367,488	4,176	$88	814	$451
23	Denitrification Retrofit of Huntington Pond	$104,720	1,190	$88	To be determined	To be determined
24	Denitrification Retrofit of Flounder Creek Pond	$75,328	856	$88	To be determined	To be determined
34	Cliff Creek Baffle Box	$347,781	3,952	$88	797	$436
35	Thrush Drive Baffle Box	$322,200	3,661	$88	773	$417
69	Apollo/GA Baffle Box	$297,522	3,381	$88	479	$621
89	Basin 1298 Bioreactor	$85,829	917	$94	116	$740
90	Johns Road Pond Biosorption Activated Media	$23,030	245	$94	37	$622
91	Burkholm Road Biosorption Activated Media	$64,390	685	$94	104	$619
92	Carter Road Biosorption Activated Media	$62,510	665	$94	101	$619
93	Wiley Avenue Biosorption Activated Media	$82,735	954	$87	144	$575

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
94	Broadway Pond Biosorption Activated Media	$42,864	456	$94	69	$621
96	Spring Creek Baffle Box	$330,841	1,057	$313	232	$1,426
97	Titusville High School Baffle Box	$111,813	1,190	$94	166	$674
98	Coleman Pond Managed Aquatic Plant System	$11,438	1,240	$9	198	$58
110	Osprey Plant Pond Managed Aquatic Plant Systems	$37,500	606	$62	88	$426
117	Basin 10 County Line Road Woodchip Bioreactor	$72,773	597	$122	90	$809
118	Basin 26 Sunset Avenue Serenity Park Woodchip Bioreactor	$73,810	605	$122	92	$802
119	Basin 141 Irwin Avenue Woodchip Bioreactor	$69,174	567	$122	86	$804
120	Draa Field Pond Managed Aquatic Plant Systems	$31,281	256	$122	38	$823
122	Basin 22 Hunting Road Serenity Park Woodchip Bioreactor	$40,077	329	$122	50	$802
124	Floating Wetlands to Existing Stormwater Ponds	$1,497	12	$125	3	$499
127	Basin 5 Dry Retention	$16,680	113	$148	18	$927
129	Forrest Avenue 72-inch Outfall Baseflow Capture/Treatment	$13,956	94	$148	12	$1,163
169	Basin 1335 (Sherwood Park) Stormwater Quality Project	$392,108	3,214	$122	879	$446
174	St. Johns 2 Baffle Box	$243,070	1,992	$122	611	$398
175, 176	High School Baffle Box and Funeral Home Baffle Box	$203,008	1,664	$122	448	$453
177	North and South Lakemont Ponds Floating Wetlands	$13,054	107	$122	25	$522
178	Marina B Managed Aquatic Plant Systems	$6,670	55	$121	7	$953
213	Johnson Junior High Denitrification Media Chamber Modification	$40,815	206	$198	Not applicable	Not applicable
214	Sand Point Park Baffle Box	$52,155	438	$119	71	$735
220	Basin 1398 Sand Dollar Canal Bioreactor	$198,024	444	$446	70	$2,829
231	North Fiske Stormwater Pond Floating Wetlands	$50,000	200	$250	32	$1,563
232	Riverfront Center Nutrient Removing Filtrations Boxes	$242,403	679	$357	160	$1,515
233	Commons and City Hall Tree Boxes	$25,040	80	$313	15	$1,669
252	Basin 89 Scottsmoor I Aurantia	$152,573	1,706	$89	292	$523
269	Coleman Pond Circulator	$126,021	353	$357	55	$2,291
270	Tennessee Street Baffle Box	$514,794	1,442	$357	191	$2,695
271	Osprey Pond Circulator	$86,394	242	$357	35	$2,468
274	Waelti Drive Pond Retrofit	$97,818	274	$357	40	$2,445
275	Lake Washington & Croton Road Pond Retrofit	$56,406	158	$357	24	$2,350

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
276	North Wickham & Conservation Place Wet Pond Retrofit	$93,177	261	$357	38	$2,452
279	Melbourne Cemetery Baffle Box	$216,342	606	$357	105	$2,060
15	Bayfront Stormwater Project	$30,624	348	$88	83	$369
67	Grant Place Baffle Box	$82,481	937	$88	193	$427
68	Crane Creek/M-1 Canal Flow Restoration	$2,033,944	24,000	$85	2,719	$748
87	Fleming Grant Biosorption Activated Media	$56,588	602	$94	91	$622
88	Espanola Baffle Box	$105,186	1,119	$94	148	$711
121	Basin 2258 Babcock Road Woodchip Bioreactor	$50,203	412	$122	62	$810
123	Ray Bullard Water Reclamation Facility Stormwater Management Area	$111,847	1,317	$85	400	$280
256	C-10 Water Management Area	$10,460,100	29,300	$357	1,300	$8,046
257	Riverview Park Baffle Box	$308,091	863	$357	168	$1,834
277	Darrow Baffle Box	$191,352	536	$357	87	$2,199
278	Line Street Cemetery Baffle Box	$274,890	770	$357	122	$2,253
-	**Vegetation Harvesting**	-	-	-	-	-
111	Draa Field Vegetation Harvesting	$86,413	786	$110	99	$873
112	County Wide Stormwater Pond Harvesting	$14,000	931	$15	327	$43
171	Mechanical Aquatic Vegetation Harvesting	$1,011,976	20,538	$49	1,664	$608
172	Horseshoe Pond Vegetative Harvesting	$8,140	4,536	$2	242	$34
208	Maritime Hammock Preserve Stormwater Pond Harvesting	$14,480	143	$101	5	$2,896
209	Basin 1398 Sand Dollar Canal Harvesting	$24,420	222	$110	21	$1,163
210	Basin 958 Pioneer Road Vegetation Harvesting	$39,930	363	$110	47	$850
211	Cocoa Beach Golf Course Stormwater Ponds Harvesting	$218,267	1,984	$110	377	$579
228	Unincorporated Countywide Vegetation Harvesting	$477,000	9,263	$51	993	$480
264	Unincorporated Countywide Vegetation Harvesting 2	$472,758	4,147	$114	593	$797
-	**Muck Removal**	-	-	-	-	-
2016-10a	Canaveral South	$14,700,000	35,382	$415	1,925	$7,636
2016-5a	Pineda Banana River Lagoon	$6,825,000	15,033	$454	686	$9,949
2016-11a	Patrick Space Force Base	$7,175,000	6,497	$1,104	382	$18,783
168a	Cocoa Beach Golf	$21,350,000	29,694	$719	2,058	$10,374
41a	Grand Canal Muck	$12,626,600	10,469	$1,206	1,396	$9,045
42a	Sykes Creek Muck	$4,705,428	19,635	$240	2,618	$1,797

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
70a	Cocoa Beach Muck Dredging – Phase III	$1,376,305	4,095	$336	780	$1,764
71	Merritt Island Muck Removal – Phase 1	$7,733,517	8,085	$957	1,540	$5,022
72a	Muck Removal of Indian Harbour Beach Canals	$3,631,815	3,780	$961	720	$5,044
101	Cocoa Beach Muck Dredging Phase II-B	$5,911,150	6,300	$938	840	$7,037
144	Satellite Beach Muck Dredging	$1,884,225	3,885	$485	518	$3,638
2016-06a	Titusville Railroad West	$3,150,000	14,406	$219	588	$5,357
2016-07a	National Aeronautics and Space Administration Causeway East	$9,975,000	21,872	$456	1,047	$9,527
2016-04a	Rockledge A	$4,375,000	7,581	$577	825	$5,303
2016-08a	Titusville Railroad East	$4,025,000	5,393	$746	227	$17,731
54a	Eau Gallie Northeast	$8,750,000	10,476	$835	1,482	$5,904
2016-3a	Muck Re-dredging in Turkey Creek	$137,329	5,691	$24	221	$621
223	Spring Creek Dredging	$80,080	154	$520	21	$3,813
236	Sunnyland Canals Muck Removal	$5,215,600	10,030	$520	336	$15,523
260	Mims Rim Ditch Muck Removal Project	$10,077,414	16,602	$607	518	$19,454
262	Shore View Lane Dredging	$44,918	74	$607	10	$4,492
-	**Treatment of Interstitial Water**	-	-	-	-	-
40	Mims Muck Removal: Outflow Water Nutrient Removal	$0	2,803	Not applicable	244	Not applicable
2016-10b	Canaveral South	$2,134,419	42,688	$50	3,887	$549
2016-5b	Pineda Banana River Lagoon	$990,980	19,820	$50	1,804	$549
2016-11b	Patrick Space Force Base	$1,041,800	20,836	$50	1,897	$549
168b	Cocoa Beach Golf	$3,013,100	99,098	$30	9,022	$334
41b	Grand Canal Interstitial	$5,610,821	89,495	$63	To be determined	To be determined
42b	Sykes Creek Interstitial	$11,248,704	64,278	$175	To be determined	To be determined
72b	Muck Interstitial Water Treatment for Indian Harbour Beach Canals	$5,483,600	27,418	$200	To be determined	To be determined
113	Satellite Beach Interstitial Water Treatment	$3,057,756	29,978	$102	3,059	$1,000
2016-06b	Titusville Railroad West	$457,375	9,148	$50	833	$549
2016-07c	National Aeronautics and Space Administration Causeway East	$1,448,355	28,967	$50	2,637	$549
2016-04b	Rockledge A	$635,244	12,705	$50	1,157	$549
2016-08b	Titusville Railroad East	$584,424	11,688	$50	1,064	$549
54b	Eau Gallie Northeast	$1,270,487	25,410	$50	2,313	$549

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
2016-3b	Muck Interstitial Water Treatment for Turkey Creek	Included in muck project	Not applicable	Not applicable	688	Not applicable
261	Mims Rim Ditch Interstitial Treatment	$1,784,135	15,700	$114	1,292	$1,381
-	**Oyster Bars**	-	-	-	-	-
2016-55	Banana River Lagoon County Oyster Bars	$1,802,798	4,569	$395	114	$15,814
75	Marina Isles Oyster Bar	$26,700	60	$445	20	$1,335
76	Bettinger Oyster Bar	$10,680	24	$445	8	$1,335
78a	McNabb Park Oyster Bar	$9,134	47	$194	1	$9,134
79	Gitlin Oyster Bar	$16,020	36	$445	12	$1,335
104	Brevard Zoo Banana River Oyster Project	$583,020	1,476	$395	37	$15,757
141	Brevard Zoo Banana River Oyster Project 2	$264,800	662	$400	17	$15,576
143	Brevard Zoo Oyster Reef Adjustments Banana River	$12,800	32	$400	1	$12,800
188	Brevard Zoo Banana River Oyster Project 3	$56,771	143	$397	4	$14,193
2016-56	North IRL County Oyster Bars	$2,358,111	5,976	$395	149	$15,826
83	Bomalaski Oyster Bar	$8,900	20	$445	7	$1,271
106	Brevard Zoo North IRL Oyster Project	$475,438	864	$550	22	$21,611
139	Brevard Zoo North IRL Oyster Project 2	$336,400	841	$400	21	$16,019
142	Brevard Zoo Oyster Reef Adjustments North IRL	$27,200	68	$400	2	$13,600
184	Brevard Zoo North Indian River Lagoon Oyster Project 3	$419,232	1,056	$397	26	$16,124
186	Brevard Zoo North Indian River Lagoon Individual Oyster Project	$173,092	436	$397	11	$15,736
272	Brevard Zoo North Indian River Lagoon Oyster Project 4	$827,450	1,742	$475	44	$18,806
80	Coconut Point/Environmentally Endangered Lands Oyster Bar	$45,120	96	$470	2	$22,560
81	Wexford Oyster Bar	$31,150	70	$445	24	$1,298
73	Riverview Senior Resort Oyster Bar	$30,304	77	$394	2	$15,152
105	Brevard Zoo Central IRL Oyster Project	$161,160	408	$395	10	$16,116
140	Brevard Zoo Central IRL Oyster Project 2	$270,800	677	$400	17	$15,929
185	Brevard Zoo Central Indian River Lagoon Tributary Pilot Oyster Project	$230,657	581	$397	15	$15,377
187	Brevard Zoo Central Indian River Lagoon Oyster Project 3	$86,546	218	$397	5	$17,309
217	Central IRL Oyster Project 4	$138,156	348	$397	9	$15,351
218	Central Oyster Project Offshore Reefs	$357,300	900	$397	23	$15,535

Project Number	Project	Save Our Lagoon Project Cost	Total Nitrogen Reductions (pounds per year)	Cost per Pound per Year of Total Nitrogen	Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus
226	Hog Point Offshore Oyster Bar	$21,023	126	$167	3	$7,008
273	Brevard Zoo Central Indian River Lagoon Oyster Project 5	$714,400	1,504	$475	38	$18,800
-	**Planted Shorelines**	-	-	-	-	-
77a	Cocoa Beach Country Club Planted Shoreline	$16,080	67	$240	23	$699
78b	McNabb Park Planted Shoreline	$1,680	7	$240	2	$840
103	Brevard Zoo North IRL Plant Project	$720	3	$240	1	$720
130	Brevard Zoo North IRL Plant Project 2	$9,840	41	$240	14	$703
180	Scottsmoor Impoundment	$10,560	44	$240	15	$704
181	Riveredge	$4,080	17	$240	6	$680
212	Titusville Causeway Multi-Trophic Restoration and Living Shoreline	$31,440	131	$240	45	$699
77b	Lagoon House Shoreline Restoration Planting	$24,000	100	$240	34	$706
133	Fisherman's Landing	$4,800	20	$240	7	$686
135	Rotary Park	$4,800	20	$240	7	$686
-	**Clam Restoration**	-	-	-	-	-
194	Aquaculture Stimulus Program	$60,000	1,000	$60	To be determined	To be determined
265	Restoration of Native Clams in the IRL – Titusville	$272,000	1,584	$172	528	$515
267	Restoration of Native Clams in the IRL - Grant Island	$170,000	990	$172	330	$515
-	**Projects Monitoring**	**$10,000,000**	-	-	-	-
-	**Contingency**	**$21,900,738**	-	-	-	-
	Total	***$487,031,755***	***1,315,443***	***$370 (average)***	***107,783***	***$4,519 (average)***

Table 6-9. Projects Cost-effectiveness

Project Number	Project	TN Reductions (Pounds per Year)	Approved Save Our Lagoon Project Cost	Approved Cost per Pound per Year of TN	Inflated/Final Save Our Lagoon Project Cost	Inflated/Final Cost per Pound per Year of TN	Total Project Cost (2024 Estimate)	Total Cost per Pound per Year of TN
-	**Public Education**	-	-	-	-	-	-	-
58a	Expanded Fertilizer Education	6,613	$881,000	$133	$975,540	$148	$881,000	$133
58b	Grass Clippings Campaign	17,800	$306,000	$17	$419,176	$24	$306,000	$17
58c	Septic System Maintenance Education	4,466	$431,000	$97	$521,674	$117	$431,000	$97
245	Irrigation Education Campaign	1,530	$306,000	$200	$327,795	$214	$306,000	$200
246	Stormwater Best Management Practice Maintenance Education	3,300	$306,000	$93	$349,101	$106	$306,000	$93
193	Oyster Gardening Program	Not applicable	$300,000	Not applicable	$300,000	Not applicable	$300,000	Not applicable
227	Restore Our Shores: Community Collaborative	Not applicable	$1,000,000	Not applicable	$1,124,521	Not applicable	$1,124,521	Not applicable
-	**Wastewater Treatment Facility Upgrades for Reclaimed Water**	-	-	-	-	-	-	-
99	Cocoa Beach Water Reclamation Facility Upgrade	2,520	$945,000	$375	$945,000	$375	$6,554,233	$2,601
2016-02a, 2016-2b	City of Titusville Osprey Wastewater Treatment Facility Phase 1 and 2	12,286	$8,219,826	$669	$8,219,826	$669	$11,926,910	$971
283	Port Saint John Wastewater Treatment Plant Replacement	2,278	$981,818	$431	$981,818	$431	$43,305,079	$19,010
2016-17	City of Palm Bay Water Reclamation Facility	20,240	$3,634,900	$180	$3,634,900	$180	$3,634,900	$180
59	City of Melbourne Grant Street Water Reclamation Facility	18,052	$6,769,500	$375	$9,596,607	$532	$10,776,660	$597
138	Ray Bullard Water Reclamation Facility Biological Nutrient Removal Upgrades	11,360	$4,260,000	$375	$6,506,916	$573	$9,000,000	$792
216	City of Rockledge Flow Equalization Basin Project	5,365	$2,054,795	$383	$2,344,222	$437	$9,976,198	$1,859
234	South Brevard Water Reclamation Facility	4,316	$1,653,028	$383	$1,770,765	$410	$2,200,000	$510
282	South Beaches Wastewater Treatment Plant Upgrade	5,734	$2,471,354	$431	$2,471,354	$431	$40,000,000	$6,976
-	**Rapid Infiltration Basin/Sprayfield Upgrades**	-	-	-	-	-	-	-
6	Long Point Park Upgrade	163	$22,207	$136	$22,207	$136	$22,207	$136
196	Sterling House Condominium Sprayfield	154	$60,000	$390	$68,451	$444	To be determined	To be determined

Project Number	Project	TN Reductions (Pounds per Year)	Approved Save Our Lagoon Project Cost	Approved Cost per Pound per Year of TN	Inflated/Final Save Our Lagoon Project Cost	Inflated/Final Cost per Pound per Year of TN	Total Project Cost (2024 Estimate)	Total Cost per Pound per Year of TN
-	**Package Plant Connection**	-	-	-	-	-	-	-
192	Oak Point Wastewater Treatment Facility Improvements	186	$279,000	$1,500	$279,000	$1,500	$647,941	$3,484
237	Willow Lakes Recreational Vehicle Park	725	$1,087,500	$1,500	$1,164,957	$1,607	$2,169,000	$2,992
239	The Cove at South Beaches Package Plant Connection	81	$121,500	$1,500	$130,154	$1,607	$1,268,500	$15,660
-	**Sewer Laterals**	-	-	-	-	-	-	-
63a	Countywide Repair/Replacement	6,196	$633,808	$102	$848,176	$137	$633,808	$102
63b	Satellite Beach Lateral Smoke Testing	Not applicable	$202,210	Not applicable	$202,210	Not applicable	$202,210	Not applicable
100	Osprey Basin Lateral Smoke Testing	Not applicable	$200,000	Not applicable	$286,012	Not applicable	$200,000	Not applicable
114	Barefoot Bay Lateral Smoke Testing	Not applicable	$32,873	Not applicable	$32,873	Not applicable	$83,564	Not applicable
115	South Beaches Lateral Smoke Testing	Not applicable	$84,304	Not applicable	$84,304	Not applicable	$192,297	Not applicable
116	Merritt Island Lateral Smoke Testing	Not applicable	$246,630	Not applicable	$246,630	Not applicable	$246,630	Not applicable
-	**Septic-to-Sewer**	-	-	-	-	-	-	-
2016-47	Sykes Creek - Zone N	2,784	$4,425,425	$1,590	$5,237,910	$1,881	$12,593,239	$4,523
2016-48	Sykes Creek - Zone M	1,798	$6,717,803	$3,736	$7,242,533	$4,028	$9,432,928	$5,246
2016-49	Sykes Creek - Zone T	3,360	$5,341,030	$1,590	$6,321,616	$1,881	$14,939,414	$4,446
2019-29	South Banana - Zone B	915	$1,372,500	$1,500	$1,962,756	$2,145	$3,640,315	$3,978
145	Merritt Island - Zone F	1,292	$1,100,000	$851	$1,586,864	$1,228	$4,300,954	$3,329
146	Merritt Island - Zone C	1,419	$1,580,000	$1,113	$2,279,314	$1,606	$4,000,750	$2,819
147	Sykes Creek - Zone R	5,040	$7,827,120	$1,553	$8,101,069	$1,607	$16,777,897	$3,329
151	Merritt Island - Zone G	7,588	$11,784,164	$1,553	$12,196,610	$1,607	$68,120,481	$8,977
222	Hedgecock/Grabowsky and Desoto Fields	81	$121,500	$1,500	$121,500	$1,500	$287,098	$3,544
238	Kelly Park	90	$135,000	$1,500	$144,615	$1,607	$659,337	$7,326
240	Rotary Park	104	$156,000	$1,500	$167,111	$1,607	$977,802	$9,402
2016-16	Banana Septic System 144 Quick Connections	3,224	$1,908,000	$592	$2,705,290	$839	To be determined	To be determined
2016-30	City of Rockledge	712	$500,580	$703	$597,973	$840	To be determined	To be determined

Project Number	Project	TN Reductions (Pounds per Year)	Approved Save Our Lagoon Project Cost	Approved Cost per Pound per Year of TN	Inflated/Final Save Our Lagoon Project Cost	Inflated/Final Cost per Pound per Year of TN	Total Project Cost (2024 Estimate)	Total Cost per Pound per Year of TN
2016-31/32	City of Cocoa - Zones J and K	3,748	$5,622,000	$1,500	$6,715,820	$1,792	$12,025,865	$3,209
2016-35	South Beaches - Zone A	1,306	$1,959,000	$1,500	$2,340,144	$1,792	To be determined	To be determined
109	City of Titusville - Zones A-G	1,563	$1,201,392	$769	$1,435,136	$918	$1,000,000	$640
203	South Central - Zone A	3,655	$5,482,500	$1,500	$6,549,178	$1,792	$11,873,437	$3,249
150	South Central - Zone D (Brevard County)	3,387	$4,774,500	$1,410	$6,887,712	$2,034	$4,977,278	$1,470
50b	South Central - Zone C	5,146	$6,600,000	$1,283	$7,620,332	$1,481	$10,304,255	$2,002
2020-34	South Central - Zone F	1,688	$1,701,972	$1,008	$2,433,921	$1,442	$1,701,972	$1,008
2019-27	Sharpes - Zone A	5,248	$7,872,000	$1,500	$11,257,428	$2,145	$8,824,805	$1,682
2019-36	South Beaches - Zone O	54	$133,488	$2,472	$190,896	$3,535	$218,225	$4,041
2019-37	South Beaches - Zone P	242	$300,348	$1,241	$429,515	$1,775	$702,800	$2,904
2019-40	Rockledge - Zone B	4,037	$5,339,520	$1,323	$7,635,831	$1,891	To be determined	To be determined
1	Breeze Swept Septic-to-Sewer Connection	2,002	$880,530	$440	$880,530	$440	$3,400,000	$1,698
2a	Merritt Island Septic Phase Out Project	2,501	$320,268	$128	$320,268	$128	$3,138,098	$1,255
61	Riverside Drive Septic-to-Sewer Conversion	305	$262,044	$859	$371,480	$1,218	$262,044	$859
62	Roxy Avenue Septic-to-Sewer Conversion	102	$88,944	$872	$126,089	$1,236	$88,944	$872
148	North Merritt Island - Zone E	3,287	$5,104,711	$1,553	$5,283,376	$1,607	$14,493,227	$4,409
152	Sharpes - Zone B	2,692	$4,038,000	$1,500	$5,825,234	$2,164	$6,460,394	$2,400
153	Cocoa - Zone C	2,550	$3,960,150	$1,553	$4,098,755	$1,607	$4,150,210	$1,628
190	Bowers Septic-to-Sewer	120	$147,000	$1,225	$196,719	$1,639	$147,000	$1,225
191	Kent and Villa Espana Septic-to-Sewer Conversion	542	$710,000	$1,310	$950,138	$1,753	$993,500	$1,833
241	Manatee Cove	24	$36,000	$1,500	$38,564	$1,607	$1,322,826	$55,118
242	Riverwalk	4	$6,000	$1,500	$6,427	$1,607	$781,007	$195,252
2016-18	North IRL Septic System 463 Quick Connections	11,339	$6,018,000	$531	$8,288,023	$731	To be determined	To be determined
2016-39	City of Palm Bay – Zone A	2,136	$2,817,256	$1,319	$3,317,208	$1,553	$4,900,000	$2,294
2016-46	City of Palm Bay – Zone B	6,809	$8,309,628	$1,220	$9,926,355	$1,458	To be determined	To be determined
4	Hoag Sewer Conversion	101	$86,031	$852	$117,493	$1,163	$100,000	$990
5	Pennwood Sewer Conversion	103	$81,000	$786	$95,860	$931	$131,932	$1,281
60	Sylvan Estates Septic-to-Sewer Conversion	1,073	$1,561,215	$1,455	$1,561,215	$1,455	$2,431,490	$2,266
136	Micco - Zone B	6,484	$10,069,652	$1,553	$10,422,090	$1,607	$12,294,552	$1,896

Project Number	Project	TN Reductions (Pounds per Year)	Approved Save Our Lagoon Project Cost	Approved Cost per Pound per Year of TN	Inflated/Final Save Our Lagoon Project Cost	Inflated/Final Cost per Pound per Year of TN	Total Project Cost (2024 Estimate)	Total Cost per Pound per Year of TN
3	Micco Sewer Line Extension (Phase I and II)	1,493	$2,239,500	$1,500	$2,996,949	$1,500	$4,870,536	$3,262
189	Avendia del Rio Septic-to-Sewer	71	$70,000	$986	$93,676	$1,319	$70,000	$986
224	Lake Ashley Circle	1,136	$1,704,000	$1,500	$1,944,016	$1,711	$3,285,000	$2,892
225	Dundee Circle and Manor Place	1,499	$2,248,500	$1,500	$2,565,212	$1,711	$4,105,000	$2,738
284	Sewer Available Not Connected Phase 2	1,011	$1,616,992	$1,599	$1,616,992	$1,599	$7,072,000	$6,995
2016-19	Central IRL Septic System 335 Quick Connections	7,378	$3,765,811	$510	$4,514,050	$612	To be determined	To be determined
-	**Septic System Upgrades**	-	-	-	-	-	-	-
51	Banana River Lagoon 100 Septic System Upgrades	1,934	$1,800,000	$931	$2,077,412	$1,074	To be determined	To be determined
52	North IRL 586 Septic System Upgrades	13,857	$10,548,000	$761	$12,366,283	$892	To be determined	To be determined
53	Central IRL 783 Septic System Upgrades	18,503	$14,094,000	$762	$16,287,585	$880	To be determined	To be determined
-	**Stormwater Projects**	-	-	-	-	-	-	-
-	Banana River Lagoon 89 Basin Projects	34,979	$17,512,532	$501	$23,891,616	$683	To be determined	To be determined
13	Central Boulevard Baffle Box	481	$34,700	$72	$34,700	$72	$43,700	$91
16	Gleason Park Reuse	48	$4,224	$88	$4,224	$88	$7,193	$150
64	Stormwater Low Impact Development Convair Cove 1 – Blakey Boulevard	30	$4,650	$155	$4,650	$155	$216,995	$7,233
65	Stormwater Low Impact Development Convair Cove 2- Dempsey Drive	29	$4,495	$155	$4,495	$155	$216,995	$7,483
66, 66b	Big Muddy at Cynthia Baffle Box and Expansion	436	$59,631	$137	$59,631	$137	$288,640	$662
85	Basin 1304 Bioreactor	958	$83,029	$87	$83,029	$87	$141,988	$148
128	Jackson Court Stormwater Treatment Facility	56	$8,266	$148	$8,266	$148	$391,633	$6,993
179	Lori Laine Basin Pipe Improvement Project	117	$17,525	$150	$17,525	$150	$3,294,803	$28,161
215	Basin 960 Pioneer Road Denitrification	105	$38,850	$370	$44,322	$422	$609,916	$5,809
219	McNabb Outfall Bioretention	44	$19,423	$441	$22,159	$504	$420,840	$9,565
205	Basin 998 Hampton Homes	312	$63,618	$204	$68,149	$218	$727,618	$2,332
206	Basin 1066 Angel Avenue	1,150	$232,200	$202	$248,738	$216	$442,200	$385
207	Basin 1124 Elliot Drive	533	$148,100	$278	$158,648	$298	$295,000	$553
235	Woodland Business Center Stormwater Retention	11	$4,906	$446	$5,255	$478	$100,981	$9,180

Project Number	Project	TN Reductions (Pounds per Year)	Approved Save Our Lagoon Project Cost	Approved Cost per Pound per Year of TN	Inflated/Final Save Our Lagoon Project Cost	Inflated/Final Cost per Pound per Year of TN	Total Project Cost (2024 Estimate)	Total Cost per Pound per Year of TN
247	Basin 998 Richland Avenue Canal	641	$130,782	$204	$140,097	$219	$414,782	$647
250	Basin 1280B Flamingo Road	161	$71,645	$445	$76,748	$477	$274,772	$1,707
251	Basin 1304 West Arlington Road	216	$96,425	$446	$103,293	$478	$179,327	$830
254	Maritime Hammock Preserve Floating Vegetative Islands	174	$8,500	$49	$8,798	$51	$8,500	$49
258	Cocoa Beach Golf Course Floating Vegetative Islands	90	$36,810	$409	$38,098	$423	$95,000	$1,056
259	Ramp Road Park - Stormwater Improvements	41	$16,796	$410	$17,384	$424	$1,500,000	$36,585
280	Westside Basin Water Quality Improvements	137	$56,033	$409	$56,033	$409	$1,650,960	$12,051
281	Cocoa Isles Boulevard Dry Pond	14	$5,726	$409	$5,726	$409	$570,000	$40,714
-	North IRL 92 Basin Projects	87,899	$27,495,773	$313	$37,468,977	$426	To be determined	To be determined
14	Church Street Type II Baffle Box	937	$88,045	$94	$88,045	$94	$233,455	$249
18	Denitrification Retrofit of Johns Road Pond	1,199	$105,512	$88	$105,512	$88	$274,564	$229
19	St. Teresa Basin Treatment	3,100	$272,800	$88	$272,800	$88	$474,292	$153
20	South Street Basin Treatment	987	$86,856	$88	$86,856	$88	$683,969	$693
21	La Paloma Basin Treatment	2,367	$208,296	$88	$208,296	$88	$375,250	$159
22	Kingsmill-Aurora Phase Two	4,176	$367,488	$88	$501,882	$120	$3,531,543	$846
23	Denitrification Retrofit of Huntington Pond	1,190	$104,720	$88	$143,017	$120	$103,851	$87
24	Denitrification Retrofit of Flounder Creek Pond	856	$75,328	$88	$102,876	$120	$444,930	$520
34	Cliff Creek Baffle Box	3,952	$347,781	$88	$347,781	$88	$737,612	$187
35	Thrush Drive Baffle Box	3,661	$322,200	$88	$322,200	$88	$609,394	$166
69	Apollo/GA Baffle Box	3,381	$297,522	$88	$421,774	$125	$825,000	$244
89	Basin 1298 Bioreactor	917	$85,829	$94	$85,829	$94	$136,100	$148
90	Johns Road Pond Biosorption Activated Media	245	$23,030	$94	$23,030	$94	$154,000	$629
91	Burkholm Road Biosorption Activated Media	685	$64,390	$94	$64,390	$94	$141,457	$207
92	Carter Road Biosorption Activated Media	665	$62,510	$94	$62,510	$94	$146,950	$221
93	Wiley Avenue Biosorption Activated Media	954	$82,735	$87	$82,735	$87	$162,216	$170
94	Broadway Pond Biosorption Activated Media	456	$42,864	$94	$42,864	$94	$269,750	$592
96	Spring Creek Baffle Box	1,057	$330,841	$313	$473,122	$448	$1,500,000	$1,419
97	Titusville High School Baffle Box	1,190	$111,813	$94	$111,813	$94	$332,800	$280

Project Number	Project	TN Reductions (Pounds per Year)	Approved Save Our Lagoon Project Cost	Approved Cost per Pound per Year of TN	Inflated/Final Save Our Lagoon Project Cost	Inflated/Final Cost per Pound per Year of TN	Total Project Cost (2024 Estimate)	Total Cost per Pound per Year of TN
98	Coleman Pond Managed Aquatic Plant System	1,240	$11,438	$9	$11,438	$9	$11,438	$9
110	Osprey Plant Pond Managed Aquatic Plant Systems	606	$37,500	$62	$37,500	$62	$37,500	$62
117	Basin 10 County Line Road Woodchip Bioreactor	597	$72,773	$122	$72,773	$122	$166,174	$278
118	Basin 26 Sunset Avenue Serenity Park Woodchip Bioreactor	605	$73,810	$122	$73,810	$122	$242,532	$401
119	Basin 141 Irwin Avenue Woodchip Bioreactor	567	$69,174	$122	$69,174	$122	$146,926	$259
120	Draa Field Pond Managed Aquatic Plant Systems	256	$31,281	$122	$31,281	$122	$48,750	$190
122	Basin 22 Hunting Road Serenity Park Woodchip Bioreactor	329	$40,077	$122	$40,077	$122	$40,077	$122
124	Floating Wetlands to Existing Stormwater Ponds	12	$1,497	$125	$1,497	$125	$14,336	$1,195
127	Basin 5 Dry Retention	113	$16,680	$148	$16,680	$148	$62,718	$555
129	Forrest Avenue 72-inch Outfall Baseflow Capture/Treatment	94	$13,956	$148	$20,133	$214	$1,216,663	$12,943
169	Basin 1335 (Sherwood Park) Stormwater Quality Project	3,214	$392,108	$122	$392,108	$122	$1,696,489	$528
174	St. Johns 2 Baffle Box	1,992	$243,070	$122	$243,070	$122	$370,224	$186
175, 176	High School Baffle Box and Funeral Home Baffle Box	1,664	$203,008	$122	$203,008	$122	$1,161,997	$698
177	North and South Lakemont Ponds Floating Wetlands	107	$13,054	$122	$13,054	$122	$38,250	$357
178	Marina B Managed Aquatic Plant Systems	55	$6,670	$121	$6,670	$121	$17,424	$317
213	Johnson Junior High Denitrification Media Chamber Modification	206	$40,815	$198	$40,815	$198	$51,675	$251
214	Sand Point Park Baffle Box	438	$52,155	$119	$52,155	$119	$281,155	$642
220	Basin 1398 Sand Dollar Canal Bioreactor	444	$198,024	$446	$225,917	$509	$1,162,973	$2,619
231	North Fiske Stormwater Pond Floating Wetlands	200	$50,000	$250	$50,000	$250	$50,000	$250
232	Riverfront Center Nutrient Removing Filtrations Boxes	679	$242,403	$357	$242,403	$357	$899,895	$1,325
233	Commons and City Hall Tree Boxes	80	$25,040	$313	$26,823	$335	$176,500	$2,206

Project Number	Project	TN Reductions (Pounds per Year)	Approved Save Our Lagoon Project Cost	Approved Cost per Pound per Year of TN	Inflated/Final Save Our Lagoon Project Cost	Inflated/Final Cost per Pound per Year of TN	Total Project Cost (2024 Estimate)	Total Cost per Pound per Year of TN
252	Basin 89 Scottsmoor I Aurantia	1,706	$152,573	$89	$152,573	$89	$1,675,262	$982
269	Coleman Pond Circulator	353	$126,021	$357	$126,021	$357	$126,021	$357
270	Tennessee Street Baffle Box	1,442	$514,794	$357	$514,794	$357	$535,000	$371
271	Osprey Pond Circulator	242	$86,394	$357	$86,394	$357	$100,000	$413
274	Waelti Drive Pond Retrofi	274	$97,818	$357	$97,818	$357	$235,000	$858
275	Lake Washington & Croton Road Pond Retrofit	158	$56,406	$357	$56,406	$357	$198,000	$1,253
276	North Wickham & Conservation Place Wet Pond Retrofit	261	$93,177	$357	$93,177	$357	$392,925	$1,505
279	Melbourne Cemetery Baffle Box	606	$216,342	$357	$216,342	$357	$2,180,000	$3,597
15	Bayfront Stormwater Project	348	$30,624	$88	$30,624	$88	$635,702	$1,827
67	Grant Place Baffle Box	937	$82,481	$88	$82,481	$88	$498,831	$532
68	Crane Creek/M-1 Canal Flow Restoration	24,000	$2,033,944	$85	$2,883,368	$120	$21,300,000	$888
87	Fleming Grant Biosorption Activated Media	602	$56,588	$94	$56,588	$94	$169,300	$281
88	Espanola Baffle Box	1,119	$105,186	$94	$150,422	$134	$550,000	$492
121	Basin 2258 Babcock Road Woodchip Bioreactor	412	$50,203	$122	$72,423	$176	$173,538	$421
123	Ray Bullard Water Reclamation Facility Stormwater Management Area	1,317	$111,847	$85	$111,847	$85	$1,604,860	$1,219
256	C-10 Water Management Area	29,300	$10,460,100	$357	$10,826,204	$369	$61,000,000	$2,082
257	Riverview Park Baffle Box	863	$308,091	$357	$318,874	$369	$951,500	$1,103
277	Darrow Baffle Box	536	$191,352	$357	$191,352	$357	$851,500	$1,589
278	Line Street Cemetery Baffle Box	770	$274,890	$357	$274,890	$357	$1,855,000	$2,409
-	**Vegetation Harvesting**	-	-	-	-	-	-	-
111	Draa Field Vegetation Harvesting	786	$86,413	$110	$86,413	$110	$115,261	$147
112	County Wide Stormwater Pond Harvesting	931	$14,000	$15	$14,000	$15	$14,777	$16
171	Mechanical Aquatic Vegetation Harvesting	20,538	$1,011,976	$49	$1,011,976	$49	$1,016,976	$50
172	Horseshoe Pond Vegetative Harvesting	4,536	$8,140	$2	$8,140	$2	$13,090	$3
208	Maritime Hammock Preserve Stormwater Pond Harvesting	143	$14,480	$101	$14,480	$101	$14,480	$101
209	Basin 1398 Sand Dollar Canal Harvesting	222	$24,420	$110	$24,420	$110	$54,000	$243
210	Basin 958 Pioneer Road Vegetation Harvesting	363	$39,930	$110	$45,554	$125	$186,000	$512
211	Cocoa Beach Golf Course Stormwater Ponds Harvesting	1,984	$218,267	$110	$218,267	$110	$449,890	$227

Project Number	Project	TN Reductions (Pounds per Year)	Approved Save Our Lagoon Project Cost	Approved Cost per Pound per Year of TN	Inflated/Final Save Our Lagoon Project Cost	Inflated/Final Cost per Pound per Year of TN	Total Project Cost (2024 Estimate)	Total Cost per Pound per Year of TN
228	Unincorporated Countywide Vegetation Harvesting	9,263	$477,000	$51	$477,000	$51	$477,000	$51
264	Unincorporated Countywide Vegetation Harvesting 2	4,147	$472,758	$114	$472,758	$114	$472,758	$114
-	**Muck Removal**	-	-	-	-	-	-	-
2016-10a	Canaveral South	35,382	$14,700,000	$415	$17,560,041	$496	$63,468,000	$1,794
2016-5a	Pineda Banana River Lagoon	15,033	$6,825,000	$454	$8,152,876	$542	$16,770,000	$1,116
2016-11a	Patrick Space Force Base	6,497	$7,175,000	$1,104	$8,570,973	$1,319	$17,630,000	$2,714
168a	Cocoa Beach Golf	29,694	$21,350,000	$719	$25,503,868	$859	$45,997,054	$1,549
41a	Grand Canal Muck	10,469	$12,626,600	$1,206	$17,189,331	$1,642	$29,200,700	$2,789
42a	Sykes Creek Muck	19,635	$4,705,428	$240	$6,426,255	$327	$56,846,000	$2,895
70a	Cocoa Beach Muck Dredging – Phase III	4,095	$1,376,305	$336	$1,376,305	$336	$2,903,356	$709
71	Merritt Island Muck Removal – Phase 1	8,085	$7,733,517	$957	$10,963,220	$1,356	$26,878,440	$3,324
72a	Muck Removal of Indian Harbour Beach Canals	3,780	$3,631,815	$961	$5,148,548	$1,362	$10,380,000	$2,746
101	Cocoa Beach Muck Dredging Phase II-B	6,300	$5,911,150	$938	$5,911,150	$938	$7,417,650	$1,177
144	Satellite Beach Muck Dredging	3,885	$1,884,225	$485	$2,718,190	$700	$8,296,940	$2,136
2016-06a	Titusville Railroad West	14,406	$3,150,000	$219	$3,762,866	$261	$29,154,000	$2,024
2016-07a	National Aeronautics and Space Administration Causeway East	21,872	$9,975,000	$456	$11,915,742	$545	$35,690,000	$1,632
2016-04a	Rockledge A	7,581	$4,375,000	$577	$5,226,203	$689	$9,890,000	$1,305
2016-08a	Titusville Railroad East	5,393	$4,025,000	$746	$4,808,108	$892	$48,332,000	$8,962
54a	Eau Gallie Northeast	10,476	$8,750,000	$835	$10,452,405	$998	$32,336,000	$3,087
2016-3a	Muck Re-dredging in Turkey Creek	5,691	$137,329	$24	$137,329	$24	$1,098,631	$193
223	Spring Creek Dredging	154	$80,080	$520	$91,360	$593	$1,500,000	$9,740
236	Sunnyland Canals Muck Removal	10,030	$5,215,600	$520	$5,587,081	$557	$10,072,478	$1,004
260	Mims Rim Ditch Muck Removal Project	16,602	$10,077,414	$607	$10,430,123	$628	$17,787,990	$1,071
262	Shore View Lane Dredging	74	$44,918	$607	$46,490	$628	$435,000	$5,878
-	**Treatment of Interstitial Water**	-	-	-	-	-	-	-
40	Mims Muck Removal: Outflow Water Nutrient Removal	2,803	$0	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
2016-10b	Canaveral South	42,688	$2,134,419	$50	$2,549,693	$60	$5,904,000	$138
2016-5b	Pineda Banana River Lagoon	19,820	$990,980	$50	$1,183,786	$60	$1,560,000	$79
2016-11b	Patrick Space Force Base	20,836	$1,041,800	$50	$1,244,493	$60	$1,640,000	$79
168b	Cocoa Beach Golf	99,098	$3,013,100	$30	$3,599,330	$36	$7,800,000	$79

Project Number	Project	TN Reductions (Pounds per Year)	Approved Save Our Lagoon Project Cost	Approved Cost per Pound per Year of TN	Inflated/Final Save Our Lagoon Project Cost	Inflated/Final Cost per Pound per Year of TN	Total Project Cost (2024 Estimate)	Total Cost per Pound per Year of TN
41b	Grand Canal Interstitial	89,495	$5,610,821	$63	$7,638,340	$85	$3,829,600	$43
42b	Sykes Creek Interstitial	64,278	$11,248,704	$175	$15,362,481	$239	$5,288,000	$82
72b	Muck Interstitial Water Treatment for Indian Harbour Beach Canals	27,418	$5,483,600	$200	$7,773,684	$284	$1,466,630	$53
113	Satellite Beach Interstitial Water Treatment	29,978	$3,057,756	$102	$4,411,131	$147	$1,630,176	$54
2016-06b	Titusville Railroad West	9,148	$457,375	$50	$546,362	$60	$2,712,000	$296
2016-07c	National Aeronautics and Space Administration Causeway East	28,967	$1,448,355	$50	$1,730,148	$60	$3,320,000	$115
2016-04b	Rockledge A	12,705	$635,244	$50	$758,837	$60	$920,000	$72
2016-08b	Titusville Railroad East	11,688	$584,424	$50	$698,130	$60	$4,496,000	$385
54b	Eau Gallie Northeast	25,410	$1,270,487	$50	$1,517,674	$60	$3,008,000	$118
2016-3b	Muck Interstitial Water Treatment for Turkey Creek	Not applicable	Included in muck project	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
261	Mims Rim Ditch Interstitial Treatment	15,700	$1,784,135	$114	$1,846,580	$118	$1,784,135	$114
-	**Oyster Bars**	-	-	-	-	-	-	-
2016-55	Banana River Lagoon County Oyster Bars	4,569	$1,802,798	$395	$2,153,550	$471	To be determined	To be determined
75	Marina Isles Oyster Bar	60	$26,700	$445	$26,700	$445	$26,700	$445
76	Bettinger Oyster Bar	24	$10,680	$445	$10,680	$445	$10,680	$445
78a	McNabb Park Oyster Bar	47	$9,134	$194	$9,134	$194	$37,192	$791
79	Gitlin Oyster Bar	36	$16,020	$445	$16,020	$445	$16,020	$445
104	Brevard Zoo Banana River Oyster Project	1,476	$583,020	$395	$833,753	$565	$583,020	$395
141	Brevard Zoo Banana River Oyster Project 2	662	$264,800	$400	$382,001	$577	$264,800	$400
143	Brevard Zoo Oyster Reef Adjustments Banana River	32	$12,800	$400	$18,465	$577	$12,800	$400
188	Brevard Zoo Banana River Oyster Project 3	143	$56,771	$397	$81,898	$573	$56,771	$397
2016-56	North IRL County Oyster Bars	5,976	$2,358,111	$395	$2,816,907	$471	To be determined	To be determined
83	Bomalaski Oyster Bar	20	$8,900	$445	$8,900	$445	$8,900	$445
106	Brevard Zoo North IRL Oyster Project	864	$475,438	$550	$475,438	$550	$475,438	$550
139	Brevard Zoo North IRL Oyster Project 2	841	$336,400	$400	$485,292	$577	$485,292	$577
142	Brevard Zoo Oyster Reef Adjustments North IRL	68	$27,200	$400	$39,239	$577	$39,239	$577
184	Brevard Zoo North Indian River Lagoon Oyster Project 3	1,056	$419,232	$397	$561,026	$531	$561,026	$531

Project Number	Project	TN Reductions (Pounds per Year)	Approved Save Our Lagoon Project Cost	Approved Cost per Pound per Year of TN	Inflated/Final Save Our Lagoon Project Cost	Inflated/Final Cost per Pound per Year of TN	Total Project Cost (2024 Estimate)	Total Cost per Pound per Year of TN
186	Brevard Zoo North Indian River Lagoon Individual Oyster Project	436	$173,092	$397	$231,636	$531	$231,636	$531
272	Brevard Zoo North Indian River Lagoon Oyster Project 4	1,742	$827,450	$475	$827,450	$475	$827,450	$475
80	Coconut Point/Environmentally Endangered Lands Oyster Bar	96	$45,120	$470	$45,120	$470	$45,120	$470
81	Wexford Oyster Bar	70	$31,150	$445	$31,150	$445	$31,150	$445
73	Riverview Senior Resort Oyster Bar	77	$30,304	$394	$30,304	$394	$30,304	$394
105	Brevard Zoo Central IRL Oyster Project	408	$161,160	$395	$161,160	$395	$161,160	$395
140	Brevard Zoo Central IRL Oyster Project 2	677	$270,800	$400	$390,657	$577	$390,657	$577
185	Brevard Zoo Central Indian River Lagoon Tributary Pilot Oyster Project	581	$230,657	$397	$308,670	$531	$308,670	$531
187	Brevard Zoo Central Indian River Lagoon Oyster Project 3	218	$86,546	$397	$115,818	$531	$115,818	$531
217	Central IRL Oyster Project 4	348	$138,156	$397	$157,616	$453	$157,616	$453
218	Central Oyster Project Offshore Reefs	900	$357,300	$397	$407,627	$453	$407,627	$453
226	Hog Point Offshore Oyster Bar	126	$21,023	$167	$21,023	$167	$73,560	$584
273	Brevard Zoo Central Indian River Lagoon Oyster Project 5	1,504	$714,400	$475	$714,400	$475	$714,400	$475
-	**Planted Shorelines**	-	-	-	-	-	-	-
77a	Cocoa Beach Country Club Planted Shoreline	67	$16,080	$240	$16,080	$240	$16,080	$240
78b	McNabb Park Planted Shoreline	7	$1,680	$240	$1,680	$240	$8,177	$1,168
103	Brevard Zoo North IRL Plant Project	3	$720	$240	$720	$240	$720	$240
130	Brevard Zoo North IRL Plant Project 2	41	$9,840	$240	$9,840	$240	$9,840	$240
180	Scottsmoor Impoundment	44	$10,560	$240	$14,132	$321	$14,132	$321
181	Riveredge	17	$4,080	$240	$4,080	$240	$4,080	$240
212	Titusville Causeway Multi-Trophic Restoration and Living Shoreline	131	$31,440	$240	$35,868	$274	$175,000	$1,336
77b	Lagoon House Shoreline Restoration Planting	100	$24,000	$240	$24,000	$240	$24,000	$240
133	Fisherman's Landing	20	$4,800	$240	$4,800	$240	$4,800	$240
135	Rotary Park	20	$4,800	$240	$4,800	$240	$4,800	$240
-	**Clam Restoration**	-	-	-	-	-	-	-

Project Number	Project	TN Reductions (Pounds per Year)	Approved Save Our Lagoon Project Cost	Approved Cost per Pound per Year of TN	Inflated/Final Save Our Lagoon Project Cost	Inflated/Final Cost per Pound per Year of TN	Total Project Cost (2024 Estimate)	Total Cost per Pound per Year of TN
194	Aquaculture Stimulus Program	1,000	$60,000	$60	$68,117	$68	To be determined	To be determined
265	Restoration of Native Clams in the IRL – Titusville	1,584	$272,000	$172	$272,000	$172	$272,000	$172
267	Restoration of Native Clams in the IRL - Grant Island	990	$170,000	$172	$170,000	$172	$170,000	$172
-	**Projects Monitoring**	-	$10,000,000	Not applicable	10,000,000	Not applicable	To be determined	Not applicable
	Total	***1,315,443***	***$465,131,017***	***$354 (average)***	***$563,834,031***	***$429 (average)***	***$1,061,540,068***	***$807 (average)***

Table 6-10. Timeline for Funding Needs (Table 46 in the Original Save Our Indian River Lagoon Project Plan)

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
Public Education	-	-	-	-	-	-	-	-	-	-	-
Fertilizer Management	-	Year 1 of Program*	Year 2 of Program*	Year 3 of Program*	Year 4 of Program*	Year 5 of Program*	Year 6 of Program*	Year 7 of Program*	Year 8 of Program	Year 9 of Program	Year 10 of Program
$975,540	-	$0	$120,951	$49,477	$46,571	$35,834	$46,364	$95,886	$193,487	$193,485	$193,485
Grass Clippings	-	Year 1 of Program*	Year 2 of Program*	Year 3 of Program*	Year 4 of Program*	Year 5 of Program*	Year 6 of Program*	Year 7 of Program*	Year 8 of Program	Year 9 of Program	Year 10 of Program
$419,176	-	$0	$20,000	$0	$6,638	$8,362	$0	$0	$128,060	$128,058	$128,058
Septic System Maintenance	-	Year 1 of Program*	Year 2 of Program*	Year 3 of Program*	Year 4 of Program*	Year 5 of Program*	Year 6 of Program*	Year 7 of Program*	Year 8 of Program	Year 9 of Program	Year 10 of Program
$521,674	-	$0	$48,380	$49,245	$22,709	$11,497	$21,816	$60,235	$102,598	$102,598	$102,596
Irrigation	-	-	-	-	-	-	Year 1 of Program*	Year 2 of Program*	Year 3 of Program	Year 4 of Program	Year 5 of Program
$327,795	-	-	-	-	-	-	$0	$0	$109,265	$109,265	$109,265
Stormwater Best Management Practice	-	-	-	-	-	-	Year 1 of Program*	Year 2 of Program*	Year 3 of Program	Year 4 of Program	Year 5 of Program
$349,101	-	-	-	-	-	-	$0	$0	$116,367	$116,367	$116,367
Oyster Gardening	-	-	-	Year 1 of Program*	Year 2 of Program*	-	-	-	-	-	-
$300,000	-	-	-	$150,000	$150,000	-	-	-	-	-	-
Restore Our Shores	-	-	-	-	-	Year 1 of Program*	Year 2 of Program*	Year 3 of Program*	Year 4 of Program	Year 5 of Program	Year 6 of Program
$1,124,521	-	-	-	-	-	$100,000	$200,000	$200,000	$238,203	$252,495	$133,823
WWTF Upgrades	-	-	-	-	-	-	-	-	-	-	-
Banana River Lagoon	-	-	Cocoa Beach*	-	-	-	-	-	-	-	-
$945,000	-	-	$945,000	-	-	-	-	-	-	-	-
North IRL	-	-	-	Titusville Osprey Design and Permitting*	Titusville Osprey Design and Start Construction*	Titusville Osprey Construction*	-	-	Port Saint John Wastewater Treatment Plant Replacement	-	-
$8,981,818	-	-	-	$1,000,000	$3,000,000	$4,000,000	-	-	$981,818	-	-
North IRL	-	-	-	-	Osprey Nutrient Upgrade Phase 2*	-	-	-	-	-	-
$219,826	-	-	-	-	$219,826	-	-	-	-	-	-
North IRL	-	-	-	-	-	Rockledge Flow Equalization Basin	-	-	-	-	-
$2,344,222	-	-	-	-	-	$2,344,222	-	-	-	-	-
Central IRL	-	Palm Bay Permit and Engineering*	Palm Bay Construction*	Palm Bay Construction*	-	-	-	-	South Beaches Upgrade	-	-
$6,106,254	-	$200,000	$1,200,000	$2,234,900	-	-	-	-	$2,471,354	-	-
Central IRL	-	-	-	Melbourne Grant Street	-	-	-	-	-	-	-
$9,596,607	-	-	-	$9,596,607	-	-	-	-	-	-	-
Central IRL	-	-	-	Ray Bullard Biological Nutrient Removal	-	-	-	-	-	-	-
$6,506,916	-	-	-	$6,506,916	-	-	-	-	-	-	-
Central IRL	-	-	-	-	-	-	South Brevard Water Reclamation Facility	-	-	-	-
$1,770,765	-	-	-	-	-	-	$1,770,765	-	-	-	-
Rapid Infiltration Basin/ Sprayfield Upgrades	-	-	-	-	-	-	-	-	-	-	-
North IRL	-	-	-	-	-	-	-	-	Sterling House Condominium	-	-
$68,451	-	-	-	-	-	-	-	-	$68,451	-	-
Central IRL	Long Point*	-	-	-	-	-	-	-	-	-	-
$22,207	$22,207	-	-	-	-	-	-	-	-	-	-

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
Package Plant Connections	-	-	-	-	-	-	-	-	-	-	-
North IRL	-	-	-	-	Oak Point*	-	Willow Lakes Recreational Vehicle Park	-	-	-	-
$1,443,957	-	-	-	-	$279,000	-	$1,164,957	-	-	-	-
Central IRL	-	-	-	-	-	-	The Cove at South Beaches	-	-	-	-
$130,154	-	-	-	-	-	-	$130,154	-	-	-	-
Sewer Laterals	-	-	-	-	-	-	-	-	-	-	-
Banana River Lagoon	-	-	-	-	Countywide Repair/ Replacement	-	-	-	-	-	-
$848,176	-	-	-	-	$848,176	-	-	-	-	-	-
Banana River Lagoon	-	-	-	-	Satellite Beach Smoke Testing*	-	-	-	-	-	-
$202,210	-	-	-	-	$202,210	-	-	-	-	-	-
North IRL	-	-	Titusville Osprey Basin	-	-	-	-	-	-	-	-
$286,012	-	-	$286,012	-	-	-	-	-	-	-	-
North IRL	-	-	-	Merritt Island Lateral Smoke Testing*	-	-	-	-	-	-	-
$246,630	-	-	-	$246,630	-	-	-	-	-	-	-
Central IRL	-	-	-	Barefoot Bay Lateral Smoke Testing*	-	-	-	-	-	-	-
$32,873	-	-	-	$32,873	-	-	-	-	-	-	-
Central IRL	-	-	-	South Beaches Lateral Smoke Testing*	-	-	-	-	-	-	-
$84,304	-	-	-	$84,304	-	-	-	-	-	-	-
Septic-to-Sewer	-	-	-	-	-	-	-	-	-	-	-
Banana River Lagoon	Sykes M Engineering	-	Sykes Creek M	-	-	-	Kelly Park	-	-	-	-
$3,366,345	$298,640	-	$2,923,090	-	-	-	$144,615	-	-	-	-
Banana River Lagoon	-	Sykes Creek N	-	-	-	-	Rotary Park	-	-	-	-
$5,155,596	-	$4,988,485	-	-	-	-	$167,111	-	-	-	-
Banana River Lagoon	Sykes T Engineering	-	-	Sykes Creek T	-	-	-	-	-	-	-
$6,020,586	$298,640	-	-	$5,721,946	-	-	-	-	-	-	-
Banana River Lagoon	-	-	-	-	South Banana B Engineering	South Banana B	-	-	-	-	-
$1,962,756	-	-	-	-	$393,266	$1,569,490	-	-	-	-	-
Banana River Lagoon	-	-	-	-	Quick Connects*	Quick Connects*	Quick Connects*	Quick Connects*	Quick Connects	Quick Connects	Quick Connects
$2,705,290	-	-	-	-	$18,407	$0	$14,688	$21,000	$883,732	$883,732	$883,731
Banana River Lagoon	-	-	-	-	Merritt Island C Engineering	Merritt Island C	Merritt Island C	-	-	-	-
$2,279,314	-	-	-	-	$209,178	$1,035,068	$1,035,068	-	-	-	-
Banana River Lagoon	-	-	-	-	Merritt Island F Engineering	-	Merritt Island F	-	-	-	-
$1,586,864	-	-	-	-	$144,260	-	$1,442,604	-	-	-	-
Banana River Lagoon	-	-	-	-	-	-	-	Sykes Creek R	-	-	-
$8,101,069	-	-	-	-	-	-	-	$8,101,069	-	-	-
Banana River Lagoon	-	-	-	-	-	-	-	Merritt Island G	-	-	-
$12,196,610	-	-	-	-	-	-	-	$12,196,610	-	-	-
Banana - Satellite Beach	-	-	-	-	-	Hedgecock/Grabowsky and Desoto Fields*	-	-	-	-	-
$121,500	-	-	-	-	-	$121,500	-	-	-	-	-

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
North IRL	South Central C Engineering	South Central C	-	-	South Central C	-	Manatee Cove	-	-	-	-
$7,658,896	$649,172	$6,090,789	-	-	$880,371	-	$38,564	-	-	-	-
North IRL	Breeze Swept*	-	-	-	-	-	Riverwalk	-	-	-	-
$886,957	$880,530	-	-	-	-	-	$6,427	-	-	-	-
North IRL	Merritt Island Redevelopment Agency*	-	-	-	-	-	-	-	-	-	-
$320,000	$320,000	-	-	-	-	-	-	-	-	-	-
North IRL	-	-	-	-	-	-	-	North Merritt Island E	-	-	-
$5,283,376	-	-	-	-	-	-	-	$5,283,376	-	-	-
North IRL	-	-	Riverside Drive	-	-	-	-	-	-	-	-
$371,480	-	-	$371,480	-	-	-	-	-	-	-	-
North IRL	-	-	Roxy Avenue	-	-	-	-	-	-	-	-
$126,089	-	-	$126,089	-	-	-	-	-	-	-	-
North IRL	-	-	-	Cocoa J and K	-	-	-	-	-	-	-
$6,715,820	-	-	-	$6,715,820	-	-	-	-	-	-	-
North IRL	-	-	-	-	-	-	-	-	Rockledge	-	-
$597,973	-	-	-	-	-	-	-	-	$597,973	-	-
North IRL	-	-	-	Titusville A-G	-	-	-	-	-	-	-
$1,435,136	-	-	-	$1,435,136	-	-	-	-	-	-	-
North IRL	-	-	-	-	Quick Connects*	Quick Connects*	Quick Connects*	Quick Connects*	Quick Connects	Quick Connects	Quick Connects
$8,288,023	-	-	-	-	$534,000	$60,663	$78,264	$66,680	$2,516,140	$2,516,138	$2,516,138
North IRL	-	-	-	-	South Central D (Brevard) Engineering	South Central D (Brevard)	-	-	-	-	-
$6,887,712	-	-	-	-	$1,377,687	$5,510,025	-	-	-	-	-
North IRL	-	-	-	-	South Central A Engineering	South Central A	-	-	-	-	-
$6,549,178	-	-	-	-	$806,328	$5,742,850	-	-	-	-	-
North IRL	-	-	-	-	-	South Beaches A	South Beaches A	-	-	-	-
$2,340,144	-	-	-	-	-	$477,824	$1,862,320	-	-	-	-
North IRL	-	-	-	-	-	-	South Central F	-	-	-	-
$2,433,921	-	-	-	-	-	-	$2,433,921	-	-	-	-
North IRL	-	-	-	South Beaches O	-	-	-	-	-	-	-
$190,896	-	-	-	$190,896	-	-	-	-	-	-	-
North IRL	-	-	-	South Beaches P	-	-	-	-	-	-	-
$429,515	-	-	-	$429,515	-	-	-	-	-	-	-
North IRL	-	-	-	-	Sharpes A Engineering	-	-	-	Sharpes A	-	-
$11,257,428	-	-	-	-	$1,780,424	-	-	-	$9,477,004	-	-
North IRL	-	-	-	-	-	-	-	-	-	Rockledge Zone B	-
$7,635,831	-	-	-	-	-	-	-	-	-	$7,635,831	-
North IRL	-	-	-	-	Sharpes B Engineering	-	-	-	Sharpes B	-	-
$5,825,234	-	-	-	-	$1,168,509	-	-	-	$4,656,725	-	-
North IRL	-	-	-	-	-	-	-	Cocoa C	-	-	-
$4,098,755	-	-	-	-	-	-	-	$4,098,755	-	-	-
North IRL	-	-	-	-	Bowers	-	-	-	-	-	-
$196,719	-	-	-	-	$196,719	-	-	-	-	-	-
North IRL	-	-	-	-	Kent and Villa Espana	-	-	-	-	-	-
$950,138	-	-	-	-	$950,138	-	-	-	-	-	-
Central IRL	-	-	-	-	Micco Phases I & II	-	-	-	-	-	-
$2,996,949	-	-	-	-	$2,996,949	-	-	-	-	-	-
Central IRL	Hoag	-	-	-	-	-	-	-	-	-	-
$117,493	$117,493	-	-	-	-	-	-	-	-	-	-
Central IRL	Pennwood	-	-	-	-	-	-	-	-	-	-

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
$55,492	$55,492	-	-	-	-	-	-	-	-	-	-
Central IRL	-	-	-	-	Palm Bay B	-	-	-	-	-	-
$9,926,355	-	-	-	-	$9,926,355	-	-	-	-	-	-
Central IRL	-	-	-	-	-	Quick Connects*	Quick Connects*	Quick Connects*	Quick Connects	Quick Connects	Quick Connects
$4,514,050	-	-	-	-	-	$11,880	$416,525	$1,597,556	$829,363	$829,363	$829,363
Central IRL	-	Sylvan Estates*	-	-	-	-	-	-	-	-	-
$1,561,215	-	$1,561,215	-	-	-	-	-	-	-	-	-
Central IRL	-	-	-	-	Palm Bay A	-	-	-	-	-	-
$3,069,596	-	-	-	-	$3,069,596	-	-	-	-	-	-
Central IRL	-	-	-	-	-	-	-	Micco B	-	-	-
$10,422,090	-	-	-	-	-	-	-	$10,422,090	-	-	-
Central IRL	-	-	-	-	Avendia del Rio	-	-	-	-	-	-
$93,676	-	-	-	-	$93,676	-	-	-	-	-	-
Central - West Melbourne	-	-	-	-	-	Lake Ashley Circle	-	-	-	-	-
$1,944,016	-	-	-	-	-	$1,944,016	-	-	-	-	-
Central - West Melbourne	-	-	-	-	-	Dundee Circle and Manor Place	-	-	-	-	-
$2,565,212	-	-	-	-	-	$2,565,212	-	-	-	-	-
Central - Palm Bay	-	-	-	-	-	-	-	-	Sewer Available Not Connected Phase 2	-	-
$1,616,992	-	-	-	-	-	-	-	-	$1,616,992	-	-
Septic Upgrades	-	-	-	-	-	-	-	-	-	-	-
Banana River Lagoon	-	-	-	-	-	5 Upgrades*	9 Upgrades*	14 Upgrades*	24 Upgrades	24 Upgrades	24 Upgrades
$2,077,412	-	-	-	-	-	$54,384	$102,258	$217,515	$567,752	$567,752	$567,751
North IRL	-	-	-	10 Upgrades*	5 Upgrades*	20 Upgrades*	33 Upgrades*	32 Upgrades*	163 Upgrades	162 Upgrades	162 Upgrades
$12,366,283	-	-	-	$176,100	$90,000	$163,855	$383,585	$388,885	$3,721,286	$3,721,286	$3,721,286
Central IRL	-	-	-	2 Upgrades*	26 Upgrades*	24 Upgrades*	67 Upgrades*	74 Upgrades*	197 Upgrades	197 Upgrades	196 Upgrades
$16,287,585	-	-	-	$34,485	$427,428	$298,087	$835,256	$1,224,189	$4,489,380	$4,489,380	$4,489,380
Stormwater Projects	-	-	-	-	-	-	-	-	-	-	-
Banana - Cape Canaveral	Central Boulevard Baffle Box*	-	-	-	-	-	-	-	-	-	-
$34,700	$34,700	-	-	-	-	-	-	-	-	-	-
Banana - Indian Harbour Beach	Gleason Park Reuse*	Big Muddy at Cynthia Baffle Box*	Big Muddy Expansion*	-	-	-	-	-	-	-	-
$63,855	$4,224	$41,695	$17,936	-	-	-	-	-	-	-	-
Banana - Cocoa Beach	-	-	-	-	Convair Cove 1 – Blakey Blvd*	McNabb Outfall Bioretention	-	Maritime Hammock Vegetative Islands	-	-	-
$35,607	-	-	-	-	$4,650	$22,159	-	$8,798	-	-	-
Banana - Cocoa Beach	-	-	-	-	Convair Cove 2- Dempsey Drive *	-	-	Cocoa Beach Golf Vegetative Islands	-	-	-
$42,593	-	-	-	-	$4,495	-	-	$38,098	-	-	-
Banana - Cocoa Beach	-	-	-	-	-	-	-	Ramp Road Park	Cocoa Isles Dry Pond	-	-
$23,110	-	-	-	-	-	-	-	$17,384	$5,726	-	-
Banana - Satellite Beach	-	-	-	Jackson Court*	Lori Laine*	-	-	-	Westside Basin	-	-
$81,824	-	-	-	$8,266	$17,525	-	-	-	$56,033	-	-
Banana - Woodland	-	-	-	-	-	-	Woodland Business Center	-	-	-	-
$5,255	-	-	-	-	-	-	$5,255	-	-	-	-
Banana - Brevard	-	-	Basin 1304 Bioreactor*	-	-	Basin 960 Pioneer Road	Basin 998 Hampton Homes	-	-	-	-
$195,500	-	-	$83,029	-	-	$44,322	$68,149	-	-	-	-
Banana - Brevard	-	-	-	-	-	-	Basin 1066 Angel Avenue	-	-	-	-
$248,738	-	-	-	-	-	-	$248,738	-	-	-	-

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
Banana - Brevard	-	-	-	-	-	-	Basin 1124 Elliot Drive	-	-	-	-
$158,648	-	-	-	-	-	-	$158,648	-	-	-	-
Banana - Brevard	-	-	-	-	-	-	Basin 998 Richland Avenue Canal	-	-	-	-
$140,097	-	-	-	-	-	-	$140,097	-	-	-	-
Banana - Brevard	-	-	-	-	-	-	Basin 1280B Flamingo Road	-	-	-	-
$76,748	-	-	-	-	-	-	$76,748	-	-	-	-
Banana - Brevard	-	-	-	-	-	-	Basin 1304 West Arlington Road	-	-	-	-
$103,293	-	-	-	-	-	-	$103,293	-	-	-	-
Banana - Brevard	-	-	-	-	-	-	-	-	30 Projects	30 Projects	29 Projects
$23,891,616	-	-	-	-	-	-	-	-	$10,408,441	$7,113,779	$6,369,396
North IRL - Cocoa	Church Street Type II Baffle Box*	-	-	Floating Wetlands*	North and South Lakemont*	-	North Fiske Floating Wetlands*	-	-	-	-
$152,596	$88,045	-	-	$1,497	$13,054	-	$50,000	-	-	-	-
North IRL - Cocoa	-	-	-	Forrest Avenue Outfall	-	-	-	-	-	-	-
$20,133	-	-	-	$20,133	-	-	-	-	-	-	-
North IRL - Titusville	-	St. Teresa Basin Treatment*	Titusville High School Baffle Box*	-	St. Johns 2 Baffle Box*	Sand Point Park Baffle Box*	Riverfront Center Nutrient Removing Boxes*	-	Coleman Pond Circulation	-	-
$1,030,851	-	$272,800	$111,813	-	$243,070	$52,155	$224,992	-	$126,021	-	-
North IRL - Titusville	-	South Street Basin Treatment*	Coleman Pond Managed Aquatic Plant System*	Osprey Plant Managed Aquatic Plant Systems*	Marina B Managed Aquatic Plants*	-	Commons and City Hall Tree Boxes	-	Tennessee Street Baffle Box	-	-
$684,081	-	$86,856	$11,438	$37,500	$6,670	-	$26,823	-	$514,794	-	-
North IRL - Titusville	-	La Paloma Basin Treatment*	-	Draa Pond Managed Aquatic Plant Systems*	-	-	-	-	Osprey Pond Circulator	-	-
$325,971	-	$208,296	-	$31,281	-	-	-	-	$86,394	-	-
North IRL - Melbourne	-	Cliff Creek Baffle Box*	Apollo/GA Baffle Box	-	High School and Funeral Home Baffle Boxes*	-	-	-	Cemetery Baffle Box	-	-
$1,188,905	-	$347,781	$421,774	-	$203,008	-	-	-	$216,342	-	-
North IRL - Melbourne	-	Thrush Drive Baffle Box*	-	-	-	-	-	-	-	-	-
$322,200	-	$322,200	-	-	-	-	-	-	-	-	-
North IRL - Melbourne	-	-	Spring Creek Baffle Box	-	Basin 1335 (Sherwood Park)*	-	-	-	-	-	-
$765,522	-	-	$473,122	-	$292,400	-	-	-	-	-	-
North IRL - Indialantic	-	-	-	Basin 5 Dry Retention*	-	-	-	-	-	-	-
$16,680	-	-	-	$16,680	-	-	-	-	-	-	-
North IRL - Brevard	-	Kingsmill-Aurora Phase Two	Basin 1298 Bioreactor*	-	-	Basin 1398 Sand Dollar Canal Bioreactor	-	-	Waelti Drive Pond Retrofi	-	-
$911,446	-	$501,882	$85,829	-	-	$225,917	-	-	$97,818	-	-
North IRL - Brevard	-	Denitrification Retrofit of Huntington Pond	Johns Road Pond*	Basin 10 County Line Road Bioreactor*	-	-	-	-	Lake Washington & Croton Road Pond	-	-
$295,226	-	$143,017	$23,030	$72,773	-	-	-	-	$56,406	-	-
North IRL - Brevard	-	Denitrification Retrofit of Flounder Creek Pond	Burkholm Road*	Basin 26 Sunset Avenue Serenity Park Bioreactor*	-	Basin 89 Scottsmoor I Aurantia*	-	-	North Wickham & Conservation Place Wet Pond	-	-
$486,826	-	$102,876	$64,390	$73,810	-	$152,573	-	-	$93,177	-	-

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
North IRL - Brevard	-	Denitrification Retrofit of Johns Road Pond*	Carter Road*	Basin 141 Irwin Avenue Woodchip Bioreactor*	-	-	-	-	-	-	-
$237,196	-	$105,512	$62,510	$69,174	-	-	-	-	-	-	-
North IRL - Brevard	-	-	Wiley Avenue*	Basin 22 Hunting Road Serenity Park Bioreactor*	-	-	-	-	-	-	-
$122,812	-	-	$82,735	$40,077	-	-	-	-	-	-	-
North IRL - Brevard	-	-	Broadway Pond*	-	-	-	-	-	-	-	-
$42,864	-	-	$42,864	-	-	-	-	-	-	-	-
North IRL - Brevard	-	-	-	-	-	Johnson Junior High Denitrification*	-	-	27 Projects	27 Projects	24 Projects
$37,509,792	-	-	-	-	-	$40,815	-	-	$17,552,169	$10,641,980	$9,274,828
Central IRL - Palm Bay	Bayfront Stormwater Project*	-	-	-	-	-	-	-	-	-	-
$30,624	$30,624	-	-	-	-	-	-	-	-	-	-
Central IRL - Melbourne	-	-	Grant Place Baffle Box*	-	Ray Bullard Stormwater Management Area*	-	-	-	Darrow Baffle Box	-	-
$385,680	-	-	$82,481	-	$111,847	-	-	-	$191,352	-	-
Central IRL - Melbourne	-	-	Espanola Baffle Box	-	-	-	-	River Park Baffle Box	Line Street Cemetery Baffle Box	-	-
$744,186	-	-	$150,422	-	-	-	-	$318,874	$274,890	-	-
Central - St. Johns River Water Management District	-	-	Crane Creek/M-1 Canal Flow Restoration	-	-	-	-	C-10 Water Management Area	-	-	-
$13,709,572	-	-	$2,883,368	-	-	-	-	$10,826,204	-	-	-
Central IRL - Brevard	-	-	Fleming Grant*	Basin 2258 Babcock Road Bioreactor	-	-	-	-	-	-	-
$129,011	-	-	$56,588	$72,423	-	-	-	-	-	-	-
Vegetation Harvesting	-	-	-	-	-	-	-	-	-	-	-
Banana - Brevard	-	-	-	-	-	Basin 958 Pioneer Road	-	-	Unincorporated Countywide 2	-	-
$518,312	-	-	-	-	-	$45,554	-	-	$472,758	-	-
Banana - Cocoa Beach	-	-	-	-	-	Maritime Hammock*	-	-	-	-	-
$7,700	-	-	-	-	-	$7,700	-	-	-	-	-
Banana - Cocoa Beach	-	-	-	-	-	-	Cocoa Beach Golf Course*	-			
$218,267	-	-	-	-	-	-	$218,267	-	-	-	-
North IRL - Brevard	-	-	-	County Wide Pond Harvesting*	Horseshoe Pond*	Basin 1398 Sand Dollar*	-	-	-	-	-
$46,560	-	-	-	$14,000	$8,140	$24,420	-	-	-	-	-
North IRL - Titusville	-	-	-	Draa Field Vegetation Harvesting*	-	-	-	-	-	-	-
$57,360	-	-	-	$57,360	-	-	-	-	-	-	-
Central IRL - Melbourne-Tillman	-	-	-	-	Mechanical Harvesting*	-	-	-	-	-	-
$1,011,976	-	-	-	-	$1,011,976	-	-	-	-	-	-
Countywide	-	-	-	-	-	-	Unincorporated Countywide*	-	-	-	-
$477,000	-	-	-	-	-	-	$477,000	-	-	-	-
Muck Removal & Interstitial Treatment	-	-	-	-	-	-	-	-	-	-	-

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
Banana River Lagoon	-	-	Cocoa Beach Phase III*	Cocoa Beach Ph II-B*	-	-	-	-	-	-	-
$7,287,455	-	-	$1,376,305	$5,911,150	-	-	-	-	-	-	-
Banana River Lagoon	-	-	Merritt Island	-	-	-	-	-	-	-	-
$10,963,220	-	-	$10,963,220	-	-	-	-	-	-	-	-
Banana River Lagoon	-	-	-	Indian Harbour Beach	Indian Harbour Beach	-	-	-	-	-	-
$12,922,232	-	-	-	$708,812	$12,213,420	-	-	-	-	-	-
Banana River Lagoon	-	-	29% Sykes Creek	-	71% Sykes Creek	-	-	-	-	-	-
$21,788,736	-	-	$8,131,624	-	$13,657,112	-	-	-	-	-	-
Banana River Lagoon	-	-	20% Grand Canal	25% Grand Canal	55% Grand Canal	-	-	-	-	-	-
$24,610,618	-	-	$4,124,950	$6,828,556	$13,657,112	-	-	-	-	-	-
Banana River Lagoon	-	-	-	2% Cocoa Beach Golf	2% Cocoa Beach Golf	8% Cocoa Beach Golf	8% Cocoa Beach Golf	20% Cocoa Beach Golf	20% Cocoa Beach Golf	20% Cocoa Beach Golf	20% Cocoa Beach Golf
$29,103,198	-	-	-	$597,280	$597,280	$2,090,481	$2,090,481	$5,931,919	$5,931,919	$5,931,919	$5,931,919
Banana River Lagoon	-	-	-	-	-	2% Canaveral South	25% Canaveral South	30% Canaveral South	35% Canaveral South	8% Canaveral South	-
$20,109,734	-	-	-	-	-	$477,824	$5,027,434	$6,032,921	$7,038,407	$1,533,148	-
Banana River Lagoon	-	-	-	-	-	3% Pineda	47% Pineda	50% Pineda	-	-	-
$9,336,662	-	-	-	-	-	$238,912	$4,429,419	$4,668,331	-	-	-
Banana River Lagoon	-	-	-	-	-	Patrick Space Force Base	-	-	-	-	-
$9,815,466	-	-	-	-	-	$9,815,466	-	-	-	-	-
Banana River Lagoon	-	-	-	Satellite Beach	Satellite Beach	-	-	-	-	-	-
$7,129,321	-	-	-	$721,302	$6,408,019	-	-	-	-	-	-
North IRL	-	-	2% Eau Gallie Northeast	49% Eau Gallie Northeast	49% Eau Gallie Northeast	-	-	-	-	-	-
$11,970,079	-	-	$239,401	$5,865,339	$5,865,339	-	-	-	-	-	-
North IRL	-	1% Titusville East	4% Titusville East	4% Titusville East	11% Titusville East	20% Titusville East	20% Titusville East	20% Titusville East	20% Titusville East	-	-
$5,506,238	-	$55,062	$220,250	$220,250	$605,686	$1,101,248	$1,101,248	$1,101,248	$1,101,246	-	-
North IRL	-	1% Titusville West	4% Titusville West	4% Titusville West	21% Titusville West	30% Titusville West	40% Titusville West	-	-	-	-
$4,309,228	-	$43,093	$172,369	$172,369	$904,938	$1,292,768	$1,723,691	-	-	-	-
North IRL	-	1% National Aeronautics and Space Administration East	4% National Aeronautics and Space Administration East	-	10% National Aeronautics and Space Administration East	10% National Aeronautics and Space Administration East	15% National Aeronautics and Space Administration East	18% National Aeronautics and Space Administration East	22% National Aeronautics and Space Administration East	20% National Aeronautics and Space Administration East	-
$13,645,890	-	$136,459	$545,835	-	$1,364,590	$1,364,590	$2,046,883	$2,495,696	$2,962,660	$2,729,177	-
North IRL	-	-	-	4% Rockledge A	48% Rockledge A	48% Rockledge A	-	-	-	-	-
$5,985,040	-	-	-	$238,912	$2,873,064	$2,873,064	-	-	-	-	-
North IRL - Melbourne	-	-	-	-	-	Spring Creek	-	-	-	-	-
$91,360	-	-	-	-	-	$91,360	-	-	-	-	-
North IRL - Melbourne	-	-	-	-	-	-	-	Mims Rim Ditch	-	-	-
$12,276,703	-	-	-	-	-	-	-	$12,276,703	-	-	-
Central IRL	-	Turkey Creek*	-	-	-	-	-	-	-	-	-
$137,329	-	$137,329	-	-	-	-	-	-	-	-	-
Central IRL	-	-	-	-	-	-	Sunnyland Canals	-	-	-	-
$5,587,081	-	-	-	-	-	-	$5,587,081	-	-	-	-
Central IRL	-	-	-	-	-	-	-	Shore View Lane	-	-	-
$46,490	-	-	-	-	-	-	-	$46,490	-	-	-
Oyster Bars	-	-	-	-	-	-	-	-	-	-	-
Banana - Brevard Zoo	-	Marina Isles*	Brevard Zoo Banana River	Brevard Zoo Banana River Oyster Project 2	Brevard Zoo Banana River Oyster Project 3	-	-	-	-	-	-
$1,324,352	-	$26,700	$833,753	$382,001	$81,898	-	-	-	-	-	-
Banana - Brevard Zoo	-	Bettinger*	-	Brevard Zoo Oyster Reef Adjustments	-	-	-	-	-	-	-
$29,145	-	$10,680	-	$18,465	-	-	-	-	-	-	-

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
Banana - Cocoa Beach	-	-	-	-	McNabb*	-	-	-	-	-	-
$9,134	-	-	-	-	$9,134	-	-	-	-	-	-
Banana - Brevard Zoo	-	Gitlin*	-	-	-	-	-	-	-	-	-
$16,020	-	$16,020	-	-	-	-	-	-	-	-	-
Banana - Brevard	-	-	-	-	-	-	-	28,556.3 square feet Oysters	28,556.3 square feet Oysters	28,556.3 square feet Oysters	28,556.3 square feet Oysters
$2,153,550	-	-	-	-	-	-	-	$538,388	$538,388	$538,387	$538,387
North IRL - Brevard Zoo	-	Bomalaski*	Brevard Zoo North IRL*	Brevard Zoo North IRL Oyster Project 2	Brevard Zoo North Indian River Lagoon Oyster Project 3	-	-	-	Brevard Zoo North Indian River Lagoon Oyster Project 4	-	-
$2,358,106	-	$8,800	$475,438	$485,292	$561,026	-	-	-	$827,450	-	-
North IRL - Brevard	-	-	-	-	-	-	-	-	49,803.3 square feet Oysters	49,803.3 square feet Oysters	49,803.3 square feet Oysters
$2,816,907	-	-	-	-	-	-	-	-	$938,969	$938,969	$938,969
North IRL - Brevard Zoo	-	-	-	Brevard Zoo Oyster Reef Adjustments	Brevard Zoo North Indian River Lagoon Individual Oyster Project	-	-	-	-	-	-
$270,875	-	-	-	$39,239	$231,636	-	-	-	-	-	-
Central IRL - Brevard Zoo	-	Coconut Point*	Brevard Zoo Central IRL*	Brevard Zoo Central IRL Oyster Project 2	Brevard Zoo Central Indian River Lagoon Oyster Project 3	-	-	-	Brevard Zoo Central Indian River Lagoon Oyster Project 5	-	-
$1,427,155	-	$45,120	$161,160	$390,657	$115,818	-	-	-	$714,400	-	-
Central IRL - Brevard Zoo	-	Wexford*	-	-	Brevard Zoo Central Indian River Lagoon Tributary Pilot Oyster Project	Central IRL Oyster Project 4	-	-	-	-	-
$497,436	-	$31,150	-	-	$308,670	$157,616	-	-	-	-	-
Central IRL - Brevard Zoo	-	-	-	-	-	Central Oyster Project Offshore Reefs	-	-	-	-	-
$407,627	-	-	-	-	-	$407,627	-	-	-	-	-
Central IRL - Brevard	-	-	-	-	-	Hog Point*	-	-	-	-	-
$21,023	-	-	-	-	-	$21,023	-	-	-	-	-
Central IRL - Brevard	-	Riverview Senior Resort*	-	-	-	-	-	-	-	-	-
$30,304	-	$30,304	-	-	-	-	-	-	-	-	-
Planted Shorelines	-	-	-	-	-	-	-	-	-	-	-
Banana - Marine Resources Council	-	Cocoa Beach*	-	-	-	-	-	-	-	-	-
$16,014	-	$16,014	-	-	-	-	-	-	-	-	-
Banana - Cocoa Beach	-	-	-	-	McNabb*	-	-	-	-	-	-
$1,680	-	-	-	-	$1,680	-	-	-	-	-	-
North IRL - Brevard Zoo	-	-	Brevard Zoo North IRL*	Brevard Zoo North IRL Plant Project 2*	-	-	-	-	-	-	-
$10,560	-	-	$720	$9,840	-	-	-	-	-	-	-
North IRL - Marine Resources Council	-	-	-	-	Scottsmoor	-	-	-	-	-	-
$14,132	-	-	-	-	$14,132	-	-	-	-	-	-
North IRL - Marine Resources Council	-	-	-	-	Riveredge*	-	-	-	-	-	-
$4,080	-	-	-	-	$4,080	-	-	-	-	-	-
North IRL - Brevard	-	-	-	-	-	Titusville Causeway	-	-	-	-	-
$35,868	-	-	-	-	-	$35,868	-	-	-	-	-
Central IRL - Marine Resources Council	-	Lagoon House*	-	Fisherman's Landing*	-	-	-	-	-	-	-

Project Name/Total Project Cost	Year 0 (Fiscal Year 2016-2017)	Year 1 (Fiscal Year 2017-2018)	Year 2 (Fiscal Year 2018-2019)	Year 3 (Fiscal Year 2019-2020)	Year 4 (Fiscal Year 2020-2021)	Year 5 (Fiscal Year 2021-2022)	Year 6 (Fiscal Year 2022-2023)	Year 7 (Fiscal Year 2023-2024)	Year 8 (Fiscal Year 2024-2025)	Year 9 (Fiscal Year 2025-2026)	Year 10 (Fiscal Year 2026-2027)
$28,761	-	$23,961	-	$4,800	-	-	-	-	-	-	-
Central IRL - Marine Resources Council	-	-	-	Rotary Park*	-	-	-	-	-	-	-
$4,800	-	-	-	$4,800	-	-	-	-	-	-	-
Clam Restoration	-	-	-	-	-	-	-	-	-	-	-
All	-	-	-	-	Aquaculture Stimulus*	Aquaculture Stimulus	-	-	-	-	-
$68,117	-	-	-	-	$36,000	$32,117	-	-	-	-	-
North IRL - IRL Clam Restoration	-	-	-	-	-	-	-	-	Titusville	-	-
$272,000	-	-	-	-	-	-	-	-	$272,000	-	-
Central IRL - IRL Clam Restoration	-	-	-	-	-	-	-	-	Grant Island	-	-
$170,000	-	-	-	-	-	-	-	-	$170,000	-	-
Project Monitoring	Year 0 Monitoring*	Year 1 Monitoring*	Year 2 Monitoring*	Year 3 Monitoring*	Year 4 Monitoring*	Year 5 Monitoring*	Year 6 Monitoring*	Year 7 Monitoring	Year 8 Monitoring	Year 9 Monitoring	Year 10 Monitoring
$10,000,000	$17,105	$170,279	$371,712	$858,018	$594,114	$887,709	$619,473	$1,620,398	$1,620,398	$1,620,397	$1,620,397
Contingency	-	-	-	-	-	-	-	-	-	-	-
Banana - Brevard	-	-	-	-	Grand Canal (Berkeley)	-	-	-	-	-	-
$217,053	-	-	-	-	$217,053	-	-	-	-	-	-
Banana - Cocoa Beach	-	Cocoa Beach Planted*	-	-	-	-	Maritime Hammock*	-	-	-	-
$6,846	-	$66	-	-	-	-	$6,780	-	-	-	-
Banana River Lagoon	-	-	-	-	-	-	-	Sykes M	-	-	-
$4,020,803	-	-	-	-	-	-	-	$4,020,803	-	-	-
Banana River Lagoon	-	-	-	-	-	-	-	Sykes N	-	-	-
$249,425	-	-	-	-	-	-	-	$249,425	-	-	-
Banana River Lagoon	-	-	-	-	-	-	-	Sykes T	-	-	-
$301,030	-	-	-	-	-	-	-	$301,030	-	-	-
Central IRL	-	Lagoon House Planted*	-	-	-	-	-	-	-	-	-
$39	-	$39	-	-	-	-	-	-	-	-	-
North IRL	Merritt Island Redevelopment Agency*	-	-	-	-	-	-	-	-	-	-
$268	$268	-	-	-	-	-	-	-	-	-	-
North IRL - Titusville	-	-	-	-	-	-	-	Riverfront Center Nutrient Removing Boxes*	-	-	-
$17,411	-	-	-	-	-	-	-	$17,411	-	-	-
North IRL - Titusville	-	-	-	-	Draa Field Vegetation Harvesting*	-	-	-	-	-	-
$29,053	-	-	-	-	$29,053	-	-	-	-	-	-
North IRL - Melbourne	-	-	-	-	Basin 1335 (Sherwood Park)*	-	-	-	-	-	-
$99,708	-	-	-	-	$99,708	-	-	-	-	-	-
Central IRL - Melbourne	-	-	-	-	Pennwood	-	-	-	-	-	-
$40,368	-	-	-	-	$40,368	-	-	-	-	-	-
Central IRL	-	-	-	-	-	-	-	Palm Bay A	-	-	-
$247,612	-	-	-	-	-	-	-	$247,612	-	-	-
All	Year 0 Contingency	Year 1 Contingency	Year 2 Contingency	Year 3 Contingency	Year 4 Contingency	Year 5 Contingency	Year 6 Contingency	Year 7 Contingency	Year 8 Contingency	Year 9 Contingency	Year 10 Contingency
$21,900,738	$8,649	$49,119	$1,482,883	$2,081,796	$4,021,203	$2,075,280	$1,651,525	$4,220,148	$3,452,036	$1,779,292	$1,078,807
$585,734,769	***$2,825,789***	***$15,773,699***	***$39,793,951***	***$60,708,702***	***$96,267,389***	***$49,633,337***	***$38,377,287***	***$98,951,727***	***$89,486,144***	***$54,372,798***	***$39,543,946***

* Completed project with actual Save Our Indian River Lagoon Trust Fund cost.

Appendix A: Funding Needs and Leveraging Opportunities

Brevard County explored a variety of possible mechanisms to fund the Indian River Lagoon (IRL) projects in this plan, including:

- Special Taxing District approved by referendum to allow an ad valorem tax levy and bonds
- Special Act by the legislature allowing ad valorem tax levy by referendum to issue bonds
- Local government surtax (0.5 cent sales tax)
- Altering legislation to allow for Tourist Development Council funding to be used for lagoon restoration
- Municipal Service Taxing Unit/Special District
- Increased stormwater utility assessment

The County placed a referendum on the November 8, 2016, ballot for the 0.5 cent sales tax, and this referendum passed by more than 60% of the vote. The Save Our Indian River Lagoon 0.5 cent sales tax will generate approximately $58.6 million per year. The proposed 1 mill increase would have generated approximately $32 million per year, whereas the proposed increase of 0.5 mill would have only generated $16 million per year. To implement the projects in a timely manner according to the schedule in **Table 6-10**, and to accelerate the projects where possible, the County will seek to use funds generated from the sales tax to leverage matching funding from grants and appropriations. If additional funding is provided through matching funds from other sources, additional projects may be implemented, which would increase the overall plan cost, and/or project timelines may be moved up to allow the benefits of those projects to occur earlier than planned.

The following includes examples of other funding programs (many from Florida Department of Environmental Protection, 2019).

IRL Water Quality Improvement Grants – This grant began in 2023 with $100 million allocated to local governments and nonstate entities to strengthen ongoing efforts to protect the IRL. In 2024, the Legislature allocated $75 million to this grant program. Project proposals can include wastewater improvements (including septic-to-sewer), stormwater management, and other projects that will help improve water quality and support the IRL Protection Program.

Section 319 grant program – The Florida Department of Environmental Protection administers funds received from United States Environmental Protection Agency to implement projects or programs that reduce nonpoint sources of pollution. Projects or programs must benefit Florida's impaired waters, and local sponsors must provide at least a 40% match or in-kind contribution. Eligible activities include demonstration and evaluation of urban and agricultural stormwater best management practices, stormwater retrofits, public education, and costs for homeowners to connect to sewer.

State water quality assistance grants – Funding may be available through periodic legislative appropriations to the Florida Department of Environmental Protection. When funds are available, the program prioritizes stormwater construction projects to benefit impaired waters, similar to the Section 319 grant program.

Water management district funding – Florida's five regional water management districts offer financial assistance for a variety of water-related projects, for water supply development, water resource development, and surface water restoration. Assistance may be provided from ad valorem tax revenues or from periodic legislative appropriations for alternative water supply development, springs restoration, and Surface Water Improvement and Management projects. The amount of funding available, matching requirements, and types of assistance may vary from year to year. Since 2023, funding has been directed to water supply, not water quality.

Budget Appropriation – The Florida Legislature may solicit applications directly for projects, including water projects, in anticipation of upcoming legislative sessions. This process is an opportunity to secure legislative sponsorship of project funding through the state budget.

IRL National Estuary Program – The IRL Council funds projects each year through their work plan process.

Tourism + Lagoon Grant Program – The Brevard County Tourism Development Council has approved funding for the development of projects that demonstrate a benefit to the health of the IRL and a positive impact to Brevard County for litter control along shorelines and causeways/entryways, restoration and protection of living shorelines, habitat restoration to support fish and wildlife viewing, and waterway destinations and access for improved and sustainable recreational waterway access. Due to revenue shortfalls in 2020, this program has been placed on an indefinite hold.

Clean Water State Revolving Fund loan program – This program provides low-interest loans to local governments to plan, design, and build or upgrade wastewater, stormwater, and nonpoint source pollution prevention projects. Discounted assistance for small communities is available. Interest rates on loans are below market rates and vary based on the economic wherewithal of the community. The Clean Water State Revolving Fund is Florida's largest financial assistance program for water infrastructure.

Florida Resilient Coastlines Program – The Florida Department of Environmental Protection offers technical assistance and funding to coastal communities dealing with increasingly complex flooding, erosion, and habitat shifts.

Resilient Florida Grants – The Resilient Florida Program was created in 2021 and is made up of several components including grants that are available to counties, municipalities, water management districts, flood control districts and regional resilience entities. The purpose of these grants is to help address the impacts of flooding and sea level rise by providing funding assistance to analyze and plan for vulnerabilities and implement projects for adaptation and mitigation.

Florida Rural Water Association Loan Program – This program provides low-interest bond or bank financing for community utility projects in coordination with the Florida Department of Environmental Protection's State Revolving Fund program. Other financial assistance may also be available.

Rural Development Rural Utilities Service Guaranteed and Direct Loans and Grants – The United States Department of Agriculture's program provides a combination of loans and grants for water, wastewater, and solid waste projects to rural communities and small incorporated municipalities.

Small Cities Community Development Block Grant Program – The Florida Department of Economic Opportunity makes funds available annually for water and sewer projects that benefit low- and moderate-income persons.

State Housing Initiatives Partnership Program – Florida Housing administers the program, which provides funds to local governments as an incentive to create partnerships that produce and preserve affordable homeownership and multifamily housing. The program is designed to provide very low, low, and moderate income families with assistance. Funding may be used for emergency repairs, new construction, rehabilitation, down payment and closing cost assistance, impact fees, construction and gap financing, mortgage buy-downs, acquisition of property for affordable housing, matching dollars for federal housing grants and programs, and homeownership counseling.

Rural Development Funding – The United States Department of Agriculture provides funds that will cover the repair and maintenance of private septic systems. The amount of funds available, as well as the specific purposes for which grants are intended, changes from year to year.

American Rescue Plan Act – The American Rescue Plan Act went into place in 2021 to help address the economic impacts from COVID-19. Funding from this act can be used by the state and local governments for a variety of projects including improvements to wastewater and stormwater infrastructure.

Federal Community Requests – Congress may solicit applications directly for projects, including water projects, for federal appropriation. This process is an opportunity to secure legislative sponsorship of project funding through the federal budget.

Appendix B: References

AECOM. 2024. Mobile Algae Harvesting to Mitigate Harmful Algal Blooms in Brackish Waterways. Final Report for Brevard County. Florida Department of Environmental Protection Innovation Technology for Harmful Algal Blooms, INV24.

Alachua County. 2012. Keeping Grass off the Streets Campaign Social Marketing Public Outreach Campaign Final Report. Alachua County Environmental Protection Department.

Al-Taliby, W. Mamoua, K., Pandit, A., Heck, H., and Berber, A. Groundwater nutrient loading into the northern Indian River Lagoon: measurements and modeling. Frontiers in Marine Science. December 2023.

Anderson, D. L. 2006. A Review of Nitrogen Loading and Treatment Performance Recommendation for Onsite Wastewater Treatment Systems in the Wekiva Study Area. Hazen and Sawyer, P.C.

Anderson, D. L. 2016. A Review of Nitrogen Loading and Treatment Performance Recommendations for Onsite Wastewater Treatment Systems (OWTS) in the Wekiva Study Area. Wekiva Issue Paper R:\40391-001.

Aoki, L.R., McGlathery, K.J., and Oreska, M.P.J. 2019. Seagrass restoration reestablishes the coastal nitrogen filter through enhanced burial. Limnology and Oceanography 65(1): 1-12.

Applied Ecology. 2018. Parcel-, Modified Focus Area, and Community-Based OSTDS Prioritization Analysis in Support of an Updated SOIRL Septic System Conversion and/or Replacement Projects. Prepared for Brevard County Natural Resources Management Department.

Applied Ecology. 2019. Save Our Indian River Lagoon Groundwater Monitoring of Sewer Lateral Retrofit Projects: Reporting Period May through August 2019. Prepared for Brevard County Natural Resources Management Department.

Applied Ecology. 2023. Save Our Indian River Lagoon Project Plan Quarterly Groundwater Quality Monitoring Report: August 2023 Through October 2023. Prepared for Brevard County under Task Order No. 19-4477-020-EC SOIRL.

Applied Ecology. 2023a. Brevard County Groundwater Monitoring Report: Annual Report for the Save Our Indian River Lagoon Project Plan Groundwater Quality Monitoring. Prepared for Brevard County Natural Resources Management Department.

Applied Ecology. 2023b. Remote Sensing of Harmful Algal Blooms in the Indian River Lagoon and Connected Waterways in Brevard County, Task 8.4 Indian River Lagoon HAB Remote Sensing Findings Memorandum, Final Report. Prepared for Brevard County.

Applied Ecology. 2024. Brevard County Groundwater Monitoring Report: Annual Report for the Save Our Indian River Lagoon Project Plan Groundwater Quality Monitoring. Prepared for Brevard County Natural Resources Management Department.

Applied Ecology. 2024. ArcNLET Model County-Wide Load Application For The Revised Septic Ordinance: Draft Memorandum. Prepared for Brevard County Natural Resources Management Department.

Applied Ecology and Marine Resources Council. 2022. Brevard County Groundwater Monitoring Report: Annual Report for the Save Our Indian River Lagoon Project Plan Groundwater Quality Monitoring. Prepared for Brevard County Natural Resources Management Department.

Arnade, L. J. 1999. Seasonal correlation of well contamination and septic tank distance. Ground Water 37: 920-923.

ASBRO, LLC. 2021. Potential of Managed Aquatic Plant Systems (MAPS) for high rate carbon capture and related co-benefits.

AtkinsRéalis. 2023. IRLNEP Seagrass Restoration Project Monitoring Report. Completed for Sea and Shoreline, LLC.

Auter, R., and Dierberg, F. April 1, 2020. Pilot-scale Deployment of a Remotely Controlled Solar Water Exchange-Recirculation-Aeration and Monitoring System in a Brevard Co. Residential Canal and Evaluation of Its Effectiveness at Nitrogen Removal and Water Quality Improvement.

Ayres Associates. 1993. An Investigation of the Surface Water Contamination Potential From On-Site Sewage Disposal Systems (OSDS) in the Turkey Creek Sub-Basin of the Indian River Lagoon Basin. St. Johns River Water Management District SWIM Project IR-1-110.1-D. Report to the Florida Department of Health and Rehabilitative Services under Contract No. LP114 and LP596.

Ayvazian S., Mulvaney, K., Zarnoch, C., Palta, M., Reichert-Nguyen, J., McNally, S., Pilaro, M., Jones, A., Terry, C., and Fulweiler, R.W. 2021. Beyond bioextraction: The role of oyster-mediated denitrification in nutrient management. Environmental Science & Technology 55: 14457-14465.

Badolato, M. Brevard County offers septic to sewer conversions.

Banta, G. T., Pedersen, M. F., and Nielsen, S. L. 2004. Decomposition of marine primary producers: Consequences for nutrient recycling and retention in coastal ecosystems, p. 187–216. In Estuarine nutrient cycling: the influence of primary producers. Kluwer Academic Publishers.

Barile, P. 2018. Widespread sewage pollution of the Indian River Lagoon system, Florida (USA) resolved by spatial analyses of macroalgal biogeochemistry. Marine Pollution Bulletin 128:557–574.

Barry, S., Reynolds, L., Braswell, A., Gittman, R., Scyphers, S., and Smyth, A. 2024. Perceived effectiveness drives shoreline decision-making for Florida's waterfront property owners. Ocean and Coastal Management 258: 107353. https://doi.org/10.1016/j.ocecoaman.2024.107353.

Beck, M., Sherwood, E., Henkel, J., Dorans, K., Ireland, K., and Varela, P. 5 August 2019. Assessment of the Cumulative Effects of Restoration Activities on Water Quality in Tampa Bay, Florida.

Bilskie, M. V., Bacopoulos, P., and Hagen, S. C. 1990. Astronomic tides and nonlinear tidal dispersion for a tropical coastal estuary with engineered features (causeways): Indian River Lagoon system. Estuarine, Coastal and Shelf Science 216:54-70.

Blue Life Program. Website.

Boesch, D.F. 2019. Barriers and bridges in abating coastal eutrophication. Frontiers in Marine Science 6: 123.

Bostater, C. and Rotkiske, T. 2016. Movement Measurements of Muck and Fluidized Mud at Dredge Sites. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Bostater, C. and Rotkiske, T. 2018. Moving Muck & Fluidized Mud & Tributary Bedload Measurements at Dredge Sites. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Boyd, C. 1969. The nutritive value of three species of water weeds. Economic Botany 23(2): 123-127.

Brehm, J. M., Pasko, D. K., and Eisenhauer, B.W. 2013. Identifying key factors in homeowner's adoption of water quality best management practices. Environmental Management. 52, 113–122.

Brevard County Natural Resources Management Department. 2017. Today's Leaves and Grass Clippings, Tomorrow's Indian River Lagoon Muck.

Brevard County Natural Resources Management. 2020. Low Impact Development Retrofit Guide.

Brevard County Natural Resources Management Department. 2021. Oyster Habitat Suitability and Rehabilitation Success Plan.

Brevard County Natural Resources Management Department. 2022. Indian River Lagoon National Estuary Program: Testing Steel Gabions and Concrete Core Modules for Use in Oyster Bars in the I.R.L. Final Report: 5/31/2022.

Brevard County Utility Services. 2013. Infrastructure Asset Evaluation.

Brevard Zoo. 203. Clam Restoration Contract #36524 Final Report. January 14, 2023.

Brewton, R.A., and Lapointe, B.E. 2023. The green macroalga Caulerpa prolifera replaces seagrass in a nitrogen enriched, phosphorus limited, urbanized estuary. Ecological Indicators 156:111035. https://doi.org/10.1016/j.ecolind.2023.111035.

Browne, M.A., and Chapman, M.G. 2011. Ecologically Informed Engineering Reduces Loss of Intertidal Biodiversity on Artificial Shorelines. Environmental Science & Technology 45:8204-8207.

Caretti, O., Reichert-Nguyen, J., and Slacum, W. 2023. Nitrogen and Phosphorus Reduction Associated with Harvest of Hatchery-Produced Oysters and Reef Restoration: Assimilation and Enhanced Denitrification Panel Recommendations. Oyster BMP Expert Panel Second Incremental Report. pp. 1-96.

Carsey, T. P., Ferry, R., Goodwin, K. D., Ortner, P. B., Proni, J., Swart, P. K., and Zhang, J. Z. 2005. Brevard County Near Shore Ocean Nutrification Analysis. National Oceanic and Atmospheric Administration/Brevard County Near Shore Nutrification Analysis Project Final Report.

Caschetto, M., Robertson, W., Petitta, M., and Aravena, R. 2018. Partial nitrification enhances natural attenuation of nitrogen in a septic system plume. Science of the Total Environment 625: 801–808.

CDM Smith and Taylor Engineering. 2014. Preliminary Concept Design for Artificial Flushing Projects in the Indian River Lagoon. Phase I – Literature Review/Preliminary Site Selection. Prepared for the St. Johns River Water Management District.

CDM Smith and Taylor Engineering. 2015. Preliminary Concept Design for Artificial Flushing Projects in the Indian River Lagoon. Phase II – Conceptual Design/Project Refinement. Prepared for the St. Johns River Water Management District.

Chang, N., Wanielista, M., Daranpob, A., Xuan, Z., and Hossain, F. 2010. New Performance-Based Passive Septic Tank Underground Drainfield for Nutrient and Pathogen Removal Using Sorption Media. Environmental Engineering Science, Volume: 27 Issue: 6, p. 469-482. doi: 10.1089/ees.2009.0387.

Cicala, S., Holland, S.P., Mansur, E.T., Muller, N.Z., and Yates, A. 2020. Expected Health Effects of Reduced Air Pollution From Covid-19 Social Distancing. Nber Working Paper Series.

City of DeLand and University of Central Florida. 2018. Final Report Bio-sorption Activated Media for Nitrogen Removal in a Rapid Infiltration Basin – Monitoring Project. Prepared for Florida Department of Environmental Protection: Project Agreement No. NS 003.

Clark, L. B., Gobler, C. J., and Sañudo-Wilhelm, S. A. 2006. Spatial and Temporal Dynamics of Dissolved Trace Metals, Organic Carbon, Mineral Nutrients, and Phytoplankton in a Coastal Lagoon: Great South Bay, New York. Estuaries and Coasts 29:841–854.

Clements, J. C. and Comeau, L. A. 2019. Nitrogen removal potential of shellfish aquaculture harvests in eastern Canada: A comparison of culture methods. Aquaculture Reports. Volume 13, March 2019, 100183.

CloseWaters LLC. 2016. Expected Monetary Value Evaluation for the Save Our Indian River Lagoon Project Plan.

Cogger, C. G., Hajjar, L. M., Moe, C. L., and Sobsey, M. D. 1988. Septic System Performance on a Coastal Barrier Island. Journal of Environmental Quality 17:401-408.

Cornwell, J. M., Kellogg, L., Owens, M. S., and Reichert-Nguyen, J. 2019. A Planning Estimate for an Oyster Reef Restoration Enhanced Denitrification Rate Based on Harris Creek Data. pp. 1-8.

Cowan, J. L. and Boynton, W. R. 1996. Sediment-water oxygen and nutrient exchanges along the longitudinal axis of Chesapeake Bay: Seasonal Patterns, controlling factors and ecological significance. Estuaries 19:562-580.

Currin, C. A., Chappell, W. S., and Deaton, A. 2010. Developing alternative shoreline armoring strategies: The living shoreline approach in North Carolina, in Shipman, H., Dethier, M.N., Gelfenbaum, G., Fresh, K.L., and Dinicola, R.S., eds., 2010, Puget Sound Shorelines and the Impacts of Armoring—Proceedings of a State of the Science Workshop, May 2009: United States Geological Survey Scientific Investigations Report 2010-5254, p. 91-102.

Cusick, K.; Duran, G. 2021. sxtA4+ and sxtA4- Genotypes Occur Together within Natural Pyrodinium bahamense Sub-Populations from the Western Atlantic. Microorganisms 9, 1128. https://doi.org/ 10.3390/microorganisms9061128.

Dawes, C. J., Hanisak, D., and Kenworthy, J. W. 1995. Seagrass biodiversity in the Indian River Lagoon. Bulletin of Marine Science 57: 59–66.

DB Environmental. April 3, 2013. Analysis of Restoration Methodologies Evaluation of Ferrate Treatment of Surface Waters: Ferrate Treatment Technologies, LLC.

De, M., Silva-Sanchez, C., Kroll, K., Walsh, M.T., Nouri, M., Hunter, M.E., Ross, M., Clauss, T.M., and Denslow, N.D. 2021. Chronic exposure to glyphosate in Florida manatee. Environmental International 152:106493. https://doi.org/10.1016/j.envint.2021.106493.

De, M. and Toor, G. S. 2017. Nitrogen transformations in the mounded drainfields of drip dispersal and gravel trench septic systems. Ecological Engineering. 102. 352-360.

DeBusk, T.A., Dierberg, F.E., DeBusk, W.F., Jackson, S.D., Potts, J.A., Galloway, S.C., Sierer-Finn, D., and Gu, B. Sulfide concentration effects on Typha domingensis Pers. (cattail) and Cladium jamaicense Crantz (sawgrass) growth in everglades marshes. Aquatic Botany 124:78-84. https://doi.org/10.1016/j.aquabot.2015.03.006.

Dewsbury, B. M., Bhat, M. and Fourqurean, J. W. 2016. A review of seagrass economic valuations: gaps and progress in valuation approaches. Ecosystem Services 18: 68–77.

Dierberg, F.E., and DeBusk, T.A. 2005. An Evaluation of Two Tracers In Surface-Flow Wetlands: Rhodamine-WT and Lithium. Wetlands 25/1:8-25.

Dierberg, F.E., DeBusk, T.A., Henry, J. L., Jackson, S. D., Galloway, S., and Gabriel, M.C. 2012. Temporal and Spatial Patterns of Internal Phosphorus Recycling in a South Florida (USA) Stormwater Treatment Area. Journal of Environmental Quality 41:1661-1673.

Dierberg, F.E., DeBusk, T.A., Larson, N.R., Kharbanda, M.D., Chan, N., and Gabriel, M.C. 2011. Effects of sulfate amendments on mineralization and phosphorus release from South Florida (USA) wetland soils under anaerobic conditions. Soil Biology & Biochemistry 43:31-45. http://dx.doi.org/10.1016/j.soilbio.2010.09.006.

Dierberg, F.E., Juston, J.J., DeBusk, T.A., Pietro, K., and Gu, B. Relationship between hydraulic efficiency and phosphorus removal in a submerged aquatic vegetation-dominated treatment wetland. Elsevier Ecological Engineering 25:9-23. doi:10.1016/j.ecoleng.2004.12.018.

Dietz, M. E., Clausen, J. C., and Filchak, K. K. 2004. Education and changes in residential nonpoint source pollution. Environmental Management 34(5), 684–690.

Donnelly, M. and Sacks, P. 2024. Brevard County Save Our Indian River Lagoon (SOIRL) Living Shoreline Monitoring – Monthly Report for June 2024. Department of Biology, University of Central Florida, 4000 Central Florida Blvd., Orlando, Florida, 32816. Date Submitted: 30 June 2024. UCF Contract Numbers: 24-03-8396, 24-03-8424, 24-03-8A22, GR107930.

Donnelly, M. and Sacks, P. 2024. Brevard County Save Our Indian River Lagoon (SOIRL) Living Shoreline Monitoring – Monthly Report for July 2024. Department of Biology, University of Central Florida, 4000 Central Florida Blvd., Orlando, Florida, 32816. Date Submitted: 31 July 2024. UCF Contract Numbers: 24-03-8396, 24-03-8424, 24-03-8A22, GR107930.

Donnelly, M. and Sacks, P. 2024. Brevard County Save Our Indian River Lagoon (SOIRL) Living Shoreline Monitoring – Monthly Report for September 2024. Department of Biology, University of Central Florida, 4000 Central Florida Blvd., Orlando, Florida, 32816. Date Submitted: September 30, 2024. UCF Contract Numbers: 24-03-8396, 24-03-8424, 24-03-8A22, GR107930.

Donnelly, M., Shaffer, M., Connor, S., and Walters, L. 2018. Shoreline Characterization in the northern Indian River Lagoon. Coastal and Estuarine Ecology Lab Research Data 2.

Fillya, R. 2021. Strategies for successful mangrove living shoreline stabilizations in shallow water subtropical estuaries. Electronic Theses and Dissertations, 2020-.501.

Fisher, T. R., Carlson, P. R., and Barber, R. T. 1982. Sediment nutrient regeneration in three North Carolina estuaries. Estuarine, Coastal and Shelf Science 14:101-116.

Fisher, T. R., Gilbert, P. M., Hagy, J.D., Harding, L. W., Houde, E. D., Kimmel, D. G., Miller, W. D., Newell, R. I. E., Roman M. R., Smith, E. M., and Stevenson, J. C. 2005. Eutrophication of Chesapeake Bay: historical trends and ecological interactions. Marine Ecology Progress Series 303:1-29.

Florida Department of Agriculture and Consumer Services. Detail Fertilizer Summary by County. From July 2011 to June 2012.

Florida Department of Agriculture and Consumer Services. Total Fertilizer and Nutrients by County. From July 2011 to June 2012.

Florida Department of Agriculture and Consumer Services. Total Fertilizer and Nutrients for Brevard County for Fiscal Year 2012-2013, Fiscal Year 2013-2014, Fiscal Year 2014-2015, and Fiscal Year 2015-2016. Personal communication on May 17, 2016.

Florida Department of Environmental Protection. 2010. Florida Friendly Best Management Practices for Protection of Water Resources by the Green Industries.

Florida Department of Environmental Protection. 2012. Removal of Aquatic Vegetation for Nutrient Credits in the Indian River Lagoon (IRL) Basin.

Florida Department of Environmental Protection. 2013a. Basin Management Action Plan for the Implementation of Total Maximum Daily Loads for Nutrients Adopted by the Florida Department of Environmental Protection in the Indian River Lagoon Basin, Central Indian River Lagoon.

Florida Department of Environmental Protection. 2013b. Basin Management Action Plan for the Implementation of Total Maximum Daily Loads for Nutrients Adopted by the Florida Department of Environmental Protection in the Indian River Lagoon Basin, Banana River Lagoon.

Florida Department of Environmental Protection. 2013c. Basin Management Action Plan for the Implementation of Total Maximum Daily Loads for Nutrients Adopted by the Florida Department of Environmental Protection in the Indian River Lagoon Basin, North Indian River Lagoon.

Florida Department of Environmental Protection. 2021a. Indian River Lagoon Basin, Banana River Lagoon Basin Management Action Plan. Division of Environmental Assessment and Restoration, Water Quality Restoration Program.

Florida Department of Environmental Protection. 2021b. Indian River Lagoon Basin, Central Indian River Lagoon Basin Management Action Plan. Division of Environmental Assessment and Restoration, Water Quality Restoration Program.

Florida Department of Environmental Protection. 2021c. Indian River Lagoon Basin, North Indian River Lagoon Basin Management Action Plan. Division of Environmental Assessment and Restoration, Water Quality Restoration Program.

Florida Department of Environmental Protection. 2014. Presentation: Indian River Lagoon Basin Management Action Plan New Project Idea Feedback.

Florida Department of Environmental Protection. 2016. Reuse Statutory Authority.

Florida Department of Environmental Protection. 2017. Nitrogen Source Inventory and Loading Estimates for the Contributing Areas of Homosassa Springs Group and Chassahowitzka Springs Group. Division of Environmental Assessment and Restoration, Water Quality Evaluation and Total Maximum Daily Loads Program, Ground Water Management Section.

Florida Department of Environmental Protection. 2018. Statewide Best Management Practice (BMP) Efficiencies for Nonpoint Source Management of Surface Waters. Draft – January 2018.

Florida Department of Environmental Protection. 2019. Water Resources Funding in Florida. Prepared by the Division of Water Restoration Assistance.

Florida Department of Environmental Protection. 2021. Statewide Best Management Practice (BMP) Efficiencies for Crediting Projects in Basin Management Action Plans (BMAPs) and Alternative Restoration Plans Draft – September 2021

Florida Department of Environmental Protection and Water Management Districts. 2010. Draft Environmental Resource Permit Stormwater Quality Applicant's Handbook: Design Requirements for Stormwater Treatment Systems in Florida.

Florida Department of Health. 2015. Florida Onsite Sewage Nitrogen Reduction Strategies Study, Final Report.

Florida Institute of Technology. 2020. Restore Lagoon Inflow Research (Phase 1) Project Summary. Prepared for the Florida Department of Education.

Florida Institute of Technology. 2021. Restore Lagoon Inflow Research (Phase 2) Project Summary. Prepared for the Florida Department of Education.

Florida Institute of Technology. 2023. Restore Lagoon Inflow Research (Phase 3) Project Summary. Prepared for the Florida Department of Education.

Forand, N., DuBois, K., Halka, J., Hardaway, S., Janek, G., Karrh, L., Koch, E., Linker, L., Mason, P., Morgereth, E., Proctor, D., Smith, K., Stack, B., Stewart, S., and Wolinski, B. 2014. Recommendations of the Expert Panel to Define Removal Rates for Shoreline Management Projects. Submitted to: Urban Stormwater Work Group Chesapeake Bay Partnership.

Fox, A. 2022. Temporal & Spatial Trends for Benthic Fluxes of Nitrogen & Phosphorus within the IRL System, February 2022.

Fox, A. 2024. The Efficacy of Subaqueous Sand Capping to reduce inputs of Nitrogen and Phosphorus to the Indian River Lagoon (Task Order 4) (Brevard County) (FP-NR). Florida Institute of Technology. April 2024.

Fox, A., Leonard, H., Springer, E., Ralston, E., and Provoncha, T. 2023. Impacts of Glyphosate on Seagrass Growth and Nutrient Cycling; Informing Aquaculture and Restoration Efforts to Improve Outcomes. Florida Institute of Technology.

Fox, A., Leonard, H., Springer, E., and Provoncha, T. 2024. Glyphosate Herbicide Impacts on the Seagrasses Halodule wrightii and Ruppia maritima from a Subtropical Florida Estuary. J. Mar. Sci. Eng. 12:1941. https://doi.org/10.3390/jmse12111941.

Fox, A. L., and English, R. 2024 Suffocating Sand; Mapping Hypoxia and its Impacts on Benthic Nutrient Fluxes in the IRL: Phase II April 2024 Quarterly Report for the Indian River Lagoon Council & Brevard County.

Fox, A. L. and Trefry, J. H. 2018. Environmental Dredging to Remove Fine-Grained, Organic-Rich Sediments and Reduce Inputs of Nitrogen and Phosphorus to a Subtropical Estuary. Marine Technology Society Journal 52:42-57.

Fox, A. L. and Trefry J. H. 2019. Lagoon-Wide Application of the Quick-Flux Technique to Determine Sediment Nitrogen and Phosphorus Fluxes (Subtask 4). Impacts of Environmental Muck Dredging 2017-2018. Florida Institute of Technology.

Fox, A. L and Trefry, J. H. 2023. Nutrient fluxes from recent deposits of fine-grained, organic-rich sediments in a Florida estuary. Front. Mar. Sci. Vol. 10-2023.

Fox, A. L., 2023. Suffocating Sand; Mapping Hypoxia and its Impact on Benthic Nutrient Fluxes in the IRL. Final Project Report Prepared for the Indian River Lagoon Council.

Freitas, J., Julian, J., Kmitta, J., Prickett C., and Rogerson, M. 2022. Department of Naval Architecture and Ocean Engineering: Ocean Engineering Capstone Design – Living Shoreline in Brevard County, FL. Report Submitted to A. Metzger, T. Johnson, and P. Magoulick (Project Advisors) 5/4/2022.

Futch, C. R. 1967. A Survey of the Oyster Resources of Brevard County, Florida. Florida Board of Conservation, Marine Laboratory.

Gao, Y., Cornwell, J. C., Stocker, D. K., and Owens, M. S. 2012. Effects of cyanobacterial-driven pH increases on sediment nutrient fluxes and coupled nitrification denitrification in a shallow fresh water estuary. Biogeosciences 9:2697-2710.

Gehl, R. J., Schmidt, J. P., Stone, L. R., Schlegel, A. J., and Clark, G. A. 2005. In Situ Measurements of Nitrate Leaching Implicate Poor Nitrogen and Irrigation Management on Sandy Soils. Journal of Environmental Quality 34:2243–2254.

Geza, M., Lowe K. S., and McCray, J. E. 2014. STUMOD—a Tool for Predicting Fate and Transport of Nitrogen in Soil Treatment Units. Environ Model Assess 19:243–256.

GHD. 2020. Summary Report: Data Collection Efforts and Determination of Muck Deposit Volume Task Order No. 1904616-001-DSR SOIRL. Prepared for Brevard County Natural Resources Management Department.

Giblin, A. E. and Gaines, A. G. 1990. Nitrogen inputs to a marine embayment: the importance of groundwater. Biogeochemistry 10:309-328.

Gilliom, R. J. and Patmont, C. R. 1983. Lake Phosphorus Loading from Septic Systems by Seasonally Perched Groundwater. Water Pollution Control Federation 55:1297-1305.

GPI Southeast. 2010. Final Report Baffle Box Effectiveness Monitoring Project. DEP Contract No. S0236. Prepared for Florida Department of Environmental Protection and Sarasota County Board of County Commissioners.

Grabowski, J. H., Brumbaugh, R. D., Conrad, R. F., Keeler, A. G., Opaluch, J. J., Peterson, C. H., Piehler, M. F., Powers, S. P., and Smyth, A. R. 2012. Economic Valuation of Ecosystem Services Provided by Oyster Reefs. BioScience, Volume 62 No. 10, p. 900-909. doi:10.1525/bio.2012.62.10.10.

Griffin, D. W., Gibson, C. J., Lipp, E. K., and Riley, K. 1999. Detection of Viral Pathogens by Reverse Transcriptase PCR and of Microbial Indicators by Standard Methods in the Canals of the Florida Keys. Applied and Environmental Microbiology 65:4118-4125.

Grizzle, R. E., Greene, J. K., and Coen, L. D. 2008. Seston removal by natural and constructed intertidal eastern oyster (Crassostrea virginica) reefs: A comparison with previous laboratory studies, and the value of in situ methods. Estuaries and Coasts 31:1208-1220.

Hale, E. and Ozborne, T.Z. 2024. Restoring Bivalves in the Indian River Lagoon Using an R-Strategy. Contract # 38589, Final Report. Submitted to St. Johns River Water Management District.

Hansen, J., Abeels, H., Donnelly, M., Escandell, O., and Wayles, J. Restoration Monitoring: Standard Operating Procedures, Product of the Brevard County Shellfish and Living Shoreline Working Group.

Harden, H. H., Roeder, E., Hooks, M., and Chanton, J. P. 2008. Evaluation of onsite sewage treatment and disposal systems in shallow karst terrain. Water Research 42: 2585 – 2597.

Harden, H. H., Chanton, J. P., Hicks, R., and Wade, E. 2010. Wakulla County Septic Tank Study Phase II Report on Performance Based Treatment Systems. The Florida State University Department of Earth, Ocean and Atmospheric Science. FDEP Agreement No: WM926.

Harper, H. H. and Baker, D. M. 2007. Evaluation of Current Stormwater Design Criteria within the State of Florida. Prepared for Florida Department of Environmental Protection, Contract No. S0108.

Harris, P. J. 1995. Water quality impacts from on-site waste disposal systems to coastal areas through groundwater discharge. Environmental Geology 26:262-268.

Harrison, M., Stanwyck, E., Beckingham, B., Starry, O., Hanlon, B., and Newcomer, J. 2012. Smart growth and the septic tank: Wastewater treatment and growth management in the Baltimore region. Land Use Policy 29:483– 492.

Hazen and Sawyer. 2015. Evaluation of Full Scale Prototype Passive Nitrogen Reduction Systems (PNRS) and Recommendations for Future Implementation. Report to the Florida Department of Health. Report. Appendices.

Heres, B., Abeels, H., Shea, C., and Crowley-McIntyre, C.E. 2024. Environmental Variables driving horseshoe crab spawning behavior in a microtidal lagoon in Florida. PLoS One 19:6 e0302433. https://doi.org/10.1371/journal.pone.0302433.

Hochmuth, G., Trenholm, L., Rainey, D., Momol, E., Lewis, C., and Niemann, B. 2016. Managing Landscape Irrigation to Avoid Soil and Nutrient Losses. EDIS Publication: SL384.

Indian River Lagoon (IRL) Clam Restoration Project. 2019. Coastal Conservation Association, University of Florida Whitney Lab, Florida Fish and Wildlife Conservation Commission. Website.

Indian River Lagoon (IRL) National Estuary Program. 2019. Looking Ahead to 2030: A 10-Year Comprehensive Conservation and Management Plan for the Indian River Lagoon, Florida.

Johnson, K. 2017. Biological Responses to Muck Dredging in the Indian River Lagoon, Part I. Seagrass Monitoring and Infaunal Surveys. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Johnson, K. and Shenker, S. 2016. Biological Responses to Muck Removal. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Judice, T.J., Widder, E.A., Falls, W.H., Avouris, D.M., Cristiano, D.J. and Ortiz, J.D. 2020. Field-Validated Detection of *Aureoumbra lagunensis* Brown Tide Blooms in the Indian River Lagoon, Florida , Using Sentinel-3A OLCI and Ground- Based Hyperspectral Spectroradiometers. GeoHealth 4/6. https://doi.org/10.1029/2019GH000238.

Katz, B. G., Griffi, D. W., McMahon, P. B., Harden, H. S., Wade, E., Hicks, R. W., and Chanton, J. P. 2010. Fate of Effluent-Borne Contaminants beneath Septic Tank Drainfields Overlying a Karst Aquifer. Journal of Environmental Quality 39:1181–1195.

Kellogg, M. L., Luckenbach, M. W., Brown, B. L., Carmichael, R. H., Cornwell, J. C., Piehler, M. F., and Owens, M. S. 2013a. Quantifying Nitrogen Removal by Oysters Workshop Report. Submitted to National Oceanic and Atmospheric Administration Chesapeake Bay Office.

Kellogg, M.L., Cornwell, J.C., Owens, M.S., and Paynter K.T. 2013. Denitrification and nutrient assimilation on a restored oyster reef. Marine Ecology Progress Series 480:1-19.

Kellogg, M.L., Smyth, A.R., Luckenbach, M.W., Carmichael, R.H., Brown, B.L., Cornwell, J.C., Piehler, M.F., Owens, M.S., Dalrymple, D.J., and Higgins, C.B. 2014. Use of oysters to mitigate eutrophication in coastal waters. Estuarine, Coastal and Shelf Science 151: 156-168.

Kelly, J. R. and Nixon, S. W. 1984. Experimental studies of the effect of organic deposition on the metabolism of a coastal marine bottom community. Marine Ecology Progress Series 17:157-169.

Kemp, W. M. and Boynton, W. R. 1984. Spatial and temporal coupling of nutrient inputs to estuarine primary production. The role of particulate transport and decomposition. Bulletin of Marine Science 35:242-247.

Kemp, W. M., Boynton, W. R., Adolf, J. E., Boesch, D. F., Boicourt, W. C., Brush, G., Cornwell, J. C., Fisher, T. R., Gilbert, P. M., Hagy, J.D., Harding, L. W., Houde, E. D., Kimmel, D. G., Miller, W. D., Newell, R. I. E., Roman M. R., Smith, E. M., and Stevenson, J. C. 2005. Eutrophication of Chesapeake Bay: historical trends and ecological interactions. Marine Ecology Progress Series 303:1-29.

Kendal, C. and McDonnel, J. J. 1998. Isotope Tracers in Catchment Hydrology. Elsevier Science B.V., Amsterdam, 839 p.

Kibler, K.M., Kitsikoudis, V., Donnelly, M., Spiering, D.W., and Walters, L. 2019. Flow-Vegetation Interaction in a Living Shoreline Restoration and Potential Effect to Mangrove Recruitment. Sustainability 11:3215. doi:10.3390/su11113215.

Kimley Horn. 2018a. South Beaches Phase 1 Smoke Testing Report. Prepared for Brevard County Utility Services Department.

Kimley Horn. 2018b. South Beaches Phase 2 Smoke Testing Report. Prepared for Brevard County Utility Services Department.

Kindervater, E., Oudsema, M., Hassett, M.C., Partridge, C.G., and Steinman, A.D. 2022. Assessment of the effectiveness of muck-digesting bacterial pellets. Lake and Reservoir Management 38/2:150-164. https://doi.org/10.1080/10402381.2022.2029635.

Knowles, L. 1995. Rainfall and Freshwater Discharge in the Indian River Basin within the St. Johns River Water Management District, East-Central Florida, 1989-91. St. Johns River Water Management.

Komita, B., Weaver, R., McClain, N., and Fox, A. 2024. Natural and Engineered Ocean Inflow Projects to Improve Water Quality Through Increased Exchange. J. Mar. Sci. Eng. 12: 2047. https://doi.org/10.3390/jmse12112047.

Kroeger, Timm. 2012. Dollars and Sense: Economic Benefits and Impacts from two Oyster Reef Restoration Projects in the Northern Gulf of Mexico. The Nature Conservancy.

Koop, K., Boynton, W. R., Wulff, F., and Carman, R. 1990. Sediment-water oxygen and nutrient exchanges along a depth gradient in the Baltic Sea. Marine Ecology Progress Series 63:65-77.

Kruse, J., Unruh, B., Marvin, J., Wichman, T., Barber, L., Samuel, N., Bossart, J., Lewis, C., and Momol, E. 2021. Synthetic Turfgrass and the Nine Principles of Florida-Friendly Landscaping. University of Florida -Institute of Food and Agricultural. https://doi.org/10.32473/edis-EP612-2021.

Lackey, J. B. Ecology in the City of Cocoa Beach Actual and Potential Changes.

Lagoon Loyal. Website.

Lambert, M. R., Giller, J. S. J., Skelly, D. K., and Bribiescas, R. G. 2016. Septic systems, but not sanitary sewer lines, are associated with elevated estradiol in male frog metamorphs from suburban ponds. General and Comparative Endocrinology 232:109–114.

Lancellotti, B. V., Loomis, J. W., Hoyt, K. P., Avizinis, E., and Amador, J. A. 2017. Evaluation of Nitrogen Concentration in Final Effluent of Advanced Nitrogen-Removal Onsite Wastewater Treatment Systems (OWTS). Water Air Soil Pollution 228: 383.

Landos, M., Smith, M., and Immig, J. 2021. Aquatic Pollutants in Oceans and Fisheries. International Pollutants Elimination Network.

Lapointe, B. E., Brewton, R. A., and Wilking, L. E. 2018. Microbial Source Tracking of Bacterial Pollution in the North Fork of the St. Lucie River. Harbor Branch Oceanographic Institute Report.

Lapointe, B.E., Brewton, R. A., Wilking, L.E., and Herren, L.W. 2023. Fertilizer restrictions are not sufficient to mitigate nutrient pollution and harmful algal blooms in the Indian River Lagoon, Florida. Marine Pollution Bulletin 193:115041. https://www.sciencedirect.com/science/article/pii/S0025326X23004733.

Lapointe, B. E., Herren, L. W., Debortoli, D. D., and Vogel, M. A. 2015. Evidence of sewage-driven eutrophication and harmful algal blooms in Florida's Indian River Lagoon. Harmful Algae 43:82–102.

Lapointe, B. E., Herren, L. W., and Paule, A. L., Septic systems contribute to nutrient pollution and harmful algal blooms in the St. Lucie Estuary, Southeast Florida, USA. Harmful Algae 70:1–22.

Lasso de la Vega, E., and Ryan, J. 2016. Analysis of nutrients and chlorophyll relative to the 2008 fertilizer ordinance in Lee County, Florida. Florida Scientist 79:125-131.

Laureano-Rosario, A.E., McFarland, M., Bradshaw II, D.J., Metz, J., Brewton, R.A., Pitts, T., Perricone, C., Schreiber, S., Stockley, N., Wang, G., Guzman, E.A., Lapointe, B.E., Wright, A.E., Jacoby, C.A., and Twardowski, M.S. 2021. Dynamics of microcystins and saxitoxin in the Indian River Lagoon, Florida. Harmful Algae 103:102012. https://doi.org/10.1016/j.hal.2021.102012.

Lazarus, S. 2017. Wind and microclimate analysis improved site characterization in support of environmental flow modeling. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Lefebvre, L. W., Provancha, J. A., Slone, D. H., and Kenworthy, W. J. 2017. Manatee grazing impacts on a mixed species seagrass bed. Marine Ecology Progress Series 564:29-45.

Lewis, R. R. III, Clark, P. A., Fehring, W. K., Greening, H. S., Johansson, R. O., and Paul, R. T. 1999. The rehabilitation of the Tampa Bay Estuary, Florida, USA, as an example of successful integrated coastal management. Marine Pollution Bulletin 37: 468–473.

Li, L., Spoelstra, J., Robertson, W. D., Schiff, S. L., and Elgood, R. J. 2014. Nitrous Oxide as an Indicator of Nitrogen Transformation in a Septic System Plume. Journal of Hydrology 519:1882-1894.

Lusk, M., Toor, G. S., and Obreza, T. 2011. Onsite Sewage Treatment and Disposal Systems: Phosphorus. University of Florida-Institute of Food and Agricultural Sciences Publication SL349.

Ma, X., Fox, A., Fox, S., and Johnson, K.B. 2023. Phytoplankton and benthic infauna responses to aeration and experimental ecological remediation, in a polluted subtropical estuary with organic-rich sediments. PLoS ONE 19:1 e0280880. https://doi.org/10.1371/journal.pone.0280880.

MacMahon, J., Knappe, J., and Gill, L.W. 2021. Sludge accumulation rates in septic tanks used as part of the on-site treatment of domestic wastewater in a northern maritime temperate climate. Journal of Environmental Management 304:114199. https://doi.org/10.1016/j.jenvman.2021.114199.

Main, V.A., Gilligan, M.K., Cole, S.M., Osborne, T.Z., Smyth, A.R., and Simpson, L.T. 2024. Challenges to Seagrass Restoration in the Indian River Lagoon, Florida. J. Mar. Sci. Eng. 12: 1847. https://doi.org/10.3390/jmse12101847.

Mallin, M. A. 2013. Septic Systems in the Coastal Environment: Multiple Water Quality Problems in Many Areas. Monitoring Water Quality, http://dx.doi.org/10.1016/B978-0-444-59395-5.00004-2.

Mallin, M. A. and McIver, M. R. 2012. Pollutant impacts to Cape Hatteras National Seashore from urban runoff and septic leachate. Marine Pollution Bulletin 64: 1356–1366.

Marine Resources Council. 2022. Grass Clippings Campaign Phase II. Focus Group and Interviews Outcomes and Recommendations Report.

Marine Resources Council and Applied Ecology. 2020. Brevard County Groundwater Monitoring and Modeling Report: Final Report for the Groundwater Pollution, Engaging the Community in Solutions (Florida Department of Environmental Protection Contract #LP05112) and Save Our Indian River Lagoon Project Plan Groundwater Quality Monitoring (Task Order #271010-14-003). Prepared for Brevard County Natural Resources Management Department.

McGaughy, K., and Reza, M. January 29, 2018. Recovery of Macro and Micro-Nutrients by Hydrothermal Carbonization of Septage. Journal of Agricultural and Food Chemistry 66/8:1854-1862. doi: 10.1021/acs.jafc.7b05667.

McGlathery, K.J. 2008. Seagrass habitats. In: Capone, D.G., Bronk, D.A., Mulholland, M.R., Carpenter, E.J. (eds) Nitrogen in the marine environment, 2nd edition. Elsevier, New York, NY, p 1037−1071.

Meeroff, D. E., Bloetscher, F., Bocca, T., and Morin, F. 2008. Evaluation of Water Quality Impacts of On-site Treatment and Disposal Systems on Urban Coastal Waters. Water Air Soil Pollution 192:11–24.

Meile, C., Porubsky, W. P., Walker, R. L., and Payne, K. 2010. Natural attenuation of nitrogen loading from septic effluents: Spatial and environmental controls. Water Research 44:1399-1408.

Merck, A.W., Deaver, J.A., Cranes, L., Morrison, E.S., Call, D.F., Boyer, T.H., Marshall, A., and Grierger, K. 2024. Stakeholder Views of Science and Technologies for Phosphorus Sustainability: A Comparative Analysis of Three Case Studies in Phosphorus Recovery in the U.S. *Society & Natural Resources*, *37*(11), 1528–1545. https://doi.org/10.1080/08941920.2024.2389806.

Morris, L.J., Hall, L.M., Jacoby, C.A., Chamberlain, R.H., Hanisak, M.D., Miller, J.D., and Virnstein, R.W. 2022. Seagrass in a changing estuary, the Indian River Lagoon, Florida, USA. Submitted to Journal: Frontiers in Marine Science.

Morton, T. G., Gold, A. J., and Sullivan, W. M. 1988. Influence of Overwatering and Fertilization on Nitrogen Losses from Home Lawns. Journal of Environmental Quality. 17 :124-130. doi:10.2134/jeq1988.00472425001700010019x.

Muni-Morgan, A., Lusk, M.G., Heil, C., Goeckner, A., Chen, H., McKenna, A., and Scanlon Holland, P. 2023. Molecular characterization of dissolved organic matter in urban stormwater pond and municipal wastewater discharges transformed by the Florida red tide dinoflagellate Karenia brevis. Elsevier Science of the Total Environment 904:166291. https://doi.org/10.1016/j.scitotenv.2023.166291.

Newell, R.I.E. and Koch, E.W. 2004. Modeling seagrass density and distribution in response to changes in turbidity stemming from bivalve filtration and seagrass sediment stabilization. Estuaries 27(5): 793-806.

Ocean Research & Conservation Association. 2022. Satellite Algae Bloom and Nutrient Source Tracking Qtly 1. St. Johns River Water Management District.

Ocean Research & Conservation Association. 2022. Satellite Algae Bloom and Nutrient Source Tracking Qtly 2, Qtly 3 and Qtly 4. St. Johns River Water Management District.

Odera, E., Martin, E., and Lamm, A. J. 2015. Southern Florida High Water Users' Public Opinions of Water in Florida. PIE2013/14-11. Gainesville, FL: University of Florida/Institute of Food and Agricultural Sciences Center for Public Issues Education.

Okaloosa County Extension. Accessed: October 5, 2017.

Olive, M., Daniel, L., and Donley, A. 2018. Septic Tank Survey: 2018. University of Central Florida Institute for Social and Behavioral Sciences. Presented to the Marine Resources Council.

Orth, R. J., Carruthers, T. J. B., Dennison, W. C., Duarte, C. M., Fourqurean, J. W., Heck Jr., K. L., Hughes, R., Kendrick, G. A., Kenworthy, J., Olyarnik, S., Short, F. T., Waycott, M., and Williams, S. L. 2006. A global crisis for seagrass ecosystems. BioScience 56:987-996.

Osborne, T. Z., Martindale, M.Q., Nunez, J. M., Beal, J., Jacoby, C., Ellis, L. R., Lasi, M., and Gidus, F. 2020. Restoration of Clam Populations in the Indian River Lagoon for Water Quality Improvement. Final Report.

Otis, R., Kreissl, J., Frederick, R., Goo, R., Casey, P., and Tonning, B. 2002. Onsite Wastewater Treatment Systems Manual. EPA/625/R-00/008.

Ott, E., Monaghan, P., and Wells, O. 2015. Strategies to Encourage Adoption of Stormwater Pond Best Management Practices by Homeowners. University of Florida-Institute of Food and Agricultural Sciences.

Ouyang, Y. and Zhang, J. 2012. Quantification of Shallow Groundwater Nutrient Dynamics in Septic Areas. Water, Air, & Soil Pollution 223:3181-3193.

Paperno, R., Dutka-Gianelli, J., and Tremain, D. Seasonal Variation in Nekton Assemblages in Tidal and Nontidal Tributaries in a Barrier Island Lagoon System. Estuaries and Coasts 41:1821–1833.

Parkinson, R.W. 2023. Relevance of ongoing mitigation efforts to reduce Indian River Lagoon water quality impairment and restore ecosystem function under changing climate. Florida Scientist 86/2:199-210.

Parkinson, R.W., Juhasz, L., Xu, J. and Fu,· Z.J. 2024. Future Shorelines: A Living Shoreline Site Selection and Design Decision Support Tool that Incorporates Future Conditions Induced by Sea Level Rise. Estuaries and Coasts 47:2641-2654. https://doi.org/10.1007/s12237-024-01425-9.

Parkinson, R.W., Seidel, S., Henderson, C., and De Freese, D. 2021. Adaptation actions to reduce impairment of Indian River Lagoon water quality caused by climate change, Florida, USA. Coastal Management. https://doi.org/10.1080/08920753.2021.1875399.

Paterson, R. G., Burby, R. J., and Nelson, A. C. 1991. Sewering the Coast: Bane or Blessing to Marine Water Quality. Coastal Management 19:239-252.

Pellett, G.L., Sebacher, D. I., Bendura R.J., and Wornom, D.E. 2012. HCl in Rocket Exhaust Clouds: Atmospheric Dispersion, Acid Aeorsol Characteristics, and Acid Rain Deposition. Journal of the Air Pollution Control Association. https://doi.org/10.1080/00022470.1983.10465578.

Phillips, P. J., Schubert, C., Argue, D., Fisher, I., Furlong, E. T., Foreman, W., Gray, J., and Chalmers, A. 2015. Concentrations of Hormones, Pharmaceuticals and Other Micropollutants in Groundwater Affected by Septic Systems in New England and New York. Science of the Total Environment 512:43-54.

Piehler, M.F. and Smyth, A.R. 2011. Habitat-specific distinctions in estuarine denitrification affect both ecosystem function and services. Ecosphere 2(1): Article 12.

Powell, B., and Martens, M. 2005. A Review of acid sulfate soil impacts, actions and policies that impact on water quality in Great Barrier Reef catchments, including a case study on remediation at East Trinity. Marine Pollution Bulletin 51/1-4:149-164. https://doi.org/10.1016/j.marpolbul.2004.10.047.

Praecipio Economics Finance Statistics. 2016. The Blue Life Campaign and its Impact on Stormwater-Related Knowledge, Familiarity, Information and Behavior: Evidence from a Survey-Based Analysis of Brevard County Residents (2012 and 2015). Prepared for the Brevard County Board of County Commissioners.

Pyper, J. 2011. Can New Waste Treatment Make Energy and Profits from Sewage Plants?. Scientific American.

Ray, N.E. and Fulweiler, R.W. 2021. Meta-analysis of oyster impacts on coastal biogeochemistry. Nature Sustainability 4: 261-269.

Ray, N.E., Hancock, B., Brush, M.J., Colden, A., Cornwell, J., Labrie, M.S., Maguire, T.J., Maxwell, T., Rogers, D., Stevick, R.J., Unruh, A., Kellogg, M.L., Smyth, A.R., and

Fulweiler, R.W. 2021. A review of how we assess denitrification in oyster habitats and proposed guidelines for future studies. Limnology and Oceanography: Methods 19: 714-731.

Reichert-Nguyen, J. and Slacum, W. 2019. Planning Estimates for Oyster Reef Restoration BMPs Related to Nitrogen and Phosphorus Assimilation Based on Harris Creek Data and Draft Recommendations from the Oyster BMP Expert Panel. pp. 1-10.

Reidenbach, M. A., Berg, P., Hume, A., Hansen, J. C. R., and Whitman, E. R. 2013. Hydrodynamics of intertidal oyster reefs: The influence of boundary layer flow processes on sediment and oxygen exchange. Fluids and Environments 3: 225-239.

Restore America's Estuaries. 2015. Living Shorelines: From Barriers to Opportunities. Arlington, VA.

Reyier, E.A., Scheidt, D.M., Stolen, E.D., Lowers, R. H., Holloway-Adkins, K.G., and Ahr, B.J. 2020. Residency and dispersal of three sportfish species from a coastal marine reserve: Insights from a regional—scale acoustic telemetry network. Global Ecology and Conservation 23:e01057. https://doi.org/10.1016/j.gecco.2020.e01057.

Richards, S., Paterson, E., Withers, P. J., and Stutter, M. 2016. Septic Tank Discharges as Multi-Pollutant Hotspots in Catchments. Science of the Total Environment 542:854-863.

Ridge, J. T., Rodriguez, A. B., and Fodrie, F. J. 2017. Evidence of exceptional oyster-reef resilience to fluctuations in sea level. Ecology and Evolution 7: 10409-10420.

Riisgard, H.U. 1988. Efficiency of particle retention and filtration rate in 6 species of Northeast American bivalves. Marine Ecology Progress Series 45: 217-223.

Rios, J. F., Ye, M., Wang, L., Lee, P. Z., Davis, H., and Hicks, R. 2013. ArcNLET: A GIS-based Software to Simulate Groundwater Nitrate Load from Septic Systems to Surface Water Bodies. Computers & Geosciences 52:108-116.

Roadcap, G.S., Hackley, K.C., Hwang, H., and Johnson, T.M. 2002. Application of Nitrogen and Oxygen Isotopes to Identify Sources of Nitrate. Proceedings, 12th Annual Illinois Groundwater Consortium Symposium.

Robertson, W. D. 1995. Development of steady-state phosphate concentrations in septic system plumes. Journal of Contaminant Hydrology 19:289-305.

Robertson, W. D. 2008. Irreversible Phosphorus Sorption in Septic System Plumes? Ground Water 46:51-60.

Robertson, W. D., Cherry, J. A., and Sudicky, E. A. 1991. Ground-water Contamination from Two Small Septic Systems on Sand Aquifers. Groundwater 29:82-92.

Robertson, W. D., Schiff, S. L., and Ptacek, C. J. 1998. Review of Phosphate Mobility and Persistence in 10 Septic System Plumes. Round Water 36:1000-1010.

Roeder, E. 2008. Revised Estimates of Nitrogen Inputs and Nitrogen Loads in the Wekiva Study Area. Bureau of Onsite Sewage Programs Florida Department of Health.

Romero, J., Lee, K., Perez, M., Mateo, M. A., and Alcoverro, T. 2006. Nutrient dynamics in seagrass ecosystems. P. 227-254. In A. W. D. Larkum, R. J. Orth, and C. M. Duarte [eds.], Seagrasses: Biology, ecology and conservation. Springer.

Rose, J.M., Gosnell, J. S., Bricker, S., Brush, M.J., Colden, A., Harris, L., Karplus, E., Laferrier, A., Merrill, N.H., Murphy, T.B., Reitsma, J., Shockley, J., Stephenson, K., Theurkauf, S., Ward, D., and Fulweiler, R.W. 2021. Opportunities and challenges for including oyster-mediated denitrification in nitrogen management plans. Estuaries and Coasts 44: 2041-2055.

Rosen, J., Gibson., M., and Bartrand, T. 2010. Assessment of the Extra-Enteric Behavior of Fecal Indicator Organisms in Ambient Waters. United States Environmental Protection Agency Office of Water (4305T).

Rubiano-Rincon, S., and Larkin, P.D. 2022. An assessment of hydrogen sulfide intrusion in the seagrass *Halodule wrightii*. Experimental Results 3/e17:1-9. https://doi.org/10.1017/exp.2022.15.

Russel, M. and Greening, H. 2015. Estimating Benefits in a Recovering Estuary: Tampa Bay, Florida. Estuaries and Coasts 38 (suppl 1): S9-S18.

Saha, N., McGaughy, K., Davis, S.C., and Reza, M. 2021. Assessing hydrothermal carbonization as sustainable home sewage management for rural counties: a case study from Appalachian Ohio. Science and the Total Environment 781:146648. https://doi.org/10.1016/j.scitotenv.2021.146648.

Salup, N. Personal communication. December 31, 2019.

Sayemuzzaman, M. and Ye, M. August 2015. Estimation of Nitrogen Loading from Converted Septic Systems (2013-14 and 2014-15) to Surface Waterbodies in Port St. Lucie, FL. Department of Scientific Computing, Florida State University. Prepared for the Florida Department of Environmental Protection. Tallahassee, Florida.

Schmidt, A. L, Wysmyk, J. K. C., Craig, S. E., and Lotze, H. K. 2012. Regional-scale effects of eutrophication on ecosystem structure and services of seagrass beds. Limnology and Oceanography 57(5): 1389-1402.

Schmidt, C. and Gallagher, S. 2017. The denitrification potential and ecosystem services from ten years of oyster bed restoration in the Indian River Lagoon.

Scyphers, S. B., Powers, S. P., Heck, K. L. Jr., and Byron, D. 2011. Oyster Reefs as Natural Breakwaters Mitigate Shoreline Loss and Facilitate Fisheries. pLoS ONE 6(8):e22396. doi:10.1371/journal.pone.0022396.

Sea and Shoreline, LLC. 2023. Indian River Lagoon National Estuary Program (IRLNEP) Seagrass Restoration Project – Final Seagrass Monitoring Report.

Seevers, B., Graham, D., Gamon, J., and Conklin, N. 1997. Education through cooperative extension. Albany, NY: Delmar Publishers.

Sharma, S., Goff, J., Moody, R. M., Byron, D. Heck Jr., K. L., Powers, S. P., Ferraro, C., and Cebrian, J. 2016. Do restored oyster reefs benefit seagrass? An experimental study in the Northern Gulf of Mexico. Restoration Ecology doi: 10.1111/rec.12329.

Shea, A.D. 2023. Let's talk about seagrass A front-end evaluation to improve messaging strategies for seagrass conservation in Indian River Lagoon visitor centers. M.S Thesis Oregon State University. 83p.

Shenker, J. 2018. Biological Responses to Muck Dredging in the Indian River Lagoon, Part II: Fish Populations and Sea Grass Transplanting Experiment. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Sills, J. 2019. Editorial expression of concern. Sciencemag. Org.

Sisson, M., Kellogg, L., Luckenbach, M., Lipcius, R., Colden, A., Cornwell, J., and Owens, M. 2011. Assessment of oyster reefs in Lynnhaven River as a Chesapeake Bay TMDL Best Management Practice. Final Report to the U.S. Army Corps of Engineers, Norfolk District and The City of Virginia Beach. Special Report No. 429 In Applied Marine Science and Ocean Engineering.

Smith, N. 1993. Tidal and Nontidal of Florida's Indian River Lagoon. Estuaries 16:739-746.

Smyth, A. 2022. Brevard County Oyster reef Denitrification Assessment. Final Project Report: 15 June 2022.

Smyth, A.R., Piehler, M.F., and Grabowski, J.H. 2015. Habitat context influences nitrogen removal by restored oyster reefs. Journal of Applied Ecology 52: 716-725.

Souto, L. 2018. Source to Slime Study in Indian River Lagoon. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Stantec Consulting Services. 2022. Canaveral South Data Collection Analysis Summary. Prepared for Brevard County Natural Resources Management Department.

St. Johns River Water Management District. 2016a. Indian River Lagoon: background and history.

St. Johns River Water Management District. 2016b. 2011 Superbloom Report; Evaluating Effects and Possible Causes with Available Data. Prepared by Indian River Lagoon 2011 Consortium.

St. Johns River Water Management District. 2020. Results of SJRWMD Model Runs. Presentation by Mike Register, Director Water Supply Planning & Assessment.

Stewart III, E.A. 2021. An Independent Review and Critique of The Florida Fish and Wildlife Conservation Commission's Invasive Plant Management Section.

Stewart III, E. A. 2021. Environmental Review of Florida's Indian River Lagoon System.

Stewart III, E. A. 2022. Environmental Review of Florida's Indian River Lagoon System.

Swann, C. P. 2000. A survey of nutrient behavior among residents in the Chesapeake Bay watershed. In: National conference on tools for urban water resource management and protection., (pp 230-237). Chicago, IL, United States Environmental Protection Agency.

Swain, E. D. and Prinos, S. T. 2018. Using Heat as a Tracer to Determine Groundwater Seepage in the Indian River Lagoon, Florida, April–November 2017. United States Geological Survey Open-File Report 2018–1151.

Tetra Tech. 2015. Letter Report: Nutrient Mitigation Alternatives for Sediment Dewatering. Prepared for Brevard County Natural Resources Management Department.

Tetra Tech. 2020. Brevard County Muck Dredging Projects (2014-2019) Summary Report. Florida Department of Environmental Protection Grant Agreement No. S0714.

Tetra Tech. 2020. Brevard County Titusville Railroad Bridge East and West Borrow Pits: Task 2.9 Bathymetric and Muck Survey. Prepared for Brevard County Natural Resources Management Department.

Tetra Tech. 2020. Brevard County NASA Causeway East Survey Area: Task 2.0 Bathymetric and Muck Survey. Prepared for Brevard County Natural Resources Management Department.

Time and Date. 2021. December 2018 Weather in Merritt Island — Graph.

Tomasko, D.A., Britt, M., and Carnevale, M.J. 2016. The ability of barley straw, cypress leaves and L-lysine to inhibit cyanobacteria in Lake Hancock, a hypereutrophic lake in Florida. Charlotte Harbor NEP 2014 Watershed Summit Proceedings. Florida Scientist 79:147-158.

Tran, K. C., Euan, J., and Isla, M. L. 2002. Public Perception of Development Issues: Impact of Water Pollution on a Small Coastal Community. Ocean & Coastal Management 45:405-420.

Treat, S. F. and Lewis III, R. R. (eds). 2006. Seagrass restoration: success, failure, and the cost of both. Lewis Environmental Services, Inc. 175 pp.

Trenholm, L. E. and Sartain, J. B. 2010. Turf Nutrient Leaching and Best Management Practices in Florida. HortTechnology, volume 20, number 1, 107-110. Prepared by the University of Florida.

Trefry, J. H. 2013. Presentation on Sediment Accumulation and Removal in the Indian River Lagoon. Presentation to the Environmental Preservation and Conservation Senate Committee. Marine and Environmental Systems, Florida Institute of Technology.

Trefry, J. H. 2018. Personal communication.

Trefry, J.H., and Fox, A.L. October 2021. Extreme Runoff of Chemical Species of Nitrogen and Phosphorus Threatens and Florida Barrier Island Lagoon. Frontiers in Marine Science 8; 752945. doi: 10.3389/fmars.2021.752945.

Trefry, J. H., Fox, A. L., Trocine, R. P., Fox, S. L., and Beckett, K. M. 2019a. Trends for Inputs of Muck Components from Rivers, Creeks and Outfalls to the Indian River Lagoon (Subtask 3). Impacts of Environmental Muck Dredging 2017–2018. Florida Institute of Technology.

Trefry, J. H., Johnson, K. B., Fox, A. L., and Ma, X. 2019b. Optimizing Selection of Sites for Environmental Dredging in the Indian River Lagoon System (Subtask 5). Impacts of Environmental Muck Dredging 2017-2018. Florida Institute of Technology.

Trefry, J. H., Trocine, R. P., Fox, A. L., Fox, S. L., Voelker, J. E., and Beckett, K. M. 2016. The Efficiency of Muck Removal from the Indian River Lagoon and Water Quality after Muck Removal. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Trefry, J. H., Trocine, R. P., Fox, A. L., Fox, S. L., Voelker, J. E., and Beckett, K. M. 2016. Determining the Effectiveness of Muck Removal on Sediment and Water Quality in the Indian River Lagoon, Florida. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Trefry, J. H., Trocine, R. P., Fox, A. L., Fox, S. L., Voelker, J. E., and Beckett, K. M. 2017. Inputs of Nitrogen and Phosphorus from Major Tributaries to the Indian River Lagoon. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Wells, J. Preserving Paradise: A Case Study of Public Attitudes And Its Impact on the Conservation of the Indian River Lagoon Watershed. University of Central Florida STARS Honors Undergraduate Theses 2024.

University of Central Florida. 2020a. January Brevard County Save Our Indian River Lagoon Oyster Monitoring Report.

University of Central Florida. 2020b. November Brevard County Save Our Indian River Lagoon Oyster Monitoring Report.

University of Central Florida. 2022a. Brevard County Save Our Indian River Lagoon (SOIRL) Living Shoreline Monitoring – Monthly Report for April 2022

University of Central Florida. 2022b. Brevard County Save Our Indian River Lagoon (SOIRL) Living Shoreline Monitoring – Monthly Report for May 2022.

University of Central Florida. 2024a. Brevard County Save Our Indian River Lagoon (SOIRL) Living Shoreline Monitoring – Monthly Report for June 2024.

University of Central Florida. 2024b. Brevard County Save Our Indian River Lagoon (SOIRL) Living Shoreline Monitoring – Monthly Report for July 2024.

University of Central Florida. 2024c. Brevard County Save Our Indian River Lagoon (SOIRL) Living Shoreline Monitoring – Monthly Report for September 2024.

University of Florida College of Engineering. 2011. Quantifying Nutrient Loads Associated with Urban Particulate Matter, and Biogenic/Litter Recovery through Current Municipal

Separate Storm Sewer System Source Control and Maintenance Practices. Prepared for Florida Stormwater Association Educational Foundation.

University of Florida-Institute of Food and Agricultural Sciences. 2012. Warm-Season Turfgrass N Rates and Irrigation Best Management Practice Verification. Prepared for the Florida Department of Environmental Protection.

University of Florida-Institute of Food and Agricultural Sciences. 2013a. Using Reclaimed Water to Irrigate Turfgrass – Lessons Learned from Research with Nitrogen. Document SL389.

University of Florida-Institute of Food and Agricultural Sciences. 2013b. Urban Turf Fertilizer Rule for Home Lawn Fertilization. Document ENH1089.

University of Florida-Institute of Food and Agricultural Sciences. 2016. Florida Friendly Landscaping, Low Impact Development.

University of Florida-Institute of Food and Agricultural Sciences. 2017. EDIS SL181-B. Tissue Testing and Interpretation for Florida Turfgrasses.

University of Florida-Institute of Food and Agricultural Sciences. 2019, SGR 136. State of the Science for Harmful Algal Blooms in Florida: Karenia brevis and Microcystis spp. Produced from: Florida Harmful Algal Bloom State of the Science Symposium.

University of Florida-Institute of Food and Agricultural Sciences. Online Resource Guide for Florida Shellfish Aquaculture. c2014-2015. Accessed December 2019.

United States Census Bureau. 2015. Persons per household, 2010-2014.

United States Environmental Protection Agency. 2000. Wastewater Technology Fact Sheet: Package Plants. EPA 832-F-00-016.

United States Environmental Protection Agency. 2002. Onsite Wastewater Treatment Manual. EPA 625/R-00/008. National Risk Management Research Laboratory, Office of Water, United States Environmental Protection Agency. Washington, DC.

United States Environmental Protection Agency. 2005. Riparian Buffer Width, Vegetative Cover, and Nitrogen Removal Effectiveness.

United States Environmental Protection Agency. 2007. Biological Nutrient Removal Processes and Costs. Fact Sheet EPA823-R-07-002. Office of Water.

United States Environmental Protection Agency. Onsite Wastewater Treatment Systems Special Issues Fact Sheet 1. Septic Tank Additive.

Uppercase, Inc. 2018. Martin, Brevard & Volusia Grass Clippings Campaign Survey Research 2018 Draft Report.

Valiela, I. and Costa, J. E. 1988. Eutrophication of Buttermilk Bay, a Cape Cod Coastal Embayment: Concentrations of Nutrients and Watershed Nutrient Budgets. Environmental Management 12:539-553.

Valiela, I., Collins, G., Kremer, J., Lajtha, K., Geist, M., Seely, B., Brawley, J., and Sham, C. H. 1997. Nitrogen Loading from Coastal Watersheds to Receiving Estuaries: New Method and Application. Ecological Applications 7:358-380.

Valiela, I., Geist, M., McClelland, J., and Tomasky, G. 2000. Nitrogen Loading from Watersheds to Estuaries: Verification of the Waquoit Bay Nitrogen Loading Model. Biogeochemistry 49:277-293.

Waite, H. 2017. Investigating the Quantity and Types of Microplastics in the Organic Tissue of Oysters and Crabs in the Indian River Lagoon. Honors in the Major Theses. 157.

Wall, C.C., Peterson, B.J., and Gobler, C.J. 2008. Facilitation of seagrass Zostera marina productivity by suspension-feeding bivalves. Marine Ecology Progress Series 357: 165-174.

Wang, L., Ye, M., Rios, J. F., Fernandes, R., Lee, P. Z., and Hicks, R. W. 2013. Estimation of Nitrate Load from Septic Systems to Surface Water Bodies Using an ArcGIS-based Software. Environmental earth sciences 70:1911-1926.

Wang P, Ph.D. 2020. Wave modeling for Max Brewer Bridge Beach and Nearshore Improvements.

Wanielista, M., Goolsby, M., Chopra, M., Chang, N., and Hardin, M. 2011. Green Residential Stormwater Management Demonstration: An Integrated Stormwater Management and Graywater System to Reduce the Quantity and Improve the Quality of Residential Water Discharges. University of Central Florida Stormwater Management Academy. Prepared for the Florida Department of Environmental Protection.

Wanielista, M. 2015. A Biosorption Activated Media Called Bold & Gold to Reduce Nutrients in Stormwater. Presentation. University of Central Florida.

Weaver, R. J. and Waite, T. D. 2018. Feasibility of muck removal at fixed locations in the IRL watershed and subsequent ferrate treatment to remove nutrients and contaminants. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Wildwood Consulting. January 2023 Indian River Lagoon Seagrass Restoration Seagrass Assembly Report Final.

Windsor, J. G., Bostater, C., Johnson, K. B., Shenker, J., Trefry, J. H., and Zarillo. G. A., Impacts of Environmental Muck Dredging 2014–2015 Final Project Report to Brevard County Natural Resources Management Department, Funding provided by the Florida legislature as part of DEP Grant Agreement No. S0714 – Brevard County Muck Dredging, Indian River Lagoon Research Institute, Florida Institute of Technology, Melbourne, Florida.

Withers, P. J. A., Jarvie, H. P., and Stoate, C. 2011. Quantifying the Impact of Septic Tank Systems on Eutrophication Risk in Rural Headwaters. Environment International 37:644-653.

Withers, P. J. A., May, L., Jarvie, H. P., Jordan, P., Doody, D., Foy, R. H., Bechmann, M., Cooksley, S., Dils, R., and Deal, N. 2012. Nutrient Emissions to Water from Septic Tank Systems in Rural Catchments: Uncertainties and Implications for Policy. Environmental Science & Policy 24:71-82.

Withers, P. J., Jordan, P., May, L., Jarvie, H. P., and Deal, N. E. 2014. Do Septic Tank Systems Pose a Hidden Threat to Water Quality? Frontiers in Ecology and the Environment 12:123-130.

Wood Environment and Infrastructure Solutions, Inc. 2021. Lake Jesup: In-Lake Phosphorus Reduction Phosphorus Technology Update and Evaluation (Tasks 1-5) Final Report. Prepared for St. Johns River Water Management District.

WSP USA E&I, INC. 2024. Field Evaluation of In-Lake Treatments to Reduce Water Column Phosphorus in Lake Jesup. Prepared for St. Johns River Water Management District.

Xiao, H., Wang, D., Hagen, S. C., Medeiros, S. C., and Hall, C. R. 2016. Assessing the Impacts of Sea-level Rise and Precipitation Change on the Surficial Aquifer in the Low-lying Coastal Alluvial Plains and Barrier Islands, East-central Florida (USA). Hydrogeology Journal 24:1791-1806.

Zanini, L., Robertson, W. D., Ptacek, C. J., Schiff, S. L., and Mayer, T. 1998. Phosphorus characterization in sediments impacted by septic effluent at four sites in central Canada. Journal of Contaminant Hydrology 33:405–429.

Zarillo, G. 2018. Numerical Flushing Experiments Final Report. Submitted to the Indian River Lagoon National Estuary Program and Canaveral Port Authority. Florida Institute of Technology, Melbourne, FL.

Zarillo, G. 2019. Numerical Model Flushing Experiments Addendum Report. Submitted to the Indian River Lagoon National Estuary Program and Canaveral Port Authority. Florida Institute of Technology, Melbourne, FL.

Zarillo, G. 2022. Impacts of Environmental Muck Dredging. DEP Grant Agreement No. NS005. Indian River Lagoon Research Institute Florida Institute of Technology.

Zarillo, G. and Listopad, C. 2016. Hydrologic and Water Quality Model for Management and Forecasting within Brevard County Waters. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Zarillo, G. and Listopad, C. 2017. Hydrologic and Water Quality Model for Management and Forecasting within Brevard County Waters. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Zarillo, G.A. 2018. The Indian River Lagoon MBON: Monitoring Marine Biodiversity Across a Marine Biogeographic Boundary. Florida Institute of Technology.

Zarillo, G. A. and Listopad, C. 2019. Sediment & Water Quality Modeling for Nutrients, Muck and Water Clarity Scenario Assessments. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Zarillo, G. A. and Listopad, C. 2022. Sediment & Water Quality Modeling for Nutrients, Muck and Water Clarity Scenario Assessments. Impacts of Environmental Muck Dredging at Florida Institute of Technology Annual Report.

Zarillo, G.A., and Weaver, R.J., March 2020. Restore Lagoon Inflow Research (Phase 1) Modeling and Engineering. Florida Institute of Technology.

Zhang, X., Liu, X., Zhang, M., Dahlgren, R. A., and Eitzel, M. 2010. A Review of Vegetated Buffers and a Meta-analysis of Their Mitigation Efficacy in Reducing Nonpoint Source Pollution. Journal of Environmental Quality 39:76-84.

Zhu, Y., Ye, M., Roeder, E., Hicks, R. W., Shi, L., and Yang, J. 2016. Estimating Ammonium and Nitrate Load from Septic Systems to Surface Water Bodies within ArcGIS Environments. Journal of Hydrology 532:177-192.

zu Ermgassen, P., Hancock, B., DeAngelis, B., Greene, J., Schuster, E., Spalding, M., and Brumbaugh, R. 2016. Setting objectives for oyster habitat restoration using ecosystem services: A manager's guide. The Nature Conservancy, Arlington VA. 76pp.

Appendix C: Seagrasses

Loss of Seagrass

In partnership, the St. Johns River Water Management District, South Florida Water Management District, and Florida Department of Environmental Protection mapped seagrass from aerial imagery taken in 1943 and every two to three years since 1986 (**Figure C-1**). Through 2009, the areal footprint of seagrass generally expanded, with some areas nearing their targets, which are benchmarks to evaluate the success of reducing nutrient loads to the Indian River Lagoon (IRL) system. Unfortunately, the areal extent of seagrass in the IRL began to decline in 2011 when mapping documented a loss of almost 43% of the acreage present in 2009. Most of this loss occurred in the reaches adjacent to Brevard County, with extensive losses in Banana River Lagoon (an 88% reduction from 24,000 to 3,000 acres) and in the IRL north of Sebastian Inlet (a 60% reduction from 50,000 to 20,000 acres). The losses resulted from several intense phytoplankton blooms (primarily single-celled algae) that reached unprecedented concentrations for a record duration as indicated by concentrations of chlorophyll-a (**Figure C-2**). Beyond the shallowest water, the bloom effectively reduced the amount of light reaching seagrasses below what they required for survival. As a result, the remaining canopies moved shoreward and to shallower depths, with decreased cover, and a disruption to the species distribution (Morris et al., 2021).

After the 2011 losses, the meadows showed some recovery in 2013 and 2015. However, a brown tide (*Aureoumbra lagunensis*) bloom in 2016 reversed recovery such that, in 2019, the areal extent of seagrasses decreased further to only 58% of that present in 2009. The prognosis is not good because, even where seagrass survives, the cover of seagrass is often less than 5%, which is a record drop from the prior 30–50% (Morris et al., 2021).

Figure C-1. Mean Areal Extent of Seagrass, Mean Length of Transects, and Mean Transect Percent Cover

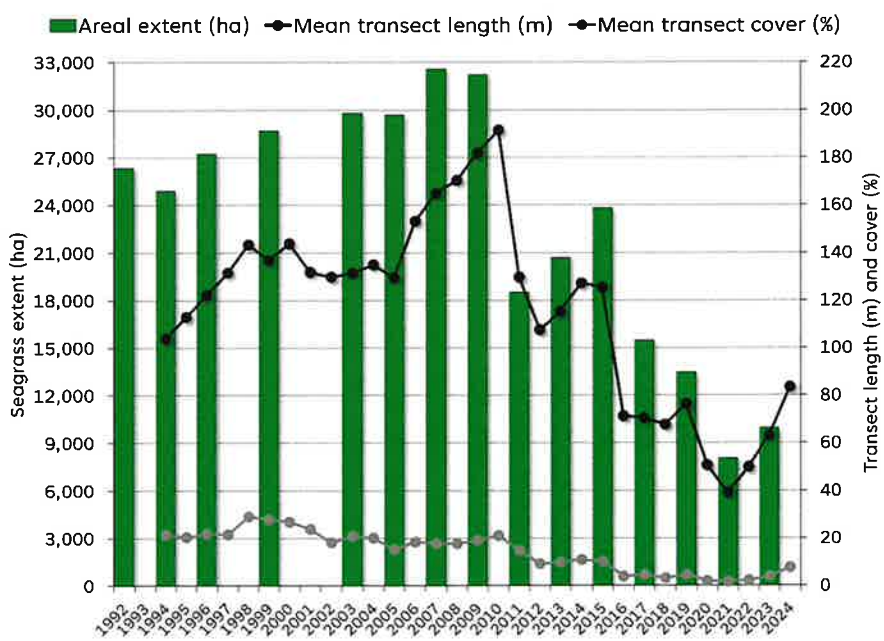


Figure C-1 Long Description

Figure C-2. Mean Chlorophyll-a Concentrations

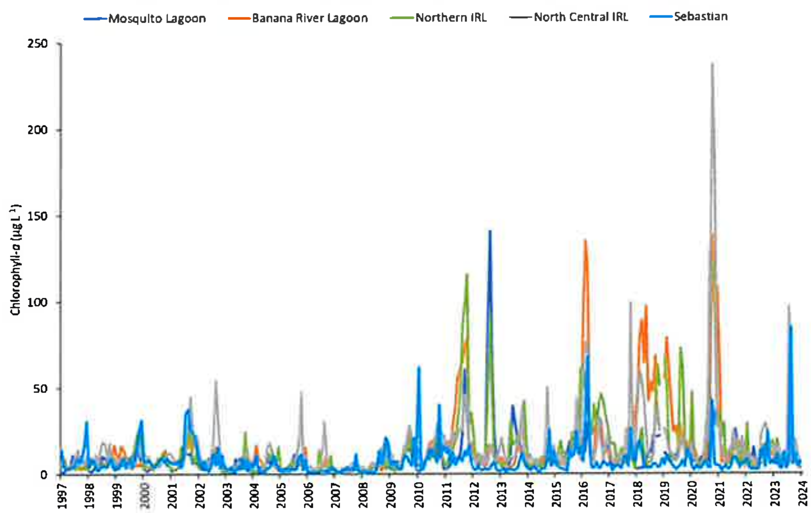
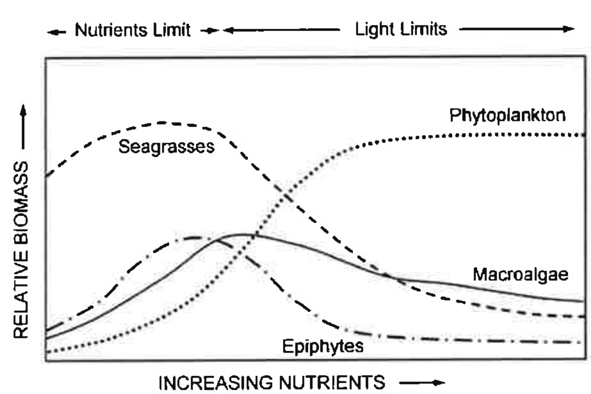


Figure C-2 Long Description

Unfortunately, the IRL appears to be following a pattern described for systems that receive increased loads of nutrients (Duarte, 1995; Burkholder et al., 2007). The pattern involves a shift in the composition of the primary producer assemblage, with higher nutrient loads differentially promoting faster growing macroalgae and ultimately phytoplankton (**Figure C-3**). The macroalgae and phytoplankton can exacerbate loss of seagrasses, primarily through shading. Loss of seagrass and macroalgae makes more nutrients available to phytoplankton through decreased competition (Schmidt et al. 2012), and loss of seagrass means that the sediments may be more prone to resuspension, which also reduces light penetration. Overall, the change in the system becomes self-perpetuating. Reducing nutrient loads represents a critical first step in efforts to reverse the shift in primary producers. However, a return to the previous areal coverage of seagrass may take some time, especially if too few recruits are available and sediments are too destabilized for colonization. Fortunately, field work conducted by the St. Johns River Water Management District in 2023 and 2024, shown in **Figure C-1**, documented seagrass expansion along some transects.

Figure C-3. Conceptual Model Illustrating a Shift in Biomass Among Major Primary Producers with Increasing Nutrient Enrichment



Note: Adapted from Burkholder et al. 2007

Nutrient Content of Seagrass

Halodule wrightii stores nutrients in its aboveground and belowground biological material, or biomass. The biomass of this and other seagrasses changes seasonally, with peak growth of aboveground shoots occurring in April and May and the greatest aboveground biomass recorded during summer. These seasonal changes introduce uncertainty into estimates of nutrient storage, but mean values will suffice for estimating return on investment in the long-term (**Table C-1**). For example, a single shoot of *Halodule wrightii* may contain up to five or more leaves in the summer, whereas in the winter this same shoot may contain only one leaf (Dunton 1996). For this estimate of nutrient content, we will assume that spring-summer growth and fall-winter senescence are equal. Thus, we will focus on our recent estimates of an average amount of aboveground and belowground biomass or standing stock of *Halodule wrightii* (**Table C-1** and **Table C-2**).

Table C-1. Estimates of Biomass for *Halodule* Species

Location	Total Biomass (grams dry weight per square meter)	Reference
Texas (Laguna Madre)	10–400	Zieman and Zieman, 1989
North Carolina (multiple locations)	22–208	Zieman and Zieman, 1989
South Florida and Tampa Bay	10–300	Zieman and Zieman, 1989
IRL (Fort Pierce Inlet)	124–198	Hefferman and Gibson, 1983
IRL (Grand Harbor/Vero)	45	Hefferman and Gibson, 1983
IRL (Link Port)	20–140	Virnstein unpublished
IRL (Brevard County)	53*	Morris, Chamberlain, and Jacoby unpublished
Texas (Laguna Madre)	10–400	Zieman and Zieman, 1989

* Mean aboveground biomass = 23 grams dry weight meters^{-2} = [(mean percent cover × 30.533) × 0.019]; mean belowground biomass = 30 grams dry weight meters^{-2} = 1.3 × aboveground biomass.

Table C-2. Total Biomass in Seagrasses Along Brevard County

Sub-lagoon	Description	Total Biomass (grams dry weight per square meter)
Mosquito Lagoon	Brevard County line to southern end of sub-lagoon	74
Banana River Lagoon	National Aeronautics and Space Administration restricted area	64
Banana River Lagoon	Remainder of Banana River Lagoon	44
IRL	North of State Road 405	51
IRL	State Road 405 to Pineda Causeway	35
IRL	Pineda Causeway to Hog Point	28
IRL	Hog Point to Brevard County line	51
Mean	***Not applicable***	***50***

Duarte (1990) compared nutrient contents of 27 species of seagrass, including *Halodule wrightii*. He determined that nitrogen and phosphorus represent about 2.2% and 0.2% of the dry weight of aboveground and belowground tissue of *Halodule wrightii*, respectively. These values are similar to those calculated during a recent study in the IRL (**Table C-3**). The values can be combined with estimates of biomass to calculate how much nitrogen and phosphorus are sequestered by 100 acres of *Halodule wrightii* on average (**Table C-4**).

Table C-3. Estimates of Nutrient Content for *Halodule wrightii* (percentage of dry weight)

Location	Carbon Above Ground	Nitrogen Above Ground	Phosphorus Above Ground	Carbon Below Ground	Nitrogen Below Ground	Phosphorus Below Ground
BRL-1	29.60	2.02	0.17	30.60	1.24	0.14
BRL-2	30.60	2.36	0.24	29.08	1.47	0.27
BRL-3	29.60	2.66	0.26	28.09	1.48	0.25
IRL-1	31.74	2.39	0.18	31.69	1.42	0.15
IRL-2	30.08	2.56	0.26	30.48	1.74	0.27
IRL-3	28.26	2.08	0.25	23.86	1.36	0.20
Mean	***29.98***	***2.35***	***0.23***	***28.97***	***1.45***	***0.21***

BRL = Banana River Lagoon, IRL = Indian River Lagoon

Table C-4. Average Amount of Nutrients Contained in Seagrass from 1996–2009

Sub-lagoon	Acres	Seagrass (pounds per 100 acres)	Nitrogen (pounds per 100 acres)	Phosphorus (pounds per 100 acres)
Southern Mosquito Lagoon	14,000	45,000	1,000	100
Banana River Lagoon	21,000	45,000	1,000	100
North IRL	19,000	37,000	900	90
Central IRL	7,000	36,000	900	90

Draft Evaluation Criteria for Planting Seagrass

Part of the wisdom accumulated from past seagrass restoration projects is the importance of selecting sites that will support seagrass growth. Key information has been synthesized into an initial guide, with higher scores and more certainty indicating better sites for planting seagrass (**Table C-5**). Please note that the presence of seagrass leads to a lower score based on the premise that natural recruitment represents the most cost-effective option for restoring seagrass. In addition, a high level of uncertainty can suggest targets for further study. This guide can be refined following pilot studies to determine optimal methods for planting seagrass (e.g., type of planting units, use of chemicals to enhance growth, and density of initial planting) and protecting it from disturbance (e.g., grazing, waves, exposure, and low salinity) until it is established.

References

Burkholder, J.M., Tomasko, D.A., and Touchette, B.W. 2007. Seagrasses and eutrophication. Journal of Experimental Marine Biology and Ecology 350: 46–72.

Duarte, C.M. 1990. Seagrass nutrient content. Marine Ecology Progress Series 6: 201–207.

Duarte, C.M. 1995. Submerged aquatic vegetation in relation to different nutrient regimes. Ophelia 41: 87–112.

Dunton, K.H. 1990. Production ecology of Ruppia maritima and Halodule wrightii Aschers in two subtropical estuaries. Journal of Experimental Marine Biology and Ecology 143: 147–164.

Hefferman J.J. and Gibson, R.A. 1983. A comparison of primary production rates in Indian River, Florida seagrass systems. Florida Scientist 46: 295–306.

Morris, L.J, Hall, L.M., Miller, J.D., Lasi, M.A., Chamberlain, R.H., Virnstein, R.W., and Jacoby, C.A. 2021. Diversity and distribution of seagrasses as related to salinity, temperature, and availability of light in the Indian River Lagoon, Florida. Proceedings of Indian River Lagoon Symposium 2020.

Schmidt, A.L., Wysmyk, J.K.C., Craig, S.E., and Lotze, H.K. 2012. Regional-scale effects of eutrophication on ecosystem structure and services of seagrass beds. Limnology and Oceanography 57(5): 1389-1402.

Zieman, J.C. and Zieman, R.T. 1989. The ecology of seagrass meadows of the west coast of Florida: a community profile. United States Fish and Wildlife Service, Biological Report 85(7.25), September 1989.

Table C-5. Guide for Ranking Potential Seagrass Restoration Sites

Category	Metric	Timeframe	Attributes for Score = 0	Attributes for Score = 2	Attributes for Score = 4	Attributes for Score = 6	Score	Uncertainty (1 = low, 3 = high)
Critical Depth Zone 0.5-0.8 meters below mean sea level	**Width of Critical Depth Zone** (distance perpendicular to shore)	**Recent**	**Very narrow:** < 25 meters wide (< 82 feet)	**Narrow:** 25-50 meters (82-164 feet)	**Moderately wide:** 50-100 meters (164-328 feet)	**Broad:** > 100 meters (> 328 feet)		
Critical Depth Zone 0.5-0.8 meters below mean sea level	**Distance to seagrass** (identified via the most recent map or targeted reconnaissance)	**Recent**	**Continuous seagrass at site and within 1 kilometer (land use code = 9116):** seagrass is a dominant feature (restoration not needed)	**Isolated:** no seagrass within 1 kilometers (0.6 miles) so conditions may be unfavorable	**Discontinuous seagrass at site and within 1 kilometers (land use code = 9113):** seagrass is patchy, so restoration may connect patches	**Seagrass nearby:** seagrass within 0.5-1.0 kilometers (0.3-0.6 miles)		
Critical Depth Zone 0.5-0.8 meters below mean sea level	**Percent cover in Critical Depth Zone** (derived from the closest transect, paired considerations)	**Past** (2000-2009)	**High:** > 30%	**Low:** 10-20%	**Moderate:** 20-30%	**High:** > 30%		
Critical Depth Zone 0.5-0.8 meters below mean sea level	**Percent cover in Critical Depth Zone** (derived from the closest transect, paired considerations)	**Last 3 Years**	**High:** > 10% (restoration not needed)	**Low:** < 10% (restoration may not help)	**Low:** < 10% (restoration may help but ultimate gain is likely limited)	**Low:** < 10% (potentially optimum site for restoration)		
Potential stressors	**Water quality** (salinity and light availability derived from the closest station)	**Last 3 Years**	**Bad:** salinity < 10 ppt anytime and < 18 ppt for > 3 consecutive months, or annual mean salinity -1 standard deviation < 17 ppt. Secchi depth < 0.5 m (1.6ft) anytime and < 0.65 m (2.1ft) for > 3 consecutive months, or annual mean Secchi depth -1 standard deviation < 0.65 m.	**Poor:** salinity < 18 ppt for 3 consecutive months but never < 12 ppt, or annual mean salinity -1 standard deviation < 17 ppt. Secchi depth < 0.65 m for < 3 consecutive months but never < 0.5 m, or annual mean Secchi depth -1 standard deviation < 0.65 m.	**Supportive:** salinity always > 18 Secchi depth always > 0.65 meters and may be 0.65-1.0 meters (2.1-3.3 feet) for 3 consecutive months	**Good:** salinity consistently > 23 Secchi depth consistently > 1.0 meters		
Potential stressors	**Sediment** (assessed via visits to the site or other current information)	**Present**	**Not supportive:** anoxic and sulfidic near the surface or easily resuspended or moved	**Minimally supportive:** hard bottom (e.g., compact sand or shells), not conducive for growth of rhizomes and roots, porewater may lack nutrients	**Generally supportive:** unconsolidated sediment that holds plants with relatively little resuspension and movement observed, porewater nutrients not limiting	**Fully supportive:** loosely consolidated sediment with firmly anchored plants if present, anoxic and sulfidic layers located below the zone occupied by roots and rhizomes, porewater rich in nutrients		
Potential stressors	**Water movement** (assessed via visits to the site or other current information)	**Present**	**High currents - possible scouring:** frequent and strong currents or waves that may cause ripples in the sediment and uproot new plants	**Moderate to high currents:** currents and waves bend plants, sweep fragments of seagrass away before they can gain a foothold, and cause some resuspension of sediment	**Moderate currents:** plants often stand upright, fragments of seagrass may be trapped, sediment typically not resuspended	**Low currents:** mild currents or waves, sediment not disturbed, no apparent negative effects on any seagrass that is present		
Potential stressors	**Shoreline characteristics** (assessed via visits the site or other current information)	**Present**	**Unnatural shoreline:** Critical Depth Zone in close proximity to urban development, including canals, and a hardened shoreline (e.g., riprap or bulkhead)	**Semi-natural shoreline:** Critical Depth Zone near moderate development and some shoreline is vegetated	**Mostly natural shoreline:** Critical Depth Zone near low to moderate development, most of the shoreline is vegetated shoreline or the site is associated with living shoreline project	**All natural shoreline:** vegetated shoreline with very limited development		
Potential stressors	**Public use** (assessed via visits to the site visits or other current information, including recent aerial photographs)	**Present**	**High use:** Critical Depth Zone adjacent to or within an area with frequent boating, swimming or fishing (e.g., aerial photographs show prop scars)	**Near high use:** Critical Depth Zone within 0.5 kilometers (0.3 miles) of a highly used area	**Not near high use:** Critical Depth Zone more than 0.5 kilometers from a highly used area	**Low use:** no public facilities nearby and limited signs of use		
Potential stressors	**Biota** (assessed via visits to the site or other current information on grazing or physical disturbance)	**Present**	**Heavy use:** site adjacent to deep water or manatee zone, power plant within 10 kilometers (6.2 miles), freshwater nearby, manatees and rays observed frequently, disturbance or grazing evident in > 50% of the area on a weekly-monthly basis	**Moderate use:** power plant > 10 kilometers away, deep water and manatee zones > 0.5 kilometers away, no freshwater nearby, disturbance or grazing evident in < 50% of the area on a monthly basis	**Intermittent use:** disturbance or grazing evident in < 25% of the area on a quarterly basis	**Rare use:** disturbance or grazing hardly evident		
Logistics	**Enhancement or protection** (assessed via visits to the site)	**Present**	**Extensive need:** dense planting required due to absence of seagrass, fencing or caging required due to grazing, other enhancement or protection required, including living shorelines, sediment barriers, wave baffles	**Substantial need:** moderately dense planting required because only 1-2% cover present, fencing or caging required, few additional enhancements or protections required	**Moderate need:** low density planting sufficient because at least 2% cover present, fencing or caging required for a limited time, other enhancements or protections beneficial but not critical	**Limited need:** minimal density planting or no planting required because > 2% cover present and protection from grazing may result in spread of seagrass, no other enhancements or protections required		
Logistics	**Maintenance** (assessed via visits to the site)	**Anticipated**	**High maintenance:** weekly cleaning	**Moderate maintenance:** monthly cleaning	**Low maintenance:** quarterly cleaning	**Minimum maintenance:** maintain as needed		
Logistics	**Staging and accessibility** (assessed via visits to the site)	**Present**	**Very difficult:** substantial impediments that may include boat ramps > 10 kilometer away, soft sediment that is easily disturbed, permitting and access issues	**Moderately difficult:** boat ramp within 10 kilometers, somewhat firm sediment, tractable permitting and access issues	**Relatively simple:** boat ramp nearby and few other issues	**No issues**		
Logistics	**Monitoring** (relevant past, current and future information on water quality and seagrasses available)	**Present**	**No external support:** no sampling of seagrass within 5 kilometers (3.1 miles), nearest water quality station not representative of conditions at the site	**Minimal external support:** seagrass surveyed within 3-5 kilometers (1.9-3.1 miles); water quality station is representative of conditions at the site	**Moderate external support:** seagrass and water quality sampled within 3 kilometers, so both are representative of conditions at the site	**Considerable external support:** seagrasses and water quality sampled at or adjacent to the site		
Total								

Notes:
Optimize potential for success by planting: a) within the Critical Depth Zone (e.g., at 0.6-0.8 meters below mean sea level) with due recognition of tides and annual changes in water levels; or b) during the spring (e.g., late March to May) when water clarity is best, water temperatures are warming, and grazing by fish is relatively low.
Scoring: if conditions do not match the attributes provided, then assign a score between the two that are most applicable.

Appendix D: Unfunded Projects

Throughout initial development and annual updates of this plan, there have been projects considered that are not funded due to being less cost-effective than similar projects that were selected for funding. If some of the recommended projects in the plan receive funding from outside sources, such as grants or legislative appropriations, additional projects could be implemented using the Save Our Indian River Lagoon Trust Fund. If funding becomes available, the projects listed in **Table D-1** through **Table D-6** include numerous unfunded opportunities sorted by the next most cost-effective projects based on total nitrogen (TN) and total phosphorus (TP) load reductions in pounds per year available for each major type of pollution reduction strategy. Most of the cost estimates in the following unfunded project tables are from 2016 and would need to be updated to current costs if considered for future funding.

Table D-1. Unfunded Wastewater Treatment Facility Reclaimed Water Upgrade Projects

Facility	Cost to Upgrade	Total Nitrogen Removed after Attenuation (pounds per year)	Cost per Pound per Year of Total Nitrogen Removed	Total Phosphorus Removed after Attenuation (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
Cape Canaveral Air Force Station	$6,000,000	3,653	$1,642	To be determined	To be determined
Brevard County South Beaches	$6,000,000	2,860	$2,098	To be determined	To be determined
Brevard County South Central Regional	$6,000,000	2,053	$2,923	To be determined	To be determined
Brevard County Port St. John	$6,000,000	1,788	$3,356	To be determined	To be determined
Rockledge Wastewater Treatment Facility	$6,000,000	1,084	$3,460	To be determined	To be determined
Brevard Count Barefoot Bay Water Reclamation Facility	$6,000,000	1,597	$5,535	To be determined	To be determined
Total	***$36,000,000***	***13,035***	***$2,762 (average)***	***To be determined***	***To be determined***

Table D-2. Unfunded Sprayfield or Rapid Infiltration Basin Upgrade Projects

Facility	Type	Estimated Cost to Upgrade	Total Nitrogen Removed from Upgrade (pounds per year)	Cost per Pound per Year of Total Nitrogen Removed
Aquarina Beach Community	Sprayfield	$82,511	730	$113
Indian River Shores Trailer Park	Rapid Infiltration Basin	$42,257	311	$136
River Grove Mobile Home Village	Rapid Infiltration Basin	$200,529	1,460	$137
South Shores Utility	Sprayfield	$330,620	929	$356
Housing Authority of Brevard County	Rapid Infiltration Basin	$57,499	152	$378
Pelican Bay Mobile Home	Rapid Infiltration Basin	$244,372	542	$451
Merritt Island Utility Company	Rapid Infiltration Basin	$544,805	1,200	$454
Enchanted Lakes Estates	Sprayfield	$39,600	62	$639
Lighthouse Cove	Sprayfield	$132,000	157	$841
River Forest Mobile Home Park	Sprayfield	$86,246	92	$937
Riverview Mobile Home and Recreational Vehicle Park	Sprayfield	$366,557	175	$2,095
Treetop Villas	Sprayfield	$115,500	54	$2,139
Tropical Trail Village	Rapid Infiltration Basin	$99,186	46	$2,156
Palm Harbor Mobile Home Park	Sprayfield	$330,620	95	$3,480
Harris Malabar Facility	Rapid Infiltration Basin	$2,293,500	494	$4,643

Facility	Type	Estimated Cost to Upgrade	Total Nitrogen Removed from Upgrade (pounds per year)	Cost per Pound per Year of Total Nitrogen Removed
Camelot Recreational Vehicle Park Inc	Sprayfield	Unknown size	To be determined	To be determined
Southern Comfort Mobile Home Park	Rapid Infiltration Basin	To be determined	To be determined	To be determined
Space X Launch Complex 39A	Sprayfield	To be determined	To be determined	To be determined
Total	-	***$4,965,802***	***6,499***	***$764 (average)***

Table D-3. Unfunded Package Plant Connection Projects

Facility Name	Number of Units	Cost to Connect to Sewer	Total Nitrogen Load Reduction (pounds per year)	Cost per Pound Per Year of Total Nitrogen Removed
Canebreaker Condo	24	$643,046	827	$778
Merritt Island Utility Company*	198	$1,493,195	1,446	$1,033
River Grove I & II Mobile Home Park	200	$1,904,918	1,759	$1,083
South Shores Utility	134	$1,444,904	1,120	$1,290
Summit Cove Condominium	84	$859,982	525	$1,638
Pelican Bay Mobile Home (also known as Riverview)	200	$1,172,552	653	$1,796
Housing Authority of Brevard County	26	$595,125	184	$3,234
Sterling House Condominium	45	$804,195	212	$3,793
Riverview Mobile Home and Recreational Vehicle Park	110	$907,684	211	$4,302
Lighthouse Cove	80	$1,1,326,456	189	$7,018
Palm Harbor Mobile Home Park	130	$872,609	115	$7,588
Tropical Trail Village	74	$791,775	104	$7,613
Enchanted Lakes Estates	190	$1,040,796	75	$13,877
Treetop Villas	28	$1,301,547	65	$20,024
Camelot Recreational Vehicle Park Inc.	178	To be determined	No data	To be determined
Southern Comfort Mobile Home Park	40	To be determined	No data	To be determined
Total	***1,741***	***$15,158,784***	***7,485***	***$2,025 (average)***

* As of 2022, the private entity that owns this package plant was not interested in connecting to central sewer.

Table D-4. Unfunded Septic-to Sewer-Projects

Service Area	Number of Lots	Cost	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound Per Year
Grant-Valkaria – Zone G	30	$1,688,550	1,418	$1,191
Grant-Valkaria – Zone E	128	$7,204,480	5,862	$1,229
Grant-Valkaria – Zone B	34	$1,913,690	1,501	$1,275
Grant-Valkaria – Zone F	17	$956,845	688	$1,390
Grant-Valkaria – Zone D	18	$1,013,130	690	$1,469
Grant-Valkaria – Zone A	42	$2,363,970	1,296	$1,824
Malabar – Zone B	64	$3,602,240	1,929	$1,867
Grant-Valkaria – Zone C	30	$1,688,550	853	$1,979
Malabar – Zone A	430	$24,202,550	11,456	$2,113
Valkaria – Zone I	223	$12,551,555	5,380	$2,333
South Beaches – Zone F	3	$168,855	70	$2,420
Valkaria – Zone J	503	$28,311,355	11,507	$2,460
Malabar – Zone C	14	$787,990	289	$2,727
South Central – Zone B	180	$10,131,300	3,700	$2,738

Service Area	Number of Lots	Cost	Total Nitrogen Reduction (pounds per year)	Total Nitrogen Cost per Pound Per Year
Sharpes – Zone B	136	$7,654,760	2,692	$2,844
South Beaches – Zone E	387	$21,782,295	7,491	$2,908
Rockledge – Zone C	91	$5,121,935	1,736	$2,950
South Beaches – Zone K	21	$1,181,985	397	$2,978
North Merritt Island – Zone F	34	$1,913,690	830	$2,306
North Merritt Island – Zone D	29	$1,632,265	685	$2,383
City of West Melbourne	60	$3,377,100	1,041	$3,244
Pineda	27	$1,519,695	644	$2,360
Sykes Creek – Zone IJ	77	$4,333,945	62	$4,504
South Beaches – Zone L	178	$10,018,730	2,973	$3,370
Sykes Creek – Zone J	63	$3,545,955	1,028	$3,448
South Banana – Zone A	88	$4,953,080	1,444	$3,430
South Central – Zone BC	13	$731,705	582	$1,257
South Beaches – Zone G	112	$6,303,920	1,764	$3,573
City of West Melbourne – Zone B	60	$3,377,100	894	$3,778
Malabar – Zone D	24	$1,350,840	352	$3,842
North Merritt Island – Zone A	107	$6,022,495	1,821	$3,307
South Beaches – Zone D	89	$5,009,365	1,273	$3,936
South Central – Zone E	411	$23,133,135	5,761	$4,015
South Beaches – Zone M	334	$18,799,190	4,293	$4,379
Grant-Valkaria – Zone H	100	$5,628,500	1,272	$4,426
Malabar – Zone F	14	$787,990	174	$4,525
Melbourne Village – Zone B	224	$12,607,840	2,705	$4,661
Sykes Creek – Zone H	74	$4,165,090	887	$4,693
South Central – Zone I	72	$4,052,520	772	$5,249
Sykes Creek – Zone G	52	$2,926,820	602	$4,858
South Beaches – Zone N	103	$5,797,355	1,193	$4,860
Sykes Creek – Zone C	81	$4,559,085	929	$4,907
Melbourne Village – Zone A	85	$4,784,225	918	$5,213
South Central – Zone H	165	$9,287,025	1,779	$5,221
South Central – Zone G	196	$11,031,860	2,090	$5,277
North Merritt Island – Zone C	71	$3,996,235	737	$5,425
Merritt Island – Zone H	285	$16,041,225	5,464	$2,936
Sykes Creek – Zone S	164	$9,230,740	1,584	$5,827
North Merritt Island – Zone B	56	$3,151,960	1,066	$2,957
Merritt Island – Zone A	249	$14,014,965	3,440	$4,074
South Beaches – Zone C	118	$6,641,630	683	$9,719
Total	***6,166***	***$347,053,310***	***111,598***	***$3,110 (average)***

Table D-5. Unfunded Stormwater Projects

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
2159	Central IRL	$589,003	2,754	$214	350	$1,683
1736	Central IRL	$998,442	4,263	$234	552	$1,809
2163	Central IRL	$299,840	1,264	$237	90	$3,332
2185	Central IRL	$287,331	1,208	$238	94	$3,057
1933	Central IRL	$738,160	2,996	$246	435	$1,697
2191	Central IRL	$472,870	1,925	$246	185	$2,556
1615	Central IRL	$755,802	3,053	$248	439	$1,722
2239	Central IRL	$408,107	1,643	$248	261	$1,564
2222	Central IRL	$381,189	1,534	$248	226	$1,687
911	North IRL	$249,681	1,004	$249	90	$2,774

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1508	Central IRL	$611,707	2,424	$252	356	$1,718
2209	Central IRL	$354,321	1,389	$255	193	$1,836
1497	Central IRL	$554,967	2,164	$256	309	$1,796
1803	Central IRL	$721,923	2,814	$257	393	$1,837
1472	Central IRL	$434,419	1,670	$260	241	$1,803
1654	Central IRL	$711,279	2,738	$260	381	$1,867
1977	Central IRL	$420,621	1,615	$260	203	$2,072
1856	Central IRL	$610,465	2,340	$261	336	$1,817
1500	Central IRL	$543,521	2,082	$261	289	$1,881
1637	Central IRL	$378,428	1,448	$261	235	$1,610
2032	Central IRL	$292,278	1,118	$261	98	$2,982
1831	Central IRL	$572,165	2,181	$262	318	$1,799
1788	Central IRL	$308,282	1,174	$263	144	$2,141
1884	Central IRL	$475,355	1,795	$265	204	$2,330
1866	Central IRL	$515,901	1,929	$267	281	$1,836
2092	Central IRL	$396,055	1,484	$267	212	$1,868
2046	Central IRL	$391,272	1,455	$269	234	$1,672
1605	Central IRL	$402,854	1,490	$270	240	$1,679
1869	Central IRL	$476,833	1,765	$270	224	$2,129
2215	Central IRL	$330,374	1,222	$270	207	$1,596
2167	Central IRL	$273,278	1,014	$270	96	$2,847
1720	Central IRL	$391,042	1,443	$271	228	$1,715
2045	Central IRL	$575,331	2,124	$271	313	$1,838
1600	Central IRL	$339,471	1,252	$271	199	$1,706
1476	Central IRL	$310,364	1,140	$272	162	$1,916
2024	Central IRL	$319,132	1,175	$272	99	$3,224
1562	Central IRL	$875,101	3,206	$273	462	$1,894
2105	Central IRL	$354,896	1,301	$273	224	$1,584
2131	Central IRL	$389,128	1,423	$273	212	$1,836
1463	Central IRL	$366,876	1,330	$276	187	$1,962
1773	Central IRL	$483,526	1,750	$276	230	$2,102
1633	Central IRL	$505,953	1,821	$278	263	$1,924
1990	Central IRL	$301,526	1,084	$278	112	$2,692
2129	Central IRL	$297,022	1,061	$280	172	$1,727
1568	Central IRL	$315,521	1,122	$281	180	$1,753
2148	Central IRL	$399,675	1,424	$281	185	$2,160
1563	Central IRL	$327,433	1,163	$282	184	$1,780
1517	Central IRL	$305,958	1,084	$282	171	$1,789
1493	Central IRL	$389,633	1,371	$284	204	$1,910
1727	Central IRL	$613,598	2,160	$284	289	$2,123
1516	Central IRL	$312,386	1,101	$284	179	$1,745
2062	Central IRL	$279,639	984	$284	84	$3,329
1642	Central IRL	$454,632	1,598	$285	229	$1,985
1561	Central IRL	$320,638	1,124	$285	176	$1,822
2271	Central IRL	$277,363	972	$285	148	$1,874
1622	Central IRL	$414,228	1,443	$287	211	$1,963
1630	Central IRL	$398,425	1,372	$290	203	$1,963
2138	Central IRL	$381,832	1,316	$290	176	$2,170
1849	Central IRL	$447,378	1,537	$291	224	$1,997
2227	Central IRL	$294,061	1,012	$291	136	$2,162
1825	Central IRL	$626,491	2,143	$292	308	$2,034
1835	Central IRL	$388,628	1,332	$292	192	$2,024
1555	Central IRL	$347,640	1,186	$293	179	$1,942
2075	Central IRL	$752,184	2,560	$294	414	$1,817

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
2104	Central IRL	$347,286	1,172	$296	186	$1,867
1738	Central IRL	$380,025	1,286	$296	189	$2,011
1512	Central IRL	$336,347	1,137	$296	171	$1,967
1537	Central IRL	$320,668	1,078	$297	150	$2,138
1681	Central IRL	$363,345	1,224	$297	182	$1,996
1843	Central IRL	$672,599	2,267	$297	275	$2,446
1597	Central IRL	$504,987	1,687	$299	241	$2,095
1758	Central IRL	$362,719	1,215	$299	160	$2,267
1688	Central IRL	$466,320	1,561	$299	236	$1,976
1582	Central IRL	$621,853	2,075	$300	320	$1,943
1781	Central IRL	$390,270	1,298	$301	189	$2,065
2142	Central IRL	$319,917	1,062	$301	161	$1,987
1581	Central IRL	$287,192	952	$302	153	$1,877
2241	Central IRL	$268,478	888	$302	135	$1,989
2141	Central IRL	$288,314	950	$303	142	$2,030
1626	Central IRL	$307,064	1,015	$303	119	$2,580
1908	Central IRL	$646,119	2,124	$304	300	$2,154
1798	Central IRL	$379,752	1,246	$305	181	$2,098
1571	Central IRL	$404,479	1,325	$305	176	$2,298
2195	Central IRL	$252,461	828	$305	78	$3,237
1813	Central IRL	$375,887	1,227	$306	119	$3,159
1695	Central IRL	$315,200	1,028	$307	169	$1,865
2047	Central IRL	$437,950	1,426	$307	194	$2,257
1717	Central IRL	$356,409	1,162	$307	168	$2,121
2199	Central IRL	$261,561	848	$308	129	$2,028
2021	Central IRL	$666,325	2,156	$309	298	$2,236
816	North IRL	$209,884	678	$310	130	$1,614
1671	Central IRL	$473,556	1,530	$310	218	$2,172
1744	Central IRL	$298,346	963	$310	130	$2,295
2188	Central IRL	$230,553	744	$310	71	$3,247
2175	Central IRL	$219,438	707	$310	55	$3,990
1741	Central IRL	$330,635	1,062	$311	158	$2,093
2219	Central IRL	$278,863	897	$311	83	$3,360
2048	Central IRL	$222,035	712	$312	65	$3,416
1811	Central IRL	$332,494	1,061	$313	156	$2,131
1847	Central IRL	$350,668	1,108	$316	161	$2,178
1759	Central IRL	$342,905	1,084	$316	158	$2,170
1708	Central IRL	$325,615	1,029	$316	149	$2,185
1906	Central IRL	$325,630	1,030	$316	116	$2,807
1518	Central IRL	$234,798	744	$316	93	$2,525
1963	Central IRL	$647,698	2,042	$317	286	$2,265
1569	Central IRL	$334,067	1,054	$317	172	$1,942
2168	Central IRL	$229,814	720	$319	72	$3,192
2013	Central IRL	$381,820	1,193	$320	140	$2,727
1544	Central IRL	$406,494	1,261	$322	181	$2,246
1750	Central IRL	$415,770	1,293	$322	141	$2,949
1737	Central IRL	$406,423	1,260	$323	176	$2,309
1834	Central IRL	$725,638	2,244	$323	297	$2,443
1608	Central IRL	$278,355	859	$324	131	$2,125
1609	Central IRL	$281,524	869	$324	131	$2,149
1752	Central IRL	$304,216	939	$324	124	$2,453
1789	Central IRL	$344,428	1,062	$324	144	$2,392
1888	Central IRL	$293,965	908	$324	98	$3,000
1940	Central IRL	$236,006	729	$324	61	$3,869

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1753	Central IRL	$254,664	779	$327	104	$2,449
2066	Central IRL	$254,346	778	$327	95	$2,677
1635	Central IRL	$304,810	930	$328	135	$2,258
2149	Central IRL	$619,821	1,887	$328	253	$2,450
1992	Central IRL	$472,972	1,444	$328	169	$2,799
1772	Central IRL	$336,473	1,027	$328	121	$2,781
1534	Central IRL	$255,220	775	$329	126	$2,026
2206	Central IRL	$235,077	715	$329	55	$4,274
1760	Central IRL	$315,743	956	$330	137	$2,305
2139	Central IRL	$431,581	1,308	$330	179	$2,411
1979	Central IRL	$368,092	1,113	$331	143	$2,574
1823	Central IRL	$262,899	794	$331	96	$2,739
1731	Central IRL	$260,213	786	$331	121	$2,151
1625	Central IRL	$262,098	793	$331	124	$2,114
2051	Central IRL	$351,288	1,058	$332	173	$2,031
1699	Central IRL	$319,591	963	$332	140	$2,283
1585	Central IRL	$266,519	803	$332	125	$2,132
1627	Central IRL	$574,028	1,719	$334	239	$2,402
2231	Central IRL	$343,349	1,027	$334	113	$3,038
2039	Central IRL	$207,905	623	$334	48	$4,331
1778	Central IRL	$316,900	945	$335	138	$2,296
1980	Central IRL	$358,742	1,071	$335	145	$2,474
1855	Central IRL	$295,593	882	$335	126	$2,346
1489	Central IRL	$268,243	801	$335	118	$2,273
1612	Central IRL	$254,111	759	$335	118	$2,153
1819	Central IRL	$308,734	922	$335	146	$2,115
2098	Central IRL	$241,566	716	$337	113	$2,138
1950	Central IRL	$275,076	815	$338	82	$3,355
1631	Central IRL	$372,048	1,098	$339	169	$2,201
1723	Central IRL	$348,115	1,026	$339	141	$2,469
2110	Central IRL	$288,520	851	$339	86	$3,355
2064	Central IRL	$311,350	916	$340	134	$2,324
2196	Central IRL	$262,466	772	$340	80	$3,281
1524	Central IRL	$459,167	1,346	$341	194	$2,367
2127	Central IRL	$337,120	990	$341	108	$3,121
1527	Central IRL	$306,553	896	$342	126	$2,433
1817	Central IRL	$270,902	792	$342	99	$2,736
1545	Central IRL	$388,103	1,133	$343	164	$2,366
1964	Central IRL	$358,029	1,044	$343	150	$2,387
1889	Central IRL	$345,391	1,006	$343	143	$2,415
1535	Central IRL	$241,925	705	$343	120	$2,016
1694	Central IRL	$288,642	839	$344	120	$2,405
1767	Central IRL	$358,435	1,039	$345	138	$2,597
1692	Central IRL	$289,841	839	$345	108	$2,684
1546	Central IRL	$239,986	695	$345	109	$2,202
1824	Central IRL	$231,326	671	$345	67	$3,453
2020	Central IRL	$483,011	1,394	$346	194	$2,490
2247	Central IRL	$202,552	585	$346	94	$2,155
1721	Central IRL	$253,031	730	$347	110	$2,300
1911	Central IRL	$296,384	855	$347	125	$2,371
1589	Central IRL	$214,845	619	$347	118	$1,821
1858	Central IRL	$444,027	1,278	$347	168	$2,643
2161	Central IRL	$433,076	1,248	$347	139	$3,116
1488	Central IRL	$230,890	664	$348	111	$2,080

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1698	Central IRL	$291,704	837	$349	123	$2,372
1662	Central IRL	$243,383	698	$349	104	$2,340
1796	Central IRL	$289,665	828	$350	120	$2,414
1425	Central IRL	$239,248	683	$350	109	$2,195
1787	Central IRL	$285,967	816	$350	120	$2,383
1632	Central IRL	$291,234	832	$350	106	$2,747
1587	Central IRL	$376,464	1,077	$350	132	$2,852
1521	Central IRL	$422,346	1,204	$351	175	$2,413
1766	Central IRL	$280,279	797	$352	113	$2,480
1732	Central IRL	$288,948	820	$352	120	$2,408
1629	Central IRL	$299,239	850	$352	120	$2,494
1974	Central IRL	$316,422	900	$352	123	$2,573
2089	Central IRL	$298,017	847	$352	91	$3,275
1468	Central IRL	$398,554	1,130	$353	149	$2,675
1747	Central IRL	$290,784	823	$353	112	$2,596
1836	Central IRL	$344,937	977	$353	110	$3,136
2177	Central IRL	$258,989	733	$353	92	$2,815
825	North IRL	$209,830	593	$354	89	$2,358
1818	Central IRL	$282,026	793	$356	117	$2,410
1616	Central IRL	$274,201	770	$356	110	$2,493
1777	Central IRL	$303,618	851	$357	124	$2,449
2165	Central IRL	$269,663	756	$357	100	$2,697
1716	Central IRL	$286,480	801	$358	117	$2,449
1802	Central IRL	$286,472	800	$358	117	$2,448
1861	Central IRL	$261,420	730	$358	102	$2,563
763	North IRL	$253,993	708	$359	107	$2,374
1614	Central IRL	$248,232	689	$360	98	$2,533
1729	Central IRL	$242,692	670	$362	85	$2,855
1492	Central IRL	$257,593	711	$362	86	$2,995
2106	Central IRL	$250,920	693	$362	86	$2,918
2166	Central IRL	$243,541	673	$362	57	$4,273
1885	Central IRL	$312,330	860	$363	128	$2,440
1748	Central IRL	$306,974	846	$363	122	$2,516
1529	Central IRL	$262,539	723	$363	105	$2,500
1657	Central IRL	$273,811	755	$363	109	$2,512
2193	Central IRL	$226,900	625	$363	87	$2,608
2038	Central IRL	$271,122	746	$363	81	$3,347
1453	Central IRL	$507,098	1,395	$364	188	$2,697
1426	Central IRL	$255,608	703	$364	111	$2,303
1480	Central IRL	$220,564	605	$365	93	$2,372
1718	Central IRL	$329,792	904	$365	122	$2,703
1647	Central IRL	$553,278	1,510	$366	211	$2,622
1961	Central IRL	$609,575	1,666	$366	222	$2,746

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
2008	Central IRL	$310,695	848	$366	118	$2,633
797	North IRL	$209,023	570	$367	83	$2,518
1865	Central IRL	$344,570	938	$367	134	$2,571
1826	Central IRL	$272,623	743	$367	108	$2,524
2176	Central IRL	$247,840	676	$367	66	$3,755
1417	Central IRL	$258,028	698	$370	106	$2,434
1978	Central IRL	$406,974	1,099	$370	137	$2,971
1880	Central IRL	$247,219	668	$370	66	$3,746
1445	Central IRL	$582,759	1,570	$371	212	$2,749
1496	Central IRL	$253,396	680	$373	99	$2,560
1665	Central IRL	$235,758	632	$373	95	$2,482
2094	Central IRL	$197,656	530	$373	77	$2,567
1478	Central IRL	$199,107	531	$375	71	$2,804
774	North IRL	$202,709	539	$376	98	$2,068
1782	Central IRL	$276,933	737	$376	107	$2,588
1674	Central IRL	$282,513	751	$376	97	$2,913
1927	Central IRL	$237,435	628	$378	69	$3,441
1452	Central IRL	$241,267	636	$379	92	$2,622
1790	Central IRL	$263,558	696	$379	92	$2,865
1548	Central IRL	$337,321	887	$380	127	$2,656
885	North IRL	$168,824	443	$381	107	$1,578
2169	Central IRL	$284,245	747	$381	108	$2,632
2197	Central IRL	$251,424	659	$382	58	$4,335
2173	Central IRL	$178,416	467	$382	41	$4,352
1892	Central IRL	$362,896	948	$383	133	$2,729
1638	Central IRL	$219,781	574	$383	90	$2,442
1678	Central IRL	$275,455	719	$383	103	$2,674
2217	Central IRL	$240,965	627	$384	64	$3,765
138	North IRL	$191,258	497	$385	87	$2,198
1967	Central IRL	$297,734	774	$385	112	$2,658
1502	Central IRL	$240,818	625	$385	88	$2,737
2189	Central IRL	$242,081	628	$385	96	$2,522
1755	Central IRL	$234,887	610	$385	90	$2,610
1740	Central IRL	$276,403	718	$385	89	$3,106
1928	Central IRL	$245,642	638	$385	66	$3,722
2012	Central IRL	$382,705	992	$386	134	$2,856
1565	Central IRL	$263,910	684	$386	80	$3,299
1722	Central IRL	$252,839	654	$387	95	$2,661
1482	Central IRL	$245,259	632	$388	94	$2,609

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1735	Central IRL	$297,248	767	$388	111	$2,678
1997	Central IRL	$214,610	553	$388	54	$3,974
2158	Central IRL	$204,946	528	$388	44	$4,658
1756	Central IRL	$243,574	625	$390	92	$2,648
2003	Central IRL	$211,452	542	$390	50	$4,229
1301	North IRL	$374,416	954	$392	138	$2,713
1418	North IRL	$323,007	824	$392	107	$3,019
1960	Central IRL	$303,753	775	$392	113	$2,688
1749	Central IRL	$252,703	645	$392	97	$2,605
1644	Central IRL	$247,942	632	$392	92	$2,695
1559	Central IRL	$212,787	543	$392	88	$2,418
2182	Central IRL	$254,653	648	$393	95	$2,681
1655	Central IRL	$300,479	765	$393	111	$2,707
860	North IRL	$192,374	488	$394	67	$2,871
2216	Central IRL	$257,417	654	$394	94	$2,738
1232	North IRL	$265,504	673	$395	99	$2,682
CO-6H	North IRL	$222,301	563	$395	82	$2,711
SJR-74	North IRL	$253,502	642	$395	85	$2,982
1494	Central IRL	$212,163	537	$395	76	$2,792
1620	Central IRL	$216,785	549	$395	77	$2,815
1619	Central IRL	$217,411	549	$396	83	$2,619
83	North IRL	$206,650	520	$397	79	$2,616
2072	Central IRL	$389,491	981	$397	141	$2,762
1593	Central IRL	$268,109	675	$397	83	$3,230
1776	Central IRL	$257,328	647	$398	94	$2,738
1461	Central IRL	$260,160	653	$398	93	$2,797
1944	Central IRL	$285,206	716	$398	103	$2,769
2111	Central IRL	$197,135	495	$398	77	$2,560
2254	Central IRL	$211,420	531	$398	72	$2,936
212	North IRL	$265,852	667	$399	90	$2,954
1618	Central IRL	$260,696	653	$399	93	$2,803
2049	Central IRL	$234,103	586	$399	74	$3,164
1931	Central IRL	$286,742	718	$399	81	$3,540
1636	Central IRL	$210,630	527	$400	76	$2,771
1751	Central IRL	$215,120	538	$400	72	$2,988
1900	Central IRL	$313,276	783	$400	94	$3,333
921	North IRL	$262,877	656	$401	88	$2,987
1584	Central IRL	$235,134	586	$401	90	$2,613
1726	Central IRL	$241,784	602	$402	88	$2,748

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1991	Central IRL	$298,181	741	$402	104	$2,867
1595	Central IRL	$230,353	573	$402	82	$2,809
TV-Garden Street Basin	North IRL	$191,077	473	$404	66	$2,895
1742	Central IRL	$243,779	603	$404	87	$2,802
1934	Central IRL	$213,996	530	$404	75	$2,853
889	North IRL	$226,666	559	$405	87	$2,605
1797	Central IRL	$234,921	580	$405	80	$2,937
1503	Central IRL	$280,733	692	$406	102	$2,752
1438	Central IRL	$287,622	709	$406	81	$3,551
2057	Central IRL	$203,069	500	$406	47	$4,321
1352	North IRL	$277,857	683	$407	99	$2,807
1707	Central IRL	$232,077	570	$407	83	$2,796
1986	Central IRL	$223,643	549	$407	60	$3,727
1624	Central IRL	$223,028	548	$407	70	$3,186
100	North IRL	$216,832	532	$408	75	$2,891
1221	North IRL	$241,264	592	$408	83	$2,907
920	North IRL	$233,204	571	$408	84	$2,776
1685	Central IRL	$328,917	806	$408	110	$2,990
1704	Central IRL	$236,734	580	$408	85	$2,785
1557	Central IRL	$216,796	532	$408	82	$2,644
2178	Central IRL	$207,789	509	$408	49	$4,241
1954	Central IRL	$190,971	468	$408	42	$4,547
1607	Central IRL	$224,022	548	$409	69	$3,247
1380	North IRL	$278,718	679	$410	95	$2,934
2069	Central IRL	$245,883	599	$410	77	$3,193
2015	Central IRL	$336,957	819	$411	115	$2,930
1907	Central IRL	$257,099	625	$411	90	$2,857
1993	Central IRL	$284,561	693	$411	80	$3,557
2115	Central IRL	$203,078	494	$411	80	$2,538
2186	Central IRL	$172,756	420	$411	38	$4,546
1240	North IRL	$244,643	594	$412	90	$2,718
1659	Central IRL	$222,374	540	$412	79	$2,815
1588	Central IRL	$207,879	505	$412	80	$2,598
1660	Central IRL	$214,088	519	$413	77	$2,780
1746	Central IRL	$222,485	539	$413	73	$3,048
2099	Central IRL	$224,774	544	$413	58	$3,875
1579	Central IRL	$237,524	574	$414	77	$3,085
806	North IRL	$269,778	649	$416	97	$2,781
1902	Central IRL	$219,188	527	$416	67	$3,271

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1837	Central IRL	$207,722	499	$416	77	$2,698
1523	Central IRL	$241,521	579	$417	85	$2,841
1952	Central IRL	$296,372	710	$417	86	$3,446
1661	Central IRL	$252,729	604	$418	93	$2,718
1711	Central IRL	$233,235	558	$418	81	$2,879
1754	Central IRL	$238,695	571	$418	83	$2,876
2250	Central IRL	$199,383	477	$418	74	$2,694
43	North IRL	$219,345	523	$419	79	$2,777
TV-Miracle City Basin	North IRL	$169,034	403	$419	55	$3,073
1634	Central IRL	$269,826	644	$419	71	$3,800
2211	Central IRL	$179,232	428	$419	49	$3,658
1530	Central IRL	$206,372	492	$419	76	$2,715
1815	Central IRL	$202,098	482	$419	48	$4,210
2065	Central IRL	$241,468	575	$420	89	$2,713
1730	Central IRL	$240,784	572	$421	79	$3,048
1953	Central IRL	$221,192	525	$421	54	$4,096
1942	Central IRL	$277,060	657	$422	79	$3,507
890	North IRL	$258,541	611	$423	82	$3,153
1313	North IRL	$259,759	612	$424	78	$3,330
1873	Central IRL	$302,034	713	$424	92	$3,283
1702	Central IRL	$230,464	544	$424	77	$2,993
903	North IRL	$310,247	730	$425	102	$3,042
1413	North IRL	$210,568	495	$425	72	$2,925
2093	Central IRL	$244,362	575	$425	64	$3,818
1921	Central IRL	$206,941	486	$426	46	$4,499
2009	Central IRL	$328,734	770	$427	107	$3,072
1505	Central IRL	$226,671	531	$427	77	$2,944
1774	Central IRL	$224,839	527	$427	56	$4,015
1437	Central IRL	$221,285	517	$428	69	$3,207
2150	Central IRL	$191,159	447	$428	39	$4,902
1466	Central IRL	$235,321	549	$429	81	$2,905
1648	Central IRL	$240,843	561	$429	57	$4,225
2130	Central IRL	$204,403	477	$429	58	$3,524
1339	North IRL	$311,214	723	$430	92	$3,383
1443	Central IRL	$203,613	473	$430	62	$3,284
1645	Central IRL	$240,802	560	$430	72	$3,344
1968	Central IRL	$341,105	791	$431	103	$3,312
1955	Central IRL	$233,916	543	$431	66	$3,544
1228	North IRL	$278,276	644	$432	79	$3,522

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1621	Central IRL	$237,519	550	$432	78	$3,045
2147	Central IRL	$216,331	501	$432	69	$3,135
1806	Central IRL	$212,036	490	$433	74	$2,865
1828	Central IRL	$257,933	595	$434	106	$2,433
1786	Central IRL	$256,195	590	$434	56	$4,575
1877	Central IRL	$283,051	651	$435	90	$3,145
1522	Central IRL	$244,226	561	$435	81	$3,015
1498	Central IRL	$228,222	525	$435	77	$2,964
2103	Central IRL	$287,111	660	$435	89	$3,226
893	North IRL	$216,604	497	$436	73	$2,967
794	North IRL	$179,333	411	$436	61	$2,940
1504	Central IRL	$222,651	511	$436	78	$2,855
1712	Central IRL	$273,528	628	$436	77	$3,552
1962	Central IRL	$246,192	565	$436	64	$3,847
1590	Central IRL	$232,077	531	$437	64	$3,626
1532	Central IRL	$183,943	421	$437	66	$2,787
2109	Central IRL	$279,673	639	$438	91	$3,073
2118	Central IRL	$265,236	606	$438	72	$3,684
1643	Central IRL	$330,542	751	$440	104	$3,178
1706	Central IRL	$220,230	501	$440	70	$3,146
2152	Central IRL	$185,273	421	$440	32	$5,790
1241	North IRL	$246,842	560	$441	74	$3,336
867	North IRL	$184,732	419	$441	42	$4,398
2256	Central IRL	$248,028	563	$441	67	$3,702
1898	Central IRL	$214,638	486	$442	47	$4,567
2225	Central IRL	$182,533	413	$442	40	$4,563
1994	Central IRL	$216,028	488	$443	49	$4,409
862	North IRL	$210,482	474	$444	73	$2,883
2190	Central IRL	$192,716	434	$444	60	$3,212
2208	Central IRL	$169,227	381	$444	29	$5,835
12	North IRL	$174,114	391	$445	63	$2,764
1244	North IRL	$287,010	643	$446	90	$3,189
1929	Central IRL	$246,824	552	$447	63	$3,918
2210	Central IRL	$186,278	417	$447	65	$2,866
1822	Central IRL	$185,476	415	$447	67	$2,768
1352C	North IRL	$235,902	526	$448	73	$3,232
1881	Central IRL	$318,792	711	$448	99	$3,220
1987	Central IRL	$213,089	476	$448	55	$3,874
2095	Central IRL	$219,373	490	$448	60	$3,656

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
152	North IRL	$168,832	376	$449	57	$2,962
884	North IRL	$217,497	483	$450	71	$3,063
1833	Central IRL	$325,815	724	$450	100	$3,258
1805	Central IRL	$239,938	533	$450	74	$3,242
1757	Central IRL	$219,653	488	$450	68	$3,230
2080	Central IRL	$296,772	660	$450	93	$3,191
2228	Central IRL	$233,917	520	$450	69	$3,390
1403	North IRL	$225,606	500	$451	76	$2,969
1354	North IRL	$231,950	513	$452	75	$3,093
1915	Central IRL	$361,469	798	$453	111	$3,256
2071	Central IRL	$297,917	658	$453	100	$2,979
2120	Central IRL	$246,760	545	$453	74	$3,335
950	North IRL	$213,661	471	$454	70	$3,052
1883	Central IRL	$219,052	482	$454	63	$3,477
1930	Central IRL	$239,049	526	$454	59	$4,052
2194	Central IRL	$185,151	408	$454	59	$3,138
2170	Central IRL	$175,709	387	$454	31	$5,668
1862	Central IRL	$232,311	509	$456	70	$3,319
1390	North IRL	$212,031	464	$457	68	$3,118
2420	North IRL	$209,315	458	$457	71	$2,948
2132	Central IRL	$305,801	669	$457	93	$3,288
1914	Central IRL	$303,209	663	$457	83	$3,653
1899	Central IRL	$304,639	666	$457	86	$3,542
2267	Central IRL	$190,191	416	$457	65	$2,926
1800	Central IRL	$217,956	476	$458	68	$3,205
1330	North IRL	$266,334	580	$459	84	$3,171
1348	North IRL	$273,634	596	$459	82	$3,337
CO-2N	North IRL	$181,815	396	$459	53	$3,430
1652	Central IRL	$301,866	657	$459	92	$3,281
2145	Central IRL	$223,532	487	$459	55	$4,064
1739	Central IRL	$203,311	442	$460	62	$3,279
1599	Central IRL	$189,647	412	$460	67	$2,831
1428	North IRL	$212,844	462	$461	68	$3,130
1670	Central IRL	$306,390	664	$461	93	$3,295
2262	Central IRL	$244,610	531	$461	63	$3,883
SJR-91	North IRL	$257,810	558	$462	74	$3,484
1679	Central IRL	$201,077	435	$462	61	$3,296
1501	Central IRL	$217,837	470	$463	66	$3,301
1765	Central IRL	$219,402	472	$465	63	$3,483

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1423	North IRL	$233,903	502	$466	74	$3,161
922	North IRL	$241,480	518	$466	74	$3,263
2037	Central IRL	$237,073	509	$466	59	$4,018
2076	Central IRL	$224,701	482	$466	54	$4,161
2192	Central IRL	$164,027	352	$466	22	$7,456
1656	Central IRL	$212,456	455	$467	65	$3,269
1506	Central IRL	$233,738	498	$469	70	$3,339
1649	Central IRL	$236,808	505	$469	70	$3,383
1969	Central IRL	$260,550	556	$469	78	$3,340
1870	Central IRL	$207,621	443	$469	59	$3,519
1549	Central IRL	$246,888	524	$471	74	$3,336
1989	Central IRL	$289,641	613	$472	85	$3,408
1602	Central IRL	$213,999	452	$473	66	$3,242
2031	Central IRL	$226,010	478	$473	53	$4,264
1734	Central IRL	$240,941	508	$474	73	$3,301
1543	Central IRL	$234,321	494	$474	72	$3,254
1719	Central IRL	$260,986	551	$474	77	$3,389
1483	Central IRL	$203,960	429	$475	63	$3,237
1807	Central IRL	$195,089	411	$475	47	$4,151
2154	Central IRL	$175,379	369	$475	32	$5,481
762	North IRL	$188,796	397	$476	49	$3,853
1841	Central IRL	$223,991	471	$476	68	$3,294
1854	Central IRL	$311,652	653	$477	88	$3,542
1573	Central IRL	$217,046	455	$477	61	$3,558
1465	Central IRL	$245,462	513	$478	69	$3,557
1536	Central IRL	$236,392	495	$478	69	$3,426
1959	Central IRL	$247,858	518	$478	68	$3,645
2419	North IRL	$230,613	481	$479	61	$3,781
2036	Central IRL	$219,805	459	$479	53	$4,147
1294	North IRL	$245,240	511	$480	76	$3,227
1257	North IRL	$229,523	478	$480	63	$3,643
2113	Central IRL	$241,923	504	$480	66	$3,666
2090	Central IRL	$201,144	419	$480	41	$4,906
1378	North IRL	$209,204	435	$481	62	$3,374
1312	North IRL	$201,420	419	$481	61	$3,302
2033	Central IRL	$238,570	496	$481	75	$3,181
1920	Central IRL	$202,624	421	$481	52	$3,897
1262	North IRL	$209,767	435	$482	64	$3,278
2063	Central IRL	$228,233	474	$482	93	$2,454

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
2410	Central IRL	$166,747	346	$482	33	$5,053
1251	North IRL	$212,377	439	$484	64	$3,318
2097	Central IRL	$228,795	473	$484	63	$3,632
2260	Central IRL	$203,448	420	$484	46	$4,423
2006	Central IRL	$236,600	488	$485	66	$3,585
2171	Central IRL	$173,323	357	$485	31	$5,591
28	North IRL	$162,006	333	$487	28	$5,786
1999	Central IRL	$266,594	547	$487	70	$3,808
2246	Central IRL	$186,617	383	$487	33	$5,655
1580	Central IRL	$210,121	431	$488	64	$3,283
1943	Central IRL	$260,695	534	$488	67	$3,891
2259	Central IRL	$173,385	355	$488	32	$5,418
1673	Central IRL	$266,779	546	$489	77	$3,465
1769	Central IRL	$201,389	412	$489	60	$3,356
2126	Central IRL	$178,985	365	$490	59	$3,034
1859	Central IRL	$212,217	432	$491	51	$4,161
851	North IRL	$193,394	393	$492	59	$3,278
1467	Central IRL	$223,922	455	$492	63	$3,554
2238	Central IRL	$194,305	395	$492	41	$4,739
1896	Central IRL	$220,423	448	$492	49	$4,498
1966	Central IRL	$206,634	418	$494	57	$3,625
1985	Central IRL	$209,798	425	$494	61	$3,439
1710	Central IRL	$229,584	465	$494	65	$3,532
1610	Central IRL	$210,809	426	$495	63	$3,346
1594	Central IRL	$240,792	486	$495	64	$3,762
166	North IRL	$160,397	322	$498	55	$2,916
2275	Central IRL	$185,662	373	$498	59	$3,147
1891	Central IRL	$298,246	597	$500	83	$3,593
1554	Central IRL	$220,093	440	$500	61	$3,608
2164	Central IRL	$196,973	394	$500	34	$5,793
SJR-119	Central IRL	$164,526	328	$502	31	$5,307
1623	Central IRL	$210,106	418	$503	58	$3,623
1701	Central IRL	$223,944	445	$503	58	$3,861
771	North IRL	$164,300	326	$504	44	$3,734
1951	Central IRL	$172,954	343	$504	32	$5,405
1293	North IRL	$219,151	434	$505	63	$3,479
1361	North IRL	$236,782	468	$506	70	$3,383
1220	North IRL	$202,769	401	$506	59	$3,437
1924	Central IRL	$242,366	478	$507	62	$3,909

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
2183	Central IRL	$179,462	354	$507	29	$6,188
1761	Central IRL	$195,084	384	$508	53	$3,681
1863	Central IRL	$236,230	464	$509	66	$3,579
1850	Central IRL	$256,497	504	$509	66	$3,886
2207	Central IRL	$182,379	358	$509	70	$2,605
2004	Central IRL	$174,599	343	$509	32	$5,456
2100	Central IRL	$173,189	339	$511	33	$5,248
1429	Central IRL	$240,569	469	$513	61	$3,944
817	North IRL	$143,577	279	$515	26	$5,522
1570	Central IRL	$236,230	459	$515	62	$3,810
1905	Central IRL	$221,755	431	$515	51	$4,348
2204	Central IRL	$179,412	347	$517	39	$4,600
217	North IRL	$208,604	401	$520	53	$3,936
1936	Central IRL	$213,647	411	$520	60	$3,561
1887	Central IRL	$171,624	330	$520	27	$6,356
1872	Central IRL	$292,790	562	$521	78	$3,754
2240	Central IRL	$191,079	367	$521	34	$5,620
1352D	North IRL	$220,862	423	$522	61	$3,621
1874	Central IRL	$287,427	551	$522	77	$3,733
1821	Central IRL	$255,573	488	$524	64	$3,993
223	North IRL	$192,609	367	$525	51	$3,777
1448	Central IRL	$251,309	479	$525	63	$3,989
2040	Central IRL	$200,819	382	$526	47	$4,273
1668	Central IRL	$206,606	392	$527	57	$3,625
2034	Central IRL	$213,674	404	$529	64	$3,339
871	North IRL	$220,192	414	$532	59	$3,732
1553	Central IRL	$218,013	410	$532	53	$4,113
2155	Central IRL	$201,400	378	$533	44	$4,577
1640	Central IRL	$240,504	450	$534	62	$3,879
1922	Central IRL	$234,406	439	$534	62	$3,781
2001	Central IRL	$167,975	313	$537	33	$5,090
1292A	North IRL	$189,427	352	$538	56	$3,383
2213	Central IRL	$168,868	312	$541	29	$5,823
2043	Central IRL	$218,263	403	$542	60	$3,638
2218	Central IRL	$149,673	276	$542	20	$7,484
194	North IRL	$182,496	336	$543	37	$4,932
1982	Central IRL	$249,677	460	$543	64	$3,901
2035	Central IRL	$180,981	333	$543	37	$4,891
2230	Central IRL	$163,846	302	$543	20	$8,192

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
RL-1A	North IRL	$178,812	328	$545	50	$3,576
1292	North IRL	$215,202	394	$546	59	$3,647
2108	Central IRL	$207,725	379	$548	52	$3,995
2018	Central IRL	$233,151	424	$550	54	$4,318
1893	Central IRL	$205,267	372	$552	43	$4,774
1956	Central IRL	$174,177	315	$553	36	$4,838
2248	Central IRL	$211,713	382	$554	45	$4,705
1945	Central IRL	$188,903	340	$556	39	$4,844
TV-Oleander Basin	North IRL	$164,330	295	$557	46	$3,572
1867	Central IRL	$188,213	338	$557	50	$3,764
1641	Central IRL	$179,838	323	$557	50	$3,597
1520	Central IRL	$188,416	338	$557	49	$3,845
1444	Central IRL	$253,528	454	$558	60	$4,225
1693	Central IRL	$206,881	369	$561	50	$4,138
882	North IRL	$187,011	333	$562	52	$3,596
2058	Central IRL	$195,690	348	$562	44	$4,448
753	North IRL	$154,855	275	$563	23	$6,733
1233A	North IRL	$175,494	311	$564	43	$4,081
2162	Central IRL	$205,277	364	$564	45	$4,562
1697	Central IRL	$206,891	367	$564	42	$4,926
2214	Central IRL	$162,494	288	$564	23	$7,065
2088	Central IRL	$206,308	365	$565	44	$4,689
1709	Central IRL	$181,205	320	$566	47	$3,855
1474	Central IRL	$179,838	317	$567	47	$3,826
		$161,708,519	446,245	$362	60,534	$2,671
1344	North IRL	$218,030	383	$569	48	$4,542
923	North IRL	$157,680	277	$569	36	$4,380
1320	North IRL	$177,885	312	$570	44	$4,043
749	North IRL	$158,485	278	$570	24	$6,604
1795	Central IRL	$207,453	364	$570	55	$3,772
1574	Central IRL	$190,272	333	$571	43	$4,425
1913	Central IRL	$189,590	332	$571	35	$5,417
113	North IRL	$170,454	298	$572	44	$3,874
2044	Central IRL	$208,713	365	$572	54	$3,865
1904	Central IRL	$215,907	374	$577	47	$4,594
1916	Central IRL	$225,498	390	$578	54	$4,176
1973	Central IRL	$152,714	264	$578	22	$6,942
2073	Central IRL	$225,345	388	$581	56	$4,024

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1224	North IRL	$180,316	310	$582	41	$4,398
1851	Central IRL	$242,266	416	$582	58	$4,177
2124	Central IRL	$199,778	343	$582	44	$4,540
79	North IRL	$176,705	303	$583	35	$5,049
RL-FDOT	North IRL	$171,338	293	$585	39	$4,393
760	North IRL	$177,985	304	$585	45	$3,955
910	North IRL	$184,202	315	$585	42	$4,386
2096	Central IRL	$176,934	302	$586	32	$5,529
1525	Central IRL	$185,016	315	$587	45	$4,111
2125	Central IRL	$182,286	310	$588	47	$3,878
216	North IRL	$157,320	267	$589	31	$5,075
2054	Central IRL	$168,315	286	$589	45	$3,740
952	North IRL	$176,787	299	$591	44	$4,018
1391	North IRL	$178,476	300	$595	45	$3,966
1404	North IRL	$162,278	272	$597	41	$3,958
1606	Central IRL	$176,050	295	$597	40	$4,401
1923	Central IRL	$223,975	373	$600	50	$4,480
1248	North IRL	$183,833	306	$601	45	$4,085
2091	Central IRL	$194,798	324	$601	42	$4,638
98	North IRL	$167,522	278	$603	42	$3,989
2068	Central IRL	$169,485	281	$603	28	$6,053
2119	Central IRL	$175,430	291	$603	27	$6,497
2133	Central IRL	$165,797	275	$603	20	$8,290
1596	Central IRL	$163,256	267	$611	43	$3,797
RL-2C	North IRL	$195,491	319	$613	43	$4,546
1245	North IRL	$209,115	340	$615	47	$4,449
2251	Central IRL	$161,954	263	$616	29	$5,585
1382	North IRL	$194,892	316	$617	45	$4,331
1333	North IRL	$172,745	280	$617	42	$4,113
1412	North IRL	$169,609	275	$617	39	$4,349
212A	North IRL	$175,018	283	$618	41	$4,269
1775	Central IRL	$169,887	275	$618	31	$5,480
1526	Central IRL	$206,736	334	$619	49	$4,219
902	North IRL	$209,517	338	$620	48	$4,365
111	North IRL	$143,830	230	$625	20	$7,192
1909	Central IRL	$174,951	280	$625	38	$4,604
2245	Central IRL	$164,536	263	$626	24	$6,856
1882	Central IRL	$198,904	315	$631	40	$4,973
5	North IRL	$146,883	232	$633	21	$6,994

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
2123	Central IRL	$179,484	283	$634	35	$5,128
2022	Central IRL	$175,880	277	$635	39	$4,510
1296	North IRL	$171,672	270	$636	40	$4,292
994	North IRL	$168,264	264	$637	41	$4,104
748A	North IRL	$149,643	235	$637	38	$3,938
751	North IRL	$193,460	303	$638	45	$4,299
2000	Central IRL	$202,990	318	$638	45	$4,511
1253	North IRL	$204,420	320	$639	44	$4,646
795	North IRL	$175,544	274	$641	37	$4,744
96	North IRL	$153,323	239	$642	31	$4,946
RL-3F	North IRL	$196,781	306	$643	44	$4,472
1231	North IRL	$194,313	302	$643	44	$4,416
954	North IRL	$162,742	253	$643	35	$4,650
2270	Central IRL	$165,569	257	$644	39	$4,245
1844	Central IRL	$182,755	283	$646	28	$6,527
SJR-80	North IRL	$155,181	239	$649	33	$4,702
1890	Central IRL	$198,091	305	$649	45	$4,402
1490	Central IRL	$158,649	242	$656	27	$5,876
CO-8A	North IRL	$168,447	256	$658	37	$4,553
CO-2QB	North IRL	$158,158	239	$662	34	$4,652
953	North IRL	$176,447	266	$663	42	$4,201
1379	North IRL	$167,905	251	$669	39	$4,305
1528	Central IRL	$194,752	291	$669	41	$4,750
1938	Central IRL	$171,806	257	$669	35	$4,909
812	North IRL	$165,304	246	$672	35	$4,723
2011	Central IRL	$191,571	284	$675	36	$5,321
857	North IRL	$169,553	251	$676	36	$4,710
2107	Central IRL	$161,504	239	$676	19	$8,500
RL-4H	North IRL	$163,738	242	$677	32	$5,117
2263	Central IRL	$170,142	251	$678	25	$6,806
1226	North IRL	$182,636	269	$679	38	$4,806
938	North IRL	$149,974	221	$679	23	$6,521
2070	Central IRL	$175,691	258	$681	38	$4,623
174	North IRL	$150,570	220	$684	36	$4,183
1578	Central IRL	$155,599	227	$685	37	$4,205
1431	North IRL	$160,493	233	$689	32	$5,015
63	North IRL	$156,920	227	$691	45	$3,487
1613	Central IRL	$149,070	215	$693	36	$4,141
1273	North IRL	$172,198	248	$694	39	$4,415

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
CO-6I	North IRL	$162,905	234	$696	35	$4,654
61A	North IRL	$151,068	217	$696	50	$3,021
1809	Central IRL	$156,670	225	$696	36	$4,352
1895	Central IRL	$167,389	240	$697	34	$4,923
1233	North IRL	$175,150	251	$698	35	$5,004
1213	North IRL	$163,433	233	$701	33	$4,953
2061	Central IRL	$160,529	229	$701	33	$4,865
1239	North IRL	$186,099	265	$702	45	$4,136
TV-Riveredge-Horizon Basin	North IRL	$186,013	265	$702	34	$5,471
1783	Central IRL	$163,711	233	$703	34	$4,815
1675	Central IRL	$177,817	253	$703	31	$5,736
1078A	North IRL	$169,756	239	$710	35	$4,850
SJR-77	North IRL	$155,205	216	$719	36	$4,311
TV-Coleman Basin	North IRL	$165,795	230	$721	29	$5,717
1297	North IRL	$168,917	234	$722	34	$4,968
2134A	Central IRL	$180,265	249	$724	33	$5,463
1838	Central IRL	$190,497	262	$727	37	$5,149
2421	North IRL	$178,648	245	$729	35	$5,104
1984	Central IRL	$186,789	256	$730	34	$5,494
2059	Central IRL	$168,213	230	$731	34	$4,947
1551	Central IRL	$183,799	251	$732	36	$5,106
1925	Central IRL	$170,480	232	$735	36	$4,736
991	North IRL	$166,963	226	$739	32	$5,218
2224	Central IRL	$148,679	201	$740	20	$7,434
SJR-112	Central IRL	$165,912	222	$747	22	$7,541
1864	Central IRL	$188,405	252	$748	35	$5,383
1937	Central IRL	$166,250	222	$749	29	$5,733
1667	Central IRL	$174,897	233	$751	30	$5,830
1838A	Central IRL	$183,603	244	$752	34	$5,400
2234	Central IRL	$150,859	200	$754	34	$4,437
2269	Central IRL	$161,614	212	$762	23	$7,027
1515	Central IRL	$170,156	222	$766	33	$5,156
1347	North IRL	$158,065	204	$775	34	$4,649
SJR-123	Central IRL	$142,192	183	$777	17	$8,364
228	North IRL	$158,804	204	$778	31	$5,123
883	North IRL	$151,010	194	$778	32	$4,719
1724	Central IRL	$154,111	198	$778	28	$5,504

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
RL-4G	North IRL	$164,741	211	$781	32	$5,148
TV-Knox McRae Basin	North IRL	$146,103	187	$781	29	$5,038
80B	North IRL	$182,116	233	$782	33	$5,519
2243A	Central IRL	$158,037	201	$786	21	$7,526
2292	Central IRL	$171,552	218	$787	30	$5,718
802	North IRL	$153,715	194	$792	26	$5,912
2277	Central IRL	$155,571	196	$794	30	$5,186
2153	Central IRL	$145,759	183	$796	12	$12,147
2286	Central IRL	$172,064	216	$797	30	$5,735
TV-Hopkins Road Basin	North IRL	$144,330	180	$802	30	$4,811
876	North IRL	$133,220	166	$803	15	$8,881
1558	Central IRL	$149,728	186	$805	29	$5,163
TV-US-1 Basin	North IRL	$184,739	229	$807	31	$5,959
2023	Central IRL	$166,744	206	$809	30	$5,558
1410	North IRL	$146,798	181	$811	27	$5,437
CO-2P	North IRL	$144,514	176	$821	24	$6,021
2112	Central IRL	$149,862	182	$823	28	$5,352
1572	Central IRL	$152,165	185	$823	28	$5,434
2157	Central IRL	$168,813	203	$832	27	$6,252
1475	North IRL	$147,466	177	$833	24	$6,144
2182A	Central IRL	$155,465	186	$836	27	$5,758
1871	Central IRL	$150,546	178	$846	29	$5,191
1433	Central IRL	$156,251	184	$849	23	$6,794
1323	North IRL	$169,203	199	$850	28	$6,043
73	North IRL	$135,168	159	$850	14	$9,655
2255	Central IRL	$147,969	174	$850	17	$8,704
1792	Central IRL	$158,207	185	$855	58	$2,728
164	North IRL	$143,163	167	$857	37	$3,869
1307A	North IRL	$162,315	187	$868	23	$7,057
2236	Central IRL	$161,651	186	$869	20	$8,083
1077	North IRL	$150,116	172	$873	25	$6,005
1770	Central IRL	$160,731	183	$878	24	$6,697
TV-Coranada Basin	North IRL	$143,833	162	$888	24	$5,993
2418	North IRL	$146,401	164	$893	24	$6,100
1259	North IRL	$159,537	177	$901	27	$5,909
CO-2O	North IRL	$149,729	166	$902	24	$6,239

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
2025	Central IRL	$163,000	180	$906	23	$7,087
CO-2R	North IRL	$148,324	162	$916	22	$6,742
1252	North IRL	$163,084	178	$916	23	$7,091
2014	Central IRL	$150,362	164	$917	26	$5,783
1875	Central IRL	$152,794	166	$920	19	$8,042
1785	Central IRL	$153,990	167	$922	16	$9,624
SJR-7	North IRL	$136,981	148	$926	23	$5,956
1564	Central IRL	$151,099	163	$927	16	$9,444
1408	North IRL	$152,469	164	$930	24	$6,353
RL-4A	North IRL	$159,442	171	$932	25	$6,378
2233	Central IRL	$149,552	160	$935	17	$8,797
2146	Central IRL	$143,671	153	$939	12	$11,973
1998	Central IRL	$160,798	171	$940	22	$7,309
1845	Central IRL	$152,231	162	$940	17	$8,955
2283	Central IRL	$159,220	169	$942	24	$6,634
90	North IRL	$155,983	165	$945	21	$7,428
2121	Central IRL	$145,101	153	$948	22	$6,596
2205	Central IRL	$135,522	143	$948	8	$16,940
2181	Central IRL	$148,707	156	$953	23	$6,466
1341	North IRL	$149,463	155	$964	23	$6,498
80	North IRL	$143,933	149	$966	15	$9,596
2249	Central IRL	$153,600	158	$972	18	$8,533
2187	Central IRL	$139,057	143	$972	14	$9,933
2202	Central IRL	$144,283	148	$975	20	$7,214
41	North IRL	$138,150	140	$987	22	$6,280
1853	Central IRL	$151,827	153	$992	23	$6,601
2082	Central IRL	$143,521	143	$1,004	22	$6,524
644	North IRL	$148,482	147	$1,010	19	$7,815
1995	Central IRL	$151,867	150	$1,012	20	$7,593
1912	Central IRL	$154,948	153	$1,013	20	$7,747
SJR-101	North IRL	$142,108	140	$1,015	23	$6,179
42	North IRL	$155,849	153	$1,019	18	$8,658
2081	Central IRL	$146,919	144	$1,020	19	$7,733
1510	Central IRL	$155,536	152	$1,023	22	$7,070
2151	Central IRL	$141,558	137	$1,033	12	$11,797
1983	Central IRL	$155,623	150	$1,037	21	$7,411
1745	Central IRL	$139,143	133	$1,046	23	$6,050
80C	North IRL	$153,473	146	$1,051	22	$6,976
1691	Central IRL	$148,920	141	$1,056	18	$8,273

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1764	Central IRL	$141,567	134	$1,056	20	$7,078
2041	Central IRL	$150,159	141	$1,065	19	$7,903
1677	Central IRL	$145,330	136	$1,069	20	$7,267
990B	Banana River	$140,020	130	$1,077	14	$10,001
1035	North IRL	$144,646	134	$1,079	21	$6,888
2220	Central IRL	$136,730	126	$1,085	10	$13,673
IHB-44A	Banana	$141,207	130	$1,086	21	$6,724
2203	Central IRL	$136,944	126	$1,087	8	$17,118
CO-9A	North IRL	$144,063	132	$1,091	19	$7,582
929A	North IRL	$158,560	145	$1,094	20	$7,928
RL-1G	North IRL	$150,459	137	$1,098	19	$7,919
RL-1N	North IRL	$150,539	137	$1,099	20	$7,527
1159	Banana	$144,090	130	$1,108	19	$7,584
979E	Banana	$140,771	126	$1,117	18	$7,821
CC-B3	Banana	$142,375	127	$1,121	19	$7,493
SJR-79	North IRL	$140,032	124	$1,129	18	$7,780
2261	Central IRL	$142,260	126	$1,129	13	$10,943
1050	Banana River	$139,477	123	$1,134	13	$10,729
IHB-50	Banana	$149,656	132	$1,134	19	$7,877
2201	Central IRL	$138,005	121	$1,141	9	$15,334
939D	North IRL	$154,205	135	$1,142	18	$8,567
1715	Central IRL	$142,774	125	$1,142	18	$7,932
979G	Banana	$141,726	124	$1,143	18	$7,874
98A	North IRL	$138,152	119	$1,161	17	$8,127
IHB-36	Banana	$142,939	123	$1,162	18	$7,941
1315	Banana	$140,785	121	$1,164	18	$7,821
CC-B4G	Banana	$141,183	121	$1,167	20	$7,059
859	North IRL	$137,192	117	$1,173	20	$6,860
RL-1I	North IRL	$146,923	125	$1,175	18	$8,162
RL-1M	North IRL	$140,343	119	$1,179	19	$7,386
940A	North IRL	$142,799	121	$1,180	18	$7,933
1332	Banana	$144,114	122	$1,181	18	$8,006
884A	North IRL	$146,046	123	$1,187	18	$8,114
1092	Banana River	$139,162	117	$1,189	12	$11,597
1291	North IRL	$140,571	118	$1,191	16	$8,786
1225	North IRL	$143,232	120	$1,194	18	$7,957
SJR-53	North IRL	$140,696	117	$1,203	20	$7,035
2114	Central IRL	$136,178	113	$1,205	18	$7,565
1226A	North IRL	$150,907	124	$1,217	17	$8,877

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1556	Central IRL	$137,856	113	$1,220	17	$8,109
SJR-89	North IRL	$145,968	119	$1,227	11	$13,270
IHB-17A	Banana	$138,047	112	$1,233	20	$6,902
SB-P-1	Banana	$140,129	113	$1,240	16	$8,758
RL-4E	North IRL	$147,689	119	$1,241	16	$9,231
100A	North IRL	$135,296	109	$1,241	18	$7,516
1960A	Central IRL	$139,860	112	$1,249	17	$8,227
1011	Banana River	$140,010	112	$1,250	16	$8,751
TV-Titusville High School 2 Basin	North IRL	$140,135	112	$1,251	16	$8,758
99	North IRL	$131,685	105	$1,254	9	$14,632
839	North IRL	$138,046	110	$1,255	16	$8,628
887	North IRL	$135,627	108	$1,256	14	$9,688
1307B	North IRL	$148,426	117	$1,269	16	$9,277
1305	North IRL	$140,441	110	$1,277	16	$8,778
921/939B	North IRL	$137,890	108	$1,277	13	$10,607
2243	Central IRL	$151,182	117	$1,292	15	$10,079
2274	Central IRL	$151,193	117	$1,292	15	$10,080
944	Banana River	$142,668	110	$1,297	14	$10,191
1733	Central IRL	$136,605	105	$1,301	16	$8,538
1167	Banana	$139,523	107	$1,304	16	$8,720
1006	Banana River	$139,086	106	$1,312	16	$8,693
RL-1O	North IRL	$129,843	99	$1,312	13	$9,988
2198	Central IRL	$135,120	103	$1,312	13	$10,394
IHB-59	Banana River	$136,730	104	$1,315	16	$8,546
2421A	Banana River	$143,888	108	$1,332	15	$9,593
RL-1V	North IRL	$138,964	104	$1,336	15	$9,264
2265	Central IRL	$145,743	109	$1,337	13	$11,211
773	North IRL	$133,236	99	$1,346	9	$14,804
2272	Central IRL	$136,064	101	$1,347	14	$9,719
IHB-45	Banana River	$132,439	98	$1,351	14	$9,460
1583	Central IRL	$136,120	100	$1,361	16	$8,508
RL-2B	North IRL	$139,142	102	$1,364	11	$12,649
769	North IRL	$132,408	97	$1,365	11	$12,037
1016B	Banana River	$132,958	96	$1,385	14	$9,497
818	North IRL	$132,341	95	$1,393	16	$8,271
1163	Banana River	$135,263	97	$1,394	10	$13,526
RL-1K	North IRL	$137,354	98	$1,402	14	$9,811
979D	Banana River	$134,725	96	$1,403	10	$13,473

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1048	Banana River	$134,248	95	$1,413	14	$9,589
CO-2D	North IRL	$137,177	97	$1,414	14	$9,798
SJR-120	Central IRL	$132,932	94	$1,414	9	$14,770
1311	North IRL	$140,523	99	$1,419	14	$10,037
869	North IRL	$139,130	98	$1,420	14	$9,938
2030	Central IRL	$142,268	100	$1,423	13	$10,944
1033	Banana River	$133,872	94	$1,424	13	$10,298
97	North IRL	$128,287	90	$1,425	8	$16,036
1219	North IRL	$139,565	97	$1,439	13	$10,736
CO-2B	North IRL	$137,272	95	$1,445	14	$9,805
IHB-20	Banana River	$137,764	95	$1,450	14	$9,840
870	North IRL	$141,526	97	$1,459	14	$10,109
1229	Banana River	$134,990	92	$1,467	16	$8,437
1319	Banana River	$139,653	95	$1,470	14	$9,975
SJR-60	North IRL	$138,426	94	$1,473	13	$10,648
CO-6E	North IRL	$129,886	88	$1,476	12	$10,824
TV-Brevard Basin	North IRL	$130,689	88	$1,485	12	$10,891
SB-GS-17	Banana River	$141,207	95	$1,486	14	$10,086
1103	Banana River	$135,094	90	$1,501	9	$15,010
1669	Central IRL	$141,697	94	$1,507	12	$11,808
1180	Banana River	$133,686	88	$1,519	9	$14,854
1105	Banana River	$133,916	88	$1,522	9	$14,880
SJR-100	North IRL	$137,321	90	$1,526	13	$10,563
IHB-15D	Banana River	$131,927	86	$1,534	15	$8,795
970B	Banana River	$133,814	87	$1,538	10	$13,381
SJR-117	Central IRL	$138,790	90	$1,542	12	$11,566
1650	Central IRL	$134,583	87	$1,547	12	$11,215
1070	Banana River	$133,578	86	$1,553	9	$14,842
1309A	Banana River	$134,751	86	$1,567	13	$10,365
TV-Grace Basin	North IRL	$131,968	84	$1,571	12	$10,997
CO-2G	North IRL	$135,397	86	$1,574	12	$11,283
2221	Central IRL	$135,586	86	$1,577	9	$15,065
RL-3H	North IRL	$143,685	91	$1,579	12	$11,974
SB-C-3	Banana River	$140,650	89	$1,580	12	$11,721
SB-LIB-1	Banana River	$144,098	91	$1,583	13	$11,084
1382A	North IRL	$134,549	85	$1,583	13	$10,350
89A	North IRL	$135,085	85	$1,589	12	$11,257
1947	Central IRL	$138,736	87	$1,595	12	$11,561
1495	Central IRL	$135,912	85	$1,599	12	$11,326

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
RL-1J	North IRL	$129,560	81	$1,600	11	$11,778
IHB-35	Banana River	$142,742	89	$1,604	12	$11,895
SB-C-11	Banana River	$135,480	84	$1,613	13	$10,422
1651	Central IRL	$135,680	84	$1,615	11	$12,335
CC-B5C	Banana River	$137,832	85	$1,622	14	$9,845
2028	Central IRL	$139,517	86	$1,622	11	$12,683
1592	Central IRL	$133,215	82	$1,625	14	$9,515
750	North IRL	$140,978	86	$1,639	13	$10,844
1903	Central IRL	$133,657	81	$1,650	9	$14,851
1016A	Banana River	$135,420	82	$1,651	11	$12,311
1306A	North IRL	$133,755	81	$1,651	10	$13,376
SJR-96	North IRL	$136,762	82	$1,668	12	$11,397
IHB-1B	Banana River	$136,968	82	$1,670	14	$9,783
2053	Central IRL	$132,331	79	$1,675	10	$13,233
1473	Central IRL	$132,546	79	$1,678	10	$13,255
1034	North IRL	$129,308	77	$1,679	12	$10,776
1743	Central IRL	$136,438	81	$1,684	11	$12,403
68	North IRL	$133,191	79	$1,686	38	$3,505
SB-D-9	Banana River	$137,236	81	$1,694	11	$12,476
SB-N-2	Banana River	$139,428	82	$1,700	12	$11,619
1306	North IRL	$134,707	79	$1,705	10	$13,471
939A	North IRL	$138,218	81	$1,706	11	$12,565
143	North IRL	$131,604	77	$1,709	8	$16,451
1011B	Banana River	$133,573	78	$1,712	10	$13,357
1100	Banana River	$132,303	77	$1,718	8	$16,538
CC-B7	Banana River	$136,813	79	$1,732	11	$12,438
1414A	North IRL	$133,879	77	$1,739	11	$12,171
SB-D-5	Banana River	$134,026	77	$1,741	11	$12,184
TV-Washington-Cheney Basin	North IRL	$131,349	75	$1,751	10	$13,135
IHB-16	Banana River	$131,775	75	$1,757	13	$10,137
938A	North IRL	$133,930	76	$1,762	10	$13,393
SJR-107	Central IRL	$135,361	76	$1,781	12	$11,280
970F	Banana River	$132,139	74	$1,786	10	$13,214
SJR-115	Central IRL	$132,335	74	$1,788	12	$11,028
IHB-56	Banana River	$137,858	77	$1,790	11	$12,533
2422	Banana River	$137,959	77	$1,792	10	$13,796
SB-SD-6	Banana River	$139,827	78	$1,793	11	$12,712
1228A	North IRL	$134,714	75	$1,796	10	$13,471

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
IHB-54	Banana River	$138,402	77	$1,797	11	$12,582
SB-SD-5	Banana River	$133,028	74	$1,798	11	$12,093
SB-C-9	Banana River	$133,411	74	$1,803	11	$12,128
SJR-50	North IRL	$130,673	72	$1,815	11	$11,879
939C	North IRL	$136,940	75	$1,826	10	$13,694
1846	Central IRL	$135,572	74	$1,832	13	$10,429
SB-FDOT	Banana River	$128,491	69	$1,862	10	$12,849
1917	Central IRL	$134,292	72	$1,865	9	$14,921
1414B	North IRL	$132,505	71	$1,866	10	$13,251
91	North IRL	$127,779	68	$1,879	6	$21,297
SJR-99	North IRL	$129,803	69	$1,881	12	$10,817
SJR-59	North IRL	$140,157	74	$1,894	10	$14,016
939E	North IRL	$132,665	70	$1,895	10	$13,267
948A	Banana River	$130,861	69	$1,897	9	$14,540
46C	North IRL	$131,674	69	$1,908	11	$11,970
1686	Central IRL	$132,089	69	$1,914	10	$13,209
1083	Banana River	$134,019	70	$1,915	9	$14,891
CC-B9A	Banana River	$127,064	66	$1,925	9	$14,118
SB-C-17	Banana River	$130,101	67	$1,942	11	$11,827
748	North IRL	$130,907	67	$1,954	7	$18,701
918	North IRL	$133,522	68	$1,964	10	$13,352
CO-6C	North IRL	$128,142	65	$1,971	11	$11,649
1299	Banana River	$136,034	69	$1,972	9	$15,115
770C	Banana River	$130,126	66	$1,972	7	$18,589
1617	Central IRL	$131,505	66	$1,993	9	$14,612
995	Banana River	$132,572	66	$2,009	10	$13,257
TV-Broad Street Basin	North IRL	$128,023	63	$2,032	9	$14,225
CO-1G	North IRL	$127,525	62	$2,057	9	$14,169
1036	Banana River	$129,665	63	$2,058	10	$12,967
CO-6N	North IRL	$130,663	63	$2,074	9	$14,518
2174	Central IRL	$131,468	63	$2,087	9	$14,608
1857	Central IRL	$131,685	63	$2,090	10	$13,169
IHB-43	Banana River	$128,925	61	$2,114	11	$11,720
RL-1F	North IRL	$131,152	62	$2,115	9	$14,572
CC-B13D	Banana River	$129,069	61	$2,116	11	$11,734
RL-1W	North IRL	$131,414	62	$2,120	9	$14,602
1190	Banana River	$129,383	61	$2,121	6	$21,564
SB-C-13	Banana River	$129,451	61	$2,122	10	$12,945
1689	Central IRL	$135,801	64	$2,122	9	$15,089

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
SB-R-13	Banana River	$130,071	61	$2,132	10	$13,007
944B	Banana River	$134,549	63	$2,136	9	$14,950
110	North IRL	$126,411	59	$2,143	5	$25,282
IHB-55	Banana River	$134,636	62	$2,172	9	$14,960
CC-B8A	Banana River	$128,360	59	$2,176	11	$11,669
1249	North IRL	$131,087	60	$2,185	9	$14,565
2276	Central IRL	$131,070	60	$2,185	9	$14,563
970A	Banana River	$130,416	59	$2,210	9	$14,491
1340	Banana River	$130,510	59	$2,212	9	$14,501
1397	North IRL	$130,606	59	$2,214	9	$14,512
SB-SD-3	Banana River	$131,339	59	$2,226	9	$14,593
IHB-11	Banana River	$130,303	57	$2,286	8	$16,288
1253B	North IRL	$130,341	57	$2,287	9	$14,482
SJR-64	North IRL	$130,578	57	$2,291	7	$18,654
1393	North IRL	$129,068	56	$2,305	8	$16,134
IHB-1A	Banana River	$129,190	56	$2,307	8	$16,149
SB-C-12	Banana River	$129,808	56	$2,318	9	$14,423
1830	Central IRL	$130,367	56	$2,328	8	$16,296
1154	Banana River	$128,370	55	$2,334	6	$21,395
711	North IRL	$128,937	55	$2,344	5	$25,787
1352B	North IRL	$132,127	56	$2,359	8	$16,516
RL-1R	North IRL	$130,165	55	$2,367	8	$16,271
2229	Central IRL	$130,479	55	$2,372	6	$21,747
937	North IRL	$128,989	54	$2,389	7	$18,427
2077	Central IRL	$129,003	54	$2,389	6	$21,501
CO-2J	North IRL	$126,653	53	$2,390	7	$18,093
SJR-98	North IRL	$127,151	53	$2,399	8	$15,894
979B	Banana River	$129,630	54	$2,401	8	$16,204
1939	Central IRL	$129,815	54	$2,404	8	$16,227
CO-6D	North IRL	$128,051	53	$2,416	8	$16,006
969B	Banana River	$130,502	54	$2,417	8	$16,313
1676	Central IRL	$130,711	54	$2,421	8	$16,339
2172	Central IRL	$130,725	54	$2,421	8	$16,341
1336B	Banana River	$133,189	55	$2,422	8	$16,649
IHB-14	Banana River	$127,654	52	$2,455	10	$12,765
TV-Habor Pointe Basin	North IRL	$130,339	53	$2,459	9	$14,482
1763	Central IRL	$130,303	53	$2,459	8	$16,288
2055	Central IRL	$132,411	53	$2,498	6	$22,069
1151	North IRL	$133,502	53	$2,519	7	$19,072

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
970	Banana River	$128,998	51	$2,529	8	$16,125
IHB-30	Banana River	$127,309	50	$2,546	9	$14,145
1540	Central IRL	$129,914	51	$2,547	7	$18,559
51A	North IRL	$127,527	50	$2,551	7	$18,218
CC-B4A	Banana River	$127,865	50	$2,557	9	$14,207
RL-1D	North IRL	$128,736	50	$2,575	7	$18,391
1011A	Banana River	$131,604	51	$2,580	7	$18,801
IHB-24	Banana River	$129,256	50	$2,585	7	$18,465
2101	Central IRL	$129,375	50	$2,588	6	$21,563
1672	Central IRL	$130,835	50	$2,617	6	$21,806
173	North IRL	$131,015	50	$2,620	7	$18,716
1054	Banana River	$128,507	49	$2,623	5	$25,701
997B	Banana River	$128,652	49	$2,626	7	$18,379
RL-1S	North IRL	$128,765	49	$2,628	7	$18,395
863	North IRL	$131,490	50	$2,630	7	$18,784
IHB-37	Banana River	$129,072	49	$2,634	7	$18,439
1001A	Banana River	$127,473	48	$2,656	7	$18,210
IHB-42	Banana River	$127,817	48	$2,663	6	$21,303
SB-GS-1	Banana River	$127,820	48	$2,663	8	$15,978
959B	Banana River	$130,546	49	$2,664	7	$18,649
SJR-76	Banana River	$128,333	48	$2,674	6	$21,389
970G	Banana River	$128,380	48	$2,675	7	$18,340
970H	Banana River	$128,478	48	$2,677	7	$18,354
997E	Banana River	$128,526	48	$2,678	7	$18,361
929	North IRL	$131,198	49	$2,678	8	$16,400
1414	North IRL	$128,626	48	$2,680	7	$18,375
2237	Central IRL	$132,187	49	$2,698	6	$22,031
IHB-15A	Banana River	$129,677	48	$2,702	7	$18,525
1001B	Banana River	$127,381	47	$2,710	7	$18,197
SB-GS-11	Banana River	$127,585	47	$2,715	7	$18,226
CO-1B	North IRL	$127,745	47	$2,718	7	$18,249
1876	Central IRL	$130,806	48	$2,725	7	$18,687
1700	Central IRL	$128,407	47	$2,732	7	$18,344
IHB-9	Banana River	$128,438	47	$2,733	7	$18,348
1316	North IRL	$131,291	48	$2,735	7	$18,756
1829	Central IRL	$128,594	47	$2,736	7	$18,371
2102	Central IRL	$127,057	46	$2,762	7	$18,151
CO-3	North IRL	$125,251	45	$2,783	6	$20,875
1780	Central IRL	$128,296	46	$2,789	7	$18,328

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
SB-GS-18	Banana River	$128,595	46	$2,796	7	$18,371
948	Banana River	$131,512	47	$2,798	6	$21,919
2351	Banana River	$126,277	45	$2,806	5	$25,255
IHB-5	Banana River	$126,832	45	$2,818	7	$18,119
CC-B5F	Banana River	$127,550	45	$2,834	6	$21,258
1545A	Central IRL	$127,812	45	$2,840	7	$18,259
CO-6F	North IRL	$125,145	44	$2,844	6	$20,858
1252B	North IRL	$130,959	46	$2,847	6	$21,827
SB-C-10	Banana River	$128,244	45	$2,850	7	$18,321
1008	Banana River	$128,228	45	$2,850	6	$21,371
1682	Central IRL	$129,396	45	$2,875	6	$21,566
CC-B10B	Banana River	$126,962	44	$2,886	7	$18,137
1814	Central IRL	$130,117	45	$2,891	6	$21,686
RL-1L	North IRL	$127,308	44	$2,893	7	$18,187
1971	Central IRL	$127,604	44	$2,900	6	$21,267
IHB-53	Banana River	$130,362	44	$2,963	6	$21,727
1001	Banana River	$127,401	43	$2,963	6	$21,234
2104A	Central IRL	$127,733	43	$2,971	6	$21,289
1182	Banana River	$127,788	43	$2,972	6	$21,298
1860	Central IRL	$128,190	43	$2,981	6	$21,365
1771	Central IRL	$128,850	43	$2,997	5	$25,770
IHB-47	Banana River	$125,918	42	$2,998	8	$15,740
SB-C-16	Banana River	$126,087	42	$3,002	8	$15,761
1878	Central IRL	$129,116	43	$3,003	5	$25,823
1176	Banana River	$126,661	42	$3,016	5	$25,332
1012	Banana River	$130,035	43	$3,024	5	$26,007
1217	Banana River	$127,054	42	$3,025	5	$25,411
944C	Banana River	$130,130	43	$3,026	6	$21,688
SB-C-14	Banana River	$127,293	42	$3,031	6	$21,216
940C	Banana River	$127,627	42	$3,039	6	$21,271
CO-4	North IRL	$124,590	41	$3,039	5	$24,918
CC-B5B	Banana River	$127,920	42	$3,046	6	$21,320
1935	Central IRL	$125,098	41	$3,051	6	$20,850
SB-C-5	Banana River	$128,659	42	$3,063	6	$21,443
TV-Vectorspace-Columbia Basin	North IRL	$128,944	42	$3,070	6	$21,491
793	North IRL	$126,326	41	$3,081	5	$25,265
1910	Central IRL	$129,571	42	$3,085	5	$25,914
RL-1X	North IRL	$127,986	41	$3,122	6	$21,331

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1784	Central IRL	$128,383	41	$3,131	5	$25,677
990D	Banana River	$128,600	41	$3,137	5	$25,720
1519	Central IRL	$126,096	40	$3,152	8	$15,762
CC-B9B	Banana River	$126,115	40	$3,153	7	$18,016
1178	Banana River	$126,201	40	$3,155	4	$31,550
1107	Banana River	$126,296	40	$3,157	4	$31,574
SB-C-7	Banana River	$127,156	40	$3,179	6	$21,193
1996	Central IRL	$127,418	40	$3,185	6	$21,236
CO-7	North IRL	$125,074	39	$3,207	5	$25,015
80A	North IRL	$128,785	40	$3,220	6	$21,464
2253	Central IRL	$125,567	39	$3,220	4	$31,392
IHB-80	Banana River	$125,954	39	$3,230	7	$17,993
SB-C-8	Banana River	$126,953	39	$3,255	6	$21,159
1827	Central IRL	$127,237	39	$3,262	6	$21,206
231	North IRL	$127,408	39	$3,267	4	$31,852
IHB-15B	Banana River	$127,989	39	$3,282	5	$25,598
SJR-16	North IRL	$128,035	39	$3,283	5	$25,607
IHB-15C	Banana River	$128,329	39	$3,290	5	$25,666
2295	Central IRL	$125,326	38	$3,298	3	$41,775
SJR-102	North IRL	$125,560	38	$3,304	6	$20,927
46A	North IRL	$126,124	38	$3,319	6	$21,021
TV-Washington Basin	North IRL	$126,235	38	$3,322	6	$21,039
1011D	Banana River	$126,583	38	$3,331	5	$25,317
IHB-21	Banana River	$126,804	38	$3,337	5	$25,361
SB-SD-7	Banana River	$130,372	39	$3,343	5	$26,074
108	North IRL	$124,223	37	$3,357	3	$41,408
CO-2A1	North IRL	$125,456	37	$3,391	5	$25,091
TV-Pelican Point Basin	North IRL	$125,459	37	$3,391	6	$20,910
CO-1H	North IRL	$126,398	37	$3,416	6	$21,066
948B	Banana River	$126,271	36	$3,508	5	$25,254
1360	Banana River	$126,330	36	$3,509	5	$25,266
CO-6M	North IRL	$126,504	36	$3,514	5	$25,301
IHB-32	Banana River	$126,594	36	$3,517	5	$25,319
IHB-23	Banana River	$126,606	36	$3,517	5	$25,321
1714	Central IRL	$126,665	36	$3,518	5	$25,333
IHB-18	Banana River	$126,736	36	$3,520	5	$25,347
SB-R-1	Banana River	$126,782	36	$3,522	5	$25,356
1422	North IRL	$128,446	36	$3,568	5	$25,689

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
CO-2E	North IRL	$125,020	35	$3,572	5	$25,004
SB-WS-21	Banana River	$125,628	35	$3,589	5	$25,126
SJR-29	North IRL	$125,794	35	$3,594	5	$25,159
SB-WS-5	Banana River	$126,086	35	$3,602	5	$25,217
TV-Ponce De Leon Basin-A	North IRL	$129,759	36	$3,604	5	$25,952
2122	Central IRL	$126,266	35	$3,608	3	$42,089
1139	Banana River	$126,318	35	$3,609	4	$31,580
SB-GS-10	Banana River	$126,336	35	$3,610	5	$25,267
IHB-26	Banana River	$126,348	35	$3,610	5	$25,270
1598	Central IRL	$126,790	35	$3,623	5	$25,358
1479	Central IRL	$127,408	35	$3,640	5	$25,482
IHB-34	North IRL	$127,875	35	$3,654	5	$25,575
1810	Central IRL	$127,911	35	$3,655	4	$31,978
1820	Central IRL	$124,947	34	$3,675	5	$24,989
TV-Indian River Basin	North IRL	$124,996	34	$3,676	5	$24,999
SB-J-2	Banana River	$125,037	34	$3,678	5	$25,007
CO-1E	North IRL	$125,503	34	$3,691	5	$25,101
SJR-103	Central IRL	$125,540	34	$3,692	5	$25,108
1970	Central IRL	$125,998	34	$3,706	4	$31,500
RL-1C	North IRL	$126,045	34	$3,707	5	$25,209
IHB-25	Banana River	$126,205	34	$3,712	5	$25,241
1804	Central IRL	$126,191	34	$3,712	5	$25,238
RL-4D	North IRL	$124,680	33	$3,778	5	$24,936
CC-B5D	Banana River	$128,954	34	$3,793	5	$25,791
1149	Banana River	$125,716	33	$3,810	4	$31,429
SB-D-10	Banana River	$126,001	33	$3,818	5	$25,200
2017	Central IRL	$126,006	33	$3,818	5	$25,201
SB-GS-16	Banana River	$126,029	33	$3,819	5	$25,206
1280C	Banana River	$126,114	33	$3,822	5	$25,223
IHB-17B	Banana River	$128,297	33	$3,888	5	$25,659
SJR-22	North IRL	$124,822	32	$3,901	6	$20,804
1118	Banana River	$125,105	32	$3,910	3	$41,702
SJR-9	North IRL	$125,387	32	$3,918	5	$25,077
IHB-31	Banana River	$125,571	32	$3,924	5	$25,114
1658	Central IRL	$125,655	32	$3,927	5	$25,131
CC-B4F	Banana River	$125,684	32	$3,928	5	$25,137
IHB-88	Banana River	$125,798	32	$3,931	5	$25,160
IHB-40	Banana River	$125,829	32	$3,932	5	$25,166

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
2084	Central IRL	$126,419	32	$3,951	4	$31,605
1214	North IRL	$127,274	32	$3,977	4	$31,819
117	North IRL	$123,292	31	$3,977	3	$41,097
SB-GS-13	Banana River	$127,312	32	$3,979	5	$25,462
CO-1J	North IRL	$123,390	31	$3,980	4	$30,848
891	North IRL	$123,850	31	$3,995	4	$30,963
CC-B12	Banana River	$128,508	32	$4,016	5	$25,702
SB-WS-1	Banana River	$125,286	31	$4,041	5	$25,057
979F	Banana River	$125,451	31	$4,047	5	$25,090
IHB-83	Banana River	$125,552	31	$4,050	5	$25,110
SB-TIB-1	Banana River	$125,638	31	$4,053	5	$25,128
RL-1T	North IRL	$125,768	31	$4,057	5	$25,154
65	North IRL	$122,936	30	$4,098	3	$40,979
1369	North IRL	$124,506	30	$4,150	5	$24,901
1376	North IRL	$124,644	30	$4,155	5	$24,929
1000A	Banana River	$125,350	30	$4,178	5	$25,070
2005	Central IRL	$126,138	30	$4,205	5	$25,228
SB-GS-12	Banana River	$127,859	30	$4,262	4	$31,965
1153	Banana River	$124,671	29	$4,299	5	$24,934
2050	Central IRL	$125,101	29	$4,314	3	$41,700
1455	North IRL	$125,300	29	$4,321	4	$31,325
RL-3D	North IRL	$125,553	29	$4,329	4	$31,388
2160	Central IRL	$126,798	29	$4,372	4	$31,700
SB-GS-14	Banana River	$123,873	28	$4,424	5	$24,775
SB-GS-7	Banana River	$124,243	28	$4,437	5	$24,849
970D	Banana River	$124,332	28	$4,440	4	$31,083
1197	North IRL	$125,004	28	$4,464	4	$31,251
IHB-61	Banana River	$125,069	28	$4,467	4	$31,267
898	North IRL	$126,146	28	$4,505	4	$31,537
SB-N-3	Banana River	$126,804	28	$4,529	5	$25,361
IHB-15E	Banana River	$123,491	27	$4,574	4	$30,873
SB-GS-21	Banana River	$123,642	27	$4,579	5	$24,728
CC-B8C	Banana River	$123,776	27	$4,584	5	$24,755
16A	North IRL	$123,797	27	$4,585	3	$41,266
2016	Central IRL	$123,855	27	$4,587	5	$24,771
2252	Central IRL	$123,928	27	$4,590	3	$41,309
IHB-92	Banana River	$124,151	27	$4,598	5	$24,830
1696	Central IRL	$124,380	27	$4,607	3	$41,460
975A	Banana River	$124,768	27	$4,621	4	$31,192

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1628	Central IRL	$124,992	27	$4,629	4	$31,248
SJR-25	North IRL	$125,079	27	$4,633	4	$31,270
1345	North IRL	$125,652	27	$4,654	4	$31,413
TV-Riveredge Basin	North IRL	$125,723	27	$4,656	4	$31,431
951A	Banana River	$125,965	27	$4,665	4	$31,491
2291	Central IRL	$127,539	27	$4,724	4	$31,885
151	North IRL	$123,328	26	$4,743	4	$30,832
SJR-70	North IRL	$124,501	26	$4,789	5	$24,900
IHB-65	Banana River	$124,556	26	$4,791	4	$31,139
800	North IRL	$124,585	26	$4,792	3	$41,528
SB-GS-4	Banana River	$124,639	26	$4,794	4	$31,160
1840	Central IRL	$124,651	26	$4,794	3	$41,550
IHB-38	Banana River	$124,699	26	$4,796	4	$31,175
IHB-64	Banana River	$125,326	26	$4,820	4	$31,332
1236	North IRL	$125,783	26	$4,838	4	$31,446
IHB-90	Banana River	$125,993	26	$4,846	4	$31,498
CC-B4C	Banana River	$123,385	25	$4,935	4	$30,846
1484	Central IRL	$123,740	25	$4,950	4	$30,935
1093	Banana River	$123,997	25	$4,960	3	$41,332
SB-WS-7	Banana River	$124,275	25	$4,971	4	$31,069
IHB-62	Banana River	$124,384	25	$4,975	4	$31,096
1253A	North IRL	$124,556	25	$4,982	4	$31,139
IHB-46	Banana River	$125,436	25	$5,017	4	$31,359
990C	Banana River	$123,486	24	$5,145	3	$41,162
1011E	Banana River	$124,043	24	$5,168	3	$41,348
IHB-39	Banana River	$124,427	24	$5,184	4	$31,107
1948	Central IRL	$122,842	23	$5,341	2	$61,421
SJR-86	Banana River	$123,458	23	$5,368	4	$30,865
SJR-75	Banana River	$123,924	23	$5,388	4	$30,981
SB-GS-2	Banana River	$124,051	23	$5,394	3	$41,350
SJR-56	North IRL	$124,081	23	$5,395	3	$41,360
SB-GS-19	Banana River	$124,145	23	$5,398	4	$31,036
IHB-68A	Banana River	$124,156	23	$5,398	4	$31,039
1109	Banana River	$124,150	23	$5,398	3	$41,383
2007	Central IRL	$124,257	23	$5,402	3	$41,419
1653	Central IRL	$124,258	23	$5,403	4	$31,065
IHB-19A	Banana River	$124,427	23	$5,410	3	$41,476
2029	Central IRL	$124,456	23	$5,411	4	$31,114

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
CO-2L	North IRL	$124,469	23	$5,412	3	$41,490
1957	Central IRL	$124,508	23	$5,413	3	$41,503
1477	Central IRL	$124,753	23	$5,424	3	$41,584
RL-3C	North IRL	$124,788	23	$5,426	3	$41,596
CO-1F	North IRL	$125,808	23	$5,470	3	$41,936
CO-6J	North IRL	$123,581	22	$5,617	3	$41,194
SB-WS-14	Banana River	$123,684	22	$5,622	3	$41,228
1734B	Central IRL	$123,779	22	$5,626	3	$41,260
IHB-91	Banana River	$123,980	22	$5,635	3	$41,327
CC-B4E	Banana River	$122,183	21	$5,818	3	$40,728
IHB-48B	Banana River	$123,208	21	$5,867	4	$30,802
191	North IRL	$123,323	21	$5,873	2	$61,662
970J	Banana River	$123,687	21	$5,890	3	$41,229
SB-WS-13	Banana River	$123,736	21	$5,892	3	$41,245
SB-GS-3	Banana River	$123,775	21	$5,894	3	$41,258
SB-WS-8	Banana River	$123,784	21	$5,894	3	$41,261
IHB-89	Banana River	$123,914	21	$5,901	3	$41,305
1666	Central IRL	$124,030	21	$5,906	2	$62,015
IHB-57A	Banana River	$124,086	21	$5,909	4	$31,022
IHB-58	Banana River	$124,314	21	$5,920	4	$31,079
997C	Banana River	$122,279	20	$6,114	3	$40,760
TV-Commons Basin	North IRL	$122,871	20	$6,144	3	$40,957
2268	Central IRL	$123,076	20	$6,154	3	$41,025
1533	Central IRL	$123,156	20	$6,158	3	$41,052
SJR-85	North IRL	$123,257	20	$6,163	3	$41,086
IHB-69	Banana River	$123,462	20	$6,173	3	$41,154
CO-6L	North IRL	$123,492	20	$6,175	3	$41,164
SB-WS-11	Banana River	$123,560	20	$6,178	3	$41,187
SB-R-2	Banana River	$123,589	20	$6,179	3	$41,196
IHB-81	Banana River	$123,637	20	$6,182	3	$41,212
2027	Central IRL	$123,913	20	$6,196	3	$41,304
SB-C-2	Banana River	$123,961	20	$6,198	3	$41,320
RL-3G	North IRL	$124,765	20	$6,238	3	$41,588
IHB-19B	Banana River	$125,116	20	$6,256	3	$41,705
722	North IRL	$125,301	20	$6,265	3	$41,767
60	North IRL	$122,568	19	$6,451	6	$20,428
2156	Central IRL	$122,686	19	$6,457	1	$122,686
1208	Banana River	$122,892	19	$6,468	2	$61,446

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1191	Banana River	$122,924	19	$6,470	2	$61,462
228A	North IRL	$123,004	19	$6,474	3	$41,001
1055	Banana River	$123,079	19	$6,478	2	$61,540
IHB-74	Banana River	$123,145	19	$6,481	3	$41,048
SB-WS-3	Banana River	$123,303	19	$6,490	3	$41,101
1560	Central IRL	$123,305	19	$6,490	3	$41,102
SB-WS-25	Banana River	$123,374	19	$6,493	3	$41,125
IHB-66	Banana River	$123,379	19	$6,494	3	$41,126
SB-WS-26	Banana River	$123,404	19	$6,495	3	$41,135
2074	Central IRL	$124,068	19	$6,530	2	$62,034
SB-N-4	Banana River	$124,308	19	$6,543	3	$41,436
SB-GS-8	Banana River	$122,193	18	$6,789	3	$40,731
SB-C-1	Banana River	$122,257	18	$6,792	3	$40,752
CC-B8B	Banana River	$122,496	18	$6,805	3	$40,832
1173	Banana River	$122,807	18	$6,823	3	$40,936
CO-6B	North IRL	$122,852	18	$6,825	3	$40,951
RL-1B	North IRL	$122,944	18	$6,830	3	$40,981
IHB-72	Banana River	$122,955	18	$6,831	3	$40,985
SB-WS-23	Banana River	$123,000	18	$6,833	3	$41,000
1427	Central IRL	$122,990	18	$6,833	3	$40,997
IHB-27	Banana River	$123,135	18	$6,841	3	$41,045
CO-9B	North IRL	$123,188	18	$6,844	3	$41,063
IHB-63	Banana River	$123,263	18	$6,848	3	$41,088
996	Banana River	$123,285	18	$6,849	3	$41,095
IHB-10	Banana River	$123,338	18	$6,852	3	$41,113
IHB-22	Banana River	$123,374	18	$6,854	3	$41,125
SB-C-6	Banana River	$123,393	18	$6,855	3	$41,131
2180	Central IRL	$123,531	18	$6,863	2	$61,766
2086	Central IRL	$124,070	18	$6,893	2	$62,035
1795B	Central IRL	$124,252	18	$6,903	3	$41,417
1338	Banana River	$124,452	18	$6,914	3	$41,484
IHB-57B	Banana River	$124,622	18	$6,923	3	$41,541
1405	North IRL	$124,683	18	$6,927	3	$41,561
SJR-95	North IRL	$122,186	17	$7,187	3	$40,729
884B	North IRL	$122,779	17	$7,222	3	$40,926
SJR-49	North IRL	$122,785	17	$7,223	3	$40,928
770B	Banana River	$122,961	17	$7,233	3	$40,987
SB-R-9	Banana River	$122,976	17	$7,234	2	$61,488
SJR-45	North IRL	$123,008	17	$7,236	2	$61,504

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
IHB-75	Banana River	$123,024	17	$7,237	3	$41,008
SB-R-5	Banana River	$123,038	17	$7,238	2	$61,519
SB-GS-15	Banana River	$123,063	17	$7,239	3	$41,021
SB-R-6	Banana River	$123,066	17	$7,239	3	$41,022
SB-R-7	Banana River	$123,085	17	$7,240	3	$41,028
1779	Central IRL	$123,150	17	$7,244	3	$41,050
234	North IRL	$123,388	17	$7,258	2	$61,694
2019	Central IRL	$124,103	17	$7,300	2	$62,052
IHB-41	Banana River	$124,345	17	$7,314	2	$62,173
CC-B5E	Banana River	$124,348	17	$7,315	2	$62,174
CO-6P	North IRL	$121,447	16	$7,590	2	$60,724
836	North IRL	$122,307	16	$7,644	3	$40,769
CC-B10D	Banana River	$122,575	16	$7,661	2	$61,288
SB-R-8	Banana River	$122,859	16	$7,679	2	$61,430
SB-R-11	Banana River	$122,859	16	$7,679	2	$61,430
SB-R-4	Banana River	$122,892	16	$7,681	2	$61,446
SJR-94	Banana River	$122,943	16	$7,684	3	$40,981
SB-GS-5	Banana River	$122,952	16	$7,685	2	$61,476
IHB-7B	Banana River	$123,042	16	$7,690	3	$41,014
CO-6A	North IRL	$123,059	16	$7,691	2	$61,530
2078	Central IRL	$123,467	16	$7,717	2	$61,734
1010A	Banana River	$123,713	16	$7,732	2	$61,857
IHB-76	Banana River	$123,742	16	$7,734	2	$61,871
TV-Washington-Marina Basin	North IRL	$123,959	16	$7,747	2	$61,980
TV-Kennedy Point Park Basin	North IRL	$124,140	16	$7,759	2	$62,070
CO-6G	North IRL	$121,560	15	$8,104	2	$60,780
106	North IRL	$121,606	15	$8,107	1	$121,606
SJR-108	Central IRL	$122,035	15	$8,136	3	$40,678
SB-WS-27	Banana River	$122,156	15	$8,144	3	$40,719
1104	Banana River	$122,268	15	$8,151	1	$122,268
SJR-81	North IRL	$122,269	15	$8,151	2	$61,135
1110	Banana River	$122,334	15	$8,156	1	$122,334
1156	Banana River	$122,344	15	$8,156	1	$122,344
IHB-70	Banana River	$122,396	15	$8,160	2	$61,198
IHB-7C	Banana River	$122,470	15	$8,165	2	$61,235
SB-P-2	Banana River	$122,501	15	$8,167	2	$61,251
RL-4F	North IRL	$122,582	15	$8,172	2	$61,291

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
SB-R-10	Banana River	$122,718	15	$8,181	2	$61,359
997D	Banana River	$122,728	15	$8,182	2	$61,364
SB-R-12	Banana River	$122,732	15	$8,182	2	$61,366
1420	North IRL	$122,728	15	$8,182	2	$61,364
SB-D-8	Banana River	$122,745	15	$8,183	2	$61,373
SB-TIB-2	Banana River	$122,749	15	$8,183	2	$61,375
IHB-73	Banana River	$122,763	15	$8,184	2	$61,382
SB-R-3	Banana River	$122,780	15	$8,185	2	$61,390
SJR-19	North IRL	$122,984	15	$8,199	2	$61,492
1030	North IRL	$123,531	15	$8,235	2	$61,766
1514	Central IRL	$123,795	15	$8,253	2	$61,898
SJR-104	Central IRL	$121,707	14	$8,693	1	$121,707
1143	Banana River	$122,150	14	$8,725	1	$122,150
SJR-92	Banana River	$122,183	14	$8,727	3	$40,728
SJR-83	North IRL	$122,360	14	$8,740	2	$61,180
SJR-52	North IRL	$122,434	14	$8,745	2	$61,217
SB-WS-16	Banana River	$122,440	14	$8,746	2	$61,220
IHB-28	Banana River	$122,452	14	$8,747	2	$61,226
SB-WS-15	Banana River	$122,477	14	$8,748	2	$61,239
SB-WS-18	Banana River	$122,469	14	$8,748	2	$61,235
79A	North IRL	$122,476	14	$8,748	1	$122,476
SB-WS-4	Banana River	$122,483	14	$8,749	2	$61,242
IHB-85	Banana River	$122,516	14	$8,751	2	$61,258
IHB-8	Banana River	$122,588	14	$8,756	2	$61,294
SJR-42	North IRL	$122,590	14	$8,756	2	$61,295
1249A	North IRL	$122,601	14	$8,757	2	$61,301
RL-4C	North IRL	$122,683	14	$8,763	2	$61,342
TV-Somerset Riverfront Basin	North IRL	$122,754	14	$8,768	2	$61,377
2083	Central IRL	$122,832	14	$8,774	2	$61,416
CO-8B	North IRL	$122,976	14	$8,784	2	$61,488
2244	Central IRL	$123,556	14	$8,825	2	$61,778
1981	Central IRL	$123,590	14	$8,828	2	$61,795
SB-GS-20	Banana River	$121,535	13	$9,349	2	$60,768
IHB-93	Banana River	$121,689	13	$9,361	2	$60,845
SB-WS-28	Banana River	$121,807	13	$9,370	2	$60,904
990A	Banana River	$121,826	13	$9,371	1	$121,826
SB-WS-12	Banana River	$121,853	13	$9,373	2	$60,927
SB-WS-30	Banana River	$122,094	13	$9,392	2	$61,047

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1358	Banana River	$122,237	13	$9,403	2	$61,119
SB-WS-20	Banana River	$122,302	13	$9,408	2	$61,151
998A	Banana River	$122,317	13	$9,409	2	$61,159
SB-WS-22	Banana River	$122,325	13	$9,410	2	$61,163
SJR-51	North IRL	$122,380	13	$9,414	2	$61,190
1136	Banana River	$122,437	13	$9,418	1	$122,437
1852	Central IRL	$122,430	13	$9,418	2	$61,215
970I	Banana River	$122,499	13	$9,423	1	$122,499
SB-WS-24	Banana River	$121,699	12	$10,142	2	$60,850
1160	Banana River	$121,752	12	$10,146	1	$121,752
1051	Banana River	$121,864	12	$10,155	1	$121,864
964A	Banana River	$122,060	12	$10,172	2	$61,030
IHB-86	Banana River	$122,133	12	$10,178	2	$61,067
IHB-60	Banana River	$122,176	12	$10,181	2	$61,088
IHB-4	Banana River	$122,276	12	$10,190	2	$61,138
SB-J-1	Banana River	$122,280	12	$10,190	2	$61,140
CO-2F	North IRL	$122,398	12	$10,200	2	$61,199
SJR-106	Central IRL	$122,569	12	$10,214	2	$61,285
1352A	North IRL	$122,575	12	$10,215	2	$61,288
44	North IRL	$121,170	11	$11,015	1	$121,170
SJR-121	Central IRL	$121,404	11	$11,037	1	$121,404
SB-GS-9	Banana River	$121,421	11	$11,038	2	$60,711
2280	Central IRL	$121,632	11	$11,057	1	$121,632
CC-B6A	Banana River	$121,666	11	$11,061	2	$60,833
SB-WS-6	Banana River	$121,698	11	$11,063	2	$60,849
1185	Banana River	$121,734	11	$11,067	1	$121,734
SB-SD-4	Banana River	$121,831	11	$11,076	2	$60,916
46B	North IRL	$121,946	11	$11,086	2	$60,973
IHB-12	Banana River	$122,004	11	$11,091	2	$61,002
IHB-44B	Banana River	$122,308	11	$11,119	1	$122,308
IHB-82	Banana River	$122,604	11	$11,146	2	$61,302
TV-Mount Vernon Basin	North IRL	$121,261	10	$12,126	1	$121,261
CC-B8D	Banana River	$121,399	10	$12,140	2	$60,700
20	North IRL	$121,398	10	$12,140	1	$121,398
SJR-67	North IRL	$121,480	10	$12,148	2	$60,740
TV-Riverside Basin	North IRL	$121,647	10	$12,165	2	$60,824
1116	Banana River	$121,679	10	$12,168	1	$121,679
1547	Central IRL	$121,706	10	$12,171	1	$121,706

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
SJR-18	North IRL	$121,745	10	$12,175	1	$121,745
SB-SD-1	Banana River	$121,777	10	$12,178	2	$60,889
1586	Central IRL	$121,924	10	$12,192	1	$121,924
1009	Banana River	$122,012	10	$12,201	1	$122,012
SJR-17	North IRL	$122,130	10	$12,213	1	$122,130
1531	Central IRL	$122,269	10	$12,227	1	$122,269
SB-WS-2	Banana River	$120,942	9	$13,438	1	$120,942
1794	Central IRL	$121,272	9	$13,475	1	$121,272
1513	Central IRL	$121,368	9	$13,485	1	$121,368
1199	Banana River	$121,438	9	$13,493	1	$121,438
SJR-87	North IRL	$121,481	9	$13,498	1	$121,481
1011C	Banana River	$121,504	9	$13,500	1	$121,504
SB-WS-17	Banana River	$121,568	9	$13,508	1	$121,568
988	Banana River	$121,585	9	$13,509	1	$121,585
1577	Central IRL	$121,617	9	$13,513	1	$121,617
RL-1H	North IRL	$121,627	9	$13,514	1	$121,627
SB-D-7	Banana River	$121,641	9	$13,516	1	$121,641
1879	Central IRL	$121,651	9	$13,517	1	$121,651
1791	Central IRL	$121,650	9	$13,517	1	$121,650
IHB-84	Banana River	$121,677	9	$13,520	1	$121,677
1690	Central IRL	$121,802	9	$13,534	1	$121,802
CC-B4D	Banana River	$121,929	9	$13,548	1	$121,929
1816	Central IRL	$121,979	9	$13,553	1	$121,979
2279	Central IRL	$121,983	9	$13,554	1	$121,983
SJR-55	North IRL	$122,004	9	$13,556	1	$122,004
IHB-3	Banana River	$122,009	9	$13,557	1	$122,009
SJR-65	North IRL	$122,109	9	$13,568	1	$122,109
IHB-77	Banana River	$122,424	9	$13,603	1	$122,424
170	North IRL	$120,657	8	$15,082	0	Not applicable
151A	North IRL	$120,853	8	$15,107	1	$120,853
CC-B13B	Banana River	$120,961	8	$15,120	1	$120,961
SJR-105	Central IRL	$121,015	8	$15,127	1	$121,015
SB-WS-10	Banana River	$121,110	8	$15,139	1	$121,110
1487	Central IRL	$121,112	8	$15,139	1	$121,112
1091	Banana River	$121,117	8	$15,140	1	$121,117
SJR-109	Central IRL	$121,135	8	$15,142	1	$121,135
1090	Banana River	$121,194	8	$15,149	1	$121,194
1192	Banana River	$121,298	8	$15,162	1	$121,298
1394	North IRL	$121,410	8	$15,176	1	$121,410

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1975	Central IRL	$121,404	8	$15,176	1	$121,404
2056	Central IRL	$121,474	8	$15,184	1	$121,474
RL-1U	North IRL	$121,504	8	$15,188	1	$121,504
IHB-51	Banana River	$121,539	8	$15,192	1	$121,539
CO-2C	North IRL	$121,546	8	$15,193	1	$121,546
IHB-49	Banana River	$121,562	8	$15,195	1	$121,562
SJR-84	North IRL	$121,559	8	$15,195	1	$121,559
1680	Central IRL	$121,713	8	$15,214	1	$121,713
CO-1C	North IRL	$121,907	8	$15,238	1	$121,907
214	North IRL	$120,913	7	$17,273	0	Not applicable
693	North IRL	$120,988	7	$17,284	0	Not applicable
CC-B13C	Banana River	$120,993	7	$17,285	1	$120,993
1237	Banana River	$121,073	7	$17,296	1	$121,073
1179	Banana River	$121,104	7	$17,301	1	$121,104
1201	Banana River	$121,130	7	$17,304	1	$121,130
IHB-87	Banana River	$121,173	7	$17,310	1	$121,173
SJR-114	Central IRL	$121,226	7	$17,318	1	$121,226
2257	Central IRL	$121,405	7	$17,344	1	$121,405
RL-1E	North IRL	$121,496	7	$17,357	1	$121,496
IHB-29	Banana River	$121,525	7	$17,361	1	$121,525
2266	Central IRL	$121,560	7	$17,366	1	$121,560
SJR-93	North IRL	$121,592	7	$17,370	1	$121,592
2242	Central IRL	$122,016	7	$17,431	1	$122,016
109	North IRL	$120,631	6	$20,105	0	Not applicable
CC-B4I	Banana River	$120,668	6	$20,111	1	$120,668
999	Banana River	$120,852	6	$20,142	1	$120,852
1207	Banana River	$120,903	6	$20,151	0	Not applicable
1053	Banana River	$120,920	6	$20,153	0	Not applicable
2200	Central IRL	$120,936	6	$20,156	0	Not applicable
1209	Banana River	$120,996	6	$20,166	0	Not applicable
SB-GS-6	Banana River	$121,030	6	$20,172	1	$121,030
1365	Banana River	$121,076	6	$20,179	1	$121,076
SJR-88	North IRL	$121,117	6	$20,186	0	Not applicable
IHB-67	Banana River	$121,131	6	$20,189	1	$121,131
SJR-111	Central IRL	$121,206	6	$20,201	1	$121,206
1421	North IRL	$121,301	6	$20,217	1	$121,301
1215	North IRL	$121,367	6	$20,228	1	$121,367
SJR-82	North IRL	$121,406	6	$20,234	1	$121,406
SJR-48	North IRL	$120,377	5	$24,075	0	Not applicable

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
CO-1K	North IRL	$120,561	5	$24,112	1	$120,561
CO-2A2	North IRL	$120,587	5	$24,117	0	Not applicable
213	North IRL	$120,583	5	$24,117	0	Not applicable
24	North IRL	$120,622	5	$24,124	0	Not applicable
1206	Banana River	$120,675	5	$24,135	0	Not applicable
SJR-113	Central IRL	$120,714	5	$24,143	1	$120,714
1137	Banana River	$120,724	5	$24,145	0	Not applicable
2143	Central IRL	$120,725	5	$24,145	0	Not applicable
SJR-78	Banana River	$120,762	5	$24,152	1	$120,762
SJR-36	North IRL	$120,792	5	$24,158	0	Not applicable
1211	Banana River	$120,806	5	$24,161	0	Not applicable
SJR-6	North IRL	$120,850	5	$24,170	0	Not applicable
1901	Central IRL	$120,864	5	$24,173	0	Not applicable
1049	Banana River	$120,870	5	$24,174	0	Not applicable
799	North IRL	$120,876	5	$24,175	0	Not applicable
1683	Central IRL	$120,877	5	$24,175	0	Not applicable
1550	Central IRL	$120,883	5	$24,177	1	$120,883
SJR-41	North IRL	$120,910	5	$24,182	0	Not applicable
SJR-38	North IRL	$120,913	5	$24,183	1	$120,913
SJR-61	North IRL	$120,945	5	$24,189	1	$120,945
1734A	Central IRL	$120,944	5	$24,189	1	$120,944
1868	Central IRL	$120,945	5	$24,189	1	$120,945
2052	Central IRL	$120,974	5	$24,195	1	$120,974
CC-B10C	Banana River	$121,028	5	$24,206	1	$121,028
SB-C-4	Banana River	$121,038	5	$24,208	0	Not applicable
RL-1Y	North IRL	$121,061	5	$24,212	0	Not applicable
70	North IRL	$121,074	5	$24,215	5	$24,215
TV-Powerplant Basin	North IRL	$121,145	5	$24,229	0	Not applicable
TV-Harrison-Washington Basin	North IRL	$121,190	5	$24,238	1	$121,190
1189	Banana River	$121,286	5	$24,257	1	$121,286
2010	Central IRL	$121,311	5	$24,262	1	$121,311
SJR-122	Central IRL	$120,427	4	$30,107	0	Not applicable
2137	Central IRL	$120,506	4	$30,127	0	Not applicable
SJR-28	North IRL	$120,513	4	$30,128	0	Not applicable
1161	Banana River	$120,528	4	$30,132	0	Not applicable
1793	Central IRL	$120,554	4	$30,139	0	Not applicable
IHB-71	Banana River	$120,561	4	$30,140	0	Not applicable

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
1106	Banana River	$120,578	4	$30,145	0	Not applicable
1218	Banana River	$120,632	4	$30,158	0	Not applicable
1177	Banana River	$120,637	4	$30,159	0	Not applicable
SJR-43	North IRL	$120,676	4	$30,169	0	Not applicable
888	North IRL	$120,677	4	$30,169	0	Not applicable
919	North IRL	$120,721	4	$30,180	0	Not applicable
1687	Central IRL	$120,736	4	$30,184	0	Not applicable
1343	Banana River	$120,748	4	$30,187	0	Not applicable
2128	Central IRL	$120,766	4	$30,192	0	Not applicable
2140	Central IRL	$120,811	4	$30,203	0	Not applicable
1919	Central IRL	$120,953	4	$30,238	0	Not applicable
798	North IRL	$120,360	3	$40,120	0	Not applicable
1045	Banana River	$120,404	3	$40,135	0	Not applicable
1166	Banana River	$120,428	3	$40,143	0	Not applicable
1052	Banana River	$120,429	3	$40,143	0	Not applicable
86	North IRL	$120,436	3	$40,145	0	Not applicable
1212	Banana River	$120,445	3	$40,148	0	Not applicable
1196	Banana River	$120,456	3	$40,152	0	Not applicable
1138	Banana River	$120,465	3	$40,155	0	Not applicable
1102	Banana River	$120,468	3	$40,156	0	Not applicable
TV-S. Washington East Basin	North IRL	$120,503	3	$40,168	0	Not applicable
SJR-34	North IRL	$120,504	3	$40,168	0	Not applicable
1280A	Banana River	$120,507	3	$40,169	0	Not applicable
SJR-116	Central IRL	$120,513	3	$40,171	0	Not applicable
1988	Central IRL	$120,516	3	$40,172	0	Not applicable
CO-6O	North IRL	$120,529	3	$40,176	0	Not applicable
SJR-20	North IRL	$120,532	3	$40,177	0	Not applicable
1114	Banana River	$120,543	3	$40,181	0	Not applicable
SJR-39	North IRL	$120,550	3	$40,183	0	Not applicable
SJR-46	North IRL	$120,568	3	$40,189	0	Not applicable
IHB-68B	Banana River	$120,585	3	$40,195	0	Not applicable
IHB-Ret	Banana River	$120,599	3	$40,200	0	Not applicable
1639	Central IRL	$120,686	3	$40,229	0	Not applicable
SJR-24	North IRL	$120,726	3	$40,242	0	Not applicable
SJR-23	North IRL	$120,919	3	$40,306	0	Not applicable
1194	Banana River	$120,247	2	$60,124	0	Not applicable
2223	Central IRL	$120,294	2	$60,147	0	Not applicable
712	North IRL	$120,369	2	$60,185	0	Not applicable

Basin	Sub-Lagoon	Estimated Cost	Annual Total Nitrogen Reductions (pounds per year)	Cost per year Pound per Year of Total Nitrogen Removed	Annual Total Phosphorus Reductions (pounds per year)	Cost per Pound per Year of Total Phosphorus Removed
SJR-110	Central IRL	$120,430	2	$60,215	0	Not applicable
SJR-27	North IRL	$120,441	2	$60,221	0	Not applicable
SJR-118	Central IRL	$120,469	2	$60,235	0	Not applicable
SJR-63	North IRL	$120,487	2	$60,244	0	Not applicable
2226	Central IRL	$120,000	0	$120,000	0	Not applicable
1200	Banana River	$120,075	0	$120,075	0	Not applicable
1308B	Banana River	$120,139	1	$120,139	0	Not applicable
CO-2S	North IRL	$120,151	0	$120,151	0	Not applicable
1337	Banana River	$120,157	1	$120,157	0	Not applicable
1243	Banana River	$120,160	1	$120,160	0	Not applicable
1795A	Central IRL	$120,175	1	$120,175	0	Not applicable
1042	Banana River	$120,238	1	$120,238	0	Not applicable
2235	Central IRL	$120,356	1	$120,356	0	Not applicable
CO-2H	North IRL	$121,361	1	$121,361	0	Not applicable
Total	-	***$459,640,202***	***971,063***	***$473 (average)***	***131,853***	***$3,486 (average)***

Table D-6. Unfunded Muck Dredging and Interstitial Treatment Projects

Sub-Lagoon	Indian River Lagoon Muck Sites	Dredging Cost (2024 Estimate)	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Interstitial Water Treatment Cost (2024 Estimate)	Total Cost (2024 Estimate)
Central IRL	Mullet Creek Islands Area*	$24,048,387	55,875	$430	861	$27,931	$2,078,488	$26,126,875
North IRL	National Aeronautics and Space Administration Causeway to 528^	$43,262,500	95,643	$452	4,589	$9,427	$3,800,000	$47,062,500
North IRL	Pineda to Eau Gallie ^	$78,978,289	69,153	$1,142	4,662	$16,941	$7,000,000	$85,978,289
North IRL	520 to Pineda ^	$81,210,526	69,776	$1,164	4,704	$17,264	$7,200,000	$88,410,526
Banana	Banana Venetian Collector Canals/Channels^	$304,434,211	252,672	$1,205	11,054	$27,540	$27,200,000	$331,634,211
Banana	Banana Venetian Collector Canals/Channels^	$304,434,211	252,672	$1,205	11,054	$27,541	$27,200,000	$136,278,627
North IRL	North IRL Venetian Canals/Channels^	$35,226,447	29,232	$1,205	1,827	$19,281	$3,080,000	$38,306,447
Banana	Mathers Bridge Area^	$32,101,316	25,200	$1,274	1,575	$20,382	$2,800,000	$34,901,316
Banana	Cocoa Beach High School^	$18,261,447	13,776	$1,326	861	$21,210	$1,560,000	$19,821,447
Central IRL	Central IRL Venetian Collector Canals/Channels^	$16,922,105	12,432	$1,361	777	$21,779	$1,440,000	$18,362,105
Banana	National Aeronautics and Space Administration Area*	$250,860,526	151,307	$1,658	22,995	$10,909	$22,400,000	$273,260,526
Banana	Patrick Space Force Base Borrow Pit-4^	$2,189,342	1,215	$1,802	44	$49,758	$120,000	$2,309,342
Banana	Kent Drive ^	$5,314,474	2,836	$1,874	182	$29,200	$400,000	$5,714,474
Banana	Newfound Harbor South^	$12,904,079	6,679	$1,932	365	$35,354	$1,080,000	$13,984,079
Banana	Brightwaters^	$21,833,026	11,054	$1,975	604	$36,147	$1,880,000	$23,713,026
Banana	Newfound Harbor North^	$8,886,053	4,376	$2,031	239	$37,180	$720,000	$9,606,053
North IRL	Max Brewer Causeway^	$7,993,158	3,915	$2,042	214	$37,351	$640,000	$8,633,158
Banana	Sunset Café^	$10,671,842	5,067	$2,106	277	$38,527	$880,000	$11,551,842
Banana	528 East^	$3,975,132	1,842.0	$2,158	196	$20,281	$280,000	$4,255,132
Banana	Cape Canaveral Hospital^	$6,207,368	2,764	$2,246	151	$41,108	$480,000	$6,687,368
Banana	520 Borrow Pit-1^	$4,421,579	1,842	$2,400	101	$43,778	$320,000	$4,741,579
Banana	520 Borrow Pit-4^	$4,421,579	1,842	$2,400	101	$43,778	$320,000	$4,741,579
Banana	520 Borrow Pit-5^	$3,528,684	1,382	$2,553	76	$46,430	$240,000	$3,768,684
North IRL	National Aeronautics and Space Administration Causeway West*	$12,011,184	4,673	$2,570	193	$62,234	$1,000,000	$13,011,184
Central IRL	Melbourne Causeway North^	$3,082,237	1,152	$2,676	63	$48,924	$200,000	$3,282,237
Central IRL	Front St Park^	$3,082,237	1,152	$2,676	63	$48,924	$200,000	$3,282,237

Sub-Lagoon	Indian River Lagoon Muck Sites	Dredging Cost (2024 Estimate)	Total Nitrogen Reduction (pounds per year)	Cost per Pound of Total Nitrogen Removed	Total Phosphorus Reduction (pounds per year)	Cost per Pound of Total Phosphorus Removed	Interstitial Water Treatment Cost (2024 Estimate)	Total Cost (2024 Estimate)
Banana	520 Borrow Pit-2^	$2,635,789	921	$2,862	50	$52,716	$160,000	$2,795,789
Banana	520 Borrow Pit-7^	$2,635,789	921	$2,862	50	$52,716	$160,000	$2,795,789
North IRL	Warwick Dr^	$2,635,789	921	$2,862	50	$52,716	$160,000	$2,795,789
North IRL	Crab Shack^	$2,635,789	921	$2,862	50	$52,716	$160,000	$2,795,789
North IRL	Pineda*	$14,243,421	4,610	$3,090	492	$28,944	$1,200,000	$15,443,421
Central IRL	Turkey Creek*	$13,350,526	4,298	$3,106	140	$95,361	$1,120,000	$14,470,526
Banana	520 Borrow Pit-3^	$2,189,342	691	$3,168	38	$57,614	$120,000	$2,309,342
Banana	520 Borrow Pit-6^	$2,189,342	691	$3,168	38	$57,614	$120,000	$2,309,342
North IRL	Cocoa South*	$14,243,421	4,368	$3,261	182	$78,261	$1,200,000	$15,443,421
Banana	Port Canaveral*	$24,511,711	5,285	$4,638	245	$100,048	$2,120,000	$26,631,711
North IRL	Rockledge A*	$76,299,605	14,015	$5,444	1,184	$64,420	$6,760,000	$83,059,605
Central IRL	Trout Creek^	$1,296,447	230	$5,637	13	$99,727	$40,000	$1,336,447
Central IRL	Goat Creek ^	$1,742,895	236	$7,398	98	$17,785	$80,000	$1,822,895
North IRL	Cocoa 520-528^	$10,671,842	1,194	$8,938	40	$267,465	$880,000	$11,551,842
North IRL	Eau Gallie Northwest*	$49,691,342	5,422	$9,165	244	$203,987	$4,376,000	$54,067,342
Banana	Patrick Space Force Base Borrow Pit-2^	$12,904,079	921	$14,011	50	$258,082	$1,080,000	$13,984,079
North IRL	Eau Gallie South*	$103,532,895	4,610	$22,458	777	$133,247	$9,200,000	$112,732,895
-	***Total***	***$1,637,671,966***	***1,129,784***	***$1,450 (average)***	***71,570***	***$22,882 (average)***	***$143,454,488***	***$1,585,770,867***

*Flux rate from Fox and Trefry, 2022.
^Flux rate from Fox and Trefry, 2023.

Appendix E: Withdrawn Projects

Some of the projects submitted and approved as part of a plan update were determined to be less cost-effective and/or infeasible to implement after further investigation. Stormwater basin delineations were updated in 2019 with some basins merged or renamed in the 2020 Plan Update. Therefore, these projects were removed from the Save Our Indian River Lagoon Project Plan so that the funding could be used for other projects. **Table E-1** lists the projects that have been removed from the plan at the request of the responsible entity.

Table E-1: Summary of Project Withdrawals from the Plan

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2018	Holman Road Baffle Box	City of Cape Canaveral	Banana	71	2	$6,248
2018	Center Street Baffle Box	City of Cape Canaveral	Banana	297	9	$26,136
2018	International Drive Baffle Box	City of Cape Canaveral	Banana	443	4	$34,700
2018	Angel Isles Baffle Box	City of Cape Canaveral	Banana	131	3	$11,528
2018	Cherie Down Park Swale	City of Cape Canaveral	Banana	27	9	$2,376
2018	Norwood Baffle Box Retrofit	City of Palm Bay	Central IRL	1,631	254	$143,528
2018	Victoria Pond	City of Palm Bay	Central IRL	267	42	$23,486
2018	Goode Park	City of Palm Bay	Central IRL	794	121	$69,872
2018	Florin Pond	City of Palm Bay	Central IRL	75	11	$6,600
2018	Airport Boulevard Dry Retrofit	City of Melbourne	North IRL	99	23	$8,718
2018	National Aeronautics and Space Administration Boulevard Pond Retrofit	City of Melbourne	Central IRL	1,097	157	$96,532
2018	General Aviation Drive Retrofit	City of Melbourne	Central IRL	158	10	$13,937
2018	L-1 Canal Bank Stabilization	Brevard County	North IRL	995	383	$87,560
2018	Stormwater project in Basin 979	Brevard County	Banana	3,275	448	$225,000
2018	Stormwater project in Basin 1280	Brevard County	Banana	1,735	236	$175,000
2018	Stormwater project in Basin 1063	Brevard County	Banana	1,235	192	$100,000
2018	Stormwater project in Basin 970	Brevard County	Banana	1,092	185	$100,000
2018	Stormwater project in Basin 995	Brevard County	Banana	1,048	169	$100,000
2018	Stormwater project in Basin 754	Brevard County	Banana	734	95	$100,000
2018	Stormwater project in Basin 327	Brevard County	North IRL	1,999	283	$125,000
2018	Stormwater project in Basin 1582	Brevard County	Central IRL	2,402	443	$200,000
2019	Cocoa Beach Muck Dredging – Phase III Interstitial	City of Cocoa Beach	Banana	2,942	To be determined	$514,809

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2019	Indian River Drive Oyster Bar (reduction from 1,900 to 140 feet)	Brevard County	North IRL	422	10	$166,672
2019	Indian River Drive Planted Shoreline (reduction from 1,900 to 140 feet)	Brevard County	North IRL	118	41	$20,620
2019	Stormwater project in Basin 905	Brevard County	Banana	1,143	178	$150,000
2019	Stormwater project in Basin 492	Brevard County	Banana	1,020	117	$100,000
2019	Stormwater project in Basin 522	Brevard County	Banana	795	110	$125,000
2019	Stormwater project in Basin 705	Brevard County	Banana	650	95	$100,000
2019	Stormwater project in Basin 821	Brevard County	Banana	627	123	$100,000
2019	Stormwater project in Basin 820	Brevard County	Banana	597	112	$100,000
2019	Stormwater project in Basin 47	Brevard County	North IRL	1,348	139	$125,000
2019	Stormwater project in Basin 219	Brevard County	North IRL	956	113	$125,000
2020	Cape Canaveral Air Force Station Upgrade	Cape Canaveral Air Force Station	Banana	25,627	To be determined	$6,000,000
2020	Malabar - Zone B	Brevard County	Central IRL	1,929	Not applicable	$2,135,808
2020	Malabar - Zone A	Brevard County	Central IRL	11,456	Not applicable	$14,349,960
2020	South Beaches - Zone F	Brevard County	Central IRL	70	Not applicable	$100,116
2020	Carver Cove Swale	City of Cape Canaveral	Banana	32	9	$2,816
2020	Cocoa Palms Low Impact Development	City of Cape Canaveral	Banana	13	10	$1,144
2020	M1 Canal Biosorption Activated Media	Brevard County	Central IRL	1,433	191	$66,300
2020	Oliver Oyster Bar	Brevard Zoo	North IRL	116	39	$51,620
2020	Coconut Point/Environmentally Endangered Lands Oyster Bar (reduction from 27,125 square feet to 2,400 square feet)	Brevard Zoo	Central IRL	989	367	$464,830
2020	Turkey Creek Shoreline Restoration – Oysters	City of Palm Bay	Central IRL	309	8	$122,055
2020	Eden Isles Lane Oyster Bar	Brevard Zoo	Banana	49	17	$21,805
2020	Turkey Creek Shoreline Restoration – Planted	City of Palm Bay	Central IRL	104	36	$24,960
2020	Stormwater project in Basin 388	Brevard County	Banana	1,390	138	$100,000
2020	Stormwater project in Basin 451	Brevard County	Banana	1,168	121	$100,000
2020	Stormwater project in Basin 815	Brevard County	Banana	698	113	$100,000
2020	Stormwater project in Basin 829	Brevard County	Banana	630	145	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 865	Brevard County	Banana	454	151	$100,000
2020	Stormwater project in Basin 889	Brevard County	Banana	539	85	$100,000
2020	Stormwater project in Basin 901	Brevard County	Banana	1,658	196	$150,000
2020	Stormwater project in Basin 912	Brevard County	Banana	1,025	34	$100,000
2020	Stormwater project in Basin 929	Brevard County	Banana	304	41	$100,000
2020	Stormwater project in Basin 933	Brevard County	Banana	302	38	$100,000
2020	Stormwater project in Basin 934	Brevard County	Banana	365	42	$100,000
2020	Stormwater project in Basin 938	Brevard County	Banana	424	160	$100,000
2020	Stormwater project in Basin 940	Brevard County	Banana	816	106	$100,000
2020	Stormwater project in Basin 943	Brevard County	Banana	708	90	$100,000
2020	Stormwater project in Basin 944	Brevard County	Banana	614	83	$100,000
2020	Stormwater project in Basin 955	Brevard County	Banana	522	60	$100,000
2020	Stormwater project in Basin 957	Brevard County	Banana	586	53	$100,000
2020	Stormwater project in Basin 958	Brevard County	Banana	164	26	$100,000
2020	Stormwater project in Basin 960	Brevard County	Banana	537	80	$100,000
2020	Stormwater project in Basin 961	Brevard County	Banana	431	57	$100,000
2020	Stormwater project in Basin 963	Brevard County	Banana	2,092	396	$150,000
2020	Stormwater project in Basin 969	Brevard County	Banana	528	78	$100,000
2020	Stormwater project in Basin 973	Brevard County	Banana	2,048	311	$175,000
2020	Stormwater project in Basin 975	Brevard County	Banana	521	75	$100,000
2020	Stormwater project in Basin 977	Brevard County	Banana	558	59	$100,000
2020	Stormwater project in Basin 980	Brevard County	Banana	836	127	$100,000
2020	Stormwater project in Basin 981	Brevard County	Banana	993	179	$100,000
2020	Stormwater project in Basin 982	Brevard County	Banana	642	68	$100,000
2020	Stormwater project in Basin 988	Brevard County	Banana	621	108	$100,000
2020	Stormwater project in Basin 989	Brevard County	Banana	1,030	110	$100,000
2020	Stormwater project in Basin 990	Brevard County	Banana	634	102	$100,000
2020	Stormwater project in Basin 992	Brevard County	Banana	1,244	195	$100,000
2020	Stormwater project in Basin 1000	Brevard County	Banana	277	40	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 1001	Brevard County	Banana	401	54	$100,000
2020	Stormwater project in Basin 1010	Brevard County	Banana	374	55	$100,000
2020	Stormwater project in Basin 1014	Brevard County	Banana	333	50	$100,000
2020	Stormwater project in Basin 1016	Brevard County	Banana	920	136	$100,000
2020	Stormwater project in Basin 1018	Brevard County	Banana	389	54	$100,000
2020	Stormwater project in Basin 1026	Brevard County	Banana	1,073	180	$100,000
2020	Stormwater project in Basin 1033	Brevard County	Banana	1,113	152	$100,000
2020	Stormwater project in Basin 1038	Brevard County	Banana	157	25	$100,000
2020	Stormwater project in Basin 1039	Brevard County	Banana	708	104	$100,000
2020	Stormwater project in Basin 1041	Brevard County	Banana	273	47	$100,000
2020	Stormwater project in Basin 1048	Brevard County	Banana	107	20	$100,000
2020	Stormwater project in Basin 1070	Brevard County	Banana	113	12	$100,000
2020	Stormwater project in Basin 1071	Brevard County	Banana	1,082	144	$100,000
2020	Stormwater project in Basin 1082	Brevard County	Banana	264	39	$100,000
2020	Stormwater project in Basin 1098	Brevard County	Banana	341	53	$100,000
2020	Stormwater project in Basin 1104	Brevard County	Banana	701	106	$100,000
2020	Stormwater project in Basin 1117	Brevard County	Banana	282	43	$100,000
2020	Stormwater project in Basin 1120	Brevard County	Banana	313	50	$100,000
2020	Stormwater project in Basin 1121	Brevard County	Banana	186	27	$100,000
2020	Stormwater project in Basin 1125	Brevard County	Banana	307	51	$100,000
2020	Stormwater project in Basin 1133	Brevard County	Banana	562	90	$100,000
2020	Stormwater project in Basin 1142	Brevard County	Banana	534	73	$100,000
2020	Stormwater project in Basin 1152	Brevard County	Banana	245	30	$100,000
2020	Stormwater project in Basin 1159	Brevard County	Banana	134	20	$100,000
2020	Stormwater project in Basin 1167	Brevard County	Banana	180	28	$100,000
2020	Stormwater project in Basin 1175	Brevard County	Banana	394	42	$100,000
2020	Stormwater project in Basin 1183	Brevard County	Banana	272	39	$100,000
2020	Stormwater project in Basin 1188	Brevard County	Banana	166	29	$100,000
2020	Stormwater project in Basin 1198	Brevard County	Banana	365	62	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 1220	Brevard County	Banana	396	61	$100,000
2020	Stormwater project in Basin 1223	Brevard County	Banana	561	86	$100,000
2020	Stormwater project in Basin 1225	Brevard County	Banana	122	19	$100,000
2020	Stormwater project in Basin 1231	Brevard County	Banana	300	58	$100,000
2020	Stormwater project in Basin 1248	Brevard County	Banana	306	46	$100,000
2020	Stormwater project in Basin 1250	Brevard County	Banana	188	26	$100,000
2020	Stormwater project in Basin 1251	Brevard County	Banana	448	66	$100,000
2020	Stormwater project in Basin 1262	Brevard County	Banana	443	80	$100,000
2020	Stormwater project in Basin 1265	Brevard County	Banana	743	98	$100,000
2020	Stormwater project in Basin 1270	Brevard County	Banana	187	28	$100,000
2020	Stormwater project in Basin 1296	Brevard County	Banana	241	48	$100,000
2020	Stormwater project in Basin 1302	Brevard County	Banana	172	25	$100,000
2020	Stormwater project in Basin 1303	Brevard County	Banana	166	24	$100,000
2020	Stormwater project in Basin 1305	Brevard County	Banana	119	25	$100,000
2020	Stormwater project in Basin 1310	Brevard County	Banana	583	106	$100,000
2020	Stormwater project in Basin 1311	Brevard County	Banana	104	15	$100,000
2020	Stormwater project in Basin 1314	Brevard County	Banana	170	26	$100,000
2020	Stormwater project in Basin 1317	Brevard County	Banana	1,679	143	$125,000
2020	Stormwater project in Basin 1319	Brevard County	Banana	117	16	$100,000
2020	Stormwater project in Basin 1327	Brevard County	Banana	352	52	$100,000
2020	Stormwater project in Basin 1328	Brevard County	Banana	617	89	$100,000
2020	Stormwater project in Basin 1332	Brevard County	Banana	303	47	$100,000
2020	Stormwater project in Basin 1334	Brevard County	Banana	795	130	$100,000
2020	Stormwater project in Basin 1336	Brevard County	Banana	470	68	$100,000
2020	Stormwater project in Basin 1337	Brevard County	Banana	1,121	186	$100,000
2020	Stormwater project in Basin 1338	Brevard County	Banana	256	37	$100,000
2020	Stormwater project in Basin 1343	Brevard County	Banana	1,388	142	$100,000
2020	Stormwater project in Basin 1346	Brevard County	Banana	189	28	$100,000
2020	Stormwater project in Basin 1350	Brevard County	Banana	1,049	165	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 1351	Brevard County	Banana	129	19	$100,000
2020	Stormwater project in Basin 1357	Brevard County	Banana	338	56	$100,000
2020	Stormwater project in Basin 1362	Brevard County	Banana	476	71	$100,000
2020	Stormwater project in Basin 1366	Brevard County	Banana	1,483	242	$100,000
2020	Stormwater project in Basin 1371	Brevard County	Banana	273	39	$100,000
2020	Stormwater project in Basin 1372	Brevard County	Banana	720	113	$100,000
2020	Stormwater project in Basin 1378	Brevard County	Banana	744	104	$100,000
2020	Stormwater project in Basin 2421	Brevard County	Banana	343	49	$100,000
2020	Stormwater project in Basin 83	Brevard County	North IRL	452	61	$100,000
2020	Stormwater project in Basin 100	Brevard County	North IRL	888	115	$100,000
2020	Stormwater project in Basin 105	Brevard County	North IRL	549	72	$100,000
2020	Stormwater project in Basin 212	Brevard County	North IRL	693	89	$100,000
2020	Stormwater project in Basin 228	Brevard County	North IRL	684	131	$100,000
2020	Stormwater project in Basin 262	Brevard County	North IRL	794	126	$100,000
2020	Stormwater project in Basin 263	Brevard County	North IRL	469	65	$100,000
2020	Stormwater project in Basin 288	Brevard County	North IRL	732	78	$100,000
2020	Stormwater project in Basin 289	Brevard County	North IRL	1,112	223	$100,000
2020	Stormwater project in Basin 290	Brevard County	North IRL	1,116	193	$100,000
2020	Stormwater project in Basin 291	Brevard County	North IRL	485	82	$100,000
2020	Stormwater project in Basin 294	Brevard County	North IRL	551	84	$100,000
2020	Stormwater project in Basin 335	Brevard County	North IRL	1,187	206	$100,000
2020	Stormwater project in Basin 353	Brevard County	North IRL	497	86	$100,000
2020	Stormwater project in Basin 354	Brevard County	North IRL	555	115	$100,000
2020	Stormwater project in Basin 392	Brevard County	North IRL	840	155	$100,000
2020	Stormwater project in Basin 408	Brevard County	North IRL	1,179	170	$125,000
2020	Stormwater project in Basin 454	Brevard County	North IRL	1,996	302	$150,000
2020	Stormwater project in Basin 510	Brevard County	North IRL	586	92	$100,000
2020	Stormwater project in Basin 512	Brevard County	North IRL	364	53	$100,000
2020	Stormwater project in Basin 513	Brevard County	North IRL	1,137	183	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 544	Brevard County	North IRL	624	98	$100,000
2020	Stormwater project in Basin 568	Brevard County	North IRL	534	85	$100,000
2020	Stormwater project in Basin 578	Brevard County	North IRL	430	68	$100,000
2020	Stormwater project in Basin 594	Brevard County	North IRL	833	135	$100,000
2020	Stormwater project in Basin 597	Brevard County	North IRL	800	142	$100,000
2020	Stormwater project in Basin 624	Brevard County	North IRL	860	134	$100,000
2020	Stormwater project in Basin 626	Brevard County	North IRL	1,602	193	$150,000
2020	Stormwater project in Basin 644	Brevard County	North IRL	686	94	$100,000
2020	Stormwater project in Basin 660	Brevard County	North IRL	844	212	$100,000
2020	Stormwater project in Basin 677	Brevard County	North IRL	709	136	$100,000
2020	Stormwater project in Basin 751	Brevard County	North IRL	532	121	$100,000
2020	Stormwater project in Basin 759	Brevard County	North IRL	614	98	$100,000
2020	Stormwater project in Basin 796	Brevard County	North IRL	639	98	$100,000
2020	Stormwater project in Basin 805	Brevard County	North IRL	645	94	$100,000
2020	Stormwater project in Basin 806	Brevard County	North IRL	622	100	$100,000
2020	Stormwater project in Basin 827	Brevard County	North IRL	639	96	$100,000
2020	Stormwater project in Basin 838	Brevard County	North IRL	658	135	$100,000
2020	Stormwater project in Basin 840	Brevard County	North IRL	619	84	$100,000
2020	Stormwater project in Basin 862	Brevard County	North IRL	416	72	$100,000
2020	Stormwater project in Basin 871	Brevard County	North IRL	366	53	$100,000
2020	Stormwater project in Basin 884	Brevard County	North IRL	437	68	$100,000
2020	Stormwater project in Basin 889	Brevard County	North IRL	539	85	$100,000
2020	Stormwater project in Basin 890	Brevard County	North IRL	533	110	$100,000
2020	Stormwater project in Basin 894	Brevard County	North IRL	794	116	$100,000
2020	Stormwater project in Basin 896	Brevard County	North IRL	581	123	$100,000
2020	Stormwater project in Basin 902	Brevard County	North IRL	276	35	$100,000
2020	Stormwater project in Basin 903	Brevard County	North IRL	631	88	$100,000
2020	Stormwater project in Basin 920	Brevard County	North IRL	511	87	$100,000
2020	Stormwater project in Basin 921	Brevard County	North IRL	743	96	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 922	Brevard County	North IRL	601	107	$100,000
2020	Stormwater project in Basin 938	Brevard County	North IRL	424	160	$100,000
2020	Stormwater project in Basin 939	Brevard County	North IRL	502	71	$100,000
2020	Stormwater project in Basin 940	Brevard County	North IRL	816	106	$100,000
2020	Stormwater project in Basin 952	Brevard County	North IRL	1,251	212	$100,000
2020	Stormwater project in Basin 960	Brevard County	North IRL	537	80	$100,000
2020	Stormwater project in Basin 962	Brevard County	North IRL	527	75	$100,000
2020	Stormwater project in Basin 980	Brevard County	North IRL	836	127	$100,000
2020	Stormwater project in Basin 985	Brevard County	North IRL	687	99	$100,000
2020	Stormwater project in Basin 987	Brevard County	North IRL	1,099	172	$100,000
2020	Stormwater project in Basin 993	Brevard County	North IRL	611	93	$100,000
2020	Stormwater project in Basin 1002	Brevard County	North IRL	1,181	159	$100,000
2020	Stormwater project in Basin 1016	Brevard County	North IRL	920	136	$100,000
2020	Stormwater project in Basin 1027	Brevard County	North IRL	560	84	$100,000
2020	Stormwater project in Basin 1029	Brevard County	North IRL	685	93	$100,000
2020	Stormwater project in Basin 1032	Brevard County	North IRL	719	115	$100,000
2020	Stormwater project in Basin 1033	Brevard County	North IRL	1,113	152	$100,000
2020	Stormwater project in Basin 1034	Brevard County	North IRL	902	132	$100,000
2020	Stormwater project in Basin 1037	Brevard County	North IRL	533	105	$100,000
2020	Stormwater project in Basin 1039	Brevard County	North IRL	708	104	$100,000
2020	Stormwater project in Basin 1067	Brevard County	North IRL	463	67	$100,000
2020	Stormwater project in Basin 1071	Brevard County	North IRL	1,082	144	$100,000
2020	Stormwater project in Basin 1073	Brevard County	North IRL	428	61	$100,000
2020	Stormwater project in Basin 1076	Brevard County	North IRL	595	91	$100,000
2020	Stormwater project in Basin 1077	Brevard County	North IRL	1,687	289	$150,000
2020	Stormwater project in Basin 1080	Brevard County	North IRL	861	134	$100,000
2020	Stormwater project in Basin 1081	Brevard County	North IRL	1,281	210	$100,000
2020	Stormwater project in Basin 1112	Brevard County	North IRL	1,032	166	$100,000
2020	Stormwater project in Basin 1113	Brevard County	North IRL	416	93	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 1124	Brevard County	North IRL	681	99	$100,000
2020	Stormwater project in Basin 1128	Brevard County	North IRL	279	77	$100,000
2020	Stormwater project in Basin 1150	Brevard County	North IRL	476	57	$100,000
2020	Stormwater project in Basin 1151	Brevard County	North IRL	1,057	141	$125,000
2020	Stormwater project in Basin 1172	Brevard County	North IRL	852	123	$100,000
2020	Stormwater project in Basin 1197	Brevard County	North IRL	609	82	$100,000
2020	Stormwater project in Basin 1213	Brevard County	North IRL	904	131	$100,000
2020	Stormwater project in Basin 1214	Brevard County	North IRL	727	84	$100,000
2020	Stormwater project in Basin 1215	Brevard County	North IRL	382	52	$100,000
2020	Stormwater project in Basin 1219	Brevard County	North IRL	512	60	$100,000
2020	Stormwater project in Basin 1220	Brevard County	North IRL	396	61	$100,000
2020	Stormwater project in Basin 1221	Brevard County	North IRL	545	85	$100,000
2020	Stormwater project in Basin 1222	Brevard County	North IRL	888	171	$100,000
2020	Stormwater project in Basin 1224	Brevard County	North IRL	401	111	$100,000
2020	Stormwater project in Basin 1228	Brevard County	North IRL	501	83	$100,000
2020	Stormwater project in Basin 1231	Brevard County	North IRL	300	58	$100,000
2020	Stormwater project in Basin 1233	Brevard County	North IRL	605	101	$100,000
2020	Stormwater project in Basin 1240	Brevard County	North IRL	638	100	$100,000
2020	Stormwater project in Basin 1241	Brevard County	North IRL	584	83	$100,000
2020	Stormwater project in Basin 1244	Brevard County	North IRL	576	78	$100,000
2020	Stormwater project in Basin 1245	Brevard County	North IRL	356	49	$100,000
2020	Stormwater project in Basin 1251	Brevard County	North IRL	448	66	$100,000
2020	Stormwater project in Basin 1253	Brevard County	North IRL	379	54	$100,000
2020	Stormwater project in Basin 1259	Brevard County	North IRL	450	106	$100,000
2020	Stormwater project in Basin 1262	Brevard County	North IRL	443	80	$100,000
2020	Stormwater project in Basin 1273	Brevard County	North IRL	1,964	288	$175,000
2020	Stormwater project in Basin 1291	Brevard County	North IRL	518	79	$100,000
2020	Stormwater project in Basin 1292	Brevard County	North IRL	386	60	$100,000
2020	Stormwater project in Basin 1293	Brevard County	North IRL	461	67	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 1294	Brevard County	North IRL	628	94	$100,000
2020	Stormwater project in Basin 1295	Brevard County	North IRL	800	121	$100,000
2020	Stormwater project in Basin 1301	Brevard County	North IRL	1,025	154	$125,000
2020	Stormwater project in Basin 1307	Brevard County	North IRL	431	47	$100,000
2020	Stormwater project in Basin 1312	Brevard County	North IRL	549	120	$100,000
2020	Stormwater project in Basin 1313	Brevard County	North IRL	619	92	$100,000
2020	Stormwater project in Basin 1316	Brevard County	North IRL	557	68	$100,000
2020	Stormwater project in Basin 1318	Brevard County	North IRL	1,124	148	$100,000
2020	Stormwater project in Basin 1324	Brevard County	North IRL	1,422	176	$150,000
2020	Stormwater project in Basin 1330	Brevard County	North IRL	639	89	$100,000
2020	Stormwater project in Basin 1331	Brevard County	North IRL	1,000	159	$100,000
2020	Stormwater project in Basin 1339	Brevard County	North IRL	857	103	$100,000
2020	Stormwater project in Basin 1344	Brevard County	North IRL	459	61	$100,000
2020	Stormwater project in Basin 1348	Brevard County	North IRL	723	102	$100,000
2020	Stormwater project in Basin 1354	Brevard County	North IRL	597	86	$100,000
2020	Stormwater project in Basin 1359	Brevard County	North IRL	887	142	$100,000
2020	Stormwater project in Basin 1361	Brevard County	North IRL	524	79	$100,000
2020	Stormwater project in Basin 1363	Brevard County	North IRL	715	123	$100,000
2020	Stormwater project in Basin 1367	Brevard County	North IRL	1,042	146	$100,000
2020	Stormwater project in Basin 1372	Brevard County	North IRL	720	113	$100,000
2020	Stormwater project in Basin 1378	Brevard County	North IRL	744	104	$100,000
2020	Stormwater project in Basin 1380	Brevard County	North IRL	929	134	$100,000
2020	Stormwater project in Basin 1382	Brevard County	North IRL	622	88	$100,000
2020	Stormwater project in Basin 1384	Brevard County	North IRL	923	142	$100,000
2020	Stormwater project in Basin 1389	Brevard County	North IRL	822	134	$100,000
2020	Stormwater project in Basin 1390	Brevard County	North IRL	612	92	$100,000
2020	Stormwater project in Basin 1391	Brevard County	North IRL	887	142	$100,000
2020	Stormwater project in Basin 1395	Brevard County	North IRL	768	114	$100,000
2020	Stormwater project in Basin 1398	Brevard County	North IRL	449	74	$100,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2020	Stormwater project in Basin 1401	Brevard County	North IRL	953	147	$100,000
2020	Stormwater project in Basin 1403	Brevard County	North IRL	558	88	$100,000
2020	Stormwater project in Basin 1413	Brevard County	North IRL	528	78	$100,000
2020	Stormwater project in Basin 1416	Brevard County	North IRL	1,799	229	$150,000
2020	Stormwater project in Basin 1417	Brevard County	North IRL	771	117	$100,000
2020	Stormwater project in Basin 1418	Brevard County	North IRL	832	111	$100,000
2020	Stormwater project in Basin 1423	Brevard County	North IRL	487	73	$100,000
2020	Stormwater project in Basin 1425	Brevard County	North IRL	690	113	$100,000
2020	Stormwater project in Basin 1426	Brevard County	North IRL	720	116	$100,000
2020	Stormwater project in Basin 1428	Brevard County	North IRL	440	65	$100,000
2020	Stormwater project in Basin 1429	Brevard County	North IRL	477	55	$100,000
2020	Stormwater project in Basin 1434	Brevard County	North IRL	932	112	$125,000
2020	Stormwater project in Basin 1435	Brevard County	North IRL	328	43	$100,000
2020	Stormwater project in Basin 1441	Brevard County	North IRL	1,034	149	$100,000
2020	Stormwater project in Basin 1459	Brevard County	North IRL	895	132	$100,000
2020	Stormwater project in Basin 1463	Brevard County	North IRL	1,321	195	$100,000
2020	Stormwater project in Basin 1491	Brevard County	North IRL	641	93	$100,000
2020	Stormwater project in Basin 1498	Brevard County	North IRL	483	74	$100,000
2020	Stormwater project in Basin 2419	Brevard County	North IRL	381	43	$100,000
2020	Stormwater project in Basin 2420	Brevard County	North IRL	450	121	$100,000
2020	Stormwater project in Basin 2421	Brevard County	North IRL	343	49	$100,000
2020	Stormwater project in Basin 1439	Brevard County	Central IRL	1,413	183	$200,000
2020	Stormwater project in Basin 1445	Brevard County	Central IRL	1,493	198	$200,000
2020	Stormwater project in Basin 1470	Brevard County	Central IRL	2,813	452	$200,000
2020	Stormwater project in Basin 1508	Brevard County	Central IRL	2,459	356	$200,000
2020	Stormwater project in Basin 1562	Brevard County	Central IRL	3,314	449	$275,000
2020	Stormwater project in Basin 1615	Brevard County	Central IRL	2,815	390	$200,000
2020	Stormwater project in Basin 1803	Brevard County	Central IRL	2,227	318	$200,000
2020	Stormwater project in Basin 1825	Brevard County	Central IRL	1,896	394	$200,000

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2021	Cape Shores Swales	City of Cape Canaveral	Banana	31	15	$2,746
2021	Justamere Road Swale	City of Cape Canaveral	Banana	6	3	$528
2021	Hitching Post Berms	City of Cape Canaveral	Banana	29	22	$2,552
2021	Oyster Bar	Brevard County	Banana	120	3	$47,350
2021	Stewart Road Dry Retrofit	City of Melbourne	North IRL	208	47	$18,344
2021	Stormwater project in Basin 1349	Brevard County	North IRL	1,747	268	$354,400
2021	Stormwater project in Basin 1409	Brevard County	North IRL	1,375	209	$293,800
2021	Indian River Drive Oyster Bar	Brevard County	North IRL	34	1	$13,258
2021	Indian River Drive Planted Shoreline	Brevard County	North IRL	9	3	$2,240
2021	Stormwater project in Basin 2191	Brevard County	Central IRL	1,925	185	$326,500
2021	Stormwater project in Basin 1511	Brevard County	Central IRL	2,409	378	$410,300
2022	Cape Canaveral Air Force Station Regional – Rapid Infiltration Basin	Brevard County	Banana	4,625	1,226	$5,227,200
2022	Brevard Zoo Banana River Plant Project	Brevard Zoo	Banana	13	4	$3,120
2022	Brevard Zoo Banana River Plant Project 2	Brevard Zoo	Banana	2	1	$480
2022	Newfound Harbor Drive	Marine Resources Council	Banana	7	2	$1,680
2022	Port St. John Wastewater Treatment Plant – Rapid Infiltration Basin	Brevard County	North IRL	4,116	915	$980,100
2022	Brevard Zoo North Indian River Lagoon Plant Project 3	Brevard Zoo	North IRL	4	1	$960
2022	Brevard Zoo Central IRL Plant Project	Brevard Zoo	Central IRL	8	3	$1,920
2022	Canebreaker Condo – Sprayfield	Brevard County	North IRL	61	To be determined	$36,000
2023	Burris Way Alley West Stormwater Low Impact Development Improvement	City of Cocoa Beach	Banana	3	0	$1,249
2023	Stormwater project in Basin CC-B2C	Brevard County	Banana	430	63	$128,000
2023	Stormwater project in Basin CC-B4B	Brevard County	Banana	411	66	$125,100
2023	Stormwater project in Basin 592	Brevard County	Banana	359	34	$109,500
2024	South Central – Zone D (Melbourne)	City of Melbourne	North IRL	177	Not applicable	$265,500
2024	City of Melbourne Septic-to-Sewer	City of Melbourne	North IRL	878	Not applicable	$867,672
2024	Diamond Square Stormwater Pond	City of Cocoa	North IRL	85	23	$10,383
2024	Stormwater project in Basin 1280B	Brevard County	Banana	390	50	$149,036

Year Removed	Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
2024	Stormwater project in Basin 1304	Brevard County	Banana	181	To be determined	$84,534
2024	Stormwater project in Basin 959A	Brevard County	Banana	108	15	$143,436
2024	Stormwater project in Basin 10	Brevard County	North IRL	356	To be determined	$235,599
2024	Stormwater project in Basin 115	Brevard County	North IRL	707	98	$330,570
2024	Stormwater project in Basin 1298	Brevard County	North IRL	750	113	$459,774
2024	Stormwater project in Basin 141	Brevard County	North IRL	482	77	$232,093
2024	Stormwater project in Basin 1434	Brevard County	North IRL	959	131	$400,567
2024	Stormwater project in Basin 193	Brevard County	North IRL	343	49	$297,091
2024	Stormwater project in Basin 22	Brevard County	North IRL	293	19	$164,250
2024	Stormwater project in Basin 26	Brevard County	North IRL	295	46	$195,366
2024	Stormwater project in Basin 832	Brevard County	North IRL	506	90	$259,955
2024	Stormwater project in Basin 1604	Brevard County	Central IRL	2,916	425	$697,286
2024	Stormwater project in Basin 1762	Brevard County	Central IRL	4,250	621	$1,009,602
2024	Stormwater project in Basin SJR-97	Brevard County	Central IRL	14,851	2,094	$3,207,859
2025	City of Titusville - Zone H	Brevard County	North IRL	910	Not applicable	$1,168,020
2025	Basin 116 Lionel Road	Brevard County Natural Resources	North IRL	936	142	$185,700
2025	Cherry Street Baffle Box	City of Melbourne	North IRL	980	174	$306,740
2025	Hamilton Avenue Baffle Box	City of Titusville	North IRL	1,550	209	$350,000
2025	North and South Lakemont Ponds Vegetation Harvesting	City of Cocoa	North IRL	18	4	$1,980
2025	Riverview Park Oyster Bar	City of Melbourne	Central IRL	230	78	$108,790
2025	Riverview Park Planted Shoreline	City of Melbourne	Central IRL	77	26	$18,480
2025	Indian River Shores Trailer Park+	Property Owner	Central IRL	450	To be determined	$528,627

Appendix F. Loading Estimates from Stormwater Basins on Federal Lands

The following 593 stormwater basins are located on federal lands which are not accessible to Brevard County for project implementation.

Table F-1: Summary of Stormwater Basins on Federal Lands

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 1317A	Patrick Space Force Station	Banana	33	5	$127,558
Stormwater Project in Basin 1317B	Patrick Space Force Station	Banana	24	3	$125,638
Stormwater Project in Basin 1317C	Patrick Space Force Station	Banana	1	0	$120,238
Stormwater Project in Basin 1317D	Patrick Space Force Station	Banana	74	10	$137,292
Stormwater Project in Basin 350	Cape Canaveral Space Force Station	Banana	694	85	$276,776
Stormwater Project in Basin 351	Cape Canaveral Space Force Station	Banana	12	1	$122,043
Stormwater Project in Basin 414	Cape Canaveral Space Force Station	Banana	252	31	$170,958
Stormwater Project in Basin 427	Cape Canaveral Space Force Station	Banana	3	0	$120,352
Stormwater Project in Basin 428	Cape Canaveral Space Force Station	Banana	158	18	$148,016
Stormwater Project in Basin 433	Cape Canaveral Space Force Station	Banana	21	2	$122,828
Stormwater Project in Basin 434	Cape Canaveral Space Force Station	Banana	15	1	$122,539
Stormwater Project in Basin 435	Cape Canaveral Space Force Station	Banana	10	1	$121,508
Stormwater Project in Basin 436	Cape Canaveral Space Force Station	Banana	5	0	$120,257
Stormwater Project in Basin 437	Cape Canaveral Space Force Station	Banana	8	1	$121,152
Stormwater Project in Basin 440	Cape Canaveral Space Force Station	Banana	27	3	$125,657
Stormwater Project in Basin 442	Cape Canaveral Space Force Station	Banana	21	2	$123,456
Stormwater Project in Basin 452	Cape Canaveral Space Force Station	Banana	250	22	$139,106
Stormwater Project in Basin 453	Cape Canaveral Space Force Station	Banana	405	51	$216,065
Stormwater Project in Basin 458	Cape Canaveral Space Force Station	Banana	29	3	$126,348
Stormwater Project in Basin 460	Cape Canaveral Space Force Station	Banana	18	2	$123,957
Stormwater Project in Basin 461	Cape Canaveral Space Force Station	Banana	25	3	$125,457
Stormwater Project in Basin 464	Cape Canaveral Space Force Station	Banana	297	31	$173,729

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 476	Cape Canaveral Space Force Station	Banana	680	78	$271,990
Stormwater Project in Basin 477	Cape Canaveral Space Force Station	Banana	14	1	$121,753
Stormwater Project in Basin 479	Cape Canaveral Space Force Station	Banana	445	42	$183,087
Stormwater Project in Basin 481	Cape Canaveral Space Force Station	Banana	301	30	$168,105
Stormwater Project in Basin 483	Cape Canaveral Space Force Station	Banana	708	84	$276,681
Stormwater Project in Basin 484	Cape Canaveral Space Force Station	Banana	445	40	$171,765
Stormwater Project in Basin 485	Cape Canaveral Space Force Station	Banana	75	7	$129,234
Stormwater Project in Basin 490	Cape Canaveral Space Force Station	Banana	195	17	$139,332
Stormwater Project in Basin 492	Cape Canaveral Space Force Station	Banana	410	48	$213,991
Stormwater Project in Basin 496	Cape Canaveral Space Force Station	Banana	75	7	$130,450
Stormwater Project in Basin 497	Cape Canaveral Space Force Station	Banana	952	95	$277,315
Stormwater Project in Basin 502	Cape Canaveral Space Force Station	Banana	157	15	$140,212
Stormwater Project in Basin 503	Cape Canaveral Space Force Station	Banana	245	23	$151,242
Stormwater Project in Basin 504	Cape Canaveral Space Force Station	Banana	213	22	$156,284
Stormwater Project in Basin 505	Cape Canaveral Space Force Station	Banana	11	1	$121,591
Stormwater Project in Basin 507	Cape Canaveral Space Force Station	Banana	115	12	$138,364
Stormwater Project in Basin 508	Cape Canaveral Space Force Station	Banana	546	59	$232,568
Stormwater Project in Basin 516	Cape Canaveral Space Force Station	Banana	4	0	$120,540
Stormwater Project in Basin 517	Cape Canaveral Space Force Station	Banana	14	1	$122,929
Stormwater Project in Basin 518	Cape Canaveral Space Force Station	Banana	147	18	$155,919
Stormwater Project in Basin 519	Cape Canaveral Space Force Station	Banana	5	0	$120,822
Stormwater Project in Basin 520	Cape Canaveral Space Force Station	Banana	400	35	$166,140
Stormwater Project in Basin 522	Cape Canaveral Space Force Station	Banana	123	17	$154,479
Stormwater Project in Basin 524	Cape Canaveral Space Force Station	Banana	14	1	$122,101
Stormwater Project in Basin 525	Cape Canaveral Space Force Station	Banana	5	0	$120,931
Stormwater Project in Basin 526	Cape Canaveral Space Force Station	Banana	3	0	$120,402

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 530	Cape Canaveral Space Force Station	Banana	4	0	$120,699
Stormwater Project in Basin 532	Cape Canaveral Space Force Station	Banana	2	0	$120,436
Stormwater Project in Basin 535	Cape Canaveral Space Force Station	Banana	174	15	$136,378
Stormwater Project in Basin 537	Cape Canaveral Space Force Station	Banana	591	68	$242,931
Stormwater Project in Basin 538	Cape Canaveral Space Force Station	Banana	2	0	$120,052
Stormwater Project in Basin 539	Cape Canaveral Space Force Station	Banana	936	98	$294,448
Stormwater Project in Basin 542	Cape Canaveral Space Force Station	Banana	2	0	$120,420
Stormwater Project in Basin 543	Cape Canaveral Space Force Station	Banana	511	54	$211,734
Stormwater Project in Basin 545	Cape Canaveral Space Force Station	Banana	247	22	$143,766
Stormwater Project in Basin 546	Cape Canaveral Space Force Station	Banana	219	22	$149,286
Stormwater Project in Basin 558	Cape Canaveral Space Force Station	Banana	338	34	$167,188
Stormwater Project in Basin 565	Cape Canaveral Space Force Station	Banana	8	1	$121,420
Stormwater Project in Basin 566	Cape Canaveral Space Force Station	Banana	18	2	$122,866
Stormwater Project in Basin 567	Cape Canaveral Space Force Station	Banana	35	5	$129,082
Stormwater Project in Basin 574	Cape Canaveral Space Force Station	Banana	328	39	$188,688
Stormwater Project in Basin 581	Cape Canaveral Space Force Station	Banana	40	3	$122,256
Stormwater Project in Basin 583	Cape Canaveral Space Force Station	Banana	9	1	$120,492
Stormwater Project in Basin 584	Cape Canaveral Space Force Station	Banana	204	16	$134,849
Stormwater Project in Basin 585	Cape Canaveral Space Force Station	Banana	474	48	$201,430
Stormwater Project in Basin 586	Cape Canaveral Space Force Station	Banana	236	22	$149,602
Stormwater Project in Basin 587	Cape Canaveral Space Force Station	Banana	158	13	$134,978
Stormwater Project in Basin 588	Cape Canaveral Space Force Station	Banana	26	2	$122,236
Stormwater Project in Basin 591	Cape Canaveral Space Force Station	Banana	399	37	$171,474
Stormwater Project in Basin 592	Cape Canaveral Space Force Station	Banana	359	35	$169,452
Stormwater Project in Basin 601	Cape Canaveral Space Force Station	Banana	506	52	$201,219
Stormwater Project in Basin 602	Cape Canaveral Space Force Station	Banana	1,134	122	$338,996

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 611	Cape Canaveral Space Force Station	Banana	1,354	115	$256,647
Stormwater Project in Basin 631	Cape Canaveral Space Force Station	Banana	3	0	$120,579
Stormwater Project in Basin 638	Cape Canaveral Space Force Station	Banana	446	47	$199,197
Stormwater Project in Basin 641	Cape Canaveral Space Force Station	Banana	70	8	$131,197
Stormwater Project in Basin 648	Cape Canaveral Space Force Station	Banana	176	20	$143,059
Stormwater Project in Basin 650	Cape Canaveral Space Force Station	Banana	1,251	160	$426,918
Stormwater Project in Basin 673	Cape Canaveral Space Force Station	Banana	595	70	$253,457
Stormwater Project in Basin 674	Cape Canaveral Space Force Station	Banana	1,206	145	$409,459
Stormwater Project in Basin 675	Cape Canaveral Space Force Station	Banana	158	17	$142,551
Stormwater Project in Basin 678	Cape Canaveral Space Force Station	Banana	368	36	$176,033
Stormwater Project in Basin 680	Cape Canaveral Space Force Station	Banana	32	3	$124,328
Stormwater Project in Basin 685	Cape Canaveral Space Force Station	Banana	200	21	$150,460
Stormwater Project in Basin 686	Cape Canaveral Space Force Station	Banana	234	27	$169,301
Stormwater Project in Basin 688	Cape Canaveral Space Force Station	Banana	97	8	$132,611
Stormwater Project in Basin 691	Cape Canaveral Space Force Station	Banana	1,749	183	$436,739
Stormwater Project in Basin 698	Cape Canaveral Space Force Station	Banana	100	9	$133,830
Stormwater Project in Basin 700	Cape Canaveral Space Force Station	Banana	1	0	$120,167
Stormwater Project in Basin 702	Cape Canaveral Space Force Station	Banana	194	18	$142,703
Stormwater Project in Basin 703	Cape Canaveral Space Force Station	Banana	300	27	$159,456
Stormwater Project in Basin 704	Cape Canaveral Space Force Station	Banana	198	20	$152,385
Stormwater Project in Basin 717	Cape Canaveral Space Force Station	Banana	194	19	$148,811
Stormwater Project in Basin 720	Cape Canaveral Space Force Station	Banana	29	2	$122,672
Stormwater Project in Basin 730	Cape Canaveral Space Force Station	Banana	576	62	$221,908
Stormwater Project in Basin 739	Cape Canaveral Space Force Station	Banana	287	22	$150,360
Stormwater Project in Basin 740	Cape Canaveral Space Force Station	Banana	68	5	$125,185
Stormwater Project in Basin 741	Cape Canaveral Space Force Station	Banana	232	24	$156,946

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 742	Cape Canaveral Space Force Station	Banana	251	20	$141,714
Stormwater Project in Basin 743	Cape Canaveral Space Force Station	Banana	251	26	$163,115
Stormwater Project in Basin 766	Cape Canaveral Space Force Station	Banana	212	20	$146,845
Stormwater Project in Basin 767	Cape Canaveral Space Force Station	Banana	192	17	$140,485
Stormwater Project in Basin 775	Cape Canaveral Space Force Station	Banana	6	0	$120,732
Stormwater Project in Basin 776	Cape Canaveral Space Force Station	Banana	13	1	$121,362
Stormwater Project in Basin 777	Cape Canaveral Space Force Station	Banana	65	4	$125,076
Stormwater Project in Basin 778	Cape Canaveral Space Force Station	Banana	166	11	$130,475
Stormwater Project in Basin 780	Cape Canaveral Space Force Station	Banana	1	0	$120,148
Stormwater Project in Basin 781	Cape Canaveral Space Force Station	Banana	817	82	$255,027
Stormwater Project in Basin 782	Cape Canaveral Space Force Station	Banana	240	16	$143,362
Stormwater Project in Basin 813	Cape Canaveral Space Force Station	Banana	37	3	$123,807
Stormwater Project in Basin 828	Cape Canaveral Space Force Station	Banana	1,397	127	$315,752
Stormwater Project in Basin 834	Cape Canaveral Space Force Station	Banana	198	18	$139,674
Stormwater Project in Basin 843	Cape Canaveral Space Force Station	Banana	154	12	$129,666
Stormwater Project in Basin 846	Cape Canaveral Space Force Station	Banana	226	16	$132,260
Stormwater Project in Basin 856	Cape Canaveral Space Force Station	Banana	291	25	$152,037
Stormwater Project in Basin 858	Cape Canaveral Space Force Station	Banana	152	16	$144,003
Stormwater Project in Basin 861	Cape Canaveral Space Force Station	Banana	56	5	$125,737
Stormwater Project in Basin 873	Cape Canaveral Space Force Station	Banana	775	69	$212,263
Stormwater Project in Basin 899	Cape Canaveral Space Force Station	Banana	176	14	$137,011
Stormwater Project in Basin 900	Cape Canaveral Space Force Station	Banana	96	9	$131,215
Stormwater Project in Basin 914	Cape Canaveral Space Force Station	Banana	45	5	$127,099
Stormwater Project in Basin 915	Cape Canaveral Space Force Station	Banana	143	17	$144,915
Stormwater Project in Basin 925	Cape Canaveral Space Force Station	Banana	895	90	$260,900
Stormwater Project in Basin 925A	Cape Canaveral Space Force Station	Banana	4	0	$120,676

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 931	Cape Canaveral Space Force Station	Banana	9	1	$121,786
Stormwater Project in Basin 933	Cape Canaveral Space Force Station	Banana	206	27	$156,691
Stormwater Project in Basin 943	Cape Canaveral Space Force Station	Banana	155	19	$146,493
Stormwater Project in Basin CCAFS-10A	Cape Canaveral Space Force Station	Banana	296	50	$183,549
Stormwater Project in Basin CCAFS-11A	Cape Canaveral Space Force Station	Banana	31	5	$126,749
Stormwater Project in Basin CCAFS-11B	Cape Canaveral Space Force Station	Banana	27	3	$125,174
Stormwater Project in Basin CCAFS-11C	Cape Canaveral Space Force Station	Banana	44	5	$126,552
Stormwater Project in Basin CCAFS-12A	Cape Canaveral Space Force Station	Banana	45	16	$130,363
Stormwater Project in Basin CCAFS-12B	Cape Canaveral Space Force Station	Banana	38	16	$128,410
Stormwater Project in Basin CCAFS-12C	Cape Canaveral Space Force Station	Banana	118	29	$147,161
Stormwater Project in Basin CCAFS-12D	Cape Canaveral Space Force Station	Banana	23	3	$124,239
Stormwater Project in Basin CCAFS-12E	Cape Canaveral Space Force Station	Banana	14	2	$122,459
Stormwater Project in Basin CCAFS-13A	Cape Canaveral Space Force Station	Banana	371	56	$219,668
Stormwater Project in Basin CCAFS-13B	Cape Canaveral Space Force Station	Banana	109	46	$146,003
Stormwater Project in Basin CCAFS-13C	Cape Canaveral Space Force Station	Banana	28	4	$125,136
Stormwater Project in Basin CCAFS-1A	Cape Canaveral Space Force Station	Banana	2,531	390	$831,706
Stormwater Project in Basin CCAFS-1B	Cape Canaveral Space Force Station	Banana	69	9	$136,873
Stormwater Project in Basin CCAFS-1C	Cape Canaveral Space Force Station	Banana	19	3	$123,404
Stormwater Project in Basin CCAFS-1D	Cape Canaveral Space Force Station	Banana	23	4	$124,631
Stormwater Project in Basin CCAFS-1E	Cape Canaveral Space Force Station	Banana	139	22	$156,767
Stormwater Project in Basin CCAFS-2A	Cape Canaveral Space Force Station	Banana	1,778	309	$632,338
Stormwater Project in Basin CCAFS-2B	Cape Canaveral Space Force Station	Banana	14	2	$122,455
Stormwater Project in Basin CCAFS-2C	Cape Canaveral Space Force Station	Banana	33	5	$127,129
Stormwater Project in Basin CCAFS-2D	Cape Canaveral Space Force Station	Banana	62	8	$131,020
Stormwater Project in Basin CCAFS-3A	Cape Canaveral Space Force Station	Banana	2,896	450	$914,034
Stormwater Project in Basin CCAFS-3B	Cape Canaveral Space Force Station	Banana	54	7	$132,029

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin CCAFS-3C	Cape Canaveral Space Force Station	Banana	55	8	$129,864
Stormwater Project in Basin CCAFS-4A	Cape Canaveral Space Force Station	Banana	2,091	297	$629,909
Stormwater Project in Basin CCAFS-4B	Cape Canaveral Space Force Station	Banana	440	59	$233,369
Stormwater Project in Basin CCAFS-4C	Cape Canaveral Space Force Station	Banana	801	115	$344,722
Stormwater Project in Basin CCAFS-5A	Cape Canaveral Space Force Station	Banana	1,967	281	$641,772
Stormwater Project in Basin CCAFS-5B	Cape Canaveral Space Force Station	Banana	133	19	$150,454
Stormwater Project in Basin CCAFS-5C	Cape Canaveral Space Force Station	Banana	459	64	$240,538
Stormwater Project in Basin CCAFS-6A	Cape Canaveral Space Force Station	Banana	734	81	$267,363
Stormwater Project in Basin CCAFS-6B	Cape Canaveral Space Force Station	Banana	3,907	545	$1,170,193
Stormwater Project in Basin CCAFS-6C	Cape Canaveral Space Force Station	Banana	55	6	$127,055
Stormwater Project in Basin CCAFS-6D	Cape Canaveral Space Force Station	Banana	905	108	$317,334
Stormwater Project in Basin CCAFS-6E	Cape Canaveral Space Force Station	Banana	165	21	$157,474
Stormwater Project in Basin CCAFS-7A	Cape Canaveral Space Force Station	Banana	125	17	$150,928
Stormwater Project in Basin CCAFS-7B	Cape Canaveral Space Force Station	Banana	328	44	$209,094
Stormwater Project in Basin CCAFS-7C	Cape Canaveral Space Force Station	Banana	65	8	$135,268
Stormwater Project in Basin CCAFS-7D	Cape Canaveral Space Force Station	Banana	95	13	$143,731
Stormwater Project in Basin CCAFS-8A	Cape Canaveral Space Force Station	Banana	468	59	$226,505
Stormwater Project in Basin CCAFS-9A	Cape Canaveral Space Force Station	Banana	613	129	$256,367
Stormwater Project in Basin PAFB-10A	Patrick Space Force Station	Banana	92	12	$141,669
Stormwater Project in Basin PAFB-10B	Patrick Space Force Station	Banana	160	22	$160,842
Stormwater Project in Basin PAFB-10C	Patrick Space Force Station	Banana	20	3	$124,886
Stormwater Project in Basin PAFB-11A	Patrick Space Force Station	Banana	56	8	$134,819
Stormwater Project in Basin PAFB-11B	Patrick Space Force Station	Banana	30	4	$128,038
Stormwater Project in Basin PAFB-11C	Patrick Space Force Station	Banana	5	0	$121,158
Stormwater Project in Basin PAFB-11D	Patrick Space Force Station	Banana	23	3	$125,988
Stormwater Project in Basin PAFB-12A	Patrick Space Force Station	Banana	32	5	$127,973

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin PAFB-12B	Patrick Space Force Station	Banana	8	1	$122,018
Stormwater Project in Basin PAFB-13A	Patrick Space Force Station	Banana	322	44	$191,485
Stormwater Project in Basin PAFB-13B	Patrick Space Force Station	Banana	36	5	$128,471
Stormwater Project in Basin PAFB-14A	Patrick Space Force Station	Banana	270	38	$159,168
Stormwater Project in Basin PAFB-14B	Patrick Space Force Station	Banana	5	0	$120,451
Stormwater Project in Basin PAFB-14C	Patrick Space Force Station	Banana	14	2	$122,251
Stormwater Project in Basin PAFB-14D	Patrick Space Force Station	Banana	0	0	$120,055
Stormwater Project in Basin PAFB-14E	Patrick Space Force Station	Banana	12	1	$122,745
Stormwater Project in Basin PAFB-15	Patrick Space Force Station	Banana	7	1	$120,992
Stormwater Project in Basin PAFB-16	Patrick Space Force Station	Banana	36	5	$129,033
Stormwater Project in Basin PAFB-17A	Patrick Space Force Station	Banana	54	9	$129,866
Stormwater Project in Basin PAFB-17B	Patrick Space Force Station	Banana	1	0	$120,193
Stormwater Project in Basin PAFB-17C	Patrick Space Force Station	Banana	22	3	$125,038
Stormwater Project in Basin PAFB-18A	Patrick Space Force Station	Banana	223	31	$179,403
Stormwater Project in Basin PAFB-18B	Patrick Space Force Station	Banana	25	4	$126,280
Stormwater Project in Basin PAFB-18C	Patrick Space Force Station	Banana	9	1	$122,000
Stormwater Project in Basin PAFB-18D	Patrick Space Force Station	Banana	2	0	$120,538
Stormwater Project in Basin PAFB-18E	Patrick Space Force Station	Banana	9	1	$122,318
Stormwater Project in Basin PAFB-1A	Patrick Space Force Station	Banana	9	1	$122,497
Stormwater Project in Basin PAFB-1B	Patrick Space Force Station	Banana	35	5	$129,143
Stormwater Project in Basin PAFB-1C	Patrick Space Force Station	Banana	75	10	$135,896
Stormwater Project in Basin PAFB-1D	Patrick Space Force Station	Banana	348	48	$224,282
Stormwater Project in Basin PAFB-1E	Patrick Space Force Station	Banana	131	18	$152,597
Stormwater Project in Basin PAFB-1F	Patrick Space Force Station	Banana	68	9	$133,372
Stormwater Project in Basin PAFB-1G	Patrick Space Force Station	Banana	28	4	$128,257
Stormwater Project in Basin PAFB-1H	Patrick Space Force Station	Banana	86	12	$143,392

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin PAFB-1K	Patrick Space Force Station	Banana	18	2	$123,328
Stormwater Project in Basin PAFB-1L	Patrick Space Force Station	Banana	13	2	$123,211
Stormwater Project in Basin PAFB-1M	Patrick Space Force Station	Banana	7	1	$121,532
Stormwater Project in Basin PAFB-2A	Patrick Space Force Station	Banana	184	26	$172,101
Stormwater Project in Basin PAFB-2B	Patrick Space Force Station	Banana	176	24	$169,582
Stormwater Project in Basin PAFB-2C	Patrick Space Force Station	Banana	212	27	$171,242
Stormwater Project in Basin PAFB-2D	Patrick Space Force Station	Banana	174	23	$162,396
Stormwater Project in Basin PAFB-2E	Patrick Space Force Station	Banana	170	23	$166,535
Stormwater Project in Basin PAFB-2F	Patrick Space Force Station	Banana	396	54	$234,305
Stormwater Project in Basin PAFB-2H	Patrick Space Force Station	Banana	17	2	$123,611
Stormwater Project in Basin PAFB-3A	Patrick Space Force Station	Banana	135	18	$157,229
Stormwater Project in Basin PAFB-3B	Patrick Space Force Station	Banana	74	10	$139,459
Stormwater Project in Basin PAFB-4A	Patrick Space Force Station	Banana	266	36	$195,564
Stormwater Project in Basin PAFB-5A	Patrick Space Force Station	Banana	551	74	$279,283
Stormwater Project in Basin PAFB-5B	Patrick Space Force Station	Banana	174	23	$168,303
Stormwater Project in Basin PAFB-6A	Patrick Space Force Station	Banana	59	8	$135,311
Stormwater Project in Basin PAFB-6B	Patrick Space Force Station	Banana	14	2	$123,493
Stormwater Project in Basin PAFB-6C	Patrick Space Force Station	Banana	18	2	$124,695
Stormwater Project in Basin PAFB-7A	Patrick Space Force Station	Banana	400	53	$228,456
Stormwater Project in Basin PAFB-7F	Patrick Space Force Station	Banana	92	13	$143,461
Stormwater Project in Basin PAFB-7G	Patrick Space Force Station	Banana	123	17	$152,295
Stormwater Project in Basin PAFB-8A	Patrick Space Force Station	Banana	101	12	$143,232
Stormwater Project in Basin PAFB-9A	Patrick Space Force Station	Banana	55	7	$133,655
Stormwater Project in Basin SJR-44	Cape Canaveral Space Force Station	Banana	1	0	$120,404
Stormwater Project in Basin SJR-47	Cape Canaveral Space Force Station	Banana	158	21	$164,956
Stormwater Project in Basin SJR-54	Cape Canaveral Space Force Station	Banana	5	1	$121,207

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin SJR-58	Cape Canaveral Space Force Station	Banana	3	0	$120,733
Stormwater Project in Basin SJR-62	Cape Canaveral Space Force Station	Banana	1	0	$120,299
Stormwater Project in Basin SJR-66	Cape Canaveral Space Force Station	Banana	4	0	$120,755
Stormwater Project in Basin SJR-68	Cape Canaveral Space Force Station	Banana	3	0	$120,734
Stormwater Project in Basin SJR-69	Cape Canaveral Space Force Station	Banana	6	1	$121,080
Stormwater Project in Basin SJR-71	Cape Canaveral Space Force Station	Banana	12	2	$122,528
Stormwater Project in Basin SJR-72	Cape Canaveral Space Force Station	Banana	4	0	$120,630
Stormwater Project in Basin SJR-73	Cape Canaveral Space Force Station	Banana	2	0	$120,370
Stormwater Project in Basin 101	Cape Canaveral Space Force Station	North IRL	135	18	$158,757
Stormwater Project in Basin 102	Cape Canaveral Space Force Station	North IRL	24	2	$123,272
Stormwater Project in Basin 103	Cape Canaveral Space Force Station	North IRL	5	0	$120,743
Stormwater Project in Basin 104	Cape Canaveral Space Force Station	North IRL	2	0	$120,650
Stormwater Project in Basin 11	Cape Canaveral Space Force Station	North IRL	8	1	$122,253
Stormwater Project in Basin 114	Cape Canaveral Space Force Station	North IRL	235	25	$164,639
Stormwater Project in Basin 119	Cape Canaveral Space Force Station	North IRL	131	13	$139,370
Stormwater Project in Basin 120	Cape Canaveral Space Force Station	North IRL	162	22	$167,856
Stormwater Project in Basin 121	Cape Canaveral Space Force Station	North IRL	27	4	$127,540
Stormwater Project in Basin 122	Cape Canaveral Space Force Station	North IRL	77	8	$131,639
Stormwater Project in Basin 124	Cape Canaveral Space Force Station	North IRL	209	25	$162,791
Stormwater Project in Basin 125	Cape Canaveral Space Force Station	North IRL	0	0	$120,054
Stormwater Project in Basin 127	Cape Canaveral Space Force Station	North IRL	1	0	$120,208
Stormwater Project in Basin 128	Cape Canaveral Space Force Station	North IRL	11	1	$123,012
Stormwater Project in Basin 129	Cape Canaveral Space Force Station	North IRL	146	20	$162,784
Stormwater Project in Basin 130	Cape Canaveral Space Force Station	North IRL	45	6	$132,801
Stormwater Project in Basin 131	Cape Canaveral Space Force Station	North IRL	137	17	$151,099
Stormwater Project in Basin 132	Cape Canaveral Space Force Station	North IRL	0	0	$120,093

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 133	Cape Canaveral Space Force Station	North IRL	181	25	$174,712
Stormwater Project in Basin 134	Cape Canaveral Space Force Station	North IRL	395	54	$243,918
Stormwater Project in Basin 136	Cape Canaveral Space Force Station	North IRL	474	65	$271,097
Stormwater Project in Basin 137	Cape Canaveral Space Force Station	North IRL	407	42	$192,328
Stormwater Project in Basin 139	Cape Canaveral Space Force Station	North IRL	3	0	$120,663
Stormwater Project in Basin 140	Cape Canaveral Space Force Station	North IRL	9	1	$121,300
Stormwater Project in Basin 142	Cape Canaveral Space Force Station	North IRL	212	24	$163,418
Stormwater Project in Basin 144	Cape Canaveral Space Force Station	North IRL	7	1	$121,104
Stormwater Project in Basin 145	Cape Canaveral Space Force Station	North IRL	5	0	$120,784
Stormwater Project in Basin 147	Cape Canaveral Space Force Station	North IRL	8	1	$121,202
Stormwater Project in Basin 154	Cape Canaveral Space Force Station	North IRL	2	0	$120,266
Stormwater Project in Basin 155	Cape Canaveral Space Force Station	North IRL	914	94	$284,525
Stormwater Project in Basin 156	Cape Canaveral Space Force Station	North IRL	280	31	$176,106
Stormwater Project in Basin 157	Cape Canaveral Space Force Station	North IRL	898	90	$273,345
Stormwater Project in Basin 158	Cape Canaveral Space Force Station	North IRL	11	1	$121,767
Stormwater Project in Basin 160	Cape Canaveral Space Force Station	North IRL	13	1	$121,957
Stormwater Project in Basin 161	Cape Canaveral Space Force Station	North IRL	44	5	$129,043
Stormwater Project in Basin 162	Cape Canaveral Space Force Station	North IRL	92	13	$146,197
Stormwater Project in Basin 163	Cape Canaveral Space Force Station	North IRL	467	50	$209,806
Stormwater Project in Basin 165	Cape Canaveral Space Force Station	North IRL	5	0	$120,812
Stormwater Project in Basin 167	Cape Canaveral Space Force Station	North IRL	11	1	$122,180
Stormwater Project in Basin 17	Cape Canaveral Space Force Station	North IRL	34	5	$129,785
Stormwater Project in Basin 175	Cape Canaveral Space Force Station	North IRL	98	9	$134,242
Stormwater Project in Basin 176	Cape Canaveral Space Force Station	North IRL	797	74	$228,031
Stormwater Project in Basin 177	Cape Canaveral Space Force Station	North IRL	42	4	$126,089
Stormwater Project in Basin 178	Cape Canaveral Space Force Station	North IRL	700	72	$244,369

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 18	Cape Canaveral Space Force Station	North IRL	12	1	$122,768
Stormwater Project in Basin 181	Cape Canaveral Space Force Station	North IRL	193	16	$135,236
Stormwater Project in Basin 182	Cape Canaveral Space Force Station	North IRL	350	35	$177,526
Stormwater Project in Basin 183	Cape Canaveral Space Force Station	North IRL	175	14	$133,153
Stormwater Project in Basin 185	Cape Canaveral Space Force Station	North IRL	1	0	$120,381
Stormwater Project in Basin 186	Cape Canaveral Space Force Station	North IRL	184	19	$149,922
Stormwater Project in Basin 189	Cape Canaveral Space Force Station	North IRL	344	44	$215,595
Stormwater Project in Basin 196	Cape Canaveral Space Force Station	North IRL	11	1	$122,497
Stormwater Project in Basin 197	Cape Canaveral Space Force Station	North IRL	59	5	$128,028
Stormwater Project in Basin 198	Cape Canaveral Space Force Station	North IRL	482	46	$188,342
Stormwater Project in Basin 199	Cape Canaveral Space Force Station	North IRL	1,125	108	$301,101
Stormwater Project in Basin 200	Cape Canaveral Space Force Station	North IRL	8	1	$121,380
Stormwater Project in Basin 201	Cape Canaveral Space Force Station	North IRL	360	29	$156,489
Stormwater Project in Basin 202	Cape Canaveral Space Force Station	North IRL	5	0	$121,011
Stormwater Project in Basin 204	Cape Canaveral Space Force Station	North IRL	622	55	$189,265
Stormwater Project in Basin 205	Cape Canaveral Space Force Station	North IRL	54	5	$129,004
Stormwater Project in Basin 207	Cape Canaveral Space Force Station	North IRL	13	1	$120,806
Stormwater Project in Basin 208	Cape Canaveral Space Force Station	North IRL	726	75	$252,969
Stormwater Project in Basin 21	Cape Canaveral Space Force Station	North IRL	257	28	$182,984
Stormwater Project in Basin 210	Cape Canaveral Space Force Station	North IRL	236	23	$150,266
Stormwater Project in Basin 211	Cape Canaveral Space Force Station	North IRL	568	56	$207,347
Stormwater Project in Basin 218	Cape Canaveral Space Force Station	North IRL	491	39	$156,102
Stormwater Project in Basin 219	Cape Canaveral Space Force Station	North IRL	908	103	$327,230
Stormwater Project in Basin 220	Cape Canaveral Space Force Station	North IRL	246	25	$157,924
Stormwater Project in Basin 222	Cape Canaveral Space Force Station	North IRL	293	22	$137,866
Stormwater Project in Basin 224	Cape Canaveral Space Force Station	North IRL	571	55	$206,772

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 227	Cape Canaveral Space Force Station	North IRL	550	50	$193,431
Stormwater Project in Basin 229	Cape Canaveral Space Force Station	North IRL	206	14	$129,948
Stormwater Project in Basin 23	Cape Canaveral Space Force Station	North IRL	1	0	$120,222
Stormwater Project in Basin 230	Cape Canaveral Space Force Station	North IRL	95	8	$126,254
Stormwater Project in Basin 235	Cape Canaveral Space Force Station	North IRL	459	45	$193,661
Stormwater Project in Basin 237	Cape Canaveral Space Force Station	North IRL	128	14	$142,085
Stormwater Project in Basin 238	Cape Canaveral Space Force Station	North IRL	225	14	$130,830
Stormwater Project in Basin 239	Cape Canaveral Space Force Station	North IRL	262	21	$141,553
Stormwater Project in Basin 240	Cape Canaveral Space Force Station	North IRL	102	6	$124,151
Stormwater Project in Basin 241	Cape Canaveral Space Force Station	North IRL	37	3	$122,497
Stormwater Project in Basin 242	Cape Canaveral Space Force Station	North IRL	153	11	$128,349
Stormwater Project in Basin 243	Cape Canaveral Space Force Station	North IRL	35	2	$122,747
Stormwater Project in Basin 244	Cape Canaveral Space Force Station	North IRL	184	16	$137,110
Stormwater Project in Basin 246	Cape Canaveral Space Force Station	North IRL	63	6	$129,533
Stormwater Project in Basin 247	Cape Canaveral Space Force Station	North IRL	232	23	$146,814
Stormwater Project in Basin 248	Cape Canaveral Space Force Station	North IRL	428	44	$179,478
Stormwater Project in Basin 249	Cape Canaveral Space Force Station	North IRL	44	3	$123,702
Stormwater Project in Basin 250	Cape Canaveral Space Force Station	North IRL	239	25	$157,743
Stormwater Project in Basin 251	Cape Canaveral Space Force Station	North IRL	290	31	$170,356
Stormwater Project in Basin 252	Cape Canaveral Space Force Station	North IRL	78	8	$136,799
Stormwater Project in Basin 253	Cape Canaveral Space Force Station	North IRL	1,242	131	$303,306
Stormwater Project in Basin 254	Cape Canaveral Space Force Station	North IRL	581	45	$181,759
Stormwater Project in Basin 255	Cape Canaveral Space Force Station	North IRL	28	3	$125,870
Stormwater Project in Basin 259	Cape Canaveral Space Force Station	North IRL	88	9	$133,952
Stormwater Project in Basin 260	Cape Canaveral Space Force Station	North IRL	29	4	$126,613
Stormwater Project in Basin 261	Cape Canaveral Space Force Station	North IRL	255	35	$197,649

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 264	Cape Canaveral Space Force Station	North IRL	72	7	$129,677
Stormwater Project in Basin 265	Cape Canaveral Space Force Station	North IRL	323	31	$164,843
Stormwater Project in Basin 266	Cape Canaveral Space Force Station	North IRL	395	54	$243,731
Stormwater Project in Basin 267	Cape Canaveral Space Force Station	North IRL	18	3	$125,103
Stormwater Project in Basin 269	Cape Canaveral Space Force Station	North IRL	3	0	$120,858
Stormwater Project in Basin 271	Cape Canaveral Space Force Station	North IRL	14	2	$123,380
Stormwater Project in Basin 272	Cape Canaveral Space Force Station	North IRL	10	1	$122,166
Stormwater Project in Basin 273	Cape Canaveral Space Force Station	North IRL	2	0	$120,516
Stormwater Project in Basin 274	Cape Canaveral Space Force Station	North IRL	200	18	$140,582
Stormwater Project in Basin 275	Cape Canaveral Space Force Station	North IRL	544	51	$197,906
Stormwater Project in Basin 276	Cape Canaveral Space Force Station	North IRL	388	45	$146,739
Stormwater Project in Basin 277	Cape Canaveral Space Force Station	North IRL	214	23	$160,402
Stormwater Project in Basin 278	Cape Canaveral Space Force Station	North IRL	7	1	$121,943
Stormwater Project in Basin 279	Cape Canaveral Space Force Station	North IRL	35	5	$129,618
Stormwater Project in Basin 280	Cape Canaveral Space Force Station	North IRL	8	1	$121,010
Stormwater Project in Basin 281	Cape Canaveral Space Force Station	North IRL	1	0	$120,311
Stormwater Project in Basin 285	Cape Canaveral Space Force Station	North IRL	11	1	$123,188
Stormwater Project in Basin 286	Cape Canaveral Space Force Station	North IRL	838	63	$193,321
Stormwater Project in Basin 287	Cape Canaveral Space Force Station	North IRL	39	5	$131,189
Stormwater Project in Basin 288	Cape Canaveral Space Force Station	North IRL	318	44	$219,163
Stormwater Project in Basin 293	Cape Canaveral Space Force Station	North IRL	122	15	$142,729
Stormwater Project in Basin 295	Cape Canaveral Space Force Station	North IRL	302	32	$171,468
Stormwater Project in Basin 296	Cape Canaveral Space Force Station	North IRL	81	11	$141,222
Stormwater Project in Basin 298	Cape Canaveral Space Force Station	North IRL	208	29	$183,499
Stormwater Project in Basin 299	Cape Canaveral Space Force Station	North IRL	376	38	$178,125
Stormwater Project in Basin 3	Cape Canaveral Space Force Station	North IRL	48	6	$133,176

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 300	Cape Canaveral Space Force Station	North IRL	27	4	$127,894
Stormwater Project in Basin 301	Cape Canaveral Space Force Station	North IRL	447	47	$201,505
Stormwater Project in Basin 304	Cape Canaveral Space Force Station	North IRL	234	19	$137,722
Stormwater Project in Basin 305	Cape Canaveral Space Force Station	North IRL	260	28	$167,862
Stormwater Project in Basin 306	Cape Canaveral Space Force Station	North IRL	5	0	$121,221
Stormwater Project in Basin 308	Cape Canaveral Space Force Station	North IRL	4	0	$121,045
Stormwater Project in Basin 311	Cape Canaveral Space Force Station	North IRL	1	0	$120,246
Stormwater Project in Basin 313	Cape Canaveral Space Force Station	North IRL	299	41	$212,611
Stormwater Project in Basin 314	Cape Canaveral Space Force Station	North IRL	827	86	$260,926
Stormwater Project in Basin 315	Cape Canaveral Space Force Station	North IRL	410	57	$249,988
Stormwater Project in Basin 316	Cape Canaveral Space Force Station	North IRL	343	32	$164,265
Stormwater Project in Basin 318	Cape Canaveral Space Force Station	North IRL	48	3	$122,327
Stormwater Project in Basin 319	Cape Canaveral Space Force Station	North IRL	270	20	$138,313
Stormwater Project in Basin 32	Cape Canaveral Space Force Station	North IRL	5	0	$121,214
Stormwater Project in Basin 322	Cape Canaveral Space Force Station	North IRL	398	25	$149,134
Stormwater Project in Basin 323	Cape Canaveral Space Force Station	North IRL	343	47	$227,262
Stormwater Project in Basin 328	Cape Canaveral Space Force Station	North IRL	169	16	$141,401
Stormwater Project in Basin 329	Cape Canaveral Space Force Station	North IRL	26	3	$123,408
Stormwater Project in Basin 330	Cape Canaveral Space Force Station	North IRL	14	2	$123,193
Stormwater Project in Basin 331	Cape Canaveral Space Force Station	North IRL	181	25	$174,728
Stormwater Project in Basin 332	Cape Canaveral Space Force Station	North IRL	230	32	$190,845
Stormwater Project in Basin 333	Cape Canaveral Space Force Station	North IRL	420	42	$183,618
Stormwater Project in Basin 336	Cape Canaveral Space Force Station	North IRL	342	36	$179,123
Stormwater Project in Basin 337	Cape Canaveral Space Force Station	North IRL	268	27	$159,792
Stormwater Project in Basin 338	Cape Canaveral Space Force Station	North IRL	1,938	211	$493,710
Stormwater Project in Basin 339	Cape Canaveral Space Force Station	North IRL	23	3	$125,902

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 340	Cape Canaveral Space Force Station	North IRL	329	32	$166,456
Stormwater Project in Basin 343	Cape Canaveral Space Force Station	North IRL	181	14	$135,535
Stormwater Project in Basin 344	Cape Canaveral Space Force Station	North IRL	239	19	$140,248
Stormwater Project in Basin 345	Cape Canaveral Space Force Station	North IRL	422	37	$165,460
Stormwater Project in Basin 346	Cape Canaveral Space Force Station	North IRL	281	22	$140,552
Stormwater Project in Basin 347	Cape Canaveral Space Force Station	North IRL	75	9	$138,605
Stormwater Project in Basin 348	Cape Canaveral Space Force Station	North IRL	197	26	$165,774
Stormwater Project in Basin 349	Cape Canaveral Space Force Station	North IRL	270	33	$179,296
Stormwater Project in Basin 355	Cape Canaveral Space Force Station	North IRL	5	0	$120,785
Stormwater Project in Basin 358	Cape Canaveral Space Force Station	North IRL	252	31	$176,291
Stormwater Project in Basin 359	Cape Canaveral Space Force Station	North IRL	330	43	$199,433
Stormwater Project in Basin 361	Cape Canaveral Space Force Station	North IRL	124	17	$155,639
Stormwater Project in Basin 362	Cape Canaveral Space Force Station	North IRL	15	2	$123,887
Stormwater Project in Basin 364	Cape Canaveral Space Force Station	North IRL	269	37	$202,927
Stormwater Project in Basin 365	Cape Canaveral Space Force Station	North IRL	30	3	$124,703
Stormwater Project in Basin 366	Cape Canaveral Space Force Station	North IRL	178	18	$147,044
Stormwater Project in Basin 367	Cape Canaveral Space Force Station	North IRL	25	2	$121,293
Stormwater Project in Basin 369	Cape Canaveral Space Force Station	North IRL	16	1	$120,919
Stormwater Project in Basin 37	Cape Canaveral Space Force Station	North IRL	79	11	$142,100
Stormwater Project in Basin 370	Cape Canaveral Space Force Station	North IRL	173	11	$130,335
Stormwater Project in Basin 371	Cape Canaveral Space Force Station	North IRL	513	49	$192,985
Stormwater Project in Basin 373	Cape Canaveral Space Force Station	North IRL	469	56	$226,155
Stormwater Project in Basin 374	Cape Canaveral Space Force Station	North IRL	13	1	$121,978
Stormwater Project in Basin 376	Cape Canaveral Space Force Station	North IRL	7	0	$120,530
Stormwater Project in Basin 377	Cape Canaveral Space Force Station	North IRL	68	6	$128,019
Stormwater Project in Basin 378	Cape Canaveral Space Force Station	North IRL	16	2	$122,336

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 379	Cape Canaveral Space Force Station	North IRL	141	11	$130,542
Stormwater Project in Basin 380	Cape Canaveral Space Force Station	North IRL	107	12	$139,088
Stormwater Project in Basin 382	Cape Canaveral Space Force Station	North IRL	18	2	$122,184
Stormwater Project in Basin 383	Cape Canaveral Space Force Station	North IRL	36	3	$121,910
Stormwater Project in Basin 384	Cape Canaveral Space Force Station	North IRL	986	84	$235,379
Stormwater Project in Basin 385	Cape Canaveral Space Force Station	North IRL	323	45	$221,104
Stormwater Project in Basin 387	Cape Canaveral Space Force Station	North IRL	290	18	$137,412
Stormwater Project in Basin 388	Cape Canaveral Space Force Station	North IRL	1,203	130	$351,642
Stormwater Project in Basin 389	Cape Canaveral Space Force Station	North IRL	198	27	$180,125
Stormwater Project in Basin 391	Cape Canaveral Space Force Station	North IRL	360	45	$207,084
Stormwater Project in Basin 393	Cape Canaveral Space Force Station	North IRL	3	0	$120,435
Stormwater Project in Basin 394	Cape Canaveral Space Force Station	North IRL	2	0	$120,332
Stormwater Project in Basin 395	Cape Canaveral Space Force Station	North IRL	168	12	$132,414
Stormwater Project in Basin 396	Cape Canaveral Space Force Station	North IRL	438	50	$207,043
Stormwater Project in Basin 398	Cape Canaveral Space Force Station	North IRL	6	1	$121,532
Stormwater Project in Basin 399	Cape Canaveral Space Force Station	North IRL	43	6	$131,848
Stormwater Project in Basin 4	Cape Canaveral Space Force Station	North IRL	40	5	$127,620
Stormwater Project in Basin 401	Cape Canaveral Space Force Station	North IRL	450	52	$215,302
Stormwater Project in Basin 403	Cape Canaveral Space Force Station	North IRL	4	0	$121,124
Stormwater Project in Basin 404	Cape Canaveral Space Force Station	North IRL	228	19	$140,748
Stormwater Project in Basin 405	Cape Canaveral Space Force Station	North IRL	307	27	$154,346
Stormwater Project in Basin 406	Cape Canaveral Space Force Station	North IRL	14	1	$122,665
Stormwater Project in Basin 407	Cape Canaveral Space Force Station	North IRL	271	23	$146,621
Stormwater Project in Basin 409	Cape Canaveral Space Force Station	North IRL	2	0	$120,123
Stormwater Project in Basin 410	Cape Canaveral Space Force Station	North IRL	1,323	158	$398,654
Stormwater Project in Basin 411	Cape Canaveral Space Force Station	North IRL	3	0	$120,420

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 412	Cape Canaveral Space Force Station	North IRL	2	0	$120,188
Stormwater Project in Basin 413	Cape Canaveral Space Force Station	North IRL	915	103	$296,198
Stormwater Project in Basin 415	Cape Canaveral Space Force Station	North IRL	709	77	$244,931
Stormwater Project in Basin 416	Cape Canaveral Space Force Station	North IRL	6	0	$121,073
Stormwater Project in Basin 418	Cape Canaveral Space Force Station	North IRL	12	1	$122,114
Stormwater Project in Basin 419	Cape Canaveral Space Force Station	North IRL	50	4	$123,132
Stormwater Project in Basin 421	Cape Canaveral Space Force Station	North IRL	10	1	$121,010
Stormwater Project in Basin 422	Cape Canaveral Space Force Station	North IRL	5	0	$120,901
Stormwater Project in Basin 423	Cape Canaveral Space Force Station	North IRL	3	0	$120,442
Stormwater Project in Basin 424	Cape Canaveral Space Force Station	North IRL	3	0	$120,380
Stormwater Project in Basin 425	Cape Canaveral Space Force Station	North IRL	255	20	$139,408
Stormwater Project in Basin 439	Cape Canaveral Space Force Station	North IRL	585	53	$193,133
Stormwater Project in Basin 443	Cape Canaveral Space Force Station	North IRL	14	1	$122,065
Stormwater Project in Basin 444	Cape Canaveral Space Force Station	North IRL	32	3	$124,696
Stormwater Project in Basin 445	Cape Canaveral Space Force Station	North IRL	403	32	$153,710
Stormwater Project in Basin 446	Cape Canaveral Space Force Station	North IRL	18	2	$122,077
Stormwater Project in Basin 447	Cape Canaveral Space Force Station	North IRL	14	1	$122,216
Stormwater Project in Basin 448	Cape Canaveral Space Force Station	North IRL	7	1	$121,101
Stormwater Project in Basin 450	Cape Canaveral Space Force Station	North IRL	34	4	$124,926
Stormwater Project in Basin 451	Cape Canaveral Space Force Station	North IRL	1,076	123	$319,144
Stormwater Project in Basin 455	Cape Canaveral Space Force Station	North IRL	8	1	$121,458
Stormwater Project in Basin 456	Cape Canaveral Space Force Station	North IRL	296	30	$168,498
Stormwater Project in Basin 457	Cape Canaveral Space Force Station	North IRL	658	66	$230,225
Stormwater Project in Basin 465	Cape Canaveral Space Force Station	North IRL	6	0	$120,769
Stormwater Project in Basin 466	Cape Canaveral Space Force Station	North IRL	9	1	$121,412
Stormwater Project in Basin 467	Cape Canaveral Space Force Station	North IRL	18	2	$122,758

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 468	Cape Canaveral Space Force Station	North IRL	2	0	$120,321
Stormwater Project in Basin 47	Cape Canaveral Space Force Station	North IRL	617	80	$305,142
Stormwater Project in Basin 470	Cape Canaveral Space Force Station	North IRL	4	0	$120,593
Stormwater Project in Basin 471	Cape Canaveral Space Force Station	North IRL	2	0	$120,361
Stormwater Project in Basin 472	Cape Canaveral Space Force Station	North IRL	16	2	$122,448
Stormwater Project in Basin 473	Cape Canaveral Space Force Station	North IRL	9	1	$121,652
Stormwater Project in Basin 474	Cape Canaveral Space Force Station	North IRL	801	77	$243,883
Stormwater Project in Basin 475	Cape Canaveral Space Force Station	North IRL	409	41	$185,895
Stormwater Project in Basin 478	Cape Canaveral Space Force Station	North IRL	896	80	$259,270
Stormwater Project in Basin 48	Cape Canaveral Space Force Station	North IRL	21	3	$125,751
Stormwater Project in Basin 480	Cape Canaveral Space Force Station	North IRL	116	12	$139,254
Stormwater Project in Basin 488	Cape Canaveral Space Force Station	North IRL	23	2	$123,656
Stormwater Project in Basin 489	Cape Canaveral Space Force Station	North IRL	661	65	$232,329
Stormwater Project in Basin 491	Cape Canaveral Space Force Station	North IRL	465	46	$207,963
Stormwater Project in Basin 495	Cape Canaveral Space Force Station	North IRL	460	49	$213,834
Stormwater Project in Basin 498	Cape Canaveral Space Force Station	North IRL	1,243	118	$334,533
Stormwater Project in Basin 499	Cape Canaveral Space Force Station	North IRL	761	77	$254,570
Stormwater Project in Basin 500	Cape Canaveral Space Force Station	North IRL	517	52	$207,212
Stormwater Project in Basin 509	Cape Canaveral Space Force Station	North IRL	474	46	$192,343
Stormwater Project in Basin 514	Cape Canaveral Space Force Station	North IRL	300	31	$175,819
Stormwater Project in Basin 515	Cape Canaveral Space Force Station	North IRL	29	3	$125,735
Stormwater Project in Basin 521	Cape Canaveral Space Force Station	North IRL	247	21	$148,598
Stormwater Project in Basin 523	Cape Canaveral Space Force Station	North IRL	657	67	$236,357
Stormwater Project in Basin 527	Cape Canaveral Space Force Station	North IRL	30	3	$125,307
Stormwater Project in Basin 53	Cape Canaveral Space Force Station	North IRL	44	5	$127,361
Stormwater Project in Basin 533	Cape Canaveral Space Force Station	North IRL	344	34	$176,349

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 534	Cape Canaveral Space Force Station	North IRL	20	2	$123,244
Stormwater Project in Basin 536	Cape Canaveral Space Force Station	North IRL	324	36	$175,029
Stormwater Project in Basin 54	Cape Canaveral Space Force Station	North IRL	33	3	$124,760
Stormwater Project in Basin 548	Cape Canaveral Space Force Station	North IRL	144	12	$130,917
Stormwater Project in Basin 549	Cape Canaveral Space Force Station	North IRL	161	19	$157,002
Stormwater Project in Basin 55	Cape Canaveral Space Force Station	North IRL	11	1	$122,818
Stormwater Project in Basin 550	Cape Canaveral Space Force Station	North IRL	117	12	$137,012
Stormwater Project in Basin 552	Cape Canaveral Space Force Station	North IRL	113	9	$129,164
Stormwater Project in Basin 553	Cape Canaveral Space Force Station	North IRL	289	23	$145,960
Stormwater Project in Basin 554	Cape Canaveral Space Force Station	North IRL	243	20	$149,128
Stormwater Project in Basin 555	Cape Canaveral Space Force Station	North IRL	4	0	$120,850
Stormwater Project in Basin 557	Cape Canaveral Space Force Station	North IRL	14	2	$123,059
Stormwater Project in Basin 559	Cape Canaveral Space Force Station	North IRL	504	69	$280,413
Stormwater Project in Basin 56	Cape Canaveral Space Force Station	North IRL	4	0	$120,525
Stormwater Project in Basin 560	Cape Canaveral Space Force Station	North IRL	572	41	$148,977
Stormwater Project in Basin 57	Cape Canaveral Space Force Station	North IRL	2	0	$120,254
Stormwater Project in Basin 570	Cape Canaveral Space Force Station	North IRL	27	4	$126,761
Stormwater Project in Basin 573	Cape Canaveral Space Force Station	North IRL	247	19	$146,565
Stormwater Project in Basin 575	Cape Canaveral Space Force Station	North IRL	662	54	$206,891
Stormwater Project in Basin 576	Cape Canaveral Space Force Station	North IRL	323	29	$153,134
Stormwater Project in Basin 577	Cape Canaveral Space Force Station	North IRL	374	51	$237,534
Stormwater Project in Basin 589	Cape Canaveral Space Force Station	North IRL	208	28	$181,831
Stormwater Project in Basin 59	Cape Canaveral Space Force Station	North IRL	14	2	$123,930
Stormwater Project in Basin 590	Cape Canaveral Space Force Station	North IRL	208	15	$134,215
Stormwater Project in Basin 593	Cape Canaveral Space Force Station	North IRL	11	1	$121,215
Stormwater Project in Basin 595	Cape Canaveral Space Force Station	North IRL	261	17	$132,267

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 598	Cape Canaveral Space Force Station	North IRL	352	32	$160,501
Stormwater Project in Basin 599	Cape Canaveral Space Force Station	North IRL	217	18	$137,388
Stormwater Project in Basin 604	Cape Canaveral Space Force Station	North IRL	249	23	$129,856
Stormwater Project in Basin 606	Cape Canaveral Space Force Station	North IRL	144	13	$135,323
Stormwater Project in Basin 607	Cape Canaveral Space Force Station	North IRL	3	0	$120,133
Stormwater Project in Basin 608	Cape Canaveral Space Force Station	North IRL	744	69	$154,802
Stormwater Project in Basin 609	Cape Canaveral Space Force Station	North IRL	148	18	$130,128
Stormwater Project in Basin 610	Cape Canaveral Space Force Station	North IRL	379	44	$171,131
Stormwater Project in Basin 612	Cape Canaveral Space Force Station	North IRL	158	22	$167,198
Stormwater Project in Basin 614	Cape Canaveral Space Force Station	North IRL	149	20	$162,950
Stormwater Project in Basin 615	Cape Canaveral Space Force Station	North IRL	36	5	$130,132
Stormwater Project in Basin 616	Cape Canaveral Space Force Station	North IRL	73	10	$140,562
Stormwater Project in Basin 617	Cape Canaveral Space Force Station	North IRL	211	29	$184,217
Stormwater Project in Basin 618	Cape Canaveral Space Force Station	North IRL	324	40	$198,603
Stormwater Project in Basin 622	Cape Canaveral Space Force Station	North IRL	1,171	86	$222,784
Stormwater Project in Basin 646	Cape Canaveral Space Force Station	North IRL	95	9	$130,544
Stormwater Project in Basin 647	Cape Canaveral Space Force Station	North IRL	35	3	$122,253
Stormwater Project in Basin 649	Cape Canaveral Space Force Station	North IRL	204	17	$135,051
Stormwater Project in Basin 651	Cape Canaveral Space Force Station	North IRL	7	0	$120,528
Stormwater Project in Basin 652	Cape Canaveral Space Force Station	North IRL	334	23	$136,141
Stormwater Project in Basin 659	Cape Canaveral Space Force Station	North IRL	784	56	$182,723
Stormwater Project in Basin 662	Cape Canaveral Space Force Station	North IRL	977	100	$266,724
Stormwater Project in Basin 666	Cape Canaveral Space Force Station	North IRL	312	27	$147,452
Stormwater Project in Basin 667	Cape Canaveral Space Force Station	North IRL	4	0	$120,265
Stormwater Project in Basin 668	Cape Canaveral Space Force Station	North IRL	1,508	139	$342,882
Stormwater Project in Basin 671	Cape Canaveral Space Force Station	North IRL	225	19	$138,656

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 672	Cape Canaveral Space Force Station	North IRL	57	4	$123,082
Stormwater Project in Basin 676	Cape Canaveral Space Force Station	North IRL	9	1	$121,385
Stormwater Project in Basin 679	Cape Canaveral Space Force Station	North IRL	264	20	$136,410
Stormwater Project in Basin 692	Cape Canaveral Space Force Station	North IRL	234	15	$129,254
Stormwater Project in Basin 694	Cape Canaveral Space Force Station	North IRL	334	31	$164,877
Stormwater Project in Basin 695	Cape Canaveral Space Force Station	North IRL	388	45	$197,157
Stormwater Project in Basin 701	Cape Canaveral Space Force Station	North IRL	193	14	$130,266
Stormwater Project in Basin 715	Cape Canaveral Space Force Station	North IRL	380	35	$182,278
Stormwater Project in Basin 716	Cape Canaveral Space Force Station	North IRL	1,157	84	$184,039
Stormwater Project in Basin 724	Cape Canaveral Space Force Station	North IRL	222	16	$134,117
Stormwater Project in Basin 729	Cape Canaveral Space Force Station	North IRL	8	0	$120,325
Stormwater Project in Basin 731	Cape Canaveral Space Force Station	North IRL	301	34	$161,249
Stormwater Project in Basin 737	Cape Canaveral Space Force Station	North IRL	69	9	$125,636
Stormwater Project in Basin 738	Cape Canaveral Space Force Station	North IRL	497	50	$161,251
Stormwater Project in Basin 744	Cape Canaveral Space Force Station	North IRL	247	19	$135,902
Stormwater Project in Basin 745	Cape Canaveral Space Force Station	North IRL	2	0	$120,278
Stormwater Project in Basin 746	Cape Canaveral Space Force Station	North IRL	155	23	$141,116
Stormwater Project in Basin 747	Cape Canaveral Space Force Station	North IRL	238	37	$159,991
Stormwater Project in Basin 752	Cape Canaveral Space Force Station	North IRL	572	74	$202,972
Stormwater Project in Basin 758	Cape Canaveral Space Force Station	North IRL	533	50	$177,788
Stormwater Project in Basin 761	Cape Canaveral Space Force Station	North IRL	386	31	$141,560
Stormwater Project in Basin 77	Cape Canaveral Space Force Station	North IRL	6	0	$121,111
Stormwater Project in Basin 791	Cape Canaveral Space Force Station	North IRL	266	30	$159,130
Stormwater Project in Basin 8	Cape Canaveral Space Force Station	North IRL	18	2	$124,962
Stormwater Project in Basin 81	Cape Canaveral Space Force Station	North IRL	276	32	$183,666
Stormwater Project in Basin 826	Cape Canaveral Space Force Station	North IRL	506	71	$197,780

Project Name	Responsible Entity	Sub-Lagoon	Total Nitrogen Reduction (pounds per year)	Total Phosphorus Reduction (pounds per year)	Plan Funding
Stormwater Project in Basin 84	Cape Canaveral Space Force Station	North IRL	5	0	$120,731
Stormwater Project in Basin 85	Cape Canaveral Space Force Station	North IRL	20	3	$125,214
Stormwater Project in Basin 875	Cape Canaveral Space Force Station	North IRL	524	54	$211,654
Stormwater Project in Basin 92	Cape Canaveral Space Force Station	North IRL	44	6	$132,133
Stormwater Project in Basin 93	Cape Canaveral Space Force Station	North IRL	113	15	$149,242
Stormwater Project in Basin SJR-1	Cape Canaveral Space Force Station	North IRL	0	0	$120,098
Stormwater Project in Basin SJR-10	Cape Canaveral Space Force Station	North IRL	6	0	$120,909
Stormwater Project in Basin SJR-11	Cape Canaveral Space Force Station	North IRL	6	1	$121,714
Stormwater Project in Basin SJR-12	Cape Canaveral Space Force Station	North IRL	5	0	$121,265
Stormwater Project in Basin SJR-13	Cape Canaveral Space Force Station	North IRL	4	0	$120,969
Stormwater Project in Basin SJR-15	Cape Canaveral Space Force Station	North IRL	161	22	$165,635
Stormwater Project in Basin SJR-2	Cape Canaveral Space Force Station	North IRL	3	0	$120,823
Stormwater Project in Basin SJR-21	Cape Canaveral Space Force Station	North IRL	1	0	$120,228
Stormwater Project in Basin SJR-26	Cape Canaveral Space Force Station	North IRL	4	0	$120,236
Stormwater Project in Basin SJR-3	Cape Canaveral Space Force Station	North IRL	2	0	$120,472
Stormwater Project in Basin SJR-30	Cape Canaveral Space Force Station	North IRL	2	0	$120,478
Stormwater Project in Basin SJR-31	Cape Canaveral Space Force Station	North IRL	16	2	$121,896
Stormwater Project in Basin SJR-32	Cape Canaveral Space Force Station	North IRL	2	0	$120,420
Stormwater Project in Basin SJR-33	Cape Canaveral Space Force Station	North IRL	257	30	$175,280
Stormwater Project in Basin SJR-35	Cape Canaveral Space Force Station	North IRL	437	56	$213,523
Stormwater Project in Basin SJR-37	Cape Canaveral Space Force Station	North IRL	10	1	$122,009
Stormwater Project in Basin SJR-4	Cape Canaveral Space Force Station	North IRL	3	0	$120,882
Stormwater Project in Basin SJR-40	Cape Canaveral Space Force Station	North IRL	106	10	$132,765
Stormwater Project in Basin SJR-5	Cape Canaveral Space Force Station	North IRL	16	2	$124,376
Stormwater Project in Basin SJR-8	Cape Canaveral Space Force Station	North IRL	3	0	$120,606

Appendix G. Long Descriptions of Figures

Figure 1-1. Decline of Commercial Fishing in Brevard County

The graph shows the declining value of the commercial fishery in Brevard County using Florida Fish and Wildlife Conservation Commission data from 1995 through 2023. The commercial fishery values drop over time while fish kill counts increase with the largest peaks in 2007 and 2016. The following table is a summary of the values represented in the graph.

Reporting Year	Value of Commercial Fishery
1995	$21,808,095
1996	$24,052,219
1997	$15,027,821
1998	$11,264,215
1999	$14,765,165
2000	$15,879,487
2001	$13,096,088
2002	$6,253,406
2003	$7,155,669
2004	$8,219,153
2005	$6,314,361
2006	$6,216,198
2007	$5,127,527
2008	$8,207,268
2009	$6,166,197
2010	$6,499,390
2011	$8,354,718
2012	$7,932,126
2013	$7,278,107
2014	$6,588,523
2015	$7,960,368
2016	$6,647,791
2017	$8,444,720
2018	$6,747,679
2019	$7,925,947
2020	$6,964,288
2021	$8,575,781
2022	$9,617,469
2023	$6,623,340

Return to **Figure 1-1**.

Figure 2-2. Summary of the Save Our Indian River Lagoon Outputs and Outcomes

Graphic showing output of Public Education will result in years 0–5 early adopters lead, years 6–10 supporters join, and years 10+ Indian River Lagoon (IRL) friendly lifestyles are normal. Output of Reclaimed Water Upgrades, Sewer Later Rehabilitation, Septic-to-Sewer and Septic System Upgrades, and Stormwater Treatment will result in years 0–5 cleaner ground and surface water, years 6–10 cleaner IRL water, and years 10+ lush seagrass beds. Outputs of Muck Removal and Treatment of Muck Interstitial Water will result in years 0–5 exposed sandy sediments and tons of pollution removed, years 5–10 plentiful bottom dwelling marine life, and years 10+ abundant fishes. Output of Oyster Reefs and Living Shorelines will result in years 0–5 increased filtration, years 5–10 faster storm recovery, and years 10+ healthy stability. Outputs of Project Performance Monitoring and Plan Updates will result in years 0–5 increased efficiency and cost effectiveness, years 5–10 IRL report card shows improvement, and years 10+ the IRL economy grows.

Return to **Figure 2-2**.

Figure 4-1. Grass Clippings Example for a Typical Lot

Example graphic showing the potential for grass clippings to get onto and be left on a road. For a 100 foot by 100 foot lot with a 2,500 square foot home and driveway, it will produce an estimated 3,000 pounds of grass clippings per year containing 75 pounds of total nitrogen and 10.4 pounds of total phosphorus. Grass clippings can be blown into the road from an approximately 2-foot-wide strip of lawn.

Return to **Figure 4-1**.

Figure 4-2. Septic-to-Sewer Projects in Banana River Lagoon

Map showing the locations of the highest priority and high priority sewer locations within the northern portion of the Banana River Lagoon. The seven areas with the highest loading, which include Sykes Creek – Manatee Cove Park, North Merritt Island Zone E, Sykes Creek – Kelly Park, Sykes Creek Zone N, Merritt Island Zone C, Merritt Island Zone F, and Sykes Creek Zone M, are funded for septic removal. The map also shows the locations of all individual septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. Most are concentrated along the water in the west and southeast portions of Merritt Island with the areas closest to water being either 10–30 pounds or 30–50 pounds. The areas further from the water are 0–10 pounds. Areas are scattered across the north-central portion of Merritt Island. A line running north to south in the west shows the drainage divide. The Bennett Causeway runs east to west through the middle of the map and North Courtenay Parkway runs north to south.

Return to **Figure 4-2**.

Figure 4-3. Septic-to-Sewer Projects in Banana River Lagoon, continued

Map showing the locations of the highest priority and high priority sewer locations within the southern portion of the Banana River Lagoon. The seven areas with the highest loading, which include Merritt Island Redevelopment Agency Phase 1, Merritt Island Redevelopment Agency Phase 2 Cone Road, Sykes Creek – Rotary Park, Sykes Creek Zone R, Merritt Island Zone G, South Banana Zone B, and Sykes Creek Zone T, are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover most of the areas near the water with the areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water, including the center of Merritt Island, are 0–10 pounds. A line running north to south in the west shows the drainage divide. South Tropical Trail runs north to south through most of the septic areas on this map.

Return to **Figure 4-3**.

Figure 4-4. Septic-to-Sewer Projects in Banana River Lagoon, continued

Map showing the locations of the highest priority and high priority sewer locations within the central portion of the Banana River Lagoon. The funded areas include City of Satellite Beach – Hedgecock and City of Satellite Beach – Desoto. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. Most of Merritt Island is 10–30 pounds with a scattering of 30–50 pounds in the north portion. A few areas of 0–10 pounds are located in the center north part of the island. A line running north to south in the west shows the drainage divide. Pineda Causeway runs east to west and Rockledge Boulevard runs north to south in this area.

Return to **Figure 4-4**.

Figure 4-5. Septic-to-Sewer Projects in North IRL

Map showing the locations of the highest priority and high priority sewer locations within the northern portion of the North Indian River Lagoon. The three areas with the highest loading, which include Titusville Zone A, Titusville Zone B, and Titusville Zone C, are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. The zones previously mentioned have loading in the 10–30 pounds and 30–50 pounds range. A sparse scatter of 0–10 pound zones occur over the rest of the map with two dense concentrations in the northern half of the map. A line running north to south in the west shows the drainage divide. Garden Street runs east to west in the northern portion of the map and Cheney Highway/Orlando Road runs east to west in the southern part of the map. South Street loops through the map area.

Return to **Figure 4-5**.

Figure 4-6. Septic-to-Sewer Projects in North IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the north-central portion of the North Indian River Lagoon. The seven areas with the highest loading, which include Titusville Zone D, Titusville Zone E, Titusville Zone F, Titusville Zone G, Sharpes Zone A, Sharpes Zone B, and Cocoa Zone C, are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover most of the areas near the water with the areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water are 0–10 pounds. A line running north to south in the west shows the drainage divide. National Aeronautics and Space Administration Causeway is at the top of the map and Indian River Drive/North Cocoa Boulevard runs north to south.

Return to **Figure 4-6**.

Figure 4-7. Septic-to-Sewer Projects in North IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the central portion of the central North Indian River Lagoon. The four areas with the highest loading, which include Cocoa Zone C, Cocoa Zones J and K, City of Rockledge Breeze Swept, and Rockledge Zone B. All are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover most of the areas near the water with the areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water are 0–10 pounds. A line running north to south in the west shows the drainage divide. Bennett Causeway runs east to west in the northern portion of the map and King Street/Hubert Humphrey Causeway/Merritt Island Causeway runs east to west in the southern portion of the map. Cocoa Boulevard runs north to south in the western portion of the map and North Courtenay Parkway runs north to south in the eastern portion of the map.

Return to **Figure 4-7**.

Figure 4-8. Septic-to-Sewer Projects in North IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the south-central portion of the North Indian River Lagoon. The areas of City of Rockledge Breeze Swept, Rockledge Zone B, South Central Zone A, and South Central – Riverwalk are funded. The map also shows the locations of all septic systems with loading estimates of 0-10 pounds, 10–30 pounds, and 30–50 pounds. These cover most of the areas near the water with the areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water are 0–10 pounds. A line running north to south in the west shows the drainage divide. The Merritt Island Causeway runs east to west at the top of the map. Cocoa Boulevard/Rockledge Boulevard runs north to south in the western portion of the map and South Tropical Trail runs north to south in the eastern portion of the map.

Return to **Figure 4-8**.

Figure 4-9. Septic-to-Sewer Projects in North IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the southern portion of the North Indian River Lagoon. The areas of South Central Zone C, South Central Zone D (Brevard), City of Melbourne Riverside, City of Melbourne Zone A, City of Melbourne Kent, City of Melbourne Villa Espana, and South Central Zone F are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover most of the areas near the water with the areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water are 0–10 pounds. A line running north to south in the west shows the drainage divide. Pineda Causeway runs east to west in the middle of the map. Rockledge Drive runs north to south in the western portion of the map and South Tropical Trail runs north to south in the eastern portion.

Return to **Figure 4-9**.

Figure 4-10. Septic-to-Sewer Projects in North IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the southern portion of the North Indian River Lagoon. The areas of City of Melbourne Riverside, City of Melbourne Zone A, City of Melbourne Kent, City of Melbourne Villa Espana, City of Melbourne Bowers, South Central Zone F, South Beaches Zone A, South Beaches Zone P, and South Beaches Zone O are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover most of the areas near the water with the areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water are 0–10 pounds. Clusters of all three types of loading are located in the west-central and southwest part of the map. A line running north to south in the west shows the drainage divide. Eau Gallie Boulevard runs east to west in the middle of the map. Dixie Highway runs north to south in the western portion of the map and Patrick Drive runs north to south in the eastern portion.

Return to **Figure 4-10**.

Figure 4-11. Septic-to-Sewer Projects in Central IRL

Map showing the locations of the highest priority and high priority sewer locations within the northern portion of the Central Indian River Lagoon. The funded areas include City of West Melbourne Dundee Place and Manor Place, City of West Melbourne Lake Ashley Circle, City of West Melbourne Sylvan Estates, City of Melbourne Roxy, City of Melbourne Pennwood, City of Melbourne Hoag, and City of Melbourne Avenida del Rio are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover some of the areas near the water with the areas closest to the water being 30–50 pounds. The areas further from the water are 0–10 pounds and 10–30 pounds mostly clustered in the center of the map just west of the Melbourne Causeway along U.S. 192 and approximately 4 miles west of U.S. 192 in West Melbourne. New Haven Avenue/Melbourne Causeway runs east to west through the middle of the map. Babcock Street runs north to south in the middle of the map and Dixie Highway runs north to south closer to the eastern portion of the map.

Return to **Figure 4-11**.

Figure 4-12. Septic-to-Sewer Projects in Central IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the southern portion of the Central Indian River Lagoon. The funded areas include City of Palm Bay Zones A and B. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover about 30% of the map with a few areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water are 0–10 pounds and tightly clustered in the western part of the map west of Babcock Street in the Malabar area. Clusters of all three types of loading are located away from the water in the central and south central part of the map. Babcock Street runs north to south in the western portion of the map and Dixie Highway runs north to south in the western portion.

Return to **Figure 4-12**.

Figure 4-13. Septic-to-Sewer Projects in Central IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the south central portion of the Central Indian River Lagoon. None of the areas on this map are funded. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover half of the areas near the water on the Barrier Island on the eastern portion of the map. Isolated clusters of high loading areas are located along the waterfront on the mainland or western side of the map. Clusters of all three types of loading are located away from the water in the west-central and southwest part of the map. Highway A1A runs north to south in the middle of the map.

Return to **Figure 4-13**.

Figure 4-14. Septic-to-Sewer Projects in Central IRL, continued

Map showing the locations of the highest priority and high priority sewer locations within the southern portion of the Central Indian River Lagoon. The funded areas include Micco Zones A and B. The map also shows the locations of all septic systems with loading estimates of 0–10 pounds, 10–30 pounds, and 30–50 pounds. These cover most of the areas near the water and along the Saint Sebastian River with the areas closest to the water being either 10–30 pounds or 30–50 pounds. The areas further from the water in the northwestern portion of the map are 30–50 pounds. Clusters of all three types of loading are located in the northwestern and southern part of the map. Dixie Highway runs north to south in the middle of the map and Highway A1A runs north to south in the western portion of the map.

Return to **Figure 4-14**.

Figure 4-15. Quick Connection Septic-to-Sewer Locations in North Brevard County

Map showing the locations of properties eligible to receive reimbursement to connect to a sewer system in the northern portion of the north Indian River Lagoon. Dots scattered along the map indicate whether the owner can connect to a force main or gravity type sewer and whether the parcel is a high priority. On this map, the dots are mostly near the water. Approximately half are for force main connections and half are for gravity sewer connections. A line running north to south in the west shows the drainage divide. These sites are located north and south of the National Aeronautics and Space Administration Causeway on the western side of the IRL.

Return to **Figure 4-15**.

Figure 4-16. Quick Connection Septic-to-Sewer Locations in Central Brevard County

Map showing the locations of properties eligible to receive reimbursement to connect to a sewer system in the central Indian River Lagoon. Dots scattered along the map indicate whether the owner can connect to a force main or gravity type sewer and whether the parcel is a high priority. On this map, the dots are mostly near the water and tightly clustered in the northern portion of the map on Merritt Island. A few are scattered near the water in the southern portion of the map south of the Pineda Causeway. Approximately half are for force main connections and half are for gravity sewer connections. A line running north to south in the west shows the drainage divide. The sites are located near the Merritt Island Causeway to the northern portion of the map and Pineda Causeway to the southern portion of the map.

Return to **Figure 4-16**.

Figure 4-17. Quick Connection Septic-to-Sewer Locations in South Brevard County

Map showing the locations of properties eligible to receive reimbursement to connect to a sewer system in the southern portion of the Indian River Lagoon in Brevard County. Dots scattered along the map indicate whether the owner can connect to a force main or gravity type sewer and whether the parcel is a high priority. On this map, the dots are mostly near the water and tightly clustered in the northern portion of the map near Melbourne and Eau Gallie. A few are scattered near the water in the central portion of the map near Malabar. Approximately 20% are for force main connections and approximately 80% are for gravity sewer connections. A line running north to south in the west shows the drainage divide.

Return to **Figure 4-17**.

Figure 4-18. Example In-Ground Nitrogen-Reducing Biofilter Septic System

This a diagram showing how an in-ground nitrogen reducing biofilter is constructed. It shows a septic tank to the left with a pipe leading out of it with an arrow showing the direction of water flow to the drainfield. The drainfield area is depicted as an 18-inch layer of soil above a 12-inch layer of woodchips or other denitrification media. A layer below these shows an empty space which indicates native soil that should be at least six inches above the seasonal high water table.

Return to **Figure 4-18**.

Figure 4-19. Septic System Upgrades in North Brevard County

Map showing the locations of properties eligible to receive reimbursement to install an upgraded septic system in the northern portion of Brevard County along the Indian River Lagoon. Dots scattered along the map indicate whether the owner is eligible to receive reimbursement. On this map, the dots are mostly near the water and scattered from north to south. A line running north to south in the west shows the drainage divide. The National Aeronautics and Space Administration Causeway runs east to west near the southern part of the map.

Return to **Figure 4-19**.

Figure 4-20. Septic System Upgrades in Central Brevard County

Map showing the locations of properties eligible to receive reimbursement to install an upgraded septic system in the central portion of Brevard County along the Indian River Lagoon. Dots scattered along the map indicate whether the owner is eligible to receive reimbursement. On this map, the dots are mostly near the water and scattered from north to south on Merritt Island. A line running north to south in the west shows the drainage divide. The Bennett Causeway and Merritt Island Causeway run east to west in the northern portion of the map. Rockledge Parkway runs north to south on the western side and Courtenay Parkway runs north to south on the eastern side of the IRL.

Return to **Figure 4-20**.

Figure 4-21. Septic System Upgrades in South Brevard County

Map showing the locations of properties eligible to receive reimbursement to install an upgraded septic system in the southern portion of Brevard County along the Indian River Lagoon. Dots scattered along the map indicate whether the owner is eligible to receive reimbursement. On this map, the dots are mostly near the water and scattered from north to south on along U.S. 1 and about one to three miles inland. A line running north to south in the west shows the drainage divide. The Eau Gallie Causeway and 5th Avenue run east to west near the top of the map Babcock Street runs north to south in the middle of the map.

Return to **Figure 4-21**.

Figure 4-22. Stormwater Projects in North Brevard County

Map showing the selected basins for stormwater treatment in the northern portion of the Banana River Lagoon and North Indian River Lagoon in Brevard County. Project areas cover most of the shoreline on the mainland and are all part of the North Indian River Lagoon. Project areas cover the southern portion of North Merritt Island and half are part of the North Indian River Lagoon while the other half are part of the Banana River Lagoon. Project areas cover the southern part of the Barrier Island and all are part of the Banana River Lagoon.

Return to **Figure 4-22**.

Figure 4-23. Stormwater Projects in Central Brevard County

Map showing the selected basins for stormwater treatment in the southern portion of the Banana River Lagoon and North Indian River Lagoon in Brevard County. Project areas cover roughly 80% of the shoreline on the mainland and are all part of the North Indian River Lagoon. Project areas cover the southern portion of South Merritt Island and 40% are part of the North Indian River Lagoon while 60% are part of the Banana River Lagoon. Project areas cover roughly 80% of the Barrier Island and all are part of the Banana River Lagoon.

Return to **Figure 4-23**.

Figure 4-24. Stormwater Projects in South Brevard County

Map showing the selected basins for stormwater treatment in the Central Indian River Lagoon for Brevard County. Project areas cover roughly 40% of the shoreline on the mainland and are mostly part of the North Indian River Lagoon with two that are Central Indian River Lagoon. Several Central Indian River Lagoon projects are scattered inland. Project areas cover roughly 80% of the Barrier Island and all are part of the Banana River Lagoon.

Return to **Figure 4-24**.

Figure 4-25. Location of Muck Removal Projects in the Northern Banana River Lagoon

Map of the northern Banana River Lagoon in Brevard County showing the locations of the funded and unfunded muck removal projects. Four unfunded projects are in the very northern part of the Banana River Lagoon near the top of the map. Towards the bottom of the map, just south of State Highway 528, are two funded projects: Canaveral South is along the Barrier Island shoreline and Merritt Island Phase I is along the Merritt Island shoreline. Additional unfunded projects are located at the bottom of the map, as well as the canals on Merritt Island.

Return to **Figure 4-25**.

Figure 4-26. Location of Muck Removal Projects in the Southern Banana River Lagoon

Map of the southern Banana River Lagoon in Brevard County showing the locations of the funded and unfunded muck removal projects. Towards the top of the map, just south of State Highway 528, are three funded projects. Canaveral South is along the Barrier Island shoreline. Merritt Island Phase I is just to the south and west along the Merritt Island shoreline. The Sykes Creek project is a little further south and west from that project. Further south, below State

Highway 520, is the Cocoa Beach IIB project along the Barrier Island shoreline. South of that is the Cocoa Beach Phase III project. To the west of that is the Cocoa Beach Golf project. About six miles south along the Barrier Island is the Patrick Space Force Base project. To the west of that is the Pineda Banana River Lagoon project near the Merritt Island shoreline. South of that project, and south of State Highway 404 is the Grand Canal project on the Barrier Island. South of that project is the Satellite Beach project followed by the Indian Harbour Beach project.

Return of **Figure 4-26**.

Figure 4-27. Location of Muck Removal Projects in North IRL

Map of the North Indian River Lagoon in Brevard County showing the locations of the funded and unfunded muck removal projects. Seven funded projects are shown. Mims Rim Ditch is at the top of the map along the mainland shoreline. To the south of that is the Titusville Railroad West project. Just east of that on the Merritt Island shoreline is the Titusville Railroad East project. The National Aeronautics and Space Administration Causeway East project is about 10 miles south along the Merritt Island shoreline and just north of State Highway 405. The Rockledge A project is about 15 miles south along the Merritt Island shoreline. The Eau Gallie Northeast project is about 9 miles south near the Merritt Island shoreline. The Spring Creek project is located about two miles south and near the bottom of the map on the mainland.

Return to **Figure 4-27**.

Figure 4-28. Location of Muck Removal Projects in Central IRL

Map of the Central Indian River Lagoon in Brevard County showing the locations of the funded and unfunded muck removal projects. The only funded projects are the Turkey Creek project, which is about three miles south of U.S. Highway 192 along the mainland shoreline, and Sunnyland, which is on the barrier island near the south end of the map.

Return to **Figure 4-28**.

Figure 4-29. Phase I Potential Enhanced Circulation Project Locations

Map of Brevard County showing a 40 square mile area where potential enhanced circulation projects could be located. The St. Johns River Water Management District identified potential projects the following areas: one in the southern part of the Mosquito Lagoon, one in the northern part of the Banana River Lagoon, two in Cape Canaveral, one at Patrick Air (Space) Force Base, and one at Malabar. They identified four internal projects with one at the north end of Merritt Island, two around Haulover Canal, and one in central Merritt Island. CDM Smith identified 23 additional potential project locations both internal and external spread throughout Brevard County with a heavy concentration around central Merritt Island.

Return to **Figure 4-29**.

Figure 4-30. Shoreline Survey to Identify Locations Appropriate for Oyster Bars and Planted Shorelines

Map of Brevard County showing the shoreline survey edge types including bulkhead and seawall, hardened slope and riprap, and no structures. No structures were found mainly in the northern portion of Brevard County on the mainland and also around the central part of Merritt Island near Kennedy Space Center. There were also small concentrations on the southern part of Merritt Island in the Banana River Lagoon and on the southern portion of the Barrier Island. The rest of the shoreline was interspersed with both bulkhead and seawall types and hardened slope and riprap types. A large concentration of bulkhead and seawall was found on the western shore of Merritt Island, along Sykes Creek, in Cocoa Beach, and much of the west coast of the central Barrier Island.

Return to **Figure 4-30**.

Figure 4-31. Estimated Economic Value of Some Seagrass Services

Graphic showing the economic value provided by seagrass adapted from Dewsbury et. al. (2016). Seagrasses provide direct grazing by turtles, manatees, fish, and snails, which has an unknown economic value. It is also nursery grounds for fish and crabs and benefit coral reefs, commercial fisheries, and recreation for a $4,600 per acre per year economic value. Additionally, it sequesters carbon, which reduces carbon dioxide for a $162 per acre per year economic value. It also reduces wave energy, which leads to sediment stability and improved water quality for an unknown economic benefit. Finally, it cycles and sequesters nutrients for an economic value of $7,695 per acre per year. Seagrasses provide a total economic benefit of $12,457 per acre per year. In 2007, there were 72,400 acres providing a total benefit of more than $902,000,000.

Return to **Figure 4-31**.

Figure 4-32. Completed Projects in North Brevard County

Map of North Brevard County showing locations of 21 completed projects. Near the top of the map, the Basin 10 County Line Road woodchip bioreactor is located at the north end on the west shore of the Indian River Lagoon. About two miles southeast of that is the Basin 26 Sunset Road Serenity Park woodchip bioreactor. About a half mile southeast of that is the Basin 22 Huntington Road Serenity Park woodchip bioreactor. One mile southwest of that is the Basin 51 Johns Road pond biosorption activated media and Basin 62 denitrification retrofit of Johns Road Pond. About a half mile southeast of that is the County stormwater pond harvesting. One mile south of that is the Basin 89 Scottsmoor I Aurantia Road denitrification. One mile south of that is Basin 100 Burkholm Road biosorption activated media. A half mile south of that is Basin 115 Carter Road biosorption activated media. One mile south of that is the Basin 141 Irwin Avenue woodchip bioreactor. One mile south of that is the Basin 193 Wiley Avenue biosorption activated media. To the east of that is Mims muck removal. About three miles south is Coleman Pond managed aquatic plant system. About a mile southeast is the Osprey Plant pond managed aquatic plant system, Osprey Wastewater Treatment Facility, and Marina B managed aquatic plant system. About a half mile southwest is the Draa Field vegetation harvesting and Draa Field pond managed aquatic plant systems. One mile southeast is the South Street baffle box. About a half mile southwest is the St. Johns 2 baffle box project.

Return to **Figure 4-32**.

Figure 4-33. Completed Projects in North Central Brevard County

Map of North Central Brevard County showing locations of 7 completed projects. Near the top of the map is the St. Johns 2 baffle box. About one and half miles to the southeast is the Titusville High School baffle box along the western shore of the Indian River Lagoon. One mile south of that is St. Theresa baffle box. About a half mile south of that is the La Paloma baffle box. About three miles south of that is the Riverfront Center Nutrient Removing Filtration Boxes. About 2 miles south of that is the Oak Point Wastewater Treatment Facility improvements. About three miles south of that is the Basin 832 Broadway biosorption activated media project.

Return to **Figure 4-33**.

Figure 4-34. Completed Projects in Central Brevard County

Map of North Central Brevard County showing locations of 15 completed projects. Near the top of the map is the floating wetlands to existing stormwater ponds. About a quarter mile to the southeast is the North Fiske stormwater pond floating wetlands and North and South Lakemont ponds floating wetlands. Two miles south of that is the Church Street baffle box. Two miles south of that is the Breeze Swept septic removal. In the middle part of Merritt Island is the Merritt Island lateral smoke testing. About one and a half miles south of that is the Merritt Island Redevelopment Agency Septic Removal Phase 1 and Phase 2 septic removal projects. Near the top of the map on the barrier island is the Central Boulevard baffle box. About three and a half miles south of that is the Cocoa Beach muck dredging Phase II-b. One mile south of that is the Maritime Hammock Preserve stormwater pond vegetation harvesting. About a half mile southwest of that is the Convair Cove 1 stormwater and Convair Cove 2 stormwater projects. About one mile south of that is the Cocoa Beach muck dredging Phase III. To the west of that is the Cocoa Beach Water Reclamation Facility upgrade. About a half mile southwest of that is the Cocoa Beach golf course stormwater pond harvesting.

Return to **Figure 4-34**.

Figure 4-35. Completed Projects in South Central Brevard County

Map of South Central Brevard County showing locations of 19 completed projects. Near the top of the map is the Horseshoe Pond vegetative harvesting and Basin 1298 bioreactor. Two miles south of that is the Sherwood Park stormwater quality project. One mile south of that is the Thrush Drive baffle box. One mile southeast of that is the Cliff Creek baffle box. One mile to the west of that is the Johnson Junior High denitrification media chamber modification. About four miles southwest of that is the Sylvan Estates septic-to-sewer conversion project. About three miles southeast of that is the Ray Bullard Water Reclamation Facility stormwater management area. About two miles east of that is the Grant Place baffle box. On the barrier island towards the top of the map is the Basin 1304 bioreactor. Two miles south of that is the Jackson Court stormwater treatment facility. About a half mile south of that is the Lori Laine Basin pipe improvement project. About a half mile south of that is the Hedgecock/Grabowsky and Desoto Fields septic-to-sewer conversion. About one mile south of that is the Satellite Beach lateral smoke testing. One mile south of that is the Big Muddy at Cynthia baffle box. About one mile southwest of that is the Gleason Park reuse. About one and half miles south of that is the Basin 1398 Sand Dollar canal harvesting. About two miles south of that is the Basin 5 dry retention project.

Return to **Figure 4-35**.

Figure 4-36. Completed Projects in South Brevard County

Map of south Brevard County showing locations of 7 completed projects. Near the top of the map is the Bayfront stormwater project and Turkey Creek muck removal. About two miles southwest of that is the City of Palm Bay Water Reclamation Facility. About 9 miles southeast of that is the Barefoot Bay lateral smoke testing project. About 3 miles south of that is the Basin 2134 Fleming Grant biosorption activated media. Near the top of the map on the barrier island is the South Beach lateral smoke testing. Near the bottom of the map on the barrier island is the Long Point package plant upgrade.

Return to **Figure 4-36**.

Figure 4-37. Countywide Groundwater Nutrient Concentrations for TN (top) and TP (bottom)

Bar graphs showing the total nitrogen (TN) and total phosphorus (TP) concentrations in groundwater for four areas: natural or undeveloped, septic system communities, sewer communities, and reclaimed water communities. The following table summarizes the values shown in the bar graphs.

Area	Total Nitrogen Concentration (milligrams per liter)	Total Phosphorus Concentration (milligrams per liter)
Natural, Undeveloped Area	0.47	0.12
Septic Communities	6.08	1.06
Sewer Communities	1.96	0.19
Reclaimed Water Communities	5.93	0.27

Return to **Figure 4-37**.

Figure 4-38. Monitoring Sensor Locations at the Grand Canal Dredge Material Management Area from May 1 – 31, 2024

Map showing the locations of air monitor stations placed downwind of construction activities, which were relocated daily based on prevailing wind direction from the National Oceanic and Atmospheric Administration forecast. Starting in the northwest corner is the May 4 location, going to the east is the May 8 location, then the May 30 and 31 location, and then the May 9 location. South of those, going from west to east are the May 16, May 13, May 14, and May 24 locations. South of those, going from west to east, are the May 6 and 28, May 1, May 17, and May 1 locations. Going further to the southwest is the May 15 location. South of those, going from west to east, are the May 20, May 11, May 10, May 29, and May 7 locations. The furthest south, going from west to east are the May 23, May 21 and 22, May 2, May 3, and May 18 locations. In addition, in the very south-central portion is the location for stationary air monitor for the construction area closest to the Tortoise Island homes.

Return to **Figure 4-38**

Figure 4-39. Effluent Concentrations from Interstitial Water Treatment at Grand Canal

A scatterplot showing the effluent concentrations from interstitial water treatment at Grand Canal with total nitrogen (TN) on the left axis and total phosphorus (TP) on the right axis. The blue horizontal line indicates the nitrogen effluent target (3 milligrams per liter) while the green line indicates the phosphorus effluent target (0.075 milligrams per liter). The following table summarizes the values shown in the chart.

Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)	Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)
11/5/2019	3.80	0.2700	8/5/2022	0.86	0.0097
11/6/2019	4.00	0.3600	8/6/2022	0.89	0.0097
11/7/2019	9.60	0.7300	8/8/2022	1.80	0.0097
11/8/2019	14.50	1.2000	8/9/2022	2.70	0.0097
11/9/2019	15.30	1.3000	8/10/2022	2.40	0.0097
11/11/2019	13.20	1.2000	8/11/2022	3.00	0.0097
11/12/2019	10.90	0.9000	8/12/2022	1.30	0.0177
11/13/2019	19.40	1.6000	8/13/2022	1.20	0.0097
11/14/2019	14.30	1.2000	8/15/2022	1.10	0.0097
11/15/2019	12.00	1.1000	8/18/2022	1.20	0.0190
11/16/2019	14.90	1.3000	8/19/2022	-	-
11/18/2019	9.90	0.9500	8/20/2022	1.10	0.0127
11/19/2019	3.80	1.5000	8/22/2022	1.10	0.0179
11/19/2019	20.00	1.5000	8/23/2022	0.97	0.0097
11/20/2019	24.00	1.7000	8/24/2022	1.00	0.0097
8/28/2020	20.00	1.8000	8/25/2022	0.98	0.0097
8/31/2020	19.00	1.9000	8/26/2022	0.63	0.0097
9/1/2020	16.00	1.6000	8/27/2022	1.70	0.0097
9/2/2020	1.20	0.9700	8/29/2022	0.91	0.0152
9/3/2020	2.70	2.0000	8/30/2022	1.60	0.0097
9/4/2020	1.40	0.1200	8/31/2022	1.30	0.0097
9/5/2020	4.10	0.1800	9/10/2022	1.70	0.0097
9/8/2020	8.20	1.0000	9/12/2022	1.60	0.0137
9/9/2020	6.70	0.1400	9/13/2022	1.70	0.0097
9/10/2020	0.58	0.0450	9/14/2022	1.00	0.0273
9/11/2020	1.50	0.1300	9/15/2022	1.40	0.0097
9/12/2020	1.30	0.1300	9/16/2022	1.40	0.0097
9/14/2020	0.94	0.1400	9/17/2022	1.00	0.2080
9/15/2020	1.30	0.2800	9/19/2022	1.10	0.1490
9/18/2020	0.66	0.2600	9/20/2022	0.93	0.0097
9/19/2020	6.70	0.1300	9/21/2022	2.20	0.0105
9/21/2020	2.00	0.0600	9/22/2022	1.10	0.0097
9/22/2020	2.80	0.0890	9/23/2022	1.30	0.1560
9/23/2020	1.90	0.1400	9/24/2022	1.30	0.0185
9/24/2020	2.60	0.0790	9/26/2022	43.00	0.0097
9/25/2020	2.50	0.0960	10/1/2022	1.50	0.0097
9/26/2020	2.10	0.0680	10/4/2022	0.63	0.0097
9/28/2020	1.20	0.0630	10/5/2022	1.20	0.0097
3/30/2021	5.20	0.5400	10/6/2022	1.60	0.0097

Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)	Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)
3/31/2021	38.00	1.7000	10/7/2022	1.80	0.0097
4/1/2021	37.00	1.9000	10/8/2022	1.60	0.0097
4/2/2021	53.00	0.3600	10/10/2022	1.60	0.0097
4/3/2021	47.00	1.8000	10/12/2022	1.10	0.0097
4/5/2021	35.00	0.1600	10/13/2022	0.71	0.0097
4/7/2021	1.80	0.1500	10/14/2022	0.63	0.0097
4/8/2021	1.50	0.1100	10/15/2022	6.80	0.0097
4/9/2021	11.00	0.0390	10/17/2022	6.50	0.0097
4/12/2021	1.00	0.0720	10/18/2022	0.12	0.0097
4/13/2021	1.20	0.1400	10/19/2022	0.62	0.0097
4/14/2021	0.69	0.1300	10/20/2022	0.10	0.0097
4/15/2021	1.30	0.0750	10/21/2022	2.70	0.0097
4/16/2021	1.60	0.1400	10/22/2022	1.30	0.0097
4/21/2021	1.20	0.1500	10/24/2022	1.30	0.0097
4/22/2021	0.91	0.0770	10/25/2022	4.50	0.0097
4/23/2021	1.30	0.0740	10/26/2022	2.60	0.0097
4/24/2021	0.74	0.0690	10/27/2022	2.00	0.0097
4/26/2021	0.83	0.0670	10/28/2022	1.30	0.0097
4/27/2021	2.10	0.0700	10/29/2022	2.20	0.0097
4/28/2021	1.70	0.0700	10/31/2022	2.10	0.0097
4/29/2021	1.20	0.1600	11/1/2022	0.84	0.0097
4/30/2021	1.40	0.0820	11/2/2022	1.20	0.0097
5/1/2021	2.20	0.0580	11/3/2022	0.90	0.0097
5/3/2021	1.00	0.0330	11/4/2022	1.40	0.0097
5/4/2021	1.30	0.0830	11/5/2022	1.10	0.0097
5/5/2021	1.30	0.1400	11/7/2022	0.43	0.0097
5/6/2021	11.00	0.1100	11/8/2022	1.30	0.0097
5/7/2021	2.20	0.1000	11/11/2022	2.40	0.0097
5/8/2021	33.00	0.0860	11/15/2022	1.10	0.0097
5/10/2021	1.90	0.1000	11/16/2022	1.20	0.0097
5/11/2021	1.60	0.1700	11/17/2022	1.80	0.0097
5/12/2021	1.80	0.1900	11/18/2022	1.50	0.0097
5/13/2021	1.50	0.0200	11/19/2022	1.30	0.0097
5/14/2021	2.00	0.0560	11/20/2022	3.00	0.0097
5/15/2021	1.90	0.2400	11/21/2022	1.60	0.0097
5/17/2021	2.30	0.0980	11/22/2022	2.80	0.3110
5/18/2021	2.10	0.2200	11/23/2022	6.90	0.6640
5/19/2021	13.00	0.2100	11/28/2022	4.90	0.7610
5/20/2021	29.00	0.2100	6/24/2023	12.00	0.0061

Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)	Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)
5/21/2021	19.00	0.0360	6/26/2023	18.00	0.0061
5/22/2021	16.00	0.5800	6/27/2023	1.40	0.0061
5/24/2021	4.10	0.4200	6/28/2023	2.80	0.0061
5/25/2021	2.30	0.4900	6/29/2023	1.30	0.0061
5/26/2021	19.00	0.2800	6/30/2023	1.10	0.0061
5/27/2021	2.20	0.2800	7/1/2023	0.88	0.0061
5/28/2021	1.30	0.2600	7/3/2023	1.30	0.0210
5/29/2021	1.30	0.1800	7/5/2023	1.20	0.0061
6/2/2021	0.83	1.0000	7/7/2023	0.83	0.0061
6/3/2021	1.30	0.4100	7/8/2023	0.42	0.0061
6/4/2021	1.40	0.1200	7/12/2023	0.90	0.0061
6/5/2021	24.00	0.2800	7/13/2023	1.30	0.0061
6/7/2021	34.00	0.9100	7/14/2023	1.00	0.0061
6/8/2021	35.00	0.1200	7/15/2023	1.30	0.0061
6/9/2021	6.00	0.1200	7/18/2023	0.82	0.0061
6/14/2021	2.60	0.1100	7/19/2023	1.50	0.0061
6/15/2021	9.50	0.1600	7/20/2023	1.70	0.0061
6/16/2021	1.70	0.3100	7/21/2023	1.50	0.0061
6/17/2021	1.90	0.2500	7/22/2023	1.60	0.0061
6/18/2021	2.40	0.2700	7/24/2023	1.50	0.0254
6/19/2021	0.30	0.1000	7/25/2023	0.09	0.0061
6/21/2021	0.44	0.0840	7/26/2023	0.67	0.0061
6/22/2021	0.27	0.0940	7/27/2023	0.08	0.0061
6/23/2021	0.88	0.1400	7/28/2023	0.58	0.0061
6/24/2021	1.10	0.1000	7/29/2023	0.67	0.0157
6/25/2021	0.84	0.2000	7/31/2023	0.76	0.0061
6/26/2021	1.40	0.1400	8/1/2023	1.70	0.0061
6/28/2021	1.20	0.0780	8/2/2023	0.51	0.0061
6/29/2021	1.40	0.1600	8/3/2023	1.70	0.0061
6/30/2021	28.00	0.2000	8/4/2023	0.69	0.0061
7/1/2021	2.40	0.1100	8/5/2023	1.00	0.0100
7/2/2021	1.80	0.1200	8/7/2023	1.10	0.0061
7/6/2021	4.30	0.0780	8/8/2023	1.10	0.0061
7/7/2021	3.00	0.1100	8/9/2023	0.17	0.0100
7/8/2021	1.40	0.0420	8/10/2023	0.84	0.0072
7/9/2021	6.80	0.0770	8/11/2023	1.20	0.0061
7/12/2021	2.10	0.0520	8/12/2023	1.20	0.0061
7/13/2021	1.60	0.0400	8/14/2023	1.30	0.0061
7/14/2021	2.20	0.0820	8/15/2023	1.40	0.0061
7/15/2021	2.80	0.0710	8/16/2023	0.11	0.0061

Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)	Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)
7/16/2021	2.80	0.0640	8/17/2023	0.43	0.0061
7/17/2021	1.90	0.0890	8/18/2023	1.40	0.0061
7/19/2021	1.30	0.0700	8/19/2023	1.00	0.0061
7/20/2021	0.90	0.0800	8/21/2023	0.54	0.0061
7/21/2021	1.30	0.0820	8/22/2023	1.20	0.0061
7/22/2021	1.20	0.0680	8/23/2023	1.30	0.0132
7/23/2021	1.80	0.0990	8/24/2023	1.10	0.0061
7/24/2021	1.90	0.1600	8/25/2023	1.30	0.0061
7/29/2021	1.50	0.1600	8/26/2023	0.78	0.0061
7/30/2021	1.60	0.0820	8/28/2023	1.30	0.0061
8/2/2021	1.20	0.1100	8/29/2023	1.40	0.0061
8/3/2021	0.80	0.0800	8/30/2023	2.10	0.0061
8/4/2021	1.60	0.0200	8/31/2023	1.80	0.0061
8/5/2021	2.80	0.0200	9/1/2023	0.71	0.0061
8/6/2021	3.00	0.0390	9/2/2023	1.20	0.0061
8/9/2021	22.00	0.0930	9/5/2023	1.10	0.0061
8/10/2021	21.00	1.4000	9/7/2023	0.78	0.0268
8/11/2021	2.70	0.0200	9/8/2023	0.92	0.0061
8/12/2021	2.10	0.0540	9/11/2023	0.96	0.0061
8/13/2021	2.70	0.0690	9/12/2023	1.20	0.0061
8/14/2021	2.20	0.0450	9/13/2023	0.85	0.0061
8/16/2021	14.00	0.0450	9/16/2023	0.74	0.0061
8/17/2021	2.00	0.1000	9/18/2023	1.10	0.0061
8/18/2021	2.40	0.0960	9/19/2023	0.55	0.0061
8/19/2021	1.40	0.0600	9/20/2023	1.40	0.0061
8/20/2021	3.30	0.0790	9/21/2023	0.45	0.0061
8/23/2021	3.90	0.0610	9/22/2023	6.60	0.0061
8/24/2021	1.40	0.0500	9/23/2023	0.70	0.0061
8/25/2021	1.60	0.0480	9/25/2023	1.30	0.0061
8/26/2021	1.20	0.0310	9/28/2023	0.74	0.0061
8/27/2021	1.20	0.0620	9/29/2023	0.76	0.0061
8/30/2021	1.50	0.1100	9/30/2023	0.66	0.0061
8/31/2021	4.90	0.0640	10/2/2023	0.48	0.0061
9/1/2021	2.30	0.0520	10/3/2023	0.61	0.0061
9/2/2021	2.00	0.1100	10/4/2023	0.75	0.1830
9/3/2021	2.60	0.0360	10/5/2023	0.61	0.0061
9/7/2021	1.80	0.0760	10/6/2023	0.83	0.0061
9/8/2021	2.40	0.0410	10/7/2023	0.66	0.0061
9/9/2021	2.00	0.0440	10/10/2023	0.87	0.0061
9/10/2021	1.20	0.0510	10/11/2023	0.67	0.0061

Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)	Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)
9/11/2021	1.80	0.0790	10/12/2023	1.20	0.0061
9/13/2021	1.90	0.0220	10/13/2023	1.30	0.0061
9/14/2021	4.00	0.0430	10/14/2023	1.10	0.0061
9/15/2021	2.20	0.0610	10/16/2023	0.62	0.0085
9/18/2021	1.60	0.0550	10/17/2023	0.92	0.0061
9/20/2021	0.64	0.0710	10/18/2023	1.10	0.0061
9/21/2021	1.40	0.0820	10/19/2023	0.44	0.0061
9/22/2021	2.70	0.0880	10/20/2023	5.10	0.0061
9/23/2021	2.10	0.0790	10/21/2023	0.90	0.0061
9/24/2021	1.90	0.0900	10/23/2023	0.92	0.0061
9/25/2021	9.50	0.0870	10/24/2023	0.86	0.0061
9/27/2021	3.20	0.1000	10/25/2023	0.43	0.0061
9/28/2021	4.30	0.0690	10/26/2023	0.65	0.0061
9/29/2021	1.70	0.0500	10/27/2023	0.37	0.0061
9/30/2021	1.50	0.0590	10/28/2023	0.52	0.0061
10/1/2021	1.60	0.0550	10/30/2023	0.77	0.0061
10/2/2021	1.90	0.0320	10/31/2023	1.30	0.0061
10/4/2021	1.80	0.0290	11/1/2023	0.56	0.0061
10/8/2021	3.60	0.0340	11/2/2023	0.75	0.0061
10/9/2021	1.70	0.1600	11/3/2023	0.66	0.0061
10/11/2021	5.00	0.2400	11/6/2023	0.85	0.0061
10/12/2021	1.50	0.1300	11/9/2023	0.20	0.0061
10/13/2021	1.60	0.2100	11/10/2023	0.39	0.0061
10/14/2021	1.90	0.1000	11/11/2023	0.62	0.0061
10/15/2021	1.10	0.1100	11/13/2023	2.00	0.0061
10/16/2021	1.90	0.2600	11/14/2023	2.40	0.0061
10/18/2021	3.50	0.1700	11/15/2023	2.10	0.0061
10/19/2021	1.20	0.2000	11/16/2023	2.00	0.0343
10/20/2021	1.50	0.0520	11/17/2023	1.20	0.5100
10/21/2021	3.10	0.4000	11/18/2023	0.32	0.2360
10/22/2021	1.00	0.1300	11/20/2023	0.46	0.0061
10/23/2021	1.30	0.3000	11/21/2023	1.50	0.0061
10/25/2021	1.40	0.2500	11/22/2023	0.74	0.0061
10/26/2021	1.10	0.3200	11/27/2023	0.02	0.0171
10/27/2021	1.60	0.2600	11/28/2023	33.00	0.0203
10/28/2021	1.40	0.3600	11/29/2023	1.70	0.0832
10/29/2021	1.30	0.1500	11/30/2023	3.70	0.0061
10/30/2021	1.20	0.0820	4/1/2024	8.90	0.0061
11/1/2021	1.00	0.2800	4/2/2024	14.00	0.0061
11/2/2021	0.99	0.1000	4/3/2024	19.00	0.0877

Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)	Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)
11/3/2021	1.30	0.1400	4/4/2024	1.10	0.0061
11/4/2021	1.40	0.1700	4/5/2024	1.60	0.0061
11/5/2021	1.40	0.2800	4/6/2024	0.81	0.0061
11/6/2021	1.10	0.4000	4/8/2024	0.63	0.0061
11/7/2021	0.94	0.5400	4/9/2024	0.82	0.0061
11/8/2021	1.20	0.4700	4/10/2024	0.65	0.0061
11/9/2021	1.00	0.3300	4/12/2024	0.76	0.0061
11/10/2021	1.10	0.3000	4/13/2024	1.10	0.0061
11/11/2021	1.80	0.4100	4/15/2024	0.62	0.0061
11/12/2021	1.70	0.3300	4/16/2024	0.72	0.0061
11/15/2021	1.10	0.0920	4/17/2024	1.20	0.0061
11/16/2021	0.99	0.1500	4/18/2024	1.40	0.0061
11/17/2021	1.70	0.1500	4/19/2024	1.60	0.0248
11/18/2021	1.70	0.2100	4/22/2024	1.50	0.0061
11/19/2021	1.50	0.2900	4/30/2024	1.60	0.0061
11/20/2021	0.30	0.2200	5/1/2024	2.10	0.0061
11/21/2021	0.45	0.2600	5/2/2024	2.50	0.0061
11/22/2021	0.60	0.1600	5/3/2024	1.10	0.0061
11/23/2021	0.45	0.4300	5/6/2024	2.10	0.0061
11/24/2021	1.10	0.1500	5/7/2024	2.10	0.0061
11/27/2021	1.20	0.1700	5/8/2024	2.40	0.0061
11/28/2021	1.50	0.2600	5/9/2024	1.80	0.0061
11/29/2021	1.50	0.2500	5/10/2024	1.90	0.0061
11/30/2021	1.60	0.2500	5/11/2024	1.10	0.0061
3/22/2022	27.00	0.3000	5/13/2024	1.50	0.0061
3/23/2022	37.00	0.3500	5/14/2024	1.50	0.0061
3/24/2022	25.00	0.2300	5/15/2024	1.80	0.0061
3/25/2022	26.00	0.3000	5/16/2024	1.50	0.0061
3/26/2022	38.00	0.2000	5/17/2024	0.32	0.0061
3/28/2022	36.00	0.3200	5/18/2024	0.09	0.0061
3/29/2022	33.00	0.2100	5/21/2024	0.20	0.0061
3/30/2022	33.00	0.4500	5/22/2024	0.50	0.0061
3/31/2022	18.00	0.1900	5/23/2024	1.50	0.0090
4/1/2022	14.00	0.1600	5/24/2024	1.80	0.0061
4/2/2022	11.00	0.0500	5/28/2024	1.10	0.0088
4/4/2022	16.00	0.0760	5/29/2024	0.73	0.0061
4/5/2022	19.00	0.1000	5/30/2024	0.28	0.0136
4/18/2022	5.70	0.0710	5/31/2024	4.40	0.0850
4/20/2022	2.80	0.0104	6/1/2024	0.09	0.0097
4/21/2022	1.40	0.0435	6/3/2024	20.00	0.0929

Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)	Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)
4/22/2022	1.30	0.0332	6/4/2024	18.00	0.0886
4/23/2022	2.30	0.0256	6/5/2024	7.10	0.0273
4/25/2022	9.40	0.0097	6/6/2024	2.50	0.0174
4/26/2022	7.80	0.0424	6/7/2024	0.39	0.0123
4/27/2022	3.60	0.0262	6/8/2024	2.60	0.0202
4/28/2022	2.10	0.0585	6/10/2024	2.70	0.0321
4/29/2022	1.40	0.0097	6/13/2024	0.86	0.0163
5/2/2022	1.10	0.0097	6/14/2024	0.91	0.0244
5/3/2022	2.10	0.0097	6/15/2024	1.50	0.0172
5/5/2022	1.50	0.0097	6/17/2024	0.33	0.0106
5/6/2022	1.70	0.0097	6/18/2024	0.38	0.0092
5/7/2022	3.50	0.0212	6/19/2024	0.18	0.0061
5/9/2022	2.40	0.0097	6/20/2024	0.58	0.0061
5/11/2022	2.50	0.0097	6/21/2024	2.30	0.0070
5/12/2022	1.50		6/22/2024	1.10	0.0110
5/13/2022	2.40	0.0551	6/25/2024	0.44	0.0061
5/14/2022	1.40	0.1230	6/26/2024	0.66	0.0061
5/16/2022	1.40	0.0816	6/27/2024	0.18	0.0211
5/17/2022	1.60	0.0377	6/28/2024	0.69	0.0208
5/18/2022	1.70	0.0529	6/29/2024	1.30	0.0061
5/19/2022	3.70	0.0333	7/1/2024	0.89	0.0061
5/20/2022	1.30	0.0388	7/2/2024	0.70	0.0061
5/21/2022	1.70	0.0111	7/8/2024	1.00	0.0061
5/23/2022	1.60	0.0114	7/9/2024	0.62	0.0061
5/24/2022	0.86	0.0105	7/10/2024	2.00	0.0079
5/25/2022	1.00	0.0112	7/11/2024	0.85	0.0061
5/26/2022	1.60	0.0205	7/13/2024	1.10	0.0061
5/27/2022	0.91	0.0642	7/15/2024	2.50	0.0061
5/28/2022	0.66	0.0147	7/16/2024	0.96	0.0061
5/31/2022	0.66	0.0175	7/17/2024	0.96	0.0061
6/1/2022	1.80	0.1470	7/19/2024	0.93	0.0061
6/2/2022	2.10	0.0465	7/20/2024	2.40	0.0061
6/3/2022	1.80	0.0828	7/22/2024	2.50	0.0061
6/6/2022	0.98	0.0755	7/23/2024	1.20	0.0061
6/9/2022	1.10	0.0490	7/24/2024	1.80	0.0061
6/10/2022	1.20	0.5030	7/25/2024	1.60	0.0061
6/11/2022	22.00	0.0169	7/26/2024	1.40	0.0061
6/13/2022	13.00	0.0629	7/27/2024	0.38	0.0061
6/14/2022	5.80	0.0774	7/29/2024	0.76	0.0090
6/15/2022	5.30	0.0594	7/30/2024	0.61	0.0190
6/16/2022	1.60	0.0621	7/31/2024	0.57	0.0061
6/17/2022	1.80	0.0644	8/1/2024	0.91	0.0061
6/20/2022	1.90	0.0693	8/2/2024	1.30	0.0061
6/21/2022	1.30	0.0448	8/3/2024	0.98	0.0102
6/22/2022	1.10	0.0435	8/5/2024	0.07	0.0061
6/23/2022	5.90	0.0207	8/6/2024	0.21	0.0061
6/24/2022	4.50	0.0931	8/7/2024	0.85	0.0061
6/25/2022	1.10	0.0790	8/8/2024	1.10	0.0061
6/27/2022	18.00	0.0591	8/9/2024	2.60	0.0061
6/28/2022	12.00	0.0674	8/10/2024	7.90	0.0061
6/29/2022	24.00	0.0523	8/12/2024	5.00	0.0061
6/30/2022	1.10	0.0497	8/13/2024	1.00	0.0061
7/1/2022	1.10	0.0685	8/15/2024	0.67	0.0061
7/2/2022	1.10	0.0634	8/16/2024	0.77	0.0061
7/5/2022	1.10	0.0623	8/17/2024	0.79	0.0061

Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)	Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)
7/6/2022	1.10	0.0903	8/20/2024	1.90	0.0061
7/7/2022	1.30	0.1060	8/21/2024	1.60	0.0061
7/11/2022	4.50	0.0982	8/22/2024	1.30	0.0205
7/12/2022	4.10	0.1790	8/23/2024	0.87	0.0205
7/13/2022	1.00	0.0097	8/26/2024	0.85	0.0122
7/14/2022	1.10	0.0143	8/27/2024	0.92	0.0112
7/15/2022	1.10	0.0167	8/28/2024	0.77	0.0091
7/16/2022	1.10	0.0167	8/29/2024	1.60	0.0061
7/18/2022	0.95	0.0158	8/30/2024	1.70	0.0061
7/19/2022	0.93	0.0153	9/3/2024	2.00	0.0061
7/20/2022	0.82	0.0316	9/4/2024	1.80	0.0061
7/21/2022	1.00	0.0392	9/5/2024	0.38	0.0061
7/22/2022	0.98	0.0377	9/6/2024	0.17	0.0061
7/23/2022	0.84	0.0395	9/7/2024	0.20	0.0061
7/25/2022	0.85	0.0097	9/9/2024	0.35	0.0061
7/26/2022	0.93	0.0097	9/10/2024	0.25	0.0061
7/27/2022	0.94	0.0164	9/11/2024	0.68	0.0328
7/28/2022	5.90	0.0097	9/12/2024	0.45	0.0206
7/29/2022	6.10	0.0097	9/13/2024	0.69	0.0230
7/30/2022	2.50	0.0097	9/14/2024	0.47	0.0148
8/1/2022	2.30	0.0097	9/16/2024	0.85	0.0061
8/2/2022	2.20	0.0097	9/17/2024	2.00	0.0061
8/4/2022	1.90	0.0141	9/18/2024	0.73	0.0061

Return to **Figure 4-39**.

Figure 4-40. Effluent Concentrations from Interstitial Water Treatment at Sykes Creek

A scatterplot showing the effluent concentrations from interstitial water treatment at Sykes Creek with total nitrogen (TN) on the left axis and total phosphorus (TP) on the right axis. The blue horizontal line indicates the nitrogen effluent target (3 milligrams per liter) while the green line indicates the phosphorus effluent target (0.075 milligrams per liter). The following table summarizes the values shown in the chart.

Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)	Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)
8/16/2022	3.00	0.0323	1/24/2023	2.50	0.0097
8/17/2022	13.00	0.0097	1/27/2023	0.28	0.0770
8/18/2022	12.00	0.0273	1/28/2023	0.08	0.0521
8/19/2022	1.90	0.0097	1/30/2023	0.05	0.0097
8/20/2022	2.10	0.0097	1/31/2023	1.30	0.0097
8/21/2022	1.80	0.0097	2/3/2023	2.30	0.0097
8/22/2022	0.77	0.0097	2/4/2023	1.90	0.0097
8/24/2022	3.40	0.0097	2/6/2023	1.50	0.0097
8/26/2022	1.00	0.0097	2/8/2023	1.40	0.0097
8/29/2022	1.80	0.0300	2/9/2023	4.20	0.0097
8/30/2022	1.10	0.0097	2/10/2023	1.60	0.0097

Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)	Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)
8/31/2022	2.50	0.0097	2/11/2023	5.00	0.0097
9/1/2022	1.20	0.0214	2/13/2023	2.30	0.0097
9/2/2022	1.70	0.0097	2/14/2023	1.40	0.0097
9/6/2022	0.84	0.0097	2/15/2023	1.30	0.0097
9/7/2022	1.30	0.0438	2/16/2023	1.20	0.0097
9/8/2022	0.63	0.0097	2/17/2023	1.00	0.0097
9/9/2022	2.40	0.0131	2/18/2023	1.60	0.0097
9/10/2022	1.40	0.0097	2/23/2023	1.50	0.0097
9/12/2022	1.40	0.0097	2/24/2023	4.00	0.0097
9/13/2022	0.79	0.0259	2/25/2023	2.90	0.0097
9/14/2022	0.57	0.0328	2/27/2023	1.50	0.0097
9/15/2022	1.60	0.0147	3/2/2023	1.60	0.0097
9/16/2022	5.80	0.0303	3/3/2023	1.20	0.0623
9/20/2022	1.30	0.0097	3/8/2023	1.00	0.0097
9/21/2022	0.84	0.0161	3/9/2023	1.50	0.0270
9/22/2022	1.80	0.0097	3/14/2023	1.50	0.0097
9/23/2022	0.61	0.0204	3/15/2023	1.20	0.0501
9/24/2022	1.90	0.0327	3/16/2023	1.40	0.0371
9/26/2022	1.40	0.0097	3/17/2023	2.00	0.0276
10/3/2022	2.40	0.0097	3/18/2023	3.70	0.0097
10/4/2022	5.10	0.0097	3/20/2023	2.40	0.0166
10/5/2022	8.00	0.0097	3/22/2023	0.89	0.0108
10/6/2022	4.40	0.0097	3/23/2023	0.98	0.0232
10/7/2022	2.20	0.0097	3/27/2023	1.80	0.0144
10/8/2022	3.50	0.0097	3/28/2023	1.20	0.0212
10/10/2022	4.80	0.0097	3/29/2023	1.10	0.0308
10/11/2022	0.99	0.0160	3/30/2023	1.10	0.0097
10/12/2022	1.20	0.0097	3/31/2023	1.80	0.0418
10/13/2022	0.89	0.0097	4/1/2023	0.80	0.0097
10/14/2022	0.46	0.0097	4/3/2023	1.70	0.0222
10/15/2022	1.30	0.0097	4/4/2023	1.80	0.0097
10/18/2022	0.08	0.0269	4/5/2023	1.50	0.0275
10/19/2022	0.59	0.0097	4/17/2023	1.10	0.0410
10/20/2022	0.04	0.0097	4/18/2023	1.20	0.0123
10/21/2022	1.70	0.0097	4/19/2023	0.80	0.0097
10/22/2022	3.30	0.0097	4/20/2023	2.60	0.0097
10/24/2022	0.97	0.0097	4/21/2023	1.70	0.0097
10/25/2022	4.50	0.0097	4/22/2023	1.90	0.0230
10/26/2022	2.60	0.0180	4/24/2023	5.20	0.0097
10/27/2022	2.00	0.0097	4/25/2023	1.80	0.0097

Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)	Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)
10/28/2022	0.86	0.0210	4/26/2023	1.80	0.0097
10/29/2022	1.00	0.0097	4/27/2023	3.00	0.0138
10/31/2022	0.98	0.0097	4/28/2023	3.00	0.0097
11/1/2022	2.20	0.0097	5/1/2023	1.30	0.0218
11/2/2022	1.60	0.0097	5/2/2023	3.30	0.0149
11/3/2022	1.70	0.0097	5/8/2023	2.20	0.0270
11/4/2022	0.90	0.0097	5/9/2023	1.10	0.0097
11/7/2022	0.37	0.0097	5/10/2023	1.00	0.0438
11/8/2022	1.20	0.0097	5/11/2023	0.96	0.0097
11/11/2022	2.80	0.0097	5/12/2023	1.50	0.0097
11/12/2022	3.80	0.0097	5/13/2023	1.20	0.0097
11/14/2022	1.40	0.0097	5/15/2023	1.10	0.0097
11/17/2022	0.57	0.0097	5/16/2023	1.30	0.0097
11/18/2022	3.50	0.0097	5/18/2023	1.40	0.0097
11/19/2022	1.70	0.0097	5/19/2023	1.50	0.0097
12/3/2022	4.30	0.0097	5/20/2023	0.15	0.0097
12/5/2022	5.00	0.0097	5/22/2023	0.95	0.0097
12/6/2022	2.40	0.0097	6/2/2023	1.30	0.0097
12/7/2022	6.10	0.0097	6/3/2023	1.00	0.0097
12/8/2022	1.10	0.0097	6/4/2023	0.93	0.0097
12/9/2022	7.10	0.0097	6/5/2023	0.87	0.0097
12/10/2022	7.80	0.0097	6/6/2023	1.60	0.0097
12/12/2022	8.40	0.0097	6/7/2023	0.50	0.0097
12/13/2022	14.00	0.0097	6/8/2023	0.72	0.0097
12/14/2022	6.50	0.0097	6/10/2023	1.90	0.0097
12/17/2022	1.20	0.0097	6/11/2023	1.70	0.0097
12/19/2022	8.10	0.0097	6/19/2023	6.80	0.0224
12/20/2022	2.00	0.0623	6/21/2023	2.00	0.0097
12/21/2022	6.90	0.0097	6/22/2023	2.00	0.0097
12/22/2022	4.20	0.0097	6/27/2023	3.90	0.0065
12/27/2022	1.10	0.0097	6/28/2023	1.50	0.0061
12/28/2022	2.00	0.0097	6/29/2023	3.60	0.0061
12/29/2022	1.00	0.0097	6/30/2023	1.70	0.0107
12/30/2022	1.20	0.0097	7/1/2023	1.40	0.0061
1/2/2023	3.60	0.0097	7/5/2023	4.20	0.0096
1/3/2023	1.50	0.0378	7/6/2023	1.60	0.1730
1/5/2023	1.20	0.0097	7/8/2023	1.60	0.0061
1/6/2023	0.88	0.0097	7/11/2023	2.20	0.0061
1/7/2023	13.00	0.0097	7/12/2023	1.60	0.0061
1/9/2023	1.50	0.0097	7/14/2023	1.10	0.0061
1/10/2023	1.70	0.0097	7/21/2023	0.79	0.0191

Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)	Sample Date	Total Nitrogen (milligrams per liter)	Total Phosphorus (milligrams per liter)
1/11/2023	0.80	0.0262	7/25/2023	4.80	0.1020
1/12/2023	0.79	0.0097	7/26/2023	1.00	0.0993
1/13/2023	0.65	0.0097	7/27/2023	3.80	0.0760
1/16/2023	2.20	0.0097	7/28/2023	1.30	0.0350
1/17/2023	1.50	0.0097	7/29/2023	1.10	0.0462
1/18/2023	1.70	0.0097	7/31/2023	1.70	0.0446
1/19/2023	0.05	0.0097	8/1/2023	1.10	0.0399
1/20/2023	1.30	0.0097	8/2/2023	8.30	0.2940
1/23/2023	1.50	0.0097	-	-	-

Return to **Figure 4-40**.

Figure 4-41. Distribution of Oyster Sizes, Age, and Average Number of Measured Oysters Per Sample Unit

A bar chart showing the distribution of oyster sizes, as of most recent monitoring, for oyster sites within the Banana River Lagoon, North Indian River Lagoon, and Central Indian River Lagoon. At each site, the average number of measured oysters per size class per sample for the most recent monitoring event are shown. The number of settlers, subadults, adults, and large adults are shown. The following table summarizes the values shown in the bar graph.

Location	Monitoring Date	Settler	Subadult	Adult	Large Adult
Bomalaski 4.5 years	1/2023	0.00000	0.33333	3.33330	1.33330
Bettinger 3 years	12/2021	0.00000	0.00000	0.25000	0.00000
Gitlin 2.5 years	12/2021	0.00000	0.00000	0.40000	0.60000
Marina Isles 4.5 years	1/2024	0.00000	0.16667	1.33333	1.16667
Coconut Point 3 years	1/2023	0.33333	0.00000	0.00000	0.00000
Hog Point 2 years	4/2022	3.00000	10.80000	20.80000	5.00000
Maritime Hammock 2 years	4/2022	6.80000	13.80000	21.60000	4.40000
Riverview Senior 3.5 years	1/2022	30.80000	10.00000	7.90000	0.00000
Ahmed Niland 3.5 years	3/2024	6.00000	8.11111	4.77778	1.00000
MacNiel Pitner 4.0 years	3/2024	3.50000	6.37500	6.00000	2.37500
Riverside Drive 3.5 years	2/2024	2.92308	5.30769	3.00000	0.38462
Dragon Point 1.0 year	12/2021	11.00000	13.12500	5.00000	0.00000
Sands 2.0 years	1/2023	0.00000	5.80000	12.00000	8.60000
Wexford 3.0 years	1/2024	14.80000	19.20000	7.40000	1.00000
Melbourne Beach 2.0 years	1/2024	2.37500	7.62500	9.75000	2.25000
Palm Bay 2.0 years	1/2024	28.50000	17.33334	4.16667	0.00000
Indialantic/Melbourne 2.5 years	1/2024	10.76923	4.69231	7.23077	3.00000
Ryckman 2.0 years	4/2024	24.62500	6.50000	4.87500	1.50000
Satellite Beach/Tropical Trail 1.0 year	5/2023	0.70000	3.50000	14.90000	7.10000
Castaway 2.0 years	9/2024	23.18750	12.93750	8.31250	5.75000
Tropical Trail 1.0 year	7/2024	19.60000	24.30000	5.50000	0.60000
Indialantic 1.0 year	11/2023	11.00000	26.00000	2.66667	0.00000
Rainwater 0.5 year	4/2024	14.75000	20.96429	14.00000	0.28571

Return to **Figure 4-41**.

Figure 4-42. Average Oyster Density Per Square Foot

A bar graph showing the average oyster density per square foot at the most recent fully censused monitoring event for all monitoring areas. The following table summarizes the values shown in the bar graph.

Location	Monitoring Date	Average Oyster Density
Bomalaski 4.5 years	1/2023	2.32
Bettinger 3 years	12/2021	0.12
Gitlin 2.5 years	12/2021	0.46
Marina Isles 4.5 years	1/2024	1.21
Coconut Point 3 years	1/2023	0.15
Hog Point 2 years	4/2022	18.39
Maritime Hammock 2 years	4/2022	51.38
Riverview Senior 3.5 years	1/2022	98.94
Ahmed Niland 3.5 years	3/2024	8.18
MacNiel Pitner 4.0 years	3/2024	8.50
Riverside Drive 3.5 years	2/2024	5.39
Dragon Point 1.0 year	12/2021	14.56
Sands 2.0 years	1/2023	13.20
Wexford 3.0 years	1/2024	24.40
Melbourne Beach 2.0 years	1/2024	10.36
Palm Bay 2.0 years	1/2024	56.81
Indialantic/Melbourne 2.5 years	1/2024	14.86
Ryckman 2.0 years	4/2024	21.00
Satellite Beach/Tropical Trail 1.0 year	5/2023	14.05
Castaway 2.0 years	9/2024	134.55
Tropical Trail 1.0 year	7/2024	140.85
Indialantic 1.0 year	11/2023	70.84
Rainwater 0.5 year	4/2024	250.66

Return to **Figure 4-42**

Figure 4-43. Average Dry Total Weight Per Square Foot

A bar graph showing the average dry total weight in pounds per square foot at the most recent fully censused monitoring event for all monitoring areas. The following table summarizes the values shown in the bar graph.

Location	Monitoring Date	Average Dry Total Weight (pounds per square foot)
Bomalaski 4.5 years	1/2023	0.003683
Bettinger 3 years	12/2021	0.000201
Gitlin 2.5 years	12/2021	0.000982
Marina Isles 4.5 years	1/2024	0.002352
Coconut Point 3 years	1/2023	0.000215
Hog Point 2 years	4/2022	0.019020
Maritime Hammock 2 years	4/2022	0.018120
Riverview Senior 3.5 years	1/2022	0.005847
Ahmed Niland 3.5 years	3/2024	0.004351
MacNiel Pitner 4.0 years	3/2024	0.007378
Riverside Drive 3.5 years	2/2024	0.003084
Dragon Point 1.0 year	12/2021	0.004935
Sands 2.0 years	1/2023	0.018994
Wexford 3.0 years	1/2024	0.014794
Melbourne Beach 2.0 years	1/2024	0.009210
Palm Bay 2.0 years	1/2024	0.004643

Location	Monitoring Date	Average Dry Total Weight (pounds per square foot)
Indialantic/Melbourne 2.5 years	1/2024	0.008735
Ryckman 2.0 years	4/2024	0.010528
Satellite Beach/Tropical Trail 1.0 year	5/2023	0.018687
Castaway 2.0 years	9/2024	0.015897
Tropical Trail 1.0 year	7/2024	0.007774
Indialantic 1.0 year	11/2023	0.005275
Rainwater 0.5 year	4/2024	0.010728

Return to **Figure 4-43**

Figure 4-44. Average Number of Measured Oysters in Each Size Class for Ultraviolet Stabilized Plastic Mesh Bags (left) and Galvanized After Welding Steel Gabions (right)

A bar chart showing the average number of measured oysters in each size class per monitored unit at the Wexford oyster bar for modules constructed from ultraviolet stabilized plastic mesh bags and galvanized after welding steel gabions. Each bar represents the age of the project for each monitoring event. The number of settlers, subadults, adults, and large adults are shown. The following table summarizes the values shown in the bar graph.

Location	Settler	Subadult	Adult	Large Adult
Wexford Bags 0 year	Not applicable	Not applicable	Not applicable	Not applicable
Wexford Bags 0.08 year	5.8	0.2	0.0	0.0
Wexford Bags 0.25 year	8.5	0.8	0.0	0.0
Wexford Bags 0.5 year	6.3	17.5	0.8	0.0
Wexford Bags 1 year	14.8	29.3	5.0	0.0
Wexford Bags 1.5 years	36.8	7.7	4.3	0.0
Wexford Bags 2.0 years	17.0	15.2	10.67	0.2
Wexford Gabions 0 year	Not applicable	Not applicable	Not applicable	Not applicable
Wexford Gabions 0.08 year	32.2	2.3	0.0	0.0
Wexford Gabions 0.25 year	32.2	11.0	1.0	0.0
Wexford Gabions 0.5 year	12.0	25.2	5.5	0.0
Wexford Gabions 1 year	9.3	22.3	17.2	1.2
Wexford Gabions 1.5 years	31.5	8.8	7.7	2.0
Wexford Gabions 2.0 years	13.0	14.7	14.7	7.7

Return to **Figure 4-44**.

Figure 4-45. Comparison of Corral Wall and Stacked Gabion Oyster Module Performance

A line graph showing the average number of oysters per sample comparing corral walls and stacked gabions modules over one year of monitoring. The following table summarizes the values shown in the line graph.

Location and Module	Number of Oysters Per Sample at 1 Month	Number of Oysters Per Sample at 3 Months	Number of Oysters Per Sample at 6 Months	Number of Oysters Per Sample at 1 Year	Number of Oysters Per Sample at 1.5 Years	Number of Oysters Per Sample at 2 Years
Castaway Cove Narrow Gabion	32.8	54.5	47.3	377.3	296.3	401.0

Location and Module	Number of Oysters Per Sample at 1 Month	Number of Oysters Per Sample at 3 Months	Number of Oysters Per Sample at 6 Months	Number of Oysters Per Sample at 1 Year	Number of Oysters Per Sample at 1.5 Years	Number of Oysters Per Sample at 2 Years
Castaway Cove Wide Gabion	22.3	65.5	39.8	251.8	219.3	249.0
Castaway Cove Narrow Corral	31.0	81.5	70.0	252.5	185.3	216.8
Castaway Cove Wide Corral	20.3	65.8	65.0	210.0	150.0	209.5

Return to **Figure 4-45**

Figure 4-46. Comparison of Gabion Corral Wall and Coquina Corral Wall Performance

A line graph showing the average oyster density per square foot for each module at the Rainwater reef. Comparing gabion corral walls with coquina corral walls and a gabion control module for the first six months of monitoring. The following table summarizes the values shown in the line graph.

Module Number	Module Description	1 Month	3 Months	6 Months
1	Coquina Corral	5,420.7	4,862.9	2,583.3
2	Gabion Corral	4,189.8	3,154.6	2,711.0
3	Gabion Corral	1,381.7	2,560.5	2,051.1
4	Gabion Control Module	10,532.3	5,411.3	3,752.7
5	Gabion Corral	7,437.1	4,637.1	2,619.6
6	Gabion Corral	4,533.9	4,638.4	2,634.4
7	Coquina Corral	3,072.6	3,932.8	2,515.1

Return to **Figure 4-46**

Figure 5-2. Evolution of Project Funding Allocations

Series of pie charts showing the percent distribution of funding from the original plan to each of the plan updates in 2017–2025. Public education makes up less than 1% of the total funding in all years except 2022–2025 when it is about 1%. Wastewater facility upgrades for reclaimed water were 3% of the costs in the original plan and 2017 Supplement; 4% in the 2018 Update; 7% in the 2019 Update; and 6% in the 2020–2025 Updates. Rapid infiltration basins/sprayfield upgrades were added in the 2019 Update as 1% of the cost, 2% in the 2020 and 2021 Updates, and less than 1% in the 2022–2025 Updates. Package plant connections were added in the 2021 Update and represent 1% of the costs, also in the 2022 Update and less than 1% of the costs in the 2023–2025 Updates. Sewer laterals were added in the 2019 Update and represent less than 1% of the cost in all years. Septic-to-sewer was 14% of the cost in the original plan and 2017 Supplement, 13% in the 2018 Update, 26% in the 2019 Update, 30% in the 2020 and 2021 Updates, 31% in the 2022 Update, 30% in the 2023 Update, 29% in the 2024 and 2025 Updates. Septic system upgrades were 7% of the cost in the original plan and 2017 Supplement, 6% in the 2018 and 2019 Updates, 7% in the 2020–2023 Updates, 6% in the 2024 and 2025 Updates. Stormwater projects were 4% of the costs in the original plan and 2017 and 2018 Updates; 11% in the 2019 Update; 12% in the 2020 Update; 11% in the 2021 and 2022 Updates; 15% in the 2023 and 2024 Updates, and 14% in the 2025 Update. Vegetation harvesting was added in the 2021 Update and is less than 1% of the cost in the 2021 and 2022 Updates, 1% of the costs in the 2023 Update, less than 1% of the costs in the 2024 Update, and 1% of the costs in the 2025 Update. Muck removal was 66% of the cost in the original plan and 2017 Supplement, 58% in the 2018 Update, 30% in the 2019 Update, 27% in the 2020 Update, 26% in the 2021–2023 Updates, and 29% in the 2024 and 2025 Updates. Treatment of interstitial water was added in the 2019 Update at 13% of the costs, 12% in the 2020 Update, 11% in the 2021–2023 Updates, and 8% of the costs in the 2024 and 2025 Updates. Oyster bars and living shorelines were 3% of the costs in the original plan through the 2019 Update, and 2% in the 2020–2025 Updates. Project monitoring was 3% of the costs in the original plan through the 2019 Update, and 2% in the 2020–2025 Updates.

Return to **Figure 5-2**.

Figure C-1. Mean Areal Extent of Seagrass, Mean Length of Transects, and Mean Transect Percent Cover

A line and bar graph showing seagrass extent in hectares, mean transect length in meters, and mean transect percent cover. The date range is 1943 and then every year from 1992 to 2024. In 1943, the seagrass extent was 29,538 hectares. In 1992 the extent was 26,333 hectares. The extent gradually climbed to a peak of around 32,000 hectares in 2007 and 2009. The extent then drastically dropped in 2011 to 18,506 hectares. It slowly increased to 23,797 hectares in 2015 and then dropped to 13,438 hectares in 2019. A further drop to 8,021 hectares occurred in 2021. There was an increase in 2023 to 9,924 hectares. The mean transect length followed a similar trend in years starting at 104 meters in 1994 with a peak of 192 meters in 2010. It dropped to 68 meters in 2018 and increased to 76 meters in 2016. It then dropped to a low of 39 meters in 2021, but increased to 50 meters in 2022, 63 meters in 2023, and 83 meters in 2024.The following table summarizes the data shown in the graph.

Year	Seagrass extent (hectares)	Mean transect length (meters)	Mean transect cover (percent)
1943	29,538	No data	No data
1992	26,333	No data	No data
1994	24,893	104	21.46
1995	No data	113	20.45
1996	27,230	122	21.76
1997	No data	132	21.55
1998	No data	143	29.17
1999	28,699	137	27.83
2000	No data	144	26.90
2001	No data	132	23.87
2002	No data	130	18.16
2003	29,799	132	20.78
2004	No data	135	20.06
2005	29,691	130	15.13
2006	No data	153	18.46
2007	32,551	165	17.70
2008	No data	170	17.73
2009	32,209	182	19.10
2010	No data	192	21.02
2011	18,506	130	14.72
2012	No data	108	9.13
2013	20,703	115	9.79
2014	No data	127	10.90
2015	23,797	125	10.02
2016	No data	71	3.91
2017	15,463	70	4.55

Year	Seagrass extent (hectares)	Mean transect length (meters)	Mean transect cover (percent)
2018	No data	68	3.13
2019	13,438	76	4.47
2020	No data	51	1.95
2021	8,021	39	1.61
2022	No data	50	2.23
2023	9,924	63	3.85
2024	No data	83	7.57

Return to **Figure C-1**.

Figure C-2. Mean Chlorophyll-a Concentrations

Line graph of mean chlorophyll-a in micrograms per liter showing lines for the Mosquito Lagoon, Banana River Lagoon, Northern Indian River Lagoon (IRL), North Central IRL, and Sebastian. The following table summarizes the data shown in the graph.

Year	Month	Mosquito Lagoon	Banana River Lagoon	Northern IRL	North Central IRL	Sebastian
1997	1	1.56	12.40	4.46	15.36	14.03
1997	2	1.15	9.61	5.44	5.39	4.38
1997	3	2.43	5.61	3.80	5.15	3.11
1997	4	3.43	2.69	4.88	3.65	3.22
1997	5	4.74	3.25	3.86	3.39	3.45
1997	6	11.16	4.83	5.39	5.09	4.30
1997	7	7.94	3.13	2.87	9.64	5.29
1997	8	10.07	3.44	4.91	14.34	8.60
1997	9	10.52	3.52	4.60	6.13	6.42
1997	10	8.29	2.95	3.88	7.23	9.61
1997	11	6.16	5.62	3.89	6.64	16.48
1997	12	3.64	9.06	3.03	10.43	30.58
1998	1	2.25	6.48	3.18	5.15	4.82
1998	2	1.25	10.03	5.98	9.20	8.61
1998	3	2.73	6.18	7.78	6.63	8.03
1998	4	4.61	7.58	6.27	11.35	3.70
1998	5	5.76	2.41	3.20	6.37	1.92
1998	6	5.32	3.30	2.97	13.82	3.46
1998	7	10.51	6.24	6.99	18.83	4.58
1998	8	8.60	6.34	4.90	17.54	4.09
1998	9	9.61	7.70	3.99	8.77	4.48
1998	10	9.06	9.22	7.38	17.88	8.92
1998	11	6.52	9.00	4.72	4.89	8.65
1998	12	8.62	17.00	9.49	5.09	2.61
1999	1	2.78	11.95	7.53	8.74	3.51
1999	2	4.95	9.40	3.31	5.82	4.16
1999	3	4.59	16.71	7.45	7.37	8.12
1999	4	7.19	14.16	7.24	7.01	9.90
1999	5	7.25	10.33	9.70	3.54	4.06
1999	6	8.83	5.92	9.62	4.46	6.19

Year	Month	Mosquito Lagoon	Banana River Lagoon	Northern IRL	North Central IRL	Sebastian
1999	7	9.71	3.74	8.80	4.83	9.03
1999	8	10.94	3.39	10.24	7.21	4.10
1999	9	4.90	7.31	17.21	10.97	10.80
1999	10	19.08	5.16	23.13	16.00	15.10
1999	11	10.57	4.98	26.20	13.62	25.90
1999	12	5.33	7.58	15.15	10.35	31.40
2000	1	4.53	7.08	2.90	12.47	8.20
2000	2	1.68	4.61	6.96	10.24	6.95
2000	3	2.32	4.12	10.23	9.75	7.93
2000	4	3.51	4.36	6.65	6.11	6.52
2000	5	4.89	5.82	2.43	5.36	4.81
2000	6	6.35	5.61	4.20	5.38	4.68
2000	7	5.14	4.85	9.55	4.19	5.92
2000	8	6.78	5.04	8.23	4.60	8.54
2000	9	9.70	8.18	12.49	9.24	9.70
2000	10	8.40	14.05	10.75	8.64	6.83
2000	11	5.08	8.45	10.20	11.71	9.09
2000	12	5.40	5.33	4.34	11.99	7.76
2001	1	1.68	7.64	3.24	11.50	6.61
2001	2	2.23	7.87	2.24	8.17	5.94
2001	3	2.86	7.80	3.24	5.82	6.35
2001	4	4.75	6.76	4.18	5.98	8.13
2001	5	4.96	5.19	15.89	5.88	3.71
2001	6	10.66	13.24	5.10	5.13	9.13
2001	7	11.85	14.57	13.77	21.93	34.82
2001	8	11.68	15.57	25.63	29.22	37.70
2001	9	11.92	30.51	21.25	44.84	25.30
2001	10	6.22	13.74	9.73	27.02	24.25
2001	11	8.94	19.90	6.36	16.40	22.20
2001	12	6.03	18.53	13.40	22.36	14.40
2002	1	3.80	8.61	3.48	13.68	8.01
2002	2	3.23	7.60	5.26	4.12	3.75
2002	3	2.65	6.65	4.70	3.94	7.65
2002	4	5.90	4.85	4.80	7.76	3.15
2002	5	9.28	3.78	6.80	5.41	1.30
2002	6	5.38	4.20	7.07	9.83	4.20
2002	7	9.43	8.25	13.13	18.66	11.70
2002	8	5.25	16.08	12.53	53.96	5.90
2002	9	7.20	11.85	14.23	31.78	15.55
2002	10	7.65	14.60	10.83	12.10	3.40
2002	11	4.95	6.18	1.17	7.58	11.00
2002	12	0.98	3.00	1.13	5.52	3.90
2003	1	0.78	3.55	1.70	3.48	3.00
2003	2	0.88	1.40	0.90	2.10	2.75
2003	3	1.70	2.58	3.00	4.70	3.70

Year	Month	Mosquito Lagoon	Banana River Lagoon	Northern IRL	North Central IRL	Sebastian
2003	4	0.98	2.28	3.30	2.62	1.40
2003	5	8.98	1.53	4.00	2.52	1.15
2003	6	6.15	4.18	5.60	7.08	4.10
2003	7	8.83	4.03	6.53	5.18	2.60
2003	8	9.73	8.88	2.80	6.71	8.55
2003	9	5.83	15.58	24.57	9.90	3.40
2003	10	2.08	11.35	6.33	15.40	8.30
2003	11	2.00	9.10	3.93	5.60	2.45
2003	12	2.03	5.05	0.67	3.84	6.30
2004	1	0.80	7.60	3.13	4.16	4.30
2004	2	1.30	16.90	0.77	7.18	11.15
2004	3	1.03	9.25	2.37	3.52	3.15
2004	4	4.03	7.75	3.20	2.24	1.00
2004	5	4.44	5.50	0.77	1.34	1.35
2004	6	4.03	3.98	2.73	5.64	1.15
2004	7	8.95	3.18	13.24	15.21	3.45
2004	8	6.28	3.85	8.47	18.12	3.85
2004	9	13.33	5.40	13.77	11.48	6.20
2004	10	5.68	4.48	5.43	9.32	10.70
2004	11	4.68	2.78	3.93	4.16	5.95
2004	12	2.23	5.00	15.67	5.64	3.65
2005	1	3.85	3.25	4.53	3.16	1.60
2005	2	0.85	2.05	1.07	1.72	1.80
2005	3	1.75	2.28	1.23	2.94	3.40
2005	4	2.45	2.85	1.37	2.08	2.45
2005	5	5.65	2.85	1.47	1.62	1.60
2005	6	4.38	1.85	8.67	2.34	3.60
2005	7	11.28	3.13	2.13	3.66	2.65
2005	8	10.63	9.28	10.57	11.94	3.00
2005	9	5.23	8.20	21.53	18.10	9.50
2005	10	10.60	5.33	39.87	47.88	11.40
2005	11	4.03	6.58	5.00	3.92	2.25
2005	12	5.08	15.80	4.63	10.90	8.25
2006	1	1.66	2.90	1.80	2.88	0.90
2006	2	1.17	4.73	1.03	5.02	0.85
2006	3	1.33	2.25	1.80	2.16	0.90
2006	4	1.45	1.38	3.13	1.46	0.65
2006	5	1.58	3.60	2.73	4.02	1.15
2006	6	1.48	2.30	13.83	4.46	1.10
2006	7	6.00	3.05	4.97	4.18	2.00
2006	8	4.53	5.15	4.40	30.56	1.60
2006	9	4.98	10.55	5.90	14.08	2.25
2006	10	0.83	1.20	1.40	1.54	0.50
2006	11	2.98	2.68	10.90	3.62	3.40
2006	12	1.68	2.83	1.07	3.92	3.65

Year	Month	Mosquito Lagoon	Banana River Lagoon	Northern IRL	North Central IRL	Sebastian
2007	1	1.38	3.20	1.07	2.26	2.50
2007	2	1.13	0.83	0.77	1.20	1.15
2007	3	1.03	0.35	0.50	0.92	0.40
2007	4	1.25	1.25	1.70	3.82	1.80
2007	5	1.55	1.48	2.70	1.84	2.00
2007	6	3.08	1.58	1.37	1.28	4.10
2007	7	2.38	0.73	2.57	3.30	2.50
2007	8	4.09	2.10	3.30	6.24	2.25
2007	9	2.43	2.75	1.67	6.50	2.25
2007	10	7.45	5.88	3.30	5.10	11.50
2007	11	1.80	5.20	1.50	5.54	2.00
2007	12	0.40	3.65	0.33	1.64	1.60
2008	1	0.49	3.33	1.33	4.82	0.90
2008	2	0.93	1.95	0.43	1.20	2.05
2008	3	1.60	2.25	1.97	3.18	0.90
2008	4	1.58	3.08	4.57	5.00	0.65
2008	5	2.40	6.68	2.43	6.46	0.70
2008	6	5.83	5.45	3.90	4.24	1.15
2008	7	5.20	6.03	3.00	6.16	1.80
2008	8	4.80	7.08	7.30	10.10	13.45
2008	9	5.35	1.95	15.07	9.10	6.15
2008	10	5.48	4.33	9.23	17.44	9.35
2008	11	5.35	4.23	2.70	7.38	21.05
2008	12	4.18	13.70	10.10	19.08	18.05
2009	1	3.08	3.95	7.27	11.62	4.55
2009	2	2.48	4.75	2.83	10.90	7.50
2009	3	1.25	2.40	0.60	3.64	6.65
2009	4	7.28	5.80	6.30	5.90	3.35
2009	5	5.23	3.18	5.53	6.00	2.70
2009	6	5.38	8.20	2.57	5.86	3.65
2009	7	11.53	16.48	16.47	11.80	10.75
2009	8	16.63	18.07	12.72	21.06	10.14
2009	9	13.42	17.65	28.27	28.07	7.01
2009	10	15.93	13.64	9.34	20.82	4.64
2009	11	7.99	15.99	6.06	10.54	20.85
2009	12	2.93	8.79	3.63	2.96	4.43
2010	1	1.25	14.46	5.09	14.32	62.15
2010	2	2.22	8.31	5.46	11.37	2.98
2010	3	4.57	2.93	3.62	2.50	3.00
2010	4	7.77	8.06	6.99	5.58	8.17
2010	5	9.37	13.05	13.71	14.83	8.94
2010	6	8.36	18.15	9.21	12.64	14.38
2010	7	12.28	19.45	10.08	16.72	10.88
2010	8	17.77	17.94	10.14	21.49	9.75
2010	9	15.68	18.05	20.99	28.86	6.41

Year	Month	Mosquito Lagoon	Banana River Lagoon	Northern IRL	North Central IRL	Sebastian
2010	10	8.89	19.34	17.46	26.14	39.91
2010	11	13.02	12.82	11.30	22.88	11.14
2010	12	3.00	13.73	8.03	22.23	16.42
2011	1	2.96	16.66	3.53	15.72	12.13
2011	2	3.76	19.14	9.16	16.61	15.18
2011	3	5.70	15.52	7.92	11.11	5.86
2011	4	7.62	29.88	15.16	24.25	12.40
2011	5	8.82	38.79	18.76	20.01	5.13
2011	6	8.93	55.84	29.90	21.81	7.09
2011	7	10.99	61.33	46.03	26.55	9.59
2011	8	23.22	65.85	86.44	25.16	7.00
2011	9	60.49	74.03	99.05	45.71	13.35
2011	10	37.42	78.74	115.39	45.96	10.49
2011	11	16.28	16.13	28.59	21.92	16.76
2011	12	18.23	17.66	35.42	7.14	6.20
2012	1	17.13	10.35	20.02	10.21	2.57
2012	2	8.47	7.69	5.42	5.06	2.14
2012	3	5.47	10.85	8.55	11.75	4.25
2012	4	5.63	8.09	7.18	10.83	2.15
2012	5	6.80	5.32	10.23	6.00	1.86
2012	6	6.69	4.72	8.31	12.52	3.53
2012	7	88.79	16.30	47.09	5.13	2.11
2012	8	140.54	16.09	91.27	16.79	2.94
2012	9	63.23	16.68	42.75	12.92	5.65
2012	10	22.66	7.89	6.97	7.74	6.41
2012	11	8.11	5.25	6.08	7.33	2.44
2012	12	7.81	7.94	7.43	12.53	1.44
2013	1	3.87	9.55	3.95	20.70	2.02
2013	2	3.51	5.72	6.01	13.30	2.43
2013	3	2.32	7.72	5.20	6.39	1.05
2013	4	2.77	3.17	6.51	7.13	1.83
2013	5	7.79	3.72	29.62	9.91	3.25
2013	6	39.47	4.34	16.74	8.52	2.02
2013	7	28.34	7.09	17.95	9.81	1.88
2013	8	20.52	16.71	22.46	20.08	3.21
2013	9	17.18	14.02	19.03	21.01	7.82
2013	10	11.75	9.66	37.88	39.74	12.02
2013	11	7.93	12.32	42.17	8.80	6.76
2013	12	4.34	8.04	17.82	7.35	3.78
2014	1	1.85	4.87	2.08	11.31	3.17
2014	2	2.44	5.29	3.87	9.28	2.02
2014	3	3.37	3.52	5.01	4.52	4.18
2014	4	4.94	5.03	8.25	4.43	3.31
2014	5	4.50	5.62	7.02	6.64	1.23
2014	6	7.68	9.15	3.58	9.24	1.23

Year	Month	Mosquito Lagoon	Banana River Lagoon	Northern IRL	North Central IRL	Sebastian
2014	7	5.63	6.44	6.17	10.29	3.28
2014	8	9.59	14.36	4.87	11.40	2.73
2014	9	7.40	19.04	9.89	50.05	7.57
2014	10	7.48	17.62	7.85	16.97	25.55
2014	11	6.51	8.83	4.23	12.27	4.46
2014	12	5.92	14.95	16.50	16.14	13.30
2015	1	8.79	9.69	4.17	7.69	6.05
2015	2	7.54	6.02	13.44	8.85	3.62
2015	3	5.43	6.21	19.10	12.57	2.95
2015	4	9.50	5.53	11.96	5.42	2.93
2015	5	9.84	7.41	12.35	4.41	1.80
2015	6	12.58	5.36	3.54	6.05	1.25
2015	7	18.72	10.07	11.34	8.70	12.89
2015	8	19.47	15.92	23.91	13.11	9.80
2015	9	18.69	19.41	17.09	18.88	11.20
2015	10	14.07	22.07	19.50	44.60	24.50
2015	11	24.91	20.64	19.81	17.60	11.00
2015	12	16.31	8.01	60.99	17.62	15.65
2016	1	20.38	91.83	61.37	60.34	6.92
2016	2	12.57	135.25	50.65	75.95	35.27
2016	3	29.18	117.50	40.00	74.24	67.80
2016	4	25.44	23.98	29.05	20.24	12.52
2016	5	23.12	12.19	24.34	9.65	3.48
2016	6	25.78	7.07	40.23	8.96	3.27
2016	7	27.81	36.49	27.03	16.65	6.61
2016	8	33.06	24.13	41.19	32.68	2.85
2016	9	29.92	29.54	46.01	17.12	3.82
2016	10	15.68	8.45	41.75	9.91	7.16
2016	11	13.02	15.23	34.53	15.01	6.00
2016	12	15.90	12.33	28.38	23.09	4.33
2017	1	7.49	10.42	18.98	14.15	6.30
2017	2	4.91	6.29	16.82	8.63	1.62
2017	3	4.29	6.87	17.39	5.45	3.20
2017	4	4.41	4.55	5.97	7.40	4.58
2017	5	6.76	10.12	10.05	10.42	4.35
2017	6	7.26	14.13	15.06	6.41	2.85
2017	7	10.24	11.20	5.56	11.84	9.38
2017	8	10.80	20.83	7.78	26.45	8.85
2017	9	9.41	11.10	6.67	9.51	4.05
2017	10	23.66	25.27	9.02	99.15	26.02
2017	11	6.70	21.81	7.68	12.02	11.27
2017	12	3.84	34.65	2.93	10.93	7.53
2018	1	2.70	44.47	13.04	39.06	16.78
2018	2	3.20	79.15	18.32	59.67	19.10
2018	3	2.72	89.25	26.41	53.59	12.57

Year	Month	Mosquito Lagoon	Banana River Lagoon	Northern IRL	North Central IRL	Sebastian
2018	4	4.53	64.56	12.99	42.67	4.32
2018	5	7.30	97.11	3.13	22.99	2.94
2018	6	13.09	42.39	6.15	10.85	3.60
2018	7	12.10	53.19	6.87	8.75	3.09
2018	8	22.33	47.41	10.35	10.48	5.74
2018	9	21.25	68.53	39.11	30.21	5.50
2018	10	21.47	31.14	63.07	38.95	3.61
2018	11	21.82	27.03	51.14	25.07	3.67
2018	12	-	-	-	-	8.77
2019	1	12.12	55.24	68.44	26.24	5.03
2019	2	10.67	78.77	52.45	19.75	10.35
2019	3	9.03	60.29	15.51	13.78	7.54
2019	4	7.26	41.96	6.38	11.67	5.86
2019	5	11.25	24.51	8.49	10.72	4.02
2019	6	7.43	27.45	7.88	7.00	2.20
2019	7	16.38	16.40	9.52	9.83	3.38
2019	8	15.59	29.01	72.60	16.77	4.55
2019	9	19.39	18.11	62.30	22.20	7.86
2019	10	12.81	13.16	21.49	11.23	3.75
2019	11	17.63	18.26	10.35	9.53	14.15
2019	12	12.58	7.84	8.13	12.11	9.80
2020	1	8.94	30.35	47.61	17.72	3.93
2020	2	6.39	14.68	7.76	9.00	2.05
2020	3	7.09	11.42	8.15	7.12	4.74
2020	4	5.54	4.48	7.14	3.39	2.83
2020	5	9.21	2.90	3.82	2.69	2.91
2020	6	10.10	7.56	10.90	7.32	5.10
2020	7	23.68	7.00	12.77	29.37	7.09
2020	8	6.97	23.11	41.69	19.39	3.59
2020	9	46.25	51.49	129.39	96.34	3.07
2020	10	22.45	138.02	118.90	236.89	42.21
2020	11	31.60	99.11	108.93	185.26	5.06
2020	12	39.82	108.32	27.30	32.17	4.74
2021	1	26.19	65.37	35.87	27.93	4.39
2021	2	6.62	5.85	21.57	13.08	1.45
2021	3	10.32	15.90	29.73	8.21	3.33
2021	4	3.91	7.85	5.23	6.10	4.27
2021	5	8.71	6.83	5.66	13.31	2.36
2021	6	15.22	11.21	5.93	12.88	4.16
2021	7	16.78	18.17	14.14	25.53	10.00
2021	8	25.66	13.41	18.13	18.74	8.99
2021	9	13.83	18.49	10.28	10.95	5.91
2021	10	11.31	17.66	2.50	16.23	4.10
2021	11	10.84	7.71	15.47	21.36	5.60
2021	12	6.11	3.71	5.13	7.27	6.62
2022	1	8.46	7.80	31.96	11.36	7.96
2022	2	3.03	6.83	5.54	11.95	3.92
2022	3	5.05	4.73	5.24	7.48	2.30
2022	4	14.95	4.31	10.23	9.05	2.58
2022	5	6.93	3.08	2.55	4.79	2.03
2022	6	5.13	9.59	2.99	4.39	2.43
2022	7	15.22	6.08	7.43	22.16	12.82
2022	8	15.47	6.90	17.55	26.36	13.96
2022	9	14.89	6.20	21.75	29.29	3.76
2022	10	14.66	13.22	17.48	24.51	24.28
2022	11	7.16	9.69	12.75	15.34	5.28
2022	12	7.41	12.12	20.01	16.03	6.37

Year	Month	Mosquito Lagoon	Banana River Lagoon	Northern IRL	North Central IRL	Sebastian
2023	1	6.52	7.36	13.08	11.52	5.24
2023	2	5.39	11.65	19.93	16.73	11.38
2023	3	6.00	8.88	13.26	13.33	3.59
2023	4	5.93	5.70	5.84	9.06	2.67
2023	5	4.01	3.03	8.59	4.98	12.36
2023	6	3.85	13.92	8.92	5.27	2.70
2023	7	14.81	12.55	16.53	96.79	6.49
2023	8	21.20	5.91	21.87	73.80	84.79
2023	9	6.00	6.07	9.60	6.58	5.44
2023	10	8.23	7.25	10.89	19.85	11.48
2023	11	6.33	4.38	11.58	12.39	3.96
2023	12	3.12	2.70	6.45	5.07	6.84

Return to **Figure C-2**.

Table 1. Project Application Table

Project Number	Project Name	Entity	Project Type	Eligible Cost-Share Rate ($/pound TN)	Total Cost ($/pound TN)	TN Reduction (pounds/year)	Total Cost	Maximum Eligible SOIRL Cost Share	Eligible Cost Share Request	Cumulative SOIRL Funding Increase	Dollar Amount Secured Grants	Notes
264	Unincorporated Countywide Vegetation Harvesting 2	Brevard County Natural Resources	Vegetation Harvesting	$114	$114	4,147	$472,758	$472,758	$472,758	$472,758	$0	Expand aquatic vegetation harvesting program; Remove an estimated 2,750,000 pounds of plant material; purchase an amphibious excavator, rake, work boat, and nanobubble generator.
265	Restoration of native clams in the Indian River Lagoon - Titusville	Indian River Lagoon Clam Restoration Project	Clam	$172	$172	1,584	$272,000	$272,000	$272,000	$744,758	$0	Distribute clam seed via drone; Repatriate 24 million clams in the Titusville area with a target survival of 8 million reproductively capable clams.
266	Restoration of native clams in the Indian River Lagoon - Hog Point Cove	Indian River Lagoon Clam Restoration Project	Clam	$172	$172	990	$170,000	$170,000	$170,000	$914,758	$0	Distribute clam seed via drone; Repatriate 15 million clams in the Hog's Point Cove area with a target survival of 5 million reproductively capable clams.
267	Restoration of native clams in the Indian River Lagoon - Grant Island	Indian River Lagoon Clam Restoration Project	Clam	$172	$172	990	$170,000	$170,000	$170,000	$1,084,758	$0	Distribute clam seed via drone; Repatriate 15 million clams to the Grant Island area with a target survival of 5 million reproductively capable clams.
268	Restoration of native clams in the Indian River Lagoon - Rockledge	Indian River Lagoon Clam Restoration Project	Clam	$172	$172	594	$102,000	$102,000	$102,000	$1,186,758	$0	Distribute clam seed via drone; Repatriate 9 million clams to the Rockledge area with a target survival of 3 million reproductively capable clams.
269	Coleman Pond Circulator	City of Titusville	Stormwater	$357	$357	353	$126,021	$126,021	$126,021	$1,312,779	$0	Install pond circulator device in conjunction with previously installed floating wetland islands to increase nutrient uptake.
270	Tennessee St Baffle Box	City of Titusville	Stormwater	$357	$371	1,442	$535,000	$514,794	$514,794	$1,827,573	$0	Install second generation baffle box to treat 673 acres.
271	Osprey Pond Circulator	City of Titusville	Stormwater	$357	$413	242	$100,000	$86,394	$86,394	$1,913,967	$0	Install pond circulator device in conjunction with previously installed floating wetland islands to increase nutrient uptake.
272	Brevard Zoo North IRL Oyster Project 4	Brevard Zoo	Oyster	$475	$475	1,742	$827,450	$827,450	$827,450	$2,741,417	$0	Construct 43,560 square feet of oyster bars.
273	Brevard Zoo Central IRL Oyster Project 5	Brevard Zoo	Oyster	$475	$475	1,504	$714,400	$714,400	$714,400	$3,455,817	$0	Construct 37,602 square feet of oyster bars. This project is scalable.
274	Waelti Drive Pond Retrofit	Brevard County Natural Resources	Stormwater	$357	$858	274	$235,000	$97,818	$97,818	$3,553,635	$137,182	Install floating wetlands with turbidity curtains in wet pond.

Project Number	Project Name	Entity	Project Type	Eligible Cost-Share Rate ($/pound TN)	Total Cost ($/pound TN)	TN Reduction (pounds/year)	Total Cost	Maximum Eligible SOIRL Cost Share	Eligible Cost Share Request	Cumulative SOIRL Funding Increase	Dollar Amount Secured Grants	Notes
275	Lake Washington & Croton Road Pond Retrofit	Brevard County Natural Resources	Stormwater	$357	$1,253	158	$198,000	$56,406	$56,406	$3,610,041	$141,594	Install floating wetlands with turbidity curtains in wet pond.
276	N. Wickham & Conservation Place Wet Pond Retrofit	Brevard County Natural Resources	Stormwater	$357	$1,505	261	$392,925	$93,177	$93,177	$3,703,218	$221,224	Install floating wetlands with turbidity curtains in wet pond.
277	Darrow Baffle Box	City of Melbourne	Stormwater	$357	$1,589	536	$851,500	$191,352	$191,352	$3,894,570	$0	Install third-generation baffle box
278	Line Street Cemetery Baffle Box	City of Melbourne	Stormwater	$357	$2,409	770	$1,855,000	$274,890	$274,890	$4,169,460	$0	Install third-generation baffle box
279	Melbourne Cemetery Baffle Box	City of Melbourne	Stormwater	$357	$3,597	606	$2,180,000	$216,342	$216,342	$4,385,802	$0	Install third-generation baffle box
280	Westside Basin Water Quality Improvements	City of Satellite Beach	Stormwater	$409	$12,051	137	$1,650,960	$56,033	$56,033	$4,441,835	$0	Install 26 biosorption activated media tree wells, 9 BAM bioswales, and 53 inlet baskets.
281	Cocoa Isles Blvd Dry Pond	City of Cocoa Beach	Stormwater	$409	$40,714	14	$570,000	$5,726	$5,726	$4,447,561	$0	Install bioretention area enhanced with biosorption activated media and planted with Florida natives.
282	South Beaches Wastewater Treatment Plant Upgrade	Brevard County Utility Services Department	Wastewater Treatment Facility Upgrade	$431	$7,552	5,734	$43,305,079	$2,471,354	$2,471,354	$6,918,915	$14,200,000	Convert to Advanced Wastewater Treatment; Project will reduce total nitrogen concentration to 2 mg/L and total phosphorus concentration to 1 mg/L.
283	Port Saint John Wastewater Treatment Plant Replacement	Brevard County Utility Services Department	Wastewater Treatment Facility Upgrade	$431	$17,559	2,278	$40,000,000	$981,818	$981,818	$7,900,733	$0	Design new plant with Advanced Wastewater Treatment to replace the existing facility in Port Saint John. Land has not been acquired.
284	Palm Bay Septic to Sewer Conversion Project - Sewer Available Not Connected (SANC) Phase 2	City of Palm Bay	Quick Connect	$1,600	$6,998	1,011	$7,072,000	$1,616,992	$1,616,992	$9,517,725	$0	Connect up to 416 properties from septic to sewer.

= Not recommended by the Citizen Oversight Committee

= Recommended with the stipulation to review and contract up to the amount exceeding regulatory requirements

Save Our Indian River Lagoon Funding Application Short Form:

Unincorporated Countywide Vegetation Harvesting 2

Project Details
Entity: Brevard County Stormwater Management

Project Type: Aquatic Vegetation Harvesting

Sub Lagoon: All

Location: Stormwater pond near Sykes Creek

Project Description: Brevard County seeks to expand its aquatic vegetation harvesting program through the acquisition of an amphibious excavator with a specialized aquatic vegetation rake, plus a second work boat with an attachment designed to harvest water lettuce and water hyacinth. Approimately $465,000 of this request is pursuant to the aforementioned acquisitions. The remaining funds will be used for sediment lab analysis and on-site monitoring equipment for a pilot nanobubble generator project at a brackish stormwater pond adjacent to Sykes Creek in order to determine quantify any resulting Total Nitrogen benefits. This request will allow the initial removal of 2,750,000 pounds of excess vegetation from stormwater management sites throughout Brevard situated within the Indian River Lagoon watershed.

Education and Outreach:

Estimated Water Quality Benefits
Total Nitrogen Reduction (lbs/year): 4,147

Total Phosphorus Reduction (lbs/year): 593

Costs
Total Project Cost: $472,758

Estimated Cost per Pound Total Nitrogen Removed: $114

Estimated Cost per Pound Total Phosphorus Removed: $797

Eligible Tax Funding Cost Share: $472,758

Project Funding
Is Local Match in Adopted Budget: No

Dollar Amount of Local Cost Share:

Dollar Amount Secured Grant(s):

Additional Information

Other Indian River Lagoon Benefits: For decades, management of such vegetation relied chiefly on aquatic herbicides, resulting in downstream release of sequestered nutrients and organic matter.

Notes:

Save Our Indian River Lagoon Funding Application Short Form:

Restoration of native clam communities in the Indian River Lagoon for improved water quality - Titusville

Project Details

Entity: Indian River Lagoon Clam Restoration Project

Project Type: Oyster/Clam Restoration

Sub Lagoon: North Indian River Lagoon

Location: 28.519299° -80.737211°

Project Description: The Indian River Lagoon (IRL) is in critical condition and many resource management agencies and non-profits are supporting a myriad of projects and programs to find solutions to our water quality crisis. From muck dredging to septic to sewer conversion to restoring oysters and mangroves, these projects are addressing the fundamental problem of excess nitrogen and phosphorus, however the often underestimated clam has received relatively little attention. Clams have been a significant ecological entity in the Indian River Lagoon for centuries, however, due to their life cycle and ecology, they are rarely seen unless one is looking in the sediment to find them. An estimated 9.2 billion clams were removed from the Indian River Lagoon during the 80's and 90's when little regulation was in place on open harvest of wild clams. In the early 2000's clam landings were at an all time low and the population teetered on collapse just prior to the super algal blooms of 2011 and beyond. Today, the Indian River lagoon Clam Restoration Project, a consortium of scientists, sportsmen, private businesses and conservationist are working to bring clams back in numbers that can aid in attenuating the algal blooms that keep our seagrasses from re-establishing. This group has already successfully repatriated 28 million adult clams and 13 million juvenile clams to IRL waters over the last five years. The effort invested in finding superior genetic resiliency in native hard clam varieties and the lessons learned by experimentation in out-planting these clams has provided this group with the tools and knowledge to maximize the effectiveness of restoration dollars. Similar to oyster restoration projects, this work leverages the natural life cycle of clams and their reproductive capacity to exponentially grow the effectiveness of their biofiltration activities.

This project proposes to use new clam restoration techniques that have been tested over the 20 months (Osborne et al. 2024) and have proven effective and significantly lower the cost of clam restoration activities. Using a drone, we will distribute 2-3 mm clam seed at densities needed to achieve 1 million clams per acre over sandy bottom. This technique uses no netting or other protective gear and thus reduces environmental risk while also reducing labor costs for maintaining protective gear. Overall, this technique allows us to restore clams for less than half the cost of our previous work. Seed clams will be distributed on approved grounds and monitored for the duration of the project period to quantify the survival and determine mass of

Nitrogen and Phosphorus removed from the water column. Additionally, this approach helps build ecosystem function by providing much needed energy to the lower trophic levels that in turn support healthy fisheries.

This project will repatriate 24 million clams to the Indian River Lagoon (IRL) adjacent to Titusville (Project Zone A) in the Northern IRL with a target survival of 8 million adult/reproductively capable clams. After one year these clams will be reproductively viable with spawning potential in the 100's of millions of larvae that can continue to colonize the IRL naturally. Because the portal does not allow for calculated costs for clams (oysters only) the relevent statistics are included lbs of Nitrogen removed = 1584; cost per lb of Nitrogen = $172; lbs of Phosphorus removed = 528; cost per lb of Phosphorus = $515.

Education and Outreach: We utilize a diversity of outreach strategies to educate and engage the public about the lagoon and our specific efforts to help its recovery. Through informational spots on television via Blair Wiggins Outdoors, local radio (Jim Ross Catch a Memory show), and routine lectures/presentations in public forums, scientific meetings and K-12 schools, we reached over 300,000 members of the pubic. Public outreach through social media outlets has become the premier avenue for increasing awareness about relevant Lagoon issues. Project partners, Coastal Conservation Association, University of Florida Whitney Laboratory, Lagoon Solutions, New Swell Mangrove and Shoreline Restoration, Florida Oceanographic Society, and several others leveraged social media platforms to reach over 500,000 people last year concerning clam restoration. Outreach through tv and print based news media has also been impactful with numbers of viewers estimated to be in excess of 10 million last year. We will continue these efforts in the years to come as a part of our project performance.

Estimated Water Quality Benefits

Total Nitrogen Reduction (lbs/year): 1,584

Total Phosphorus Reduction (lbs/year): 528

Costs

Total Project Cost: $272,000

Estimated Cost per Pound Total Nitrogen Removed: $172

Estimated Cost per Pound Total Phosphorus Removed: $515

Eligible Tax Funding Cost Share: $272,000

Project Funding

Is Local Match in Adopted Budget:

Dollar Amount of Local Cost Share:

Dollar Amount Secured Grant(s): A $2,000,000 grant has been secured to start this project and offset hatchery and labor costs.

Additional Information

Other Indian River Lagoon Benefits: Seagrasses and clams exhibit a mutually beneficial relationship when grown together. Clams provide nutrients directly to the rooting zone of seagrasses and also alleviate sulfide stress from anaerobic sediments. Seagrass health and performance increases with presence of clams.

Juvenile clams also benefit the complex food web of the IRL estuary. While attrition is natural in shellfish beds, we see benefit from this predation by crabs and fish which then supplies higher trophic levels with a food source ultimately providing lift to the entire ecosystem.

Beyond Nitrogen and Phosphorus removal, the ability to reduce turbidity in the water column is tremendously helpful to catalyze seagrass return. Further, the constant removal of algal biomass can further reduce available nutrients in these areas as filtration process couples algal particles with the sediment, effectively slowing the nutrient recycling process. Five million clams filter fifty million gallons of water per day!

Projecting this project out five years suggests 128 million clams sequestering 115,200 kilograms of Nitrogen and 3,840 kilograms of P while filtering over 1 trillion gallons of water per day!

Notes:

Save Our Indian River Lagoon Funding Application Short Form:

Restoration of native clam communities in the Indian River Lagoon for improved water quality - Hog Point Cove

Project Details

Entity: Indian River Lagoon Clam Restoration Project

Project Type: Oyster/Clam Restoration

Sub Lagoon: Central Indian River Lagoon

Location: 27.997808° -80.527443°

Project Description: The Indian River Lagoon (IRL) is in critical condition and many resource management agencies and non-profits are supporting a myriad of projects and programs to find solutions to our water quality crisis. From muck dredging to septic to sewer conversion to restoring oysters and mangroves, these projects are addressing the fundamental problem of excess nitrogen and phosphorus, however the often underestimated clam has received relatively little attention. Clams have been a significant ecological entity in the Indian River Lagoon for centuries, however, due to their life cycle and ecology, they are rarely seen unless one is looking in the sediment to find them. An estimated 9.2 billion clams were removed from the Indian River Lagoon during the 80's and 90's when little regulation was in place on open harvest of wild clams. In the early 2000's clam landings were at an all time low and the population teetered on collapse just prior to the super algal blooms of 2011 and beyond. Today, the Indian River lagoon Clam Restoration Project, a consortium of scientists, sportsmen, private businesses and conservationist are working to bring clams back in numbers that can aid in attenuating the algal blooms that keep our seagrasses from re-establishing. This group has already successfully repatriated 28 million adult clams and 13 million juvenile clams to IRL waters over the last five years. The effort invested in finding superior genetic resiliency in native hard clam varieties and the lessons learned by experimentation in out-planting these clams has provided this group with the tools and knowledge to maximize the effectiveness of restoration dollars. Similar to oyster restoration projects, this work leverages the natural life cycle of clams and their reproductive capacity to exponentially grow the effectiveness of their biofiltration activities.

This project proposes to use new clam restoration techniques that have been tested over the 20 months (Osborne et al. 2024) and have proven effective and significantly lower the cost of clam restoration activities. Using a drone, we will distribute 2-3 mm clam seed at densities needed to achieve 1 million clams per acre over sandy bottom. This technique uses no netting or other protective gear and thus reduces environmental risk while also reducing labor costs for maintaining protective gear. Overall, this technique allows us to restore clams for less than half the cost of our previous work. Seed clams will be distributed on approved grounds and monitored for the duration of the project period to quantify the survival and determine mass of

Nitrogen and Phosphorus removed from the water column. Additionally, this approach helps build ecosystem function by providing much needed energy to the lower trophic levels that in turn support healthy fisheries.

This project will repatriate 15 million clams to the Indian River Lagoon (IRL) in Hog's Point Cove in the Central IRL with a target survival of 5 million adult/reproductively capable clams. After one year these clams will be reproductively viable with spawning potential in the 100's of millions of larvae that can continue to colonize the IRL naturally. Because the portal does not allow entry of calculated numbers (clams are different from oysters) they are provided here lbs of Nitrogen removed = 990; cost per lb of Nitrogen = $172; lbs of Phosphorus removed = 330; cost per lb of Phosphorus = $515.

Education and Outreach: We utilize a diversity of outreach strategies to educate and engage the public about the lagoon and our specific efforts to help its recovery. Through informational spots on television via Blair Wiggins Outdoors, local radio (Jim Ross Catch a Memory show), and routine lectures/ presentations in public forums, scientific meetings and K-12 schools, we reached over 300,000 members of the pubic. Public outreach through social media outlets has become the premier avenue for increasing awareness about relevant Lagoon issues. Project partners, Coastal Conservation Association, University of Florida Whitney Laboratory, Lagoon Solutions, New Swell Mangrove and Shoreline Restoration, Florida Oceanographic Society, and several others leveraged social media platforms to reach over 500,000 people last year concerning clam restoration. Outreach through tv and print based news media has also been impactful with numbers of viewers estimated to be in excess of 10 million last year. We will continue these efforts in the years to come as a part of our project performance.

Estimated Water Quality Benefits

Total Nitrogen Reduction (lbs/year): 990

Total Phosphorus Reduction (lbs/year): 330

Costs

Total Project Cost: $170,000

Estimated Cost per Pound Total Nitrogen Removed: $172

Estimated Cost per Pound Total Phosphorus Removed: $515

Eligible Tax Funding Cost Share: $170,000

Project Funding

Is Local Match in Adopted Budget:

Dollar Amount of Local Cost Share:

Dollar Amount Secured Grant(s): A $2,000,000 grant has been secured to start this project and offset hatchery and labor costs.

Additional Information

Other Indian River Lagoon Benefits: Seagrasses and clams exhibit a mutually beneficial relationship when grown together. Clams provide nutrients directly to the rooting zone of seagrasses and also alleviate sulfide stress from anaerobic sediments. Seagrass health and performance increases with presence of clams.

Juvenile clams also benefit the complex food web of the IRL estuary. While attrition is natural in shellfish beds, we see benefit from this predation by crabs and fish which then supplies higher trophic levels with a food source ultimately providing lift to the entire ecosystem.

Beyond Nitrogen and Phosphorus removal, the ability to reduce turbidity in the water column is tremendously helpful to catalyze seagrass return. Further, the constant removal of algal biomass can further reduce available nutrients in these areas as filtration process couples algal particles with the sediment, effectively slowing the nutrient recycling process. Five million clams filter fifty million gallons of water per day!

Notes:

Save Our Indian River Lagoon Funding Application Short Form:

Restoration of native clam communities in the Indian River Lagoon for improved water quality - Grant Island

Project Details

Entity: Indian River Lagoon Clam Restoration Project

Project Type: Oyster/Clam Restoration

Sub Lagoon: Central Indian River Lagoon

Location: 27.925064° -80.506793° (on state aquaculture lease owned by Blair Wiggins)

Project Description: The Indian River Lagoon (IRL) is in critical condition and many resource management agencies and non-profits are supporting a myriad of projects and programs to find solutions to our water quality crisis. From muck dredging to septic to sewer conversion to restoring oysters and mangroves, these projects are addressing the fundamental problem of excess nitrogen and phosphorus, however the often underestimated clam has received relatively little attention. Clams have been a significant ecological entity in the Indian River Lagoon for centuries, however, due to their life cycle and ecology, they are rarely seen unless one is looking in the sediment to find them. An estimated 9.2 billion clams were removed from the IRL during the 80's and 90's when little regulation was in place on open harvest of wild clams. In the early 2000's clam landings were at an all time low and the population teetered on collapse just prior to the super algal blooms of 2011 and beyond. Today, the Indian River lagoon Clam Restoration Project, a consortium of scientists, sportsmen, private businesses and conservationist are working to bring clams back in numbers that can aid in attenuating the algal blooms that keep our seagrasses from re-establishing. This group has already successfully repatriated 28 million adult clams and 13 million juvenile clams to IRL waters over the last five years. The effort invested in finding superior genetic resiliency in native hard clam varieties and the lessons learned by experimentation in out-planting these clams has provided this group with the tools and knowledge to maximize the effectiveness of restoration dollars. Similar to oyster restoration projects, this work leverages the natural life cycle of clams and their reproductive capacity to exponentially grow the effectiveness of their biofiltration activities.

This project proposes to use new clam restoration techniques that have been tested over the 20 months (Osborne et al. 2024) and have proven effective and significantly lower the cost of clam restoration activities. Using a drone, we will distribute 2-3 mm clam seed at densities needed to achieve 1 million clams per acre over sandy bottom. This technique uses no netting or other protective gear and thus reduces environmental risk while also reducing labor costs for maintaining protective gear. Overall, this technique allows us to restore clams for less than half the cost of our previous work. Seed clams will be distributed on approved grounds and monitored for the duration of the project period to quantify the survival and determine mass of Nitrogen and Phosphorus removed from the water column. Additionally, this approach helps build ecosystem function by providing much needed energy to the lower trophic levels that in turn support healthy fisheries.

This project will repatriate 15 million clams to the Indian River Lagoon (IRL) adjacent to Grant Island in the Central IRL with a target survival of 5 million adult/reproductively capable clams. After one year these clams will be reproductively viable with spawning potential in the 100's of millions of larvae that can continue to colonize the IRL naturally. Because the online submission does not allow for entering the specific N and P data (self calculated for oysters only), it is included here lbs of Nitrogen removed = 990; cost per lb of Nitrogen =$172; lbs of Phosphorus removed = 330 cost per lb of Phosphorus = $515.

Education and Outreach: We utilize a diversity of outreach strategies to educate and engage the public about the lagoon and our specific efforts to help its recovery. Through informational spots on television via Blair Wiggins Outdoors, local radio (Jim Ross Catch a Memory show), and routine lectures/ presentations in public forums, scientific meetings and K-12 schools, we reached over 300,000 members of the pubic. Public outreach through social media outlets has become the premier avenue for increasing awareness about relevant Lagoon issues. Project partners, Coastal Conservation Association, University of Florida Whitney Laboratory, Lagoon Solutions, New Swell Mangrove and Shoreline Restoration, Florida Oceanographic Society, and several others leveraged social media platforms to reach over 700,000 people last year concerning clam restoration. Outreach through tv and print based news media has also been impactful with numbers of viewers estimated to be in excess of 10 million last year. We will continue these efforts in the years to come as a part of our project performance.

Estimated Water Quality Benefits

Total Nitrogen Reduction (lbs/year): 990

Total Phosphorus Reduction (lbs/year): 330

Costs

Total Project Cost: $170,000

Estimated Cost per Pound Total Nitrogen Removed: $172

Estimated Cost per Pound Total Phosphorus Removed: $515

Eligible Tax Funding Cost Share: $170,000

Project Funding

Is Local Match in Adopted Budget:

Dollar Amount of Local Cost Share:

Dollar Amount Secured Grant(s): A $2,000,000 grant has been secured to start this project and offset hatchery and labor costs.

Additional Information

Other Indian River Lagoon Benefits: Seagrasses and clams exhibit a mutually beneficial relationship when grown together. Clams provide nutrients directly to the rooting zone of seagrasses and also alleviate sulfide stress from anaerobic sediments. Seagrass health and performance increases with presence of clams.

Juvenile clams also benefit the complex food web of the IRL estuary. While attrition is natural in shellfish beds, we see benefit from this predation by crabs and fish which then supplies higher trophic levels with a food source ultimately providing lift to the entire ecosystem.

Beyond Nitrogen and Phosphorus removal, the ability to reduce turbidity in the water column is tremendously helpful to catalyze seagrass return. Further, the constant removal of algal biomass can further reduce available nutrients in these areas as filtration process couples algal particles with the sediment, effectively slowing the nutrient recycling process. Five million clams filter fifty million gallons of water per day!

Notes:

Save Our Indian River Lagoon Funding Application Short Form:

Restoration of native clam communities in the Indian River Lagoon for improved water quality - Rockledge

Project Details

Entity: Indian River Lagoon Clam Restoration Project

Project Type: Oyster/Clam Restoration

Sub Lagoon: North Indian River Lagoon

Location: 28.231322° -80.671708° 6485 south US-1, Rockledge, FL 32955

Project Description: The Indian River Lagoon (IRL) is in critical condition and many resource management agencies and non-profits are supporting a myriad of projects and programs to find solutions to our water quality crisis. From muck dredging to septic to sewer conversion to restoring oysters and mangroves, these projects are addressing the fundamental problem of excess nitrogen and phosphorus, however the often underestimated clam has received relatively little attention. Clams have been a significant ecological entity in the Indian River Lagoon for centuries, however, due to their life cycle and ecology, they are rarely seen unless one is looking in the sediment to find them. An estimated 9.2 billion clams were removed from the IRL during the 80's and 90's when little regulation was in place on open harvest of wild clams. In the early 2000's clam landings were at an all time low and the population teetered on collapse just prior to the super algal blooms of 2011 and beyond. Today, the Indian River lagoon Clam Restoration Project, a consortium of scientists, sportsmen, private businesses and conservationist are working to bring clams back in numbers that can aid in attenuating the algal blooms that keep our seagrasses from re-establishing. This group has already successfully repatriated 28 million adult clams and 13 million juvenile clams to IRL waters over the last five years. The effort invested in finding superior genetic resiliency in native hard clam varieties and the lessons learned by experimentation in out-planting these clams has provided this group with the tools and knowledge to maximize the effectiveness of restoration dollars. Similar to oyster restoration projects, this work leverages the natural life cycle of clams and their reproductive capacity to exponentially grow the effectiveness of their biofiltration activities.

This project proposes to use new clam restoration techniques that have been tested over the 20 months (Osborne et al. 2024) and have proven effective and significantly lower the cost of clam restoration activities. Using a drone, we will distribute 2-3mm clam seed at densities needed to achieve 1 million clams per acre over sandy bottom. This technique uses no netting or other protective gear and thus reduces environmental risk while also reducing labor costs for maintaining protective gear. Overall, this technique allows us to restore clams for less than half the cost of our previous work. Seed clams will be distributed on approved grounds and monitored for the duration of the project period to quantify the survival and determine mass of N and P removed from the water column. Additionally, this approach helps build ecosystem function by providing much needed energy to the lower trophic levels that in turn support healthy fisheries.

This project will repatriate 9 mil clams to the Indian River Lagoon (IRL) in the Rockledge area (Project zone B) in the Northern IRL with a target survival of 3 mil adult/ reproductively capable clams. After one year these clams will be reproductively viable with spawning potential in the 100's of millions of larvae that can continue to colonize the IRL naturally. Because the portal does not allow for calculated costs for clams (oysters only) the relevant statistics are included lbs of Nitrogen removed = 594; cost per lb of Nitrogen = $172; lbs of Phosphorus removed = 198, cost per lb of Phosphorus = $515.

Education and Outreach: We utilize a diversity of outreach strategies to educate and engage the public about the lagoon and our specific efforts to help its recovery. Through informational spots on television via Blair Wiggins Outdoors, local radio (Jim Ross Catch a Memory show), and routine lectures/ presentations in public forums, scientific meetings and K-12 schools, we reached over 300,000 members of the pubic. Public outreach through social media outlets has become the premier avenue for increasing awareness about relevant Lagoon issues. Project partners, Coastal Conservation Association, University of Florida Whitney Laboratory, Lagoon Solutions, New Swell Mangrove and Shoreline Restoration, Florida Oceanographic Society, and several others leveraged social media platforms to reach over 500,000 people last year concerning clam restoration. Outreach through tv and print based news media has also been impactful with numbers of viewers estimated to be in excess of 10 million last year. We will continue these efforts in the years to come as a part of our project performance.

Estimated Water Quality Benefits

Total Nitrogen Reduction (lbs/year): 594

Total Phosphorus Reduction (lbs/year): 198

Costs

Total Project Cost: $102,000

Estimated Cost per Pound Total Nitrogen Removed: $172

Estimated Cost per Pound Total Phosphorus Removed: $515

Eligible Tax Funding Cost Share: $102,000

Project Funding

Is Local Match in Adopted Budget:

Dollar Amount of Local Cost Share:

Dollar Amount Secured Grant(s): A $2,000,000 grant has been secured to start this project and offset hatchery and labor costs.

Additional Information

Other Indian River Lagoon Benefits: Seagrasses and clams exhibit a mutually beneficial relationship when grown together. Clams provide nutrients directly to the rooting zone of seagrasses and also alleviate sulfide stress from anaerobic sediments. Seagrass health and performance increases with presence of clams.

Juvenile clams also benefit the complex food web of the IRL estuary. While attrition is natural in shellfish beds, we see benefit from this predation by crabs and fish which then supplies higher trophic levels with a food source ultimately providing lift to the entire ecosystem.

Beyond Nitrogen and Phosphorus removal, the ability to reduce turbidity in the water column is tremendously helpful to catalyze seagrass return. Further, the constant removal of algal biomass can further reduce available nutrients in these areas as filtration process couples algal particles with the sediment, effectively slowing the nutrient recycling process. Three million clams filter thirty million gallons of water per day!

Five year growth of clam population suggest after 5 years there could be 48 million clams, sequestering 4,320 lbs of Nitrogen and 1,440 lbs of Phosphorus all while filtering 480 million gallons of water!

Notes:

Save Our Indian River Lagoon Funding Application Short Form: **Coleman Pond Circulator**

Project Details
Entity: City of Titusville

Project Type: Stormwater

Sub Lagoon: North Indian River Lagoon

Location: 28.630326; -80.826648

Project Description: Installation of a pond circulator device in conjunction with already installed floating wetland islands. This project will install a pond circulator to increase the nutrient uptake by 10% as shown in Brevard County's pilot study.

Education and Outreach:

Estimated Water Quality Benefits
Total Nitrogen Reduction (lbs/year): 353

Total Phosphorus Reduction (lbs/year): 55

Costs
Total Project Cost: $126,021

Estimated Cost per Pound Total Nitrogen Removed: $357

Estimated Cost per Pound Total Phosphorus Removed: $2,291

Eligible Tax Funding Cost Share: $126,021

Project Funding
Is Local Match in Adopted Budget: No

Dollar Amount of Local Cost Share:

Dollar Amount Secured Grant(s):

Additional Information
Other Indian River Lagoon Benefits:

Notes:

Save Our Indian River Lagoon Funding Application Short Form:

Tennessee St Baffle Box

Project Details

Entity: City of Titusville

Project Type: Stormwater

Sub Lagoon: North Indian River Lagoon

Location: 28.629917, -80.827499; Tennessee St & Georgia Ave

Project Description: Installation of a second generation baffle box fitted with nutrient reducing biosorption filtration media at Tennessee St within the Chain of Lakes Basin. This baffle box will treat 673 acres of highly developed land prior to the water discharging into the Indian River Lagoon. This project will remove 1,442 lbs/year of total nitrogen and 191 lbs/year of total phosphorus.

Education and Outreach:

Estimated Water Quality Benefits

Total Nitrogen Reduction (lbs/year): 1,442

Total Phosphorus Reduction (lbs/year): 191

Costs

Total Project Cost: $535,000

Estimated Cost per Pound Total Nitrogen Removed: $371

Estimated Cost per Pound Total Phosphorus Removed: $2,801

Eligible Tax Funding Cost Share: $514,794

Project Funding

Is Local Match in Adopted Budget: No

Dollar Amount of Local Cost Share:

Dollar Amount Secured Grant(s):

Additional Information

Other Indian River Lagoon Benefits:

Notes:

Save Our Indian River Lagoon Funding Application Short Form: **Osprey Pond Circulator**

Project Details
Entity: City of Titusville

Project Type: Stormwater

Sub Lagoon: North Indian River Lagoon

Location: 28.622834; -0.814727

Project Description: Installation of a pond circulator device in conjunction with already installed floating wetland islands. This project will install a pond circulator to increase the nutrient uptake by 10% as shown in Brevard County's pilot study.

Education and Outreach:

Estimated Water Quality Benefits
Total Nitrogen Reduction (lbs/year): 242

Total Phosphorus Reduction (lbs/year): 35

Costs
Total Project Cost: $100,000

Estimated Cost per Pound Total Nitrogen Removed: $413

Estimated Cost per Pound Total Phosphorus Removed: $2,857

Eligible Tax Funding Cost Share: $86,394

Project Funding
Is Local Match in Adopted Budget: No

Dollar Amount of Local Cost Share:

Dollar Amount Secured Grant(s):

Additional Information
Other Indian River Lagoon Benefits:

Notes:

Save Our Indian River Lagoon Funding Application Short Form: **Brevard Zoo North IRL Oyster Project 4**

Project Details
Entity: Brevard Zoo

Project Type: Oyster/Clam Restoration

Sub Lagoon: North Indian River Lagoon

Location: Proposed sites, substitutions will be selected as needed: 28.156461454678997, -80.63919330062829; 28.15969103679429, -80.64063024338961; 28.106605990843182, -80.61494431751252; 28.101114473501195, -80.61239488218364

Project Description: Brevard Zoo intends to construct 43,560 square feet of oyster projects in the North Basin of the Indian River Lagoon. The designs will be site specific and will be approved by the County before construction begins. We will consult with the County to determine whether or not live oysters need to be added to each specific location.

Education and Outreach: Brevard Zoo regularly engages the community in restoration efforts and education. We attend community events, hold presentations in schools, host volunteer opportunities and bring people into the Zoo to learn about the state of the lagoon and current conservation efforts, including oyster projects. We are not asking for any additional funding to continue this effort.

Estimated Water Quality Benefits
Total Nitrogen Reduction (lbs/year): 1,742

Total Phosphorus Reduction (lbs/year): 44

Costs
Total Project Cost: $827,450

Estimated Cost per Pound Total Nitrogen Removed: $475

Estimated Cost per Pound Total Phosphorus Removed: $18,806

Eligible Tax Funding Cost Share: $827,450

Project Funding
Is Local Match in Adopted Budget: No

Dollar Amount of Local Cost Share: $0

Dollar Amount Secured Grant(s): $0

Additional Information

Other Indian River Lagoon Benefits: Oyster reef installations not only reduce nutrients, but they also support hundreds of species in the Indian River Lagoon, including many fish and crab species.

Notes:

Save Our Indian River Lagoon Funding Application Short Form: **Brevard Zoo Central IRL Oyster Project 5**

Project Details

Entity: Brevard Zoo

Project Type: Oyster/Clam Restoration

Sub Lagoon: Central Indian River Lagoon

Location: Proposed sites, substitutions will be selected as needed: 27.9700325618981, -80.54414975969682; 27.967937252575382, -80.54275771368124; 27.83845550179957, -80.49711947985077

Project Description: Brevard Zoo intends to construct 37,602 square feet of oyster projects in the Central Basin of the Indian River Lagoon (IRL) . This project is scalable. The design will be site specific and will be approved by the County before construction begins. We will consult with the County to determine whether or not live oysters need to be added to each specific location.

Education and Outreach: Brevard Zoo regularly engages the community in restoration efforts and education. We attend community events, hold presentations in schools, host volunteer opportunities and bring people into the Zoo to learn about the state of the lagoon and current conservation efforts, including oyster projects. We are not asking for any additional funding to continue this effort.

Estimated Water Quality Benefits

Total Nitrogen Reduction (lbs/year): 1,504

Total Phosphorus Reduction (lbs/year): 38

Costs

Total Project Cost: $714,400

Estimated Cost per Pound Total Nitrogen Removed: $475

Estimated Cost per Pound Total Phosphorus Removed: $18,800

Eligible Tax Funding Cost Share: $714,400

Project Funding

Is Local Match in Adopted Budget: No

Dollar Amount of Local Cost Share: $0

Dollar Amount Secured Grant(s): $0

Additional Information

Other Indian River Lagoon Benefits: Oyster reef installations not only reduce nutrients, but they also support hundreds of species in the IRL, including many species of fish and crabs.

Notes:

Save Our Indian River Lagoon Funding Application Short Form: **Waelti Drive Pond Retrofit**

Project Details
Entity: Brevard County Natural Resources

Project Type: Stormwater

Sub Lagoon: North Indian River Lagoon

Location: 28°13'53.2"N 80°40'38.7"W

Project Description: The proposed stormwater retrofit to the Waelti Drive wet pond utilizes the Martin Treatment Wetland System paired with turbidity curtains to optimize nutrient removal. The Floating Treatment Wetlands provides an additional 12% removal of total phosphorus and total nitrogen in existing wet detention pond and is designed to have a durable eight-inch platform for plants and root protection. The root zone and media produced from the Floating Treatment Wetlands creates habitat for Periphyton which successfully removes harmful nutrients such as phosphorus and nitrogen from stormwater. In addition, these floating treatment wetlands will act as hangers for the turbidity curtains. The Floating Treatment Wetlands paired with the turbidity curtains would act as baffles in the wet pond to increase the ponds flow path. The extended flow path will result in increased volumetric utilization and residence time to enhance nutrient removal. Wet ponds main source of nutrient removal is sediment settling, and pollutant uptake, through biological activity in the pond. With this system in place the total removal of nitrogen and phosphorus in the pond will increase by 27%.

Education and Outreach: N/A

Estimated Water Quality Benefits
Total Nitrogen Reduction (lbs/year): 274

Total Phosphorus Reduction (lbs/year): 40

Costs
Total Project Cost: $235,000

Estimated Cost per Pound Total Nitrogen Removed: $858

Estimated Cost per Pound Total Phosphorus Removed: $5,875

Eligible Tax Funding Cost Share: $97,818

Project Funding
Is Local Match in Adopted Budget: Yes

Dollar Amount of Local Cost Share:

Dollar Amount Secured Grant(s): $137,182

Additional Information

Other Indian River Lagoon Benefits:

Notes:

Save Our Indian River Lagoon Funding Application Short Form: **Lake Washington & Croton Road Pond Retrofit**

Project Details
Entity: Brevard County Natural Resources

Project Type: Stormwater

Sub Lagoon: North Indian River Lagoon

Location: 28° 8'50.29"N 80°39'13.87"W

Project Description: The proposed stormwater retrofit to the Lake Washington and Croton Road wet pond utilizes the Martin Treatment Wetland System paired with turbidity curtains to optimize nutrient removal. The Floating Treatment Wetlands provides an additional 12% removal of total phosphorus and total nitrogen in existing wet detention pond and is designed to have a durable eight-inch platform for plants and root protection. The root zone and media produced from the Floating Treatment Wetlands creates habitat for Periphyton which successfully removes harmful nutrients such as phosphorus and nitrogen from stormwater. In addition, these floating treatment wetlands will act as hangers for the turbidity curtains. The Floating Treatment Wetlands paired with the turbidity curtains would act as baffles in the wet pond to increase the ponds flow path. The extended flow path will result in increased volumetric utilization and residence time to enhance nutrient removal. Wet ponds main source of nutrient removal is sediment settling, and pollutant uptake, through biological activity in the pond. With this system in place the total removal of nitrogen and phosphorus in the pond will increase by 27%.

Education and Outreach: N/A

Estimated Water Quality Benefits
Total Nitrogen Reduction (lbs/year): 158

Total Phosphorus Reduction (lbs/year): 24

Costs
Total Project Cost: $198,000

Estimated Cost per Pound Total Nitrogen Removed: $1,253

Estimated Cost per Pound Total Phosphorus Removed: $8,250

Eligible Tax Funding Cost Share: $56,406

Project Funding
Is Local Match in Adopted Budget: Yes

Dollar Amount of Local Cost Share:

Dollar Amount Secured Grant(s): $143,594

Additional Information

Other Indian River Lagoon Benefits:

Notes:

Save Our Indian River Lagoon Funding Application Short Form: **N. Wickham & Conservation Place Wet Pond Retrofit**

Project Details
Entity: Brevard County Natural Resources

Project Type: Stormwater

Sub Lagoon: North Indian River Lagoon

Location: 28°10'42.03"N 80°40'21.33"W

Project Description: The proposed stormwater retrofit to the N. Wickham & Conservation Place Wet Pond wet pond utilizes the Martin Treatment Wetland System paired with turbidity curtains to optimize nutrient removal. The Floating Treatment Wetlands provides an additional 12% removal of total phosphorus and total nitrogen in existing wet detention pond and is designed to have a durable eight-inch platform for plants and root protection. The root zone and media produced from the Floating Treatment Wetlands creates habitat for Periphyton which successfully removes harmful nutrients such as phosphorus and nitrogen from stormwater. In addition, these floating treatment wetlands will act as hangers for the turbidity curtains. The Floating Treatment Wetlands paired with the turbidity curtains would act as baffles in the wet pond to increase the ponds flow path. The extended flow path will result in increased volumetric utilization and residence time to enhance nutrient removal. Wet ponds main source of nutrient removal is sediment settling, and pollutant uptake, through biological activity in the pond. With this system in place the total removal of nitrogen and phosphorus in the pond will increase by 27%.

Education and Outreach: N/A

Estimated Water Quality Benefits
Total Nitrogen Reduction (lbs/year): 261

Total Phosphorus Reduction (lbs/year): 38

Costs
Total Project Cost: $392,925

Estimated Cost per Pound Total Nitrogen Removed: $1,505

Estimated Cost per Pound Total Phosphorus Removed: $10,340

Eligible Tax Funding Cost Share: $93,177

Project Funding
Is Local Match in Adopted Budget: Yes

Dollar Amount of Local Cost Share:

Dollar Amount Secured Grant(s): $219,224

Additional Information

Other Indian River Lagoon Benefits:

Notes:

Save Our Indian River Lagoon Funding Application Short Form: **Darrow Baffle Box**

Project Details
Entity: City of Melbourne

Project Type: Stormwater

Sub Lagoon: Central Indian River Lagoon

Location: 28.071582, -80.614863

Project Description: Installation of a third generation baffle box near the Darrow Avenue in south Melbourne to serve a drainage basin to be finalized during design. This baffle box will be on a drainage ditch collection runoff that outfalls to Crane Creek and then into the Indian River Lagoon. The basin is mostly made up of a variety of very old residential uses. This basin has little to no stormwater treatment and this baffle box will provide treatment where there is none. This project shall be funded for design in FY26 with construction scheduled for FY27. If grant funding becomes available, the project would be accelerated.

Education and Outreach: A flyer explaining what a baffle box is and how it works will be sent to the residents within the basin.

Estimated Water Quality Benefits
Total Nitrogen Reduction (lbs/year): 536

Total Phosphorus Reduction (lbs/year): 87

Costs
Total Project Cost: $851,500

Estimated Cost per Pound Total Nitrogen Removed: $1,589

Estimated Cost per Pound Total Phosphorus Removed: $9,787

Eligible Tax Funding Cost Share: $191,352

Project Funding
Is Local Match in Adopted Budget: Yes

Dollar Amount of Local Cost Share: $660,148

Dollar Amount Secured Grant(s):

Additional Information
Other Indian River Lagoon Benefits: The baffle box will remove sediment and trash from the system.

Notes:

Save Our Indian River Lagoon Funding Application Short Form: **Line Street Cemetery Baffle Box**

Project Details

Entity: City of Melbourne

Project Type: Stormwater

Sub Lagoon: Central Indian River Lagoon

Location: 28.07168846957472, -80.6077372837633

Project Description: Installation of a third generation baffle box near the Line Street Cemetery in south Melbourne to serve a drainage basin to be finalized during design. This baffle box will be on a drainage ditch collection runoff that outfalls to Crane Creek and then into the Indian River Lagoon. The basin is mostly made up of a variety of very old residential uses. This basin has little to no stormwater treatment and this baffle box will provide treatment where their is none. This project shall be funded for design in FY26 with construction scheduled for FY27. If grant funding becomes available, the project would be accelerated.

Education and Outreach: A flyer explaining what a baffle box is and how it works will be sent to the residents within the basin. An informational sign will be installed at the project adjacent to the City historical cemetery.

Estimated Water Quality Benefits

Total Nitrogen Reduction (lbs/year): 770

Total Phosphorus Reduction (lbs/year): 122

Costs

Total Project Cost: $1,855,000

Estimated Cost per Pound Total Nitrogen Removed: $2,409

Estimated Cost per Pound Total Phosphorus Removed: $15,205

Eligible Tax Funding Cost Share: $274,890

Project Funding

Is Local Match in Adopted Budget: Yes

Dollar Amount of Local Cost Share: $505,110

Dollar Amount Secured Grant(s):

Additional Information

Other Indian River Lagoon Benefits: The baffle box will remove sediment and trash from the system.

Notes:

Save Our Indian River Lagoon Funding Application Short Form:

Melbourne Cemetery Baffle Box

Project Details

Entity: City of Melbourne

Project Type: Stormwater

Sub Lagoon: North Indian River Lagoon

Location: 28.085502642934607, -80.61048527753879

Project Description: Installation of a third generation baffle box near the Melbourne Cemetery to serve a drainage basin to be finalized during design. This baffle box will be on a drainage ditch collection runoff that outfalls to the Indian River Lagoon. The basin is mostly made up of a variety of very old residential, commercial and institutional uses. This basin has little to no stormwater treatment and this baffle box will provide treatment where their is none. This project shall be funded for design in FY27 with construction scheduled for FY28. If grant funding becomes available, the project would be accelerated.

Education and Outreach: A flyer explaining what a baffle box is and how it works will be sent to the residents within the basin. An informational sign will be installed at the Civic Center across the street from the Cemetery. This will allow for a large audience to see the sign.

Estimated Water Quality Benefits

Total Nitrogen Reduction (lbs/year): 606

Total Phosphorus Reduction (lbs/year): 105

Costs

Total Project Cost: $2,180,000

Estimated Cost per Pound Total Nitrogen Removed: $3,597

Estimated Cost per Pound Total Phosphorus Removed: $20,762

Eligible Tax Funding Cost Share: $216,342

Project Funding

Is Local Match in Adopted Budget: Yes

Dollar Amount of Local Cost Share: $1,783,658

Dollar Amount Secured Grant(s):

Additional Information

Other Indian River Lagoon Benefits: The baffle box will remove sediment and trash from the system.

Notes:

Save Our Indian River Lagoon Funding Application Short Form: **Westside Basin Water Quality Improvements**

Project Details

Entity: City of Satellite Beach

Project Type: Stormwater

Sub Lagoon: Banana River

Location: 28.179416201697197, -80.60808695159598

Project Description: Satellite Beach is addressing stormwater management in 66 acres of its 119-acre Westside Basin. The developed residential and commercial area lacks treatment, with many small basins draining through individual outfalls. To improve water quality, stormwater will flow into 26 tree wells with biosorption activated media (BAM) filters placed at key stormwater inlets. Moreover, 9 BAM-lined bioswales draining 18 sub-basins will be installed upstream. Lastly, 53 inlet baskets will be installed to capture 5 tons of debris and sediment (muck contributors) annually. All best management practices (BMPs) will enhance removal of Total Nitrogen and Total Phosphorus from stormwater flows into the Banana River Lagoon.

Education and Outreach: The construction of a water quality improvement project in the Westside Basin represents a crucial effort to enhance the ecological health of the Banana River Lagoon. This initiative specifically targets the reduction of nitrogen and phosphorous levels, which are significant pollutants affecting water quality and marine life in the lagoon. To ensure the success of this project and encourage community involvement, comprehensive public outreach efforts will be implemented.

Key messages of the outreach campaign will focus on educating the public about how the Westside Basin Water Quality Improvements project intends to remove nitrogen and phosphorous from the lagoon through green infrastructure, thereby improving water quality and restoring ecosystem balance. Additionally, the campaign will emphasize the impact of individual actions on water quality in the lagoon, including proper waste management and litter control. It will also highlight the direct benefits of improved water quality on marine habitats, recreational activities, and the overall health of the fragile Banana River Lagoon ecosystem. The community will also be educated on the role of nutrients in algal blooms and seagrass health.

The target audience for these outreach efforts includes residents, commercial business owners, and the community at large. They will directly receive information through workshops and the distribution of door-to-door educational materials. These efforts will encourage the community to adopt responsible practices such as proper fertilizer use and minimizing stormwater runoff.

The outreach strategy will employ a multi-channel approach, leveraging traditional media such as newsletters and brochures alongside digital platforms like social media and the city website to reach diverse audiences effectively. Continuous engagement will be maintained through ongoing project updates, success stories, and interactive Question and Answer sessions to address community concerns and gather feedback. Regular evaluation of the outreach efforts will ensure their effectiveness, allowing for adjustments to strategies as necessary to maximize engagement and understanding among all stakeholders.

In conclusion, through robust public outreach efforts, the City aims to empower residents, businesses, and stakeholders to actively participate in and support the water quality improvement project in the Banana River Lagoon. By fostering a shared understanding of the project's goals and benefits, the City and the community can work together to achieve sustainable environmental stewardship and preserve natural resources.

Estimated Water Quality Benefits

Total Nitrogen Reduction (lbs/year): 137

Total Phosphorus Reduction (lbs/year): 24

Costs

Total Project Cost: $1,650,960

Estimated Cost per Pound Total Nitrogen Removed: $12,051

Estimated Cost per Pound Total Phosphorus Removed: $68,790

Eligible Tax Funding Cost Share: $56,033

Project Funding

Is Local Match in Adopted Budget: No

Dollar Amount of Local Cost Share:

Dollar Amount Secured Grant(s):

Additional Information

Other Indian River Lagoon Benefits: The biosorption activate media (BAM) material utilized in bioswales and tree wells can remove up to 90% of bacteria from stormwater flows to the Indian River Lagoon. The project also identifies 53 locations for the installation of inlet baskets. These baskets are designed to capture and retain vegetative debris, sediments, and other particulate matter that would otherwise flow unchecked into the lagoon, exacerbating its nutrient imbalance and contributing to the accumulation of nutrient-laden muck. This muck, composed of clay, sand, silt, minerals, and decaying organic matter, not only compromises water clarity and oxygen levels but also hinders the growth of seagrasses and fosters conditions conducive to harmful algal blooms. According to the Florida Stormwater Association Municpal Separate

Storm Sewer System (MS4) Load Reduction Assessment Tool, the baskets also remove a small amount of Total Nitrogen and Total Phosphorus contained within the sediment and debris.

Furthermore, baskets prevent unsightly plastic-containing litter that contributes to microplastics from entering the lagoon. Studies show high levels of microplastics in the surface water and shellfish species. While the full extent of microplastic impacts to human health and the environment are still being examined, research has demonstrated that microorganisms ingest microplastics when they mistake them for food, resulting in bioaccumulation in the lagoon fauna tissues over time. This may impact Indian River Lagoon fisheries, which are estimated to generate $30 million in annual revenue for the region. Microplastics can also transport pollutants and are durable and resistant to degradation, perpetually persisting in the environment.

Notes:

Save Our Indian River Lagoon Funding Application Short Form: **Cocoa Isles Blvd Dry Pond**

Project Details
Entity: City of Cocoa Beach

Project Type: Stormwater

Sub Lagoon: Banana River

Location: 28.32951676142842, -80.61643602498961

Project Description: There is a small area at the end of Cocoa isles Blvd to install a bioretention area to treat and infiltrate runoff from a low-density residential area. Treatment will be enhanced by lining the retention area with bioactivated media (BAM) and planted with Florida native plants. This system greatly reduces nutrient/pollutant loading to the receiving water while also protecting the barrier island's surficial aquifer. This project will benefit the Banana River Lagoon and this project is being implemented to reduce the pollutant load.

Education and Outreach: The target audience is the residents and visitors of Cocoa Beach. The City will post about the improvements and benefits of the bioretention area to the Banana River Lagoon and aquifer on the City's website and social media pages.

Estimated Water Quality Benefits
Total Nitrogen Reduction (lbs/year): 14

Total Phosphorus Reduction (lbs/year): 2

Costs
Total Project Cost: $570,000

Estimated Cost per Pound Total Nitrogen Removed: $40,714

Estimated Cost per Pound Total Phosphorus Removed: $285,000

Eligible Tax Funding Cost Share: $5,726

Project Funding
Is Local Match in Adopted Budget: Yes

Dollar Amount of Local Cost Share:

Dollar Amount Secured Grant(s):

Additional Information
Other Indian River Lagoon Benefits: The project is about to go into the design phase and at that point BMPTrains will be used to determine the Total Nitrogen and Total Phosphorus reductions.

Based on the City's Stormwater Master Plan, it is estimated that 14.33 lbs/year of Total Nitrogen and 2.26 lbs/year of Total Phosphorus will be removed.

Notes:

Save Our Indian River Lagoon Funding Application Short Form: **South Beaches Wastewater Treatment Plant Upgrade**

Project Details

Entity: Brevard County Utility Services Department

Project Type: Wastewater Treatment Facility Upgrade

Sub Lagoon: Central Indian River Lagoon

Location: South Beaches WWTF - 2800 S Hwy A1A, Melbourne Beach, FL 32951

Project Description: This project is for the conversion of the existing 2 Million Gallon per Day (MGD) Activated Sludge Treatment Train and 6 MGD Carrousel Treatment System to Advanced Wastewater Treatment (AWT). Only High Level Disinfection (HLD) is currently required to meet permit requirements, but the higher treatment level of AWT will allow a redution in nutrient loading to reuse customers. The Save Our Indian River Lagoon grant money would be put towards the cost of construction.

Education and Outreach: None.

Estimated Water Quality Benefits

Total Nitrogen Reduction (lbs/year): 5,734

Total Phosphorus Reduction (lbs/year): 1,147

Costs

Total Project Cost: $43,305,079

Estimated Cost per Pound Total Nitrogen Removed: $7,552

Estimated Cost per Pound Total Phosphorus Removed: $37,755

Eligible Tax Funding Cost Share: $2,471,354

Project Funding

Is Local Match in Adopted Budget: N/A

Dollar Amount of Local Cost Share: N/A

Dollar Amount Secured Grant(s): $14,200,000

Additional Information

Other Indian River Lagoon Benefits:

Notes: Project will reduce total nitrogen concentration to 2 mg/L and total phosphorus concentration to 1 mg/L.

Save Our Indian River Lagoon Funding Application Short Form: **Port Saint John Wastewater Treatment Plant Replacement**

Project Details
Entity: Brevard County Utility Services Department

Project Type: Wastewater Treatment Facility Upgrade

Sub Lagoon: North Indian River Lagoon

Location: Current plant is at 3910 Juanita St., Cocoa FL. New site has not been purchased.

Project Description: Advanced water treatment component of the design to replace the existing wastewater treatment facility in Port Saint John. Current plant does not meet Basin Management Action Plan (BMAP) requirements.

Education and Outreach: N/a

Estimated Water Quality Benefits
Total Nitrogen Reduction (lbs/year): 2,278

Total Phosphorus Reduction (lbs/year): 2,278

Costs
Total Project Cost: $40,000,000

Estimated Cost per Pound Total Nitrogen Removed: $17,559

Estimated Cost per Pound Total Phosphorus Removed: $17,559

Eligible Tax Funding Cost Share: $981,818

Project Funding
Is Local Match in Adopted Budget: No

Dollar Amount of Local Cost Share: N/A

Dollar Amount Secured Grant(s): N/A

Additional Information
Other Indian River Lagoon Benefits: This new plant will allow for increased plant capacity for potential future septic to sewer conversion projects in the the Port Saint John area. The existing wastewater treatment facility is at capacity and not rated for additional flows.

Notes:

Save Our Indian River Lagoon Funding Application Short Form: **City of Palm Septic to Sewer Conversion Project - Sewer Available Not Connected (SANC) Phase 2**

Project Details
Entity: City of Palm Bay

Project Type: Quick Connection

Sub Lagoon: Central Indian River Lagoon

Location: 80.6613225°W, 28.0049701°N

Project Description: The City of Palm Bay will be moving forward with Phase Two of its "Sewer Available Not Connected (SANC) Multi Phased – Multi Year Plan," a septic-to-sewer conversion initiative focused on improving water quality in the Indian River Lagoon, if awarded Florida Department of Environmental Protection Water Quality Improvement grant funds, in 2025. This phase targets 416 properties that will transition from Onsite Sewage Treatment and Disposal Systems (OSTDS) to the City's sanitary sewer system currently serving the area. If pending grant funds are received, Mandatory connection notifications will begin in July 2025. Grant funding is critical to support the financial costs of connecting these 416 priority properties, ensuring the successful execution of this phase and reinforcing Palm Bay's commitment to the long-term protection of the Indian River Lagoon.

Education and Outreach: The City of Palm Bay's public outreach program began in response to growing concerns about the environmental and health impacts of septic systems within the rapidly growing community. The City's septic-to-sewer conversion program includes a public outreach component utilizing community meetings, informational materials, digital communications, and direct mailings aimed at educating and engaging residents. The City has expanded its outreach efforts to include more targeted communication and support for residents in low-income areas, as highlighted by the recent septic-to-sewer program funded by the American Rescue Plan Act (ARPA). The City plans to continue prioritizing outreach efforts to facilitate a smooth implementation of septic-to-sewer connections, address challenges, and ensure broad community support as the project progresses. Last November, the public outreach efforts resulted in the City adopting a mandatory ordinance requiring all residents with sewer availability to connect to the sewer system. This ordinance clearly demonstrates the City's unwavering commitment to upgrading its infrastructure and ensuring all eligible properties comply with the new standards. KEY MESSAGES: 1. Health and Environmental Benefits: Protects the environment (Indian River Lagoon and Turkey Creek Estuaries) and improves public health. 2. Financial Assistance: City's Council already authorized wavers of utilities fees. 3. Mandatory Compliance: Last November new mandatory ordinance 4. Streamlined Process: The city provides support and clear information to make the transition as smooth as possible. TARGET AUDIENCE: 1. Low-Income Residents: Eligible for financial assistance and priority in the program. 2. Residents with Sewer Access: Required to connect under the new ordinance. 3. Community Members with Septic Systems: Impacted by health and environmental risks.

Estimated Water Quality Benefits

Total Nitrogen Reduction (lbs/year): 1,011

Total Phosphorus Reduction (lbs/year): N/A

Costs

Total Project Cost: $7,072,000

Estimated Cost per Pound Total Nitrogen Removed: $6,998

Estimated Cost per Pound Total Phosphorus Removed: N/A

Eligible Tax Funding Cost Share: $1,616,992

Project Funding

Is Local Match in Adopted Budget: Yes

Dollar Amount of Local Cost Share: $2,072,000

Dollar Amount Secured Grant(s): $0

Additional Information

Other Indian River Lagoon Benefits: Implementation of this program will improve Indian River Lagoon (IRL) vital signs evaluated as part of the IRL restoration program including seagrasses, filter feeders, contaminants, legacy loads, wastewater, impaired waters, biodiversity, species of concern, forage fishes, fisheries, harmful algal blooms, and the overall state of the IRL.

Notes:

Meeting

Item: J. I. SOTRL

Motion By:

2nd By:

Commissioner	District	Yes	No
Delaney	1		✓
1st Vice Chair Goodson	2	✓	
2nd Adkinson	3	✓	
Altman	5	✓	
Chair Feltner	4	✓	