Final

LONGBOAT KEY SUBAQUEOUS FORCE MAIN

Mitigation Plan Document

Prepared for
Town of Longboat Key

June 2021

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Prepared for
Town of Longboat Key
Under Subcontract to Carollo Engineers

June 2021

4200 West Cypress Street
Suite 450
Tampa, FL 33607
813.207.7200
esassoc.com

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1.0 Introduction

1.1 Project Background

Currently, domestic wastewater from the barrier island Town of Longboat Key (Town) is collected and pumped, via Lift Station D, to the mainland for treatment at the Manatee County Southwest Regional Water Reclamation Facility (SWRWRF). The wastewater is transported via a 20-inch inner diameter (ID) ductile iron pipe (DIP) force main that was constructed in 1973 and placed into operation in 1975. This pipeline is the sole mode of wastewater transmission from the barrier island to the mainland and has been in continuous service for 45 years. When constructed, the service life is considered to be 50 years. The existing force main was constructed using barge mounted equipment that excavated an open trench along the bottom of Sarasota Bay, laid the pipe in the trench, and then buried the pipe with the excavated material. Upon project completion, an as-built survey was completed.

The subaqueous force main provided decades of service without any known incidents of leakage or failure. However, due to concerns about the age of the force main, the Town began conducting inspections of the subaqueous pipeline to determine the depth of the bury and the general external condition of the ductile iron pipe. Inspections were conducted in 1992, 1996, 2007, and 2011. In 2015 the Town conducted an internal Smart Ball® pipe wall assessment of the force main interior condition to determine the pipe wall thickness and degree of corrosion. The conclusions derived from the external inspections were that the force main was generally in good condition with sufficient bury depth (e.g., 2 foot minimum); while the 2017 internal inspection concluded that the pipe wall thickness was sufficient to provide another 20-25 years of service.

Given the age of the force main, the Town contracted with CDM Smith in 2015 to evaluate five alternative alignments (routes), including the existing alignment, as well as various pipe materials and alternative construction approaches for replacing the existing force main (CDM Smith/Laney, 2015). A total of 90 scenarios (alignment + pipe material + construction approach) were identified. After an initial feasibility screening, the list of scenarios was reduced to 44. These various scenarios were ranked pursuant to a range of criteria.

The highest ranked scenario was the existing alignment (Alignment 1) using a single pull Horizontal Directional Drill (HDD). However, these conclusions were qualified, contingent upon the determination of suitable geotechnical conditions in the subaqueous portion of the alignment, as well as the technical feasibility of conducting a single pull HDD under the 2.3 mile crossing of Sarasota Bay. At the time of this writing, the 2.3-mile crossing of Sarasota Bay would be longest HDD single pull subaqueous project in the U.S., testing the limits of this technology.

Due to concerns about the suitable geotechnical conditions, technical feasibility, failure risks, and cost of the HDD construction approach, the Town contracted with Carollo Engineers (Carollo) and Environmental Science Associates (ESA) in 2017 to initiate discussions with the Florida Department of Environmental Protection (FDEP) and the U.S. Army Corps of Engineers (USACE) to assess the permitability of an open cut construction approach to install a redundant force main adjacent to the existing force main. Based on the feedback received from the FDEP and USACE in these meetings, ESA conducted an environmental assessment of the marine resources at risk in the existing alignment - including seagrasses, mangroves, and oysters (ESA, 2019).

In 2019 Carollo and ESA conducted pre-application meetings with the FDEP and the USACE, during which the findings of the environmental assessment were presented, and the intent to pursue an open cut construction approach within the existing alignment was discussed. Feedback was received from both agencies with respect to the need to conduct an alternatives analysis, and to select an alignment and construction approach that best avoids and/or minimizes environmental impacts and risks.

On June 29, 2020, a sewage leak was discovered within the mangrove fringe along the east side of the existing force main alignment in Manatee County, approximately 350 feet from the open waters of Sarasota Bay, underneath fringing mangroves. The cause of the leak appeared to be corrosion of the buried pipe where it was found to be in contact with a log or tree stump.

The leak was quickly contained and repaired, and the volume of sewage that was discharged to the environment was determined to be approximately 14 million gallons. To gain access to repair the leak a dirt haul road had to be constructed into the mangroves (see **Figure 1-1**). In addition, the discharge of raw sewage resulted in the die off of mangroves due to hydrologic stress. In total, the sewage leak and the road fill impacts resulted in 1.43 acres of impacts to mangroves and fringe freshwater wetlands.

On February 22, 2021 the Town of Longboat Key executed a Consent Order with the FDEP to address restoration of the mangrove and freshwater wetland impacts, as well as other measures to prevent future leaks, and to respond in a timely and effective manner if another leak occurs. The June 2020 leak has elevated concerns about the condition and remaining service life of the existing force main, thus creating a need to further explore the construction of a new redundant force main at this time.

Figure 1-1
Repair of Existing Force Main Within Mangroves

In October 2020, the Town of Longboat Key submitted permit applications to both the FDEP and USACE for a new redundant sewer force main, proposing an open cut trench construction approach. A *Permit Support Document* (Carollo Engineers/ESA) was included as part of the permit applications submittals. That document provided: a summary of the alternatives analysis conducted by the Carollo/ESA consultant team; a summary of the proposed open-cut construction approach for the preferred alignment; a description of existing environmental conditions; quantification of temporary impacts to aquatic resources; and a narrative discussion of the proposed conceptual mitigation approach to compensate for those impacts.

This *Longboat Key Redundant Force Main Mitigation Plan* document has been prepared to provide a detailed description of the various proposed mitigation components for the project in response to agency Requests for Additional Information. The mitigation plan described herein addresses the 12 elements of a mitigation plan, as required under 40 CFR Part 230 *Compensatory Mitigation for Losses of Aquatic Resources; Final Rule*, promulgated by the U.S. Environmental Protection Agency in 2008. In addition to this document, construction plans for the proposed mitigation components are provided as part of the revised *Permit Plans* set, submitted concurrently.

1.2 Project Purpose and Need

The purpose of the proposed project is to construct a redundant domestic wastewater force main adjacent to, and north of, the existing force main. Given the approaching end of the projected service life of the existing force main, and the recently discovered and repaired sewage leak, there is a high degree of urgency to obtain permits to allow the Town the ability to complete this critical infrastructure project expeditiously.

Given that there are very limited options for conveying domestic sewage flows to the wastewater treatment plant should there a failure of existing sewer force main, the construction of a new redundant force main is a high priority infrastructure project needed to reduce the risk of future sewage leaks, to provide additional and redundant flow capacity, and to potentially facilitate the return of reclaimed water to Longboat Key to support regional potable water conservation initiatives.

1.3 Alternatives Analysis

In October 2020, the Town of Longboat Key submitted permit applications to both the FDEP and USACE for a new redundant sewer force main, proposing an open cut trench construction approach. The *Permit Support Document* (Carollo Engineers/ESA) was provided as part of the permit applications submittals. This document included a detailed alternatives analysis.

1.3.1 Alignment Alternatives

The alternatives analysis evaluated several subaqueous alignments, including the alignment of the existing force main (Alignment 1), as well as an upland alignment (Alignment 5). The other subaqueous alignments would all involve new impacts to previously unimpacted wetlands and submerged habitats, and were eliminated from further consideration accordingly. Alignment 5 would involve the construction of a new pipeline and pump stations northward across Longboat Pass to Bradenton Beach, and then across Sarasota Bay along the Cortez Road bridge corridor to the Manatee County SWRWRF. Given that impacts to aquatic resources would likely be reduced, this alignment was evaluated for feasibility.

Constructing a new force main along Alignment 5 would require substantial modifications to the Town's existing wastewater infrastructure. In addition, Alignment 5 poses numerous and extensive engineering and public impact constraints, including: ROW limitations; hydraulic constraints; utility and roadway conflicts; increased operation and maintenance requirements; traffic disruptions; odor; and overall public opposition. Given concerns about the recent leak and the remaining service life of the existing force main, the construction of a redundant force main is a critical and urgent priority infrastructure project. All of these issues cumulatively make Alignment 5 infeasible with respect to schedule as well as budget.

Based on the CDM Smith/Laney (2015) alignment analysis, and the evaluations presented in the *Permit Support Document*, Alignment 1 is clearly the preferred alignment. The Town's wastewater infrastructure has been designed and constructed over the years to collect and pump domestic sewage to existing Lift Station D, and to pump all collected sewage from this lift station to the Manatee County SWRWRF through the existing subaqueous force main. Alignment 1 is a long-established and previously impacted utility corridor which encompasses the existing force main; and could accommodate the construction of a redundant force main parallel to the existing force main with minimal new environmental impacts. The location and alignment of the existing and proposed new force main is shown in **Figure 1-2** below.

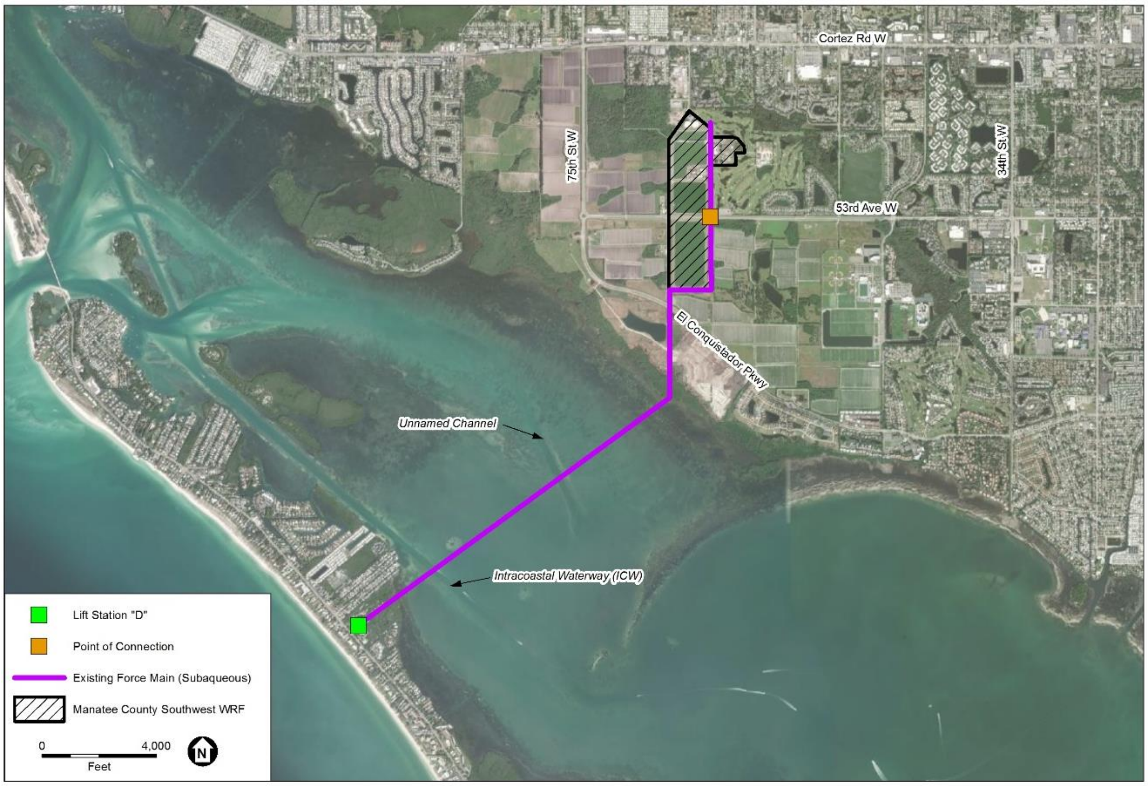

Figure 1-2
Existing Force Main Alignment (Alignment 1)

1.3.2 Construction Alternatives

The highest ranked construction alternative for Alignment 1 was Alternative 1 (All Open-Cut Trench), followed by Alternatives 5 (Hybrid 3) and Alternative 6 (Hybrid 4). Alternatives 5 and 6 both involve trenchless construction approaches (e.g., horizontal directional drill) on the western end of the project that would avoid surface impacts west of the Intra-Coastal Waterway (ICW). However, four of the eight hybrid alternatives evaluated were eliminated due to the fatal engineering flaw of having high points in the force main transmission line that would require an air release valve (ARV) be installed in Sarasota Bay, which would require frequent maintenance and pose high failure and leak risks. Furthermore, all of the trenchless construction approaches have the additional risk of frac-outs, or the collapse of the bore hole and the discharge of drilling fluids into overlying surface waters.

Given that the open-cut trench construction approach is the most proven construction method that meets all other engineering specifications, Alternative 1 was chosen as the preferred construction alternative for the proposed project. The full alternatives analysis is presented in the *Permit Support Document* (Carollo Engineers/ESA, 2020).

While Alternative 1 (All Open-Cut Trench) does have the greatest impacts to wetlands and submerged habitats, it must be emphasized here that any and all impacts to these resources caused by the proposed project are associated with project construction only. No components of the proposed project will result in a permanent loss of any ecological resources within Alignment 1; therefore, all impacts are considered to be temporary. Furthermore, the proposed construction approach has been developed to avoid and minimize impacts to wetlands and submerged habitats to the greatest extent feasible.

1.4 Proposed Construction Approach

As proposed, the redundant force main will be constructed of 20-inch ID High Density Polyethylene (HDPE) pipe, which is impervious to corrosion and is highly resilient, thus making it ideal for applications in the marine environment. The proposed new force main will be constructed adjacent to, and 50 feet north (in most segments) of the existing force main using an open cut trench construction approach. Upon completion of the new force main, the existing force main may be rehabilitated by lining it with a smaller diameter HDPE pipe, upon which it can be used as a redundant sewage line, or used for the return of the highly treated reclaimed water back to Longboat Key to offset the use of potable water for irrigation

During construction, direct physical impacts to the surface area of the bay bottom, as well as to the mangrove fringe on both ends of the project, will be minimized through tight confinement of the work areas. Secondary impacts caused by turbidity will be stringently controlled and minimized by using sheet piling, shoring, and turbidity screens. The project construction corridor along Alignment 1 can be broken down into five segments based on ground conditions and water depth, as shown in **Figure 1-3.**

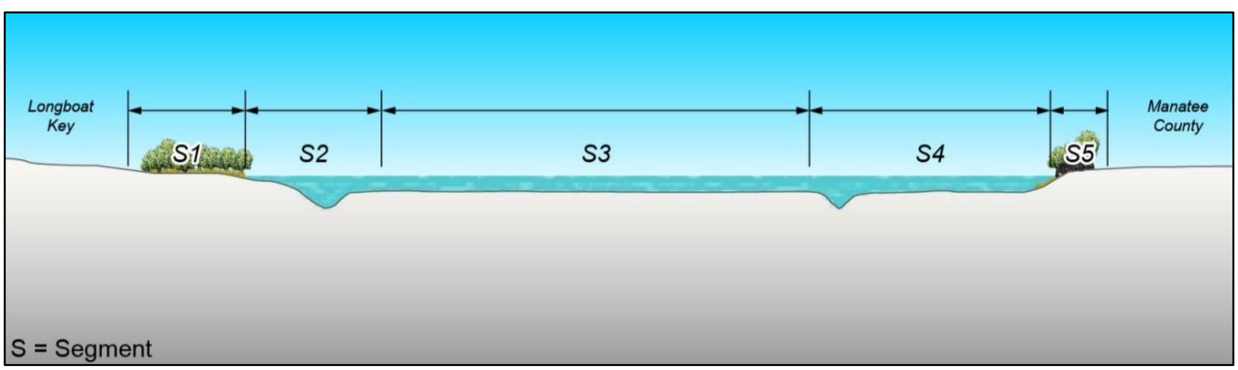

Figure 1-3
Project Segmentation Scheme

The project construction limits and methods vary in each of the five segments based on ground conditions, water depth and other constraints such as existing easements and public facilities. It should be noted that the extent of impacts has been reduced from the initial permit application submittals, as the project construction limits and methods were subsequently revised to further minimize impacts to wetlands and submerged habitats. Specifically, the project construction cross-section widths were reduced in Segments 1, 2, 4, and 5 compared to the initial *Permit Plans* set. The following figures show the construction limits and methods to be used in the five project segments.

Figure 1-4 and **Figure 1-5** show the typical construction limits and proposed construction methods for Segment 1 (west end intertidal/upland zone) and Segment 5 (east end intertidal/upland zone), respectively.

In both Segments 1 and 5, earthmoving equipment will be used to dig the trench, install the trench box and pipe material, and to bury the new force main. Spoils will be temporarily stockpiled immediately adjacent to the trench cut, and then placed back into the trench. Following construction, all disturbed work areas will be restored back to pre-construction topographic elevations, and re-planted with mangroves and/or freshwater wetland species, as described in Section 2.

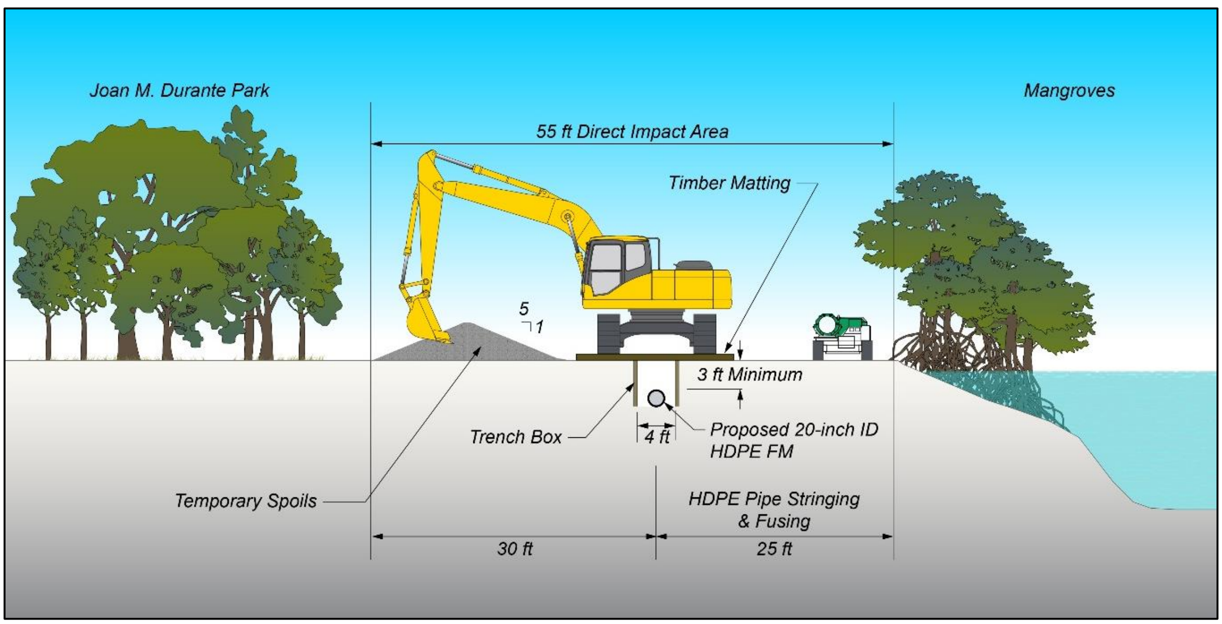

Figure 1-4
Construction Limits and Methods in Segment 1

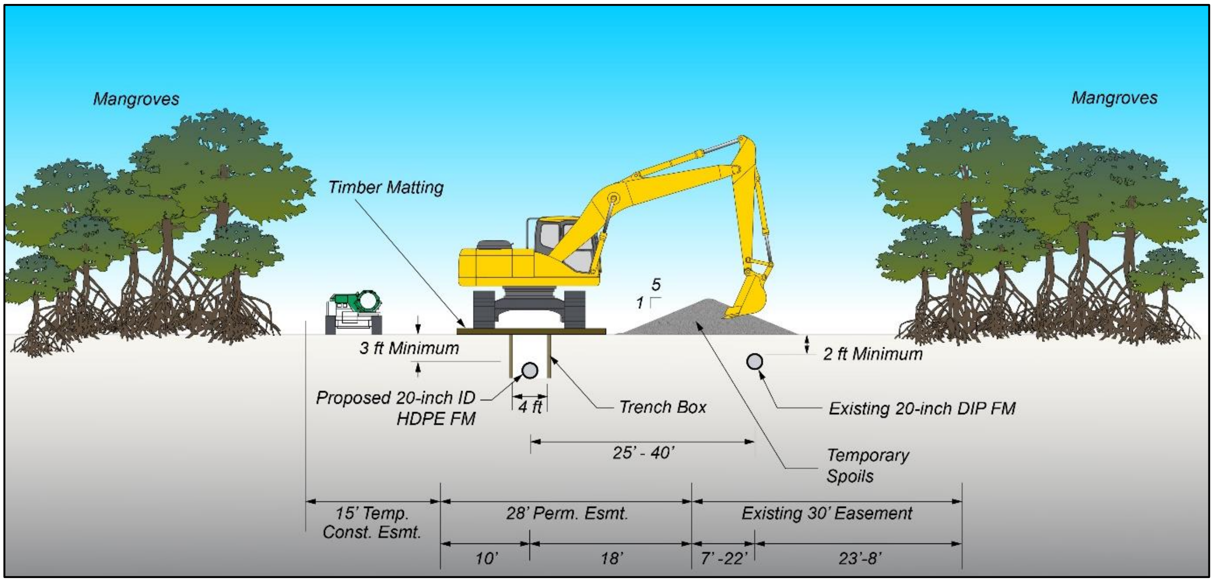

Figure 1-5
Construction Limits and Methods in Segment 2

Figure 1-6 shows the typical construction limits and proposed construction methods for Segments 2 and 4 (shallow subtidal zones). In Segments 2 and 4, barge mounted earthmoving equipment will be used to dig the trench, install the pipe material, and to bury the new force main. Spoils will be temporarily stockpiled in the barge-mounted hoppers with fluid containment and turbidity controls, and then placed back into the trench. Following construction, all disturbed work areas will be restored back to pre-construction bathymetric elevations.

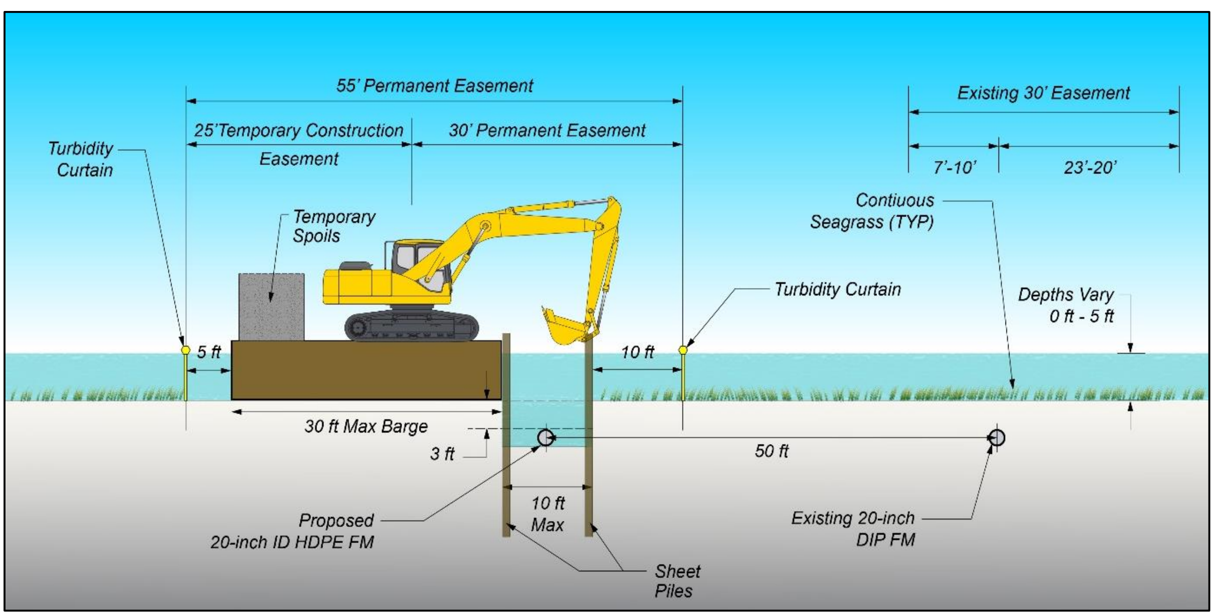

Figure 1-6
Construction Limits and Methods in Segments 2 and 4

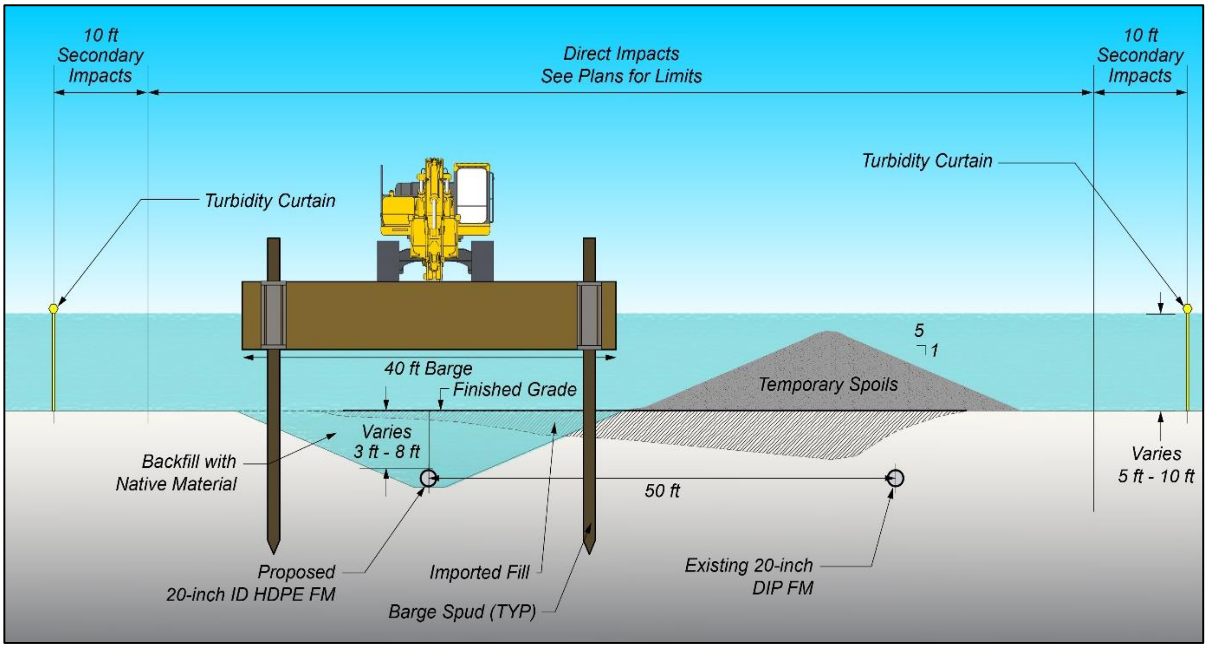

Figure 1-7
Construction Limits and Methods in Segment 3

Figure 1-7 shows the typical construction limits and proposed construction methods for Segments 3 (deep subtidal zone). In Segment 3, barge mounted earthmoving equipment will be used to dig the trench, install the pipe material, and to bury the new force main. Spoils will be temporarily stockpiled on the bay bottom adjacent to the existing force main, and then placed back into the trench cut. The entire work area will be contained by turbidity screens. Following construction, the new trench cut will be restored back to pre-construction bathymetric elevations. Excess spoils will be used to fill the old trench cut from the existing force main, and supplemented with additional offsite material, as a component of the project mitigation plan discussed in Section 2 below.

The difference in construction methods between Segments 2 and 4, and Segment 3, is that in the shallow subtidal areas smaller shallow-draft barges will be used; whereas in the deeper subtidal areas, larger floating barges with spuds will be used. The smaller shallow-draft barges used in Segments 2 and 4 will rest on the bottom in some areas during low tides, thus causing physical disturbance of the bottom. The larger barges used in Segment 3 will not rest on the bottom; however, some physical disturbance of the bottom will likely occur where spuds are used to secure the barge position.

1.5 Project Impacts

The construction limits methods described above have been designed to avoid and minimize impacts to wetlands and submerged habitats to the greatest extent possible. Avoidance and minimization of impacts will be achieved through: 1) routing of the new force main north of the existing force main, which avoids some areas of continuous seagrass by staying within the impact area of the existing force main, and minimizes impacts to mangroves on the west side of the project; and 2) development of specific construction methods for each segment, which minimize the open-cut trench footprint, as well as secondary impacts caused by temporary turbidity increases. Nonetheless, as proposed, the project will incur impacts to wetlands and submerged habitats.

Table 1-1 below provides a summary of direct and secondary impacts to wetlands and the submerged habitats of concern in Alignment 1. As noted above, the extent of project impacts has been reduced from the initial permit application submittals, as the project construction limits and methods were subsequently revised to further minimize impacts to wetlands and submerged habitats.

TABLE 1-1
SUMMARY OF PROJECT IMPACTS TO WETLANDS AND SUBMERGED HABITATS (REVISED)

Wetlands and Submerged Habitats	Direct Impact Area (acres)	Secondary Impact Area (acres)	Total Impact Area (acres)
Freshwater Wetlands	0.17	N/A	0.17
Mangroves and Intertidal Habitats	0.79	N/A	0.79
Seagrasses	1.91	2.41	4.41
Oysters	0.11	N/A	0.11

For seagrasses the impact quantification was based on the 2020 seagrass survey conducted by ESA. The subsequent release of 2020 seagrass maps produced by the Southwest Florida Water Management District have confirmed the general seagrass distribution in the project area as mapped by ESA, and show even less seagrass in the Segment 3 of Alignment 1. For freshwater and intertidal wetland, and oysters, 2020 aerial photography from Manatee County was utilized, supplemented by field surveys.

In Table 1-1, direct impacts represent the land or bottom surface area that will be physically disturbed by excavation of soils and sediments to access the construction areas and install the new force main, followed by the burial of the force main with the same native materials. Secondary impacts represent the surface area of submerged bottom that may be impacted by increased turbidity within the work areas. Secondary impacts areas are outside of the sheet piling that will contain the excavation and force main burial activities, but within turbidity screening that will encompass the entire construction area.

It must be emphasized that all direct and secondary impacts associated with the proposed project using the open-cut trench construction approach will be **temporary impacts only**. There will be no permanent hardening or placement of structures on the land surface or on the bay bottom in the work areas, and there will be no permanent alteration of topographic elevations or bathymetric contours (e.g., permanent dredge and fill areas). All directly impacted areas will be restored back to natural elevations and grades immediately upon installation and burial of the new force main. In addition, as part of the proposed mitigation plan described in Section 2, old trench and dredge cuts will be backfilled to adjacent grade with suitable sediment material and appropriately stabilized to support seagrass recovery in previously impacted areas that have been too deep to support seagrass for over 50 years.

2.0 Mitigation Plan

As stated above the mitigation plan described in the following sections addresses the 12 elements of a mitigation plan, as required under 40 CFR Part 230 Compensatory Mitigation for Losses of Aquatic Resources; Final Rule, promulgated by the U.S. Environmental Protection Agency in 2008. In addition to this document, construction plans for the proposed mitigation components are provided as part of the revised *Permit Plans* set, submitted concurrently as part of this response to Requests for Additional Information.

2.1 Objectives

The quantitative objectives of this proposed mitigation plan in terms of both acreages and ratios, and the methods to attain these objectives, are summarized in **Table 2-1** below.

TABLE 2-1
SUMMARY OF MITIGATION PLAN OBJECTIVES AND COMPENSATION METHODS

Wetlands and Submerged Habitats	Total Impact Area (acres)	Compensation Method(s)	Compensation Area / Ratio (acres)
Freshwater Wetlands	0.17	Restoration	0.17 / 1:1
Mangroves and Intertidal Habitats	0.79	Restoration/Enhancement	1.18 / 1.5:1
Seagrasses	4.41	Restoration/Establishment	8.73 / 2:1
Oysters	0.11	Restoration/Establishment	0.22 / 2:1

There are four components of this mitigation plan, which correspond to each of the four types of wetlands or submerged habitats to be impacted. Section 2.6 below provides a narrative description of each of the four mitigation components, while the *Mitigation Plans* set provides plans and general specifications for each component.

2.2 Site Selection

All four mitigation components will be conducted onsite within the project limits, and in immediately adjacent or nearby areas. Figure 2-1 below shows the location of each of the four mitigation components.

Onsite mitigation is most appropriate as there are numerous opportunities within the project limits, and in immediately adjacent or nearby areas, where previous dredge and fill impacts can be effectively remediated. There are several old trench and dredge cuts within the project limits that have not supported seagrasses for decades, even during the apex of seagrass expansion in northern Sarasota Bay (circa 2016), as bottom depths are below the photic zone. In addition to old trench and dredge cuts, Sister Keys - a cluster of mangrove islands owned by the Town of Longboat Key - offers extensive opportunities to restore tidal wetlands in two areas that were filled with dredge spoil material generated during the construction of the ICW.

SOURCE: ESA, 2019.

Town of Longboat Key Subaqueous Force Main
Figure 2-1
Longboat Key Mitigation Plan

Given the regional seagrass losses in northern Sarasota Bay, as described in Section 2.4, and the numerous historic dredge and fill impacts in the project vicinity, there are extensive opportunities to accomplish ecologically self-sustaining aquatic resource restoration, establishment, enhancement, and preservation onsite and in immediately adjacent or nearby areas. These mitigation opportunities are the most practical for the affected watershed. All four components of the mitigation plan, as well as success monitoring, can be accomplished most cost-effectively if implemented with the immediate vicinity of the project.

2.3 Site Protection Instrument

The primary mitigation site protection instruments will be utility and/or conservation easements recorded by, or dedicated to the Town of Longboat and the State of Florida. The approach for each project segment (see Figure 1-3) is summarized below.

- Segment 1 (western project terminus) – Impacts to mangroves and other intertidal wetlands will be restored on lands currently owned by the Town of Longboat Key. The applicant will maintain a utility easement over these areas. The utility easement will allow for any necessary maintenance or repair of the submerged force main, but will otherwise restrict or prohibit any other disturbances or dredge and fill impacts within the easement limits.
- Segments 2, 3, and 4 (submerged lands) – Impacts to seagrasses will be mitigated by backfilling old trench and dredge cuts, and seagrass transplanting, on submerged lands owned by the State of Florida. The applicant has applied for a sovereign submerged lands lease and utility easement with the State of Florida. The utility easement will allow for any necessary maintenance or repair of the submerged force mains, but will otherwise restrict prohibit any other disturbances or dredge and fill impacts within the easement limits.
- Segment 5 (eastern project terminus) – Impacts to mangroves and other intertidal wetlands will be restored on lands currently owned by the Long Bar Pointe Mitigation Bank, and will be consistent with the plans approved as part of the mitigation bank permit. The applicant will maintain a utility easement over these areas. The utility easement will allow for any necessary maintenance or repair of the submerged force main, but will otherwise restrict or prohibit any other disturbances or dredge and fill impacts within the easement limits.

In addition to mitigation constructed within the project limits, the applicant will record a conservation easement over all mitigation areas constructed on Sister Keys (e.g. scrape down of fill areas to create new tidal wetlands). In summary, all restoration, enhancement, and establishment areas will be protected under protected utility and/or conservation easements in perpetuity.

2.4 Baseline Information

Relevant baseline information for the wetlands and submerged habitats affected by the proposed project.

2.4.1 Freshwater Wetlands

The only freshwater wetlands to be impacted by the proposed project are highly disturbed wetlands that exist within the existing force main easement, on the eastern terminus (Segment 5) of the project limits. These wetlands are encompassed within the Long Bar Pointe Mitigation Bank, permitted by the FDEP (pending USACE approval). As part of the mitigation bank activities, the property owner cleared extensive Brazilian pepper along the upland fringe of mangroves in this area in 2019 and left these areas non-vegetated, to be restored to native species as part of the mitigation bank master plan. Currently, these wetlands are infested with invasive nuisance species including castor bean and primrose willow, but are expected to be restored pursuant to the specifications defined in the State mitigation bank permit.

2.4.2 Mangroves and Intertidal Habitats

Mangroves and non-vegetated tidal flats and estuarine beaches occur on both the western terminus (Segment 1) and eastern terminus (Segment 5) of the project limits. These are fringe mangrove forests fronting northern Sarasota Bay, and are composed of red (*Rhizophora mangle*), black (*Avicennia germanens*) and white (*Laguncularia racemosa*) mangroves. In Segment 5, the mangrove fringe occurs on lands owned by the Town of Longboat Key (Joan M. Durante Park), and has been impacted by minor historical dredge and fill activities. In Segment 5, the mangrove fringe occurs on lands owned by the Long Bar Pointe Mitigation Bank, and has been impacted by: 1) previous construction of the original force main; 2) temporary road fill associated with the repair of the recent force main leak; and 3) hydrologic stress from the discharge and pooling of raw sewage.

2.4.3 Seagrasses

The Southwest Florida Water Management District (SWFWMD) surveys and maps seagrass, oyster, and tidal flat distributions within the coastal waters in its jurisdiction every two years, with data extending back to 1988. Geospatial datasets and maps are produced and provided to the public for resource management purposes. The methodology used to develop these data include the collection of high resolution aerial imagery under ideal conditions for subtidal observations, when water clarity is optimal (e.g. winter months during low tides). The aerial imagery is then groundtruthed in the field and digital polygons of these marine resources are produced through both geospatial machine-learning algorithms and visual digitization. Seagrass is mapped as two categories: 1) sparse; and 2) continuous. **Figure 2-2** shows a time series plot of seagrass coverage in northern Sarasota Bay (e.g., between Siesta Key Drive and Manatee Avenue), as derived from the SWFWMD seagrass mapping program and other historical data sources.

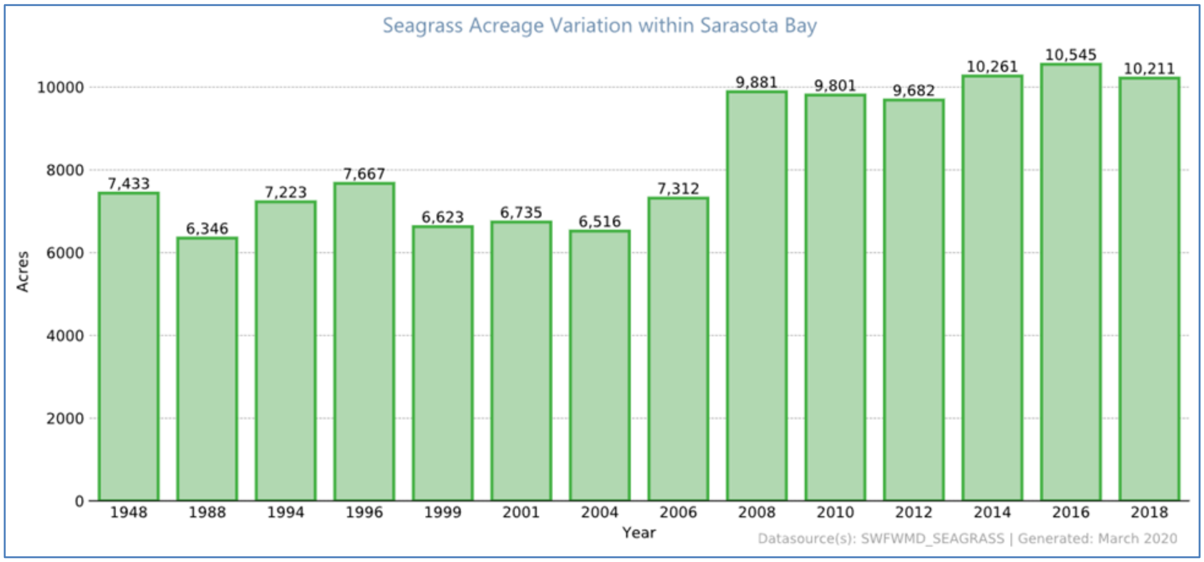

Figure 2-2
Seagrass Acreage Trends in Northern Sarasota Bay

As shown in Figure 2-2, seagrass coverage in northern Sarasota Bay reached its apex in the 2016 mapping period. Beginning in the summer of 2018 there was a protracted red tide event that co-occurred with the sustained chlorophyll-a values seen over the same months. Water quality data collected during this during time period suggest that northern Sarasota Bay was impacted by both a red tide and a more traditional phytoplankton bloom during the period of late 2018 to early 2019. There was also a lesser red tide event in 2016-2017 that didn't appear to have the same effect on chlorophyll-a. Based on SWFWMD seagrass mapping, the 2018-2019 period seems to co-occur with the period during which seagrass meadows have been lost or substantially diminished in the waters north and west of Long Bar Point.

Thus, the combination of algal blooms from both red tide and non-red tide organisms appears to have resulted in a substantial reduction in water clarity, which caused a rapid and massive decline in seagrass coverage in the project vicinity. SWFWMD has recently released their 2020 seagrass maps as provisional, and they indicated even more substantial seagrass losses between 2018 and 2020.

Figure 2-3 shows seagrass coverage in 2018 (SWFWMD) and 2020 (ESA) within the project limits of Alignment 1, which is represented by a 300-foot wide corridor with the existing force main serving as the centerline. Consistent with observed seagrass trends discussed above, the 2020 seagrass coverage shows a very substantial decline over the 2018 coverage. Of particular note are the deep trenched areas in Segment 3 that did not support seagrass during the 2016 apex of seagrass coverage in this area. Similarly, the entire bottom area of the unnamed is also devoid of seagrass in 2016, and likely has never supported seagrass since it was dredged. As described in the *Permit Support Document*, the cause for the lack of seagrass coverage in these areas is the deeper bottom depths, which fall below the viable photic zone for seagrass recruitment and growth.

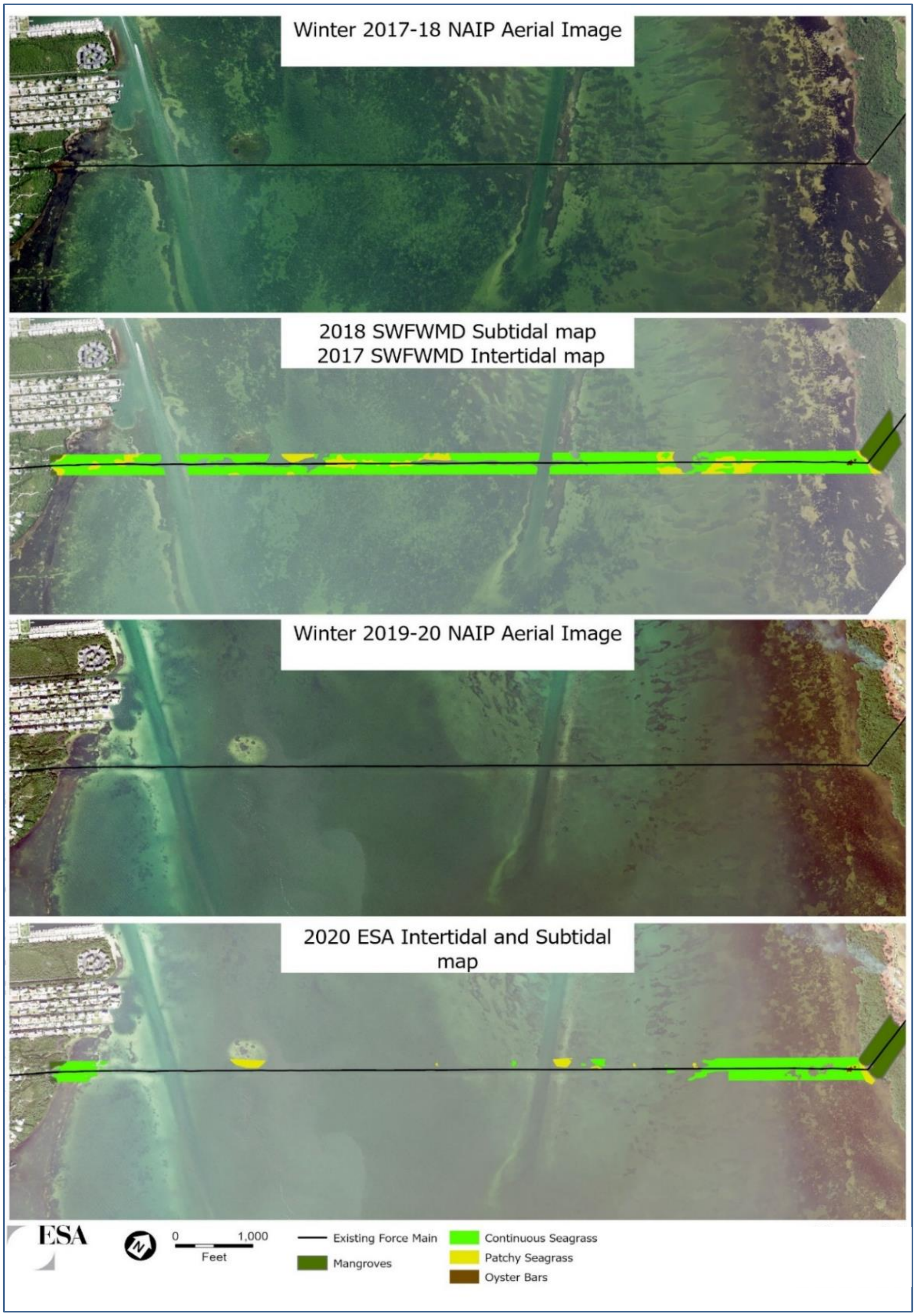

Figure 2-3
Seagrass Coverage Within the Project Limits 2017-2020

2.4.4 Oysters

Several small (<0.5 acre) oval-shaped oyster reefs occur along the eastern shoreline of northern Sarasota Bay, and appear to be associated with relict karst features and/or minor freshwater spring discharges. In addition to natural oyster reefs, the Sarasota Bay Estuary Program has constructed four oyster reef "restoration" projects along the same shoreline, which appear very similar to the natural reefs. All of the oyster reefs in the project vicinity are low-relief (1-3 feet) clusters of aggregated eastern oyster (*Crassostrea virginica*) shells that occur on the sediment surface. Oyster reefs in the project vicinity have not be significantly impacted by dredge and fill activities nor degraded water quality.

2.5 Determination of Credits

As noted above, the extent of project impacts has been reduced from the initial permit application submittals, as the project construction limits and methods were subsequently revised to further minimize impacts to wetlands and submerged habitats. In addition, mitigation options and the proposed mitigation plan have come into better focus. Accordingly, a revised Uniform Mitigation Assessment Methodology (UMAM) analysis has been prepared for project to reflect the reductions in project impacts and quantification and feasibility determination of the four mitigation plan components.

Table 2-2 below shows the revised UMAM analysis, including risk and time lag factors. This analysis shows that project impacts and mitigation can be feasibly balanced, and that all project impacts will effectively offset by the proposed mitigation plan activities.

2.6 Mitigation Work Plan

Detailed mitigation plans including appropriate plan-view and cross section drawings, and specifications, have been prepared in CADD format and submitted concurrently with this Mitigation Plan document. The narratives provided below describe background information and the mitigation work plan associated with each of the mitigation components.

2.6.1 Component 1 – Freshwater Wetlands

The only freshwater wetlands to be impacted by the proposed project occur on the eastern terminus of the project limits. The proposed project will impact approximately 0.17 acres of highly disturbed freshwater wetlands within the existing force main easement. These wetlands are encompassed within the Long Bar Pointe Mitigation Bank, permitted by the FDEP (pending USACE approval). As part of the mitigation bank activities, the property owner cleared extensive Brazilian pepper along the upland fringe of mangroves in this area in 2019 and left these areas non-vegetated, to be restored to native species as part of the mitigation bank master plan. Currently, these wetlands are infested with invasive nuisance species including castor bean and primrose willow.

TABLE 2-2
TOWN OF LONGBOAT KEY REDUNDANT SUBAQUEOUS SEWER FORCE MAIN UMAM SUMMARY (REVISED 5/21/2021)

Impacts

	Area (Acres)	Landscape		Water		Community Structure		Total Score			Functional
		Pre/Impact	With Impact	Pre/Impact	With Impact	Pre/Impact	With Impact	Pre/Impact	With Impact	Delta	Loss
Freshwater Wetlands	0.17	3	3	3	3	2	0	0.27	0.20	-0.07	**-0.01**
Mangroves/Intertidal Habitats	0.79	8	8	7	7	7	3	0.73	0.60	-0.13	**-0.11**
Seagrasses	4.41	7	7	6	6	7	5	0.67	0.60	-0.07	**-0.29**
Oysters	0.11	8	8	7	7	7	7	0.73	0.73	0.00	**0.00**
Total	**5.48**								**Total**		**-0.41**

Mitigation

	Area (Acres)	Landscape		Water		Community Structure		Total Score			Only Used for Preservation		Risk Factors			Functional
		Current	W/Mitigation	Current	W/Mitigation	Current	W/Mitigation	Current	W/Mitigation	Delta	Pres. Adj. Factor	Adj. Mit. Delta	Risk	Time Lag	RFG	Gain
Freshwater wetland restoration via grading and planting with desirable native species	0.17	3	3	3	3	2	9	0.27	0.50	0.23	N/A	N/A	1.00	2.00	0.12	**0.02**
Mangrove restortion and enhancement via grading, planting, and improved tidal flushing	1.18	8	8	7	9	7	9	0.73	0.87	0.13	N/A	N/A	1.00	3.00	0.04	**0.05**
Seagrass restoration and establishment via dredge cut backfilling and transplanting plugs from impact areas	8.73	7	7	6	9	3	9	0.53	0.83	0.30	N/A	N/A	2.00	4.00	0.04	**0.33**
Oyster restoration and establishment via relocation of existing oysters and placement of oyster bags and modules	0.22	7	7	7	8	7	8	0.70	0.77	0.07	N/A	N/A	1.00	1.00	0.07	**0.01**
Total	**10.30**													**Total**		**0.41**

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Given the current poor condition of wetlands in this area, the Town of Longboat Key proposes to restore 0.17 acres of freshwater wetlands for a mitigation to impact ratio of 1:1. This will be accomplished by direct restoration through grading and planting of the impact sites within the existing force main easement, followed by ongoing nuisance species management to ensure proper plant succession. The Town will also coordinate with the Long Bar Pointe Mitigation Bank to ensure that restoration activities are consistent with those approved for surrounding the mitigation bank.

2.6.2 Component 2 – Mangroves and Intertidal Habitats

The proposed project will impact a total of 0.79 acres of mangroves and tidal flats that occur on both the western (Segment 1) and eastern (Segment 5) ends of the project limits. Impacts on the western end of the project occur on lands owned by the Town of Longboat Key, including portions of Joan M. Durante Park. Impacts on the east end of the project occur within the existing force main easement on lands encompassed by the Long Bar Pointe Mitigation Bank, permitted by the FDEP (pending USACE approval).

Impacted mangroves and intertidal habitats in both areas will be directly restored immediately following installation of the new force main by grading these areas back to pre-construction topographic elevations, and then planting with 1-gallon nursery grown mangroves on 3-foot centers. It is anticipated that the majority of the plant material will be black mangroves (*Avicennia germanens*); however, red and white mangroves may also be planted where appropriate based on natural zonation.

Prior to the sewage leak there was approximately 0.2 acres of non-vegetated fill areas along the existing force main alignment, as determined from historical aerial photography. Most of these areas were impacted by the temporary haul road that was constructed to repair the sewage leak. As part of the mitigation plan, these areas will also be graded and planted.

In addition to mangrove plantings on the eastern end of the project, a shallow swale will be constructed within the existing pipeline easement to facilitate improved tidal flushing and circulation into restored areas and adjacent mangrove forest. Based on ecological assessments done as part of the sewage leak Consent Order, it was determined that portions of the mangrove forest in this area are suffering from poor tidal circulation, resulting hydrologic stress indicated by stunted and dying mangroves. The shallow swale is an enhancement that is expected to both accelerate the succession of the mangrove plantings and increase natural recruitment of mangrove seedlings.

Given the time lag loss of ecological function as mangrove plantings grow, the Town of Longboat proposes to restore 1.18 acres of mangroves for a mitigation to impact ratio of 1.5:1. If possible, this objective will be attained entirely through onsite restoration and enhancement. Accordingly, the Town will coordinate with the Long Bar Pointe Mitigation Bank to determine other intertidal wetland restoration potential in the general project vicinity outside of the Town's existing utility easement, and to ensure that restoration activities are consistent with those approved for the mitigation bank.

If the direct onsite restoration of 1.18 acres is not possible then additional restoration opportunities exist on Sister Keys, mangrove islands owned by the Town of Longboat Key. There are two spoil disposal sites on Sister Keys that were filled with spoil from the dredging of the ICW in the 1970's (see Figure 2-1 above). The north and south spoil disposal areas are 3.1 and 6.8 acres in size, respectively; and portions of these fill areas could be scraped down and restored back to intertidal or subtidal habitat. This would actually constitute new wetland creation as the fill areas are currently uplands. Therefore, the objective for mangrove and intertidal habitats can be easily attained within the project vicinity without the need to purchase credits at a mitigation bank.

2.6.3 Component 3 – Seagrasses

As redesigned, the proposed project will directly impact 1.91 acres of seagrasses through excavation, and may result in secondary impacts to seagrasses (through turbidity shading and smothering) of up to 2.41 acres. The total maximum seagrass impact area is estimated to be 4.41 acres, assuming the destruction of all seagrasses within the secondary impact areas, which is not likely

As discussed in Section 2.4.3 above, as well as the *Permit Support Document* submitted with the permit application, Sarasota Bay has experienced a very substantial seagrass loss over the past 2-3 years due to a severe and extended red tide bloom, and possibly more chronic declines in water clarity. This is particularly true for the northern Sarasota Bay project area. Mitigation for the proposed project has the potential to result in a net environmental benefit to the Sarasota Bay marine ecosystem with respect to seagrass recovery.

Portions of the open cut trench previously excavated for the placement of the existing force main were never properly backfilled, resulting in persistent deep areas with bottom depths that have not supported seagrasses for over 50 years, even when seagrass coverage was at its apex in 2016. In addition, an unnamed dredged channel runs perpendicular to the existing force main along the eastern side of the project. This channel was dredged prior to Clean Water Act requirements, and it too has bottom depths that have not supported seagrasses since it was constructed.

As part of the project mitigation plan, the old trench cut, and a portion of the unmarked dredged channel will be backfilled to adjacent grade with suitable sediment material, and appropriately stabilized, to support seagrass recovery. There are several nearby sources of suitable sediment material to be used for the proposed backfilling, including:

- Excess excavation material generated from the installation of the new force main;
- Dredge spoil from maintenance dredging of existing residential canals and navigation channels on or adjacent to Longboat Key;
- Legacy dredge spoil deposited on Sister Keys as part of the original dredging of the Intra-Coastal Waterway (ICW);
- Dredge spoil generated by the future maintenance dredging of the ICW by the West Coast Inland Navigation District (WCIND); and
- Upland-sourced fill material.

Using suitable fill material from the above-listed sources, the applicant proposes to backfill 8.73 acres of historical and persistent deep dredge cuts up to the natural adjacent bathymetry, which in most places occurs within the current photic zone. The Sister Keys spoil disposal areas contain over 84,000 cubic yards of fill material that was originally dredged from the adjacent ICW. The fill available from this source alone would provide 10 times the amount of material needed, and this material is compatible in grain size with ambient sediments in the proposed backfill areas. The fill areas include the old trench cut from the original force main installation, as well as a portion of the unnamed channel. The 8.73 acres of backfill will result in a mitigation to total impact ratio of approximately 2:1. This ratio assumes complete destruction of all seagrass in the secondary impact areas, which is not likely. Therefore, the actual ratio will probably be higher than 2:1 following seagrass recovery.

The proper backfilling of these deep areas with suitable fill material to support seagrass recovery in the project vicinity is expected over time to fully offset all temporary disturbances to seagrasses and marine benthic communities associated with project construction, and could result in a net increase in seagrass coverage in the project vicinity of northern Sarasota Bay over time assuming that suitable regional water clarity is maintained or improved. The rate of seagrass recovery will be dependent primarily on depth, sediment quality, and water clarity over the long term. However, while the depth and sediment quality in the backfilled areas can be controlled in the mitigation construction process, the long-term clarity of the overlying water column is a function of nutrient inputs to northern Sarasota Bay, as well as other factors such as periodic red tide events. Therefore, unlike other wetland mitigation, seagrass mitigation and subsequent natural recruitment/recovery is largely out of the control of permittees.

Given the time lag and uncertainties involved is seagrass recovery, seagrass establishment in the backfilled areas will be accomplished through limited transplanting of suitable seagrasses from the direct impact areas. It is the experience of the ESA consultant team that transplanting of seagrass is costly and marginally successful in most cases, especially bare root transplanting. The success of seagrass transplanting increases when it involves thick continuous seagrass material with dense root mats that can be extracted as consolidated plant/sediment plugs and installed immediately to nearby recipient sites.

The applicant is amenable to transplanting up to 1.0 acre of the most suitable seagrass material from the direct impact areas to the shallower backfilled restoration areas. This accounts for greater than 50 percent of the direct impact area. However, because seagrass communities in the project vicinity are currently under stress due to recent declines in water clarity, the cost/benefit of conducting more extensive seagrass transplanting on this project is not technical defensible at this time. Accordingly, all transplanted plugs will be installed in shallower bottom areas that are less than -5 feet NAVD88 in depth so that the variable of light transmission is better controlled. The Sarasota Bay Estuary Program has indicated that they support this approach to seagrass transplanting for the proposed project, given the current uncertainties in regional water quality status and trends.

Finally, if monitoring indicates that the backfilled deep cut areas are not recruiting seagrass at an acceptable rate, it may be possible to create new shallow subtidal lagoons by scraping down portions of the dredge spoil disposal areas on Sister Keys. Dredge spoil removed from these areas can also potentially be used as a source of suitable fill material to backfill the deep cut areas, as noted above. The applicant will consider the restoration of intertidal and subtidal wetlands in these spoil disposal areas, and the beneficial reuse of this spoil material for backfilling deep dredged cuts, if additional mitigation is needed to provide reasonable assurance for permit approval.

2.6.4 Component 4 – Oysters

The proposed project will directly impact approximately 0.11 acres of oyster habitat. The impact area is located just offshore of the eastern shoreline, where the new force main construction will transect the northern edge of two small oval-shaped oyster outcrops. The oysters present in the project construction area are low-relief accreted shell clusters that reside on the sediment surface. To minimize impacts, it may be possible during construction to excavate the oysters to be impacted, temporarily hold them on site, and then place them back in their original location once the force main is buried and the natural grade is restored.

Even though oyster impacts may be minimized by physically relocating them during construction, the applicant proposes to restore 0.22 acres of oysters for a mitigation to impact ratio of 2:1. This objective will be attained entirely through onsite restoration and enhancement. The appropriate and proven technique for establishing new oyster reef growth is filling biodegradable mesh bags with cleaned oyster shell, and placement of the bags along with other hard substrate such a lime rock or hollow concrete oyster modules in locations with suitable salinity and a quiescent wave energy environment. These methods have been successfully used by the Sarasota Bay Estuary Program (SBEP) to create new oyster reefs in northern Sarasota Bay at the same depths with similar bottom conditions as the proposed mitigation for this project.

As proposed, oyster bags and modules will be placed on the southern and western edges of the impacted oyster outcrops to extend the perimeter of these areas to attain the objective of 0.11 acres. In addition, if feasible, existing oysters within the impact areas will be excavated, held onsite during the force main installation, and then placed back in their original location. If most of the existing relocated oysters survive, then a ratio greater than 2:1 will be attained.

2.7 Maintenance Plan

The purpose of maintenance activities is to provide continued support of the habitat enhancement, restoration and creation areas such that they attain the desired end points and performance standards. The applicant is committed to appropriately maintaining the restored and/or created habitats associated with the four components of this mitigation plan to ensure that the objectives and performance standards are met within the prescribed permit monitoring and maintenance timeframe. Maintenance activities for each of the four mitigation plan components are briefly discussed below, while **Table 2-2** summarizes the maintenance plan components.

2.7.1 Component 1 – Freshwater Wetlands

The freshwater wetland restoration areas will be planted with native desirable species. The planted areas will be inspected bi-annually to ensure that the design coverage is being attained and any dead plants will be replaced with the same species. If it is determined that the observed successional zonation would better support different species, then the planting plan will be appropriately revised and implemented to ensure that the performance standards are met. In addition, bi-annual maintenance activities will include herbicide spraying as needed to control exotic and nuisance species.

2.7.2 Component 2 – Mangroves and Intertidal Habitats

The intertidal wetland restoration areas will be planted with three mangrove species (black, red and white mangroves). The planted areas will be inspected bi-annually, and any dead plants will be replaced with the same species. If it is determined that the observed successional zonation would better support different species, then the planting plan will be appropriately revised and implemented to ensure that the performance standards are met. In addition, the mangrove planting areas will be enhanced by the creation of a tidal flushing swale that is hydrologically connected to Sarasota Bay. Therefore, maintenance of the mangrove planting areas will also consist of periodic hand excavation of accreted sediment in the flushing swale to ensure efficient tidal circulation and natural mangrove recruitment.

2.7.3 Component 3 – Seagrasses

Seagrass restoration areas will be backfilled with suitable sediment material to attain a design depth within the photic zone. In addition, 1.0 acre of existing seagrass from the direct impact areas will be transplanted into shallower portions of the project construction corridor. Maintenance activities for the seagrass component will involve bi-annual monitoring of the backfill areas to ensure that the design depths area being maintained and significant erosion is not occurring. If the backfill material is eroding, then the placement of additional higher-density sediment material may be required.

In addition, the seagrass transplant area will also be monitored bi-annually to ensure that the design coverage is being attained. Dead individual seagrass transplants will be replaced if it is determined that the overall transplant zone is succeeding (e.g., native sediments and depths are conducive to recruitment).

2.7.4 Component 4 – Oysters

The oyster restoration areas involve both relocation of existing oysters and the placement of oyster shell bags and modules along the perimeter of the impacted oyster reefs. Oyster restoration areas will be monitored bi-annually to ensure that relocated oysters are surviving, and that the oyster bags and modules are recruiting new oysters (e.g., they are in appropriate depth and salinity zones). If either of these criteria are not being met, then the additional oyster bags and/or modules may be placed in other more suitable nearby locations.

TABLE 2-2
SUMMARY OF MAINTENANCE PLAN COMPONENTS

Mitigation Plan Component	Mitigation Area (acres)	Compensation Methods	Maintenance Methods
Freshwater Wetlands	0.17	Plantings	Replacement plantings Exotic controls
Mangroves and Intertidal Habitats	1.18	Plantings	Replacement plantings Maintenance of tidal flushing channel
Seagrasses	8.73	Backfill sediment Transplanting existing seagrass	Maintenance of design depths Replacement transplants
Oysters	0.22	Relocation of existing oysters Placement of shell bags/modules	Additional shell bags/modules

2.8 Performance Standards

Performance standards for compensatory mitigation projects are ecologically-based metrics to be used to determine whether the mitigation plan components are attaining the stated objectives. Metrics typically include vegetative, hydrological, and soils criteria – with specific attainment timeframes - that can be readily measured to document success or failure. **Table 2-3** shows the proposed performance standards and associated attainment timeframes for each of the mitigation plan components.

TABLE 2-3
PROPOSED PERFORMANCE STANDARDS

Mitigation Plan Component	Mitigation Area (acres)	Performance Standards	Attainment Timeframe
Freshwater Wetlands	0.17	>90% coverage of desirable native species; <10% coverage of exotic/nuisance species	3 years
Mangroves and Intertidal Habitats	1.18	100% survival of planted mangroves; >90% coverage mangroves in planted areas Tidal flushing channel functioning properly	4 years
Seagrasses	8.73	100% of backfill areas at design depth; evidence of natural seagrass recruitment 75% survival of seagrass transplants	5 years
Oysters	0.22	100% survival of relocated oysters; shell bags/modules clearly recruiting new oysters	2 years

2.9 Monitoring Requirement

Monitoring of the four mitigation plan components will be critical to attaining the overall plan objectives and the specific performance standards for each. Periodic routine monitoring is required to assess whether the compensatory mitigation project is on track to meet performance standards, or if adaptive management measures are needed.

The applicant will conduct bi-annual monitoring (e.g., every 6 months) of the four mitigation plan components for a period of 5 years, to cover the attainment timeframes shown in Table 2-3 above. Monitoring will be discontinued for mitigation components that meet their performance standards at the end of their specified attainment timeframe. However, if a mitigation component is not meeting its performance standard at the end of its attainment timeframe, then monitoring will continue until the performance standard is met. It should also be noted that seagrass extent and density in the project limits, including the mitigation areas, will be monitoring by SWFWMD every two years as part of their routine seagrass and subtidal habitat mapping program.

The applicant will also submit comprehensive annual monitoring reports to the USACE. A total of five (5) annual monitoring reports will be submitted unless monitoring is extended due to a failure to meet a specified performance standard. The annual monitoring reports shall include all required content, and be provided in the format, specified in *Regulatory Guidance Letter 08-03: Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Restoration, Establishment, and/or Enhancement of Aquatic Resources* (USACE, 2008).

2.10 Long-Term Management Plan

Long-term management of the four mitigation plan components will be addressed primarily through their respective landscape locations.

2.10.1 Component 1 – Freshwater Wetlands

One freshwater wetland mitigation area is located at the east end of the project limits will become part of the Long Bar Pointe Mitigation Bank. Although a utility easement will remain over both the existing and new force main, habitats and vegetation communities within the easement will be protected and managed consistent with the State mitigation bank permit

2.10.2 Component 2 – Mangroves and Intertidal Habitats

Mangrove and intertidal habitat mitigation areas are located on both the west and east ends of the project limits. On the west side, this mitigation will be conducted within Joan Durante Park, a natural and recreational area owned by the Town of Longboat Key. Protection and management of these areas will be conducted as part of the park management plan. On the east side, the mangrove mitigation will become part of the Long Bar Pointe Mitigation Bank. Although a utility easement will remain over both the existing and new force main, habitats and vegetation communities within the easement will be managed as part of the mitigation bank permit. Additional mangrove and intertidal wetland mitigation that may be constructed on Sister Keys will be managed as natural areas by the Town of Longboat Key, the owner of the property.

2.10.3 Component 3 – Seagrasses

Seagrass mitigation areas located within the subtidal portions of the force main construction corridor will remain under the ownership of the State of Florida as sovereign submerged lands. Although a utility easement will remain over both the existing and new force main, seagrasses and other subtidal habitats will be protected and subject to the resource and water quality management conducted by multiple agencies including the Florida Department of Environmental

Protection, the Florida Fish and Wildlife Conservation Commission, and the Sarasota Bay Estuary Program. In addition, SWFWMD will continue to monitor and map seagrasses and other subtidal habitats in the project vicinity. Additional seagrass and subtidal habitat mitigation that may be constructed on Sister Keys will be managed as natural areas by the Town of Longboat Key, the owner of the property.

2.10.4 Component 4 – Oysters

The oyster mitigation located within the subtidal portions of the force main construction corridor will remain under the ownership of the State of Florida as sovereign submerged lands. Although a utility easement will remain over both the existing and new force main, seagrasses and other subtidal habitats will be protected and subject to resource management conducted by multiple agencies including the Florida Department of Environmental Protection, the Florida Fish and Wildlife Conservation Commission, and the Sarasota Bay Estuary Program. In addition, SWFWMD will continue to monitor and map seagrasses and oyster reefs in the project vicinity.

2.11 Adaptive Management Plan

Adaptive management refers to a management strategy that addresses unforeseen changes in site conditions or other components of a compensatory mitigation project, including the party or parties responsible for implementing adaptive management measures.

Clearly, the most unpredictable aspect of the proposed mitigation plan is the natural recovery of seagrasses within the project vicinity. The primary factor involved in seagrass recovery within the project vicinity is water clarity, which in turn is a function of nutrient inputs as well as periodic red tide events. The applicant has little or no control in maintaining or improving regional water clarity. Therefore, the primary goal of the seagrass mitigation component is to restore bathymetric and benthic conditions such that they will support natural seagrass recovery when water quality conditions are suitable. To help offset this risk, the applicant has proposed to transplant 1.0 acre of the densest seagrass from direct impacts areas to shallower areas (<5 feet deep) within the project limits to increase the probability of transplant success.

Given the relative certainty of attaining performance standards, adaptive management strategies are not proposed or needed for the freshwater wetland, mangrove/intertidal habitat, and oyster components of the mitigation plan.

2.12 Financial Assurances

The Town of Longboat Key, an incorporated local government in the State of Florida, will be responsible for the full implementation of this mitigation plan, including construction, monitoring, and maintenance as part of the construction of a new redundant force main along the preferred alignment. As described in Section 1 above, the proposed redundant sewer force main project is a critical infrastructure need for the Town of Longboat Key. The project is a component of the Town's Capital Improvement Program (CIP), and will be fully funded to include all mitigation commitments described herein.