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Engineering With Nature: Designing Navigation Infrastructure for Greater Environmental Sustainability
USACE Workshop, Charleston, SC

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September 7, 2011

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The Manatee Pocket Dredging Project: Environmentally Beneficial, Sustainable, and Cost-Effective

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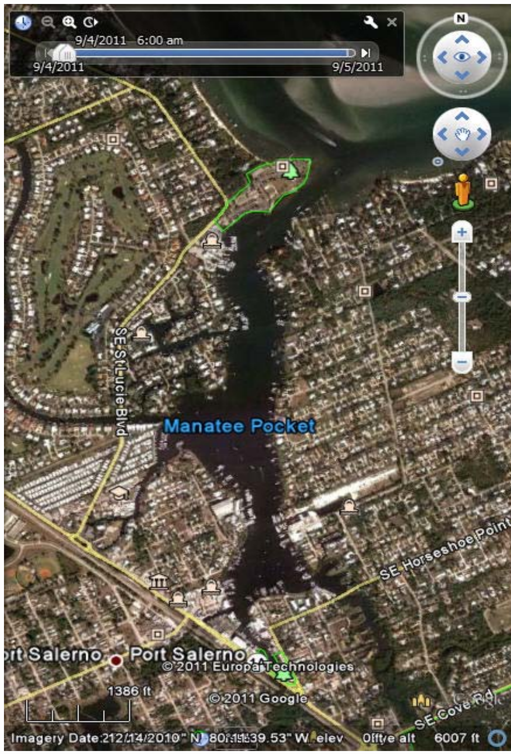
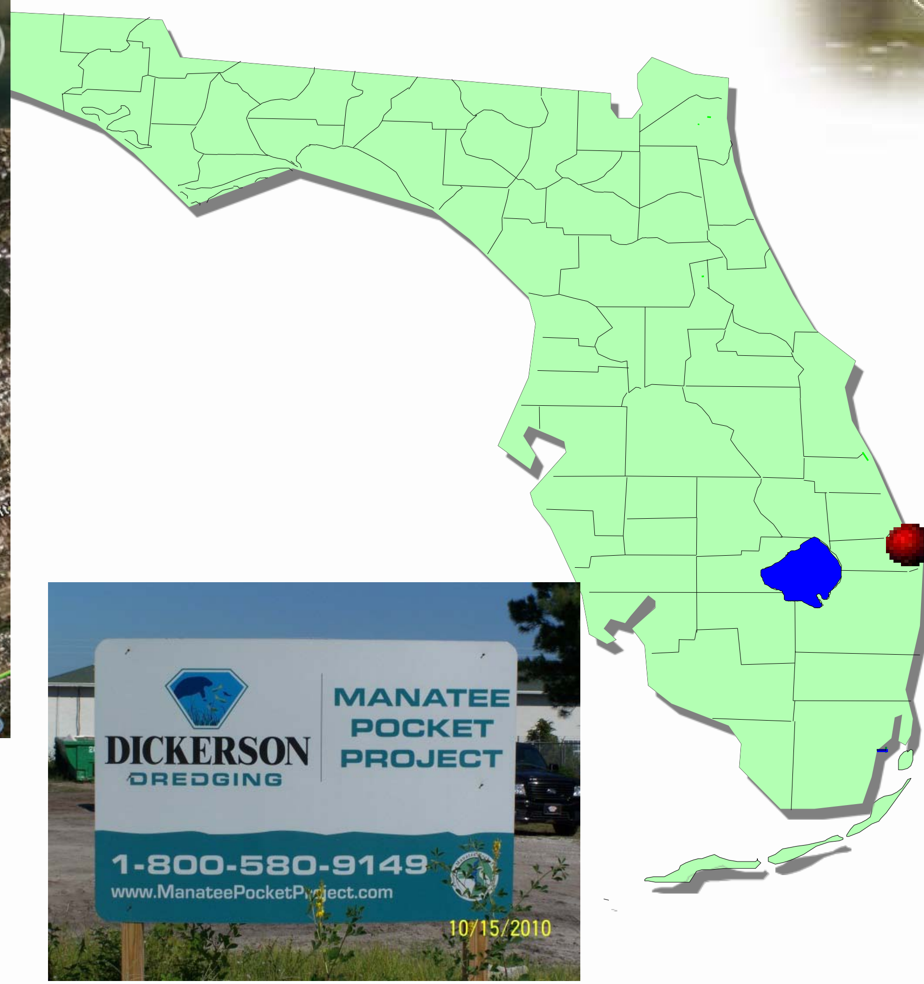
Project Location





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Manatee Pocket Site Constraints

Salerno Creek

Manatee Pocket

The Pocket, a long, narrow estuarine embayment lined with marinas and homes, contains shoals of sandy and organic sediments affecting navigation and water quality.

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The Hydraulic Dredge

Dickerson-Florida's Miss Margaret

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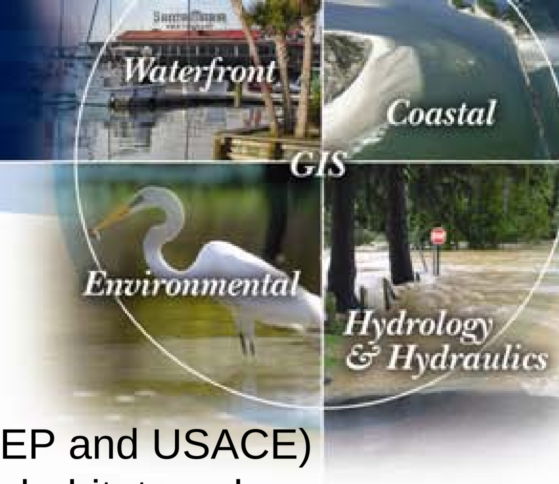
Project Benefits and Challenges

Project Benefits

- A successful environmentally sustainable dredging project,
- Benefits local navigation,
- Creates marine infrastructure, and
- Increases benthic habitat environment in Martin County FL.

Project Challenges

- Hydraulic dredging of potentially contaminated sediments,
- Pumping of the dredge slurry through more than four miles of residential development to a confined disposal facility (CDF) at the end of a local airport runway.
- Required intensive batch testing of each truckload of sediment taken from the CDF to allow determination of appropriate sediment disposal (lined landfill disposal or commercial industrial use).



Clients and Team's Goals

For Martin County:

- Complete Dredging of Manatee Pocket to permitted depth (FDEP and USACE) including channel creation, development of submerged benthic habitat, and increasing the tidal flow
- Complete as economically as possible
- Complete project in accordance with project schedule

For Dickerson Florida:

- Reduction of high concentrations of contaminants of concern at specific locations and
- Cost-effective alternatives to a very risky dredge material management plan.
- Utilize the design-build concept, with engineers working on the contractor's team.

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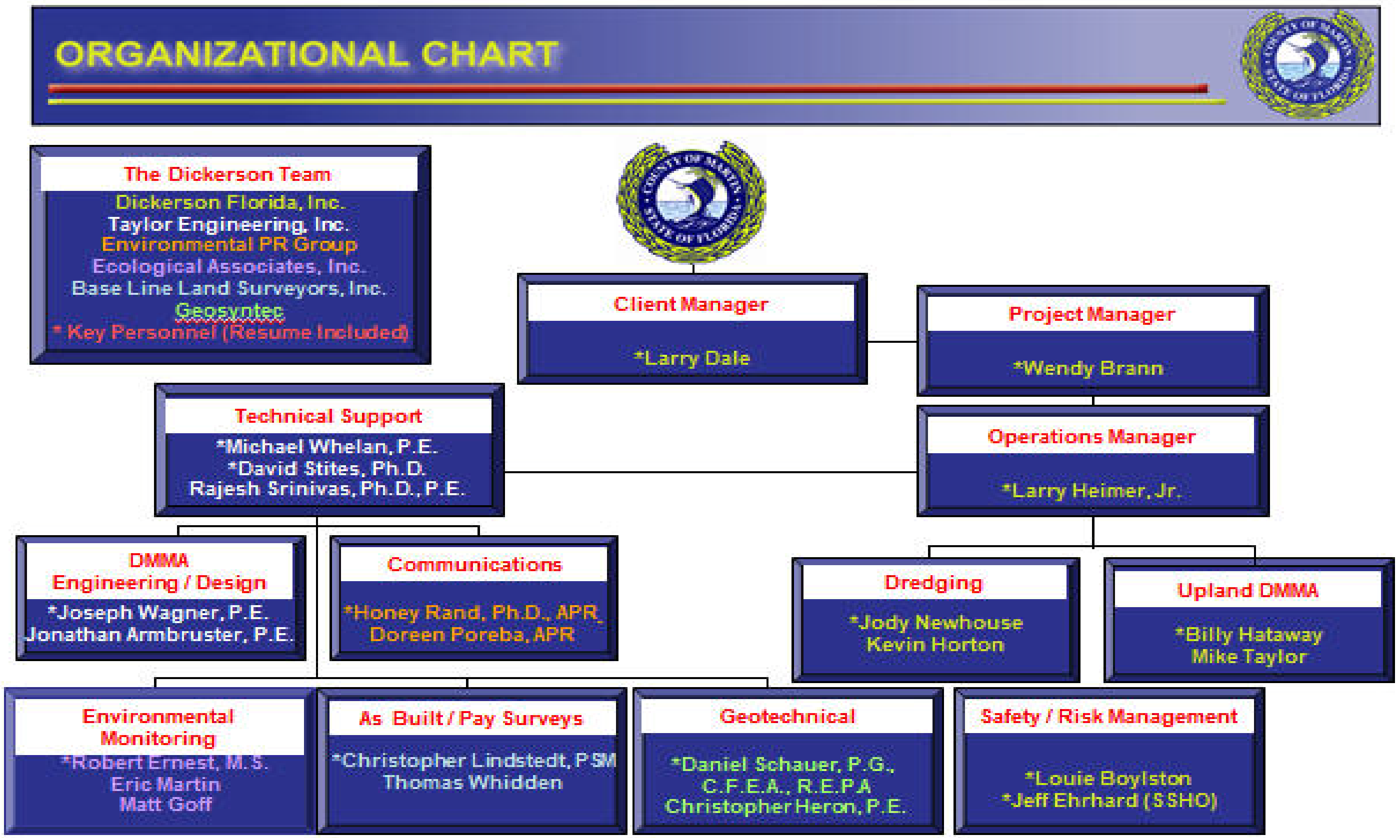
Our Design-Build Concept



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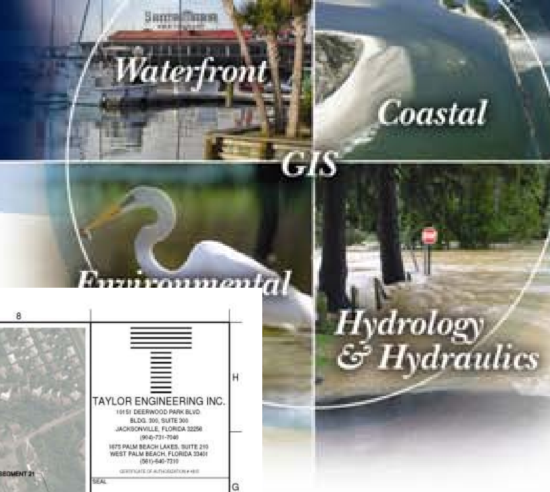
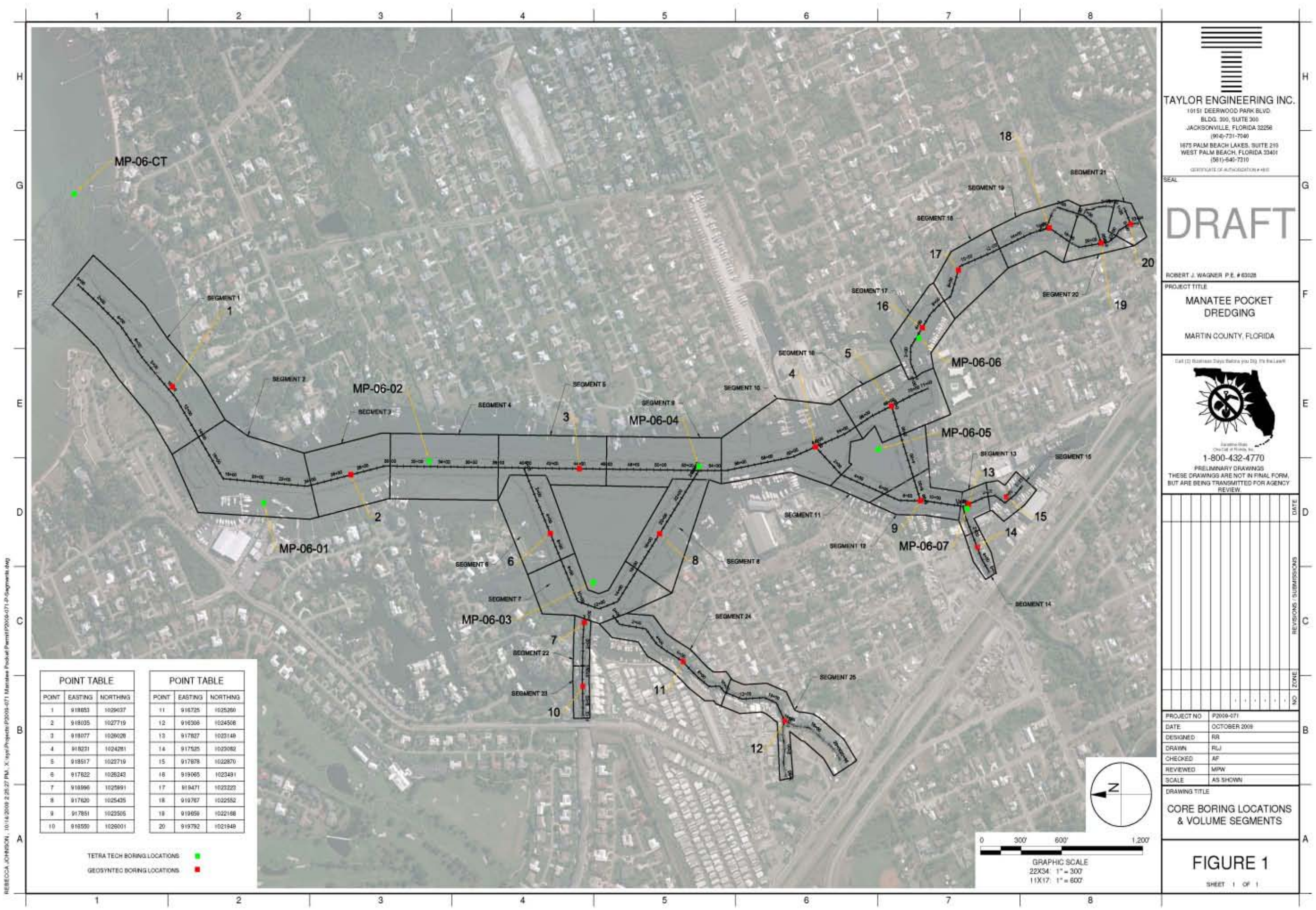
Project Team's Approach

- Resolve project challenges at the proposal stage and submitted an alternate engineering plan with its bid.
- Team must accept some failure risk at the bid and initial project stages but allowed the team to provide the county with a better project than identified in the bid offering.
- Required the collection of additional field samples to clarify the distribution of the contaminants of concern and use that data to define a dredging plan mixing sediments with high and low contaminant concentrations to achieve industrial/commercial cleanup standards.
- Relocated the CDF to a safer, closer location (the Dickerson team had identified several acceptable locations at the proposal stage).
- Develop a two-cell CDF design
- Reduce the number of booster pumps in the overland conveyance of the dredged sediments from 4 to 1



Contaminated Sediments



POINT TABLE

POINT	EASTING	NORTHING
1	918853	1029037
2	918035	1027719
3	918077	1026028
4	918231	1024281
5	918517	1022719
6	917822	1026243
7	916996	1025891
8	917620	1025435
9	917851	1023505
10	916550	1026001

POINT TABLE

POINT	EASTING	NORTHING
11	916725	1025260
12	916308	1024508
13	917827	1023148
14	917525	1023082
15	917878	1022870
16	919065	1023491
17	919471	1023223
18	919767	1022552
19	919659	1022168
20	919792	1021948

Channel Segments

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Sediment Soil Analysis

Table D-1: Dredging Volumes per Segment

SEGMENTS	VOLUME (CY)	% FINER THAN 200 SIEVE	SEGMENTS	VOLUME (CY)	% FINER THAN 200 SIEVE
1	22,198	10.9	14	831	20.6
2	15,811	6.8	15	1,413	8.3
3	8,156	36.0	16	27,824	31.5
4	10,765	42.0	17	6,690	19.4
5	11,040	38.0	18	6,453	13.8
6	14,217	14.6	19	5,053	26.6
7	30,269	17.2	20	1,877	16.6
8	20,226	36.3	21	800	18.3
9	12,656	46.5	22	2,306	5.4
10	27,517	31.6	23	2,607	7.8
11	16,298	42.4	24	8,809	9.1
12	16,298	22.2	25	3,522	6.8
13	4,280	12.6	TOTAL VOLUME		278,276

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Sediment Chemistry

Table D-2: Weighted Average Concentrations

		Soil Cleanup Target Levels		
	Units	Residential	Commercial/ Industrial	Weighted Total
Semi-volatile Organic Compounds				
Acenaphthene	mg/kg	2,400	20,000	0.016
Acenaphthylene	mg/kg	1,800	20,000	0.011
Anthracene	mg/kg	21,000	300,000	0.020
Benzo(a)anthracene	mg/kg	#	#	0.019
Benzo(a)pyrene	mg/kg	0.1	0.7	0.018
Benzo(b)fluoranthene	mg/kg	#	#	0.021
Benzo(g,h,i)perylene	mg/kg	2,500	52,000	0.015
Benzo(k)fluoranthene	mg/kg	#	#	0.014
Chrysene	mg/kg	#	#	0.019
Dibenzo(a,h)anthracene	mg/kg	#	#	0.014
Ideno (1,2,3-c,d)pyrene	mg/kg	3200	59000	0.004
1-Methylnaphthalene	mg/kg	2,600	33,000	0.006
2-Methylnaphthalene	mg/kg	#	#	0.014
Naphthalene	mg/kg	200	1,800	0.013
Phenanthrene	mg/kg	210	2,100	0.015
Pyrene	mg/kg	55	300	0.022
Benzo[a]pyrene Toxicity Equivalent Calculations				
Benzo[a]pyrene TEQs	mg/kg	0.1	0.7	0.021
Metals				
Aluminum	mg/kg	80,000	NA	7743.54
Arsenic	mg/kg	2.1	12	3.22
Cadmium	mg/kg	82	1,700	0.31
Copper	mg/kg	150	8,900	27.94
Lead	mg/kg	400	1,400	12.04
Mercury	mg/kg	3	17	0.12
Zinc	mg/kg	26,000	630,000	40.51

Notes: # = Refer to Benzo[a]pyrene TEQ (Total Equivalent Value) for the calculated Benzo(a)pyrene equivalent value and applicable screening criteria.

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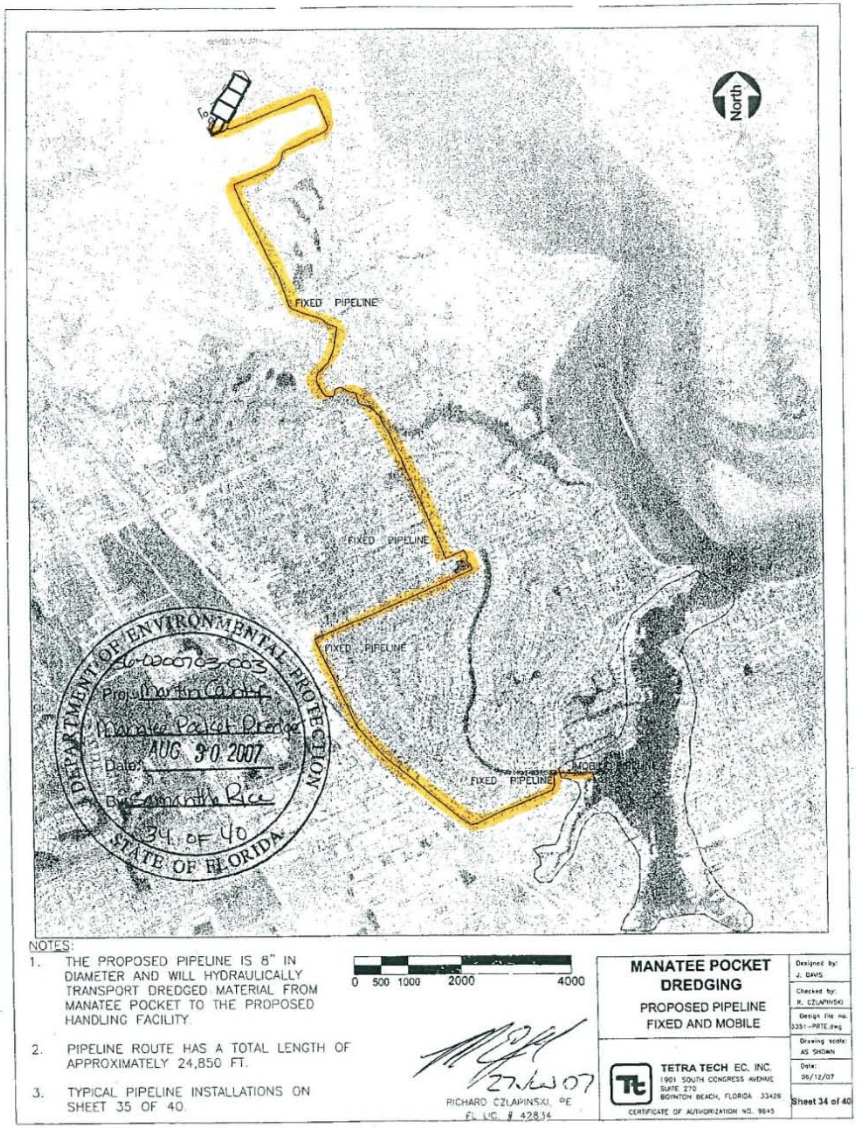
Permitted Pipeline Routes



- Used Airport Site
- +/- 4 miles of Pipeline through Residential neighborhoods
- Crossings through Residential driveway
- Directional drills under local streets
- Through Gopher tortoise habitat
- Through Golf Course and surrounding Community

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Coastal
GIS
Environmental
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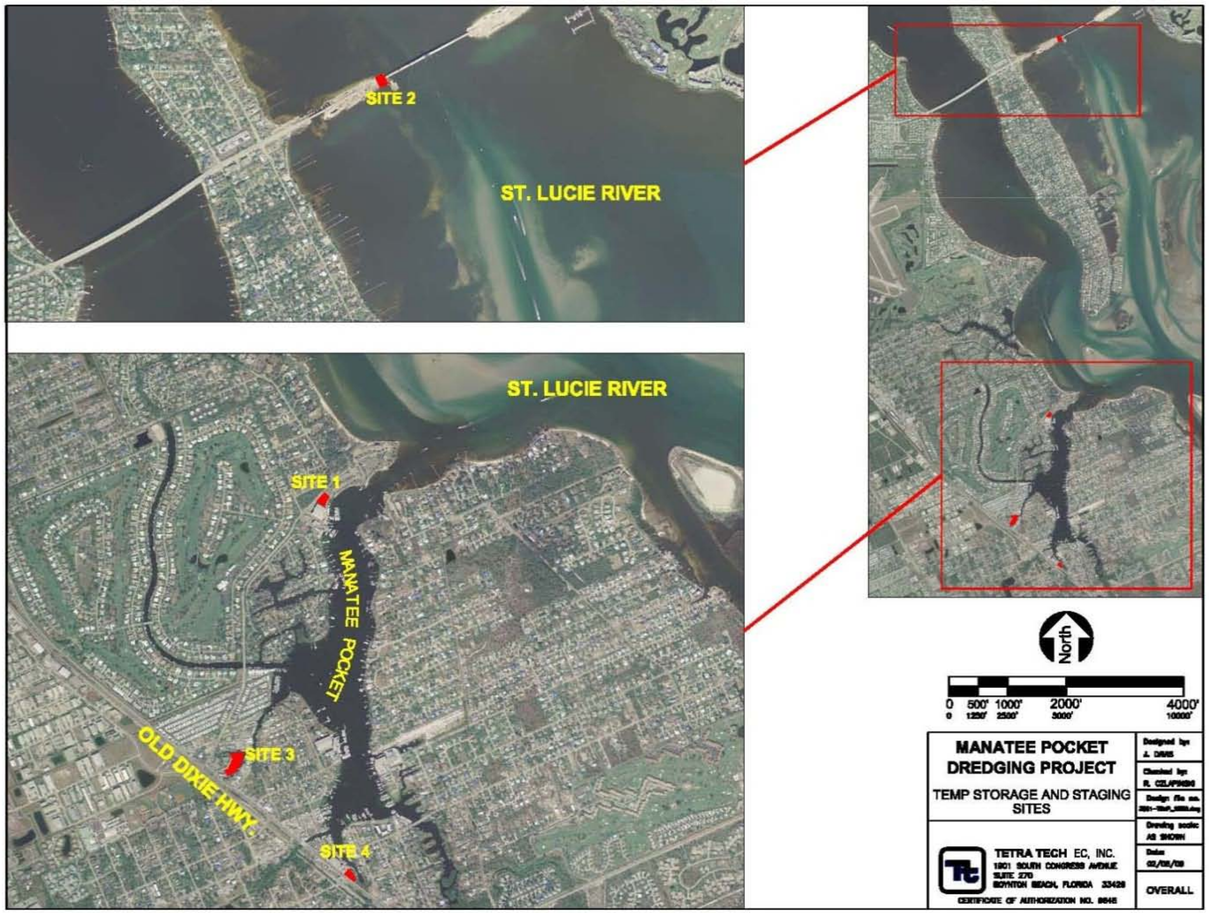
Permitted Staging Areas



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Teams solution to the CDF

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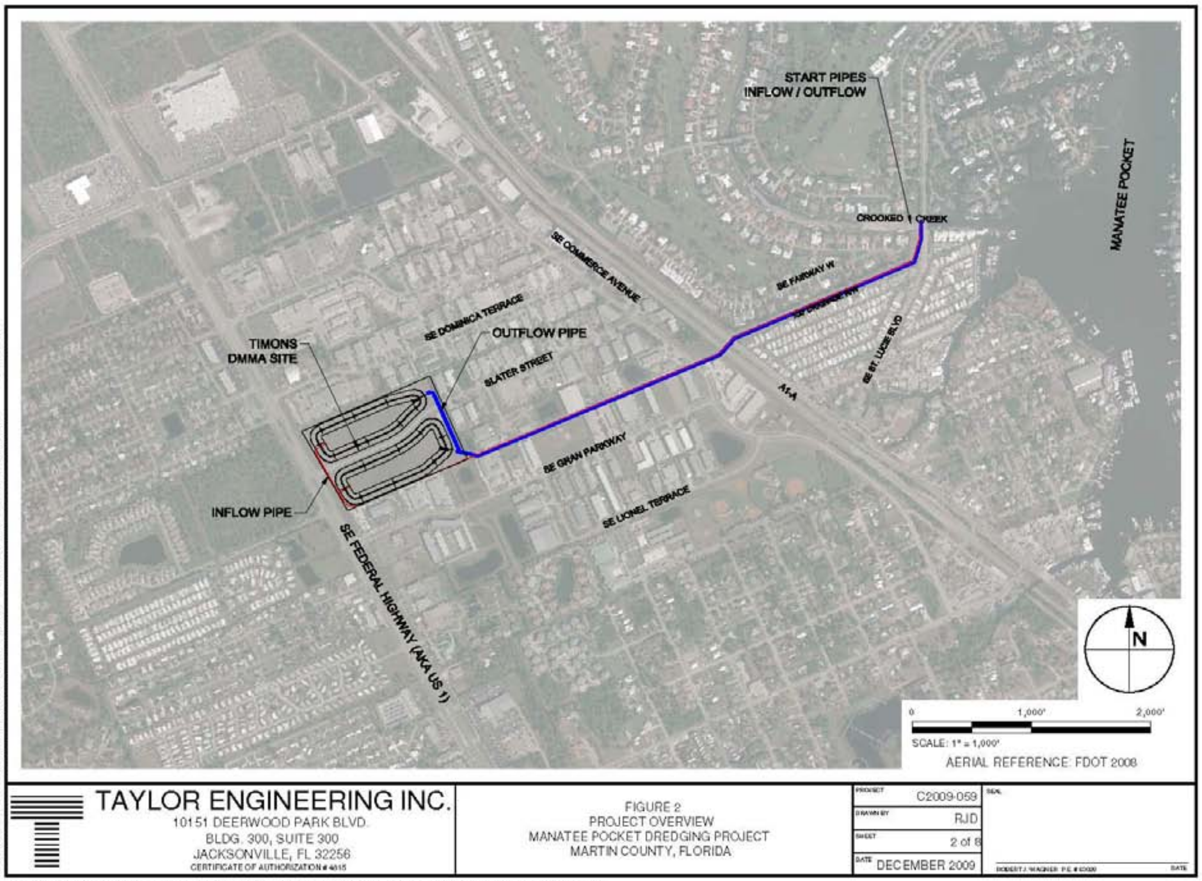
Team’s Pipeline Route



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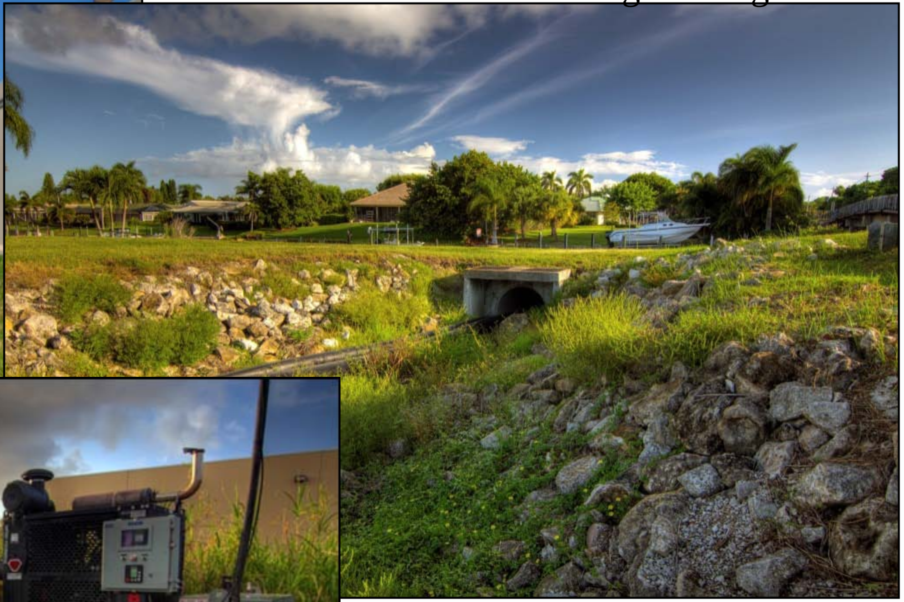
Pipeline Routes Using Existing R/O/W

Existing Drainage Swale

Existing Drainage Swale



Booster Pump Placed in Industrially Zoned Area

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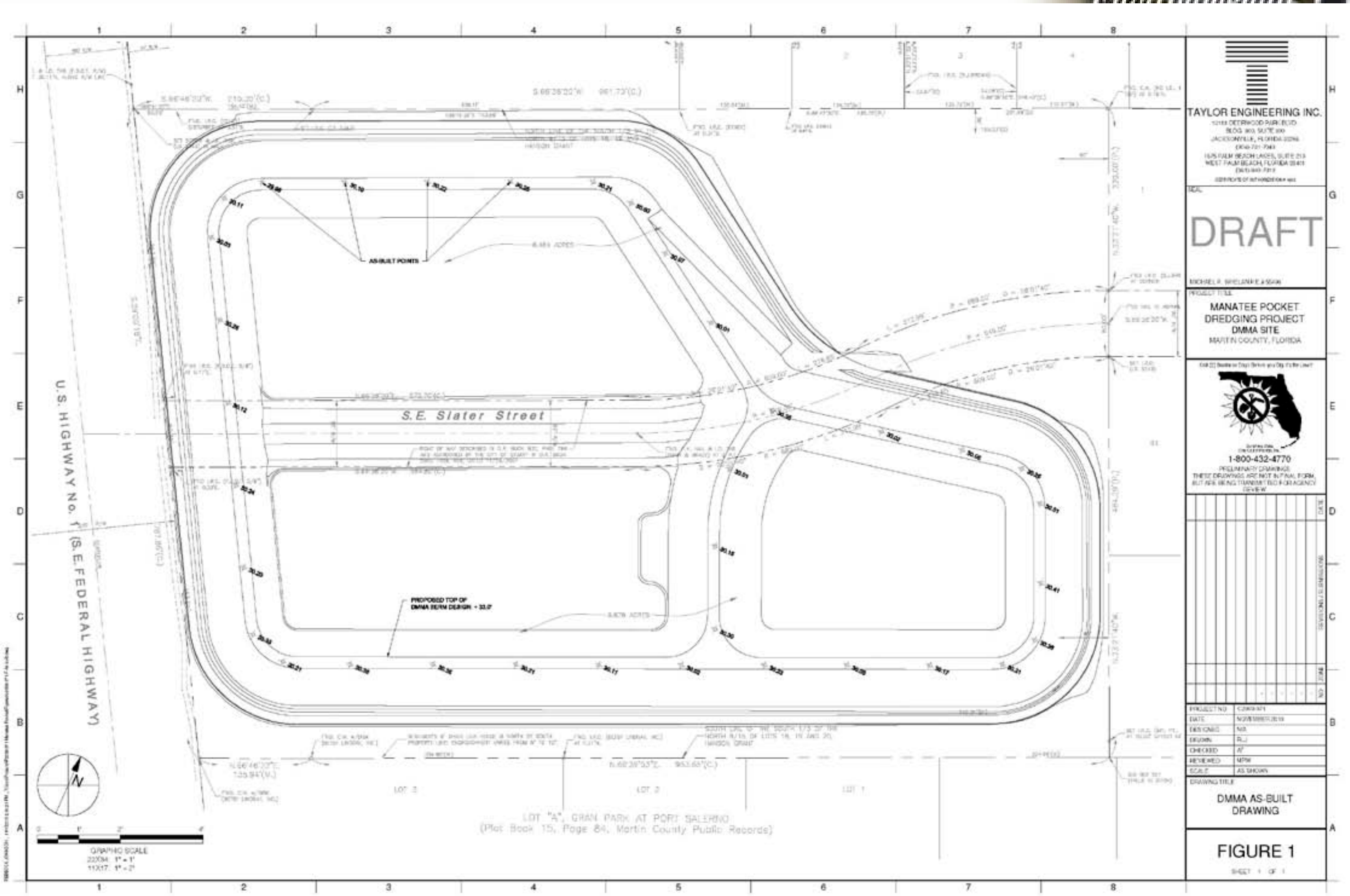
Proposed Temporary CDF



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Temporary CDF Facility

Temporary Weirs

Temporary Seepage Swale

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Temporary CDF

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Temporary CDF in Operation

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Project's Final Results

- Risk acceptance and engineering design work in the proposal

  a winning bid and approved permit modifications.
- All of the dredged sediments met commercial industrial use standards.

- Reduced overland pipeline route to about one mile long, reduced booster pump requirements from four to just one and eliminated costs to put the pipeline under residential driveways and roads.
- Smaller project allowed a shorter dredging period
- Reduced the project carbon footprint
- Increased sediment reuse, and
- Achieved Clients and Team's goals

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Questions ?

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