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


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Project Location

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

Dickerson-Florida's Miss Margaret
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.
Our Design-Build Concept

ORGANIZATIONAL CHART

The Dickerson Team
Dickerson Florida, Inc.
Taylor Engineering, Inc.
Environmental PR Group
Ecological Associates, Inc.
Base Line Land Surveyors, Inc.

* Key Personnel (Resume Included)

Geosyntec

Client Manager
*Larry Dale

Project Manager
*Wendy Brann

Operations Manager
*Larry Heimer, Jr.

Technical Support
*Michael Whelan, P.E.
*David Stites, Ph.D.
Rajesh Srinivas, Ph.D., P.E.

DMMA Engineering / Design
*Joseph Wagner, P.E.
Jonathan Armbruster, P.E.

Communications
*Honey Rand, Ph.D., APR
Doreen Foreba, APR

Dredging
*Jody Newhouse
Kevin Horton

Upland DMMA
*Billy Hataway
Mike Taylor

Environmental Monitoring
*Robert Ernest, M.S.
Eric Martin
Matt Goff

As Built / Pay Surveys
*Christopher Lindstedt, PSM
Thomas Whidden

Geotechnical
*Daniel Schauer, P.G.,
C.F.E.A., R.E.P.A
Christopher Heron, P.E.

Safety / Risk Management
*Louie Boylston
*Jeff Ehrhard (SSHO)
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

Channel Segments
Sediment Soil Analysis

Table D-1: Dredging Volumes per Segment

<table>
<thead>
<tr>
<th>SEGMENTS</th>
<th>VOLUME (CY)</th>
<th>% FINER THAN 200 SIEVE</th>
<th>SEGMENTS</th>
<th>VOLUME (CY)</th>
<th>% FINER THAN 200 SIEVE</th>
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<tbody>
<tr>
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<td>22,198</td>
<td>10.9</td>
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<td>831</td>
<td>20.6</td>
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<td>2</td>
<td>15,811</td>
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<td>15</td>
<td>1,413</td>
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<td>38.0</td>
<td>18</td>
<td>6,453</td>
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<td>6</td>
<td>14,217</td>
<td>14.6</td>
<td>19</td>
<td>5,053</td>
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<td>7</td>
<td>30,269</td>
<td>17.2</td>
<td>20</td>
<td>1,877</td>
<td>16.6</td>
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<tr>
<td>8</td>
<td>20,226</td>
<td>36.3</td>
<td>21</td>
<td>800</td>
<td>18.3</td>
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<tr>
<td>9</td>
<td>12,656</td>
<td>46.5</td>
<td>22</td>
<td>2,306</td>
<td>5.4</td>
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<td>10</td>
<td>27,517</td>
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<td>11</td>
<td>16,298</td>
<td>42.4</td>
<td>24</td>
<td>8,809</td>
<td>9.1</td>
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<tr>
<td>12</td>
<td>16,298</td>
<td>22.2</td>
<td>25</td>
<td>3,522</td>
<td>6.8</td>
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<tr>
<td>13</td>
<td>4,280</td>
<td>12.6</td>
<td></td>
<td>TOTAL VOLUME</td>
<td>278,276</td>
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</table>
# Sediment Chemistry

## Table D-2: Weighted Average Concentrations

<table>
<thead>
<tr>
<th>Organic Compounds</th>
<th>Units</th>
<th>Residential</th>
<th>Commercial/Industrial</th>
<th>Weighted Total</th>
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<tbody>
<tr>
<td><strong>Semi-volatile Organic Compounds</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acenaphthene</td>
<td>mg/kg</td>
<td>2,400</td>
<td>20,000</td>
<td>0.016</td>
</tr>
<tr>
<td>Acenaphthylene</td>
<td>mg/kg</td>
<td>1,800</td>
<td>20,000</td>
<td>0.011</td>
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<td>Anthracene</td>
<td>mg/kg</td>
<td>21,000</td>
<td>300,000</td>
<td>0.020</td>
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<tr>
<td>Benzo(a)anthracene</td>
<td>mg/kg</td>
<td>#</td>
<td>#</td>
<td>0.019</td>
</tr>
<tr>
<td>Benzo(a)pyrene</td>
<td>mg/kg</td>
<td>0.1</td>
<td>0.7</td>
<td>0.018</td>
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<tr>
<td>Benzo(b)fluoranthene</td>
<td>mg/kg</td>
<td>#</td>
<td>#</td>
<td>0.021</td>
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<tr>
<td>Benzo(g,h,i)perylene</td>
<td>mg/kg</td>
<td>2,500</td>
<td>52,000</td>
<td>0.015</td>
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<tr>
<td>Benzo(k)fluoranthene</td>
<td>mg/kg</td>
<td>#</td>
<td>#</td>
<td>0.014</td>
</tr>
<tr>
<td>Chrysene</td>
<td>mg/kg</td>
<td>#</td>
<td>#</td>
<td>0.019</td>
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<tr>
<td>Dibenzo(a,h)anthracene</td>
<td>mg/kg</td>
<td>#</td>
<td>#</td>
<td>0.014</td>
</tr>
<tr>
<td>Ideno (1,2,3-c,d)pyrene</td>
<td>mg/kg</td>
<td>3200</td>
<td>59000</td>
<td>0.004</td>
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<tr>
<td>1-Methylnaphthalene</td>
<td>mg/kg</td>
<td>2,600</td>
<td>33,000</td>
<td>0.006</td>
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<tr>
<td>2-Methylnaphthalene</td>
<td>mg/kg</td>
<td>#</td>
<td>#</td>
<td>0.014</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>mg/kg</td>
<td>200</td>
<td>1,800</td>
<td>0.013</td>
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<tr>
<td>Phenanthrene</td>
<td>mg/kg</td>
<td>210</td>
<td>2,100</td>
<td>0.015</td>
</tr>
<tr>
<td>Pyrene</td>
<td>mg/kg</td>
<td>55</td>
<td>300</td>
<td>0.022</td>
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</tbody>
</table>

## Benzo[a]pyrene Toxicity Equivalent Calculations

<table>
<thead>
<tr>
<th>Benzo[a]pyrene TEQs</th>
<th>mg/kg</th>
<th>Residential</th>
<th>Commercial</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0.7</td>
<td>0.021</td>
<td></td>
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</tr>
</tbody>
</table>

## Metals

<table>
<thead>
<tr>
<th>Element</th>
<th>Units</th>
<th>Residential</th>
<th>Commercial</th>
<th>Weighted Total</th>
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</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>mg/kg</td>
<td>80,000</td>
<td>NA</td>
<td>7743.54</td>
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<tr>
<td>Arsenic</td>
<td>mg/kg</td>
<td>2.1</td>
<td>12</td>
<td>3.22</td>
</tr>
<tr>
<td>Cadmium</td>
<td>mg/kg</td>
<td>82</td>
<td>1,700</td>
<td>0.31</td>
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<tr>
<td>Copper</td>
<td>mg/kg</td>
<td>150</td>
<td>8,900</td>
<td>27.94</td>
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<tr>
<td>Lead</td>
<td>mg/kg</td>
<td>400</td>
<td>1,400</td>
<td>12.04</td>
</tr>
<tr>
<td>Mercury</td>
<td>mg/kg</td>
<td>3</td>
<td>17</td>
<td>0.12</td>
</tr>
<tr>
<td>Zinc</td>
<td>mg/kg</td>
<td>26,000</td>
<td>630,000</td>
<td>40.51</td>
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</tbody>
</table>

Notes: 
- # = Refer to Benzo[a]pyrene TEQ (Total Equivalent Value) for the calculated Benzo(a)pyrene equivalent value and applicable screening criteria.
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
Permitted Staging Areas
Teams solution to the CDF
Team’s Pipeline Route
Pipeline Routes Using Existing R/O/W

Existing Drainage Swale

Booster Pump Placed in Industrially Zoned Area
Proposed Temporary CDF
Temporary CDF Facility

Temporary Weirs

Temporary Seepage Swale
Temporary CDF in Operation
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
Questions?