The Baker Park Improvement Project – Protecting the Community with an Innovative Gas Mitigation System

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Presentation Outline

• Project Location and Overview
• Site History
• Project Details
• Summary of Geotechnical Design Analysis
• LFG Mitigation Design
• Description of the Cupolex® System
• Installation of Cupolex® System
• Final Inspection and Testing
• Conclusions
• Acknowledgment
Project Location and Overview

- USGS North Naples, FL 7.5-minute quadrangle map (see left)
- Between Gordon River and Riverside Circle in downtown Naples
- Southern Connector of the Gordon River Greenway
- Landscape, hardscape, and civil improvements to City-owned property
Site History

- 15-acre property, owned by the City of Naples
- Previously used as landfill for disposal of horticultural debris and dredged spoil material
Site History – Aerial Photographs

April 2017

May 2017

June 2017

July 2017

August 2017

September 2017 (post Irma)
Project Details – Park Improvements

- Roadway extensions, parking lot expansion
- Utility services
- Drainage improvements
- Creation of a Founders Garden, playgrounds, passive recreation
- Kayak launch
- Café building
- Family restrooms
- Pavilion, sunrise terrace, piers, boardwalks
- Walking paths, lawn areas, and art displays
Project Details – Park Improvements

90% BASE MASTER PLAN (Excludes Alternates)
Services Provided by Geosyntec

• **Geotechnical Evaluations**
  – Soil Borings and Laboratory Testing
  – Dredge Spoils Material Suitability Evaluation
  – Foundation System Design and Analysis
  – Structural Design Support
  – Knoll (Dredge Spoil Mound) Preloading and Settlement Evaluation

• **LFG Mitigation Services**
  – Methane concentrations detected during drilling of soil borings
  – Active gas mitigation system for enclosed structures
LFG Mitigation System Design

• Primarily for enclosed structures
  – Café and Restroom Buildings
  – Sub-slab ventilation to mitigate methane

• Utilized Cupolex® concrete forming systems
  – Vent void space created by using Cupolex® forms below the building footprint

• Venting provided by small fans to draw outdoor air
  – Methane concentrations below 10% LEL
What is Cupoplex®

- 100% recycled plastic forms used to create a continuous void space below concrete slabs
- Also known as an “aerated floor”
How does it work?

Aerated floors work the same way as traditional sub-slab depressurization (SSD) or sub-slab venting (SSV) systems, except the void space:

- eliminates the membrane and gravel layer,
- allows more efficient airflow and mass removal, and
- results in more efficient ventilation.
Superior load support

- The dome shaped forms create an orthogonal grid of **arches** in the concrete slab.
- Cupolex floors support greater loads than flat slabs with the same concrete volume.
- Loads distributed over larger areas and can be designed for any subgrade condition.

*Cupolex is being used to replace aggregate for roads in Canada*
Less $$ than traditional systems

<table>
<thead>
<tr>
<th>Item</th>
<th>Cupolex® Aerated Floor</th>
<th>Traditional Gravel &amp; Liner System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forms</td>
<td>1.75</td>
<td>NA</td>
</tr>
<tr>
<td>Concrete (5” equivalent)</td>
<td>same</td>
<td>same</td>
</tr>
<tr>
<td>¾” clean gravel (4-6”)</td>
<td>NA</td>
<td>1.50</td>
</tr>
<tr>
<td>Welded Wire Mesh</td>
<td>0.30</td>
<td>NA</td>
</tr>
<tr>
<td>Steel</td>
<td>NA</td>
<td>0.75</td>
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<tr>
<td>Liner</td>
<td>NA</td>
<td>1.00 – 5.00</td>
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<tr>
<td>Perforated Pipe</td>
<td>NA</td>
<td>Not calculated</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$2.05/SF</strong></td>
<td><strong>$3.25 – $7.25/SF</strong></td>
</tr>
</tbody>
</table>

Additional savings can be realized with reduced concrete volumes and more efficient forming, potentially resulting in no additional cost over standard floor.
Cupoplex® System Installation

- forms are placed by general labor
- field fabricated “boots” placed around pipe penetrations
- caps placed on perimeter of forms
Cupolex® System Installation

- reinforcement bar or welded wire mesh placed above Cupolex forms
- can be designed as fully structural slabs
Diagnostic and Testing

- Perform diagnostic tests to:
  - Check for leaks
  - Evaluate methane levels
  - Select fan(s) slabs
Final Inspection and Integrity Testing
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Acknowledgements

- City of Naples
- Kimley Horn – Prime Consultant
- Manhattan Construction – General Contractor
- Cupolex Building Systems – Vendor – Cupolex® forms
- Stirling & Wilbur Eng. Group – Structural Engineer