Session B5- Planning and permitting for historic dam removals to restore fish passage on the Raritan River, New Jersey

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*El Paso Corporation*

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“Completely Preventing the Ascent”

Planning & Permitting for Historical Dam Removals to Restore Fish Passage in the Raritan River, New Jersey

John W. Jengo, PG

June 28, 2011
Presentation Outline

- Introduction
- Project Locations
- Project Objectives
- Calco Dam Overview
- Calco Dam Removal Preparation
- Project Schedule
- Questions
"The ascent of shad and anadromous fishes is...entirely prevented by a dam...completely preventing the ascent of any anadromous fishes above that point."

"It is probable that but few shad have spawned in the Raritan river since the erection of the dam."

"The chief cause of diminution arose...by the erection of dams impassable by anadromous fishes returning to their spawning grounds."
Project Development Timeline

- **1992-2004**
  - Site Investigation/Remediation

- **2004-2007**
  - Assessment of Potential NRD Impact

- **2008**
  - Balancing NRD and Compensation Projects

- **2008-2011**
  - Technical Data Acquisition, Modeling, Legal Agreements, Permitting, Bids, Contractor Selection
Project Locations

Location of the Raritan Basin within New Jersey

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal
Raritan River Fish Passage Initiative

Phase I - Calco Dam Removal
Project Objectives

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal
Re-Establish Fish Passage

Restore anadromous species migration into unobstructed, free-flowing river conditions over pebbly river substrates that are ideal for spawning.

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal
Enhance River Ecology

Restore natural Raritan River processes, water chemistry, and biodiversity

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal
Similar dam removals yielded ~$10M in economic benefits
Raritan River Fish Passage Initiative

Eliminate dam-related accidents and fatalities

Phase I - Calco Dam Removal
Calco Dam Overview
Built 1938 as a low head loss dispersant weir for discharge of dyes

910 cfs

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal
Run-of-the-River structure with no flood storage capacity

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal
36-inch Effluent Pipe; 41 8-inch diameter outlets; 21.25-23 ft breadth

Raritan River Fish Passage Initiative

Phase I - Calco Dam Removal
“Flashy” river where magnitude increases can occur within hours

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal
Raritan River Fish Passage Initiative

Phase I - Calco Dam Removal
Raritan River Fish Passage Initiative

Phase I - Calco Dam Removal

Feasibility Study

<table>
<thead>
<tr>
<th>Activity</th>
<th>Minimum Cost 1 Dam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify Ownership/Obtain Authorization</td>
<td>$2,500</td>
</tr>
<tr>
<td>Gather Dam Information</td>
<td>$4,000</td>
</tr>
<tr>
<td>Survey Data</td>
<td>$12,000</td>
</tr>
<tr>
<td>Obtain River Hydrology Data</td>
<td>$12,500</td>
</tr>
<tr>
<td>Complete River Model</td>
<td>$15,000</td>
</tr>
<tr>
<td>Sediment Samples &amp; Concrete Cores</td>
<td>$10,000</td>
</tr>
<tr>
<td>Complete HEC-RAS Model</td>
<td>$15,000</td>
</tr>
<tr>
<td>Complete Breaching Calculations</td>
<td>$5,000</td>
</tr>
<tr>
<td>Engineering Design</td>
<td>$2,500</td>
</tr>
<tr>
<td>Drawings</td>
<td>$3,000</td>
</tr>
<tr>
<td>Water Supply Alternative (Nevius Street)</td>
<td>$13,000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$94,500</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Minimum Cost 1 Dam</th>
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</thead>
<tbody>
<tr>
<td>Dam Removal Permit</td>
<td>$10,000</td>
</tr>
<tr>
<td>Water Lowering Permit</td>
<td>$800</td>
</tr>
<tr>
<td>Land Use General Permit</td>
<td>$7,000</td>
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<tr>
<td>Other Permits</td>
<td>$30,000</td>
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<tr>
<td>TOTAL</td>
<td>$47,800</td>
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<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Calco</th>
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<tbody>
<tr>
<td>Construction Costs</td>
<td>$451,500</td>
</tr>
<tr>
<td>Bond = 2%</td>
<td>$9,000</td>
</tr>
<tr>
<td>Subtotal</td>
<td>$460,500</td>
</tr>
<tr>
<td>Construction Management = 8%</td>
<td>$36,800</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$497,300</td>
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</tbody>
</table>
River Discharge Data

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal
River Discharge Data

Discharge, cubic feet per second

USGS 01403060 Raritan River below Calco Dam at Bound Brook, NJ

Daily mean discharge

Period of approved data

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal
River Discharge Observations

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal

220 cfs
1120 cfs
9400 cfs
Raritan River Fish Passage Initiative

Phase I - Calco Dam Removal
River Bed Elevation Survey

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal
Raritan River Fish Passage Initiative

Phase I - Calco Dam Removal
HEC-RAS Modeling

Raritan River Fish Passage Initiative

Phase I - Calco Dam Removal
### Meyer-Peter and Muller's Equation

Calco Dam

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>$T_c$</td>
<td>0.047</td>
</tr>
<tr>
<td>$G$</td>
<td>2.65</td>
</tr>
<tr>
<td>$g$</td>
<td>32.2 ft/s²</td>
</tr>
<tr>
<td>$v$</td>
<td>9.81 m/s²</td>
</tr>
<tr>
<td>$y$</td>
<td>62.4 lb/ft³</td>
</tr>
<tr>
<td>$Y_s$</td>
<td>165.4 lb/ft³</td>
</tr>
<tr>
<td>$d_{50}$</td>
<td>38.9 mm</td>
</tr>
<tr>
<td>$h$ (10-yr)</td>
<td>17.20 ft</td>
</tr>
<tr>
<td>$S_w$</td>
<td>0.0004</td>
</tr>
<tr>
<td>$W$</td>
<td>200 ft</td>
</tr>
</tbody>
</table>

### Specific Gravity

$$q_{sw} = \frac{8(m - T_c)^{1/2}}{v([G - 1]gd_{50}^2)}$$
This Dam Demolition Agreement ("Agreement") is made and entered into this 25th day of January 2011, by and between The Somerset Raritan Valley Sewerage Authority, having an address at Polhemus Lane, P.O. Box 6400, Bridgewater, New Jersey 08807 (the address at 1001 tion, a Delaware , P.O. Box 2511, located at Raritan y ("Calco Dam"); ion ("DEP") and the Calco Dam to the Raritan River s; of the Calco Dam, tatus of the Calco demolition of the authorities, pursue demolition of the breaching and/or (collectively, the
Concrete Coring & Testing

Raritan River Fish Passage Initiative
*Phase I - Calco Dam Removal*
Concrete Coring & Testing

Concrete Test Report

Client: MWH Americas, Inc.
Project: Calco Dam Sediment Analysis
Calco Dam Concrete Tests
Job No: 95-101082-01

Mix Data
Supplier
Mix Identification
Specified Design Strength (psi)

Details of Sample
Date Sampled 5/18/1938
Date Received 10/15/2010
General Location Crest
Curing Method 5 Day Bag Cure
Field Sample ID C-1
Field Cure Temp (°F) High
Low
Contractor MWH Americas
Truck No.
Sampled By MWH Americas
Submitted By MWH Americas
Weather
Est. Wind (mph)
Est. Rh (%)

Compressive Strength of Concrete Cylinders
Specimen ID 200461
Date Tested 10/19/10
Dimensions (in) 26452
Height 7.30
Area (in²) 10.78
Type of Cap B
Ultimate Load (lbf) 62500
Type of Fracture 1
Compressive Strength (psi) 5800

Average Compressive Strength (psi)
Staging Areas and River Access

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal
Bathymetric Survey for Equipment Transits

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal
Raritan River Fish Passage Initiative

Phase I - Calco Dam Removal
State of New Jersey
Department of Environmental Protection
Dam Safety Permit Application

State of New Jersey
Department of Environmental Protection
Division of Land Use Regulation Application Form (LURP-2)

Department of Environmental Protection
Division of Parks and Forestry
State Park Service

Special Use Permit (SUP) Application

State of New Jersey
Department of Environmental Protection
Delaware and Raritan Canal Commission Application

36 CFR PART 800 -- PROTECTION OF HISTORIC PROPERTIES (incorporating amendments effective August 5, 2004)
Subpart B -- The Section 106 Process

NEW JERSEY DIVISION OF FISH AND WILDLIFE
Bureau of Freshwater Fisheries
P.O. Box 394 Lebanon, NJ 08833
Phone: (908) 236-2118 Fax: (908) 236-7280

APPLICATION FOR A WATER LOWERING PERMIT

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal
NEW JERSEY
PUBLIC NOTICE ENVIRONMENTAL PROTECTION & BUREAU OF DAM SAFETY

Affidavit of Publication

Publisher's Fee $72.60 Affidavit $35.00

State of New Jersey
Somerset County } SS.
Personally appeared

Of the Courier News, a newspaper printed in Freehold, New Jersey and published in Somerville, in said County and State, and of general circulation in said county, who being duly sworn, deposeth and saith that the advertisement of which the annexed is a true copy, has been published in the said newspaper 3 times, once in each issue as follows:

1/31/11, 2/01/11, 2/02/11

and 626448 (North), in Bridgewater and Franklin Townships The dam structure is being breached to re-establish unobstructed, free-flowing river conditions on the Raritan River that will benefit water quality, public safety, and fish passage for anadromous and catadromous fish. Dam breach calculations
Raritan River Fish Passage Initiative
*Phase I - Calco Dam Removal*

**D&R Canal**

**Other Issues**
Other Issues

Rip-Rap Removal

Raritan River Fish Passage Initiative
*Phase I - Calco Dam Removal*
Other Issues

Dam Screening Structure

Raritan River Fish Passage Initiative

Phase I - Calco Dam Removal

Diversion Weir
Project Schedule

- 2008
  - Project Selection
  - Dam and Land Ownership
  - Feasibility Study
- 2009
  - Commence River Discharge Data & Observation
  - River Bed & Dam Surveying
  - River and Tributary Habitat Reconnaissance
  - Sediment Sampling & Analyses
  - HEC-RAS Modeling
Project Schedule

• 2010
  - Demolition & Access Agreements
  - Concrete Coring & Testing
  - Equipment Access & Bathymetric Survey
  - Engineering & Hydraulic Evaluation
  - State & Other Permit Submittal/Public Notices

• 2011
  - Development of Bid Packages (Feb. 2011)
  - NJDEP & Other Agency Permit Approvals (May 2011)
  - Selection of Demolition Contractor (June 2011)
  - Commence Demolition (July 2011)!

Raritan River Fish Passage Initiative
Phase I - Calco Dam Removal
Thanks. Any Questions?