Master Contracting Six
Final Presentation
Senior Design, Spring 2014
Nicole Bonomo
Jake Yatsko
Shannon Ritter
Noel Rangel
William Osthoff
Jason Filer

Construction of the Sox Mill Road/Library Road interchange in 1929.

The original Fat’s Park restaurant (left) opened in 1949. The bowling lanes (right) were present day. This is a photograph of the former site of Fat’s Park Restaurant.
Timeline
- 1900s: Dirt path intersecting West Liberty Ave. and Warrington Ave.
- 1914: Kaiser Ave. was replaced with Saw Mill Run Road
- 1920: Liberty Tunnel starts construction
- 1928: Saw Mill Run Blvd. was part of Allegheny county “City Beautiful” bond
- 1930: Library Road extension
- 1947: Request Army COE Study
- 1951: Saw Mill Run extension (West End Bypass)
- 1960: First Congress Response
- 1961–1964: Army COE Study is performed
- 1964: Army COE suspends study due to PA involvement. (traffic)
- 1971: Resume Army COE study
- 1975: Channel Improvement Project recommended
- 1986: Federal Money is approved (However, another study is required)
- 1992: Study completed
- 2004: Plans in place for replacement
- 2007: Project restarted
- 2008: Traffic study done
- 2010: Redesigned plans are put in place
- 2013: Construction begins
Today

Project Location Map
Site Pictures

Site Pictures: Facing South East
Site Pictures

Site Pictures: Jughandle “Leg A”
Site Pictures: The Jughandle

Site Pictures
Site Pictures: Bridge #4

Site Pictures
Site Pictures: Sawmill Run

Site Pictures
Site Pictures: Existing Bridge #6

Site Pictures: Existing Bridge #6
Site Pictures

Site Pictures: 51 South from B6
Site Pictures: Existing Bridge #6

Site Pictures
Site Pictures: Existing Bridge #5

Phasing Plans
PennDOT Phases 1–10
Demolition of Existing Structures; Construction of Jughandle and Bridge #4; Construction of Temporary Glenbury Ave

Construction of Jughandle “Leg A” and Temporary Widening
Begin Bridge #6 Replacement; Glenbury Ave. Construction

LEGEND:
- ROADWAY CONSTRUCTION
- BRIDGE RECONSTRUCTION

Phase 3

Rt. 88 Temporary Roadway

LEGEND:
- TEMPORARY ROADWAY

Phase 4
Continue Bridge #6 Replacement; Rt. 88 Construction; Rt. 88 Retaining Wall; Temporary Hillview Ave.

Complete Bridge #6 Replacement; Complete Rt. 88 Construction; Hillview Ave. Construction
Widening of 51; Stewart Ave and Provost Ave/Fairhaven Rd Construction; Begin Bridge #1, #2 and #3 Construction

Complete Bridge #3 and Continue Bridge #5; Continue Fairhaven Rd Construction
Continue Bridge #3 and Bridge #5; Continue Rt. 51 Construction

Complete Remaining Mill and Overlay; Complete Bridge #5; Final Pavement Markings; Signaling; Signage; ITS; Testing
Project Completion

Primavera Schedule
Graphical WBS

Tabular WBS from Primavera

<table>
<thead>
<tr>
<th>WBS Code</th>
<th>WBS Name</th>
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<tbody>
<tr>
<td>ECHS 28000 Ph.C.</td>
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Schedule

Activity ID | Activity Name | Original Duration | Early Start | Early Finish | Late Start | Late Finish | Total Float |
---|---|---|---|---|---|---|---|
Construction Phase 1 | 121 | 23 Mar 13 | 12 Nov 13 | 22 Jul 13 | 16 |
Erosion and Sedimentation Control | 67 | 21 Jun 13 | 25 Sep 13 | 26 Aug 13 | 12 |
Utility Relocations | 121 | 23 Mar 13 | 12 Nov 13 | 22 Jul 13 | 16 |
MPT | 1d | 20 Jun 13 | 20 Jun 13 | 23 Aug 13 | 23 |
Demo | 21d | 06 Jul 13 | 05 Aug 13 | 22 Jul 13 | 08 |
Roadway | 36d | 18 Sep 13 | 06 Nov 13 | 23 Sep 13 | 07 |
Juiglhandle (sta 0+00 to 4+96.58; sta 5+43.64) | 35d | 18 Sep 13 | 06 Nov 13 | 23 Sep 13 | 07 |
A1440 | Excavate/Subgrade/E | 3d | 18 Sep 13 | 20 Sep 13 | 23 Sep 13 | 25 |
A1450 | Excavate/Install Drain | 10d | 20 Sep 13 | 03 Oct 13 | 23 Sep 13 | 04 |
A1460 | Install Subbase (sta 0+1) | 3d | 01 Oct 13 | 03 Oct 13 | 05 Oct 13 | 11 |

Schedule

Activity ID | Activity Name | Original Duration | Early Start | Early Finish | Late Start | Late Finish | Total Float |
---|---|---|---|---|---|---|---|
Jujiglhandle Long A | 41 | 13 Nov 11 | 08 Nov 11 | 08 Nov 11 | 11 |
A1360 | Excavate/Subgrade/Entrenchment | 26 | 13 Nov 11 | 08 Nov 11 | 08 Nov 11 | 11 |
A1370 | Concrete/Install Drainage | 7d | 22 Nov 11 | 01 Dec 11 | 01 Dec 11 | 7d |
A1380 | | 8d | 05 Dec 11 | 06 Dec 11 | 06 Dec 11 | 8d |
A1390 | Pipe Buried | 10d | 05 Dec 11 | 15 Dec 11 | 15 Dec 11 | 10 |
A1410 | FRP/PC/Glass | 7d | 16 Dec 11 | 23 Dec 11 | 23 Dec 11 | 7d |
A1420 | Drainage Adjustments/Recon | 16 | 16 Dec 11 | 01 Jan 12 | 01 Jan 12 | 16 |
A1430 | | 16 | 01 Jan 12 | 01 Jan 12 | 01 Jan 12 | 16 |
A1440 | Concrete Foundation of Existing Curb and Sidewalk | 28 | 20 Jan 12 | 04 Apr 12 | 04 Apr 12 | 28 |
A1460 | | 12 | 05 Apr 12 | 05 Apr 12 | 05 Apr 12 | 12 |

Start Or after | | 20 Dec 11 | 31 Dec 11 | 31 Dec 11 | 0% |
Secondary Finish | | 31 Dec 11 | 31 Dec 11 | 31 Dec 11 | 0%
Primary Finish | | 31 Dec 11 | 31 Dec 11 | 31 Dec 11 | 0%
Secondary Start | | 01 Jan 12 | 01 Jan 12 | 01 Jan 12 | 0%
Traffic Control Plan

**SUMMARY**

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<th>Description</th>
<th>Date</th>
<th>Status</th>
<th>Notes</th>
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| 01 | Task 1 Details | 04/17/2014 | Pending | Additional information...
| 02 | Task 2 Details | 04/17/2014 | Completed | Task completed successfully...
| 03 | Task 3 Details | 04/17/2014 | Delayed | Due to unforeseen circumstances...
| 04 | Task 4 Details | 04/17/2014 | In Progress | Continuing with current steps...
| 05 | Task 5 Details | 04/17/2014 | Deferred | Prioritizing other tasks...
| 06 | Task 6 Details | 04/17/2014 | Completed | Task completed successfully...
| 07 | Task 7 Details | 04/17/2014 | In Progress | Continuing with current steps...
| 08 | Task 8 Details | 04/17/2014 | Deferred | Prioritizing other tasks...
| 09 | Task 9 Details | 04/17/2014 | Completed | Task completed successfully...
| 10 | Task 10 Details | 04/17/2014 | Delayed | Due to unforeseen circumstances...

### Traffic Control Plan

#### Phasing

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<th>Duration</th>
<th>Calendar Date</th>
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<td>3/14-3/28</td>
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<td>3/29-4/12</td>
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### Table of Traffic Control Devices

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<th>Phase 3</th>
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Cost Estimate Breakdown

- Proposal
  - Bid Form
- Takeoff Spreadsheet
  - Material
  - Labor
  - Equipment
  - Subcontractor

- Cost Curve
- Man Hour Curves

PROPOSAL Report - Project 28000

BID PACKAGE SUMMARY

- Project: 28000
- Bid Package: 1
- Project Type: Standard
- Federal Project Status: MDOT Owned
- State Type of Work: RELOCATION/NEW CONSTRUCTION
- Prequalification Required: Yes
- Pre-Bid Meeting: Optional
- Scheduled Let: 04/20/2013 11:00 AM
- Anticipated MTP: 06/20/2013
- Required Completion: 11/04/2015
- Project Cost Range: $10,000,000.00 - $10,099,999.99
- Structure Work: 48.30%
- DWE: 7%
- Wage Rates: Yes
Bid Form

102.04 INTERPRETATION OF APPROXIMATE ESTIMATE OF QUANTITIES—The estimate of quantities, shown on the proposal, and in the contract, is approximate and is shown only as a basis for the calculation upon which the contract award is to be made. The Department does not assume any responsibility that the quantities will actually be required in the project construction, nor will the Contractor be allowed to plead misunderstanding or deception because of the quantity estimates or because of the character of the work, the location, or other conditions. The Department reserves the right to increase, to decrease, or to omit any of the quantities of work. An increase or decrease of the quantities of the items will not be sufficient grounds for granting an increase in the unit prices bid, except as specified in Section 110.02.

<table>
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<th>Unit</th>
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<td>0225-0004</td>
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<td>0226-0010</td>
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<td>Cubic Yard</td>
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<td>0226-0007</td>
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<td>0212-0002</td>
<td>Square Yard</td>
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Tabulations
Rebar

Takeoff Spreadsheet

- Examination of Specs and Drawings
- Bid Item Number
- Activities
- References
- Material Unit Prices
## Labor Costs

### Crew Definition

- **Identifying Durations**

## Equipment Costs

### MC6

### Takeoff Spreadsheet

- **Labor Costs**
- **Equipment Costs**

### Takeoff Spreadsheet

- **Labor Estimate**
- **Crew Definition**
- **Identifying Durations**
Takeoff Spreadsheet

- Equipment Estimate
- RS Means
- Durations

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Weekly Rental/ O&amp;M rate</th>
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<tr>
<td>Digger</td>
<td>$6,625.00</td>
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<tr>
<td>Mini Excavator</td>
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<td>Excavator</td>
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<td>Skid Steer</td>
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<td>Tri axle</td>
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<td>Flatbed</td>
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<td>Compactor</td>
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<td>Pump Truck</td>
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<td>Drum Roller</td>
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<tr>
<td>Crane</td>
<td>$4,025.00</td>
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Takeoff Spreadsheet

- Equipment Estimate
- RS Means
- Durations

[Table and diagrams]
Safety Management Plan

Sections
- MC6 MANAGEMENT POLICY STATEMENT
- RESPONSIBILITIES
  - CORPORATE SAFETY RESPONSIBILITIES
  - SAFETY DIRECTOR RESPONSIBILITIES
  - SUPERINTENDENT/FOREMAN RESPONSIBILITIES
  - EMPLOYEE RESPONSIBILITIES
- CONSEQUENCES AND DISCIPLINARY ACTIONS
- NEW EMPLOYEE TRAINING
- ACCIDENT INVESTIGATION
- RECORD KEEPING
- SUBCONTRACTOR COMPLIANCE
- TOOLBOX TALKS
- PROJECT SPECIFIC CONCERNS
Project Specific Concerns

- Communication
- Electrical
- Personal Protective Equipment
- Tools
- Trenching and Excavation
- Cranes
- Machinery
- Fire Protection
- Housekeeping
- Material Handling

Emergency Information

AMBULANCE 911
POLICE 911
FIRE 911

MINOR INJURIES:
MedExpress Brentwood  (9am–9pm) (412) 884 – 0327
3516 Saw Mill Run Blvd, Pittsburgh PA
Directions
South on SR-51(Saw Mill Run Blvd) go 1.2 miles
MedExpress on RIGHT

HOSPITAL
St Clair Hospital  (412) 942 – 4000
1000 Brower Hill Rd, Pittsburgh, PA
Directions
West of SR-88 (Library Rd) go 0.2 miles
Turn RIGHT onto Castle Shannon Rd go 1.1 miles
Continue onto Scott Rd go 1.0 miles
Turn LEFT onto Washington Rd go 0.1 miles
Turn RIGHT onto Bower Hill Rd go 1.4 miles
St Clair Hospital on RIGHT
Utility Relocation

- Includes electric, telephone, cable TV, fiber optics, natural gas, water, sanitary and storm sewers.
Alcosan

- Saw Mill Run Interceptor Relocation
- 394 LF 36-inch class IV sewer
- 4 manholes installed
- Reconnect to existing 36-inch sewer

Pittsburgh Water and Sewer Authority

- 579 LF epoxy lined iron sewer
- 574 LF reinforced concrete pipe sewer
- 20 pre-cast manholes with cast-in-place bases
- Fill abandoned sewers with 122 CY grout
Coordination

- Communication is key.
- Invite each company to review the existing utility plan set.
- Invite each utility company to a preliminary Utility Coordination Meeting.
- Identify potential conflicts.
- Notify utility owner in writing at least 15 days prior to starting operation.

Utility Relocations

- **Pennsylvania American Water Company**
  60 days are required after the contractor’s notice to proceed.

- **Columbia Gas**
  120 days are required after the contractor’s notice to proceed.
  Seasonal shutdown restrictions will limit construction April – September.
Utility Relocations

- **Duquesne Light**
  180 days are required after contractor’s notice to proceed.

- **Comcast**
  60 days are required after D.L. completes their work.

- **Verizon**
  397 days are required after Comcast completes their work.

Delays

- Utility relocation conflicts are a major cause of delays to highway contractors.
- PennDOT will compensate the contractor for utility delays where the delay occurred through no fault of the contractor.
- Within 10 days of any utility relocation delay, contractor must notify PennDOT.
Delay Procedure

- Keep daily records of labor, material, equipment, and site overhead expenses for all operations affected.
- Weekly—Prepare and submit a written report that indicates the number of days behind schedule, explain how utility relocation delayed operations.

Documentation

- Upon completion of the project, submit a report that contains itemization of all extra costs and a list of actions taken to minimize delay.
- Submit dates when utility owner was contacted and copies of minutes from any meetings with the owner.
Risk Management Plan

Risk Management

- **Process**
  - Identify
  - Analyze
    - Probability/Impact
    - Category
      - Cost, Scope, Schedule, Quality
  - Response Approach
    - Avoid, Mitigate, Accept, Transfer, Defer
## Risk Assessment Forms

### Master Contracting Six

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#### Description

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<tr>
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<td>1 &lt;10%</td>
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<tr>
<td>4 60-90%</td>
<td>2 10-40%</td>
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</tr>
<tr>
<td>3 40-60%</td>
<td>1 &gt;51mil</td>
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</tr>
<tr>
<td>2 $500,000</td>
<td>1 $10,000</td>
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<tr>
<td>1 $100,000</td>
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### Mitigation

- **Approach**: Contingency plan
- **Contingency plan to be documented in (DCL)**

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### Master Contracting Six

<table>
<thead>
<tr>
<th>Risk Assessment Form</th>
<th>State of Information</th>
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### Risk Assessment Forms

### Master Contracting Six

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<table>
<thead>
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<th>State of Information</th>
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**MC6**
Risk Register

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<tr>
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<tr>
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<tr>
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<td>1</td>
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Quality Assurance/Quality Control Plan

MC6

4/17/2014
QA/QC

- Quality Assurance
  - Ensure work will be performed correctly
- Quality Control
  - Verify work is being performed correctly
- Process
  - Procedures
  - Inspections
  - Schedules

Inspection Form
Activity Log

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Category</th>
<th>Inspection/ Audit/ Test</th>
<th>Frequency</th>
<th>Date Completed</th>
<th>Date Submitted</th>
<th>Results</th>
<th>Deficiency</th>
<th>Comments</th>
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<tbody>
<tr>
<td>001</td>
<td>Subcontractor</td>
<td>Audit Quality of Workmanship</td>
<td>Prior to work</td>
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<td>002</td>
<td>Supplier</td>
<td>Audit Material Integrity</td>
<td>Prior to work</td>
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<td>Material delivery</td>
<td>Request for Compliance with Project Specifications</td>
<td>Prior to work</td>
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<td>006</td>
<td>Performance</td>
<td>Inspection</td>
<td>Monthly</td>
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<td>007</td>
<td>Standards</td>
<td>Follow-up assessments</td>
<td>Open completion</td>
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<td>Performance</td>
<td>Customer satisfaction reports</td>
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Deficiency Log

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<th>QA/RC Manager initials</th>
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<th>PM/ Installs</th>
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Submittals

Submittal Log

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<td>Complete</td>
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<td>2</td>
<td>Construction Submittal</td>
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<td>4/17/2014</td>
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<td>Material Sample Submission</td>
<td>Pending</td>
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<td>Blueprint Submission</td>
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<td>4/17/2014</td>
<td>2:00 PM</td>
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MC6

4/17/2014
Synchro™ Model

- Detailed real-time traffic modeling
- Any scenario can be modeled
- Test designs before implementation
- Before and after comparison
Synchro – Pre Construction

Synchro – Post Construction
Example Subcontract
Furnish and Install Reinforcing Steel

Subcontract
Design Aspect:
Storm Water Detention Tank

July, 2013
USGS Rain Gage Locations

GIS Topographic Map: 5’ Elevations
Topographic Areas

Design Aspect:  
West Storm Water Detention Tank
Bridge #6 Plan View

Hydraulic Data from Bridge #6

<table>
<thead>
<tr>
<th>HYDRAULIC DATA</th>
<th>BRIDGE NO 6A</th>
<th>DRAINAGE AREA 6.1 SQ. MILES</th>
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<tr>
<td>FREQUENCY</td>
<td>MAGNITUDE</td>
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<td>50 YEAR</td>
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Boring Locations from Bridge #6

Soil Boring #22 from Bridge #6
Bridge #6 Cross Section

Intersection Plan View
Intersection Utility Plan

Intersection Utility Profile
Hillview Ave Utility Profile

West Tank Footprint
Rt 88 Tank Location

Design Aspect:
East Storm Water Detention Tank
Bridge #4 Plan View

Hydraulic Data from Bridge #4

<table>
<thead>
<tr>
<th>FREQUENCY</th>
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<th>ELEVATION</th>
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Boring Locations from Bridge #4

Soil Boring #3 from Bridge #4
Bridge #4 Cross Section

Jughandle Plan View
Jughandle Tank Footprint

Design Drawings: West Tank
Footer Plan View

Roof Plan View
East Elevation

North Elevation
Section 1: North/South

Section 2: East West
Revit Model:
West Tank

Tank in 3-D, from Southeast Elevation
Tank in #–D, from Southwest Elevation

Questions?
Thank You

A very special thank you to:
Dr. Oyler
Prof. Beck
Dr. Magalotti
Heath Butler of PennDOT
Brian Frye of JB Fay

Thank you to all Civil engineering faculty