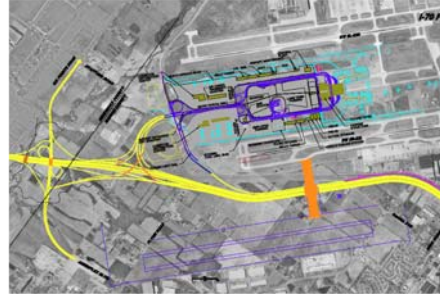




## Moving 3 Million Yards of Earth



## Project Overview



## Project Overview

- Re-Align & Widen 4 Miles of I-70 Mainline + New CD System
- Construct New Six Points Interchange
- Construct New Airport Interchange
- Construct 10 New Bridge Structures
- Install 2 Miles of 96" Pipe
- Relocate 10,000 Ft. of Creek Channels
- Project Design Started in April 2002
- Open to Traffic Date - December 2004



## Project Overview

- Fast Track Process - Accelerated Design & Construction Schedule
- Project Broken into 7 Contracts - Let as Design Phases Completed
- 2.9 Million Cys Excavation & Embankment Required
- Grading & Embankment Contract Completion Key to Project Success
- Grading Contract Let October 2002; Work Started in November 2002



## Grading Contract

- Major Embankments to be Complete by May 2003
- All Excavation Complete by July 2003
- Winter Embankment Construction Critical to Schedule
- Soil Modification Selected to Allow Uninterrupted Construction During Winter
- Analysis Indicated Use of KLD
- Winter '02-'03 Produced Extreme Weather Conditions



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## GRADING CONTRACT

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## Site Investigation

Courtesy INDOT & PB

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## Economic Haul

GENERAL HAUL DISTANCES FOR MOBILE SYSTEMS

Courtesy Caterpillar Inc

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## Machine Selection

Caterpillar 637 Scraper  
(Courtesy CASE Corporation)

- Dual Engines
- Tractor Engine = 450 HP
- Scraper Engine = 249 HP
- Heaped Capacity = 31 CY

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## Machine Selection

Wheel Tractor with Pulled Scraper  
(Courtesy CASE Corporation)

- Single Engine
- Tractor Engine = 425 HP
- 3 Bucket Set Up Heaped Capacity = 54 CY
- Top Speed = 25 MPH

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## Machine Selection

Quadtrac Tractor with Pulled Scraper  
(Courtesy CASE Corporation)

- 4 Independent Tracks
- Single Engine
- Tractor = 450 HP
- 3 Bucket Set Up Heaped Capacity = 54 CY


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## Case Scenario

Courtesy INDOT & PB


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## Productivity & Cost



Caterpillar 637 Scraper  
(Courtesy Caterpillar, Inc)

- Dual Engines
- Productivity = 90 CY/HR
- Much Higher EOE
- \$3.19/CY

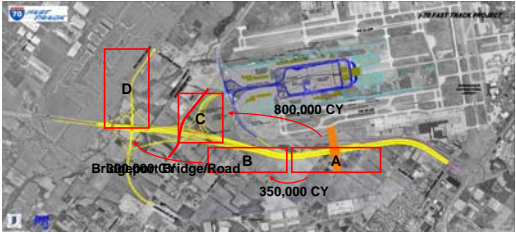


STX 425 with Pulled Scraper  
(Courtesy CASE Corporation)

- Single Engine
- Productivity = 75 CY/HR
- Average EOE
- \$2.80/CY

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## Mass Haul & Haul Road



Courtesy INDOT & PB

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## Bridgeport Bridge Shoring

- Existing Bridgeport was the only access across I-70 closed to traffic
- Predetermined by INDOT that existing structure could only carry 40 Ton load across.
- Extra weight of Tractors and 3 full Scraper Buckets necessitated the use of Temporary Shoring
- H piles and cross beam members used on each span without effecting traffic on I-70 accomplished this.

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## Haul Road Maintenance



- Walsh Construction's goal was to provide straight and smooth haul roads.
- The condition of the haul road greatly affected our production.
- Big difference between a tractor moving at 20 mph vs. 25 mph, hauling 54 CY each time over an 11 hour shift.
- We accomplished this by constantly using a CAT 12H Motor Grader.

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## Scraper Operations (in cut section)



- Pull Type 18 CY Scraper Buckets.
- Two models used: Miskin SP-D18 & John Deere 1810E
- Unnecessary for Excavator and Dozer to load scraper buckets.
- Wide open mouth scraper bucket. 30 Degree cutting edge angle.
- Each cut is 3 to 5 inches deep, i.e. clean cut area.
- Smooth cutting edges typically used, however serrated edges can be used in hard ground.
- Scraper Buckets can also be top loaded.

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## Scraper Operations (in fill section)



- Miskin Scraper Buckets use gravity to unload in the fill
- John Deere Scraper Buckets use a hydraulic ejector to unload.
- Unloads in even 8" to 12" lifts
- Precise Dumping. Dump one Bucket after another in a continuous train.

### Placement of Fill



- After Scraper Bucket has dumped, a CAT D6 Dozer will knock down any small piles to create an even 8" lift.
- The lift is either compacted with a CAT 815 Sheepsfoot Compactor to achieve the required density or Soil Modified.
- All Dozers were equipped with GPS.

### Cat D6R GPS Dozer



- All grades are downloaded from a website, created by an outside engineering firm that generated the grades from the contract drawings.
- Information is downloaded onto a Memory Card. This memory card is installed into a Sitevision Monitor in each dozer cab.
- Stakeless Environment.
- Typically six crews of two men each would have been used to stake a project of this magnitude. Walsh Construction used two engineers.

### Soil Modification



### Shift Schedule

- Walsh Construction used a day and night shift to complete the project on schedule.
- Two 11 hour shifts were incorporated each day.
- The 12<sup>th</sup> hour was used for re-fueling and maintenance.
- During winter months, Walsh Construction worked 7 days a week to maintain soil temperature above 35 degrees.
- The third worst winter in Indiana was just another challenge for Walsh Construction to overcome.

### 96" Pipe



- Over 11,000 LF of 96" Pipe
- Deepest section was 42' below existing grade
- Material used for pipe was "96" SmoothCor Metal Pipe"
- Polymer Coated Double Walled Pipe.

### Pipe Material Selection





- Reduced Weight, 66% lighter than concrete pipe
- Reduced weight also affected handling and placement.



- 20' long sections. Less joints, over 11,000 LF.
- Material Selection affected equipment selection

### Soil Condition



- Soil Borings were carried out prior to the bid to establish exact material that was to be encountered on 96" pipe.
- Typically the material encountered was clay, hard (blue) clay, sandstone, siltstone and shale.
- Pockets of groundwater were encountered above hard rock . The hard rock was approximately 10' below the invert of the pipe.

### Equipment Selection




- Hitachi EX1200 excavator was used to dig and place the 96" pipe. The operating weight of this piece of equipment is 250,000 #. Walsh Construction used a 7 ½ CY bucket.
- The spoil material was handled with a CAT 345 Excavator.
- B-Borrow material was placed using a CAT 325 with plate tamp.
- Dirt Backfill was placed with two CAT D8 Dozers and CAT 815 Sheepsfoot Compactor.
- A Trench Box was specially made for this application. 28' long, 14' wide and 18' tall.

### Construction Statistics


- 3,000,000 CY of Earthwork (volume of 3 Conseco Fieldhouses)
- 11,000 LF of 96" Pipe
- One of the worst winters in decades
- **Completed the job as scheduled!!!**

### Final Product





## Construction Issues

- *Continuous shifts during sub-freezing temps. to maintain 35 degree soil*
- *Proctor required for each lift due to time sensitivity of modified soil properties*
- *Reduced durability of nuke gauges in freezing temps.*



## Construction Issues

- *Excess material > planned due to reduced shrinkage of treated soil*
- *Post modified soil is an "engineered" material - may be < 100 pcf*
- *JTRP Studying lime modification & developing new guidelines for use by INDOT*



## Construction Issues

- *Final quantity measurements?*
  - *Use of GPS for original & final surfaces*
  - *Use of DTM to provide quantities*
  - *Additional CE for sectioning*
- *When is modification warranted?*
  - *MC taken daily compared to optimum*
  - *Drying time vs. Schedule*
  - *Sub on-site vs. Additional mobilizations*

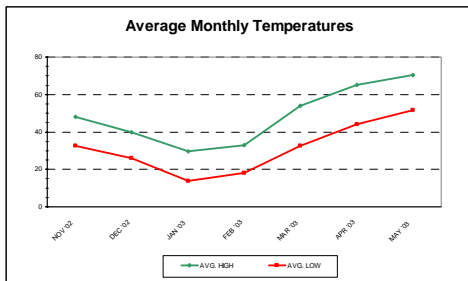


## Construction Facts

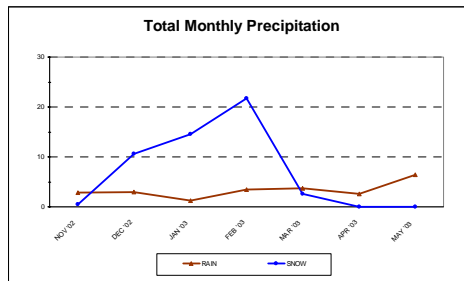
- *2.97 Million Cys Moved from Nov. 2002 thru August 2003 at a Cost of \$11.2 Million*
- *118,000 Tons of KLD Incorporated into Embankments at a Cost of \$7.1 Million*
- *Total Unit Cost = \$6.87 per Cy in Embankment*
- *Avg. Pct. KLD = 5.4%*
- *Critical Embankments Completed on Schedule*



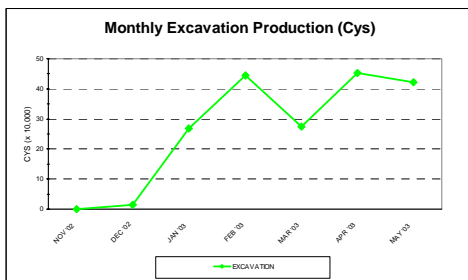
## Temperature



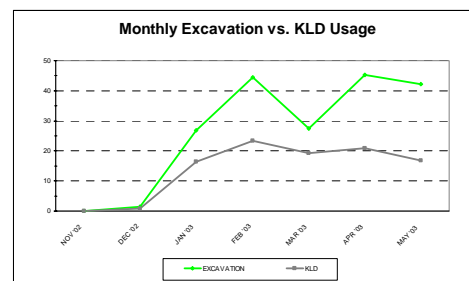
## Precipitation



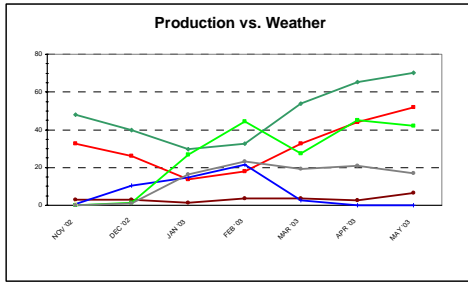
## Production



## Production



## Production



## Benefits

- *Eliminates Typical Construction Winter Downtime*
- *Provides Engineered Soil & Improved Material for Embankment*
- *Allows Excellent Process Control*
- *Cost Effective? - \$7.1 Million to Gain 5 Month's Production - 1 Construction Season*
- *Maintained Critical Schedule for Project Completion*



## Work in Progress



Dec. '03



## Questions



**WALSH**