

## RADIAL 16 CANAL AND ROAD BETWEEN $5^{TH}$ RING AND $30^{TH}$ de agosto curichi

International Senior Design Project



#### International Senior Design

- Walter Henry School
- Design Project

#### Introduction

# International Senior Design 2008 Tip Third Engineering









#### Outline

- 🗆 Santa Cruz, Bolivia
- Project Site
- Methods and Procedures
- Design Options
- Final Recommendation
- Cost Benefit Analysis
- Conclusion
- Questions





#### General Background









#### Project Background











### Methods and Procedures



#### Santa Cruz, Bolivia





### Michigan Technological University

- Water calculations
- Roadway calculations
- Project estimate and schedule
- AutoCAD drawings



#### Watershed





#### **Existing Conditions**



## 30<sup>th</sup> de Agosto Curichi

- Formation
- Landfill
- Rainy Season
- Curichi Health







### **Existing Conditions**









### **Canal Design**









### **Canal Design Options**

Canal
Underground Pipe
Earthen
Concrete Lined





#### **Underground Pipe**





# Slope/Grade 5<sup>th</sup> Ring Intersection



#### **Earthen Canal**







#### **Concrete Lined Canal**





#### **Canal Layout**



### **Canal Summary**





Detail #4: Canal Section Dimensions







### **Canal Summary**



#### **Canal Recommendation**

- Open Canal
  - 1 kilometer
- Box Culvert
  11 meters

126 Days (1 Construction Season)

\$364,000 (2,543,000 Bolivianos)

Box Culvert / Sediment Trap Extension
14 meters



### **Road Design Options**

Road
Asphalt
Gravel
Concrete





### Asphalt Pavement

#### Advantages

- Less maintenance than gravel road
- Less dust than gravel road
- Easier maintenance than non-reinforced concrete pavement

#### Disadvantages

- High Initial Cost
- Poor resistance to fatigue failure
- Availability of Equipment





#### Gravel Road



#### **Advantages**

- Relatively low initial cost
- Constructed using simple equipment

#### Disadvantages

- Requires continuous maintenance
- Dust
- Sediments entering canal



### Non-Reinforced Concrete Pavement

#### Advantages

- Durable
- Low maintenance
- Experienced labor
- Bolivian Standard

#### Disadvantages

- Higher initial cost
- Expensive to repair





#### **Road Recommendation**

## Non-Reinforced Concrete Road \$395,000 (2,764,000 Bolivianos)

#### 

- Temporary Gravel Road
   \$76,000 (527,000 Bolivianos)
   ~20% Cost of NRC
  - Future Base



120 Days



#### **Benefits**









#### Conclusion

In Santa Cruz
In Houghton
Overall Experience





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## More Information Available









