Storm Drainage Design for Flooding of Moscú Avenue and Barrio Los Pinos

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Outline

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Introduction
Background

Barrio Los Pinos
While In Bolívia...

1. Walked project site
2. Surveyed
3. Collected soil samples
While In Bolivia...

1. Walked project site
2. Surveyed
3. Collected soil samples
While In Bolívia...

1. Walked project site
2. Surveyed
3. Collected soil samples
While In Bolivia...

4. Met with government officials and local residents
Flooding Along Moscú Avenue
Flooding Along Moscú Avenue
Flooding Along Moscú Avenue
Flooding At Intersection of Moscú Avenue and Urbanización Road
Existing Conditions
Existing Conditions

Watershed Areas and Directions of Flow
Piraí River

Watt’s Canal

Curichi (swampy pond area)
Project Implications

- Health
- Environmental
- Economic
- Safety
- Sustainability
Problem Areas

Problem Area 1 (flooding area)

Problem Area 2 (removed culvert)

Problem Area 3 (flooding area)

Problem Area 4 (existing canal)
Design Options

1 – Sump Pump
2 – Underground Storm Sewer and Earthen Canal
3 – Replace Culvert Removed in 2006
4 – Fill and Grade Horse Road
5 – Retrench Existing Canals
Design Option #1 – Sump Pump

Advantages
→ Most direct route
→ Minimal earthwork
→ Lower initial expense

Disadvantages
→ Extensive maintenance
→ Sediment causes additional upkeep
→ No space
→ Slow water removal rate
Design Option #2 – Underground Storm Sewer and Earthen Canal

Advantages
→ Less maintenance than sump pump
→ Follows typical Bolivian design

Disadvantages
→ Longer route
→ More earthwork
→ Higher upfront costs
Design Option #2 – Underground Storm Sewer and Earthen Canal

Proposed New Pipe Along Urbanización Road

Proposed New Soccer Field Canal
Design Option #3 – Add Culvert Under University Entrance Road

**Advantages**
- Decreases flooding
- Simple solution
- Low maintenance

**Disadvantages**
- Redoing previous work
- Paved road – costly, more work
Design Option #3 – Add Culvert Under University Entrance Road
Design Option #4 – Filling & Grading Horse Road

Advantages
- Low cost
- Simple solution

Disadvantages
- Contributes more water to largest flooding area on Moscú
- Potential to create new flooding areas
**Design Option #5 – Retrench Existing Canals**

**Advantages**
- Low cost
- Simple maintenance
- Canals function properly

**Disadvantages**
- Slight cost compared to doing nothing
Design Option #5 – Retrench Existing Canals
Design Option #5 – Retrench Existing Canals
Design Option #5 – Retrench Existing Canals

6th Ring Canal to Curichi – Existing Section Type I

6th Ring Canal to Curichi Proposed Section
Clean Out Culverts

Clogged Culverts
Recommendations

- Barrio Los Pinos
- Urbanización Rd.
- University Canal Rd.
- 6th Ring
- Moscú Avenue
- Curichi
**Costs**

*Implement Design Options*

2 – Underground Storm Sewer and Earthen Canal  
$86,510

3 – Replace Culvert Removed in 2006  
$7,722

5 – Retrench Existing Canals  
$18,112

**AND** Clean Out Existing Culverts  
$156

*Total Estimated Cost = $112,500*
Benefits

- Eliminates Standing Water
- Less Potential for Disease
- Increases Property Values
- Increases Safety
- Allows Proper Storm Drainage