District 12 Police Station: On-Site Wastewater Treatment and Storm Water Evaluation and Design

2008 International Senior Design, Santa Cruz, Bolivia

Introduction

In August 2008, 10 students and 2 professors traveled to Santa Cruz, Bolivia. During the 2 weeks in Bolivia students were divided into teams of 3 and 4 and assigned a design project. Students had the opportunity to work on a construction project at Walter Henry School, gather information about their projects and experience Bolivian culture.

Project Assignment and Location

S.D.E. was assigned the challenge of designing a wastewater treatment and storm water solution for a Police Station in District 12 of Santa Cruz.

District 12

Santa Cruz, Bolivia

Police Station

Methods and Procedures

While in Bolivia, S.D.E. held meetings with the policemen and sub district mayors, gathered survey and soil data, and performed a water quality analysis.

(L to R): Soil Boring, Team Meeting, Surveying

Existing Conditions

The site was found to have a high groundwater table, sandy soil, and a malfunctioning wastewater treatment system. The storm water from the roof was discharged underground, causing flooding in the rainy season.

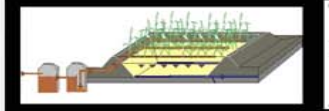
(L to R): Soccer Field Behind Station, Existing Septic tank (too small for flow), Full Inspection Basin

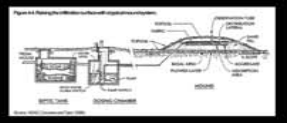
Design Options

A septic tank is typically used for primary treatment of wastewater, where solids settle out. Secondary treatment involves further removal of solids and bacteria from the water. S.D.E. researched the following 12 design options for secondary wastewater treatment at the police station.

1. Pozo Ciego (Dry Well)
2. Activated Sludge
3. Lagoons
4. Gravity Drain Field
5. Pressurized Drain Field
6. Drip Line Effluent Drain Field
7. Box Sand Filter
8. Trickling Filter
9. Imhoff Septic Tank
10. Composting Toilets
11. Constructed Wetlands
12. Mound Drain Field

Due to the high groundwater table, flow rate, and allotted space, the first 9 options were considered not feasible. The final 3 options were then furthered researched.



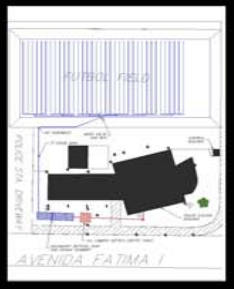


(L to R): Composting Toilet, Constructed Wetland, Mound Drain Field

2 design options were considered for storm water improvements: a trench gate and catch basins. Trench gates are larger and more expensive than catch basins.

Final Recommendation

S.D.E. recommends implementing a mound design system for wastewater treatment and a new drainage system with catch basins at the police station.



(L):The mound system would utilize the existing septic tank for primary treatment, followed by a secondary settling/dosing tank, and then a mound drain field over the existing dirt soccer field.

(R):The underground roof pipes would be attached to a new storm drain with catch basins and would flow to a current drainage ditch on the property.

Conclusion

Based on this study and design, S.D.E. concludes these design recommendations to be an improvement to its benefactors and an advantageous development until sanitary sewer can be installed.

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