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3 September 2004

Dr. Richard Gosser
Partners in Progress
329 N Fairfield St
Ligonier PA 15658

Ref: Makaya Water Project
Engineering Study
IDEA Project No. 8001

Dear Dr. Gosser,

I have completed a review of the water pumping project, based on the literature you have provided. As we discussed, there are a number of options available to meet the requirements of this project. The purpose of this report is to identify those options and describe the advantages and disadvantages of them. Throughout this report, I have relied upon the information contained in the report originally prepared by Mr. Pedro Gonzales Baucells.

GENERAL

The expected flow rate available from the springs is approximately 7500 Gallons per Day (GPD). This flow is to be collected in a cistern 1300 feet away from the springs and pumped approximately 1470 feet to the APF Commercial Center. The elevation of the Commercial Center is approximately 164 feet above the proposed collection cistern.

It is unclear at this time why the collection cistern is to be 1300 feet away from the springs. Further, because the locational data are approximate, sufficient factors of safety must be applied to ensure that the hardware procured will function as desired. We have added an additional 10% to the elevation, and an additional 15% (which is common) to the Total Dynamic Head (TDH).

There are four basic components to this new system:

1. Cistern
2. Pump and Prime Mover (Pump Driver)
3. Piping
4. Reservoir or Distribution Tank

Each of these components offers several choices. The final choice should be based on pricing, availability, and constructability. Because this project is in a remote and poor area, we have made certain assumptions about constructability issues. These assumptions should be reviewed for accuracy.

ASSUMPTIONS

1. Construction equipment such as backhoes used for excavating is not available. Any excavation is to be by hand, and will therefore be time-consuming.
2. Skilled trades are not accessible.
3. Rigging equipment is not available. Tripods (or other hand-made structures) and chainfalls will be required for unloading equipment, unless it can be delivered by a boom-truck. The most cumbersome items will be the tanks, which will weigh approximately 1800 lb.
4. Concrete equipment pads will be built on which to place the equipment.
5. Diesel fuel cost is \$2.00 per gallon.