Pinnacle Healthcare Consortium

Strategic Implementation Plan:
Clean Water and Bio-Waste Management Plan
Nord Department of Haiti

Commissioned by: Pinnacle Healthcare Consortium
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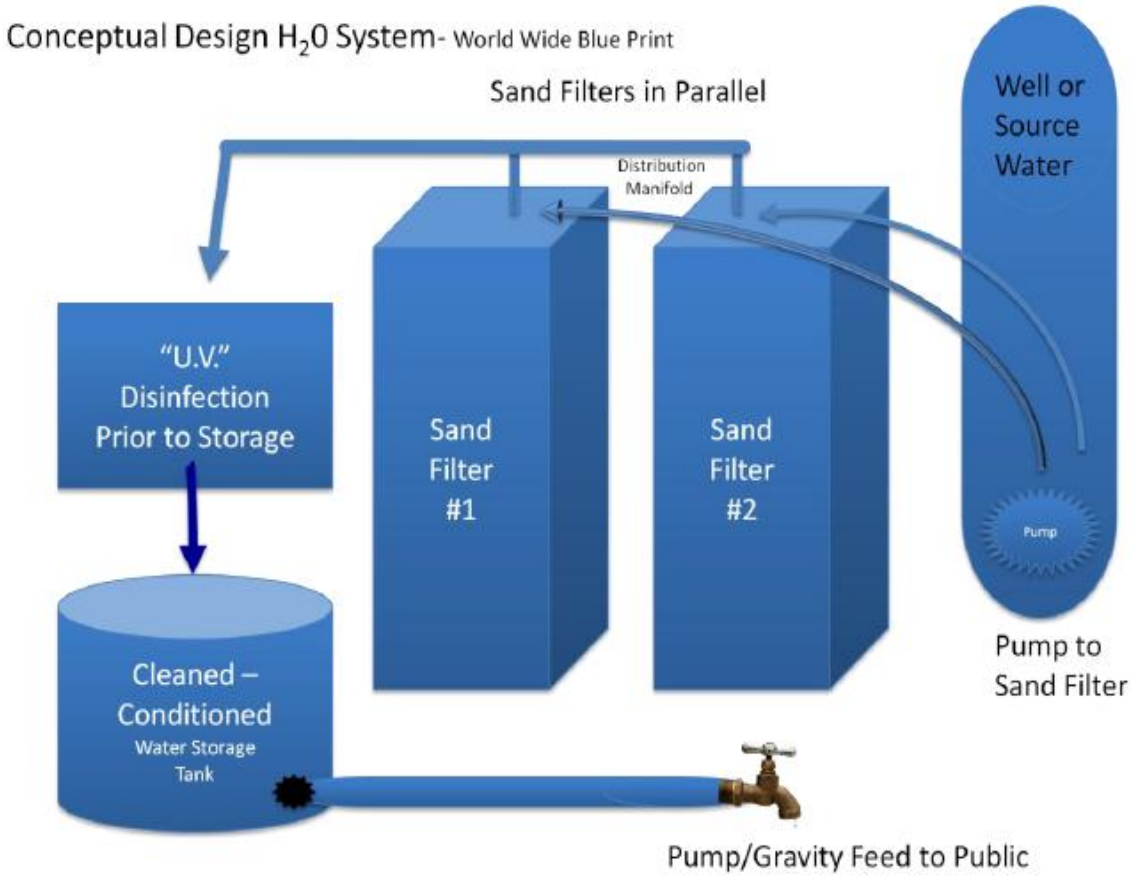
Introduction

The reasons behind the persistent lack of infrastructure development in the Nord department of Haiti are complex and have no easy solutions. There are numerous socioeconomic, cultural and political hurdles to surmount in order to provide sustainable models of infrastructure development. Implementing simple systems for the provision of bio-waste management infrastructure and sustainable clean water remains the cornerstone to improving the population health indices and by proxy its economic growth and development.

Pinnacle Healthcare Consortium (PHC) is familiar with the challenges faced in providing infrastructure improvement programs in developing countries. Our first step will be to construct a *Stakeholder Consultation Statement* in order to seek the appropriate balance of ownership between the government, private and public stakeholders for these initiatives.

The key objectives of this **Clean Water and Bio-Waste Management** initiative are:

1. Constructing a system that is economically viable and sustainable in the Haitian setting
    a. Low technology, and thus operationally stable
    b. Labor intensive, hence creating employment opportunities
2. Horizontal integration with the Solid Waste Management initiative commissioned by Arden Primary Care
3. Creating valuable by products from the operations to put back into the economy
    a. Compost and fertilizer
    b. Reprocessing recyclates for international export
    c. Electricity generation
4. Piloting the system in Cap-Haitien with the potential for national roll out
    a. Education and capacity building opportunities for local Haitians to ultimately manage the system



CLEAN WATER INITIATIVE

The importance of a clean water supply cannot be overstated in view of the fact contaminated water intended for human consumption will be laden with disease producing/causing microorganisms. Manifestations will occur in the form cholera, typhoid, hepatitis, and other diseases that will adversely affect the health and economic viability of the Haitian recovery process.
The proposed water cleanup/purification systems can be phased into operation. Initially, a very basic but effective system as described diagrammatically below should be considered. The proposed design does not require expensive technology advanced systems but does provide a supply of clean water for outlying villages/communities. The system is scalable in size, flexible to accommodate the source of water, employs the existing labor force in the development of the requisite infrastructure such as canals/ditches, collection and distribution system. The source of water could be from rivers/streams, cisterns, or wells.

Many advantages of this type of system include:

- Simple effective passive design concept that has been used in Afghanistan and other countries to aid the poor
- Scalable from rural villages to more densely populated areas
- Employs residents in constructing required infrastructure
    - Ditches/water transportation system
    - Concrete or plastic collection vessels
- Minimal and low cost construction materials may be used
- Minimal operating/life cycle cost
- Requires little or no mechanical power, chemicals or replaceable parts, and requires minimal operator training and only periodic maintenance. This is often the appropriate technology for poor and isolated areas.
- Slow sand filters are recognized by the World Health Organization, Oxfam, United Nations and the United States Environmental Protection Agency as being superior technology for the treatment of surface water sources. According to the World Health Organization, "Under suitable circumstances, slow sand filtration may be not only the cheapest and simplest but also the most efficient method of water treatment."

Typical Installation

MUNICIPAL / BIOWASTE INITIATIVE

Sewage treatment, or domestic wastewater treatment, is the process of removing contaminants from wastewater and household sewage, both runoff (effluents) and domestic. It includes physical, chemical, and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce an environmentally-safe fluid waste stream (or treated effluent) and a solid waste (or treated sludge) suitable for disposal or reuse (usually as farm fertilizer). Using advanced technology it is now possible to re-use sewage effluent for drinking water but is not deemed appropriate for the Haitian Project.

Sewage can be treated close to where it is created, a decentralized system, (in septic tanks, biofilters or aerobic treatment systems), or be collected and transported via a network of pipes and pump stations to a municipal treatment plant, a centralized system. Sewage treatment generally involves three stages, called primary, secondary and tertiary treatment.

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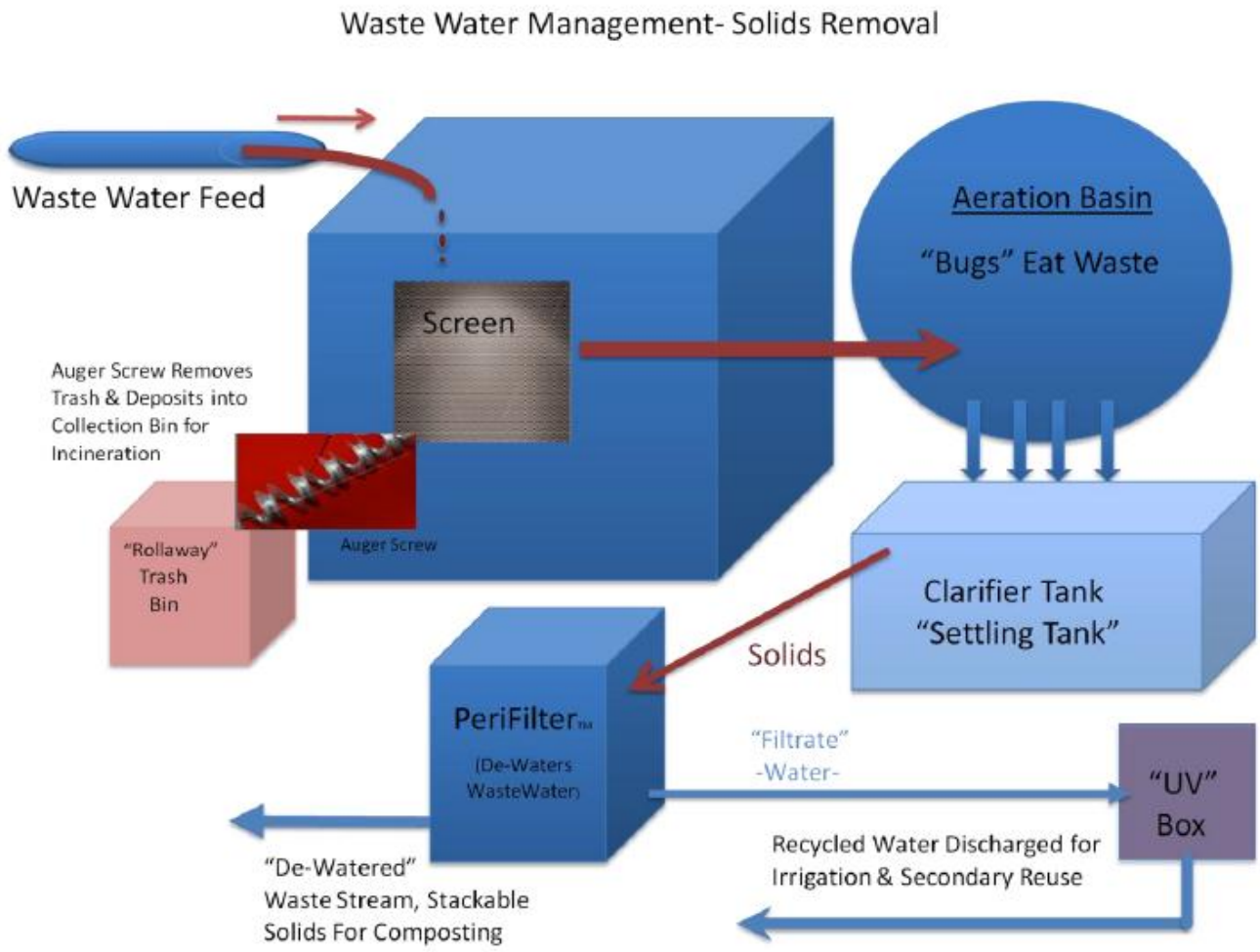
- ***Primary treatment*** consists of temporarily holding the sewage in a quiescent basin where heavy solids can settle to the bottom.
- ***Secondary treatment*** removes dissolved and suspended biological matter. Secondary treatment is typically performed by indigenous, water-borne micro-organisms in a managed habitat. Secondary treatment may require a separation process to remove the micro-organisms from the treated water prior to discharge or tertiary treatment.
- ***Tertiary treatment*** is sometimes defined as anything more than primary and secondary treatment in order to allow rejection into a highly sensitive or fragile ecosystem (estuaries, low-flow rivers, coral reefs...). Treated water is sometimes disinfected chemically or physically (for example, by lagoons and microfiltration) prior to discharge into a stream, river, bay, lagoon or wetland, or it can be used for the irrigation. If it is sufficiently clean, it can also be used for groundwater recharge or agricultural purposes.

The recommended initial methodology would be the installation of a centralized septic tank system that is economically feasible, scalable, flexible and efficient thereby minimizing potential health hazards. Initially, a "communal central" system would be established and scaled to accommodate multiple family dwellings. Human waste would be collected at each household then transported to the communal site for disposal. Later, the required infrastructure of pipelines and pumps could be installed thereby providing a more comprehensive and efficient approach for disposal.



Collecting the wastewater for treatment is very basic. The first step is to remove large objects (down to 100 mm) using a screening device. Then by adding specific bacteria and aerating, we can quickly treat the wastewater to remove specific waterborne health hazards. By transferring a percentage of the wastewater to a clarifier, we separate the bacteria (solids) from the wastewater. The solids are dewatered and the clean water is sent for additional disinfection (UV). The wastewater is now clean enough for secondary reuse in agricultural or other industrial applications that don't require fresh potable water. The solids can be either composted or incinerate as a fuel source.

Construction and installation would be have two phases.

Phase 1 – ***Primary Treatment***

- Minimal construction supervision
- Extensive use of the local work force
- Low cost construction materials (lumber/wood)
- Phased development approach
- No elaborate infrastructure required

Phase 2

- Development of infrastructure essential to construction of ***Secondary Treatment*** process described above.

Conclusion

This strategic implementation summary will deliver a final system that is efficient, economical, simple, and operationally sustainable. All our clean water and bio-waste management activity will be horizontally integrated with the Solid Waste Management initiative commissioned by Arden Primary Care. Further work needs to be undertaken as part if a Feasibility Study to determine the extent of each of the above operations coming on-line. As part of this work collection of data, investigation, and assessment is required and will be provided by our technical experts.

These infrastructure changing programs will usher improved health outcomes, essential by product for the agricultural trade, local employment opportunities, and build a solid framework for an income generating recycling facility and creation of a sustainable waste management system for the region. Opportunities for the private sector will continue through commitment from operators (such as Suez, Vivendi as well as US based companies), technology, and industrial plant providers.