To: Michael Bonderer
Michael@homesfromtheheart.org

Saturday, May 24, 2014

Re: Letter of Report for San Luis Talpa, project site in El Salvador.

Dear Mr. Bonderer,

The purpose of this letter is to summarize our site visit to your San Luis Talpa project site and provide you with our findings and recommendations.

I. Project Site:

The site currently has 9 fourplexes, 5 duplexes, an office, water treatment building and a daycare center. Three of the nine fourplexes and two of the 5 duplexes are in various stages of completion. Of the 30 livable units, 23 are currently occupied. Service water is provided for shower, toilet and outside sink for each of the units, additionally each unit has its own septic tank and leach field.

II. Sewer System:

The waste water system consists of a 38" diameter by 52" (approximately 255 gallon) poly plastic tank with a sanitary tee on the outlet followed by a 4'deep by 7' long by 3' wide gravel infiltration pit for each unit. Each unit has a shower, toilet and outside sink connected to a 4" PVC sewer line to the septic tank.

There was ponding water between buildings 2 & 3 and 3 & 4 and along the dirt drive in front of buildings 3 & 4 (see appendix A) Project Site Sketch. Upon further inspection it was determined that some of the sink drains from building 3 had been disconnected from the septic system and were draining directly onto the ground (see appendix B for pictures). Both the shower and toilet still drain to the septic system which appears to be functioning properly. We recommend reconnecting the sink drains to the septic tanks.

There was evidence of surfacing septic tank effluent behind and alongside building #14. Draining the sink shower or toilet resulted in effluent bubbling up through the ground in several places behind building #14(see appendix C for pictures). We recommend repairing/replacing this septic system, see section 3 "recommendations" below.

1. *Sub-surface / Soil Investigation:*

- We performed 4 subsurface percolation tests throughout the site (see Project Site Sketch) to evaluate the required application rate. Test holes 1, 2, & 4 were dug to a depth of 27" to 31" from the surface and produced similar results of 3.68, 2.7 & 3.34 min/in respectively resulting in an average application rate of 1.2 Sq.Ft./gpd. Test hole #3 was dug in an existing unfinished leach pit behind building #10 with a starting depth of approximately 4 feet below the existing grade. A garden hose was used to attempt to fill the test hole but the soil was so sandy that even after 15 minutes of running the hose the hole did not retain any water (See appendix D) for percolation test data.

- We verified the depth to groundwater at approximately 20 feet by measurement through the onsite well casing.

2. ***Concerns:***
   - The application rate of 1.2 gpd/sf (0.83sf/gpd) is typical of a course sand with a very high percolation rate and would be classified as a "type Ia soil" by New Mexico environmental standards (see appendix E). For reference, New Mexico regulations do not permit conventional treatment systems (septic tank leach field) with in class IA soils where the depth to ground water is less than 30 feet. Because conventional (septic tank leach field) system relies heavily on the receiving soils to adequately treat and assimilate the final effluent, it is imperative to assure adequate soil depth above the seasonal high water table. With adequate depth, the soil is capable of acting as both a filter and a surface upon witch chemical and biochemical processes can occur to ensure pathogen removal and treatment of organic and inorganic substances prior to discharging into groundwater.
   - The percolation test #3 in the bottom of the unfinished leaching pit is worrisome because it would not retain any water suggesting that effluent may be discharging almost directly to groundwater with little or no treatment.
   - Based on our observations of leach pit size and assuming there is adequate depth of acceptable soil below leach pit (prior to sand) the leach pits can handle approximately 50.4gpd.
     - Application area:
       - Bottom width = 3ft.
       - Sidewall height = 3ft.
       - Affective width (3+3+3) = 9ft.
       - Length = 7fi.

       Application area = 9ft x 7ft = 63sf.
     - Capacity:
     - 63 sf. ÷ 1.25sf/gpd = 50.4gpd
     - In our experience even the most conservative communities use at least 100gpd per house and prescriptive flow rates as suggested by most regulatory agencies can be as high as 350gpd per house.
   - Our measurement of the existing septic tank behind unit 10 was 38" diameter by 52" long or 255 gallons. A properly sized septic tank should be 2 to 2.5 times the daily flow rate.
3. ***Recommendations:***
   - It is widely accepted that properly sized leach fields within approved soil types (type IB, II, III &IV) can sufficiently treat septic tank effluent and remove viruses and bacteria to acceptable levels with 2-4ft of unsaturated soil. Therefore a mound disposal system may be a viable option if constructed with the required depth of acceptable soils. Alternatively,

based on our percolation tests of the shallow soils, we recommend placing at least 2' of surface soils (more silty soils) at the bottom of a leach field excavation (more sandy soils). This would require over excavating the leach fields 2' (make them 2' deeper) and then backfilling with the more silty soils. Another alternative is to make the leach fields shallower so that they are never dug down deep into the sandy soils.

- A small onsite package treatment system such as Orenco (see appendix F) could also be used to treat to acceptable levels but would still require adequately sized leach fields. Many regulatory agencies will allow for up to 30% reduction in leach field size with secondary treatment.
- At a minimum, we recommend doubling the capacity (size) of the leach fields for all future units and utilizing shallower trenches or placing the 2' of top soil in the bottom of the leach fields in order to maintain adequate soil separation from groundwater or sand layer.
- Move the tenants form unit #14 to another available units and allow the sewer system to sit for a month and dry out prior to excavating and fixing/re-building said sewer system using a larger leach field as described above and possibly a larger tank.
- If plastic or poly tanks are to be used for future tanks we recommend backfilling around the tank with pea gravel at least two thirds of the way up the sides of the tank to prevent tank deformation or damage do to backfilling. See Appendix G for an example of a plastic tank manufactures backfill requirements.

III. Water System Description:

The water system is made up of (1) ground water well, (2) 30 gallon hydro-pneumatic pressure tanks, (1) booster pump, (1) concrete Cistern system and the distribution water system consist of ¾" IPS schedule 13.5 PVC pipe.

The well consists of a 4" diameter schedule 40 pvc well casing that is 40' in depth with a static water level at 20'. It is unknown if the well has perforated piping and the pump size is unknown. According to residents of the community the well was hydrostatically drilled by using a 2" water pump to drill into the ground, as water was pumped in it created a hole and pushed up the dirt until they reached the 40ft. depth.

The well did not have a sanitary seal so we fabricated one by using a 4" PVC cap that we modified to fit the actual well casing, water line and loose electrical wires. We then sealed the cap with silicone caulk. The concrete well collar around the well casing had eroded underneath and there was signs that surface water may have been running under the concrete and presumably into the well. The void under the concrete was approximately 6 to 8" and was the habitat for a large frog (see appendix H) for pictures. We filled under and up and around the existing concrete collar and sloped it away from the well casing to prevent future surface water infiltration.

The drop pipe in the well is 1 ¼" diameter Schedule 40 PVC pipe, and the transmission pipe from the well to the cistern is 1 ¼" diameter schedule 40 PVC pipe. The water is pumped from the cistern to (2) 30 gallon hydro-pneumatic pressure tanks, using (1) booster pump to create pressure. The water pressure is not known and is extremely low.

The water from the cistern is used primarily for bathing, washing and flushing toilets. Each family needs to purchase potable water to use for cooking and consumption purposes.

There is water purification and disinfection system installed in building #12 that includes a sodium filter and 4 carbon filters, a U.V. disinfection and an ozone injection system (see appendix I for pictures). We turned on the system and tested it and aside from some very minor water leeks all components are in good operating condition. However, without knowing the chemical and biological makeup of the water at this time it is impossible to determine the potability of the water and therefore the system is not currently being utilized.

During our site visit we conducted some cursory water testing to include:

- PH = 7.4 to 8.0
- Alkalinity = 300ppm
- NH3 = 0ppm
- NH2 = 0ppm
- Ammonia = 0.4ppm
- TDS = 394ppm

While there was nothing alarming about the cursory tests, it certainly cannot be considered a test of potability and further testing is required.

1. ***Concerns:***
   - During our inspection we removed the lid to the cistern and found that the water was yellow in color, it had tadpoles, and some type of Horsehair/Gordian worms perhaps from grasshoppers that ingested the larvae in the water and drowned. Additionally, there was a thin yellowish surface layer resembling oil, grease fat or possibly petroleum products. Roots from surrounding vegetation had also found their way into the cistern. We purchased Bleach and HTH 70% to super chlorinated the well and the cistern.
   - Possibility of surface water contamination to groundwater, insufficient soils to adequately treat septic tank effluent prior to contact with groundwater and possible chemical, herbicides or insecticides contamination.
   - The pressure to the water system is extremely low and needs to be increased.
   -

2. ***Recommendations:***
   - We recommend performing water portability tests to include total coliform bacteria, lead, nitrate, nitrite, radon, calcium, copper, iron, magnesium, manganese, potassium, sodium, chloride, chlorine, hardness, pH, total dissolved solids, sulfate, ammonia , fecal/E.coli, alkalinity, odor, conductivity, sediment, turbidity, arsenic and volatile organic and synthetic organic compounds (VOC's and SOC's).
     a. Since the local labs had reservations about providing tests for VOS's, SOC's and herbicides/insecticides, we brought some samples back with use and have sent them to Hall Environments Laboratories in New Mexico who will be donating their time to perform the testing.

b. We did receive a quote for water testing from a local lab in San Salvador (see appendix J)

- Seal off Cistern to prevent discoloration from possible infiltration from surface runoff, vegetation growth in and around the Cistern and insect infestation. If it is not practically feasible to seal the cistern, we recommend evaluating its applicability and looking into just utilizing pressure tanks in conjunction with the well pump and doing away with the cistern.
- Because of our concern that there may be little to no treatment of the septic tank effluent prior to contact with groundwater, we recommend installing a hypo- chlorinator at the well house control station to disinfect the water prior to the water entering the Cistern to achieve and maintain a free chlorine residual of 0.2 to 0.5 mg/l (see Appendix K for chlorination recommendation)
- In order to really understand the water and wastewater demands we really need to monitor usage, therefore we recommend installing a water meter on the discharge side of the well.
- Even though the water system has a Ultra Violet treatment systems that is approximately 300'–500' away from the well it would benefit the community to have the hypo –chlorinator in use due to the fact that it is unknown if the water from the well is under the influence of surface water which could have Giardia which is a Cyst that cannot be penetrated due to the hard shell of the Cyst (see Appendix K for chlorination recommendation). In addition the U.V. requires clean water that is less than 15 ntu's and free of color. Note: The U.V. treatment system was installed to allow the residents to pick up potable water at a centralized location for consumption purposes, however it has not been used and has been inactive. We got the system to operate but could not inform the residents that the water was safe to consume due to the fact that the water needs to be analyzed by a certified lab to verify what contaminants are in the water.
- Increase water pressure for the system by increasing the Bladder tank pressure if possible.

We are truly pleased to offer you our recommendations and would like to thank you again for the opportunity to visit your San Luis Talpa facility and to be a small part of this wonderful project. I look forward to working with you again in whatever capacity we can be of further assistance. Please call or e-mail with any questions, comments or concerns.

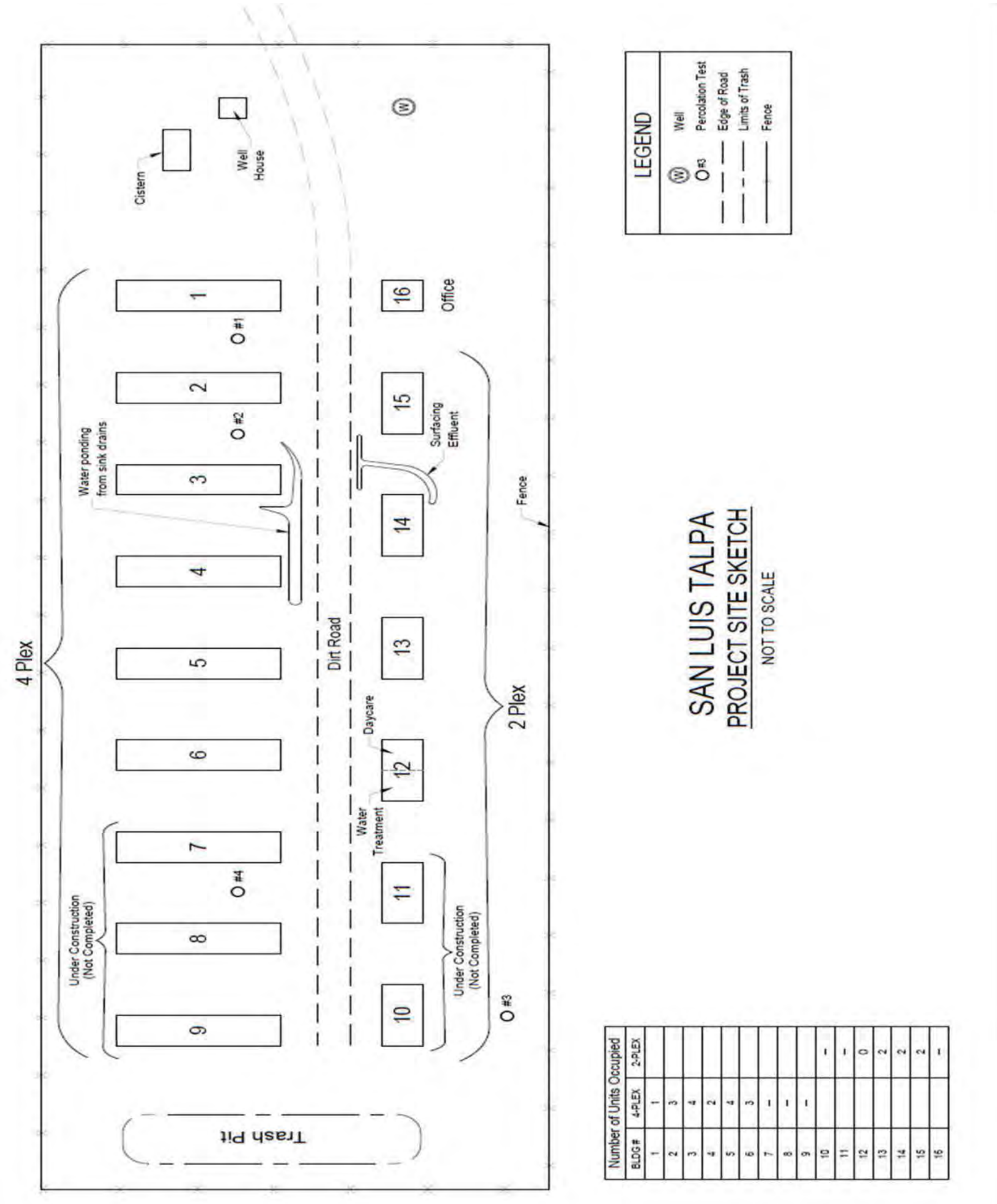
Sincerely,
Souder Miller & Associates

Ewan Young

Ewan Young
Civil Engineering Designer / Project Manager

Cc. Peter Fant
Marvin Martinez
Lou Harrington
Holly Chapman

Appendix A
Site Sketch



Number of Units Occupied

BLDG#	4-PLEX	2-PLEX
1	1	
2	3	
3	4	
4	2	
5	4	
6	3	
7	1	
8	1	
9	1	
10		1
11		1
12		0
13		2
14		2
15		2
16		1

Appendix B

Water Ponding around Buildings

Appendix C
Surfacing Septic Tank Effluent

Appendix D
Percolation Test Data

Percolation Test Data Form

Percolation Test

Location: San Luis Talpa

Test Hole No. 1

Depth to Bottom of hole 29"

Diameter/Dimensions of hole 7.5"

Depth	**Soil Texture**
0-12"	top soil
12-29"	Sandy Loam

Percolation test by: ECY

Date of Test: 5/19/2014

Time	Time Interval Minutes	Measure-ment inches	Depth in water level inches	Percolation rate, minutes per inch	Remarks
1:22		18 1/2			
1:27	0:05	21 5/8	3 1/8	0.0011	
1:32	0:05	23 1/8	1 1/2	0.0023	
1:37	0:05	24 1/4	1 1/8	0.0031	
1:42	0:05	25 1/2	1 1/4	0.0028	
1:47	0:05	26 3/16	11/16	0.0051	
1:52	0:05	26 7/8	11/16	0.0051	
1:57	0:05	28	1 1/8	0.0031	
	35		9 1/2		

Percolation Rate = 3.6842 **Minutes per Inch**

Application Rate = 1.2 gpd/sf

Percolation Test Data Form

Percolation Test

Location: San Luis Talpa

Test Hole No. 2

Depth to Bottom of hole 27"

Diameter/Dimensions of hole 7.5"

Depth	**Soil Texture**
0-12"	top soil
12-29"	Sandy Loam

Percolation test by: ECY

Date of Test: 5/19/2014

Time	**Time Interval Minutes**	**Measure-ment inches**	**Depth in water level inches**	**Percolation rate, minutes per inch**	**Remarks**
2:00		17			
2:05	0:05	20 1/2	3 1/2	0.0010	
2:10	0:05	22 5/8	2 1/8	0.0016	
2:15	0:05	24 1/4	1 5/8	0.0021	
2:20	0:05	25	3/4	0.0046	
2:25	0:05	26 1/8	1 1/8	0.0031	
2:27	0:02	27	7/8	0.0016	
	27		10		

Percolation Rate = 2.7000 **Minutes per Inch**

Application Rate = 1.2 gpd/sf

Percolation Test Data Form

Percolation Test

Location: San Luis Talpa

Test Hole No. 4

Depth to Bottom of hole 31"

Diameter/Dimensions of hole 7.5"

Depth	Soil Texture
0-12"	top soil
12-29"	Sandy Loam

Percolation test by: ECY

Date of Test: 5/19/2014

Time	Time Interval Minutes	Measure-ment inches	Depth in water level inches	Percolation rate, minutes per inch	Remarks
3:12		18 1/2			
3:17	0:05	21 5/8	3 1/8	0.0011	
3:22	0:05	23 1/8	1 1/2	0.0023	
3:27	0:05	24 1/4	1 1/8	0.0031	
3:32	0:05	25 1/2	1 1/4	0.0028	
3:37	0:05	26 3/16	11/16	0.0051	
3:40	0:03	26 7/8	11/16	0.0030	
	28.00		8 3/8		

Percolation Rate = 3.3433 **Minutes per Inch**

Application Rate = 1.2 gpd/sf

Appendix E

Application Rate

feet below the surface of the ground. Risers must be provided to extend the arch, dome or cover to within twelve (12) inches of the surface.

J. An approved vented inlet fitting shall be provided in every seepage pit so arranged as to prevent the inflow from damaging the sidewall. When using a one or two piece concrete slab cover inlet, the inlet fitting may be an approved one fourth (1/4) bend fitting discharging through an opening in the top of the slab cover. On multiple seepage pit installations, the outlet fittings shall meet the requirements of Subsection B of 20.7.3.702 NMAC.
[20.7.3.702 NMAC - Rp, 20.7.3.406 NMAC, 9/1/05]

20.7.3.703 DESIGN; AREA OF DISPOSAL FIELD AND SEEPAGE PITS:

A. The minimum required absorption area in a disposal field in square feet, and in seepage pits in square feet of side wall, shall be predicated on the liquid waste design flow rate and shall be determined by utilizing the following Table 703.1 based on the soil classification found in the proposed location of the disposal field.

B. The soil classification shall be determined by two test holes located at opposite ends of the proposed disposal area.

C. A detailed soil profile, in accordance with USDA soil classification methodology, shall be submitted with the liquid waste application for each hole, indicating soil horizons, horizon thickness as a function of depth, and soil texture.

D. USDA soil surveys may be used where available to help assess typical soils in the area of the proposed installation.

E. The required absorption area shall be sized on the most restrictive soil horizon located below and within 4 feet of the bottom the absorption area.

F. Conventional treatment systems shall not be constructed in type Ia soils where the depth to groundwater is less than 30 feet, type IV soils, or gravel. For these soils, refer to 20.7.3.605 NMAC.

G. Effluent distribution to type IV soils shall be accomplished by means of timed low pressure dosed distribution.

H. The required absorption area shall be calculated by the following formula: ABSORPTION AREA = Q X AR, where: Q = the design flow rate in gallons per day, AR = application rate (from Table 703.1)

Table 703.1: Application Rates by Soil Types for Conventional Treatment Systems

Soil Type	Soil Texture	Application Rate (AR) (sq. ft./gal/day)
Ia	Course Sand	1.25 (See Subsection F of 20.7.3.703 NMAC)
Ib	Medium Sand, Loamy Sand	2.00
II	Sandy Loam, Fine Sand , Loam	2.00
III	Silt, Silt Loam, Clay Loam, Silty Clay Loam, Sandy Clay Loam	2.00
IV	Sandy Clay, Silty Clay, Clay	5.00 (See Subsection G of 20.7.3.703 NMAC)

I. The gravel content of in-place natural soil shall not exceed 30%.

J. Disposal trenches shall conform to the following.

(1) The trench width shall be no less than one foot or no more than three feet.

(2) A minimum of six inches of aggregate shall be placed below the invert of the distribution pipe to provide surge storage. This area of trench sidewall shall not be used in calculating the absorption area.

(3) Up to an additional three feet of aggregate may be placed below the distribution pipe.

(4) The total absorption area shall be calculated utilizing the total trench bottom and sidewall area, excluding

TABLE 7-2

RECOMMENDED RATES OF WASTEWATER APPLICATION FOR TRENCH AND BED BOTTOM AREAS (4)(11)(12)[a]

Soil Texture	Percolation Rate	Application Rate[b]
	min/in.	gpd/ft^2
Gravel, coarse sand	<1	Not suitable[c]
Coarse to medium sand	1 - 5	1.2
Fine sand, loamy sand	6 - 15	0.8
Sandy loam, loam	16 - 30	0.6
Loam, porous silt loam	31 - 60	0.45
Silty clay loam, clay loam[d]	61 - 120	0.2[e]

[a] May be suitable estimates for sidewall infiltration rates.

[b] Rates based on septic tank effluent from a domestic waste source. A factor of safety may be desirable for wastes of significantly different character.

[c] Soils with percolation rates <1 min/in. can be used if the soil is replaced with a suitably thick (>2 ft) layer of loamy sand or sand.

[d] Soils without expandable clays.

[e] These soils may be easily damaged during construction.

Appendix H
Well Pictures






Appendix I
Water Purification Unit

Appendix J
Water Testing Quote

LECC

No. de Inscripción 357

Pag. 1 de 1

ASOCIACION HOMES FROM THE HEART INC
SR. EWAN YOUNG

Cotización: CL-405-055
Elaborada: 19-may-2014
Vigente al: 19-jun-2014

En respuesta a su atenta solicitud referente al análisis requerido, le indicamos las determinaciones a efectuar:

ANALISIS DE AGUA POTABLE POR FRECUENCIA		**446.02**
Recuento de Coliformes Totales *		
Recuento de Coliformes Fecales *		
Recuento de E. Coli *		
Cloro Residual	ANALISIS MINIMO O MENSUAL	
Color Verdadero		
Olor		
Temperatura		
pH *		
Solidos Totales Disueltos		
Aluminio		
Hierro Total		
Manganeso		
Bario		
Arsénico *		
Cadmio		
Cianuro		
Cromo Total		
Mercurio		
Níquel		
Plomo *		
Antimonio		
Selenio	ANALISIS NORMAL O BIMENSUAL	
Recuento Total de Bacterias Heterótrofas *		
Sulfatos		
Dureza Total como $CaCO_3$ *		
Zinc *		
Nitratos		
Nitritos		
Fluor	ANALISIS COMPLETO O ANUAL	

OBSERVACIONES:
- **Tiempo de entrega: de 6 hasta 12 días hábiles contados a patir de 1 día después de ingresada la muestra**
- **Forma de pago: 50% anticipo y 50% contra entrega de resultados en LECC**
- **Precio NO incluye Toma y Transporte de Muestras ***
- **Referencia: NSO 13.07.01:08 Agua Potable (2da Actualización)**
* **Pruebas acreditadas bajo Norma ISO 17025 vigente**

Esperando haber cumplido con lo solicitado nos es grato reiterar nuestro agradecimiento por darnos la oportunidad de servirle

Notas importantes

- Cualquier trabajo no descrito en esta cotización tendrá un costo adicional
- Las muestras deben venir acompañadas de una solicitud en papel membretado que indique: Nombre del Producto, Lote (Si aplica), Cantidad de muestra enviada, Determinaciones y Metodología Requerida, Nombre, Firma, Teléfono, e-mail y Número de cotización.
- Estamos acreditados por OSA bajo ISO 17025 en pruebas específicas
- Para la recepción de muestras se requiere el 50% de anticipo
- Para depósitos o transferencias en Banco de America Central: Cuenta: 200721710, a nombre de: ESEBESA, S.A. DE C.V.

Subtotal:	$ 446.02
I.V.A.:	$ 57.98
Total:	$ 504.00

Tels. (503) 2525 0200 Fax. (503) 2525 0222
Calle San Antonio Abad No. 1965, San Salvador, El Salvador.
info@lecc.com.sv / www.lecc.com.sv

Zulma de Solórzano

LECC

No. de Inscripción 357

Pag. 1 de 1

ASOCIACION HOMES FROM THE HEART INC
SR. EWAN YOUNG

Cotización: CL-405-056
Elaborada: 19-may-2014
Vigente al: 19-jun-2014

En respuesta a su atenta solicitud referente al análisis requerido, le indicamos las determinaciones a efectuar:

ANALISIS SUBCONTRATADOS DE AGUA POTABLE	**407.08**
Boro	
Plaguicidas Carbamatos	
Plaguicidas Organoclorados	
Plaguicidas Organofosforados	

OBSERVACIONES:
- Tiempo de entrega: de 15 hasta 21 días hábiles contados a patir de 1 día después de ingresada la muestra
- Forma de pago: 50% anticipo y 50% contra entrega de resultados en LECC
- Precio NO incluye Toma y Transporte de Muestras *
- Referencia: NSO 13.07.01:08 Agua Potable (2da Actualización)
*** Pruebas acreditadas bajo Norma ISO 17025 vigente**

Esperando haber cumplido con lo solicitado nos es grato reiterar nuestro agradecimiento por darnos la oportunidad de servirle

Notas importantes
- Cualquier trabajo no descrito en esta cotización tendrá un costo adicional
- Las muestras deben venir acompañadas de una solicitud en papel membretado que indique: Nombre del Producto, Lote (Si aplica), Cantidad de muestra enviada, Determinaciones y Metodología Requerida, Nombre, Firma, Teléfono, e-mail y Número de cotización.
- Estamos acreditados por OSA bajo ISO 17025 en pruebas específicas
- Para la recepción de muestras se requiere el 50% de anticipo
- Para depósitos o transferencias en Banco de America Central: Cuenta: 200721710, a nombre de: ESEBESA, S.A. DE C.V.

Subtotal:	$ 407.08
I.V.A.:	$ 52.92
Total:	$ 460.00

Tels. (503) 2525 0200 Fax (503) 2525 0222
Calle San Antonio Abad No. 1965, San Salvador, El Salvador.
info@lecc.com.sv / www.lecc.com.sv

Zulma de Solórzano

Appendix K
Chlorination

One of the safest, easiest and most cost effective ways to chlorinate this water system would be to use standard household bleach, more specifically Clorox with a 5.25 to 8.0% chlorine concentration by volume. As noted above the residual chlorine in the distribution system should be in the range of 0.2 to 0.5 mg/l to ensure adequate disinfection. The actual chlorine dose should equal the chlorine demand plus the desired residual. The Chlorine demand is equal to the amount of chlorine used up as it reacts with bacteria, chemicals and other constituents in the water. However, since we do not know the demand at this time we can start by adding a dose equal to the desired residual and increase the dose strength each day while monitoring the residual in the distribution system until the desired residual is attained. The residual chlorine can be tested with chlorine test strips readily available from USABlueBook.com (see below).

The calculations below are based solely on the desired residual with no known demand. Therefore, the operator should slowly increase the solution strength until the desired residual of 0.5mg/l is obtained in the distribution system but under no circumstances should the residual be greater than 4mg/l

Assuming the average daily flow is around 3,000gpd and a chlorine concentration of 5.25%, the amount of Clorox needed would be around 0.0286 gallons or around ½ cup.

- $$Cl(lbs./d) = \frac{\text{Volume (MGD) x Dose(mg/l) x 8.34 (lbs.-l / mg-MG}}{\text{(\% Concentration / 100)}}$$

- $$Cl\ (lbs./d) = \frac{\text{0.003MGD x 0.5mg/l x 8.34lbs-l/mg-MG}}{\text{5.25\% / 100}} = 0.2383lbs/d$$
- $$\frac{\text{0.2383lbs/d}}{\text{8.34lbs/gal}} = \textbf{0.0286gal/day = 0.45 cups or ½ cup}$$

- We recommend starting with ½ cup of Clorox in a 5 gallon bucket and using a pump with a pump rate of 5gal/day to effectively add ½ cup of Clorox to the system in a 24hr period.

We recommend using the Stenner Peristaltic pump MFR#85MJH1A1S to continually drip a 5 gallon bucket of Clorox and water mixture into the cistern over a 24 hour period (see pump info below).