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August 14, 2008

Hartstine Island Estates Association
c/o Dean Anderson
3410 Broadmoor Dr. NE
Tacoma, WA 98422

Re: Water Tank Location Engineering Study for Hartstine Island Water System.

Dear Mr. Anderson:

Martig Engineering has completed its evaluation of alternatives associated with the placement and construction of a new Water Storage Tank for your System.

TANK PROBLEMS

Both existing Redwood Tanks are old, and need replacing because:

1. Their age is greater than 33-years and the wood has deteriorated;
2. The roofs are in dire need of replacement;
3. Coliform Bacteria problems develop within the tanks during warm summer months; &
4. The Owner of the properties surrounding the existing tanks would like them to be moved.

ELEVATION STUDY

Since the original records associated with the approval and construction of the Water System were misplaced, by both the State and the Owner, an Elevation Survey was required to determine the ground elevations along the constructed water main and at alternative tank location sites.

In June 2008, Forest Land Surveys and Martig Engineering completed the necessary survey. The Attachment 1, Ground Elevation Survey Map, shows the necessary measured elevations throughout the System. Attachment 2 shows the location of the measured elevations.

ALTERNATIVE LOCATIONS

Four alternative Tank sitting locations were evaluated. The Attachment 3, Alternative Sites Map shows the location of these alternative sites.

1. Existing Tank Site;
2. Neighbor's Proposed Site;
3. Site at Community Swimming Pool; &
4. Site at System Well.

DISCUSSION OF ALTERNATIVE SITES

The following Table compares the necessary changes and/or additional requirements associated with the respective alternatives:

<u>PARAMETER</u>	#1	#2	#3	#4
a. Additional Land:	No	Yes	Yes	Yes
b. New Tank Supply Piping:	No	Yes	Yes	No
c. Gravity Supply to most Homes:	Yes	Yes	No	No
d. Pump Supply to all Homes:	No	No	Yes	Yes
e. New System Demand Pump:	No	No	Yes	Yes
f. Booster Pump Relocation:	No	Yes	Yes	Yes
g. New Booster Pump Piping:	No	Yes	Yes	Yes
h. Taller Storage Tank:	No	Yes	No	No
i. Requires Increased Electric Power:	No	No	Yes	Yes
j. Higher O & M Costs:	No	Slight	Yes	Yes
k. System Reliability (1st thru 4th):	1st	2nd	4th	3rd
l. Least Capital Cost (1st thru 4th):	1st	2nd	4th	3rd

The Attachment 4 Tank Elevation Summary shows the relative location and tank bottom elevations for the four alternatives.

The following discussion compares the four alternative tank sitting locations.

1. Existing Tank Site:

The water system currently has two Redwood storage tanks. Given the piping configuration, the total usable storage is 23,000 gallons considering both tanks.

The original Hartstine Island Plat created the 40.0' x 40.0' Lot upon which these two tanks are placed. Also placed upon this Lot is a wood framed building that houses the Booster Station (two booster pumps, controls, and a pressure-tank) necessary to supply water, with adequate pressure, to the higher elevation Lots within the Plat.

Mason County Regulation 17.04.223 sets forth the requirements for Platted Lots and respective "Setback Requirements".

- a. Paragraph "E" exempts "Lot Size Requirements" for Lots whose dedicated purpose is for "Utility Facilities". Water system tanks and Booster Stations are "Utility Facilities";
- b. Paragraph "D" presents that "Setbacks for Lots with widths less than 100-feet shall be 10% of the lot width, but in no case shall it be less than 5-feet". The 40.0-foot wide Utilities Facility Lot" should have setbacks of not less than 5-feet.

The second water storage tank placed upon the designated Utility Lot appears to be too close to the Lot's Property Line, potentially even over the line onto the neighbor's property. A LOT PROPERTY LINE SURVEY SHOULD BE CONDUCTED, BY A LICENSED LAND SURVEYOR, TO DETERMINE THE EXACT BOUNDARIES OF THIS 40.0' X 40.0' LOT.

Mason County Regulation 17.04.224 sets forth "Height Restrictions". The Maximum Height is 35-feet, except for Water Tanks or necessary structural elements associated with otherwise compliant permitted land use.

CONTINUED USE -- If this existing Lot, Alternative #1, is used for the necessary water storage tank upgrading, the following design parameters are recommended:

- a. Lot corners must be established by a Licensed Land Surveyor;
- b. If two water storage tanks are used, the Setback from the Property Line should be at least 5-feet;
- c. If a single storage tank is used, the Setback should be as close to 10-feet as possible (a new, single, 20-foot diameter tank would have 10-foot setbacks if placed within the geometric center of the 40.0' x 40.0' Lot);
- d. The existing Booster Station will not be moved. The new tank(s) must be placed, within the Lot boundaries, while allowing a 3' to 5' space between the Booster Station and the tank footing;
- e. A 6' to 8' high Cedar fence should be placed along the Property Lines to provide a visual screening of the Lot's interior. A 20-foot wide gate should be placed on the southeasterly Property Line portion of the fence to facilitate access from the adjacent 20-foot wide access Easement.
- f. To compare the four alternatives, a tank storage volume sufficient to replace the existing Active Storage volume is used. A single 20-foot diameter tank, 12-foot high provides 23,500 gallons of Active Storage, slightly greater than the existing 23,000 gallons;
- g. NOTE: The WSDOH may ultimately require a higher Active Storage volume. A fully developed Hartstine Island System may serve up to 95 connections. At 600 gallons per connection, 78 connections could require as much as 46,800 gallons and 95 connections as much as 57,000. Therefore, a 25-foot diameter tank 17-feet high might be required.

IMPLEMENTATION -- To implement Alternative #1, the following steps are required:

- a. Have a Licensed Land Surveyor set the four property corners of this 40.0' x 40.0' Lot;
- b. Obtain WSDOH approval for the selected new tank;
- c. Process an Administrative Variance with Mason County to accommodate the setbacks for the new tank (required setbacks between 5.0' and 10.0');
- d. Rent a portable water storage tank, placing it upon the north end of the 20-foot wide access easement, and use temporary float controls and piping to serve the system until the new tank is constructed;
- e. Remove the two existing Redwood tanks and their foundations;
- f. Install the new tank (20' Dia x 12' High) and place it in service;
- g. Remove the rented storage tank and install the new fence and gate along the property lines.

2. Neighbor's Proposed Site:

The neighbor who owns the property, surrounding the existing 40.0' x 40.0' Platted Utilities Lot, upon which the existing tanks and Booster Station are placed, would like the Tanks and Booster Station relocated.

He has volunteered that a portion of his land could be used to accommodate moving these water system components, as shown on Attachment 5.

Attachment 6 shows this Alternative #2 location on a portion of the County Tax Parcel Map, Scale 1' = 100', along with the Alternative #1 location.

DISCUSSION -- This proposed new Lot would require the full Setbacks specified within the Mason County Regulation 17.04.223, since it is being newly developed.

The new Lot minimum width, parallel to the existing 20-foot wide Easement, would be 71-feet for a 20-foot diameter tank and 76-feet wide for a 25-foot diameter tank.

The minimum depth of the new Lot, at the centerline of a 20-foot diameter tank, would be 65-feet from the westerly edge of the existing 20-foot wide Easement (85-feet from the Owner's easterly Property Line) and 70-feet from the westerly edge of the Easement thru the centerline of a 25-foot diameter tank (90-feet from the Owner's easterly Property Line).

Note that the configuration proposed for a 20-foot diameter tank in Attachments 5 & 6 does not properly accommodate the existing 20-foot wide Easement. It would be necessary to move the proposed tank location northerly and/or westerly so

that the Front 25-foot Setback is measured from the westerly edge of the Easement. This movement would be increased if a 25-foot diameter tank becomes necessary.

IMPLEMENTATION -- To implement Alternative #2, the following steps are required:

- a. Obtain WSDOH approval for the selected new tank;
- b. Purchase the property in accordance with the expanded Lot size, size as determined to fit the new tank and Booster Station within the required Setbacks;
- c. Have a Licensed Land Surveyor set the property corners for the required boundaries of this new Lot;
- d. Install a new, slightly higher pressure-rated Booster Station to replace the existing one;
- e. Install the new 20' Dia x 22' High tank (THE NEW TANK AT THIS LOCATION MUST BE 10-FEET HIGHER THAN THE TANK REQUIRED IN ALTERNATIVE #1, DUE TO THE GROUND ELEVATION DIFFERENCE);
- f. Install approximately 350 lineal feet of new 3-inch Schedule 40 PVC water Main pipe to connect the new tank to the existing Main from the Well;
- g. Place new tank and Booster Station in service;
- h. Remove existing Redwood tanks and Booster Station;
- i. Install the new fence and gate along the property lines.

3. Site at Community Swimming Pool:

The Community owns Lot 35. The Community Swimming Pool facility is located upon the southerly portion of this lot.

Alternative #3 involves placing the new tank on the northerly portion of this Lot 35. However, our preliminary study suggests that a portion of Lot 36 would be required in order to provide the necessary land area for the new tank, the new Booster Station, and the required new constant flow Pump Delivery Station.

DISCUSSION -- This created Alternative #3 Lot would require the full Setbacks specified within the Mason County Regulation 17.04.223, since it is being newly developed.

The new Lot minimum width, parallel to E. Dana, would be 71-feet for a 20-foot diameter tank and 76-feet wide for a 25-foot diameter tank.

The minimum depth of the new Lot, at the centerline of a 20-foot diameter tank, would be 65-feet from the edges of the new lot and 70-feet thru the centerline of a 25-foot diameter tank. Both existing Lots 35 & 36 have adequate depths for such a new lot.

Alternative #3 requires a new Pump Delivery Station to deliver water to the Lots presently supplied by gravity flow from the existing higher elevation Redwood tanks (these tanks being replaced by a new tank at this Alternative #3 location).

IMPLEMENTATION -- To implement Alternative #3, the following steps are required:

- a. Obtain WSDOH approval for the selected new tank;
- b. Purchase the necessary portion of the Lot 36 in accordance with the expanded Lot size, size as determined to fit the new tank, new Booster Station, and new Pump Delivery Station within the required Setbacks;
- c. Have a Licensed Land Surveyor set the property corners for the required boundaries of this new Lot;
- d. Install a new, higher pressure-rated Booster Station to replace the existing one;
- e. Install the new tank (20' Dia x 12' High);
- f. Install the new Pump Delivery Station;
- g. Install the new complex Control Equipment;
- h. Install approximately 1200 lineal feet of new 3-inch Schedule 40 PVC water Main pipe to connect the new tank to the existing Main from the Well;
- i. Place new tank, Booster Station, Pump Delivery System, and new Controls in service;
- j. Remove existing Redwood tanks and Booster Station and install fence.

This is creates a complex Water System that would never be designed to supply water to a Plat such as yours.

4. Site at Existing Well:

This Alternative #4 considers placing the new tank at the location of the existing Well that supplies water to the existing System. Attachment 7 shows the location of the existing Well on its Platted Utilities Facility Lot.

The existing Lot is 40.0' x 40.0' in size and must have a 20-foot wide Easement to it (the existence of an Easement has not been researched/confirmed).

DISCUSSION -- This Alternative #4 is also complex. The new 20' Dia x 12' High tank would be placed here.

Like Alternative #3, this alternative will require a Pump Delivery Station to deliver water to the Lots designed to be served by gravity flow from the existing two Redwood tanks.

Also required is a new/relocated Booster Station with its own new small supply tank. The relocation could be to the northerly portion of the Swimming Pool Lot 35. The new supply tank for the relocated Booster Station could be a 5000 gallon

tank. Here, 1200 lineal feet of new 3" Main would be required to connect the new supply tank. (It might make more sense to maintain the existing Booster Station at its present location. However, the new small supply tank would be necessary at this location to supply water to the Booster station).

IMPLEMENTATION -- To implement Alternative #4, the following steps are required:

- a. Obtain WSDOH approval for the selected new tank;
- b. Purchase the property in accordance with the expanded Lot size, size as determined to fit the new tank, new Booster Station, and new Pump Delivery Station within the required Setbacks;
- c. Have a Licensed Land Surveyor set the property corners for the required boundaries of this new Lot;
- d. Install a new, higher pressure-rated Booster Station with its new small supply tank to replace the existing station;
- e. Install the new tank (20' Dia x 12' High);
- f. Install the new Pump Delivery Station;
- g. Install the new complex Control Equipment;
- h. Install approximately 1200 lineal feet of new 3-inch Schedule 40 PVC water Main pipe to connect the new booster supply tank to the existing Main from the Well;
- i. Place new tank, Booster Station, Pump Delivery System, and new Controls in service;
- j. Remove existing Redwood tanks and Booster Station and install new fencing.

This creates a complex Water System that would never be designed to supply water to a Plat such as yours.

COST ANALYSIS

Alternative #1: provides the least cost alternative, maintaining the best overall system design. Its estimated cost is \$ 100,000.00, including:

a. Design and permits;.....	\$ 4,000	
b. Land Survey, setting property corners;	2,000	
c. Rent temporary storage tank;.....	2,000 *	
d. Remove existing tanks and foundations;.....	10,000	
e. New tank foundation;.....	8,000	
f. New 20' Dia x 12' High Steel Tank;.....	55,000	
g. Minor piping and control connections;.....	3,000	
h. New Cedar fence and gate.....	6,000	
i. 11% Contingency:.....	<u>10,000</u>	
TOTAL ESTIMATED BUDGET COST		\$100,000

New Site

Alternative #2: provides the next best overall system design, but does cost more. Its estimated cost is , including:

a. Design and permits;.....	\$ 6,500	
b. Land Survey, setting property corners;.....	3,000	
c. Purchase of additional land area;.....	10,000 *	
d. New tank foundation;.....	10,000	
e. New 20' Dia x 22' High Steel Tank;.....	70,000	
f. New Booster Station;.....	20,000 *	
g. Install 350 lineal feet of new 3" Main;.....	7,000	
h. Remove existing tanks and foundations;.....	10,000	
i. Remove existing Booster Station;.....	3,000 *	
j. New Cedar fence and gate.....	9,000	
k. 11% Contingency:.....	<u>16,500</u>	
TOTAL ESTIMATED BUDGET COST		\$165,000

* Indicates that Item is Unique to Alternative

Alternatives #3 & #4: These two alternatives become complex because a Pump Delivery Station is required to deliver water to the Lots designed to be served by gravity flow from the existing storage tanks. Complex/Sophisticated Controls or thousands of feet of new water Main piping become necessary. Therefore, the cost of either of these alternatives becomes tens of thousands of dollars higher than the cost of Alternative #1 or #2.