FREELAND WATER & SEWER DISTRICT

ISLAND COUNTY **WASHINGTON**

BERCOT ROAD INTERTIE STUDY

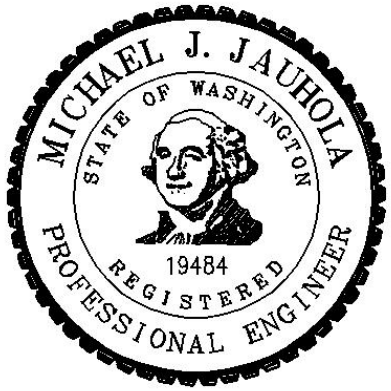
G&O #13507
NOVEMBER 2013

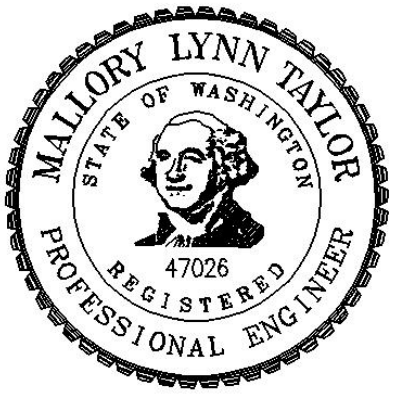
Gray & Osborne, Inc.
CONSULTING ENGINEERS

FREELAND WATER & SEWER DISTRICT

ISLAND COUNTY **WASHINGTON**

BERCOT ROAD INTERTIE STUDY





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INTRODUCTION

The Freeland Water & Sewer District (District) is considering plans to construct an intertie between the District's water system and the Harbor Hills Community Water System (Harbor Hills). Both systems are owned and operated by the District; however, the Harbor Hills system is located outside the boundaries of the District, but within their Retail Service Area. Figure 1 shows the vicinity map for the area.

The purpose of this intertie report is to meet the requirements of WAC 246-290-132, including:

- Purpose of the intertie;
- Alternatives to an intertie to accomplish a similar purpose;
- Description of the physical components of the intertie;
- Hydraulic model results;
- Water right self-assessment;
- Potential stipulations for inclusion into an intertie agreement, including legal aspects; and
- Cost estimates for the design, permitting, and construction of the intertie.

FREELAND WATER SYSTEM DESCRIPTION

The District water system, ID 26450, is located in Island County and provides water for a population of 617 through a total of 485 service connections, per the 2013 Water Facilities Infrastructure (WFI) Form. The system has three well sources, two reservoirs, and approximately 60,000 lineal feet of pipe. Wells 1 (current capacity 150 gpm) and 2 (current capacity 189 gpm) pump into Reservoir 1 which sets the pressure of the system at a hydraulic grade line (HGL) of 286 feet. Well 3 (current capacity 122.5 gpm) pumps into Reservoir 2, which has an overflow elevation of 344 feet. Reservoir 2 is in an isolated pressure zone and feeds Reservoir 1 via a pressure reducing valve (PRV). A larger PRV provides additional fire flow to the distribution system from Reservoir 2. Figure 2 shows the water system infrastructure for the Districts water system.

The elevations in the District vary greatly and range from 245 feet at the base of Reservoir 1 to 6 feet along Holmes Harbor. The intersection of Bercot Road and Honeymoon Bay Road (the location of the proposed intertie) is at an elevation of 220 feet. This is the location where the District has historically seen pressure and fire flow deficiencies. Four homes in this area are currently served by a small booster station to maintain adequate pressures, as such, the booster is too small to provide adequate fire flows. The high elevation in this portion of the District's service area results in low pressures when served off of the existing 286 pressure zone. Creating a higher pressure zone in the northwest portion of the District would allow for increased pressures, increased fire flows, and the potential to serve additional development.

HARBOR HILLS WATER SYSTEM DESCRIPTION

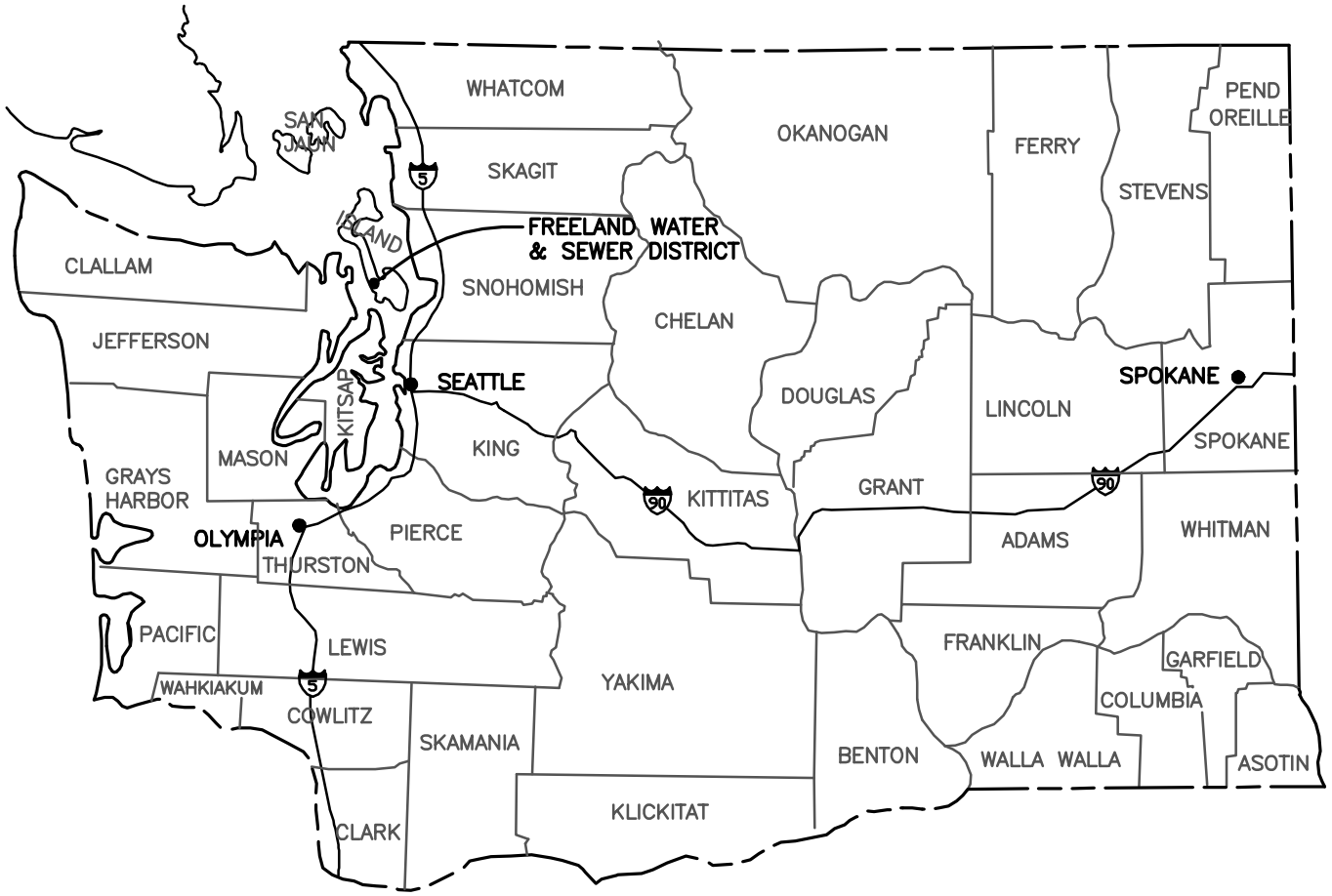
The Harbor Hills system, ID 33860, is also located in Island County and provides water for a population of 925 through 391 service connections, per the 2013 WFI. The system has four wells; only Well 3 operates as a constant source of supply to the system at a rate of 150 gpm and is equipped with a new treatment plant. Well 1 (current capacity 70 gpm) and Well 2 (current capacity 88 gpm) operate as emergency sources, and Well 4 is presently not in service. Well 3 has a treatment plant, two 105,000-gallon reservoirs and a booster pump station (BPS) transfers water out of the reservoirs into the distribution system. Harbor Hills also has three PRVs and approximately 31,000 lineal feet of distribution main. The pump station sets the HGL of the system at 427 feet. Figure 2 shows the water system infrastructure for the Harbor Hills water system.

The intersection for the proposed intertie is at an elevation of 220 feet. The District's Reservoir 1 sets the HGL at 286 feet and is located approximately 2.5 miles from the intersection. The Harbor Hills water system provides pressure via a booster pump from Reservoir 3 at an HGL of 427, located about 0.5 mile from the intersection. Therefore, there is a significant pressure difference between the two systems in the Bercot Road area.

INTERTIE PURPOSE

The physical connection of the intertie is proposed in the northwest corner of the District, near the intersection of Bercot Road and Honeymoon Bay Road. Currently, this area is served by a looped 8-inch-diameter water main. Due to the elevation of this area (220 feet) relative to Reservoir No. 1 (HGL=286), the water system is unable to provide adequate pressure (30 psi) under peak hour demand, per state law. In order to provide adequate pressure to four residential properties near the intersection, the main has been isolated with closed valves on Bercot Road and Honeymoon Bay Road, to create a separate pressure zone, boosted by a small (2-inch) booster station on Bercot Road. This booster station maintains pressure in the isolated 8-inch main at about 55-60 psi, however the main has to be flushed periodically. There are no fire hydrants in the area. In this configuration, with the 8-inch main isolated, adequate fire flow is not available. Also, because the loop is closed, fire flows along the rectangle formed by Honeymoon Bay Road, Bercot Road, and Shoreview Avenue, are slightly reduced. However, the most likely significant limiting factor to fire flows in this area is the single 8-inch main along Shoreview Avenue supplying water to the rectangle.

The December 2011 *Freeland Water System Plan Update*, (WSP) identifies fire flow pressure inadequacies in the northwest and northeast corners of the service area. The proposed Freeland Water & Sewer District intertie with Harbor Hills Water Association would serve three purposes. First, the intertie would provide domestic water to the developed and populated portions of the District in the rare case the District loses its source(s) due to aquifer/well contamination or a significant main break in the southern part of the District (south of and including SR 527). Second, an intertie connection



VICINITY MAP

NOT TO SCALE

FREELAND WATER & SEWER DISTRICT
BERCOT ROAD INTERTIE STUDY
FIGURE 1
VICINITY MAP

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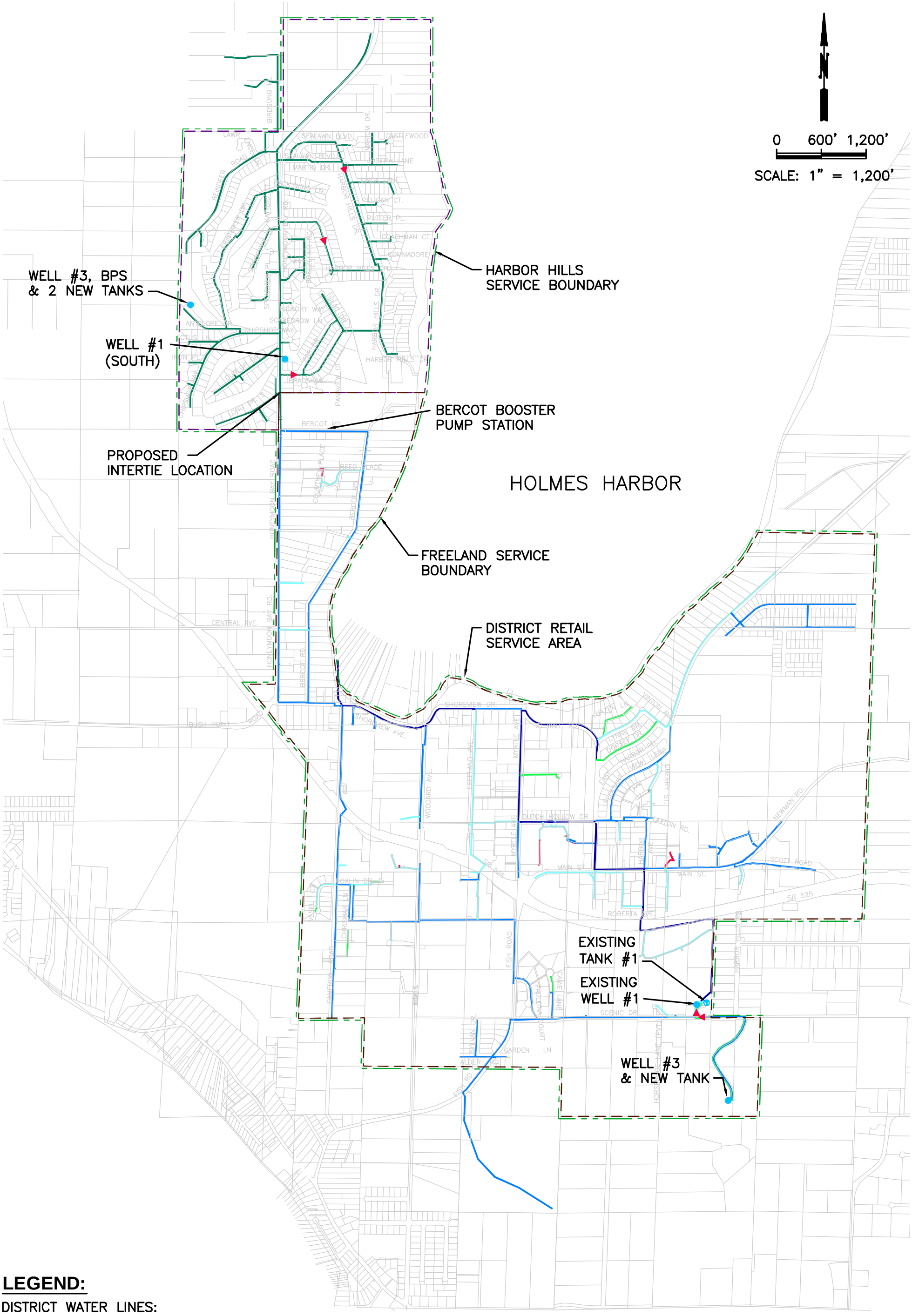
0 600' 1,200'
SCALE: 1" = 1,200'
WELL #3, BPS
& 2 NEW TANKS
WELL #1
(SOUTH)
PROPOSED
INTERTIE LOCATION
HARBOR HILLS
SERVICE BOUNDARY
BERCOT BOOSTER
PUMP STATION
HOLMES HARBOR
FREELAND SERVICE
BOUNDARY
DISTRICT RETAIL
SERVICE AREA
EXISTING
TANK #1
EXISTING
WELL #1
WELL #3
& NEW TANK
SEALAWN BLVD.
MARTIN DR.
HARBOR HILLS DR.
BERCOT RD.
SHOREVIEW DR.
SHOREVIEW AVE.
MAIN ST.
SR 525
SCOTT ROAD
DUTCH HOLLOW DR
NEWMAN RD.
CENTRAL AVE.
BUSH POINT ROAD
FISH ROAD
SCENIC DR.
GARDEN LN
ALDER RD.
LEGEND:
DISTRICT WATER LINES:
1"
2"
4"
6"
8"
10"
HARBOR HILLS WATER LINE
PRV
FREELAND WATER &
SEWER DISTRICT
BERCOT ROAD INTERTIE STUDY
FIGURE 2
WATER SYSTEM INFRASTRUCTURE
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would provide additional fire flow to the District's system. Third, depending on the configuration of the intertie, it would resolve low pressure and fire flow deficiencies in the northwest portion of the District, near the intersection of Bercot Road and Honeymoon Bay Road. Other variables exist in this discussion, including which system supplies water to the customers in the affected area, currently served by the District.

REGULATORY REQUIREMENTS FOR AN INTERTIE

WAC 246-290-132 is very specific regarding items that must be approved by the State Departments of Health (DOH) and Ecology to construct a system intertie. In summary, for a non-emergency intertie, the following is required:

- The intertie must be addressed in an approved coordinated water system plan or an approved water system plan, update, or amendment, including:
    - Location, date, purpose, capacity, service area, and usage;
    - A copy of the intertie agreement;
    - Description of how the intertie improves system reliability, enhances the manageability, provides opportunities for conjunctive use, and delays the need to develop new sources;
    - Identification of potential public health or safety concerns;
    - Discussion of water quality and treatment issues;
    - Demonstration of the source and hydraulic capacity for each system at the design flow rate through the intertie;
    - Water right self-assessment;
    - Identification of alternative sources that will be utilized when the intertie agreement expires;
    - Identification of alternatives to an intertie; and
    - The intertie must be addressed in a construction document per WAC 246-290-120, including:
        - Demonstration of the installation of a source meter; and
        - Water right self-assessment, if not previously provided.

WAC 246-290-132 also specifies what is required for an emergency intertie:

- Emergency interties must be addressed in an approved coordinated water system plan or an approved water system plan, update, or amendment, including:
    - Description of intended use;
    - Location and operational date;
    - Intertie agreement detailing conditions and limitations;
    - Hydraulic analysis for each system; and
- The intertie must be addressed in a project report under WAC 246-290-110 or a construction document per WAC 246-290-120.

Prior to DOH approval of interties, systems must also address the Groundwater Rule and how the intertie will affect each systems coliform monitoring plan.

HYDRAULIC MODELING ANALYSIS

The District's hydraulic model was obtained from Davido Consulting Group as a WaterCAD file. Gray & Osborne converted this file for use in the hydraulic modeling platform, H2ONet. A hydraulic model for Harbor Hills was not available but was created using an AutoCAD base map provided by the District.

HYDRAULIC MODEL ASSUMPTIONS

WAC 246-290-230 requires systems to maintain a minimum pressure of 30 psi under peak hour demand (PHD) conditions with equalizing storage (ES) depleted from reservoirs. This section of the WAC also requires systems to maintain a minimum pressure of 20 psi during fire flows under maximum day demand (MDD) conditions and with ES and fire suppression storage (FSS) depleted from reservoirs.

The hydraulic analysis presented in this report assumes the isolation valves on Honeymoon Bay Road and Bercot Road are open. Assumptions for the hydraulic modeling are listed below in Table 1.

TABLE 1

Hydraulic Modeling Assumptions

Item	District	Harbor Hills
2013 MDD	269,418(1) gpd	234,600(2) gpd
2013 PHD	365(3) gpm	363(4) gpm
Buildout PHD	NA	531(5) gpm
BPS from Reservoirs	NA	130 ft at 210 gpm(6)
Max. Fire Flow	1,000 gpm for 60 mins	500 gpm for 30 mins

(1) Based on 498 gpd/ERU in the District WSP and a total of 541 ERUs (from District). Used for fire flow scenarios, minimum 20 psi required in distribution system.

(2) Based on 600 gpd/ERU in the Harbor Hills WSP and a total of 391 ERUs. Used for fire flow scenarios, minimum 20 psi required in distribution system.

(3) Planning number used in District WSP. Used for peak day scenarios, minimum 30 psi required in distribution system.

(4) Calculated from DOH Water System Design Manual equation 5-1. Used for fire flow scenarios, minimum 20 psi required in distribution system.

(5) From the Project Report for the Harbor Hills BPS and Reservoirs. Equal to 629 ERUs at buildout.

(6) Point taken from 10 hp pump curve. District to verify pump curve and operating rates.

RESERVOIR LEVELS

The District's Reservoir 2 feeds Reservoir 1 constantly through a PRV to maintain an HGL between 286 and 285 feet at all times. Therefore, all ES and FSS are depleted from Reservoir 2 in this analysis. Table 2 lists the calculated reservoir elevation levels in the District.

TABLE 2

District Reservoir Elevation Levels

Reservoir Elevation (ft)	District Reservoir 1	District Reservoir 2
Base Elevation	247.00	325.00
Overflow Elevation	286.15	344.50
Bottom Elevation of OS(1)	285.15	341.50
Bottom Elevation of ES(2)	285.15	337.50
Bottom Elevation of FSS(3)	285.15	331.50

(1) Operational storage is equal to one foot in Reservoir 1 and three feet in Reservoir 2
(2) From Table 26 of the District's WSP, equal to 46,000 gallons. Taken entirely out of Reservoir 2.
(3) From page 41 of the District's WSP, equal to 60,000 gallons. Taken entirely out of Reservoir 2.

Harbor Hills record drawings of the booster pump station show six pumps in parallel that supply the distribution system from the two 105,000-gallon reservoirs, this was replicated in the hydraulic model and maintains the system pressure. Wells 1 and 2 are emergency sources and are not included in the hydraulic model. Well 4 is currently not equipped to deliver flow to the system.

Table 3 lists the calculated reservoir elevation levels in Harbor Hills, assuming one foot of operational storage.

TABLE 3

Harbor Hills Reservoir Elevation Levels

Reservoir Elevation (ft)	Harbor Hills Twin Reservoirs
Base Elevation	240.00
Overflow Elevation	260.00
Bottom Elevation of OS(1)	259.00
Bottom Elevation of ES(2)	254.77
Bottom Elevation of FSS(3)	253.35

(1) Operational storage assumed to be one foot in each reservoir.
(2) From Calculations Appendix, '[d] Reservoir Sizing' of the Harbor Hills WSP, ES equal to 44,713 gallons. Volume taken from each reservoir.
(3) Based on 500 gpm for 30 minutes, FSS equal to 15,000 gallons. Volume taken from each reservoir.

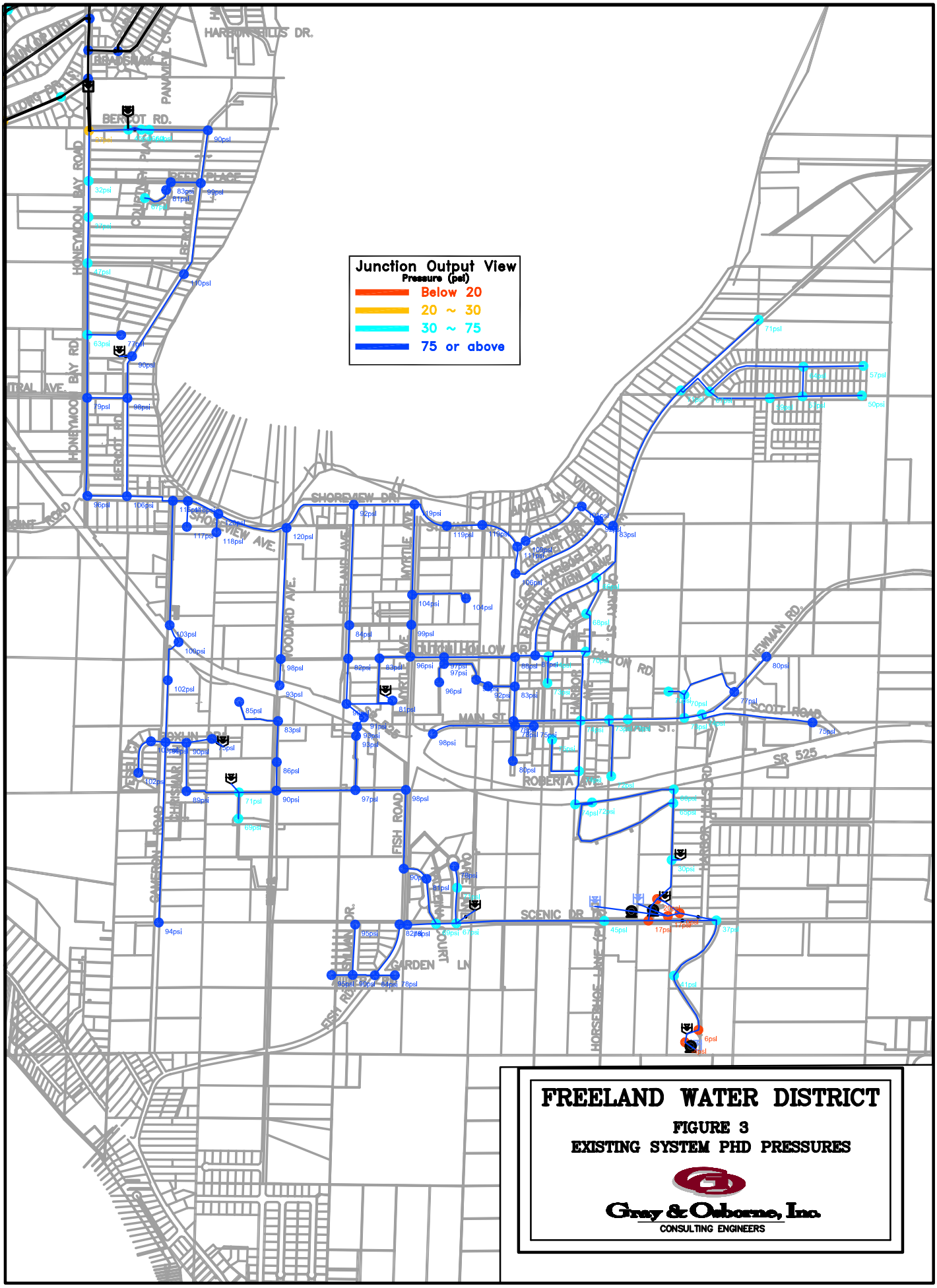
EXISTING SYSTEM HYDRAULIC MODELING RESULTS

Figures 3 and 4 show the District and Harbor Hills existing system pressures under PHD. The District output shows pressure deficiencies at the high elevation along Bercot Road and in the southeast by the well sources. In Harbor Hills all areas exceed the minimum pressure of 30 psi.

Figures 5 and 6 show the District and Harbor Hills fire flow availability under MDD.

The District's existing peak hour demand (PHD) pressure and maximum day demand (MDD) fire flows represented in Figures 3 and 5 indicate 27 psi and 505 gpm, respectively, at the intersection node. The model confirms what has been known regarding pressures in the area for some time.

During fire flow scenarios, the hydraulic model checks all nodes for the maximum flow that can be withdrawn without bringing pressures below 20 psi anywhere in the distribution system. Technically, the system has no available fire flow because areas at the base of the reservoirs and Well 3 are below 20 psi during MDD. However, to run the fire flow scenario, the pressure nodes were taken out of the 'critical node' search range. This means that the model will not consider these low pressure nodes when determining fire flow availability. It is assumed that the critical nodes are on a transmission main at and have no service connections. Figure 5 shows that all locations in the District can get a minimum of 500 gpm for an hour if the isolation valves on Bercot Road and Honeymoon Bay Road are open. Some of the industrial area cannot achieve the required 1,000 gpm for an hour while maintaining 20 psi.



FREELAND WATER DISTRICT

FIGURE 3
EXISTING SYSTEM PHD PRESSURES

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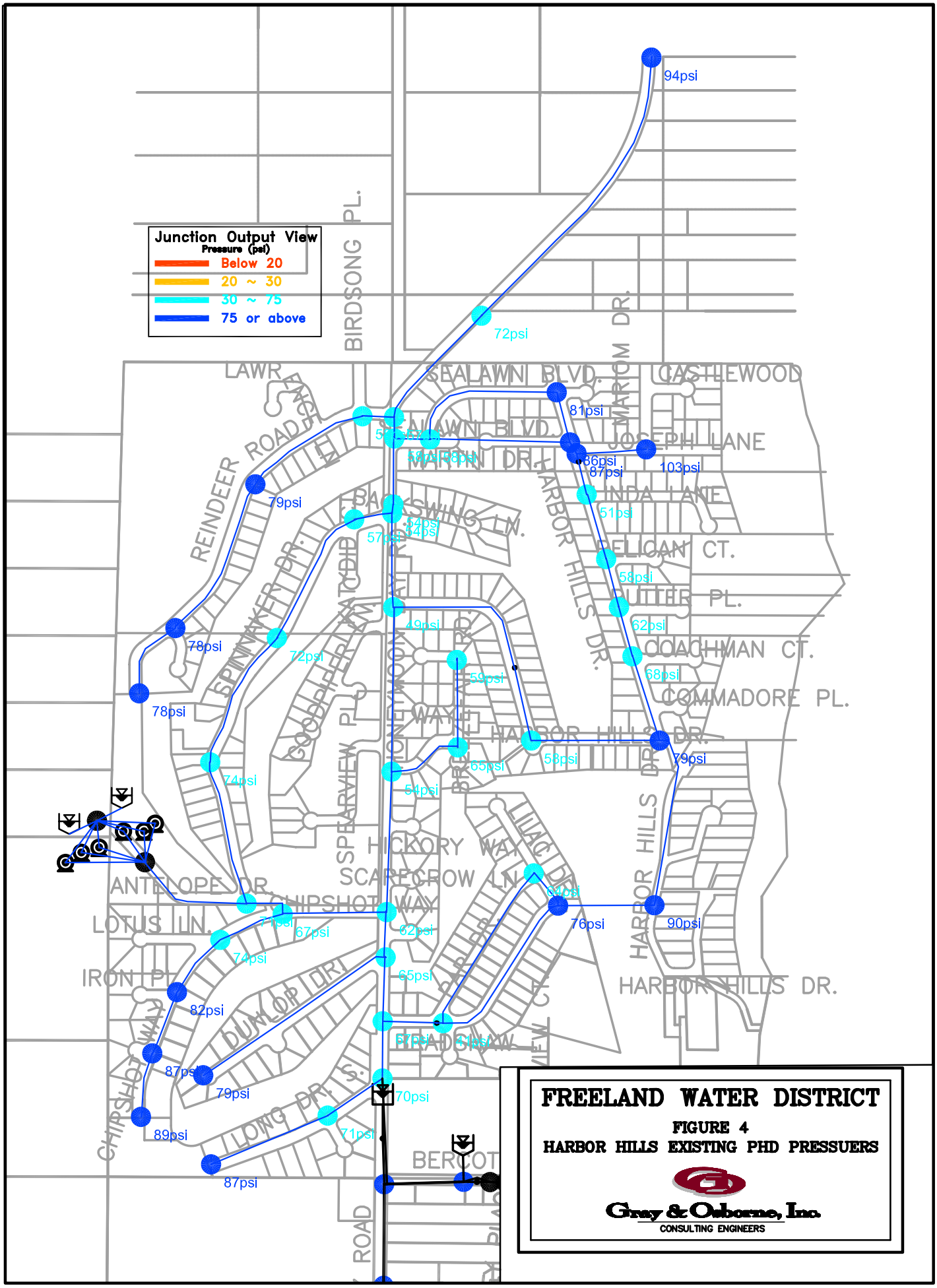

FREELAND WATER DISTRICT

FIGURE 4

HARBOR HILLS EXISTING PHD PRESSUERS

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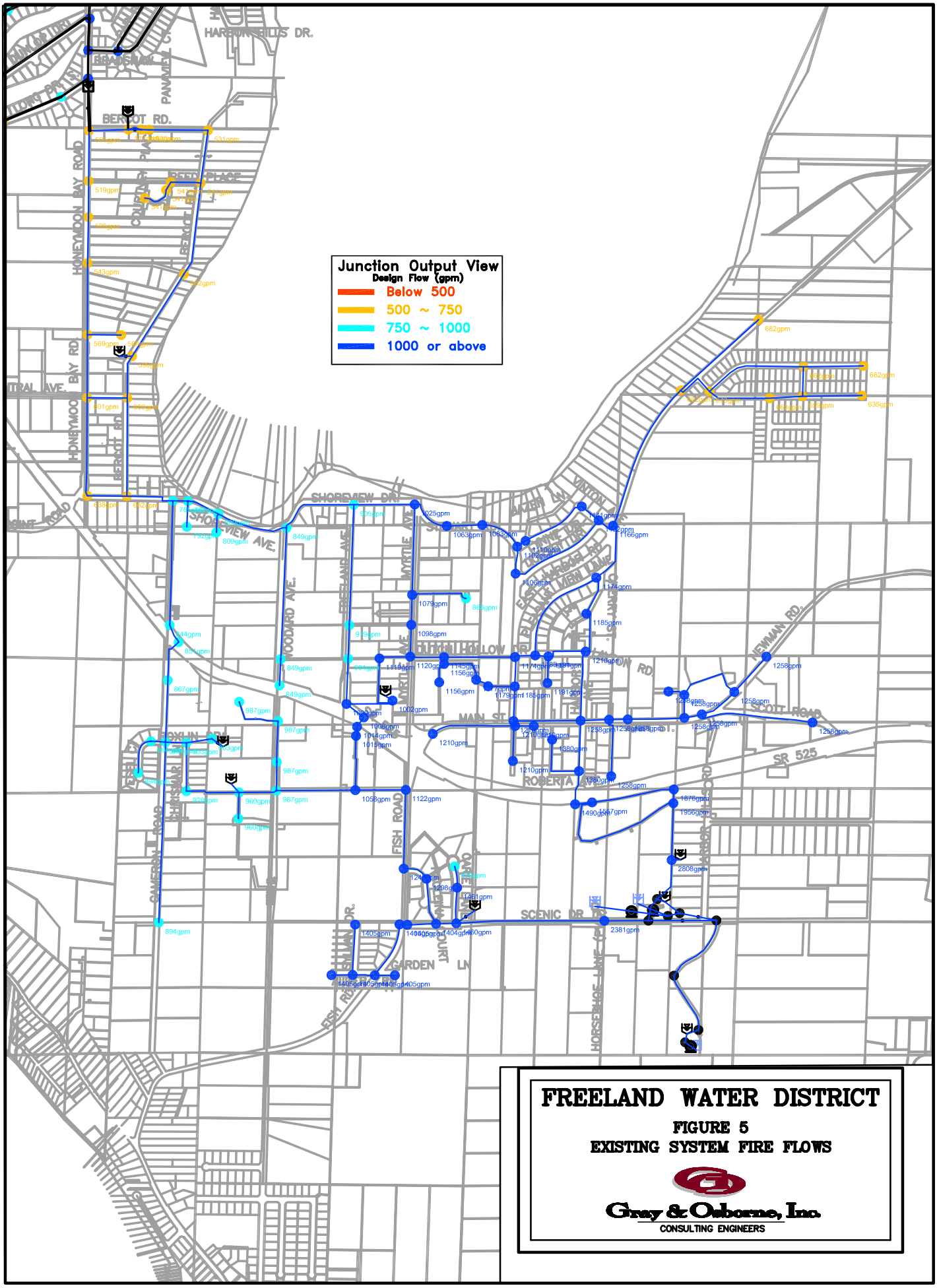

FREELAND WATER DISTRICT

FIGURE 5
EXISTING SYSTEM FIRE FLOWS

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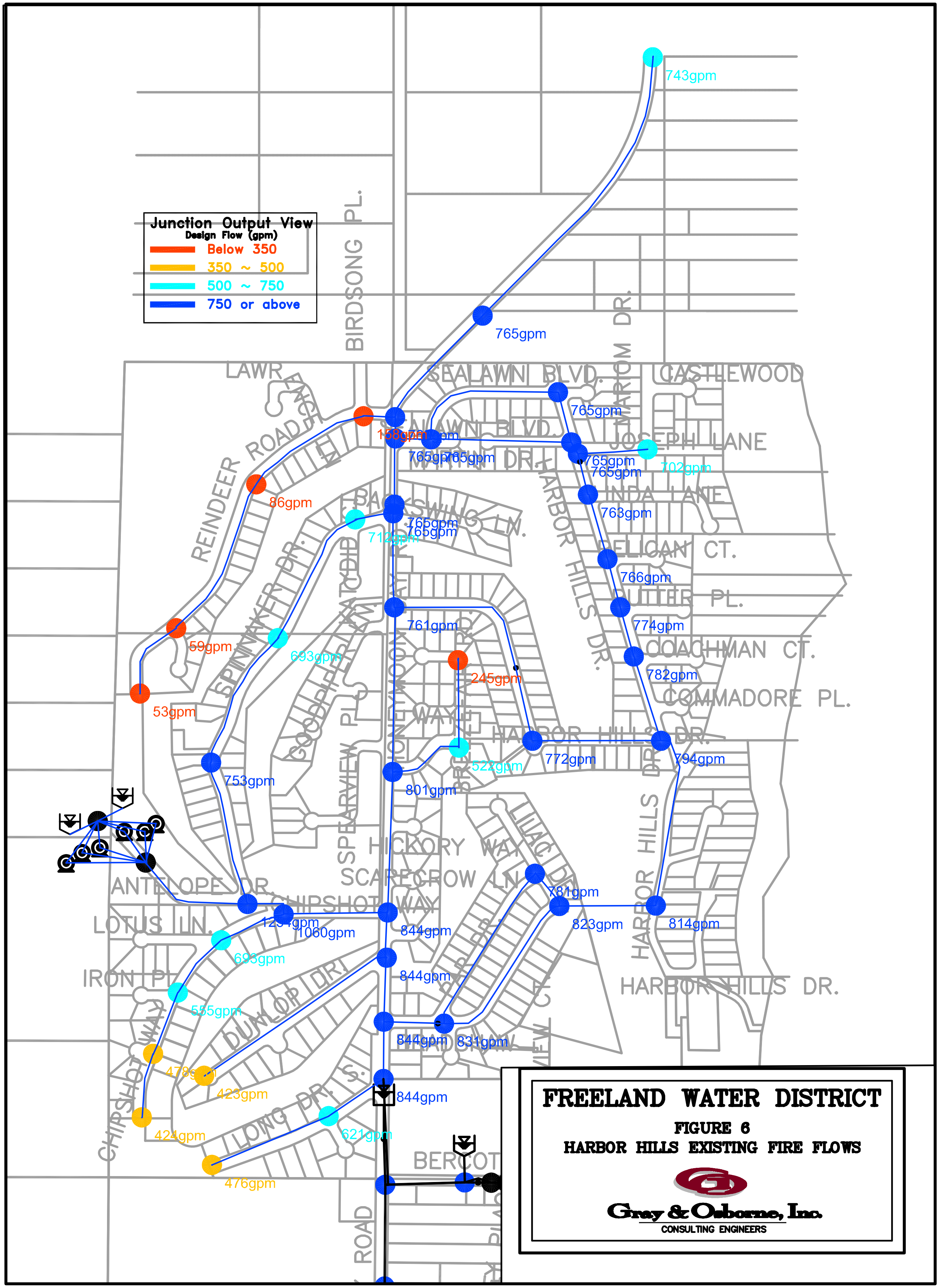

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FIGURE 6
HARBOR HILLS EXISTING FIRE FLOWS

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Figure 6 shows that there are nine locations in Harbor Hills where the minimum fire flow of 500 gpm cannot be met in the Harbor Hills system. This is because these areas are served by dead end 2-inch and 4-inch waterlines.

Summary of Existing Deficiencies:

- The District has pressures below 30 psi at Bercot Road and by the well sources. There are no services by the well.
- The District fire flow is less than 1,000 gpm in required industrial areas.
- Harbor Hills fire flow is less than 500 gpm at dead end 2-inch and 4-inch mains.

INTERTIE HYDRAULIC MODELING RESULTS

The intertie was simulated in the District's hydraulic model as a fixed head reservoir with a flow control valve. When Reservoir 1 continues to serve the system and the intertie is also at an HGL of 285.15 feet, the demands in the system are met by Reservoir 1 at 237 gpm and the intertie at 132 gpm. The hydraulic model verified that high elevation pressures are not improved with the addition of the intertie.

The intertie in Harbor Hills was modeled as a high demand node off of the 8-inch main at the south of the system. The maximum flow that can be supplied to the District through the intertie during PHD, without bringing pressure below 30 psi in Harbor Hills, is 450 gpm for existing conditions.

Buildout PHD was applied to the Harbor Hills hydraulic model to determine the maximum future flow that can be supplied to the District through the intertie. If no additional improvements are made to the system, they can supply 300 gpm to the District at buildout.

Figure 7 shows the available fire flows in the District with both the intertie and Reservoir 1 at an HGL of 285.15 feet. The flow control valve from Harbor Hills was set for a maximum flow rate of 450 gpm, per the above analysis. Fire flows are significantly improved throughout the District with the addition of the intertie.

Figure 8 shows the pressures during PHD with the high elevations in the District served directly from the Harbor Hills system at an HGL of 427 feet. The hydraulic model shows that pressures are improved and a PRV is not required to serve high elevations in the District. This would function as a permanent intertie to serve the three single-family residences which are currently on the Bercot Road BPS. Fire flows would not be provided to the rest of the District through the permanent intertie, and the District would lose its looped system.

Summary:

- An intertie at an HGL of 285 feet does not improve pressures in the District.
- Harbor Hills can currently supply a maximum of 450 gpm to the District.
- At buildout, Harbor Hills can supply a maximum of 300 gpm to the District.
- An emergency intertie with a PRV set at an HGL of 285 feet improves fire flows in the District.
- A permanent intertie at an HGL of 427, improves pressures in the District when served directly from Harbor Hills, and the District loses its looped system, which may affect fire flows.

INTERTIE ALTERNATIVES

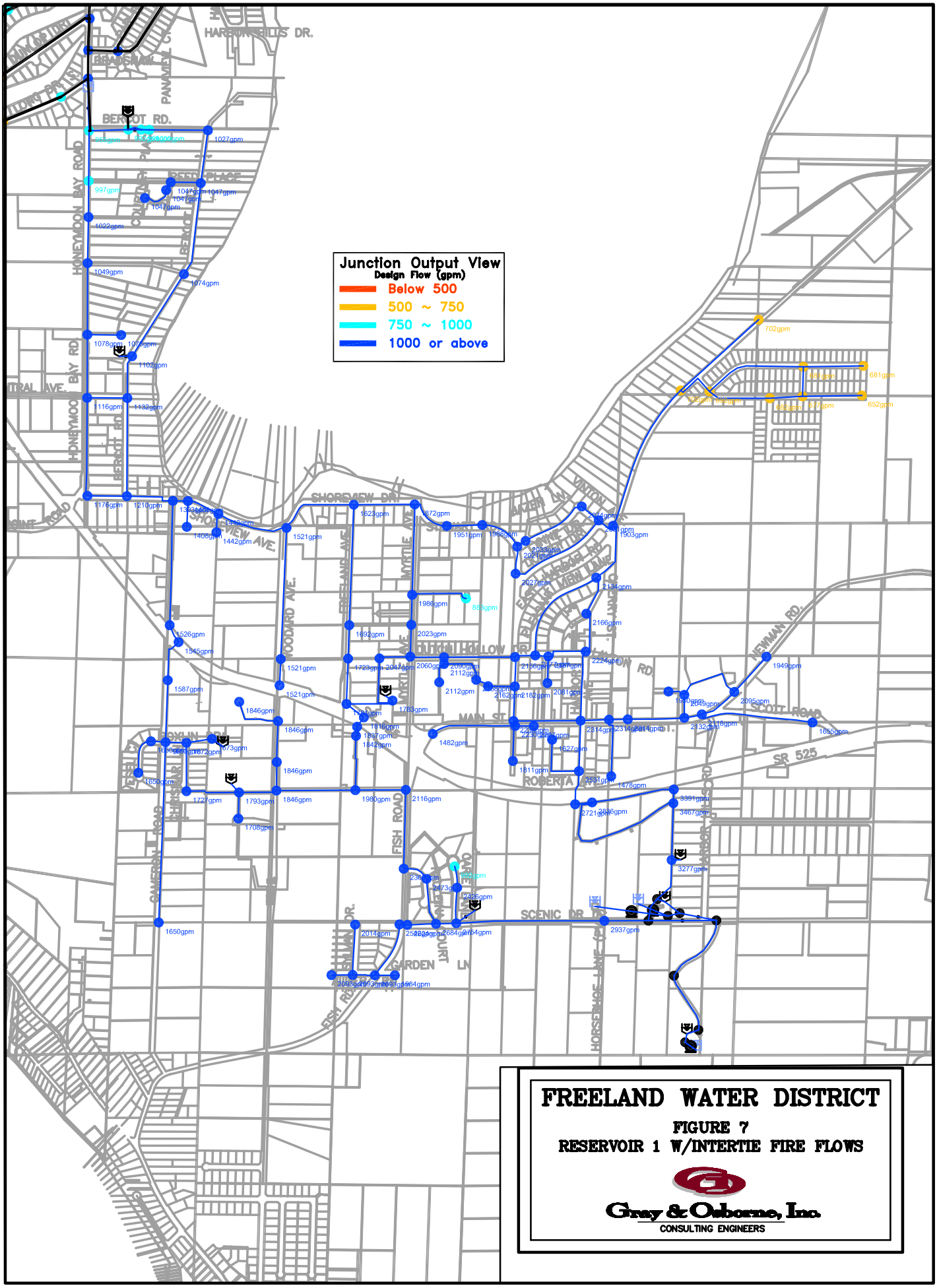
Several alternatives have been discussed for resolving fire flow and pressure problems in the Bercot Road and Honeymoon Bay Road area, and to provide an emergency supply to the District. Non-intertie alternatives were evaluated but are not discussed in detail in this report. These alternatives include constructing a parallel 4-inch line or a larger booster pump station to serve the high elevation areas at a higher pressure zone. The alternatives described below include both permanent and emergency interties between Harbor Hills and the District.

ALTERNATIVE NO. 1 – INTERTIE AT HGL 280 FEET

An intertie with Harbor Hills could be made with a large PRV, set at an HGL of 280, very nearly the same as the current system grade. Both isolation valves would be opened, allowing circulation in the looped 8-inch main. This would be a true emergency intertie, that would only open when a system pressure loss was detected, such as during a high fire flow demand in Freeland. Water would be metered through the PRV until system pressure returned to normal, presumably after the fire demand subsided. However, this alternative would not provide any pressure boost to the area, and therefore, would not address the pressure deficiency. Also, the customers in the area would still be served by the District. Cost for the emergency intertie only is estimated at $153,000. Figure 9 shows Alternative 1 components.

ALTERNATIVE NO. 2 – INTERTIE WITH NEW 315 PRESSURE ZONE

Alternative No. 2 would include a permanent intertie with Harbor Hills using a combination large and small PRV station near the intersection. The isolation valve on Bercot Road would remain closed, and an additional PRV would be needed on Honeymoon Bay Road, to allow Harbor Hills water to be used in case of an emergency, such as high fire flow demand. The small PRV (2-inch) would be set at an HGL of 315 feet, thereby allowing water into the new zone for domestic use at adequate pressure. The large PRV would be set at an HGL of 310 feet to allow higher flows (than the 2-inch



FREELAND WATER DISTRICT

FIGURE 7
RESERVOIR 1 W/INTERTIE FIRE FLOWS

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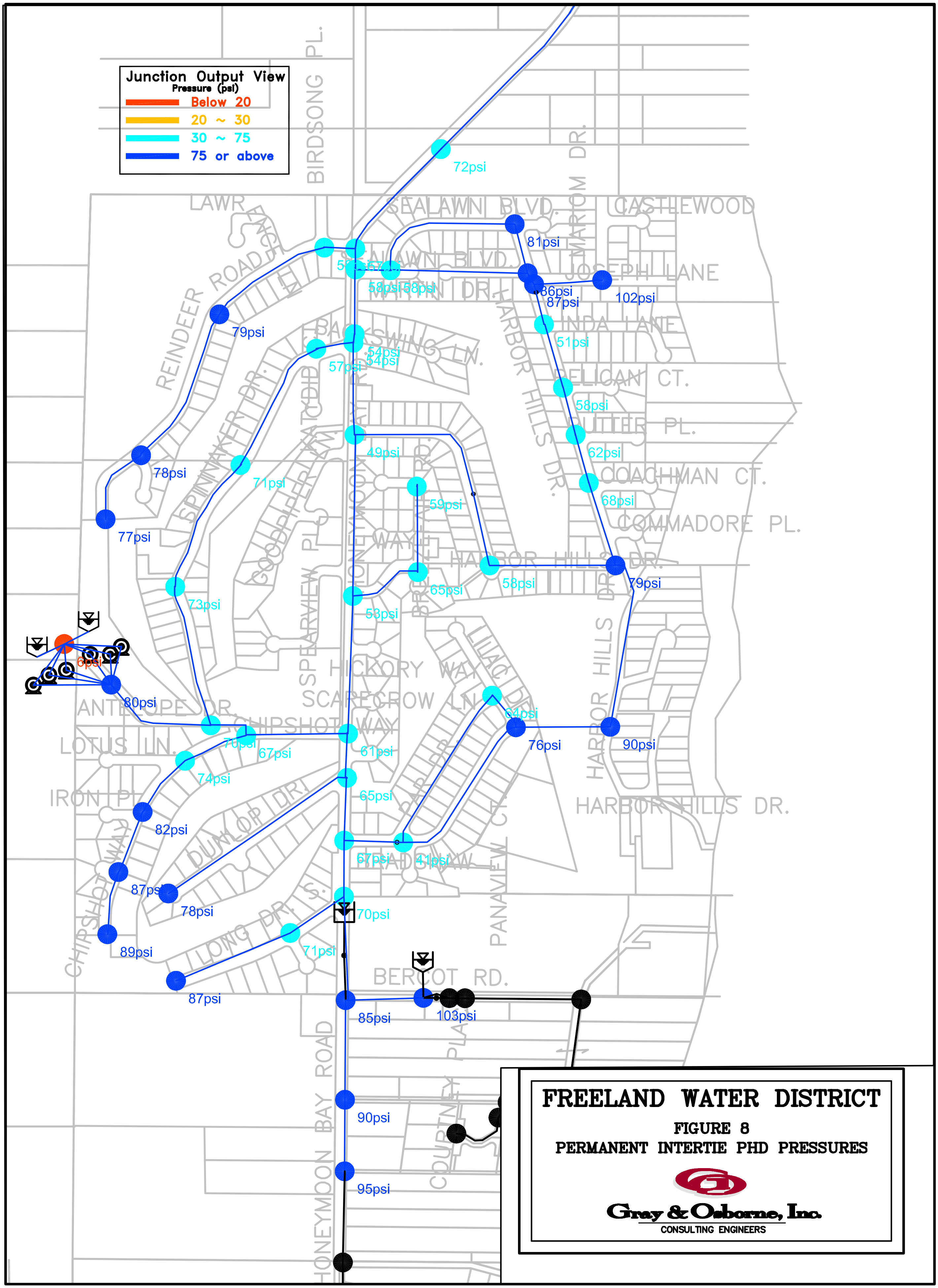

Junction Output View
Pressure (psi)
Below 20
20 ~ 30
30 ~ 75
75 or above
BIRDSONG PL.
MARIOM DR.
SEALAWN BLVD.
CASTLEWOOD
LAWR
REINDEER ROAD
JOSEPH LANE
MARTIN DR.
HARBOR HILLS DR.
LINDA LANE
PELICAN CT.
JUPITER PL.
COACHMAN CT.
COMMADORE PL.
SPINNAKER DR.
GOODPIPER
SPEARVIEW PL.
HONEYMOON BAY RD.
HICKORY WAY
SCARECROW LN.
ANTELOPE DR.
CHIPSHOT WAY
LOTUS LN.
IRON PL.
DUNLOP DR.
LONG DR.
LILAC DR.
PANAVIEW CT.
HARBOR HILLS DR.
BERCOT RD.
HONEYMOON BAY ROAD
COURTNEY PL.
72psi
81psi
86psi
87psi
102psi
79psi
58psi
58psi
51psi
54psi
54psi
57psi
58psi
62psi
78psi
49psi
71psi
68psi
59psi
77psi
79psi
58psi
65psi
73psi
53psi
80psi
64psi
76psi
90psi
61psi
67psi
74psi
65psi
82psi
67psi
41psi
87psi
78psi
70psi
89psi
71psi
87psi
85psi
103psi
90psi
95psi

FREELAND WATER DISTRICT

FIGURE 8

PERMANENT INTERTIE PHD PRESSURES

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could provide) into the 8-inch main during significant pressure drops. The PRV on Honeymoon Bay Road would be set at an HGL of 280 feet to allow the new pressure zone to supply fire flow during high demand situations. Advantages of this alternative include a permanent new supply, higher fire flows in Freeland and the new pressure zone area, and increased pressures. Disadvantages include higher capital costs, multiple PRVs to maintain, loss of the 8-inch loop on Bercot Road, and Freeland customers would be served by Harbor Hills. Cost is estimated at $221,000. Figure 10 shows Alternative 2 components.

ALTERNATIVE NO. 3 – PERMANENT AND EMERGENCY INTERTIE

This alternative includes connecting Harbor Hills to the District with a new 8-inch main to the intersection at Bercot Road and Honeymoon Bay Road. An 8-inch check valve and bypass meter would be installed on the new 8-inch line. The four homes in the high elevation area would be served via individual PRVs. The valve on Honeymoon Bay Road would be closed, isolating the new 427 pressure zone. The existing booster pump on Bercot Road would be removed and 4-inch and 2-inch PRVs would be installed in the existing vault. This PRV station would provide domestic supply or fire flows to the District in case of emergencies. Fire flows would be provided to the new pressure zone from Harbor Hills via two new fire hydrants installed on the existing 8-inch waterline. This alternative would improve system pressures and fire flow availability in the high elevation area. Additionally, this alternative will provide an emergency source to the rest of the District's water system. Cost is estimated at $189,000. Figure 11 shows Alternative 3 components.

Alternative 3 is the preferred intertie alternative due to the low cost and the ability to improve emergency fire flows and existing pressure deficiencies in the District.

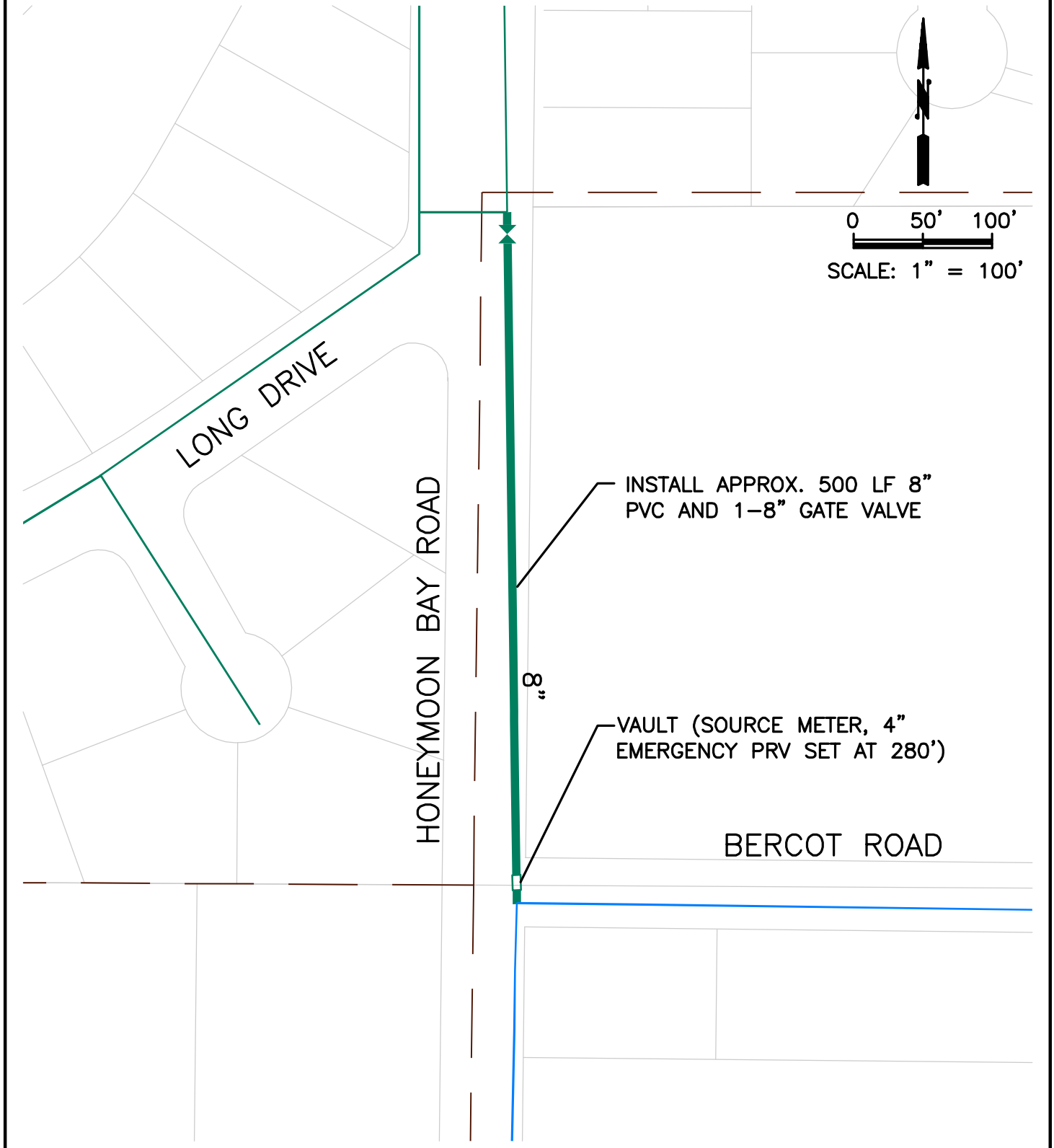
Table 4 lists the various intertie alternatives and their associated costs.

TABLE 4

Intertie Alternatives

Alternative	Pressure Increase	Fire Flow Increase	Intertie	Water Supply	8-Inch Valves Open	Cost
1	N	Y	E	District	Y	$153,000
2	Y	Y	E, P	Harbor Hills	N	$221,000
3	Y	Y	E, P	Harbor Hills	N	$189,000
Existing	Y	N	N	District	N	$0

E = Emergency Intertie; P = Permanent Intertie



LEGEND:

DISTRICT WATER LINES:

- 1"
- 2"
- 4"
- 6"
- 8"
- 10"
- HARBOR HILLS WATER LINE

FREELAND WATER & SEWER DISTRICT
BERCOT ROAD INTERTIE STUDY
FIGURE 9
ALTERNATIVE 1

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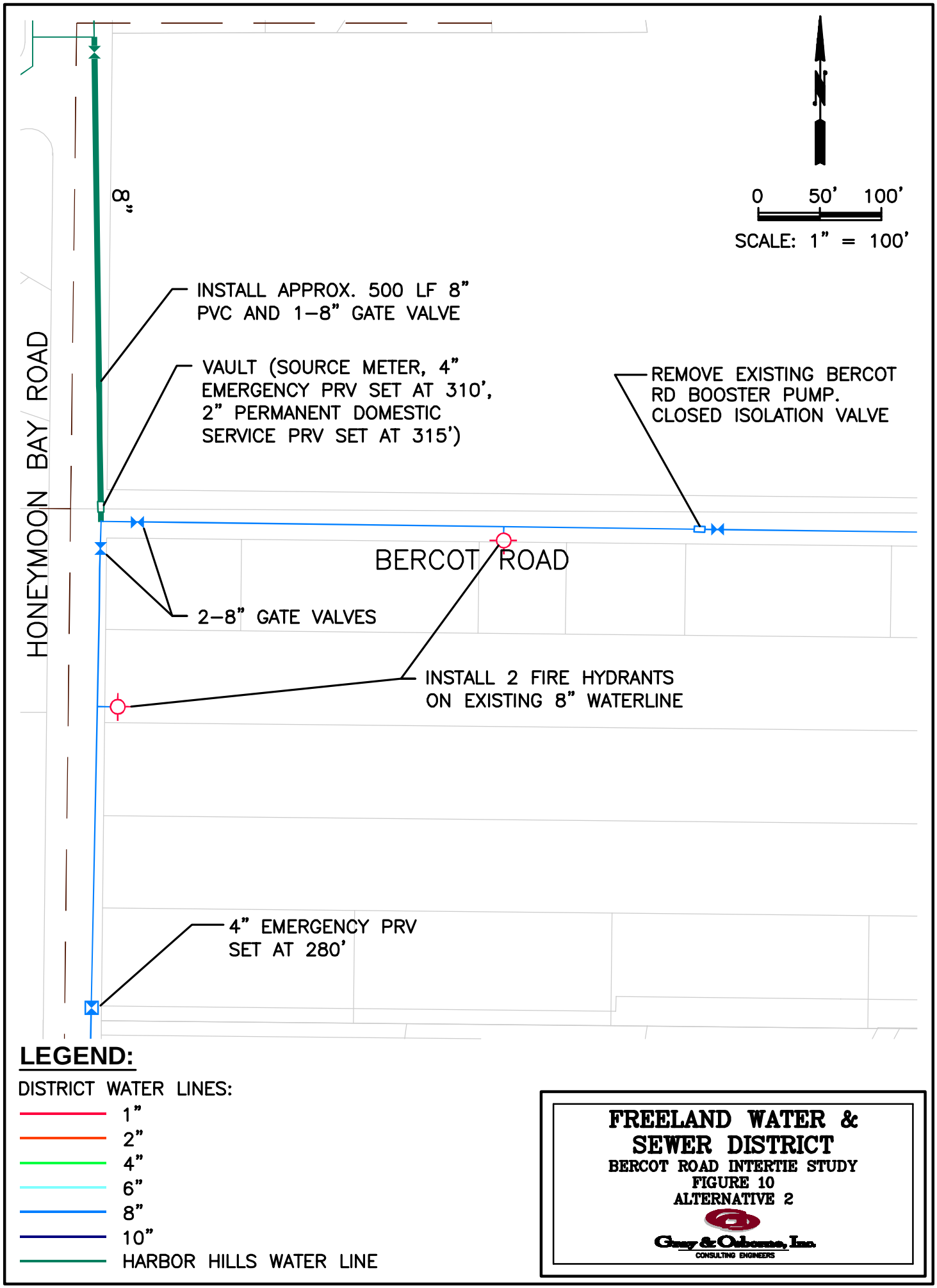
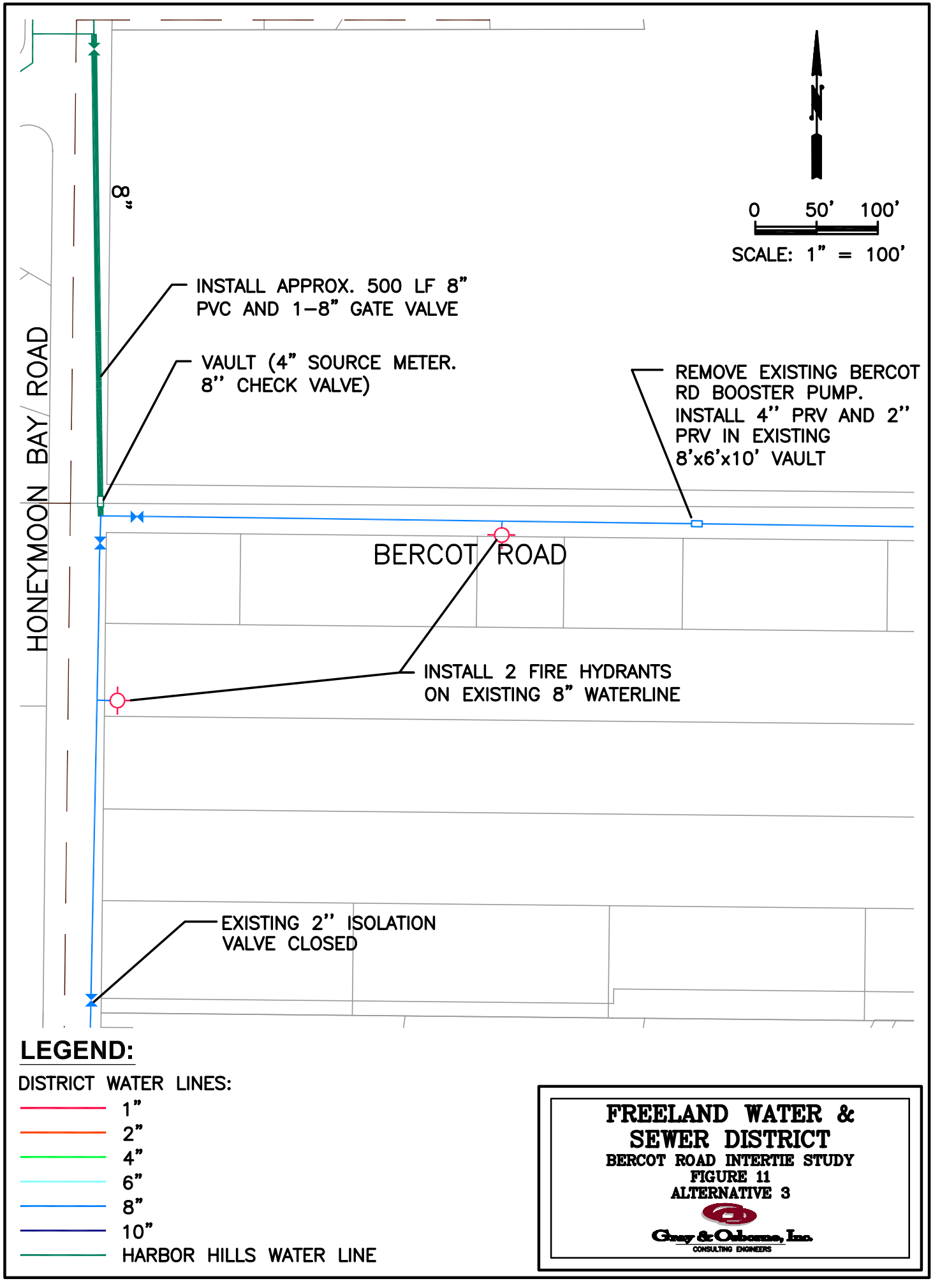

N
0 50' 100'
SCALE: 1" = 100'
8"
INSTALL APPROX. 500 LF 8" PVC AND 1-8" GATE VALVE
VAULT (SOURCE METER, 4" EMERGENCY PRV SET AT 310', 2" PERMANENT DOMESTIC SERVICE PRV SET AT 315')
REMOVE EXISTING BERCOT RD BOOSTER PUMP. CLOSED ISOLATION VALVE
HONEYMOON BAY ROAD
BERCOT ROAD
2-8" GATE VALVES
INSTALL 2 FIRE HYDRANTS ON EXISTING 8" WATERLINE
4" EMERGENCY PRV SET AT 280'
LEGEND:
DISTRICT WATER LINES:
1"
2"
4"
6"
8"
10"
HARBOR HILLS WATER LINE
FREELAND WATER & SEWER DISTRICT
BERCOT ROAD INTERTIE STUDY
FIGURE 10
ALTERNATIVE 2
Gray & Osborne, Inc.
CONSULTING ENGINEERS



LEGEND:

DISTRICT WATER LINES:

- 1"
- 2"
- 4"
- 6"
- 8"
- 10"
- HARBOR HILLS WATER LINE

FREELAND WATER & SEWER DISTRICT
BERCOT ROAD INTERTIE STUDY
FIGURE 11
ALTERNATIVE 3

Gray & Osborne, Inc.
CONSULTING ENGINEERS

WATER RIGHTS AND SOURCE ANALYSIS

The District has instantaneous water rights for 635 gpm and annual rights for 510 acre-ft per year for all of its wells combined. Well 1 has a capacity of 150 gpm, Well 2 has a capacity of 189 gpm, and Well 3 has a capacity of 122.5 gpm, for a total pumping capacity of 461.5 gpm. The maximum annual withdrawal from the wells is 120 acre-ft per year. Therefore, the District has excess water rights. See Appendix A for the completed DOH water rights analysis form.

The Harbor Hills 2003 Water System Plan states that they have water rights for 398 gpm and annual rights for 345.5 acre-ft per year for all its wells combined. Well 1 has a pumping capacity of 70 gpm, Well 2 has a capacity of 88 gpm, and Well 3 has a pumping capacity of 150 gpm, for a total pumping capacity of 308 gpm. However, Harbor Hills has not used Well 1 or Well 2 for several years and rely solely on Well 3 to fill their Reservoirs and meet demands. Therefore, Harbor Hills has an excess of instantaneous water rights. The annual volume pumped from the Harbor Hills wells is unknown. More information is needed to complete the water rights analysis form. See Appendix B for the DOH water rights analysis form for Harbor Hills.

The maximum day demand for Harbor Hills is 234,600 gpd which is equivalent to 163 gpm. The peak hour demand for Harbor Hill is 363 gpm and the fire flow demand is 500 gpm. The maximum volume of water that Harbor Hills is capable of supplying to the District is equal to the pumping capacity in to the Harbor Hills distribution system, less the fire flow demand of 500 gpm. At this time, it is assumed the booster pump station has an ultimate capacity of 1,200 gpm. Although Wells 1 and 2 are equipped, they are emergency sources and will therefore not be included in this source analysis. These assumptions yield a maximum flow to the Harbor Hills distribution system of 1,200 gpm. With 500 gpm being reserved for Harbor Hills peak hour demands (and fire flow), there is approximately 700 gpm available to the District through the intertie. However, as shown in the hydraulic analysis, flows above 450 gpm through the intertie, yield pressures below 30 psi in Harbor Hills. Therefore, the distribution system is the limiting factor governing the maximum flow through the intertie.

SUMMARY OF ANALYSIS

It is not apparent that Harbor Hills or the District are limited in their water rights or pumping capacity. Harbor Hills is limited in the volume available to the District through the intertie by their distribution system. The hydraulic analysis shows that pressures are not improved through the emergency intertie. Fire flows are improved significantly in the District through the emergency intertie at 285 feet.

The hydraulic analysis indicates that pressures will be maintained and fire flows will be improved through an emergency intertie. A permanent intertie will improve system pressures and serve only the high elevations in the northwest portion of the District. The

hydraulic analysis indicates that Harbor Hills can provide flows up to 450 gpm to the District.

INTERTIE AGREEMENT

Although both the Harbor Hills water system and the District water system are both owned and operated by the District, each system has separate utility billings, customers, and debts. It is for this reason that the District must pay Harbor Hills for the volume of water purchased through the intertie at a wholesale rate. Since both systems are owned by the District, no other legal issues are anticipated with the intertie.

The following language should be considered as part of the intertie agreement between Harbor Hills and the District:

> *The purpose of this Agreement is to provide for an intertie between water distribution systems of each Party to allow the District access to Harbor Hills water supply in the event of an emergency and for permanent domestic service for four residences.*
>
> *Harbor Hills agrees to allow the District an emergency standby source of water through an intertie connection between Harbor Hills and District water systems at the location as described and depicted on Exhibit A attached. An emergency shall be considered any event including, but not limited to power outages, a pump system failure, or failure in the ability of the District to maintain its water system capacity for fire protection purposes or public consumption. An emergency shall terminate at such time as the capacity of the District water system is restored to its pre-emergency status.*
>
> *The District shall pay Harbor Hills for all domestic water delivered through the intertie at the Harbor Hills current single family consumption rate. Water shall be measured based on service meter readings for the four District customers supplied by Harbor Hills. Harbor Hills shall bill the District on a bi-monthly basis for the amount of water delivered to the District through the intertie, and the District shall pay Harbor Hills within thirty (30) days of the date of billing. Any Harbor Hills billings not paid by the District within the thirty day period shall accrue interest at the rate of 12 percent per annum until paid.*
>
> *All water purchased by and delivered to the District hereunder shall only be resold by the District to its customers within the District's water service boundary for use therein.*

PRELIMINARY COST ESTIMATES

The preliminary cost estimate for preferred Alternative 3 is $189,000. This includes connection via an 8-inch waterline, check valve, 4-inch PRV, 2-inch PRV, two fire hydrants and four connections to residences with individual PRVs. The cost includes all components described in the "Intertie Description," restoration, traffic control, tax, 30 percent contingency, and 30 percent engineering and administration. Land acquisition is not included in the cost. It is assumed that the PRV station will be constructed within the right-of-way. Preliminary Cost Estimates are shown in Appendix C.

APPENDIX A

FREELAND WATER RIGHTS SELF ASSESSMENT

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 1

WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – EXISTING STATUS

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		EXISTING CONSUMPTION		CURRENT WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. Certificate #5825	Freeland Water District	Sept 20, 1965	S01, S02, S04	Primary	250 gpm	168 acre-ft				
2. Permit G1-27463	Freeland Water & Sewer District	May 4, 1994	Well	Primary	100 gpm	80 acre-ft				
3. Combined	Freeland Water & Sewer District	-	Well Field	Primary	350 gpm	248 acre-ft	350 gpm	120 acre-ft	0 gpm	128 acre-ft
4. Permit G1-28039	Freeland Water & Sewer District	June 10, 1999	Well 1, 2, 3, 4	Primary	285 gpm	262 acre-ft				
Claims 1.										
TOTAL	**********	********	********	**********	635 gpm	510 acre-ft	350 gpm	120 acre-ft	285 gpm	390 acre-ft

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		EXISTING CONSUMPTION THROUGH INTERTIE		CURRENT INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
2.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1.					

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☐ Eastern Drinking Water
Department of Health
16201 E Indiana Ave, Suite 1500
Spokane Valley, WA 99216
Phone: (509) 329-2100
Fax: (509) 329-2104

APPENDIX B

HARBOR HILLS WATER RIGHTS SELF ASSESSMENT

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 1

WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – EXISTING STATUS

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		EXISTING CONSUMPTION		CURRENT WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. GWP-8956	Harbor Hills Water Company, LLC	August 1, 1968	Wells (#1, #2, #3, #4)	Primary	100 gpm	80 acre-ft				
2. GWP-8957	Harbor Hills Water Company, LLC	August 1, 1968	Wells (#1, #2, #3, #4)	Yes, Irrigation of 30 acres supplemental to reclaimed 4/15 to 10/15	100 gpm	80 acre-ft				
3. G1-24595P	Harbor Hills Water Company, LLC	January 4, 1985	Wells	Primary	45 gpm	5.3 acre-ft				
4. G1-26424P	Harbor Hills Water Company, LLC	December 11, 1991	One well (Well #3)	Primary	153 gpm	180.2 acre-ft				
5. Permit G1-27219P	Harbor Hills Water Company, LLC	June 29, 1993	One well (Well #2)	This and GWP-8956 not to exceed 100 gpm	100 gpm	33 acre-ft				
							150 gpm	acre-ft	gpm	acre-ft
Claims 1.										
TOTAL	**********	********	********	**********	398 gpm	345.5 acre-ft	gpm	acre-ft	gpm	acre-ft

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		EXISTING CONSUMPTION THROUGH INTERTIE		CURRENT INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
2.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1.					

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Spokane Valley, WA 99216
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Fax: (509) 329-2104

APPENDIX C

COST ESTIMATES

Freeland Water & Sewer District
Alternative 1 Cost Estimate
Bercot Road Intertie

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 8,000	$ 8,000
2	8-inch DI Water Pipe, Including Fittings	500 LF	$ 65	$ 32,500
3	Locate Existing Utilities	LUMP SUM	$ 1,000	$ 1,000
4	Erosion Control	LUMP SUM	$ 1,000	$ 1,000
5	Additional Pipe Fittings	230 LB	$ 3.50	$ 805
6	Trench Safety Systems	LUMP SUM	$ 1,000	$ 1,000
7	3-inch Gate Valves	2 EA	$ 500	$ 1,000
8	6-inch PRV Station	LUMP SUM	$ 20,000	$ 20,000
9	Gravel Backfill	240 CY	$ 15	$ 3,600
10	Foundation Gravel	30 TN	$ 20	$ 600
11	Asphalt Concrete Class B	170 SQ YD	$ 45	$ 7,650
12	Sawcutting	1,000 LF	$ 2	$ 2,000
13	Crushed Surfacing, Top Course	30 TN	$ 15	$ 450
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	20 HRS	$ 35	$ 700
	Subtotal			$ 83,305
	Tax rate (8.7%)			7,248
	Subtotal:			$ 90,553
	Contingency (30%)			$ 27,447
	Total Estimated Construction Cost:			**$ 118,000**
	Engineering and Administrative Costs (30%):			$ 35,000
	Total Estimated Project Cost:			**$ 153,000**

Freeland Water & Sewer District
Alternative 2 Cost Estimate
Bercot Road Intertie

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 11,000	$ 11,000
2	8-inch DI Water Pipe, Including Fittings	500 LF	$ 65	$ 32,500
3	Locate Existing Utilities	LUMP SUM	$ 2,000	$ 2,000
4	Erosion Control	LUMP SUM	$ 2,000	$ 2,000
5	Additional Pipe Fittings	230 LB	$ 3.50	$ 805
6	Trench Safety Systems	LUMP SUM	$ 1,000	$ 1,000
7	8-inch Gate Valves	2 EA	$ 500	$ 1,000
8	4-in & 2-in PRV Station	LUMP SUM	$ 30,000	$ 30,000
9	4-inch PRV Station	LUMP SUM	$ 20,000	$ 20,000
10	Fire Hydrant	2 EA	$ 1,000	$ 2,000
11	Gravel Backfill	240 CY	$ 15	$ 3,600
12	Foundation Gravel	30 TN	$ 20	$ 600
13	Asphalt Concrete Class B	170 SQ YD	$ 45	$ 7,650
14	Sawcutting	1,000 LF	$ 2	$ 2,000
15	Crushed Surfacing, Top Course	30 TN	$ 15	$ 450
16	Connections to Existing System	2 EA	$ 1,500	$ 3,000
17	Traffic Control	20 HRS	$ 35	$ 700
	Subtotal			$ 120,305
	Tax rate (8.7%)			10,467
	Subtotal:			$ 130,772
	Contingency (30%)			$ 39,228
	Total Estimated Construction Cost:			**$ 170,000**
	Engineering and Administrative Costs (30%):			$ 51,000
	Total Estimated Project Cost:			**$ 221,000**

Freeland Water & Sewer District
Alternative 3 Cost Estimate
Bercot Road Intertie

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 9,000	$ 9,000
2	8-inch DI Water Pipe, Including Fittings	500 LF	$ 65	$ 32,500
3	Locate Existing Utilities	LUMP SUM	$ 2,000	$ 2,000
4	Erosion Control	LUMP SUM	$ 2,000	$ 2,000
5	Additional Pipe Fittings	230 LB	$ 3.50	$ 805
6	Trench Safety Systems	LUMP SUM	$ 1,000	$ 1,000
7	Check Valve & Source Meter	LUMP SUM	$ 5,000	$ 5,000
8	4-in & 2-in PRV Station	LUMP SUM	$ 30,000	$ 30,000
9	Fire Hydrants	2 EA	$ 1,000	$ 2,000
10	Gravel Backfill	240 CY	$ 15	$ 3,600
11	Foundation Gravel	30 TN	$ 20	$ 600
12	Asphalt Concrete Class B	170 SQ YD	$ 45	$ 7,650
13	Sawcutting	1,000 LF	$ 2	$ 2,000
14	Crushed Surfacing, Top Course	30 TN	$ 15	$ 450
15	Connections to Existing System	2 EA	$ 1,500	$ 3,000
16	Traffic Control	20 HRS	$ 35	$ 700
	Subtotal			$ 102,305
	Tax rate (8.7%)			8,901
	Subtotal:			$ 111,206
	Contingency (30%)			$ 33,794
	Total Estimated Construction Cost:			**$ 145,000**
	Engineering and Administrative Costs (30%):			$ 44,000
	Total Estimated Project Cost:			**$ 189,000**