Approved by SBWA Board on 11/12/2022

Wellhead Protection Plan
Sunlight Beach Water Association

1.0 Executive Summary

A wellhead protection plan (WPP) is required in the Small Water Systems Management Program (SWSMP) for all Group A water systems in Washington State by the Department of Health (DOH). The WPP must address current and future vulnerabilities to protect the wellhead in order to continue to provide safe and reliable drinking water to members. A Ground Water Contamination Susceptibility Assessment Survey Form is also required by the State and is given in the SBWA Vulnerability and Improvement Plan as part of the SWSMP.

The SBWA WPP is a good-faith effort to document information from an eight-month review of authoritative sources comprising over 100 hours including discussions with a local, experienced hydrogeologist. An independent, professional assessment of contamination risks will be independently performed by an experienced hydrogeologist as part of the Office of Drinking Water (ODW) State Revolving Fund Consolidation Feasibility Study Grant awarded in July of 2022 to neighboring SunVista/Sunlight Beach HOA (SV-SLB HOA) water system in partnership with SBWA. This 2-year, $50,000 study grant will assess the contamination risks and aging infrastructure requirements as well as the capital and operating costs for several options to address these areas for each water system operating separately and for operating as a consolidated water system.

1.1 Need for Near-Term Action

The SBWA annual operating permit is BLUE rather than GREEN. A BLUE permit means that the well site does not meet the 100-foot radius for a sanitary area around the wellhead (due to the proximity to Sunlight Beach Road). A BLUE permit also requires a plan to obtain a GREEN permit. The SBWA WPP provides the initial basis for this plan that will be revised after the study grant results are available.

The SBWA well is currently located at the bottom of a hill at a low sea level elevation near Useless Bay (~0.1 mile) and near a marsh (~100 feet). The single SBWA well is at risk from contaminants that threaten the delivery of potable water. Nearer-term contaminants include nitrates and microbials from septic systems planned for development immediately upgrade of the well and sea water intrusion.

The Board needs to pursue and evaluate a near-term opportunity to acquire property and/or easements at a higher elevation, upgrade of the planned development that essentially eliminates the near-term contamination risks and provides sufficient space to accommodate future treatment facilities that may be required as new regulations continue to emerge.

1.2 Treatment Options

Avoiding contamination from microbials, nitrates, and sea water is a more economical and feasible approach for SBWA. Treatment options require more space than is available at the current SWBA well site, are costly to install, maintain, monitor, and control, and often have burdensome waste disposal

requirements. Some summary comments are given below, but treatment options are not discussed further in the SBWA WPP. Several references are cited for additional information.

Microbial contamination requires treatment with chlorine with installation, maintenance, monitoring, and control costs as well as required space for equipment. Also, chlorine treatment is currently not acceptable to many SBWA members.

DOH Guidance Document #331-309 (revised March, 2018) discussed several treatment options for nitrate contamination for small water systems. Treatment systems for nitrates (such as ion exchange, reverse osmosis, and electrodialysis/electrodialysis reversal) appear unsuitable for SBWA due to requirements for space, costly installation, costly maintenance and control systems, as well as significant waste disposal requirements for some treatment options.

Sea water contamination is very difficult to treat especially from flooding and requires expensive cleaning after a flooding event. Continuous treatment options, such as distillation, apparently cannot produce sufficient throughput to meet the SBWA water delivery requirements as well as being expensive to install and maintain. Some shoreline wells on Camano Island have apparently resorted to limited and scheduled water usage to reduce sea water intrusion to allowable levels.

Other farther-term contaminants, such as PFAS, are currently under investigation by State and Federal agencies to determine testing and treatment requirements. The risks to SBWA are exacerbated by a single well and the currently small well site (20 feet by 20 feet) that severely limits treatment facilities.

1.3 Summary of Near-Term Risk Areas

The SBWA WPP focuses on three major, near-term risk areas:

- Microbial and nitrate contamination from planned septic systems immediately upgrade of the well,
- Sea water intrusion due to the low elevation and proximity to Useless Bay and to a marsh, and
- Physical protection of the wellhead.

Microbial and Nitrate Contamination Risks:

SBWA has not experienced any exceedances (including microbial) in several decades and does not currently treat its water. There is a potentially high, near-term risk of contamination from microbials from ten septic systems in the planned development immediately upgrade of the SBWA well. Microbial contamination requires treatment with chlorine within very limited space on the well site.

The near-term risk of nitrate contamination is also potentially high due to upgrade septic systems in the planned development. The SBWA WPP does not estimate the nitrate contamination levels from upgrade development principally because of uncertainties regarding aquifer flow direction. The volume flow rate of the aquifer diluting septic effluent and the resulting nitrate contamination level are highly dependent on aquifer flow direction. The risks of nitrate contamination from upgrade septic systems will be determined by an experienced hydrogeologist as part of the two-year, $50,000 study grant just awarded in July, 2022 to SV-SLB HOA in partnership with SBWA.

The nitrate level in SBWA well water is about 2.7 gr/ml and has been stable for the past twenty years. The State Reporting Level (SRL) is 5.0 gr/ml and the State Maximum Contamination Level (MCL) is 10.0 gr/ml. The nitrate levels in septic system effluent can be as high as 60 gr/ml per DOH. Thus, the direction and volume flow rate of aquifer flow that dilutes the effluent is critical to estimating nitrate contamination levels. Nitrates from rainwater is negligible due to the low nitrate level (0.1 gr/ml) and the low flow rate (only about 10% of annual rainwater reaches the aquifer). The contribution from surface fertilizers is also negligible.

Nitrate levels in the aquifer are significantly lower at deeper depths. The SBWA well draws water at about 20 feet deep. Nitrate measurements from the near-by SV-SLB HOA 50-foot deep well show nitrate levels at about 0.5 gr/ml. However, well water at that depth has to be filtered for arsenic and manganese. Space for treatment facilities is severely limited at the currently small SBWA well site. In addition, deeper wells are more at risk for sea water intrusion or "upconing" as discussed below.

Sea Water Intrusion Risks:
DOH rates the risks of sea water intrusion as "high" for all wells that are at low sea level elevation and/or within 0.5 miles of a large body of sea water. The SBWA well meets both of these DOH criteria. As discussed below, the risks of sea water intrusion are essentially eliminated for wells at higher sea level elevations even if the location is within 0.5 miles of Useless Bay. The risks are also low for nearby wells at higher elevations even though these wells also draw water from below sea level.

Sea water intrusion into the SBWA well can occur from three principal sources:

- storm surges from nearby Useless Bay,
- flooding from sea level rise and high tides, and
- intrusion from sea water below the aquifer, called "upconing".

For the SBWA well, the near-term risks of sea water intrusion from storm surges are potentially high as evidenced by recent overtopping events from Useless Bay. The risks of flooding from sea level rise and high tides are also potentially high due to the proximity to Useless Bay (~0.1 mile) and to a marsh (within 100 feet). NOAA predicts a high current risk that flooding from sea level rise as well as from high tides will occur within about 30 feet of the SBWA well as shown in Figures 3.2 and 3.3. Flooding on Sunlight Beach Road from king tides in January of 2022 exemplify current tidal flood levels.

The risk of upconing for the SBWA well is "low" based on Island County revised criteria (June 2015) using Water Elevation Levels (WEL) and chloride concentration measurements for the SBWA well. WEL is the level of the water table or static water level. If the WEL is above 8.4 feet NAVD88 (North American Vertical Datum 1988) or 4 feet above mean sea level (AMSL), then the risk of upconing is "low" at any chloride concentration level. The SBWA well meets the criteria for a "low" risk of upconing. Deeper wells and higher pumping rates increase the risks of upconing.

1.4 Options to Address Contamination Risks

Substantially reducing near-term contamination risks for SBWA requires access to at least one higher elevation well that is upgrade of the planned septic systems. The SBWA WPP qualitatively evaluates two potential access options shown in Figure 2.1:

(1) install facilities in the NE corner of the parcel upgrade of planned development (Site 1A), and
(2) consolidate with the neighboring SV-SLB HOA water system (in Site 1 or another site).

Both options involve acquiring property and/or easements that enable the installation of new facilities. There are current opportunities including Site 1/1A that need to be pursued in the near term. New facilities could then be planned and installed over a few years. The study grant will assess several sites including Site 1.

As shown in Figure 2.1, Sites 1 and 1A are upgrade of the planned development and would eliminate nitrate and microbial contamination from upgrade septic systems in the planned development as well as contamination risks from sea water intrusion. Current zoning restrictions for undeveloped land upgrade of Site 1/1A appear to limit development to a few lots. Site 1/1A is about 120 feet above mean sea level (MSL) and eliminates the risk of sea water intrusion from storm surges and flooding. Site 1/1A is about 0.3 miles from Useless Bay which would further reduce the already low risk of upconing. Depending on property/easement acquisition costs, reasonable special assessments might be able to fund new facilities for SBWA in Site 1A over a few years. The study grant will assess operating and capital costs for SBWA operating as a separate water system for several sites including Site 1A.

Option 2, consolidating with SV-SLB HOA Water System, would result in similar reductions in these contamination risks for SBWA. Consolidation is a complex process requiring approval of both Boards and two-thirds of the members of each water system. A consolidated water system is a major element in the study grant. The costs of new facilities as well as property acquisition costs would be spread over a much larger customer base in a consolidated water system. The study grant will quantitatively assess the operating and capital costs for a consolidated water system for Site 1 as well as for other sites.

Farther-term Risks:

SBWA is assessing farther-term contamination risks, such as PFAS (a group of harmful polyfluoroalkyl substances), as a member of the Whidbey Island Water Systems Association (WIWSA). The SBWA WPP will be revised to address possible PFAS contamination after State and Federal agencies determine acceptable levels as well as testing and compliance requirements. The SBWA WPP will be revised based on the results of the study grant. More detailed discussion of the contamination risks and physical protection measures are included below.

2.0 Nitrate and Microbial Contamination Risks

Figure 2.1 shows the location of facilities for both water systems and the upgrade property planned for development. This parcel is part of the SV-SLB HOA water system service area which has granted ten water connections to the owners as agreed in previous contracts.

Microbial contamination is essentially eliminated by moving the well upgrade of the planned septic systems which is the same approach for addressing nitrate contamination risks. A Level 1 Nitrate Balance Model from the Department of Health (DOH) that estimates nitrate contamination levels from large on-site septic systems (LOSS) is discussed in some detail. A recent report (2021) cited in the

references provides a probabilistic risk model to estimate phosphorus, nitrate, and microbial pollution from septic tanks. This recent model has not yet been evaluated, but the same physics of dilution apply as well as the same sensitivity to aquifer flow direction.

The SBWA WPP does not estimate the contamination levels of microbials nor nitrates from the planned upgrade septic systems due to uncertainties regarding aquifer flow direction, but the risks are potentially high.

Figure 2.1 Aerial View of Two Water System Facilities & Upgrade Property

2.1 Nitrate Contamination Sources

The nitrate level in well water results from the mixing of nitrates from three sources:

- the nitrates from the effluent from upgrade septic systems,
- the nitrate level in the aquifer flowing into the mixing volume, and
- the nitrates from rainwater entering the aquifer.

The contribution from rainwater is negligible due to the low nitrate level (0.1 g/ml) and the low flow rate (only 10% of the annual rainfall reached the aquifer). Nitrate contributions from fertilizers on the surface are also negligible.

DOH uses a Level 1 Nitrate Balance Equation to estimate the nitrate levels from the effluent from large on-site septic systems (LOSS) flowing into the aquifer as cited in the references. Applying the Level 1 Model to a group of distributed septic systems instead of a single on-site septic system requires some adjustments, but this model appears to be the best available methodology to estimate nitrate levels from upgrade septic systems.

The Level 1 Model uses a simple mixing equation to estimate nitrate contamination levels after the entering aquifer flow dilutes the septic effluent:
(((Nitrate level of effluent x volume flow rate of effluent) + (Nitrate level in aquifer x volume flow rate of aquifer flowing into the mixing volume)) / (volume flow rate of effluent + aquifer volume flow rate))

The mixing volume used in the Level 1 Model is the upper portion of the aquifer near the well. The volume flow rate of the aquifer entering the mixing volume is directly dependent on the cross-sectional area of the entering aquifer flow, that is, the product of the mixing volume depth and the mixing volume width perpendicular to the aquifer flow direction. DOH recommends using a 20-foot depth in the Level 1 Model (which is also the depth of the SBWA well.) Since the width of the aquifer flow entering the mixing volume is measured perpendicular to the aquifer flow direction, the nitrate levels in the mixing volume are highly dependent on the aquifer flow direction (also called the groundwater direction).

2.2 Aquifer Flow Direction

The aquifer flow direction may be indicated from down slope gradients in Water Elevation Levels (WEL) (also called static water levels or water table levels) in nearby upgrade wells. Figure 2.2 shows WEL levels for several nearby wells (within about 1 mile from the SBWA well) from the Island County hydrogeologist's Well Viewer website and the DOE well log website cited in the references. The WEL levels are generally consistent up to about a mile upgrade of the SBWA well and do not appear to indicate a specific aquifer flow direction.

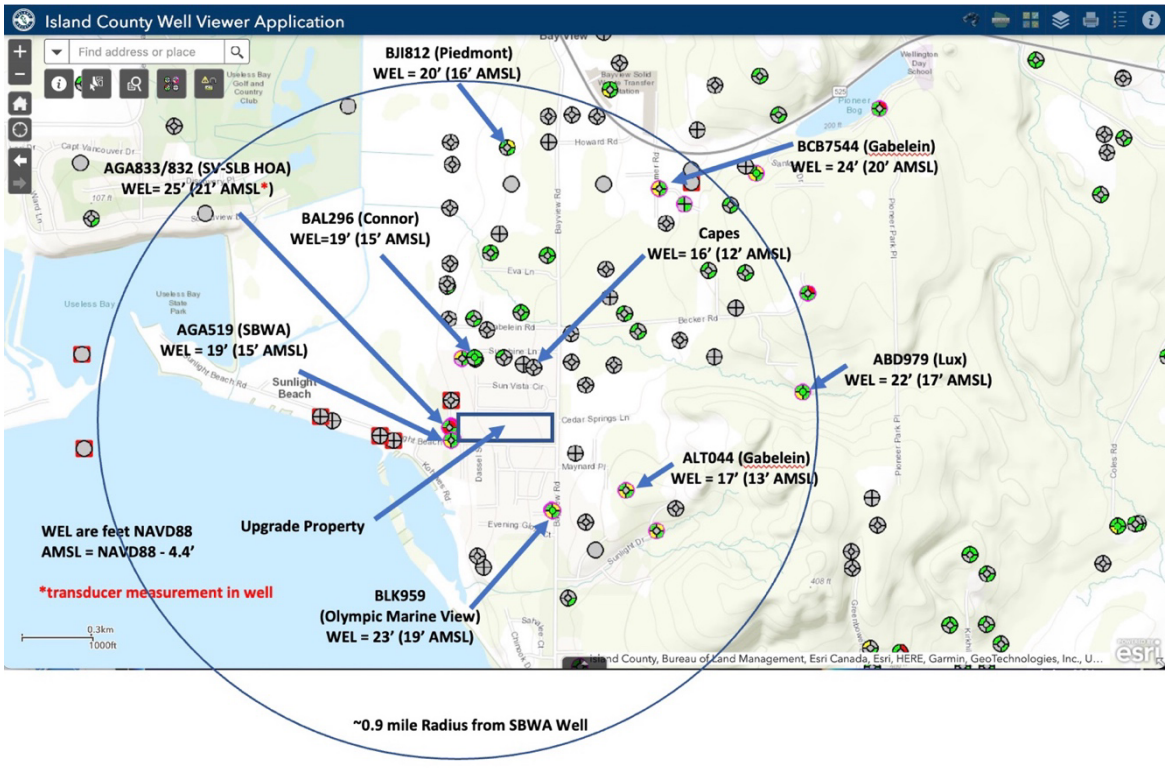

Figure 2.2 Water Elevation Levels in Nearby Upgrade Wells

Discussions with the experienced hydrogeologist confirmed that the WELs for nearby wells should be consistent within a few feet since nearby wells access the same aquifer. Small variations in WELs are due principally to changes in the tidal levels when the wells were drilled. As advised by the hydrogeologist, a subsequent review of the USGS investigative report on Whidbey Island aquifers (cited in the references) indicates that the aquifer flow direction near the coast is typically perpendicular to the prevailing shoreline. Figure 2.3 shows the complexity of aquifers and the general aquifer flow directions for North Whidbey from the USGS report.

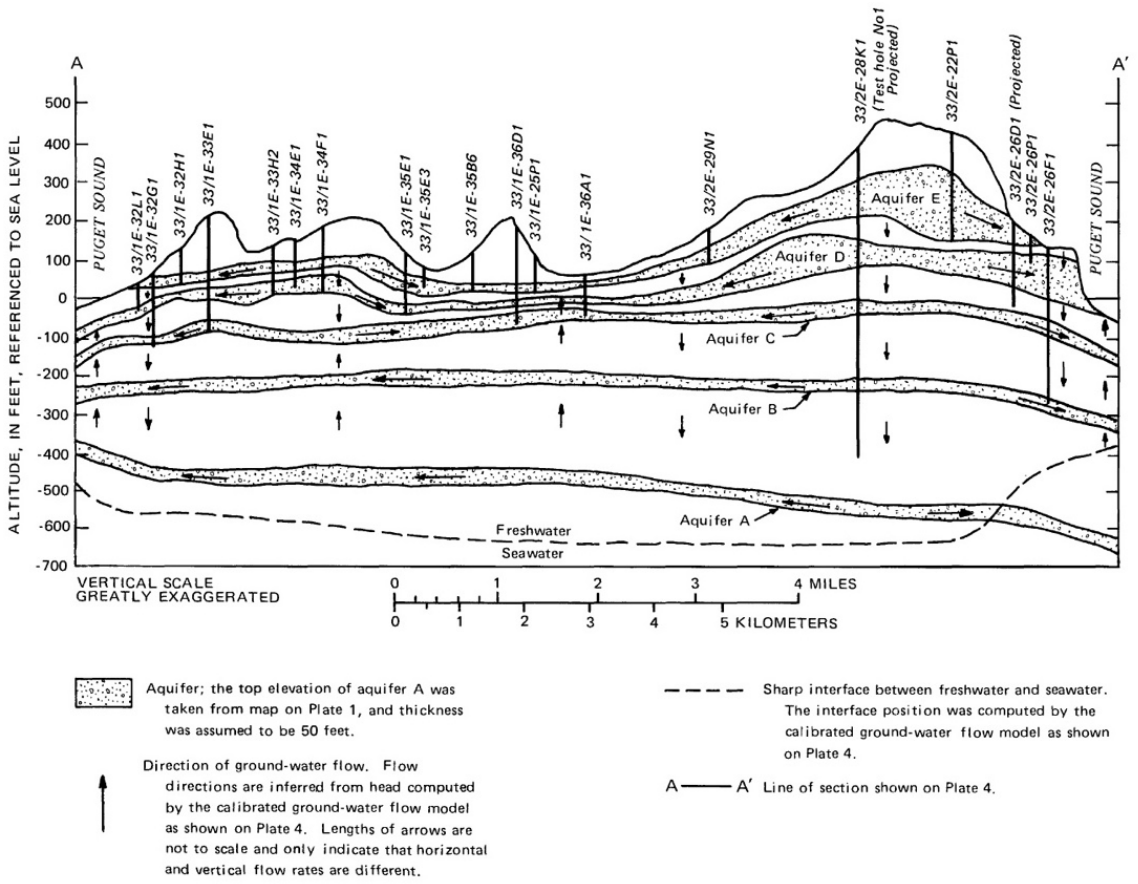

Figure 2.3 Schematic Hydrogeologic Section of Ground-water System in Northern Whidbey Island

Figure 2.4 shows an aerial view of the shorelines near the SBWA well and indicates the complexity of determining the shoreline and aquifer flow directions. The local downgrade topographical direction is reasonably consistent with a possible aquifer flow direction. The upgrade parcel is about 300 feet wide (East to West) and about 1500 feet long (North to South) upgrade of the well, so the cross-sectional area perpendicular to the aquifer flow direction, and thus the aquifer volume flow rate diluting the septic effluent, can vary significantly depending on the aquifer flow direction.

Given the uncertainty of and sensitivity to aquifer flow direction, the SBWA WPP does not estimate the nitrate contamination levels from upgrade septic systems planned for development. The study grant

will independently evaluate the nitrate contamination risks as well as assess the feasibility and costs of options to address this risk.

It is clear, however, that the SBWA well is in a vulnerable location. Chlorine treatment may be required to remove microbial contaminants from upgrade septic systems even if nitrates are below the allowable limits. In addition, the SBWA well is at risk for sea water intrusion in its present location.

Figure 2.4 Shorelines Near SBWA Well

3.0 Sea Water Intrusion Risks

Figure 3.1 shows a diagram of sea water and freshwater near a coastline from the Island County Water Resource Management Plan (WRMP) "Appendix F: Seawater Intrusion Topic Paper" cited in the references. The fresh groundwater is lighter than sea water and is not a "pool of water", but is actually contained within permeable layers of soil.

As previously discussed, sea water intrusion into the SBWA well occurs from three principal sources:

- storm surges from nearby Useless Bay,
- flooding from sea level rise and high tides, and
- intrusion from sea water below the aquifer, called "upconing".

The risks from each source are discussed below.

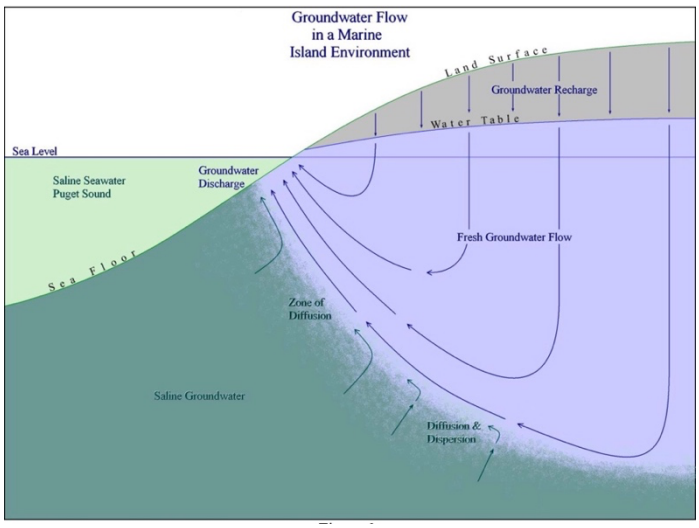

Figure 3.1 Diagram of Groundwater Flow in a Marine Environment

3.1 Near-term Risks of Sea Water Intrusion

Risks from Storm Surges and Flooding

The near-term risks of sea water intrusion for the SBWA well from storm surges are potentially high as evidenced by recent overtopping events from nearby Useless Bay (~0.1 mile). The risks of flooding from sea level rise and high tides are also potentially high due principally to the proximity of Useless Bay and a marsh (within 100 feet). Figures 3.2 and 3.4 show the high current risks of flooding from sea level rise and high tides to within 30 feet of the SBWA well from NOAA data. The references include a link to a NOAA website with an interactive map for viewer selected areas and levels of sea level rise as well as other risk factors.

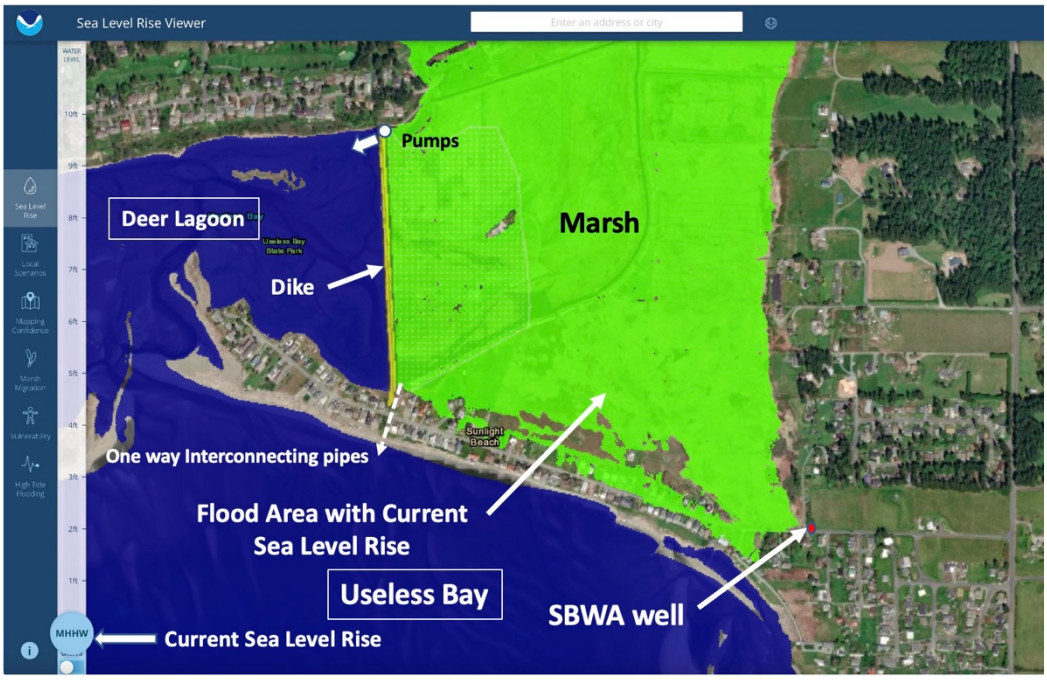

Figure 3.2 NOAA Current Sea Level Rise Map Near SBWA Well

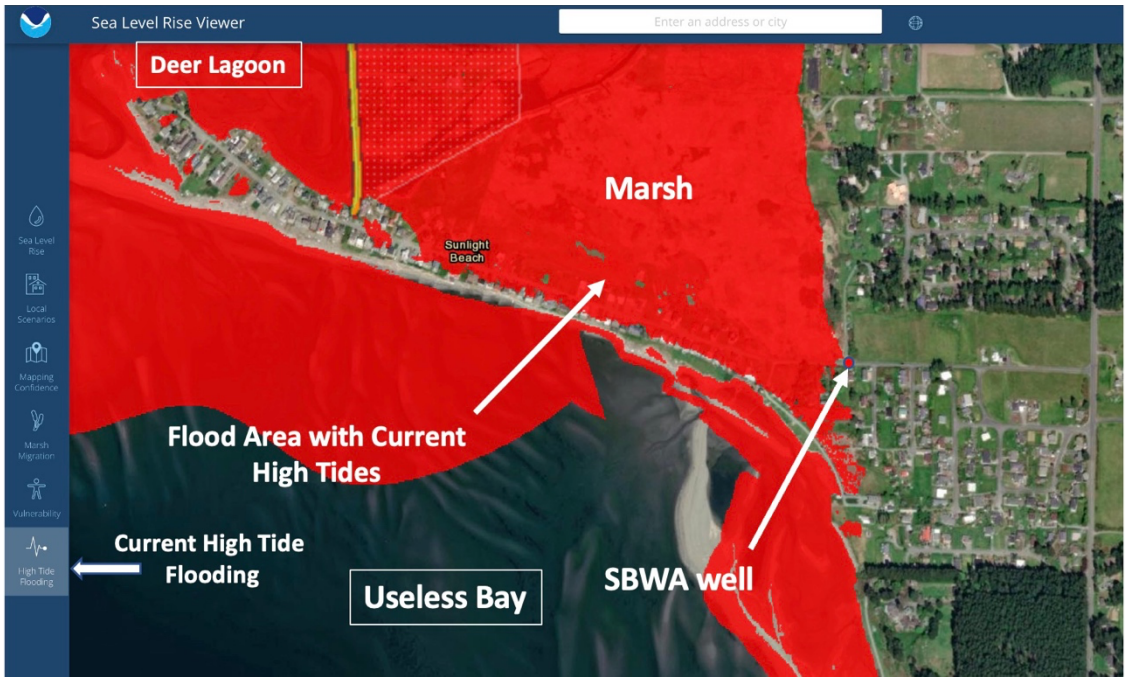

Figure 3.3 NOAA Current Flood Map from High Tides near SBWA Well

King tide flooding in January of 2022 exemplify flooding levels from high tides. Currently, the water level in the nearby marsh is maintained below flood levels through one-way pipes that connect the marsh with Useless Bay allowing water to flow into the bay at low tide. In addition, pumps operating at the Northwest corner of the marsh move water into Deer Lagoon. These pumps operate frequently during the rainy season as the marsh is filled by runoff from a large area upgrade of the marsh.

Risks of Sea Water Intrusion from Upconing

Figure 3.4 shows a diagram of upconing, sea water intrusion into well water from sea water below the aquifer, from the Island County Island County WRMP reference.

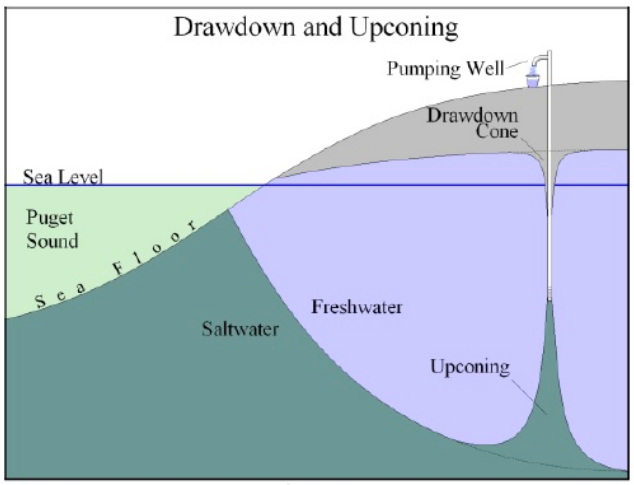

Figure 3.4 Diagram of Sea Water Upconing

Island County issued revised intrusion risk categories for upconing in June 2015. Doug Kelly, the former Island County hydrogeologist, gave the revised table of risk categories shown in Figure 3.5 in his briefing on "Camano Island Aquifers, Your Groundwater" cited in the references.

Using the criteria defined above, the new Seawater Intrusion Policy would be defined as follows:

Risk Category	Water Level Elevation [1]	Chloride Concentration [2]
Low	Greater than 8.4	Any [3]
Medium	Less than or Equal to 8.4	Less than 100
High	Less than or Equal to 8.4	Between 100 and 250
Very High	Less than or Equal to 8.4	Greater than 250

Table 3.

[1] Water Level Elevation in feet NAVD 88. +4 feet NAVD88 = 0 feet relative to Mean Tide Level in the Puget Sound. For example, 8.4 feet NAVD88 = 4.4 feet above Mean Tide Level.
[2] Chloride Concentration in Milligrams per Liter (mg/l)
[3] Where water level elevations are greater than 8.4 feet, chloride concentrations are irrelevant

Figure 3.5 Island County Risk Categories for Upconing

The WEL for the SBWA well is about 19 feet NAVD88 and the measured chloride concentration level is 10.0 mg/l according to the Island County Well Viewer website cited in the references. The resulting upconing risk category for the SBWA well is "low".

Although the upconing risk category is low, the SBWA well is currently at risk for sea water intrusion from storm surges and flooding from sea level rise and high tides. Access to a well that is at higher elevation is required to eliminate these flooding risks. The study grant will provide a more in-depth assessment of sea water intrusion risks and options to address these risks. Several references on sea water intrusion were reviewed and are cited in the references. The SWBA WPP qualitatively evaluated two options to address both sea water and nitrate/microbial contamination risks.

4.0 Options to Reduce Nitrate/Microbial and Sea Water Contamination Risks

Substantially reducing near-term contamination risks for the SBWA well requires access to at least one higher elevation well that is upgrade of the planned septic systems. The WPP qualitatively evaluates two potential access options:

(1) install facilities in the NE corner of the parcel upgrade of planned development (Site 1A), and
(2) consolidate with the neighboring SunVista/Sunlight Beach HOA (SV-SLB HOA) water system.

Both options involve acquiring property and/or easements that enable the installation of new facilities upgrade of the planned development. There are current opportunities to acquire suitable property and/or easements that need to be pursued and evaluated by the Board in the near term. New facilities could then be planned and installed over a few years. The study grant will assess several sites including Site 1/1A.

4.1 Qualitative Evaluation of Options

Figure 4.1 summarizes a qualitative evaluation of each option of the impact on contamination risks as well as costs and complexity. The principal rationale for the two options is discussed below.

		Risk Level			Other		
Option #	Description	Nitrate Contamination	Sea Water Intrusion	Arsenic Contamination	Costs to Implement	Complexity to Implement	Future Treatment Options
0	Current Location and Facilities	Potentially high risk	Potentially high risk from storm surges and flooding. Low risk for upconing.	No treatment required	N/A	N/A	Not feasible in current space
1	New facilities at NE corner of parcel with well water still drawn at current depth in aquifer (Site 1A)	Significantly lower	Eliminates intrusion from storm surges and flooding. Farther from Useless Bay so low upconing risk is reduced further.	No treatment required	Possibly within reasonable special assessments over a few years	High if construction loan is needed	Can be accommodated
2	Consolidated Water System	Significantly lower	Eliminates intrusion from storm surges and flooding. Farther from Useless Bay so low upconing risk is reduced further.	Treatment required if using 50 foot-deep well	High, but shared with another water system	High. Consolidation agreements and approval process are complex and lengthy. Construction loan is more likely due to higher capital costs.	Can be accommodated

Figure 4.1 Preliminary Qualitative Evaluation of Options

4.2 Option 1: Locate New Facilities at the NE Corner of the Upgrade Parcel

There appears to be sufficient area available to locate new facilities in the NE corner of the parcel being developed. A 100-foot radius sanitary area is required around the wellhead which is about 1.0 acre and the potentially available undeveloped area is about 1.6 acres per recent discussions with the property owner's representative. The operating permit for SBWA could possibly become GREEN instead of BLUE.

The well would have to be about 140 feet deep to access water at the same depth in the aquifer as the current well. No treatment facilities would be required for the new well for microbial and nitrate contamination from planned upgrade septic systems since these septic systems would be downgrade of the new well. Current zoning requirements appear to limit development upgrade of Site 1/1A to a few lots.

Sea water intrusion risks would also be low for the new well as intrusion from storm surges and flooding would be eliminated (except for possible tsunamis). The current low risks of sea water intrusion from upconing would be further reduced given the greater distance from Useless Bay (~0.3 miles vs ~0.1 mile).

A good estimate of the new well characteristics is given by the two nearby Olympic Marine View wells which are at the same elevation as Site 1/1A (about 120 feet AMSL). The most recent well was drilled in 2015, is 143 feet deep, and does not require treatment for arsenic or manganese. The WEL is about 23 feet NAVD88 (19 feet AMSL) and the chloride concentration level is 10.0 so the sea water intrusion risk from upconing is also low. This well is about 0.25 miles from the shoreline and the bottom of this well is about 7 feet below MSL which is the same depth as the SBWA well.

The property/easement acquisition cost is not clear, but the cost of drilling a 140-foot deep well is about $10,000 (~$72/ft) plus another $3500 for screens, casing, and other equipment according to a local well driller. A new pumphouse would cost significantly more, but would not require treatment facilities since the well water should not contain arsenic or manganese at the same depth of the aquifer as the current well.

In addition, the existing storage tanks are located mid-way on the North border of the parcel as shown previously in Figure 2.1, thus reducing the distance and the subsequent cost of a new pipeline from the new pumphouse to the existing storage tanks. Total costs could possibly be within the ability of SBWA members to fund through reasonable special assessments over a few years. The study grant will assess the operating and capital costs for Site 1/1A for SBWA operating as a separate water system.

A no-interest construction loan is also possible, but involves a complex process and would require SBWA to adopt a consumption-based water rate structure rather than the current fixed annual fee. A new water rate structure requires amendments to the Bylaws and approval of a majority of members.

4.3 Option 2: Consolidate with SV-SLB HOA Water System

Figure 4.2 shows the service areas and facilities of SBWA and SV-SLB HOA water systems. As shown, the service areas significantly overlap.

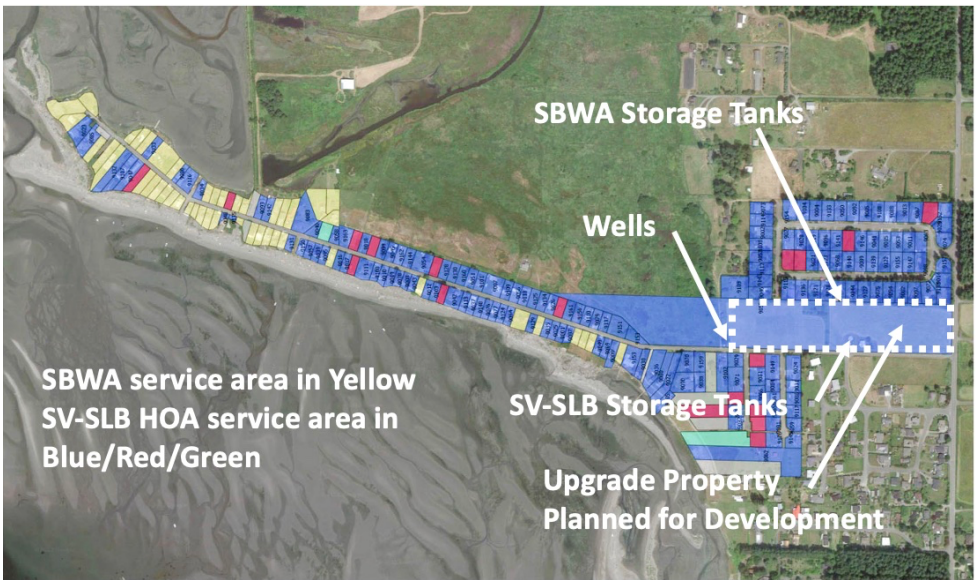

Figure 4.2 Approximate Service Areas and Facilities of Both Water Systems

SBWA is a relatively simple water system that does not treat its water. There is a single production well and pumphouse on a 20-foot by 20-foot site. A single pipeline leads to the water storage tanks and another single line runs from the pumphouse down Sunlight Beach Road to its service area. Water from the tanks is gravity fed. Figure 2.1 previously showed the location of the single pipeline to the water storage tanks that was moved in 1998 to about 10 feet below the apparently currently planned development of the upgrade parcel.

SBWA operating costs are much lower than for the SV-SLB HOA water system and are normally below the SBWA annual income. SBWA has a reserve that is more than four times the normal annual operating expenses. Reasonable special assessments have been levied in the past to fund periodic water system improvements.

The SV-SLB HOA water system serves about 3.5 times more connections than SBWA with significantly larger annual income and reserves funded by consumption-based water rates. A consolidated water system would have greater capacity to fund major water system improvements that will inevitably be required. Their water is treated with chlorine and arsenic and manganese are filtered since they have one well that is 50 feet deep. Their other well is about the same depth as the SBWA well.

Both water systems have operated for over 75 years and have instituted significant system upgrades in past several decades. Consolidating water systems is a complex process requiring the approval of both Boards and two-thirds of the members of each water system.

The study grant will evaluate several locations for a consolidated water system including Site 1. For each location, the study grant will assess the risks of nitrate, sea water intrusion, and arsenic contamination and aging infrastructure and assess the feasibility and costs of options to address these risks. Potential issues related to water rights and permits of a consolidated water system will also be addressed.

5.0 Physical Protection of the Wellhead

The wellhead is on a level 20-foot by 20-foot parcel owned by SBWA about thirty feet from the center of Sunlight Beach Road (dead-end, paved) and about 10 feet from the centerline of Old Henry Lane (narrow, unpaved). The wellhead is protected only by a partial paver wall as shown in Figure 5.1.

Figure 5.1 SBWA Wellhead and Pumphouse

The seal on the wellhead is critical to preventing contamination of the water system. A leak in that seal was repaired in December of 2021 due apparently to damage by a vehicle backing up on the narrow road next to the wellhead. The only current physical protection for the wellhead is this partial low block wall.

The Board is working to install removable bollards in front of the block wall to improve the physical protection of the wellhead. Signage will also be improved. Farther-term protective measures will be considered by the Board after the results of the study grant are available. The proximity to the paved road results in a BLUE annual permit level instead of GREEN. BLUE indicates less than a 100-foot sanitary area and requires a plan to eventually obtain a GREEN permit.

6.0 Related Research

The review included research into other methodologies to estimate nitrate contamination from septic systems and methodologies to estimate minimum lot sizes. In particular, a model by Taylor as well DOH #337-101 were reviewed as cited in the references. The Level 1 Model appears to be the best available methodology. A probabilistic model in a recent article by the Centre of Expertise for Waters cited in the references has not yet been evaluated, however, the same physics of dilution apply and the aquifer flow direction is still critical to estimating levels of nitrate/microbial contaminants.

Various documents on the effects of nitrate contamination and low-nitrate septic system designs were reviewed and this review is on-going. There are septic system designs that can reduce nitrate levels in septic effluent by over 50% although it was not clear how long these systems can reduce nitrates to that level. Washington State Administrative Codes (WAC) were reviewed for regulations on minimum land area requirements for on-site sewage systems. Several authoritative articles and websites were reviewed on sea water intrusion. Several additional references are cited for the related research as well as relevant websites.

7.0 Final Comments

An eight-month review of authoritative sources regarding nitrate and sea water contamination was conducted that clearly indicates the vulnerable location of the SBWA well. Substantially reducing near-term contamination risks to the SBWA well requires access to at least one well at higher elevation upgrade of the planned septic systems. New facilities at that location will also enable space for future treatment systems as testing and treatment regulations inevitably increase.

Two access options are qualitatively assessed: locating new facilities at the NE corner of the upgrade parcel (Site 1A) and consolidating with neighboring SV-SLB HOA water system. Current opportunities to acquire suitable property/easements need to be pursued and evaluated near term by the Board.

The review clearly supports the need for an in-depth, independent, assessment of these contamination risks. A more in-depth assessment of risks and options will be made in the study grant. The SBWA WPP will be revised when the results of the study grant are available.

References

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