



**CITY COUNCIL STUDY SESSION
TUESDAY, OCTOBER 21, 2025**

COUNCIL CHAMBERS
280 MADISON AVENUE NORTH
BAINBRIDGE ISLAND, WA

AND

REMOTE MEETING ON ZOOM
[HTTPS://BAINBRIDGEWA.ZOOM.US/J/92947338351](https://bainbridgewa.zoom.us/j/92947338351)
OR TELEPHONE: US: +1 253 215 8782
WEBINAR ID: 929 4733 8351

AGENDA

- 1. CALL TO ORDER / ROLL CALL - 6:00 PM**
- 2. APPROVAL OF AGENDA / CONFLICT OF INTEREST DISCLOSURE - 6:05 PM**
- 3. REGULAR BUSINESS**
 - 3.A (6:10 PM) Present the Groundwater Management Plan Peer Review - Public Works, 30 Minutes**
[Bainbridge Island GWMP Peer Review Documents.pdf](#)
[Keta Waters Presentation.pdf](#)
 - 3.B (6:40 PM) Consider Changes to Ethics Program, 30 Minutes**
[Ethics Board Response to Council May 27 Action_2025.08.19.pdf](#)
- 4. COMMITTEE REPORTS - 7:10 PM**
- 5. ADJOURNMENT - 7:20 PM**

GUIDING PRINCIPLES

Guiding Principle #1 - Preserve the special character of the Island, which includes downtown Winslow's small town atmosphere and function, historic buildings, extensive forested areas, meadows, farms, marine views and access, and scenic and winding roads supporting all forms of transportation.

Guiding Principle #2 - Manage the water resources of the Island to protect, restore and maintain their ecological and hydrological functions and to ensure clean and sufficient groundwater for future generations.

Guiding Principle #3 - Foster diversity with a holistic approach to meeting the needs of the Island and the human needs of its residents consistent with the stewardship of our finite environmental resources.

Guiding Principle #4 - Consider the costs and benefits to Island residents and property owners in making land use decisions.

Guiding Principle #5 - The use of land on the Island should be based on the principle that the Island's environmental resources are finite and must be maintained at a sustainable level.

Guiding Principle #6 - Nurture Bainbridge Island as a sustainable community by meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Guiding Principle #7 - Reduce greenhouse gas emissions and increase the Island's climate resilience.

Guiding Principle #8 - Support the Island's Guiding Principles and Policies through the City's organizational and operating budget decisions.



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CITY OF
BAINBRIDGE ISLAND

City Council Study Session Agenda Bill

MEETING DATE: October 21, 2025

ESTIMATED TIME: 30 Minutes

AGENDA ITEM: (6:10 PM) Present the Groundwater Management Plan Peer Review - Public Works,

SUMMARY: City staff will introduce the Groundwater Management Plan peer reviewers, Joel and Adam Massmann of Keta Waters, Inc. The reviewers will provide a brief overview of the peer review findings and answer questions from the City Council.

The recommended motion on this item is to forward the Groundwater Management Plan Peer Review to the Groundwater Management Plan Sub-Committee and Technical Advisory Committee for development of next steps and plans for public engagement.

AGENDA CATEGORY: Presentation

PROPOSED BY: Public Works

RECOMMENDED MOTION:

I move to forward the Groundwater Management Plan Peer Review to the Groundwater Management Plan Sub-Committee and Technical Advisory Committee for development of next steps and plans for public engagement.

COMMUNITY ENGAGEMENT AND OUTREACH:

Community engagement on the final draft GWMP is expected to be planned for early 2026.

FISCAL IMPACT:

Amount:	N/A
Ongoing Cost:	N/A
One-Time Cost:	N/A
Included in Current Budget?	false

BACKGROUND: Bainbridge Island residents, workers and visitors rely on groundwater for all water supply needs, from drinking water and dishwashers to toilets and garden watering. Groundwater also plays a vital role in supporting healthy streams and wetlands.

In 2022, the City began development of a Groundwater Management Plan (GWMP) that takes an Island wide approach to managing groundwater resources and serves as a document that can be adapted as needs change. The plan will include a summary of what we know about the Island's geology; groundwater systems; streams, lakes, and wetlands; climate and climate change projections; land use; and population projections.

On July 22, 2025, the City Council received the 2nd draft of the GWMP, and authorized Keta Waters, Inc. to perform a peer review of the plan. The draft peer review was completed on October 9, 2025, and is now being presented to the City Council.

The recommended motion on this item is to forward the Groundwater Management Plan Peer Review to the GWMP Sub-Committee and Technical Advisory Committee for development of next steps and plans for public engagement. The Sub-Committee includes members from the Utility Advisory Committee, the Climate Change Action Committee and the Environmental Technical Advisory Committee. The Technical Advisory Committee includes members from Kitsap Public Health, the State Department of Ecology, the Suquamish Tribe, and the Kitsap Public Utility District.

The 2nd draft of the GWMP, the GWMP Summary Memo, and other and associated documents can be found on the City's website: www.bainbridgewa.gov/1320

ATTACHMENTS:

[Bainbridge Island GWMP Peer Review Documents.pdf](#)

[Keta Waters Presentation.pdf](#)

Groundwater Management Plan (GWMP) Peer Review Documentation

- Document 1 - GWMP Draft Peer Review
- Document 2 - Peer Reviewer Comments on the GWMP Summary Memo

Document 1 - GWMP Draft Peer Review

Technical Peer Review of the City of Bainbridge Island 2nd Draft Groundwater Management Plan

Prepared by

Joel Massmann, Ph.D., P.E.

Adam Massmann, Ph.D.

**Keta Waters LP
Seattle, WA**

October 9, 2025

*****DRAFT*****

A. BACKGROUND AND OBJECTIVES

This report presents our technical peer review of the Draft Bainbridge Island Groundwater Management Plan (GWMP) as described in the July 2025 report by EA Engineering, Science, and Technology (EA, 2025a). The overall goal of this review was to validate the methodology, assumptions, data sources, modeling, and proposed management actions in the plan. Specific objectives include the following:

- Evaluate the scientific soundness and technical accuracy of the plan.
- Assess the adequacy of groundwater data, hydrologic modeling, and demand projections.
- Identify any gaps, deficiencies, or areas for improvement.
- Assess the plan conclusions, next steps, and management actions.
- Provide constructive recommendations to enhance plan effectiveness and/or completeness.

Our overarching recommendation is that investment in actions aimed at proactive mitigation and management, including water conservation and recharge enhancement, will likely provide the greatest return for achieving an overall goal of providing clean and sufficient groundwater for the natural environment and future generations. Continued study and plan refinements are not expected to change the value or priority of these actions.

Additional conclusions and recommendations are summarized below. Further discussions and support for these conclusions and recommendations are provided in the sections that follow.

A.1 Conclusions and Recommendations Related to Goals and Actions

- The GWMP would benefit from a clear and concise statement of the overall goal of groundwater management on Bainbridge Island. The groundwater management plan should then provide recommendations for specific actions aimed at achieving the goal of groundwater management. The current report (e.g., Section 1.2) does not clearly distinguish between the overarching goal and recommended actions for achieving that goal. Based on discussions and analyses presented in the GWMP, an overarching goal may be something to the effect of “Ensure clean and sufficient groundwater for our natural environment and future generations.”
- The GWMP identifies water conservation as the most cost-effective management action. This is an important conclusion; improving water conservation and reducing ground water pumping will lead to a more resilient system and does not rely on correct groundwater modeling nor certain futures, neither of which are attainable.

- The GWMP identifies managing storm and surface water as a second-most cost-effective management action. This type of management action can complement increased conservation; improved surface management can enhance groundwater recharge while protecting water quality. More broadly, we would re-state that a second key management option for improving the resilience of the system is to implement infrastructure and policy that will maximize clean groundwater recharge.
- A primary flaw of the second draft of the GWMP, in our estimation, is that it focuses on groundwater model development and future climate scenarios which can offer no meaningful guidance on how to improve water conservation and increase recharge through surface water and land use management.
- Given the cost-benefit analysis identifies water conservation as the best approach, it is surprising that there is no meaningful engagement with the problem of how to achieve water conservation, and no tangible management actions are identified related to water conservation.

A.2 Conclusions and Recommendations Related to Addressing Uncertainty

- There are inherently large uncertainties in recharge estimates developed for current conditions. The draft GWMP does not acknowledge or explicitly consider those uncertainties. These uncertainties are magnified in estimating recharge under future climate conditions. The uncertainties in current and future recharge rates are not likely to be resolved in the foreseeable future and management actions should focus on developing resilient systems that are less dependent on estimated recharge.
- The plan includes descriptions of data gaps and uncertainties (e.g., Section 4.4.7) and suggests initiatives to address these. While the initiatives can generally be justified, it should be recognized that many of these data gaps and uncertainties are inherent – there is no amount of data collection or modeling that will fully resolve them. Decisions must be made in the face of these uncertainties. The best decisions and management options are those that are resilient in the sense that they are less sensitive to these uncertainties. Water conservation and recharge enhancement fall into this category.
- The inherent uncertainty in model predictions further supports investment in proactive mitigation and management actions that focus on system resiliency, including water conservation and recharge enhancement. These investments will likely provide the greatest return for achieving an overall goal of providing clean and sufficient groundwater for the natural environment and future generations, as compared to efforts aimed at additional modeling.

- Current groundwater elevation data and modeling do not provide definitive evidence that current and future groundwater withdrawals are unsustainable. However, current groundwater elevation data and modeling also do not provide definitive evidence that current and future groundwater withdrawals are sustainable. Increasing groundwater withdrawals increases the risk of unsustainability; decreasing groundwater withdrawals decreases the risk of unsustainability. The safest course of action from a risk perspective is the one with the lowest groundwater withdrawal.

A.3 Conclusions and Recommendations Related to Groundwater Recharge

- Recharge estimates are a fundamental component of groundwater management plans because the amount of water replenishing the aquifers dictates how much water can be sustainably pumped and used for years into the future. However, although the concept of recharge is relatively simple, we have no way of measuring it directly, and estimating it poses considerable challenges.
- The best practice to generate recharge estimates that will be useful for management purposes is to use a range of estimation methods (e.g. multiple land surface models)—each of which makes different assumptions about the factors that determine recharge—and generate a range of possible recharge rates.

A.4 Conclusions and Recommendations Related to Groundwater Model Development

- The EA 2025 model (EA, 2025b) describes a groundwater flow system under current conditions that has important differences compared to two earlier models developed by the USGS (Frans and Olsen, 2011; Frans et al., 2016). In particular, the EA 2025 model describes a system where most groundwater inflow to deeper aquifers occurs as lateral or horizontal flow from off-island sources, while in the two USGS models most inflow occurs as vertical flow from above. This difference has important implications in terms of future impacts from pumping in these deeper aquifers.
- The EA 2025 model does not explicitly include streams, wetlands, or lakes. This severely limits the usefulness of the model for estimating impacts of groundwater pumping on individual streams and wetlands.
- Either of the two earlier USGS models will provide more defensible estimates of impacts of groundwater pumping on groundwater levels in deeper aquifers and on surface water features (e.g., streams, wetlands, and lakes), as compared to the EA 2025 model. This is because of changes that were made to the way geological layers are incorporated and described in the model and to the way groundwater/surface water interactions have been excluded in the model.

- Groundwater recharge is not calculated in the USGS or EA groundwater flow models. Rather, recharge is estimated externally from the model and is then incorporated as input to the model. The general method used to estimate recharge in the EA 2025 model is the same as what was used in the earlier USGS models and the recharge rates in the EA 2025 model are the same as what was used in 2016 USGS model (Frans et al., 2016).
- The approach used to estimate recharge provides estimates of annual recharge rates. These annual recharge rates are calculated based on annual precipitation rates. The recharge estimates do not depend on how that precipitation is distributed throughout the year.
- The annual recharge rates used in the groundwater model are partitioned among the different months the same way for all years, regardless of when the precipitation occurs. For example, the recharge that is assigned to April is always 12% of the annual recharge and the recharge assigned to November is always 6% of the annual value.

A.5 Conclusions and Recommendations Related to Groundwater Model Calibration

- The EA 2025 model was calibrated using a trial-and-error approach in which calculated groundwater elevations were compared to observed elevations. A comparison of calculated and observed flows was not done, in large part because there are no streams included in the model. It is generally recommended that data of different types (e.g., flow data and water level data) should be included in the calibration process to the extent possible (e.g., Hunt et al., 2005).
- The approach used to calibrate the EA 2025 model often results in non-unique parameter estimates. This means that different sets of input parameters (e.g., different combinations of variables describing hydrogeology) can give similar model calibration results, but very different results for future management options. This should be explicitly considered in assessing model scenarios.

A.6 Conclusions and Recommendations Related to Groundwater Model Application

- The groundwater model is used to estimate future groundwater levels under three different scenarios. These estimates are not directly incorporated into any management decisions. Rather, the model results simply show that reducing recharge and increasing pumping rates result in larger water level declines and that these declines increase over time (see Table ES-1, page ES-6). No targeted levels of allowable water level declines have been developed or proposed.
- The groundwater model is used to simulate water levels 20, 50, and 100 years in the future. In none of the scenarios do water levels reach equilibrium. It would

be a relatively simple task to run the model in steady-state mode to estimate what the equilibrium levels would be for different combinations of recharge rates and groundwater extraction rates. These steady-state simulations can be completed much more efficiently than the transient simulations described in the current GWMP.

- An advantage of steady-state simulations is that they can be used to help identify the combinations of groundwater recharge and groundwater extraction that will be sustainable for future generations. Those combinations that are sustainable can then be used to help identify which management options are needed to achieve the targeted levels of recharge and extraction.

A.7 Conclusions and Recommendations Related to Demand Projections

- Estimates of current groundwater withdrawals included in the GWMP vary significantly, depending on the section of the plan (see Section C below (comments on GWMP excerpts) for more details). It is difficult to fully assess demand projections if current withdrawals are not well defined.
- Demand projections included in the GWMP were developed based on fixed assumptions regarding characteristics of population growth (e.g., density and distribution) and water use rates. Both population growth characteristics and water use rates can be controlled or impacted by available water supply. These relationships should be explored in the GWMP. Assuming an exponential growth model, as is done in developing population projections, is not sustainable for finite resources. This represents a significant management issue that has not been addressed in the GWMP.

B. SPECIFIC COMMENTS FROM THE TECHNICAL ADVISORY COMMITTEE AND THE GWMP PLAN SUB-COMMITTEE

The scope of work for this peer review explicitly included responding to selected comments provided by the city's Groundwater Management Plan Sub-Committee and Technical Advisory Committee on the first draft of the GPWM. These comments are listed in Table 1 and our replies are provided below.

Comment 154.

Table 1 on page 9 in the EA model memorandum shows that the upper three layers from the USGS 2016 model were combined and the bottom three layers were eliminated. The upper three layers included Qvr, Qvt, and Qva units (recessional, till, and advance deposits, respectively). The lower three layers included a clay layer and two bedrock layers.

Combining the upper three layers essentially reduces the impact of the till layer. Figure 4 shows the estimated distribution of till on Bainbridge Island (from Figure 9 in Frans et al., 2011). The till layers are described by Frans et al. as follows: *“The till is a very compact mix of sand and gravel in a clay matrix and is somewhat discontinuous due to erosion by streams.”* These till areas likely affect the magnitude and distribution of impacts from shallow wells and the amount and discharge to streams and wetlands. The model as currently implemented has limited capability to simulate groundwater/surface water interactions, even if the layers had not been combined. These limitations are due in large part to the drain boundary conditions that are applied to all cells at the land surface in the model.

Combining the three top layers in the USGS 2016 model into a single layer does not likely affect the model's capabilities to a significant degree in terms of estimating water level declines in the deeper pumped aquifers.

Eliminating the two lower bedrock layers in the USGS 2016 model likely does not affect model results significantly. However, removing the clay basal unit and the water that is stored in it eliminates a potential source of water for the FBA aquifer. Even though the clay has low permeability, a significant amount of water can be produced by inducing leakage over the full area of a well's zone of influence. The results for vertical leakage into the FBA shown in Table 3 in Section E below suggest some seasonality to these inflows. A deeper clay unit could dampen these variations, but the effect may be small. It is not clear that much is gained in terms of model efficiency by removing this layer, as it is unlikely that it would cause any model stability issues.

Table 1. Selected comments provided by the Groundwater Management Plan Sub-Committee and Technical Advisory Committee

Comment #	Commentor	Document	Page/Sect.	Comment
154	Joel Purdy	Model Memo	9	- Combining aquifers and confining units seems problematic. How were parameters chosen? Consider adding more explanation on why this was chosen and the advantages/disadvantages. It looks like variable hydraulic conductivity values were used (based on the map). How were these chosen? Consider adding an explanation. - Does combining layers 1-3 render the surface water/ground water interaction of these layers moot? The Qva is the most significant contributor to streamflow.
274F	Keenan 1 of 2	Model Memo	10	Should be using best available science. Please reference Charlie Kratzer, PhD 2024 whitepaper on Recharge. Peer review should evaluate EAs assumptions. Numerous requests for documentation to verify EA was denied by EA and COBI
274H	Keenan 1 of 2	Model Memo	2	Peer reviewers please evaluate EA changes to the model.
274O	Keenan 1 of 2	Model Memo	9	(Peer Review - does this present any modeling issues?
274P	Keenan 1 of 2	Model Memo	9	Do these changes present any problems with modeling?
274Q	Keenan 1 of 2	Model Memo	9	"Does eliminating the Clay Basal Unit reduce understanding of the thickness of FBA in locations on the
275	Keenan 1 of 2	Model Memo	14	Peer review please verify these numbers.
281	Keenan 1 of 2	Model Memo	34	These assumptions need to be peer reviewed. Reference Charlie Kratzer 2024 Recharge white paper

283	Keenan 1 of 2	Model Memo	36	Evaluating future changes in recharge is more than just projected annual precipitation accumulation. This analysis requires peer review. Scenario parameters should consist of Low=0% change in recharge, Medium=10% loss of recharge, and High 20% loss of recharge. Medium being the most statistically accurate. Table 6. Predicted Changes In Precipitation Between October And March (2010-
454	Online	Gen	N/A	The GWMP needs to include, evaluate, and address the following: (1) production and water level data from the main production wells on the Island for the entire period that such data is available; this critical data is not discussed in the current draft; it is needed to show the cumulative decline in water levels in all aquifers using all available historical data; (2) all available information on decreased streamflow and degraded water quality in all BI watersheds; we have a responsibility to maintain adequate surface water for flora, fauna, wetlands, natural systems, etc., in addition to maintaining sustainable water supply for human needs. (3) get independent, high-quality peer review input on the questionable Scenario parameters used, e.g., the "Low Impact Scenario" (which the Draft deems "the most likely") uses a 0% change in aquifer recharge across the entire 100 year period, despite likely increases in temperatures and evapo-transpiration, and the increase in impervious surfaces and run-off due to increased development. Seems like a flawed parameter calculated to understate potentially adverse impacts on water supply. Same with 122% increase in pumping input. On Recommendations: (1) increase number of wells monitored in all aquifers, including near shoreline for seawater intrusion; (2) increase monitoring of streamflow and begin watershed rehabilitation in all watersheds; (3) require all new construction to estimate water use and identify adequate available source.

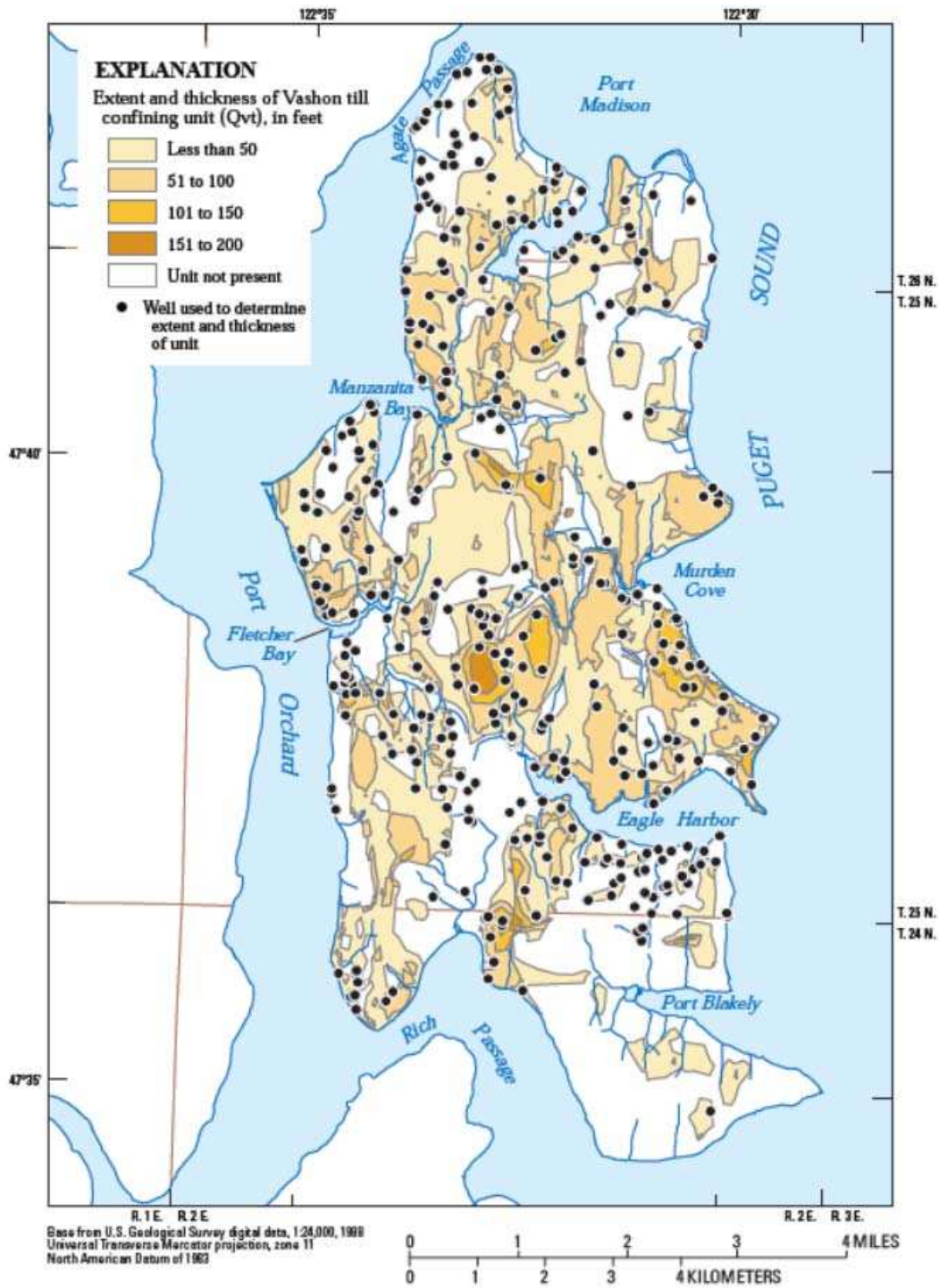


Figure 4. Distribution of glacial till (Qvt). From Figure 9 in Frans et al. (2011)

Comment 274F.

We have evaluated assumptions and methods used to estimate recharge in Section E.

Comment 274H.

Aspect (2023) converted the USGS 2016 model from MODFLOW-NWT to MODFLOW-USG and EA then converted the model back to MODFLOW-NWT. Using MODFLOW-NWT is a reasonable choice for this application.

Aspect (2023) removed the streams, wetlands, and lakes from the USGS 2016 model to improve model stability and to reduce the runtimes required to complete model simulations. As noted in the previous section, this approach is not generally-accepted practice for developing models that are intended to describe groundwater/surface water interactions. EA (2025) used this same approach for their modeling work.

EA disabled the Allow Automatic Flow Reduction function in the model. This enforces that extraction rates assigned to wells are always simulated unless the model fails to converge on a solution. This is a reasonable change for this model application.

EA also combined the top three layers in the USGS model and eliminated the bottom three layers. Our responses to Comment 154 speak to this issue.

EA modified the hydraulic conductivity values for aquifers and confining units. These modifications have changed the relative amount of vertical and horizontal inflow to the aquifers used for water supply. We address this topic in Section E.

Comment 274O.

Our responses to Comment 154 address the potential impacts from combining the top three layers

Comment 274P.

Our responses to Comment 154 address the potential impacts from eliminating the bottom three layers

Comment 274Q.

Our responses to Comment 154 discuss what role the basal clay unit may play in the groundwater flow system and how eliminating this role may impact groundwater model results.

Comment 275.

According to the EA modeling memo, the estimates of hydraulic conductivity included in their Table 2 were derived from pumping tests performed after well installation. We have not seen the data or analyses used to develop these estimates and are not able to verify the values listed in Table 2 in the EA modeling memo.

Comment 283.

We agree that evaluating future changes in recharge requires much more than evaluating changes in future annual precipitation. This is discussed in the previous section. It is difficult to identify which future recharge scenario is most likely or most statistically accurate. It is our assessment that while it may be more likely that recharge decreases in the future, there are also realistic scenarios that result in increased recharge.

Comment 454.

We agree that providing production and water level data from the main production wells on the Island would be useful (certainly more useful than the full set of well logs included in the current draft). Appendix D, the 2021 Early Warning Level Report, provides hydrographs for selected wells, and these are helpful.

It is not clear that all available information on decreased streamflow and degraded water quality in all BI watersheds should be included in the GWMP, but it would be helpful to provide a synopsis of this information and references and links to the relevant data sources.

We have provided input on scenario parameters, including recharge rates. We have also emphasized the importance of collecting data that constrain the variables and parameters that can be controlled or measured, including streamflow, water levels, and groundwater withdrawal rates.

C. COMMENTS ON SELECTED EXCERPTS FROM THE GWMP

The scope of work for peer review includes a task to provide a full list of comments and recommendations, identified by section. These comments and recommendations are provided below.

Page ES-2

The graphic shown on this page does not clearly distinguish between the overarching goal and recommended actions for achieving that goal. Ensuring clean and sufficient groundwater for our natural environment and ourselves is the goal. Developing community-wide understanding, reducing climate change impacts, and minimizing threats to water quality are actions taken to achieve that goal. Other actions that could be considered include data collection and data analysis, which would broadly include developing and improving groundwater models.

The primary purpose of Bainbridge Island's Groundwater Management Plan is to establish a comprehensive framework for cooperation between regulatory agencies and utilities to protect the island's EPA-designated Sole Source Aquifer system.

This statement of the primary purpose of the plan is not consistent with the contents of the plan.

Page ES-3

The plan addresses the impacts of development on both shallow and deep aquifer systems and calls for the implementation of comprehensive stormwater management practices.

The impacts of development on shallow systems have not been estimated in any reliable way. It is not possible to address the impacts without having a sense of what these impacts are.

In terms of conservation and management, the plan aims to mitigate a projected 7% increase in water use per house due to the projected longer, drier growing season.

There are no discussions in the plan about how this mitigation might be accomplished. There are no specific actions aimed at mitigation. There is also no justification for why a longer growing season would necessarily require residential homes to use more water. If the city is moving towards a more sustainable use of water resources, per-home and per-capita water usage could be decreased, regardless of changes to the growing season.

Page ES-4

Of this recharge, approximately 50-60% discharges to surface waters, 5-10% is withdrawn through well pumping, and 30-40% flows to the marine environment or eastward.

The basis for these estimates is not presented in the plan or in the groundwater technical memo (EA, 2025b). The groundwater model is not capable of developing reliable water balances, particularly for surface water features such as streams and wetlands. It is not clear how the 50%-60% estimate was derived.

An estimated groundwater withdrawal of 5%-10% of recharge corresponds to **683 to 1,367** acre-feet per year. The estimated groundwater production listed in Table 14 in EA 2025b is 845.7 million gallons per year, or **2,596** acre-feet/year. The total well pumping included in the EA 2025 groundwater model averages **2,313** acre-feet per year for the period January 2012 through December 2021 (from the model input files provided by COBI).

The combined water production of the City of Bainbridge Island, North Bainbridge Water Company, and South Bainbridge water systems in 2021 is reported as **1,757** acre-feet/year (Table 8, EA 2025b). The production from smaller public water systems is reported as **272** acre-feet per year (Table 9, EA 2025b) and the estimated water use for Group B systems is **112** acre-feet/year (Table 14, EA 2025). The estimated population on private wells is 4,789 (Table 13, EA 2025b) and their total estimated water use is **425** acre-feet per year or 79 gals/day/person (Table 14, EA 2025b). The combined total for all withdrawals **2,596** acre-feet/year (which includes 29 acre-feet/year from other miscellaneous withdrawals).

The modeling considered variations in recharge rates (down by as much as 20%)

The justification for a 20% reduction is not provided. This variation seems small relative to uncertainty in recent estimates of current recharge on Bainbridge Island (see Section D), and given uncertainties in future climate and land use changes. Running a simulation using a lower bound of physically-plausible future recharge is useful for planning purposes, but there is no evidence presented that this 20% reduction represents a lower bound on future recharge.

The modeling considered... significant increases in water production (up to 167%)

The purpose of this experiment should be clarified. There is no clear justification for such a large increase in water production, and increases in water production decrease the sustainability and reliability of the groundwater system. Increases in population could be offset by decreases in per-capita water use. On-island water use varies substantially (Table 2-9 on pg 2-65 of the GWMP). Exploring how the lowest water users use so much less water than the highest water users, and implementing policy based on that analysis to move the highest water users' consumption to be closer to the lowest water users' consumption could be a path toward reductions in per-capita water consumption.

Page ES-5

Groundwater drainage to surface water could decrease by as much as 40%, with implications for baseflows in streams and wetlands.

The basis for these estimates is not presented in the plan or in the groundwater technical memo. The groundwater model is not capable of developing reliable water balances, particularly for surface water features such as streams and wetlands.

Page ES-6, Table ES-1

Groundwater levels are simulated to decrease up to 6 feet after 100 years. Groundwater levels are simulated to be below mean sea level after 50 years around the South Bainbridge Wellfield.

How much above mean sea level are water levels under current conditions? If they decrease up to 6 feet after 100 years and if they are below mean sea level after 50 years, then they must be very close to seal level under current conditions. Is this true?

This is due to wells set in the FBA creating vertically induced drawdown in the aquitard separating GMA and FBA, ulitimately effecting both aquifers.

Check spelling (ultimately) and grammar (effecting).

Groundwater levels are simulated to decrease up to 50 feet after 100 years. After 100 years, drawdown of 80-100 feet is projected within 500 feet of Island Utility Wells 1 and 3. The area surrounding that zone is projected to drawdown between 60-80 feet.

The first sentence seems to be contradicted by the second. If the levels decrease up to 50 feet, then how can there be drawdowns of 80-100 feet?

Page ES-7, Table ES-1

Groundwater levels are simulated to decrease by 71 feet after 100 years. 80-100 feet of drawdown are simulated within approximately a 2,000 foot radius around Island Utility Wells 1 and 3 and approximately a 1,000 foot radius around Sands Road wells 1 and 2.

The northern part of the island experiences less drawdown, 60 to 80 feet and 40 to 60 feet
Does the 71 feet refer to the average level over the Fletcher Bay Aquifer? This should be clarified. Otherwise, the first sentence again seems to be contradicted by the second.

Groundwater levels are simulated to decrease 5 feet after 100 years. However, the mean groundwater elevation within the Qva unit will still be projected to be nearly 100 feet above sea level, so the 5 foot decrease is relatively small.

A 5-foot decrease in water levels in the top layer of the model (which includes the Qvt and Qva units) could have devastating impacts on wetlands and streams. Is this an average level? It should also be noted that the model does not provide reliable estimates of impacts to the top model layer.

Groundwater elevations are simulated to decrease by 82 feet, 5 feet more than the Mid Impact Planning Scenario.

The reported water level decline for the mid-impact scenario is 71 feet after 100 years. There is no mention of 77 feet in any of the discussions regarding the mid-impact scenario.

Page ES-8

"...the North Bainbridge and South Bainbridge systems—both owned and operated by KPUD—potentially seeing increases of 61– 115% and 194–373%, respectively. These trends reflect increasing demand on the COBI system, particularly as more areas transition from individual wells or small systems to centralized service.

How much of the KPUD increases are due to users transitioning to centralized service, versus increases in per-user consumption, versus new water users (e.g., new development)? These distinctions are important: transitions to centralized service provide opportunities for improved collective sustainable management, while increases to per-

user consumption and/or the total number of water users leads to a less sustainable and resilient groundwater system.

To address these challenges, COBI has implemented comprehensive management strategies, including stormwater programs, groundwater management plans, and climate action initiatives...

Are there other groundwater management plans? If so, can these be referenced and summarized?

Page 1-1.

See comment regarding Page ES-2 above.

Page 1-3.

The GWMP was developed through a collaborative process involving residents, water purveyors, businesses, agriculture, local governments, and state and federal agencies.

Is there a missing word associated with agriculture?

Page 1-4.

As part of this obligation, Bainbridge Island must plan to accommodate 1,977 new housing units by 2044 while preserving groundwater sustainability, in accordance in accordance with the quotas imposed by the Washington Growth Management Act.

Is this a hard and fast requirement, or can it depend on available resources (such as water supply)?

Page 2-6.

*Permit-exempt uses **are water rights** with a priority date of first use, they just do not have to go through the permit-application process...*

Yes, this is correct.

Page 2-10.

Figure 2-4 is labeled as “Groundwater Rights” and yet it does not include permit-exempt wells (see comment on Page 2-6). The figure title should note this.

Page 2-11.

A recent search of the Ecology water rights database (Ecology 2025) indicates about 205 active permitted and certified groundwater rights with a cumulative instantaneous rate of 6,810 gpm and an annual quantity of 5,118 acre-ft/yr.

Does this include permit-exempt uses, which are water rights?

Page 2-14.

The Qa for KPUD’s water systems is 1,466 AFY, based on current water rights across North Bainbridge, South Bainbridge, and consolidated systems such as Manzanita Heights and Sunset Hills.

The listed values for the individual systems total 1,376 AFY. Please check the math or explain the difference.

Page 2-16.

The pumping capacity and water rights are not sufficient to comply with COBI's supply reliability criteria.

The total annual water rights authorized for COBI is 4,399 acre-ft/yr and the total instantaneous rights is 4,957 gpm, according to text on page 2-11. The water production for the COBI in 2021 was 282 million gallons or 866 acre-feet/year, according to Table 8 in EA (2025b). What are the reliability criteria that are not being met by the available water rights?

Page 2-24.

While residential development increased in the 1970s, prompting additional clearing, it did not mark a major turning point; clearing has continued to the present day, sometimes irresponsibly.

This is an awkward sentence that is difficult to understand.

Page 2-26.

Several small wetlands are located throughout the island. Surface water drainage is generally via small spring-fed streams that discharge to Puget Sound. The streams are both permanent (about a dozen) and seasonal (approximately 40), and that permanent streams are fed by springs and seeps in the upper watersheds.

Maps available from the City's website show extensive wetlands and wetland complexes. Describing this system as "several small wetlands" is not accurate.

"Perennial" is typically used to describe streams, rather than "permanent."

Page 2-29

Stormwater runoff on Bainbridge Island is managed through a combination of built infrastructure and natural systems such as wetlands and streams) working together to reduce the discharge of pollutants to Puget Sound.

Delete).

Page 2-30.

Provide citation for Figure 2-13 and explain that it includes private wells. There are no references to Figures 2-12, 2-13, and 2-14 in the text.

Page 2-31.

On-site septic systems contribute to groundwater recharge, with amounts varying across the island. Overall, the contribution is estimated at less than 3 inches per year, equivalent to approximately 4,400 acre-feet annually—more than twice the volume of annual groundwater withdrawals, which total around 2,000 acre-feet.

This is misleading and confusing. On-site septic systems cannot contribute more than the total annual groundwater withdrawals. Three inches per year over the area of Bainbridge Island equals 4,445 acre-feet per year. The total inflow from septic recharge in the EA 2025 model for current conditions is approximately 1,251 acre-feet/year (from model files provided by COBI) or 0.84 inches/year. While 0.84 is less than 3, the way this is written is not informative.

Page 2-33.

Most of the Kitsap Peninsula is underlain by unconsolidated geologic deposits (loose materials like sand and gravel that allow water to flow in the pore space between grains), similar in hydrogeologic characteristics and sequence to those underlying Bainbridge Island. However, there is no evidence of hydraulic connection of aquifers within these similar geologic deposits.

Most of the unconsolidated deposits are highly compacted and not loose.

The EA 2025 model (EA 2025b) suggests significant groundwater exchange between deeper aquifers on Bainbridge Island and on the Kitsap Peninsula. The model and text should be consistent.

Page 2-34.

The major aquifers underlying Bainbridge Island are briefly described below in order of increasing depth and illustrated in illustrates the complex interlayering of aquifers (blue-green color) and confining units (tan and purple color).

This needs rewriting.

Page 2-37

Groundwater flows from areas of higher water levels (greater hydraulic pressure) to areas of lower water levels (lower hydraulic pressure). In an unconfined aquifer, the interface between the unsaturated and saturated zone is called the water table.

Unconfined groundwater flow is usually more directly influenced by precipitation, recharge, and well pumping. In a confined aquifer all the aquifer material is saturated and groundwater flows in response to changes in the confining pressure of overlying layers (which can be of variable thickness and permeability). This response to changes in precipitation, recharge, and pumping are often more subtle than in a water table aquifer.

This paragraph is mostly wrong and should be rewritten by someone with a background in hydrogeology or groundwater hydrology.

It should be noted that evidence for the connection of these aquifers between Bainbridge Island and the rest of the Kitsap Peninsula is not conclusive, especially for the shallower Perched and Semi-Perched Aquifers.

The units described as the “shallower perched and semi-perched aquifers” are conclusively not connected with the Kitsap Peninsula.

The rate of groundwater flow depends on the permeability or interconnectedness of the pore spaces in the sediment or bedrock and the hydraulic pressure exerted by the water in the system. This relationship is characterized as hydraulic conductivity.

This is not what hydraulic conductivity is. Hydraulic conductivity is directly related to permeability, and does not describe the relationship between flow and pressure.

Table 2-4 shows the range of hydraulic conductivity values for key aquifers on Bainbridge Island, which reflect how easily groundwater can move through each unit. The Qva and QA1 aquifers have the highest values, indicating they are the most productive and important for water supply.

The productivity and importance of aquifers for water supply depend on more than hydraulic conductivity. The units with highest hydraulic conductivity are not necessarily the most productive or important.

Page 2-38.

The units listed on the columns should be ft/day.

Page 2-41.

The lake is not hydraulically connected to deeper aquifers such as the Qva, SLA, or FBA. The basis for this statement is not provided. Based on the models that have been developed by both the USGS and EA, the lake is likely connected to these aquifers.

In addition to streams, ponds and lakes, wetlands cover an estimated 7% of the island (Kato and Warren 2001

Compare this statement to the statement page 2-26 that says “Several small wetlands are located throughout the island.”

As shown, annual average recharge values range between 0 and 17 inches.

It should be noted that 0 inches of recharge occurs offshore. All locations on the island receive recharge.

Page 2-42.

A simplified water budget for Bainbridge Island recognizes that over the long term, the aquifer recharge and discharge is in a state of ‘dynamic equilibrium’ (Welch et al. 2014).

Page 2-43

This recharge is balanced by 6,836-8,203 acre-ft per year discharge to surface water (50-60%), approximately 683 acre-ft per year (5%) discharge via well pumping, and approximately 4,101-5,469 acre-ft per year (30-40%) discharging to the marine environment or to the west towards Kitsap Peninsula (2) (USGS, 2011).

It would be helpful if the document presented a consistent set of values, particularly for the amount that is extracted at wells. See comment regarding page 3-1.

The updated Bainbridge Island model did not include septic system return (Aspect 2015).

The relevance of this is not clear. The Aspect 2015 model is not used. Both USGS models and the EA 2015 model include septic recharge.

Page 2-44

Models are calibrated to observed conditions (including groundwater levels derived from fit for purpose monitoring networks) to evaluate the appropriateness of the assumptions and data used to construct the model (Reilly and Harbaugh 2004)

How does the model calibration described in the groundwater model technical memorandum evaluate the appropriateness of the assumptions and data used to construct the model?

"Output data and results are properly contextualized and interpreted"

It is not clear how the GWMP does this. We do not see how the GWMP contextualizes modeling data and results.

On Bainbridge Island, the groundwater budget was estimated using an updated version of the 2011 U.S. Geological Survey groundwater model (see discussion in Section 4.6.6). There is no Section 4.6.6. A groundwater balance would be very helpful and should form the foundation for a groundwater management plan. THIS IS VERY IMPORTANT.

Page 2-45.

"Solutions or outputs from the model may be non-unique"

Additional discussions should be provided that describe how these non-unique solutions affect how the model results should be considered in management and policy decisions.

Page 2-47.

The 2016 Kitsap Peninsula groundwater model was supported by geological, hydrogeological, a water budget, land and water use, and climate (current and projected data) information described by Welch, Frans, and Olsen, 2016.

The reference year should be 2014.

Table 2-7 indicates approximately 40% decrease in groundwater drainage to surface water. This is an important finding that should be discussed. What are the limitations and assumptions?

Page 2-50.

With the development of the 2025 EA Model, EA has provided COBI with a well calibrated groundwater flow modeling tool that simulates groundwater flow across Bainbridge Island.

It should be noted that the model was calibrated by comparing observed and calculated water levels. It was not calibrated using flow data. While matching water levels is important, it does not eliminate the likelihood of non-unique models. This means that different sets of input parameters (e.g., different combinations of variables describing hydrogeology) can give similar model calibration results, but very different results for future management options. This should be discussed.

The Mid and High Impact Planning Scenarios represent the most conservative, yet reasonable, future conditions with both simulating the maximum estimated sea level rise and the high population growth estimate, and both simulating recharge reduction beyond what is predicted by CIG.

The CIG does not predict recharge. This is an important point to make. There are large uncertainties associated with recharge estimates.

Impact scenarios show that under all simulated future conditions, the Qva is minimally impacted, primarily due to the absence of large water system extraction and the increase in return water associated with increased production offsetting recharge reduction.

The model cannot reliably estimate impacts to the Qva because of the way the USGS model was modified in developing the EA model. These modifications include

combining the upper three model layers, eliminating boundaries that describe streams and wetlands, and assigning drain boundaries to all surface locations.

Page 2-52

The discussions on sea water intrusion should more fully explain that having water levels below sea level does not necessarily mean that sea water intrusion will occur. There can be conditions where water levels below the interior of the island may fall below sea level, and still be fully sustainable without sea water intrusion.

Seawater intrusion indicated by elevated chloride concentrations has been not been documented but may be possible in various locations on Bainbridge Island between 1957 and 2006.

This is an awkward sentence that is difficult to understand.

Page 2-64

...the Derby Downs and Islandwood Estates water system values are not reasonable for water use by ERU and are likely related to errors or other factors."

Why are these numbers not reasonable, and what are the "errors or other factors"? Water use is the part of the groundwater system humans have the most control over, and it could be the most certain quantity in the system with metering. Constraining the uncertainty on water use and understanding the factors that contribute to its variability across ERUs should be prioritized. That understanding can guide policy and infrastructure to reduce per-ERU consumption and improve the sustainability and reliability of the groundwater system.

Page 2-65

Table 2-9. Water Use by Public Water System on Bainbridge Island should be consistent with the water production tables included in EA 2025b. The total annual pumping listed in Table 2-9 adds up to 665 million gallons per year. According to the pie chart on Page 2-67, the private wells and Group B wells would therefore total 225 and 47 million gallons per year, for a grand total of 937 million gallons per year. The total reported in Table 14 in EA 2025b is 845 million gallons per year. This is a substantial difference that should be resolved.

Page 2-73

The City of Bainbridge Island Climate Action Plan (COBI 2020) described the impacts of climate change relevant to Bainbridge Island in terms six areas (temperature, precipitation/extreme weather, sea level rise, vegetation changes, ocean acidification, and slope stability). Three of these areas potentially impact the groundwater system: increasing temperature, projected changes in the timing and intensity of precipitation, and sea-level rise."

Changes in vegetation will certainly impact the groundwater system through evapotranspiration and recharge.

Page 2-74

In 2023, the COBI selected a consultant to conduct a Sea Level Rise Flooding Vulnerability and Risk Assessment for the Island. This project will result in an online

GIS-based map showing existing and future flood vulnerability. The final report will inform capital facilities planning for the 2024 Comprehensive Plan Periodic Update and summarize vulnerabilities for future adaptation efforts. Deliverables from this project are due by June 2024 (CAP 2024).

Has this assessment been finalized? If so, what are the results?

Page 3-1

Groundwater model was updated (latest data, groundwater/surface water interaction, climate change impacts).

This is misleading. The current model cannot reliably simulate groundwater/surface water interaction under current or future climate conditions. The changes made to the USGS models in the EA 2025 model make it less reliable at describing groundwater/surface water interactions.

Approximately 28% of groundwater discharge flows to streams, 53% moves to other natural features including the marine environment and deeper aquifers off-island, and 19% is extracted through wells. This understanding of the water budget helps inform sustainable management practices and future planning efforts.

Where are these numbers from? Note the following from page 2-43: “This recharge is balanced by 6,836-8,203 acre-ft per year discharge to surface water (50-60%), approximately 683 acre-ft per year (5%) discharge via well pumping, and approximately 4,101-5,469 acre-ft per year (30-40%) discharging to the marine environment or to the west towards Kitsap Peninsula.” The difference in the estimated amount extracted by wells is large and should be accounted for.

Page 3-3

This comprehensive approach allowed for a thorough assessment of potential future conditions under different climate and population growth scenarios.

It is not clear that the three scenarios thoroughly or comprehensively describe future conditions. This should be tempered. There are many other realistic scenarios that have not been considered.

The Qva aquifer showed minimal impact under all scenarios, largely due to the absence of large water system extraction and the offsetting effect of return water (EA 2025).

The current model cannot reliably simulate groundwater/surface water interaction under current or future climate conditions. This must be discussed.

Page 3-4

Stream systems are also affected, with baseflow reductions of up to 0.3 cubic feet per second, particularly in the Fletcher Bay and Eagle Harbor watersheds.

What is the source of these estimates? The current model does not include streams or wetlands. How was this calculated?

This analysis reinforces the model's value as a management tool while providing more specific details about projected impacts and recommended mitigation strategies.

It is not clear how the model has been used as management tool. What mitigation strategies have been considered? How was the model used to assess these strategies?

Page 4-3

Water conservation and efficiency remain important priorities, with both systems implementing measures to reduce water loss and maintain sustainable operation (KPUD 2020).

What measures are implemented, and how much do they reduce water loss and maintain sustainable operation?

Page 4-9

Potential impacts extend beyond groundwater level declines. Model simulations predict approximately a 40% decrease in groundwater drainage to surface water.

What is the source of these estimates? The current model does not include streams or wetlands. How was this calculated?

Page 4-12

Peninsula production in shallower aquifers can intercept recharge that could otherwise migrate downward into the GMA and FBA systems (EA 2025).

We don't see where this is described in EA, 2025. Please provide a page number for reference.

Page 4-13

The interconnected nature of the aquifer systems means that land use decisions on Bainbridge Island have far-reaching implications for groundwater resources throughout the region. Computer modeling shows that groundwater withdrawals result in impacts to the broader hydrologic system (COBI 2024), affecting not just local water levels but also regional groundwater availability and quality.

The basis for this is not clear. The statement that land use decisions have "far-reaching implications for groundwater resources throughout the region" seems a little exaggerated.

Page 4-14

The COBI is actively working to address these challenges through the development of a Groundwater Management Plan, which includes updated modeling to assess potential impacts from anticipated population growth and climate change.

Isn't **this** the Groundwater Management Plan?

Page 4-15

These discussions seem out of place and repetitive of other sections.

Page 4-16

This results in about 58% of annual withdrawals returning to the groundwater system, leading to a net consumptive withdrawal of approximately 205 acre-feet per year, which represents only about 1% of the subarea's annual groundwater recharge quantity (KPUD 2020).

This suggests that recharge is 20,500 acre-feet/year over the "subarea". Total Bainbridge Island recharge is given as 13,673 acre-feet/year. What is the "subarea", and what other consumptive systems share that subarea?

At North Bainbridge Well #9, the FBA extends from 1,125 to 1,394 feet below ground surface, with a total thickness of 270 feet (EA 2025). Previous modeling efforts had overestimated the FBA thickness at 454 feet, which could have led to significant misinterpretations of available water supply.

This overstates the significance of whether the FBA is 270 feet or 454 feet thick at a particular location. The important hydrogeological parameter is transmissivity for confined aquifers, which is the product of thickness and hydraulic conductivity. Being off by a factor of two on thickness at a particular location is not that significant, when compared to uncertainties in hydraulic conductivity.

Over the next 100 years, water extraction rates are expected to rise by 2.2 to 3.3 times, depending on the growth scenario, placing significant pressure on the island's Sole Source Aquifers.

This suggests that water extraction rates are not something that can be controlled and moderated. Perhaps a caveat that says something to the effect of without comprehensive conservation efforts, then the rates may rise by X amount.

Page 4-17

while off-island activity, particularly from the Kitsap Peninsula, could further strain local resources due to shared aquifers.

This is somewhat speculative and perhaps not likely. Is it based on model results? What are the references to support this?

The technical memorandum underscores that these are not inevitable outcomes,
What technical memorandum? Please provide a reference.

Page 4-18.

Section 4.4.7, Identifying Data Gaps Affecting Groundwater Problem Assessment

This is an important section. These data gaps and uncertainties are inherent – there is no amount of data collection or modeling that will fully resolve them. Decisions must be made in the face of these uncertainties. The best decisions and management options are those that are resilient in the sense that they are less sensitive to these uncertainties. It would helpful to note this, and not only focusing on data gaps.

There are also significant knowledge gaps regarding aquifer connectivity, particularly between Bainbridge Island and the rest of the Kitsap Peninsula. The evidence for these connections is not conclusive, especially for the shallower Perched and Semi-Perched Aquifers.

The Perched and Semi-Perched Aquifers cannot possibly be connected to the peninsula, given that they are above sea level.

Page 4-20.

The increase in ET and longer growing season is not expected to significantly impact groundwater recharge because very little recharge occurs from precipitation during this part of the year.

A longer growing season in the Pacific Northwest has the potential for large impacts to recharge; when the growing season expands earlier in the spring and later in the fall, vegetation demand for water overlaps more with the PNW wet season and water availability, which can facilitate more ET than would occur otherwise. Also, a statement that ET has little impact on recharge when there is very little recharge occurring (e.g., during the peak summer) ignores the role of soil moisture state in modulating recharge throughout the year. ET in the middle of the summer depletes soil moisture, and that soil moisture depletion can delay fall recharge when the rain returns, because the soil column has more capacity to store water above the water table.

Page 5-30.

The 2025 EA Model represents an updated and refined version of a previously developed model, providing COBI with a well-calibrated groundwater flow modeling tool that simulates groundwater flow across Bainbridge Island. The model structure accurately represents the existing aquifer framework and reasonably reflects known aquifer flow properties. The impact scenarios offer reasonable estimates of potential future climatic and water use conditions, drawing from available climate change studies and historical population and production trends.

The model does not reliably describe groundwater/surface water interactions. These interactions will play an important role in assessing potential impacts for climate change and increase groundwater production. The description of groundwater flow in deeper aquifers is one possibility out of several and is not the definitive assessment. This paragraph should be modified to note the limitations.

Page 5-36.

Large drawdowns, especially if water levels drop below MSL for extended periods of time, are not a desirable condition in island aquifers used for municipal water supply because marine water can migrate into the aquifer degrading water quality.

This may be true for wells close to the shoreline, but it is not necessarily true for all wells. Wells can draw down water levels below sea level and still be fully sustainable in terms of not causing sea water intrusion.

Page 5-37.

Section 5.8 Aquifer Storage and Recovery (ASR)

It is unlikely that ASR would be feasible on Bainbridge Island. This approach requires a significant volume of de-watered aquifers to provide the necessary storage. The aquifers beneath Bainbridge Island are not expected to become dewatered in any likely scenario. Without this dewatering, ASR simply displaces existing water in the aquifers by pushing it outward. The net increase in available water is typically minimal in these types of systems.

Page 5-41.

Given that conservation is the highest priority management strategy, it is surprising that the description and discussion is so cursory. (The number of words devoted to conservation (607) is barely more than half the number spent discussing aquifer storage and recovery (1,122), an option that likely has very limited applicability to Bainbridge Island.

D. GROUNDWATER RECHARGE

Groundwater aquifers on Bainbridge Island are replenished by rain; however, not all rain that falls on the island will make its way into the aquifers. Rain can evaporate through the plants and land surface (**evapotranspiration**); it can **runoff** into streams, rivers, lakes, and Puget Sound; and it can be **stored** in the surface soil column or water features. The only rain that replenishes the aquifer—the recharge—is that which percolates through the bottom of the soil column. In short: $\text{recharge} = \text{rain} - (\text{evapotranspiration} + \text{runoff} + \text{storage})$.

Recharge estimates are a fundamental component of groundwater management plans, because the amount of water replenishing the aquifers dictates how much water can be sustainably pumped and used for years into the future. However, although the concept of recharge is relatively simple, we have no way of measuring it directly, and estimating it poses considerable challenges.

The most common method of estimating recharge relies on land surface models (Li et al, 2021). These models ideally create computational representations of each of the factors that contribute to recharge listed in the equation above, and they allow the user to experiment with how different parameters and environmental conditions—such as land-use change—impact recharge rates. However, each individual factor that contributes to recharge is far too complicated to represent completely accurately with a computer, so each model must make simplifications and assumptions about each factor, which will inevitably introduce error into the estimates it generates. Different decisions about these assumptions and simplifications lead to substantially different estimates in recharge magnitude. As an example, in Li et al (2021), long term average recharge estimates in the Northwestern U.S. varied by over a factor 3 (106-333 mm/yr) depending on the model used.

Given this uncertainty in estimating recharge, the best practice for management decisions is to use multiple land surface models—each of which makes different assumptions about the factors that determine recharge, with varying input data and parameters, to generate a range of possible recharge rates. Vashon Island bases management monitoring on such a range of estimated recharge of 5-17 in/yr (Vashon Maury Island Groundwater Protection Committee, 2010); while it is beyond the scope of this comment to assess Vashon Island’s methods in generating this range, the important point is that a range of possible values is generated, presumably with strong physical and/or observational support. This range acknowledges the inherent uncertainty that goes into estimating recharge, and it provides managers with enough information to make decisions within that uncertainty.

The current management plan for Bainbridge Island is flawed in that 1) it uses a single number for estimated recharge—~9.3 in/yr—instead of a range, 2) that number varies from previous recharge estimates without acknowledgment or explanation of the difference, and 3) that number is derived from a method that is even more crude than the assumptions and simplifications described below (see Section E). Because of these flaws, the estimated recharge in the current GWMP is unlikely to be correct, fails to responsibly

capture the uncertainty inherent in estimating recharge, and renders the model into which it is fed fundamentally incapable of quantifying how changes in land-use, precipitation, temperature, radiation, or atmospheric aridity may impact recharge. The absence of reliable estimates of recharge rates and a lack of understanding of what controls these rates limits the usefulness of the GWMP for making informed decisions about sustainable water use on Bainbridge Island.

However, it is important to highlight that—even if you do not use the method described above to generate a plausible range of estimated recharge rates, which is admittedly resource-intensive—it is perfectly reasonable to guide decisions about management based on the known relative impacts of various factors on recharge. The Vashon-Maury Island Ground Water Management Plan (1998) uses this approach:

*“Residential low-density development can **reduce recharge by 30 percent** from previous forest cover. Rural pastures also reduce recharge, but their amount has not been estimated because hydrologic parameters have not been developed. (Hartley, David M., King County Surface Water Management, unpublished memo, August 29, 1995.) In addition, any reduction in the water supply to the till layer will reduce the **recharge to regional ground water by as much as 17 percent in areas with 30 percent impervious surface and 70 percent lawn area** (Wigmosta, et. al., 1994). This is because the topsoil above the till layer that provides the sponge-like effect to keep the till constantly supplied with water would be removed.”* (emphasis added)

Here, even though recharge is not quantified with specific values, the authors discuss the evidence-based relative impact of land use decisions on recharge and acknowledge where current understanding is incomplete, as is the case for transitions from forest cover to rural pastures. A similar approach would be appropriate on Bainbridge Island given that, regardless of what the recharge rate actually is, sound management policy will take steps to maximize it as much as possible relative to current conditions.

E. GROUNDWATER MODEL OVERVIEW

The groundwater model used to support the GWMP is described in EA 2025.¹ This model is a descendant of two previous models that were developed by the U.S. Geological Survey: the 2011 USGS model as described in Frans et al. (2011) and the 2016 USGS model as described in Frans and Olsen (2016). The 2011 model focuses specifically on Bainbridge Island while the 2016 model considers all of Kitsap County, including Bainbridge Island.

The EA 2025 model describes a groundwater flow system under current conditions that has important differences compared to the earlier 2011 and 2016 models. In particular, the EA 2025 model describes a system where most groundwater inflow to deeper aquifers occurs as lateral or horizontal flow from off-island sources, while in the USGS models most inflow occurs as vertical flow from above.² This difference has important implications in terms of future impacts from pumping in these deeper aquifers, as described in more detail in sections that follow.

A second major difference between the EA 2025 model and the earlier 2011 and 2016 models revolves around how groundwater/surface water interactions are described. The 2011 and 2016 models explicitly include streams, wetlands, and lakes and can be used to estimate how changes to the groundwater system affect these features. The EA 2025 model does not include streams, wetlands, or lakes. Instead of these features, “drains” are assigned to the land surface across the full model area. These drains remove water from the model if the calculated water level approaches the elevation of the land surface. This severely limits the usefulness of the model for estimating impacts of groundwater pumping on individual streams and wetlands.³

Water Balances

A comparison of water balances among the three models shows important differences between the EA 2025 model and the previous USGS models in terms of groundwater movement. The water balances described below are based on estimates derived for 2008. This is the last year included in the 2011 USGS model and was also the year used to illustrate water balances in the 2011 model.

¹ The file name for the model that was provided as part of the peer review package is entitled “cobi_nwtmodelv2_9layersR2_edits13024.gwv” with a time stamp of 4/12/2024.

² The deeper aquifers are referred to as the QA1, QA2, and QA3 hydrogeologic units. On Bainbridge Island, these hydrogeologic units correspond to the Sea-level aquifer (SLA), the glaciomarine aquifer (QA2), and the Fletcher Bay aquifer (QA3).

³ The streams, wetlands, and lakes were removed from the model to improve model stability and to reduce the runtimes required to complete model simulations. This approach is not a generally-accepted practice for developing models that are intended to describe groundwater/surface water interactions.

Table 2 compares horizontal and vertical inflow and outflow for the three deeper aquifers on Bainbridge Island. Outflow from wells and the overall change in the amount of water stored in each aquifer during 2008 are also included.⁴ The results included in Table 2 show that while the overall net inflows to each aquifer are similar (as shown in the last row), the source of these inflows is significantly different (particularly for the QA2 and QA3 aquifers. The USGS 2011 model shows much more vertical inflow.

Table 2. Horizontal and vertical flow in aquifers for 2008 as depicted in the USGS 2011 and EA2025 models. All values are acre-feet per year.

	Aquifer					
	QA1 (SLA)		QA2 (GMA)		QA3 (FBA)	
	EA 2025	USGS 2011	EA 2025	USGS 2011	EA 2025	USGS 2011
Horizontal inflow	292	302	422	200	714	364
Horizontal outflow	3,024	5,011	407	1,464	212	612
Vertical inflow	4,582	7,918	409	2,290	360	1,057
Vertical outflow	917	2,369	357	983	21	-81
Wells	936	1,057	67	44	841	890
Storage change	2	-2	-1	-1	0	0
Net horizontal	-2,732	-4,709	15	-1,264	502	-248
Net vertical	3,665	5,549	53	1,307	339	1,138
Overall net	933	840	68	43	841	890

Table 3 shows monthly recharge rates and inflows through the top of the three aquifers on Bainbridge Island for the USGS 2011, USGS 2016, and EA 2025 models on a monthly basis.⁵ This table shows that while recharge rates are similar for the USGS 2016 and EA 2025 models, the amount of vertical inflow to the QA2 and QA3 aquifers is significantly less in the EA 2025 model as compared to both the USGS 2011 and USGS 2016 models.

⁴ The 2008 results were used in the comparison for several reasons. First, 2008 was the most recent year simulated using the USGS 2011 model. The recharge estimates developed in the USGS 2011 model were also based on streamflow measurements collected in 2008 and the report describing the USGS 2011 model (Frans et al., 2011) included water balances for 2008.

⁵ The recharge rates listed in Table 3 are discussed in more detail in the subsection below entitled "Recharge as model input."

Table 3. Recharge rates and vertical inflow to aquifers for 2008 as depicted in the USGS 2011, USGS 2016, and EA2025 models. All values are inches per year.

Date	Recharge (inches)			Inflow through aquifer top								
				QA1			QA2			QA3		
	USGS 2011	USGS 2016	EA 2025	USGS 2011	USGS 2016	EA 2025	USGS 2011	USGS 2016	EA 2025	USGS 2011	USGS 2016	EA 2025
Jan-08	2.23	1.43	1.41	0.469	0.456	0.256	0.124	0.114	0.022	0.036	0.034	0.017
Feb-08	2.18	1.40	1.17	0.442	0.426	0.241	0.117	0.106	0.021	0.033	0.031	0.016
Mar-08	1.89	1.20	0.94	0.466	0.446	0.257	0.126	0.118	0.022	0.036	0.035	0.015
Apr-08	1.44	0.90	0.30	0.444	0.418	0.247	0.123	0.114	0.020	0.035	0.036	0.016
May-08	0.54	0.30	0.00	0.432	0.392	0.256	0.126	0.114	0.021	0.036	0.038	0.020
Jun-08	0.09	0.00	0.00	0.455	0.349	0.248	0.139	0.104	0.020	0.035	0.037	0.026
Jul-08	0.09	0.00	0.00	0.403	0.365	0.278	0.123	0.103	0.023	0.036	0.042	0.039
Aug-08	0.09	0.00	0.00	0.397	0.357	0.278	0.122	0.097	0.023	0.036	0.036	0.036
Sep-08	0.09	0.00	0.00	0.381	0.341	0.266	0.117	0.090	0.022	0.034	0.032	0.025
Oct-08	0.09	0.00	0.47	0.391	0.328	0.251	0.119	0.088	0.022	0.035	0.027	0.013
Nov-08	0.76	0.45	1.89	0.400	0.353	0.240	0.115	0.088	0.021	0.034	0.026	0.009
Dec-08	2.90	1.88	2.03	0.517	0.460	0.254	0.140	0.103	0.022	0.035	0.029	0.011
Annual total	12.40	7.58	8.22^a	5.20	4.69	3.07	1.49	1.24	0.26	0.42	0.40	0.24

^aThe recharge values assigned in the EA 2025 model appear to occur one month earlier than they should. For example, the recharge assigned to May (0 inches) is the value that should be assigned to June. If the recharge values are shifted to the correct months, the total annual recharge during 2008 in the EA 2025 model is 7.68 inches, which is very similar to the value from the USGS 2016 model.

Role of Confining Units

The comparison of water balances included in Table 2 and 3 shows that vertical flow from upper layers to lower layers is significantly less in the EA 2015 model as compared to the USGS 2011 and USGS 2016 models. The amount of vertical flow is controlled in large part by the vertical hydraulic conductivity (Kv) of the confining units that overlie the aquifers. Table 4 compares the Kv values assigned to the QC2 and QC3 confining units in the various models.⁶ This comparison shows that the values assigned in the EA 2025 model are generally much smaller than the values in the two USGS models.⁷

Table 4. Vertical hydraulic conductivity values assigned to QC2 and QC3 confining units. All values are ft/day.

	QC2			QC3		
	Vertical hydraulic conductivity values assigned to confining units					
	EA 2025	USGS 2011	USGS 2016	EA 2025	USGS 2011	USGS 2016
Average Kv	1.6E-03	1.1E-02	4.3E-02	2.9E-03	1.2E-03	3.0E-02
Median Kv	3.4E-04	9.2E-03	8.0E-03	6.0E-04	3.4E-04	2.0E-03
	Ratio of EA 2025 values to USGS values					
Average Kv		14.0%	3.7%		236.9%	9.6%
Median Kv		3.7%	4.3%		174.4%	30.0%

Figure 1 shows the distribution of vertical hydraulic conductivity values in the QC2 and QC3 confining units in the EA 2025 model. These values are not based on direct measurements, but rather were selected during model calibration.

The relatively low Kv values used for confining units in the EA 2025 model affect the estimates of the current water balances described in the previous section. These Kv values will also affect estimated water level declines under future pumping scenarios. While the exercise is beyond the scope of this peer review, it is likely that using the USGS 2011 or USGS 2016 models would result in lower estimates of water level declines in the deeper aquifers under future pumping scenarios. This opinion is based on the comparison of water balances summarized in Tables 2 and 3 and the comparison of vertical hydraulic conductivity values summarized in Table 4.

⁶ The QC2 confining unit separates the QA1 and QA2 aquifers and the QC3 confining unit separates the QA2 and QA3 aquifers.

⁷ The technical memorandum regarding the EA 2025 model (EA, 2025) does not describe the vertical hydraulic conductivity values assigned to the confining units in the model. Figures 5-D and 5-F in the memorandum show the horizontal hydraulic conductivity values, but these values are largely irrelevant. Flow in confining units is primarily vertical and is controlled by vertical hydraulic conductivity and is generally independent of horizontal hydraulic conductivity.

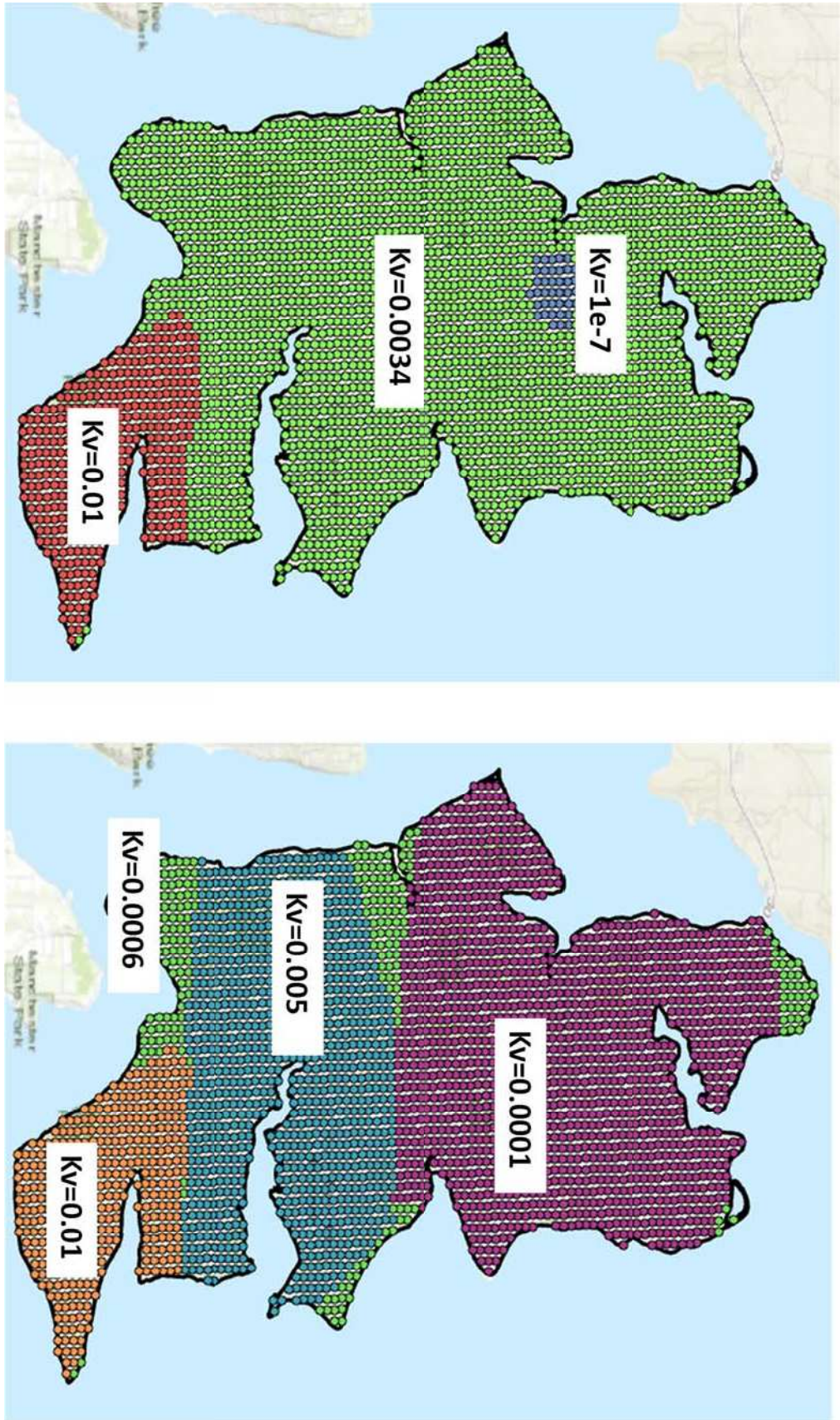


Figure 1. Vertical hydraulic conductivity (Kv) values for the QC2 (left) and QC3 (right) confining units. All values in ft/day.

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KETA WATERS

One might argue that lower K_v values will result in conservative estimates of allowable pumping rates or sustainable yields. This approach is not optimal, as it can result in compounding of conservative assumptions without explicitly recognizing or quantifying the degree of conservativeness.

Recharge as model input

Groundwater recharge is not calculated in any of the three groundwater flow models described above. Rather, recharge is estimated externally from the model and is then incorporated as input to the model. The general method used to estimate recharge was the same for all three models. This method is based on a study published by the USGS in 2001 (Bidlake and Payne, 2001) and is generally described as the Bidlake/Payne method. A general understanding of how this method works may provide an appreciation of the limitations inherent in the recharge estimates used in the models.

The Bidlake/Payne method involves using a relatively sophisticated surface hydrology model called the Deep Percolation Model or DPM. The DPM model estimates recharge based on detailed descriptions of a relatively large number of site-specific variables, including air temperature, solar radiation, evaporation rates, transpiration rates, vegetation types, soil types, and underlying geology. It is not possible to run the DPM model over the large area and the long timescales used in the groundwater flow models. Instead, the DPM model is used to estimate recharge in small watersheds (generally less than several square miles) over time periods on the order of one or two years. The recharge estimates from these detailed DPM models are then extrapolated over the full area of the groundwater model and over the full length of the time period considered in the groundwater model. This extrapolation is accomplished using relative simple regression equations.

For the USGS 2011 model, the regression equations used for the extrapolations were developed using the DPM results for data collected from October 2007 through September 2008 in the Springbrook Creek watershed on Bainbridge Island. For the USGS 2016 and EA 2025 models, the regression equations were developed using DPM results for data collected between August 1994 and April 1996 in several watersheds in the vicinity of SUBASE Bangor (Bidlake and Payne, 2001). It is not clear, based on the available information, if the regressions used in the USGS 2016 and EA 2025 models are better or worse than the estimates used in the 2011 USGS model. As shown in Table 3 in Section E, the estimates in the USGS 2016 and EA 2025 models are approximately 60% of the values in the USGS 2011 model.

It should be noted that the Bidlake/Payne regression equations provide estimates of annual recharge rates. These annual recharge rates are calculated based on annual precipitation rates. The recharge estimates do not depend on how that precipitation is distributed throughout the year. For example, a year with a very wet spring and very dry fall will have the same annual recharge rates as a year with a very dry spring and a very wet fall, provided the annual total precipitation is the same.

The annual recharge rates are partitioned among the different months the same way for all years, regardless of when the precipitation occurs. Table 5 lists how these annual recharge rates are distributed throughout the year. For example, the recharge that is assigned to April is always 12% of the annual recharge and the recharge assigned to November is always 6% of the annual value. These percentages do not change from year to year and do not depend on when precipitation occurs within the year and they do not depend on how wet or dry the land surface may be.

Table 5. Percentages of annual recharge assigned as monthly rates.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
19%	18%	16%	12%	4%	1%	1%	1%	1%	1%	6%	25%

Model Calibration

The EA 2025 model was calibrated using a trial-and-error approach in which calculated groundwater elevations were compared to observed elevations. A comparison of calculated and observed flows was not done, in large part because there are no streams included in the model. It is generally recommended that data of different types should be included in the calibration process to the extent possible (e.g., Hunt et al., 2005).

The approach used to calibrate the EA 2025 model often results in non-unique parameter estimates. This means that different sets of input parameters (e.g., different combinations of hydraulic conductivity values) can give similar model calibration results, but very different results for future management options.

Figure 4 in the EA Groundwater Flow Model Technical Memorandum (EA,2025b) is used to describe the model calibration. The figure is reproduced below as Figure 2. The following excerpt from the EA memorandum is used to describe the figure:

“An observed versus simulated graph of groundwater levels is shown on Figure 4 along with two dashed lines showing the 5% and 10% error. Ideally, all monitoring points would lie within a 10% error. For this model, 97% of modeled points fall within 10% error (9,259 out of 9,574).”

Figure 4 in the EA memorandum and its associated description present a misleading assessment of the calibration statistics. The dashed lines do not show 5% and 10% error. Rather, it appears that the +/-10% line actually shows plus or minus 30 feet, which is approximately 10% of the largest water level value shown on the graph. Most of the water levels are significantly less than 300 feet, and a 30-foot error is significantly larger than a 10% error.

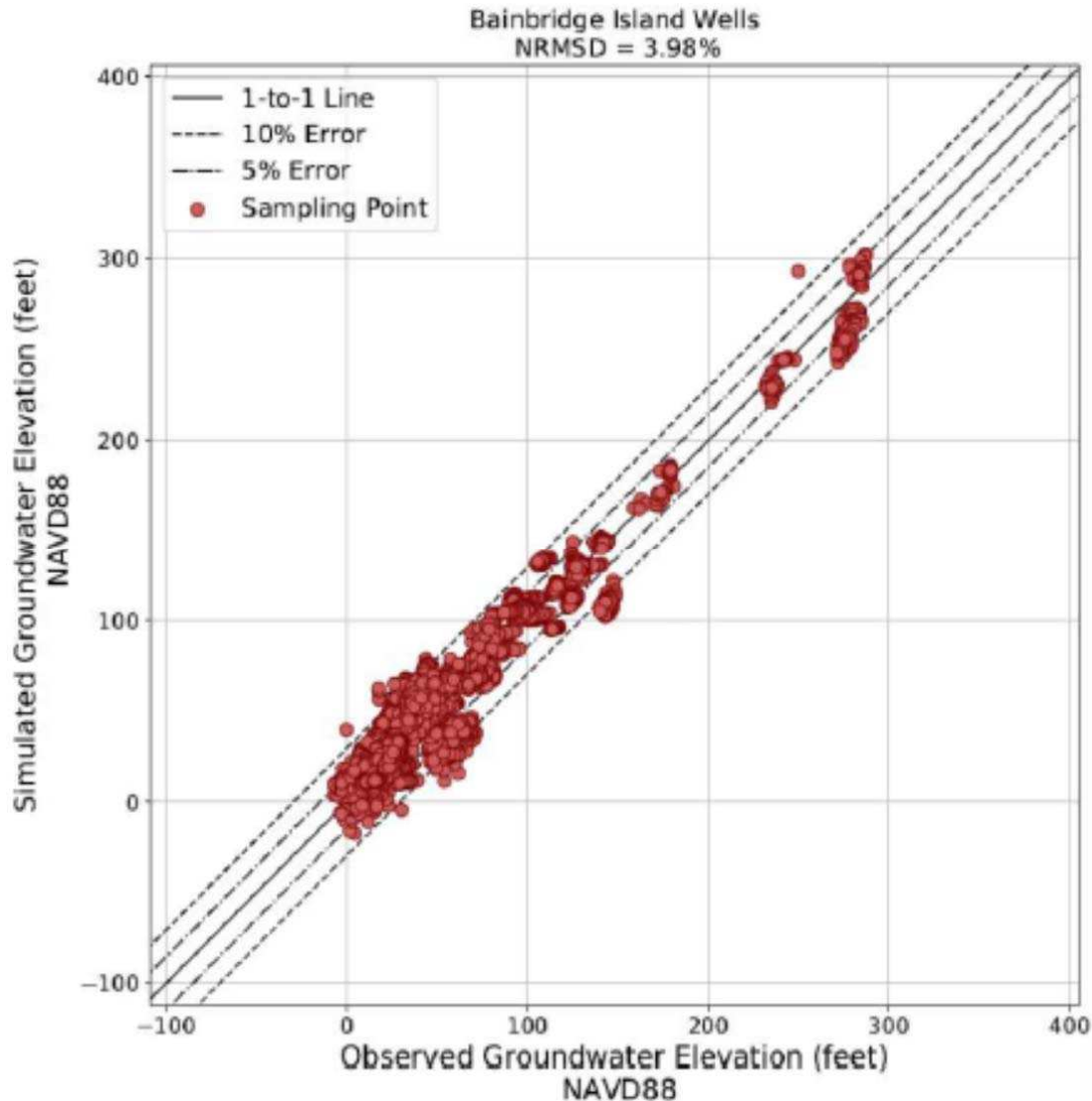


Figure 2. Plot of observed and calculated groundwater elevations as shown in Figure 4 from the EA groundwater modeling technical memorandum (EA, 2025b)

Figure 3 presents an alternative approach for showing the $\pm 10\%$ error lines and compares these lines to the observed and calculated groundwater elevations in the range of 0 to 100 feet.⁸ As an example, the $\pm 10\%$ error line for an observed water level of 30 feet is ± 3 feet. The difference between observed and calculated groundwater elevations is significantly larger than 3 feet for those observations in the vicinity of 30 feet. Most of the calculated water levels shown in Figure 3 fall significantly outside the $\pm 10\%$ lines.

⁸ The data shown in Figure 3 were taken from the file "results_31824_i2.csv" with a time stamp of 7/28/2025, 1:57 PM. This file was included in the package of materials provided by COBI for the peer review. Only those wells that are located on Bainbridge Island are included in the figure.

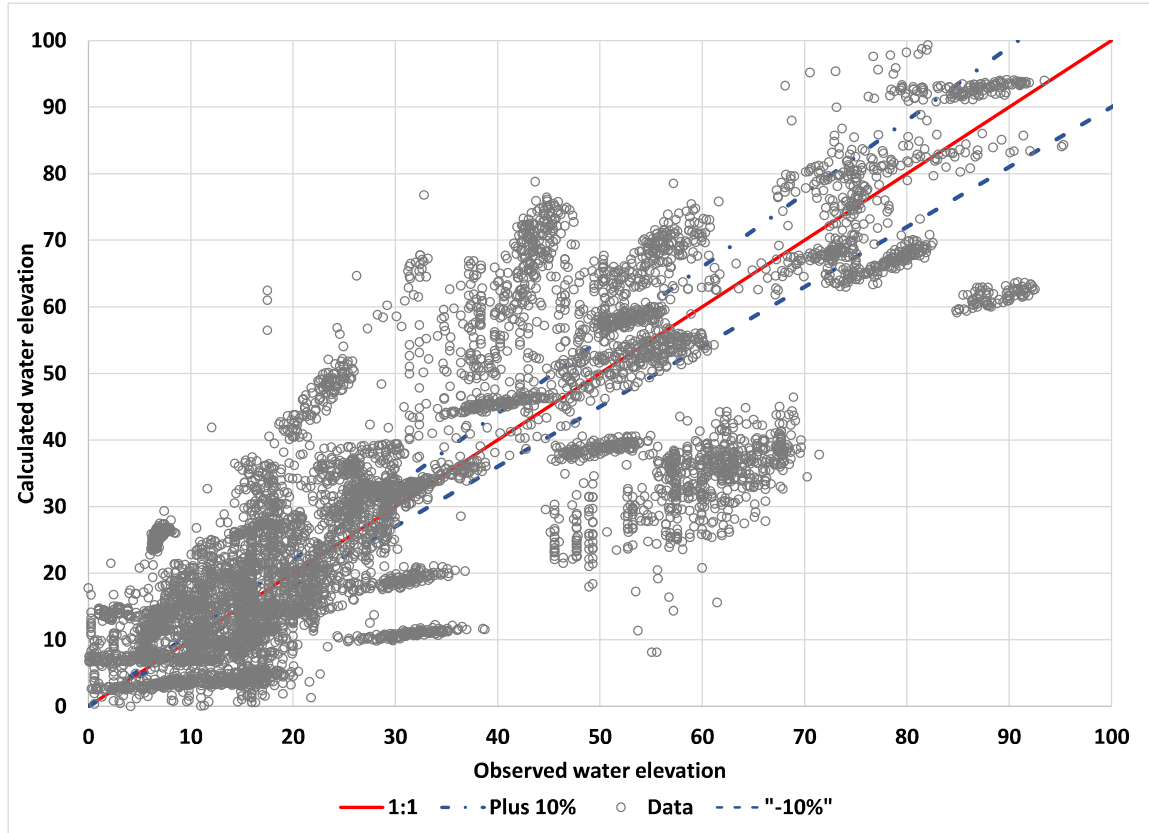


Figure 3. Comparison of observed and calculated water levels with +/- 10% error lines

As part of our peer review, we ran the EA model and graphed observed and calculated water level elevations for wells on Bainbridge Island.⁹ The results are shown in Figure 4. A comparison of these results with the results included in the July 2025 tech memo (reproduced in Figure 2 above) shows significant differences. In particular, the calculated water levels from our simulations are approximately 50 feet higher than the observed levels.

In response to the results shown in Figure 4, we emailed EA Engineering on September 4, 2025 asking if there was a different model version.¹⁰ We heard back on September 18, 2025 that there was not a different version.¹¹ We have therefore assumed that we have the model version that was relied upon in developing the GWMP.

⁹ The model version that we have is "cobi_nwtmodelv2_9layersR2_edits13024.gwv" and the time stamp is 4/12/2024.

¹⁰ Email to Luke Flores, EA Engineering, September 4, 2025.

¹¹ Email from Lee Garret, EA Engineering, forwarded by Chris Wierzbicki, COBI, September 18, 2025..

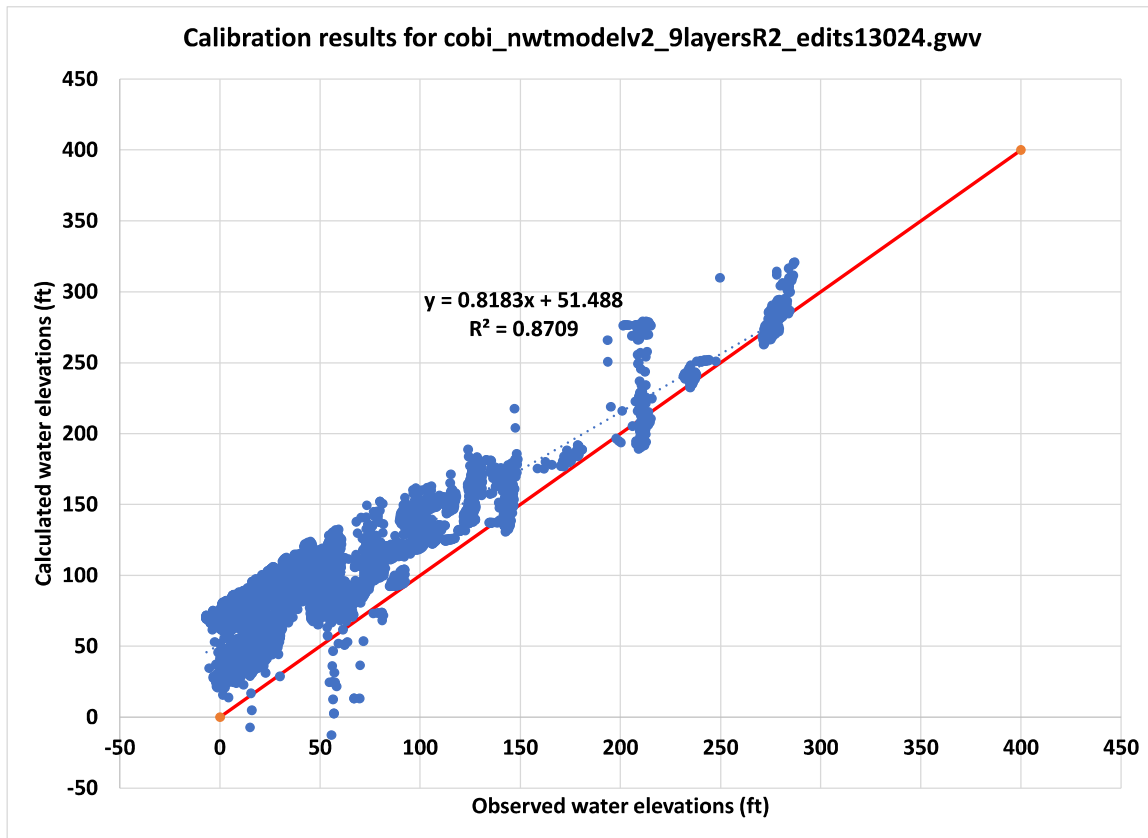


Figure 4. Plot of observed and calculated groundwater elevations derived by running the model provided as part of the peer review process.

F. PLANNING IN THE FACE OF UNCERTAINTY

Given the complexity and interdependence of the earth system, and the unprecedented rate of global climate change, uncertainties must be considered when developing predictions associated with the groundwater system. Uncertainty increases as our predictions attempt to describe conditions further into the future for specific local conditions. Any responsible attempts to produce quantitative predictions of future scenarios should address this unavoidable uncertainty and “accurately reflect the limits of current knowledge” (Parker 2010). The current version of the GWMP, and the quantitative modeling results it relies upon, do not fully acknowledge uncertainty in any reasonably-quantitative way and do not accurately reflect the limits of current knowledge. This foundational flaw significantly limits the scientific integrity of the analysis and makes the results potentially misleading for management decisions.

There are methods to quantify uncertainty and generate a range of plausible outcomes for future scenarios. One such method is ensemble modelling. An example of this method is suggested in Section D above for estimating recharge. With this approach, several models are run using different assumptions and simplifications, possibly with varying inputs and/or parameters. The output from these models is then used to attempt to bracket the range of possible outcomes. The approach may require significant resources in the form of data, expertise, and time, and even then, it does not provide a surefire method for quantitative representing uncertainty (Parker 2010). The current draft GWMP’s various recharge, pumping, and sea level modeling scenarios are limited, incomplete versions of an ensemble that under-represents the uncertainty in model parameters and recharge. If the focus is to remain on quantified approaches; we recommend, as a priority, constraining the more certain and knowable quantities like current water usage and pumping and ground water levels (e.g., increasing metering and monitoring). The report does not provide any concrete plan to constrain these more knowable quantities, but it does focus substantial resources on trying to estimate deeply uncertain quantities like future climate and groundwater levels.

To guide local decision-making, the Intergovernmental Panel on Climate Change (IPCC) recommends that stakeholders “need to consider multiple lines of evidence on all physically plausible outcomes (especially when they are contrasting) relevant to a specific decision required in response to a changing climate. Confidence in the distilled regional climate information is enhanced when there is agreement across multiple lines of evidence” (IPCC 2021 TS). In other words, to have confidence in future predictions on a local scale, there must be several lines of evidence—such as ensemble modeling and historical data—that all support each other and agree on a specific range of outcomes. This “distillation” method is the gold standard of climate science; however, it may require interdisciplinary teams of experts and access to data and resources that may make it inaccessible to smaller governments and institutions.

For a small area like Bainbridge Island, the results from quantitative modelling of future scenarios may be so uncertain that they have limited value for guiding specific management decisions. However, as Roe (2012) states in the context of policy decisions on carbon emissions and the global climate, “uncertainty is not ignorance” and “a reliance of policy

makers on scientific and economic analyses to deliver more certainty on how to optimize our future consumption... may be placing more weight on those analyses than they should be reasonably asked to bear.” Instead of being guided by specific, uncertain figures representing future conditions, planning decisions should be made that will result in a resilient groundwater system that will be able to adapt to uncertainty. In this respect, the GWMP is successful in identifying broad management areas that would result in such a system: implement policies that increase water conservation, reduce pumping, and promote increased clean recharge. A groundwater management plan built around these core principles will be the most sustainable and resilient in any future scenario, regardless of the specific quantities of precipitation, recharge, sea-level rise, etc.

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Document 2 - Peer Reviewer Comments on the GWMP Summary Memo

We found summary memo to be very clear and accessible and we think it represents the information in the plan/tech memo well (recognizing that we believe the plan and modeling have flaws that we pointed out in our report). Some specific suggestions include the following:

Page 8.

Impacts to streams and creeks:

Suggested word change: “Impacts on streams and creeks can only be partially evaluated, as the model only **roughly approximates** groundwater contributions to surface water...”

Growth on the Island: “Areas outside Winslow are subject to aquifer protection regulations – all of which substantiates the model’s recharge assumptions.” It is not clear what is meant by substantiating the model’s recharge assumptions.

The model assumes well pumps are always running – a conservative assumption...” It is not clear that this is necessarily a conservative assumption. If the water withdrawal during a particular month is fixed at a particular well, the maximum drawdown from pumping at a lower, steady rate may be lower than the maximum drawdown from intermittent pumping at higher rates followed by periods of resting.

Page 9.

The model has drain boundaries in all cells located in layer 1. These boundaries artificially control water levels and severely limit the usefulness of the model in calculating water levels in the shallow aquifer. You may want to note that the estimates of impacts to shallow aquifers are not reliable.

Page 10.

Again, because of drain boundaries in all cells located in layer 1, the estimated impacts to surface waters are not reliable. We don’t know where that graphic comes from – it was not included in the EA groundwater model tech memo. Table 2-7 in the GWMP indicates a 40% decrease in groundwater drainage to surface water. You might consider dropping the graphic and associated callouts (i.e., Cautious and Modest).

Page 13.

Consider the following revisions: “With modest growth assumptions and modest changes in climate, the Island’s water supply for human consumption is expected to be secure for the 20-year planning horizon. Increased water conservation and managed aquifer recharge are expected to provide resiliency in the 50-year horizon.”

**Technical Peer Review of the City of
Bainbridge Island 2nd Draft Groundwater
Management Plan**

October 21, 2025

**Joel Massmann
Adam Massmann**

Keta Water LP

- 1. Brief Introductions**
- 2. Summary of Conclusions/Recommendations**
- 3. Overall Rationale**

Main Conclusions/Recommendations

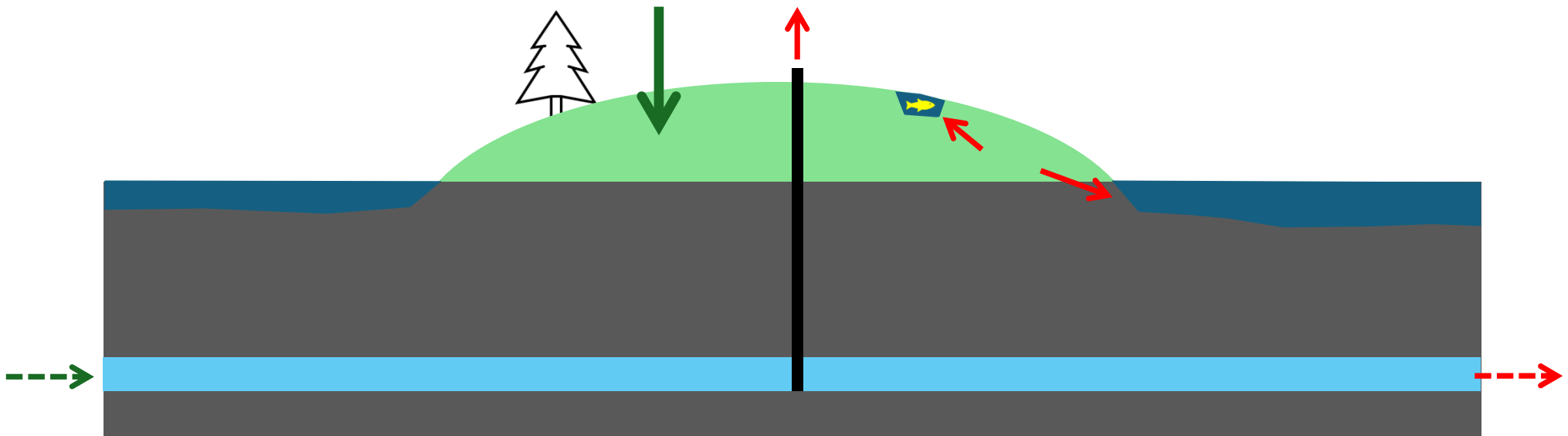
- The GWMP identifies water conservation as the most cost-effective management action. Water conservation will lead to a more resilient system and does not rely on correct groundwater modeling nor certain futures, neither of which are attainable.
- The GWMP identifies managing storm and surface water as a second-most cost-effective management action. More broadly, we would re-state that a second key management option for improving the resilience of the system is to implement infrastructure and policy that will maximize clean groundwater recharge.

Main Conclusions/Recommendations

- Current groundwater elevation data and modeling do not provide definitive evidence that current and future groundwater withdrawals are unsustainable. However, current groundwater elevation data and modeling also do not provide definitive evidence that current and future groundwater withdrawals are sustainable.
- The uncertainties in current and future recharge rates are large and are not likely to be resolved in the foreseeable future. Management actions should focus on developing resilient systems that are less dependent on estimated recharge.

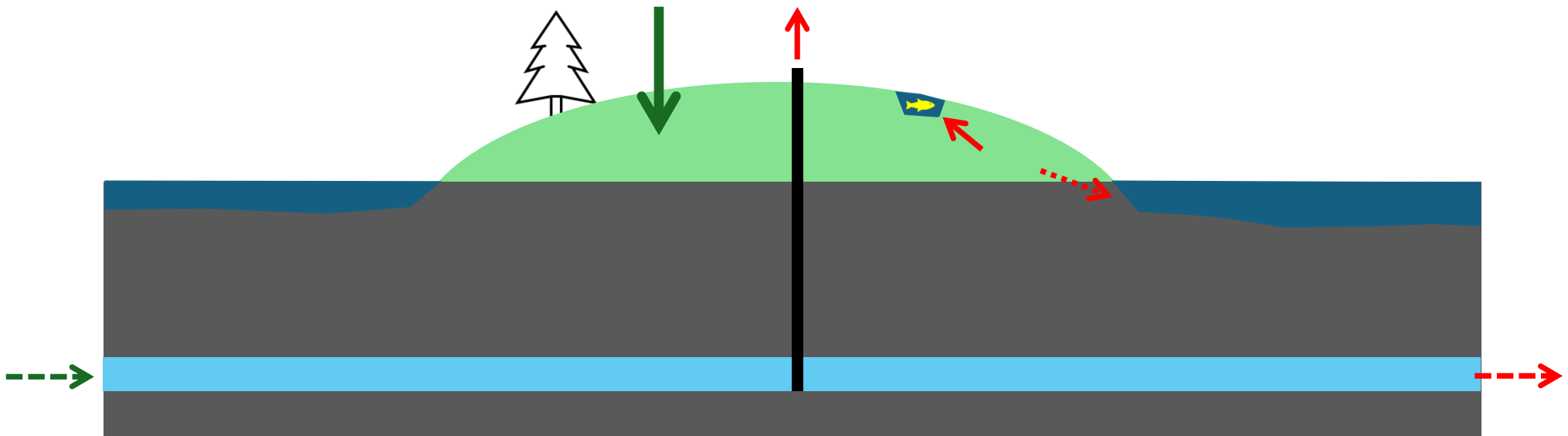
1. Brief Introductions
2. Summary of Conclusions/Recommendations
3. Overall Rationale

Wells + Streams + Saltwater + Aquifer Outflow = Recharge + Aquifer Inflow



$$2,500 + 7,500 = 12,500$$

Wells + Surface Water = Recharge



The uncertainties are large relative to the differences.



City Council Study Session Agenda Bill

MEETING DATE: October 21, 2025

ESTIMATED TIME: 30 Minutes

AGENDA ITEM: (6:40 PM) Consider Changes to Ethics Program,

SUMMARY: Council will discuss changes to the Ethics Program as proposed by the Ethics Board in the attached memorandum. Council requested additional Ethics Board discussion and potential revision on one of the items:

(ii) establish a time limit of 12 months or complaints must be received within one year of the action subject of the complaint, and the individual must be a current Councilmember or member of a commission or have left the position within 12 months for the complaint to be considered.

In a memo dated August 19, 2025, the Ethics Board provided its response, excerpted below:

1. Board Position on Amendment Eliminating Ethics Oversight Over Former Councilmembers

The Ethics Board believes that the proposal to render the Ethics Program inapplicable to councilmembers after they have left office is incompatible with both the spirit and the structure of our existing Ethics Program.

...

2. Board Position on Shifting Statute of Limitations to Time of Discovery

The Board does not support the proposed amendment changing the statute of limitations for filing a complaint from the date of which the alleged event has occurred to "time of discovery."

...

Detailed reasons are provided in the memo.

The Ethics Board has proposed the following path forward:

Adopting a consistent two-year window across both service status and event timing provides clarity for the public, City staff and the Board.

Rather than adopting either of the amendments proposed by the Council, the Ethics Board recommends aligning both standards, event occurrence and post-service eligibility, with the existing two-year timeframe already defined in Article II. Specifically:

- * Complaints must be filed within two years of the alleged *violation's occurrence*; and

- * Complaints may be filed within two years *after* a Councilmember or Advisory Group member leaves service, provided the alleged violation occurred during their term.

AGENDA CATEGORY: Discussion

PROPOSED BY: Executive

RECOMMENDED MOTION:

Discussion only.

COMMUNITY ENGAGEMENT AND OUTREACH:**FISCAL IMPACT:**

Amount:	
Ongoing Cost:	
One-Time Cost:	
Included in Current Budget?	

BACKGROUND: At the November 12, 2024, regular City Council business meeting, Council directed the City Manager to prepare amendments to the Ethics Program in accordance with the following recommendations of the Ethics Board:

- (i) the Ethics Board may provide advisory opinions to the City Manager at the manager's request;
- (ii) establish a time limit of 12 months or complaints must be received within one year of the action subject of the complaint, and the individual must be a current Councilmember or member of a commission or have left the position within 12 months for the complaint to be considered;
- (iii) Ethics training be mandatory for City advisory group members and the City Council; and
- (iv) Ethics Board materials be distributed and posted in a timely manner.

In the Ethics Board's 2024 report and 2025 workplan, approved by City Council on April 8, 2025, the Ethics Board recommended an additional change to remove references to a training pamphlet since pamphlets are no longer created and distributed.

A resolution incorporating Amendments to the Code of Ethics in the Ethics Program was reviewed with the City Council on May 13, 2025 and further was discussed by the City Council on May 27, 2025. On May 27, the City Council remanded the item back to the Ethics Board, with the request for further discussion via a motion "I move to send this back to Ethics Board to reconsider accepting complaints against individuals who are no longer in office and submitting complaints within 12 months of knowledge of the alleged offense versus commitment of the alleged offense."

ATTACHMENTS:

[Ethics Board Response to Council May 27 Action_2025.08.19.pdf](#)

To: Mayor Ashley Mathews
Deputy Mayor Jon Quitslund
Subject: Ethics Board Response to Council's May 27 Action
Date: August 19, 2025

Overview

Following City Council's May 27 discussion on the resolution associated with the Ethics Board's Annual Report and Work Plan, we respectfully submit this memo to outline the Board's position regarding the following amendments proposed by Council:

1. That former Councilmembers be entirely exempt from complaints once they leave office; and
2. That the statute of limitations for filing a complaint begin at the time of *discovery* rather than the *occurrence* of a potential violation.

Per the official minutes of the May 27, 2025 City Council meeting, the resolution was returned to the Board with amendments:

"Specifically concerning accepting complaints against individuals no longer in office and submitting complaints within 12 months of knowledge of the alleged offense versus commitment of the alleged offense"

Below is the Board's response to those proposed changes.

1. Board Position on Amendment Eliminating Ethics Oversight Over Former Councilmembers

The Ethics Board believes that the proposal to render the Ethics Program inapplicable to councilmembers after they have left office is incompatible with both the spirit and the structure of our existing Ethics Program for the following reasons:

- **The Amendment Conflicts with the Language of the Existing Program:** Article II, Section E of the City's Ethics Program establishes a two-year post-service restriction on specific actions by former Councilmembers (e.g., employment benefits or litigation involving prior matters). Allowing no complaints once a Councilmember leaves office would create a direct conflict with this provision and render ethical accountability regarding these post-service restrictions functionally unenforceable.
- **The Amendment Does Not Provide Equity Across Roles:** The proposed exemption applies only to Councilmembers. Members of City Committees and Commissions would still remain subject to ethics complaints after their service. Councilmembers are paid public officials, which carries heightened public accountability obligations. Ethical standards should apply evenly, if not more rigorously, to elected officials.

2. Board Position on Shifting Statute of Limitations to Time of Discovery

The Board does not support the proposed amendment changing the statute of limitations for filing a complaint from the date of which the alleged event has occurred to “time of discovery”, for the following reasons:

- **Uncertainty and Delay:** Determining when someone “should have discovered” a violation introduces ambiguity, invites disputes, and burdens the process with interpretive judgment.
- **Potentially Unlimited Window:** Discovery-based standards could allow complaints to be filed several years after an incident, particularly in cases involving delayed public awareness or withheld information. This would directly conflict with the proposed exemption for post-service Councilmembers, who would be unreachable under that exemption despite a potentially valid complaint.
- **Best Practices:** Most municipal ethics systems use occurrence-based limitations, often between one and five years, because they are clear, administrable, and fair to all parties.
- **Not a Legal Tribunal:** It is important to note that the Ethics Board is not a court of law. Viewing our role through a strictly legalistic lens may inadvertently shift focus away from our educational mission and erode public trust. Ethics exists across industries and professions, not just within legal parameters.

➔ **Board’s Proposed Path Forward: Two-Year Unified Standard**

Adopting a consistent two-year window across both service status and event timing provides clarity for the public, City staff, and the Board.

Rather than adopting either of the amendments proposed by the Council, the Ethics Board recommends aligning both standards, event occurrence and post-service eligibility, with the existing two-year timeframe already defined in Article II. Specifically:

- Complaints must be filed within two years of the alleged *violation’s occurrence*; and
- Complaints may be filed within two years *after* a Councilmember or Advisory Group member leaves service, provided the alleged violation occurred during their term.

Diverging standards increase the risk of confusion and procedural errors.

This approach creates consistency across Code sections and aligns with the structure already in place for post-service limitations. It is also administrable, fair, and respectful of public process.

Complaint Review and Hearing Examiner Referral

Under the current Code, complaints found to have merit and determined to involve violations of Article II may be referred to the City’s Hearing Examiner. We recognise that escalation to a formal hearing may have reputational implications, particularly for elected officials.

However, the Ethics Board approaches all complaints with neutrality and rigour. Our process is designed to be deliberative, fair, and consistent with the principles of due process. The majority of

complaints are resolved through careful evaluation without requiring a formal hearing. Our role is to apply the Code impartially, not to pursue punitive outcomes.

Clarity around this process is essential. Framing the Board as adversarial may discourage public engagement or obscure the impartial safeguards the Code is intended to provide.

Our Educational Mission

The Ethics Board's primary purpose, as defined by the Code, is educational and deliberative. We are not an enforcement body, nor do we initiate complaints or act in an adversarial capacity. Our role is to clarify standards, help uphold public trust in governance, and review submitted complaints for merit in accordance with the Code.

In light of recent Council discussions, we feel it is important to reaffirm this distinction. Comments during public meetings, such as descriptions of the Board as "coming after" Councilmembers or "sitting in judgment", may contribute to public misunderstanding of our role. While such characterisations may not be intended to mislead, they risk undermining the transparency and trust that ethics processes are designed to foster.

We respectfully encourage Council to help support clear and accurate public messaging so that residents can engage constructively and without unnecessary confusion or fear. Clear understanding benefits everyone, elected officials, advisory group members, and the broader community alike.

Clarifying Origin of Proposed Language

During the May 27 Council meeting, there was a suggestion that certain provisions be sent back to the Ethics Board for redrafting. For the record, the original language under discussion was drafted by City staff at the Council's direction—not by the Board itself.

In addition, edits to Article III, Section B(1) and the removal of Section B(1)(b) were not part of the Board's Annual Report or Work Plan recommendations. When language appears under the Board's banner but originates elsewhere, it risks confusing the public record and undermining the independence we are tasked with upholding.

Implementation Urgency

Finally, we note that several of our recommendations have taken two to three years to resolve. We are currently working to schedule mandatory ethics training for both City Council and all Advisory Groups. Further delays in clarifying the Code and finalizing the resolution will postpone this training, potentially limiting its effectiveness. Timely and clear guidance is needed to ensure that the next stage of implementation is aligned with current policy.

Our Commitment

The Ethics Board remains committed to collaboration with Council to ensure our City's ethics policies are clear, consistent, and reflective of best practices. We believe a unified two-year standard is both fair and enforceable, and we respectfully urge Council to reconsider the proposed changes in light of these concerns.

We welcome continued dialogue during a public session or through any other appropriate venue.

Current Ethics Board Members: City of Bainbridge Island

Doña Keating, *Chair*

Position 1

Term Expires: June 2026

Karen Anderson

Position 2

Term Expires: June 2026

Eve Sherling

Position 3

Term Expires: June 2027

Rafael Escandon, *Deputy Chair*

Position 6

Terms Expires: June 2028