

To: Bainbridge City Council

From: COBI Environmental Technical Advisory Committee

Re: ETAC Recommendation on *City of Bainbridge Island High Resolution Land Use and Land Cover Map* Proposal from UW Remote Sensing and Geospatial Analysis Lab

BACKGROUND

A proposal has been made to the City of Bainbridge Island regarding remote sensing and analysis of Bainbridge Island to support SMP monitoring. The proposal will produce a high resolution Land Use and Land Cover (LULC) map to describe the spatial distribution of vegetation, impervious surfaces, and a number of other potential ecological indicators on Bainbridge Island (Table 1, from proposal). Although for the purposes of the SMP the data of highest value will be the data that describes the shoreline and nearshore, the data set will cover the entire Island and this comprehensive coverage provides several additional benefits to the City for other planning and public works purposes (discussed further below). The investigators would conduct object-based image analysis (OBIA) of multispectral aerial imagery (visible light and near-infrared radiation) and LiDAR data. This technique incorporates the size, shape, texture, and spectral signature of objects in automated classification of imagery. The accuracy of the resulting LULC map will then be assessed, improved, and reported through manual interpretation of the data, as well as ground verification. The Remote Sensing and Geospatial Analysis Lab (RSGAL) has used this process to successfully produce similar LULC maps for the City of Seattle, City of Olympia, and the City of Tacoma.

Table 1.

Indicator	Habitat	Water Quality	Water Quantity
Forest cover	X	X	X
Lawns	X	X	X
Shrubs	X	X	X
Marine, freshwater riparian vegetation	X	X	X
Impervious surfaces	X	X	X
Roads	X	X	X
Floodplain area	X	X	X
Wetland acreage	X	X	X
Overwater structures	X	X	
Invasive plant cover	X		
Seagrass, kelp beds	X		
Large woody debris	X		
Trees > 100ft. tall	X		
Shoreline erosion ¹	X		

Note 1: Added by ETAC as an example of an additional indicator of shoreline changes. In this case a mid-90s LIDAR data set is available for comparison.

The goal of this project is to provide needed baseline data including natural resources and land use cover types for the COBI, and the information generated could be used for a variety of purposes by City staff and contractors. For example, ETAC has proposed that the City develop a monitoring program for the Shoreline Management Program (SMP), based on a need to measure a baseline and changes over time to address the Ecology requirement for No Net Loss (NNL) of shoreline functions as a basis of the COBI SMP. However, Ecology has provided little guidance as to how NNL should be measured, and thus COBI is in the position of defining our own methods to monitor shoreline functions and measure NNL. Developing the baseline for current shoreline uses and functions is a critical first step and this project can provide valuable information. However, we see this project as one key component of a larger monitoring program. Additional uses for this remote sensing data that have been noted by City staff include:

- engineering uses
- developing both leaf-on (summer) and leaf off (winter) orthophotos; the former are valuable for evaluating forest community composition, invasive plant distribution and canopy cover, while the latter are important for understanding ground conditions including impervious surface density and abundance;
- land use and vegetation cover for the upcoming update of the Critical Areas Ordinance (CAO) and Comp Plan.

RECOMMENDATION

ETAC members have discussed several versions of this proposal. In general, we believe this type of data has substantial value in evaluating current conditions and changes over time to the shorelines of Bainbridge Island, and providing important current information about the island as a whole for comprehensive planning purposes.

The strengths we see in the proposal that have been brought forward include the fact that there is value-added information that can be gained by working with an academic laboratory that has the capacity to ask and answer targeted research questions; the research lab proposing the work has a track record of completing similar work with other municipalities; and the lab is positioned to initiate the data collection and research in the near term, which is beneficial for collecting baseline data quickly after SMP adoption.

ETAC does recommend that several conditions be clearly established with respect to this proposal or any similar proposal to collect and analyze baseline remote sensing data:

- the proposal needs clarification about who will collect the ecological function data and the timeline for data collection.
- the end result must be a product that will be useful to and useable by COBI staff and others. The product should constitute a data set and analytical tools that the City can actually take ownership of, that can be housed within the COBI systems, and be accessed as needed by City staff. This may require the training of a qualified staff person to be able to coordinate with the proposing entity, and access and use the data. If COBI does not elect to train staff and house the data set in house, the City needs to recognize that this may limit their flexibility in using the data to ask follow up questions and track changing conditions over time, and may necessitate the continued or periodic

employment of academic or consulting entities to do this work for them. We also recommend the city make the data available to other entities, agencies, researchers, and others.

- As discussed, there are a wide variety of opportunities to use this type of remote sensing data for multiple programs and requirements including the Comp Plan, the CAO, and ongoing needs by Public Works. One of its most immediate applications, that is the focus of this proposal, is the generation of data useful for establishing baseline conditions for the SMP. To that end, it is critical that COBI carefully and closely defines the questions that are to be asked within the scope of this proposal, so that it is receiving answers to SMP-relevant issues that are consistent with the City's priorities in monitoring NNL and fulfilling the obligations of the SMP.
- To support the above goal, we recommend that ETAC continue to assist the project team with scoping of the research questions and ecological function data required, be briefed regularly on the project, and participate in technical review of interim and final deliverables.
- ETAC recommends that the City outreach to and coordinate with other Island entities that could benefit from this type of information, such as the Bainbridge Island Land Trust and the Bainbridge Island Metropolitan Park District. These entities may be useful in expanding the scope of funding assistance for which this kind of project may qualify, as well as in maximizing the benefits of this data collection by including additional groups with an interest in the stewardship and management of natural resources.