Marine Bulkhead Replacement

The purpose of this document is to provide guidance and assistance when reviewing and permitting hydraulic project applications for the replacement of an existing marine bulkhead including evaluation of the design and development of potential mitigation requirements. The guidance provides the habitat biologist with basic information to process an application.

Table of Contents

1. Application Receipt

Applications or pre-applications are submitted to Aquatic Protection Permitting System (APPS). The application and plans are reviewed in Olympia for statutory completeness under RCW77.55.021. Once the application is Accepted, the Habitat Biologist reviews and processes the application within APPS. There are many training videos and self-help documents for this process located on SharePoint.

2. Office Review

Purpose

The office review allows the biologist to become familiar with the project details, location, and determine if the project was designed to meet WAC. The biologist must be knowledgeable on RCW 77.55, WAC 220-660, and WAC 220-660-370 since the RCW and WAC are where the agency's authority comes from. Presence of fish life, including the species present, strongly influences proper project design.

Tools and Resources

Data for reviewing hydraulic projects comes from a variety of sources and may come from government agencies (local County GIS), Non-Governmental Organizations (Wild Fish Conservancy Maps), as well as private sources of information. Most of this data is available either through the WDFW GIS database or through various internet

websites. Other data may be in the form of hardcopy records acquired over time or from coworkers in the agency. All of this information is useful in preparing, but ultimately nothing replaces getting out on the ground for projects. Below is a list of commonly used resources:

- NOAA Tides and Currents program- Provides the localized elevation for MHHW.
- Google Maps and Bing Maps (provides birds eye view)- for site context, local characteristics, neighboring properties, potential equipment access (barge vs upland), estimation of Ordinary High Water Mark (OHWM), upland vegetation, vicinity of house to bluff, relative size of bluff, fetch, and orientation.
- County Assessor's parcel search- County permit information, past violations, county planner assigned to project, and parcel data. Some counties have great GIS tools with recent photo imagery to document recent changes and even violations.

Resource Information

- WDFW Forage fish map- Documented spawning locations of Pacific Sand Lance, Surf Smelt, and Pacific Herring. The measuring tool is useful for identifying distance to documented beaches and for measuring fetch. Forage fish are identified critical species which are important prey for salmonids, birds, and marine mammals. Timing provisions should be included for both beach spawning forage fish (surf smelt and sand lance) and for off-shore (pacific herring) forage fish if they may be impacted by construction activities (e.g. barge operations, heavy siltation, etc.) Beaches that are documented or have documented surf smelt spawning adjacent to a project site, and where spawning closure windows are longer than 6 months, may allow some work where forage fish survey protocols are conducted and no eggs are found. The forage fish surveys are conducted for surf smelt only, sand lance spawning beaches are a hard closure during the spawning season. See WAC 220-660-340 for more details. Not all herring spawning beaches require a closure if the bulkhead is being replaced. WDFW can ask the agent for a barge access plan, or show upland access areas if they proposing to conduct work from the upland. The biologist should check in with Fish Program Herring samplers to get the most recent use of a stock's spawning range and any updates on recent spawning activity.
- WDFW PHS on the web- Known location of priority habitats and species (PHS). PHS may identify other species of importance (oyster/shellfish beds) where barge grounding should be limited or bald eagle/great blue heron rookeries which we may request the voluntary application of timing windows (as the HPA can only protect for fish life unless we comment during State Environmental Policy Act [SEPA] review). For example, if the beach is a privately owned SFR, then they own the shellfish and can crush with a barge if they want. If the beach is public or the beach is not owned by the uplands,

then perhaps shellfish minimization and mitigation should be considered. Also consider that tribes harvest shellfish commercially on many beaches, you may need to contact the tribal shellfish biologist to determine impacts.

- WDFW Fish Passage Map- Stream specific fish and habitat data if a stream is located at the site and may need a culvert upgrade associated with the project, this is rare, but certainly can occur. Also can find this data in PHS on the web.
- WDFW ArcMap- includes all data above with a previously issued HPA location layer.
- DNR Eelgrass map – Spatially limited but good data for documented beds. This is important if a barge is going to be used to bring in material or equipment. Also to identify depths at which eelgrass may be growing in the vicinity. Generally we allow barges to cross eelgrass when accessing sites without monitoring for eelgrass impacts. It may be wise to restrict access over eelgrass during herring spawning windows if eelgrass is present. Link to eelgrass surveys should you choose to require them.
- Ecology Coastal Atlas – Drift cells, coastal landforms (including feeder bluffs), eelgrass (data not as accurate), best imagery we have of older shoreline and current up to 2006. This is reportedly being updated in fall/winter 2016/17.
- County drift-cell maps where available.
- Shipman's (2008) Geomorphic Classification of Puget Sound Nearshore Landforms.
- WDFW's "Marine Shoreline Design Guidelines" and "Your Marine Waterfront, A Guide to Protecting your Property".

3. Missing Information

Biologists may require more information at this time in order to evaluate the project. An example may be a geotechnical report (if available); however, assuming the project is in accepted status, the regulatory review clock would not stop while you are seeking this additional information. You could ask the applicant to place the application on hold while they obtain the information. Geotechnical reports are typically required for new construction, and they are also commonly completed for replacement bulkheads to show "need" but that varies with jurisdictions.

The biologist should be timely in requesting additional information. Any needed additional information should be requested within 10 days after receiving the complete application. If information needed to issue a permit is not provided, the agency may deny the application or the applicant may put it on hold before the end of the 45-day processing period. If these situations occur you should be working closely with your supervisor to avoid conflicts.

4. Site Visit

Purpose

Site reviews typically occur as a pre-application review or the review of an active application in APPS. During a pre-application meeting, the objective of the biologist is to assist the landowner or agent. This typically occurs in the form of helping them determine appropriate design options and project scope. The biologist should also discuss mitigation and what might be required depending on the impacts of the final project proposal. This is a great time to let the applicant know what will need to be included in their application for it to be considered complete and for you to issue a permit. After a pre-application review, in most cases, another field visit is not necessary. Additional assistance can be found on WDFW's website here.

When processing a formal application, the purpose of the site review is to verify structural measurements, appropriateness of the project proposal, determine project impacts, and appropriate mitigation. Once on site, the biologist should offer the applicant or agent time to explain their design proposal and what they wish to accomplish. The biologist may find the design is inappropriate for the protection of fish life and must provide suggestions for modifying the plans or suggesting an entirely different design.

- Verify information assembled from the office review.
- Identify the OHWM and determine if the OHWM has re-established behind the existing bulkhead. This usually takes about one to three years and things like pickle weed, barnacles and a wrack line may help with this determination. If a new OHWM has been established, then that is the new location for the bulkhead. If an application for an HPA is submitted for repairs within three years of the breach, the bank protection structure may be repaired or replaced in the original footprint, see WAC 220-660-370(3)a.
- Determine if the site allows for opportunities to pull back the bulkhead and/or allows for soft shore opportunities. (This cannot be required; however, soft shore approaches should be mentioned as an option where appropriate, See Marine Shoreline Design Guidelines or Your Marine Waterfront for guidance).
- Confirm Mean Higher High Waterline (MHHW) matches the plans and datum. Projects located below the MHHW line currently are in USACE jurisdiction and they should be consulted as well. Additionally, knowing the correct location of tidal elevations on the plans help to provide advice and information to applicants on armoring design (For example: will soft armoring work at the site?).
- Identify mode of bulkhead failure if possible.
- Determine length of existing and proposed bulkhead.
    - This should follow the natural curve of the bank and be measured according to the guidelines which can be found in the Marine Shorelines Design Guidelines.

- Document with photos and enter in APPS site inspection.
    - *Identify Project Impacts and Mitigation Opportunities*
- Identify shorelines and upland vegetation to be impacted.
    - Non-native or mature native vegetation, what species, age class, how many?
    - Flag vegetation you want to preserve.
    - Discuss with property owner about removal of non-native species and replanting with native species.
    - Typically require 5:1 mitigation for removing large mature native trees. Additionally, the trees should be incorporated into the beach or bulkhead design. Removal of smaller bushes and vegetation can be 1:1 mitigation, but the plantings should be dense enough to minimize being overtaken by non-native vegetation. Generally, try to encourage applicants to plant heavy for loss and that way they don't have to deal with future weeding as much, shade out the weeds approach.
- Note the position of the bulkhead in drift-cell zone(s): erosion, transport, and/or accretion beach. Note the location of the nearest feeder bluffs to the bulkhead site.
- Identify access and work zone impacts (barge grounding, excavator tracks, etc.).
- Document beach substrate class size (cobble, hardpan, sand, etc.) relative to bluff type. This will help to determine if the site could potentially be used by forage fish if documented spawning has not occurred at the site. In addition, this information is used if beach nourishment is determined to be required for mitigation. Beach nourishment may not be appropriate for the site if the bulkhead is already at MHHW or if the site is all non-native fill.
- Estimate height of the bluff and material composition. This will also be used in the formula for calculating beach nourishment if applicable.
- Estimate natural erosion rate (potential). If a geotechnical report is not available, these metrics will be used to help develop the beach nourishment proposal:
    - Low energy (lagoon) 2"/year
    - Moderate 4"/year
    - High energy (big cobble/ bluff) 6"/year
    - (note: Shipman 2010, defined erosion rates)
- Identify if any other mitigation opportunities that are on site (derelict materials that can be removed, pull the bulkhead face back landward, creation of pocket beach, etc.).

- Identify permanent reference points or bench marks and measure/record those distances on the approved plans. The reference points should taken from the waterward face for the replaced bulkhead (corner of house, tree, deck etc.). See Attachment 1 – Example Plans.
- Optional staking of proposed bulkhead location (not preferred as the stakes could be moved or dislodged, but at the base of a bluff it may be the only option). The method for staking is to place an offset stake to either side of the parcel, so the barge has a landing area, where the bulkhead will be replaced. Stretch a line between stakes, measure from the line to the bulkhead face every 10 to 20 feet. An example of this is shown in Attachment 1. Staking is typically completed with the contractor, measurements recorded on the plans, those plans signed and dated by the contractor and the biologist, and the plans uploaded to APPS. Compliance needs to be done shortly after or during bulkhead installation in case stakes are disturbed. Ideally stake location would be repeatable with triangular measurements.
- Reference points, measurements, or stake locations should be documented on the plans and scanned into APPS.

Safety Highlights

Vehicles must be parked in a safe place to not create a hazard for WDFW staff or the public. Site reviews often involve working around deep and/or flowing water which may present a drowning hazard; therefore a PFD may be necessary to maintain a safe working environment. Be sure to check in/out with a co-worker or supervisor if going to a site visit on your own.

Field Equipment and Tools

In addition to the basic safety equipment, staff should also bring the tools and equipment listed below. Conditions on site will dictate which equipment is used during the field visit.

- Business card or other agency ID
- Copy of application and plans
- IPad or other mobile device
- 100’ tape measure
- Stakes
- Clinometer
- Camera
- Field notebook
- Knee or Hip boots
- Personal Floatation Device (PFD)
- Rain gear and/or other appropriate field clothing

5. Mitigation Determination

Always keep in mind mitigation is based on existing conditions and must be adequate to ensure no net loss of habitat function due to the impacts of the project. Discuss onsite or after the site visit:

- Project impacts to fish and fish habitat,
- Project design and alternatives – as needed,
- Construction techniques proposed and alternatives – as needed
- Mitigation measures for impacts to fish and fish habitat.

Do not surprise the applicant or contractor with mitigation in an HPA not discussed previously. As discussed above, mitigation could include any or all of the following, see Attachment 2:

- Beach nourishment,
- Riparian plantings,
- Removal of derelict debris-generally required in addition to other mitigation but significant or offsite debris could be in place of other mitigation,
- Relocating structure landward-minimizing armoring footprint,
- Placement of large woody debris if appropriate,
- Shellfish seeding - typically only if damage to existing public shellfish resources.

Generally, by the time you are on-site with a contractor or an application is already in the permitting process, the applicant has made up their mind on what kind of structure they want. However, it's never a bad time to discuss soft-shore alternatives provided in WDFW's "Marine Shoreline Design Guidelines" and "Your Marine Waterfront, A Guide to Protecting your Property" if the site is applicable to a less hardened structure.

6. Rules of Thumb

- Once you have drafted the permit in APPS, it is okay to share a draft and supporting documents with the applicant for review, if there is time.
- If the previously existing bulkhead was constructed out of creosote piles, remove and dispose of contaminated soils 1 foot behind creosote bulkhead and cap with imported clean beach nourishment.
- At no time shall more than one cubic yard of material for one foot of lineal length on the beach be placed. Material may be placed off site but within

same drift cell or over time within the five year permit. Basically we want to keep the material as high up on the beach, above MHHW. Below MHHW may require a USACE permit or may bury eggs.

- If a barge is used for construction in an area where eelgrass is documented or the biologist has concerns about eelgrass and prop scour, an eelgrass survey and/or barge operation plan can be requested.
- Ecology blocks and redi rock are not preferred materials for bulkheads primarily because they are prone to failure due to poor drainage. Drainage is difficult to achieve behind structures made out of this material. In addition, the flat surface of ecology blocks typically exacerbates vertical erosion. If ecology blocks are unavoidable, they should be constructed perpendicular to the shore, not parallel, that is the short side of the block should be parallel with the beach and the long side of the block perpendicular. This will allow for optimum stability and drainage; however, it will require extra blocks and extra excavation.
- The waterward face of the replacement bulkhead should not exceed the waterward face of previously existing bulkhead.
- The bulkhead should be buried a minimum of 18 inches below existing grade.
- The bulkhead footprint should only be constructed waterward of existing bulkhead if justified for safety concerns. Mitigation will be required for the increased footprint.
- Large woody material should only be placed on the beach for mitigation if it can be placed above MHHW. Use of chains should be limited to minimize damage to the bulkhead and instead be buried half way into the substrate. An anchored log that floats at high water can act as a battering ram on bulkheads and damage them.
- Beach nourishment specifications should be consistent with Penttila, D. 2007, or should attempt to mimic on-site conditions. A sediment grain size analysis could be appropriate for some projects. But generally, the material excavated for bulkhead footings is decent material to place on the beach as beach nourishment. The exception would be when there is an excess of clay or extremely fine sediments.
- When time and workload allow, it is strongly recommended that a post-construction compliance inspection is scheduled with the applicant and/or agent. The purpose of this inspection is to ensure the project was constructed according to the permit conditions required for the protection of fish-life. Large, complex, or high risk projects should be prioritized for inspection. Additionally, any project that implements novel, nonstandard construction techniques or structures should be inspected. This compliance inspection should be done preferably when the contractor is still on site so as to correct any issues and be recorded in APPS or other permitting databases in a timely fashion.

7. Relevant WACs

This guidance is for bulkhead replacements only.

WAC 220-660-310 - Tidal reference areas
WAC 220-660-320 - Saltwater habitats of special concern
WAC 220-660-360 - Common saltwater technical provisions
WAC 220-660-330 - Prohibited work times in saltwater areas
WAC 220-660-370 - Bulkheads and bank protection in saltwater areas

Hopefully in the future additional guidance will be available for new marine bank protection. It is important to read and understand the differences between RCW 77.55.141 which applies to single-family residence bank protection that will **not** result in a permanent loss of critical food fish and shellfish habitat, and RCW 77.55.021 which applies to nonsingle-family residence bank protection and single-family residence bank protection that does ***not*** comply with the criteria in RCW 77.55.141. The department may deny bank protection applications processed under RCW 77.55.021 that do not provide proper protection of fish life. Appropriate methods to design marine bank protection are available in the department's Marine Shoreline Design Guidelines, as well as other published manuals and guidelines.

8. Example Plans

Please see Attachment 1 for example plans.

9. References

Penttila, D. 2007. Marine Forage Fishes in Puget Sound. Puget Sound Nearshore Partnership Report No. 2007-03, Seattle, WA.

Shipman, H. 2008. Geomorphic Classification of Puget Sound Nearshore Landforms

Shipman, H., 2010, The geomorphic setting of Puget Sound: implications for shoreline erosion and the impacts of erosion control structures, in Shipman, H., Dethier, M.N., Gelfenbaum, G., Fresh, K.L., and Dinicola, R.S., eds., 2010, Puget Sound Shorelines and the Impacts of Armoring—Proceedings of a State of the Science Workshop, May 2009: U.S. Geological Survey Scientific Investigations Report 2010-5254, p. 19-34.

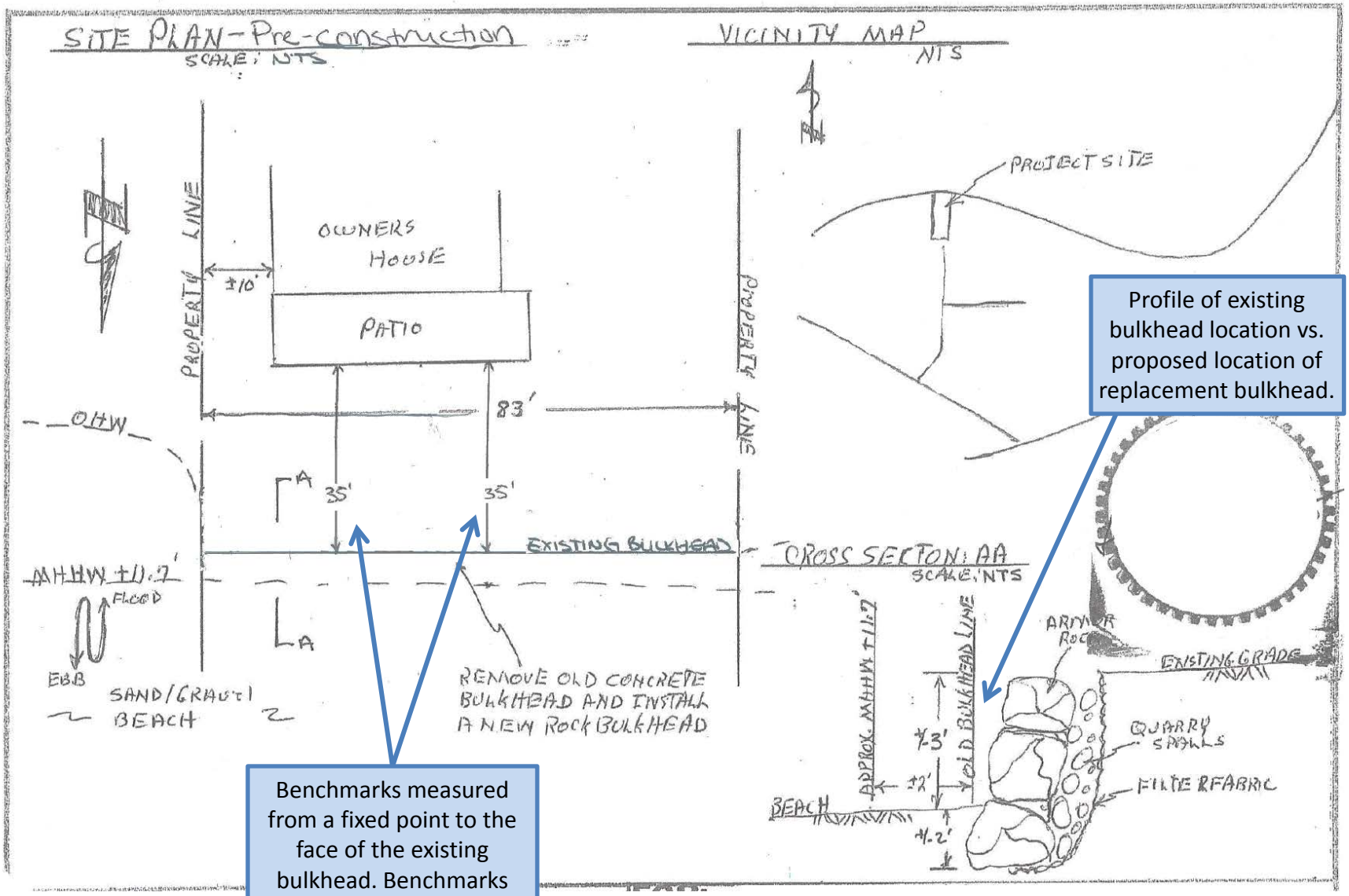
Johannessen and MacLennan; Borde, et.al., East Kitsap County Nearshore Habitat Assessment and Restoration Prioritization Framework

Net Shore-drift in Washington State, Volume 4: Hood Canal Region WDOE

Attachment 1

Example Plans

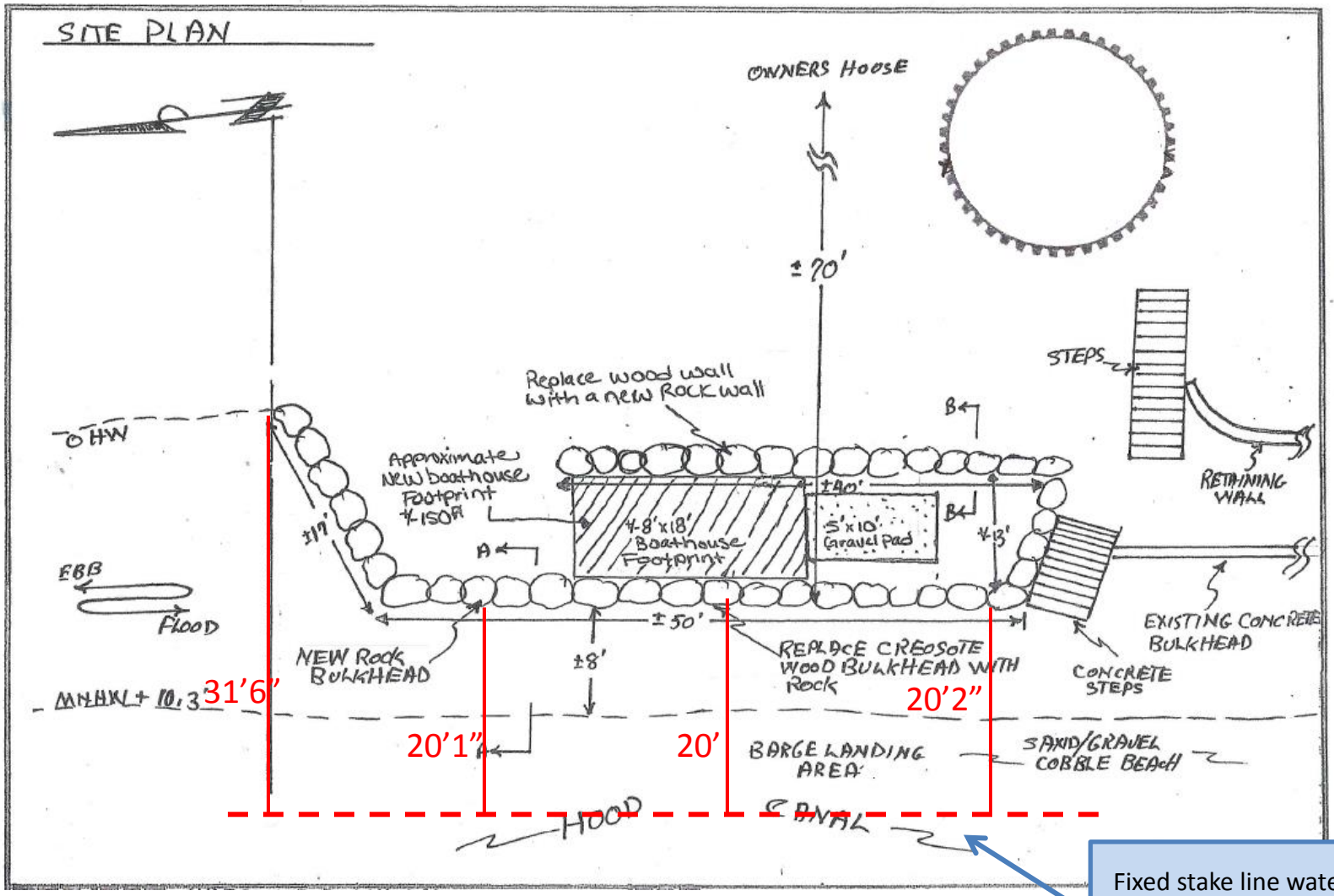
Engineered Drawing Example – Bulkhead Replacement



Profile of existing bulkhead location vs. proposed location of replacement bulkhead.

Benchmarks measured from a fixed point to the face of the existing bulkhead. Benchmarks must last up to 10 years.

Engineered Drawing Example – Bulkhead Replacement

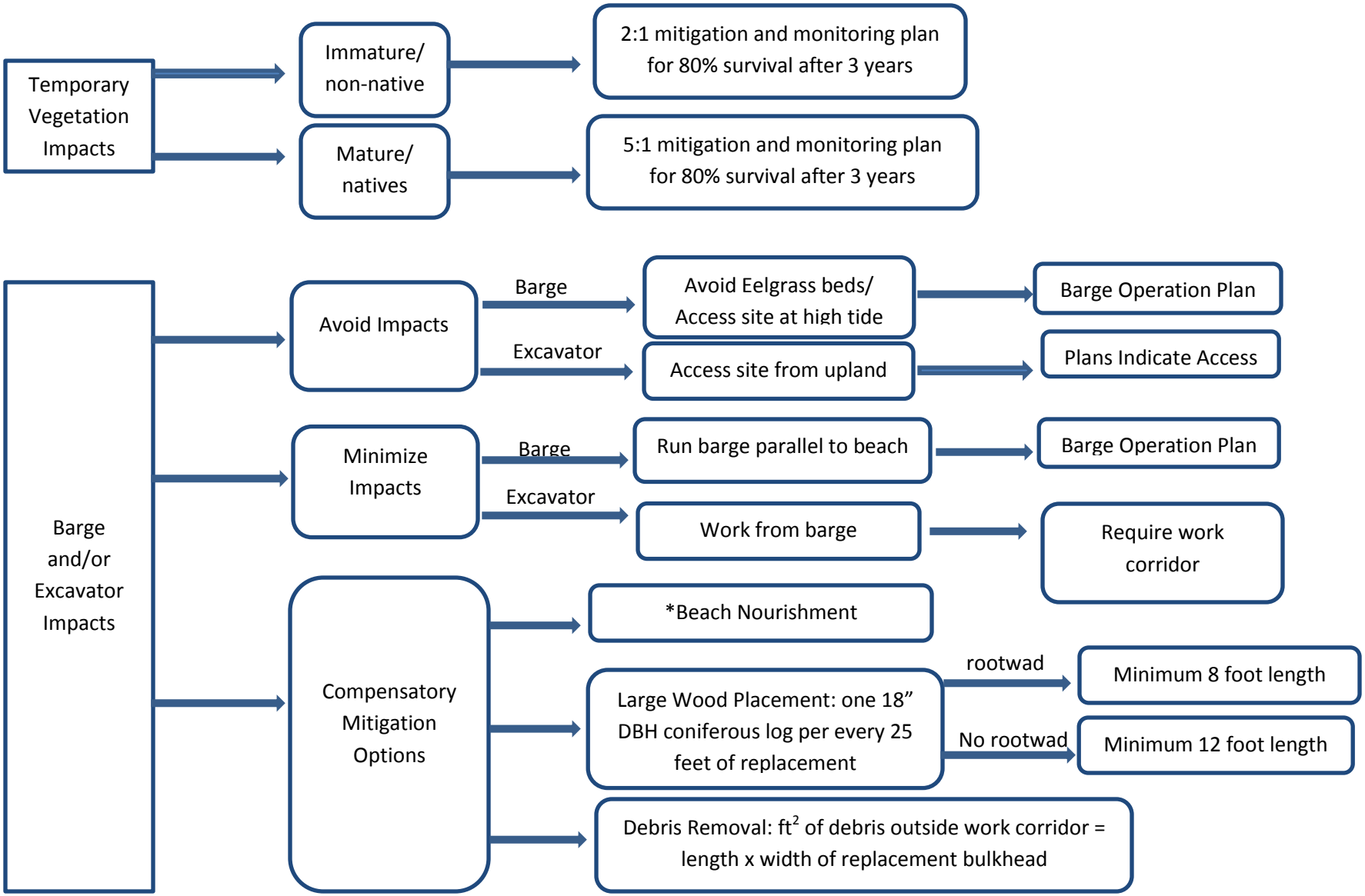


Fixed stake line waterward of bulkhead using rebar, or GPS coordinates.

Attachment 2

Mitigation Chart

Attachment 2: Bulkhead Replacement Mitigation



*We currently have methods for calculating beach nourishment for replacement bulkheads:
(Erosion rate (inches/12)) x (Length of Project (ft))x(Height of Bluff(ft))= (X ft^2)/(27) =(X yd^3)x (5year permit)
OR
1/2foot deep and 9 feet waterward for the length of the bulkhead