

**FMA and WRG Permit Application for  
A Seasonal Boat Dock and Access Ramp  
18420 Old River Landing, West Linn, OR**

**Project Description:**

This project proposes the construction of a seasonal dock that will be held in place by an upstream ramp and a downstream arm and cables. Both the ramp and arm will be secured to the shoreline by concrete footings. From the Ordinary Low Water Mark the combined length of the ramp and dock would extend approximately 50 feet into the river. No vertical pilings are proposed. As a seasonal dock, both the dock and ramp will be towed away for storage off-site, typically between the months of October and May. A similar dock and anchoring configuration exists at the adjacent, downstream property located at 18420 Old River Landing.

Approval of the proposed seasonal dock requires City of West Linn Flood Management Area (FMA) and Willamette River Greenway (WRG) permits.

***27.020 APPLICABILITY***

*A flood management area permit is required for all development in the Flood Management Area Overlay Zone. The standards that apply to flood management areas apply in addition to State or federal restrictions governing floodplains or flood hazard areas.*

Comment: The proposed dock and access ramp are located within the Flood Management Area Overlay Zone so the standards of this chapter apply.

***27.060 APPROVAL CRITERIA***

*The Planning Director shall make written findings with respect to the following criteria when approving, approving with conditions, or denying an application for development in flood management areas:*

*A. Development, excavation, and fill shall be performed in a manner to maintain or increase flood storage and conveyance capacity and not increase design flood elevations.*

Comment: No excavation or fill is proposed within the 100 year flood plain area. Calculations prepared by Munzing Structural Engineering demonstrate that the impact upon the dock itself will have negligible impact upon the flood elevation. Please see the attached calculations.

*B. No net fill increase in any floodplain is allowed. All fill placed in a floodplain shall be balanced with an equal amount of soil material removal. Excavation areas shall not exceed fill areas by more*

*than 50 percent of the square footage. Any excavation below the ordinary high water line shall not count toward compensating for fill.*

Comment: No fill is proposed within the flood plain.

*C. Excavation to balance a fill shall be located on the same lot or parcel as the fill unless it is not reasonable or practicable to do so. In such cases, the excavation shall be located in the same drainage basin and as close as possible to the fill site, so long as the proposed excavation and fill will not increase flood impacts for surrounding properties as determined through hydrologic and hydraulic analysis.*

Comment: No excavation is required because no fill is proposed.

*D. Minimum finished floor elevations must be at least one foot above the design flood height or highest flood of record, whichever is higher, for new habitable structures in the flood area.*

Comment: No structures having a finished floor are proposed. The dock, if present on the river during a flood period, will rise with the flood waters.

*E. Temporary fills permitted during construction shall be removed.*

Comment: No temporary fills are proposed.

*F. Prohibit encroachments, including fill, new construction, substantial improvements, and other development in floodways unless certification by a professional civil engineer licensed to practice in the State of Oregon is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.*

Comment: No development within the floodway area is proposed.

*G. All proposed improvements to the floodplain or floodway which might impact the flood-carrying capacity of the river shall be designed by a professional civil engineer licensed to practice in the State of Oregon.*

Comment: No improvements are proposed that would impact the flood-carrying capacity of the river. It is intended that the dock will be removed from the site during winter periods when flooding is most likely to occur. The dock will float if it is on the river when a flood does occur, but it will be tethered so that there is no impact to floodplain, floodway, or other properties.

*H. New culverts, stream crossings, and transportation projects shall be designed as balanced cut and fill projects or designed not to significantly raise the design flood elevation. Such projects shall be designed to minimize the area of fill in flood management areas and to minimize erosive velocities. Stream crossings shall be as close to perpendicular to the stream as practicable. Bridges shall be used instead of culverts wherever practicable.*

Comment: Not applicable. No new culverts, stream crossings, or transportation projects are proposed.

*I. Excavation and fill required for the construction of detention facilities or structures, and other facilities, such as levees, specifically shall be designed to reduce or mitigate flood impacts and improve water quality. Levees shall not be used to create vacant buildable land.*

Comment: Not applicable. The project does not include detention facilities or structures such as levees. It only involves a private dock.

*J. The applicant shall provide evidence that all necessary permits have been obtained from those federal, State, or local governmental agencies from which prior approval is required. (Ord. 1522, 2005; Ord. 1635 § 15, 2014; Ord. 1636 § 25, 2014)*

Comment: Applications are pending approval by the Corps of Engineers and Oregon Department of State Lands. Copies of the approvals will be submitted to the City prior to commencement of construction.

## **27.070 CONSTRUCTION MATERIALS AND METHODS**

*A. All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage using methods and practices that minimize flood damage.*

Comment: The dock materials are metal and floats that are designed for water-related use. These materials are resistant to flood damage. The dock is seasonal and it and the access ramp will be removed during winter months when flooding is most likely to occur.

*B. Electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within the components during conditions of flooding.*

Comment: No electrical, heating, ventilation, plumbing or air conditioning equipment are proposed for the dock or access ramp.

*C. New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.*

Comment: No water service is proposed for the dock or access ramp. No change to the existing home's water service is proposed.

*D. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters.*

Comment: No sewer service is proposed for the dock or access ramp. No change to the existing home's sewer service is proposed.

*E. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.*

Comment: No on-site waste disposal system is proposed.

*F. All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure.*

Comment: The dock and the access ramp will be secured to concrete pads placed on the shore line, as shown on the plans submitted with this application. A steel tether will be attached to the dock and access ramp and anchored on the shoreline so as to prevent these structures from floating away in the unlikely event that they are on the river during a major flood event.

## **27.090 NON-RESIDENTIAL CONSTRUCTION**

*New construction and substantial improvement of any commercial, industrial, or other non-residential structure shall either have the lowest floor, including basement, elevated to at least one foot above the level of the base flood elevation; or, together with attendant utility and sanitary facilities, shall:*

*A. Be flood-proofed so that below the base flood level the structure is watertight with walls impermeable to the passage of water;*

Comment: The dock is floating and will ride with the water level. There is no fixed structure that would have a lowest floor or basement.

*B. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;*

Comment: As noted elsewhere in this narrative, it is the intent of this dock that it will be seasonal in nature and will be removed from the property's river frontage prior to the wet season. However, as the City must be certain that the dock will meet the requirements of this section should the dock not be removed for some reason, or if an unusual set of conditions resulted in flood levels during the summer season, the applicant has hired an engineer to address this section. The dock and ramp, because of the nature of the river bottom which precludes driving deep piling, are not themselves designed to resist the forces of the flood. However, a cable system will be employed to tether the dock and ramp to an anchor point on the shoreline so that they cannot break free and cause damage to downstream properties. Please refer to the attached engineer's report.

*C. Be certified by a professional civil engineer licensed to practice in the State of Oregon that the design and methods of construction shall prevent seepage, collapse or cracking of basement walls, prevent buckling of basement floors, prevent backup of water from sewer lines, and have all openings located one foot above the base flood elevation. In addition, all protective features must operate automatically without human intervention;*

Comment: Not applicable. The dock does not include walls, basement floors, water or sewer lines.

*D. Non-residential construction that is elevated, but not flood-proofed (i.e., the foundation is not at least one foot above the 100-year flood elevation) shall also comply with the standards set forth in CDC 27.080. (Ord. 1522, 2005)*

Comment: Not applicable. There is no foundation or fixed floor level. The dock and ramp will float and will rise with the water level. The tethering system will ensure that they cannot break free and damage downstream property.

## **28.030 APPLICABILITY**

*A. The Willamette and Tualatin River Protection Area is an overlay zone. The zone boundaries are identified on the City's zoning map, and include:*

- 1. All land within the City of West Linn's Willamette River Greenway Area.*
- 2. All land within 200 feet of the ordinary low water mark of the Tualatin River, and all land within the 100-year floodplain of the Tualatin River.*
- 3. In addition to the Willamette Greenway and Tualatin River Protection Area boundaries, this chapter also relies on the HCA Map to delineate where development should or should not occur. Specifically, the intent is to keep out of, or minimize disturbance of, the habitat conservation areas (HCAs). Therefore, if all, or any part, of a lot or parcel is in the Willamette Greenway and Tualatin River Protection Area boundaries, and there are HCAs on the lot or parcel, a Willamette and Tualatin River Protection Area permit shall be required unless the development proposal is exempt per CDC 28.040.*

*B. At the confluence of a stream or creek with either the Tualatin or Willamette River, the standards of this chapter shall apply only to those portions of the lot or parcel fronting the river. Meanwhile, development in those portions of the property facing or adjacent to the stream or creek shall meet the transition, setbacks and other provisions of Chapter 32 CDC, Water Resource Area Protection.*

*C. All uses permitted under the provisions of the underlying base zone and within the Willamette and Tualatin River Protection Area zone are allowed in the manner prescribed by the base zone subject to applying for and obtaining a permit issued under the provisions of this chapter unless specifically exempted per CDC 28.040.*

*D. The construction of a structure in the HCA or the expansion of a structure into the HCA when the new intrusion is closer to the protected water feature than the pre-existing structure. (Ord. 1576, 2008; Ord. 1604 § 21, 2011; Ord. 1636 § 26, 2014)*

Comment: The subject property is within the 100 year flood plain of the Willamette River and, therefore, is subject to the provisions of this chapter.

## ***28.050 PROHIBITED USES***

Comment: The proposed dock is not a prohibited use.

## ***28.090 SUBMITTAL REQUIREMENTS: APPLICATION***

*A. An application for a protection area permit shall be initiated by the property owner or the owner's authorized agent. Evidence shall be provided to demonstrate that the applicant has the legal right to use the land above the OLW. The property owner's signature is required on the application form.*

Comment: The applicant has filed for a Joint Permit with the US Army Corps of Engineers and a General Authorization permit with the Oregon Department of State Lands for the proposed dock. These applications are pending review at this time.

*B. A prerequisite to the filing of an application is a pre-application conference at which time the Planning Director shall explain the provisions of this chapter and provide appropriate forms as set forth in CDC [99.030\(B\)](#).*

Comment: A pre-application conference was held on November 1, 2018 for the proposed use (PA-18-29).

*C. An application for a protection area permit shall include the completed application and:*

- 1. Narrative which addresses the approval criteria of CDC [28.110](#).*
- 2. A site plan, with HCA boundaries shown and by low, moderate, high type shown (CDC [28.120](#)).*
- 3. A grading plan if applicable (CDC [28.130](#)).*
- 4. Architectural drawings if applicable (CDC [28.140](#)).*
- 5. A landscape plan if applicable (CDC [28.150](#)).*
- 6. A mitigation plan if applicable (CDC [28.160](#)).*

Comment: This narrative addresses the criterial of CDC 28.110. A site plan is attached and shows HCA boundaries. No site grading is proposed. No architectural drawings or landscape plan are required.

*D. The applicant shall pay the requisite fees.*

Comment: The required fees have been paid.

*E. The applicant shall be responsible for, and shall apply for, all applicable State and/or federal permits.*

Comment: The DSL and Corps of Engineer permits have been filed and are in process of being reviewed.

*F. The applicant shall include a map, approved or acknowledged by DSL, of the preference rights and authorized areas if a water surface structure is proposed. (Ord. 1576, 2008; Ord. 1622 § 11, 2014)*

Comment: The applicant will provide a copy of the DSL approval once it is obtained.

## **28.110 APPROVAL CRITERIA**

*No application for development on property within the protection area shall be approved unless the decision-making authority finds that the following standards have been met or can be met by conditions of approval. The development shall comply with the following criteria as applicable:*

*A. Development: All sites.*

*1. Sites shall first be reviewed using the HCA Map to determine if the site is buildable or what portion of the site is buildable. HCAs shall be verified by the Planning Director per CDC [28.070](#) and site visit. Also, "tree canopy only" HCAs shall not constitute a development limitation and may be exempted per CDC [28.070\(A\)](#). The municipal code protection for trees and Chapters 55 and 85 CDC tree protection shall still apply.*

Comment: The HCA is shaded in green on the map below. Only two small concrete pads will be permanently installed within the HCA. No structures are proposed within the HCA.



The aerial photograph of the site shown below demonstrates that the HCA is largely disturbed by landscaping and clearing associated with the home site on the property and provides little in the way of habitat resources.



*2. HCAs shall be avoided to the greatest degree possible and development activity shall instead be directed to the areas designated "Habitat and Impact Areas Not Designated as HCAs," consistent with subsection (A)(3) of this section.*

Comment: The disturbance of the HCA will be minimal, involving only the pouring of two small concrete pads on the shore. The dock and access ramp will be installed and removed seasonally from the river surface via barge and crane.

*3. If the subject property contains no lands designated "Habitat and Impact Areas Not Designated as HCAs" and development within HCA land is the only option it shall be directed towards the low HCA areas first, then medium HCA areas and then to high HCA as the last choice. The goal is to, at best, avoid or, at least, minimize disturbance of the HCAs. (Water-dependent uses are exempt from this provision.)*

Comment: The placement of the concrete anchor pads and the seasonal access ramp within the HCA is the only viable means of providing access to the proposed dock.

*4. All development, including exempted activities of CDC 28.040, shall have approved erosion control measures per Clackamas County Erosion Prevention and Sediment Control*



*Planning and Design Manual, rev. 2008, in place prior to site disturbance and be subject to the requirements of CDC [32.070](#) and [32.080](#) as deemed applicable by the Planning Director.*

Comment: Because of the means of placement of the access ramp and dock, there will be no disturbance of site vegetation that might otherwise require erosion control measures.

*F. Access and property rights.*

- 1. Private lands within the protection area shall be recognized and respected.*
- 2. Where a legal public access to the river or elsewhere in the protection area exists, that legal public right shall be recognized and respected.*
- 3. To construct a water-dependent structure such as a dock, ramp, or gangway shall require that all pre-existing legal public access or similar legal rights in the protection area be recognized and respected. Where pre-existing legal public access, such as below the OLW, is to be obstructed by, for example, a ramp, the applicant shall provide a reasonable alternate route around, over or under the obstruction. The alternate route shall be as direct as possible. The proposed route, to include appropriate height clearances under ramps/docks and specifications for safe passage over or around ramps and docks, shall be reviewed and approved by the Planning Director for adequacy.*
- 4. Any public or private water-dependent use or facility shall be within established DSL-authorized areas.*
- 5. Legal access to, and along, the riverfront in single-family residential zoned areas shall be encouraged and pursued especially when there are reasonable expectations that a continuous trail system can be facilitated. The City recognizes the potential need for compensation where nexus and proportionality tests are not met. Fee simple ownership by the City shall be preferred. The trail should be dimensioned and designed appropriate to the terrain it traverses and the user group(s) it can reasonably expect to attract. The City shall be responsible for signing the trail and delineating the boundary between private and public lands or access easements.*

Comment: Access to the proposed dock will be from the access ramp placed on the subject property. No public access to the dock or access ramp is proposed.

*I. Docks and other water-dependent structures.*

- 1. Once the preference rights area is established by DSL, the property owner identifies where the water-dependent use will be located within the authorized portion of the preference rights area. The water-dependent use should be centered or in the middle of the preference rights/authorized area or meet the side yard setbacks of the underlying zone.*

*Private and public non-commercial docks are permitted where dredging is required so long as all applicable federal and State permits are obtained. Dredging is encouraged if deposits silt up*

*under an existing dock. Dredging is seen as preferable to the construction of longer docks/ramps.*

Comment: The proposed dock is centered in the area that has been requested for approval by DSL. Documentation of DSL approval will be provided to the City prior to placement of the dock.

*2. Both joint and single use docks shall not extend into the water any further than necessary to provide four feet between the ship's keel or fixed propeller/rudder and the bottom of the water at any time during the water's lowest point.*

Comment: The City has determined in file No. WRG-15-06/MIS-15-13 that Federal requirements to place docks in deeper water in order to protect fish habitat supersede this provision of the Community Development Code.

*3. In no case except as provided in this section shall a private ramp and private dock extend more than 100 feet from OLW towards the center of the river or slough. In the case of L-shaped docks, the 100 feet shall be measured from the OLW to the furthest part of the private dock closest to the center of the river.*

Comment: The proposed dock would extend only approximately 50 feet from OLW.

*4. Docks on sloughs and similar channels shall not extend more than 30 percent of the distance between two land masses at OHW, such as between the mainland and an island or peninsula, measured in a lineal manner at right angle to the dominant shoreline. In no way shall a dock impede existing public usage or block navigation of a channel.*

Comment: Not applicable. The site is not on a slough or similar channel.

*5. Boat storage associated with a rail launch facility shall be located above the OHW, either vertically raised above the ordinary high water line or set back behind the OHW. Such boat storage structure will be natural wood colors or similar earth tones. Private railed launch facilities are permitted for individual boat owners. The onshore setback of the storage structure is equal distance on both sides as extended perpendicular to the thread of the stream, or seven and one-half feet, whichever is the greater setback.*

Comment: Not applicable. No rail launch facility is proposed.

*6. The width of each deck section shall be no more than 12 feet wide.*

Comment: The proposed dock is composed of a 10' wide bow section and two 4' arms that provide for a boat slip. Since each section is less than 10' in width, the proposed dock complies with this requirement.

*7. For only single-user and joint-user docks, pilings shall not exceed a maximum height of eight feet above the 100-year flood elevation.*

Comment: No piling are proposed. This seasonal dock will be attached to concrete pads on the shoreline via the access ramp, a metal arm, and cross cables. The dock will be removed seasonally prior to high water events

*8. A single user non-commercial dock shall not exceed 400 square feet in deck area. The boat slip is not included in the calculation of this square footage limitation.*

Comment: The proposed dock is approximately 381 sq. ft. in deck area.

*9. Private non-commercial boat houses are allowed but only if they are within 50 feet of OLW and/or in locations sufficiently screened from view so that they do not have a significant visual impact on views from adjacent and nearby homes. Building and roof colors shall be brown, gray, beige, natural or similar earth tones. Non-commercial boat houses shall not exceed 12 feet in height measured from the boat house deck level to the roof peak. The size of the boat house shall be sized to accommodate one boat only and shall not exceed a footprint greater than 500 square feet. Boatlifts are permitted within the boat house. The above provisions also apply to open-walled boat shelters with or without boatlifts.*

Comment: Not applicable. No boat house is proposed in conjunction with the dock.

*J. Joint docks.*

Comment: Not applicable. No joint use of the dock is proposed.

*K. Non-conforming docks and other water-related structures. Pre-existing non-conforming structures, including docks, ramps, boat houses, etc., as defined in this chapter may remain in place. Replacement in kind (e.g., replacement of decking and other materials) will be allowed provided the replacement meets the standards of this chapter. However, if any non-conforming structure that is damaged and destroyed or otherwise to be replaced to the extent that the rebuilding or replacing (including replacement in kind) would exceed 50 percent of the current replacement cost of the entire structure, the owner shall be required to meet all the standards of this chapter.*

Comment: Not applicable. There are no non-conforming docks or other water-related structures on the property or the adjoining river area.

*L. Roads, driveways, utilities, or passive use recreation facilities. Roads, driveways, utilities, public paths, or passive use recreation facilities may be built in those portions of HCAs that include wetlands, riparian areas, and water resource areas when no other practical alternative exists but shall use water-permeable materials unless City engineering standards do not allow that. Construction to the minimum dimensional standards for roads is required. Full mitigation and revegetation is required, with the applicant to submit a mitigation plan pursuant to CDC [32.070](#) and a revegetation plan pursuant to CDC [32.080](#). The maximum disturbance width for utility corridors is as follows:*

- 1. For utility facility connections to utility facilities, no greater than 10 feet wide.*
- 2. For upgrade of existing utility facilities, no greater than 15 feet wide.*

3. *For new underground utility facilities, no greater than 25 feet wide, and disturbance of no more than 200 linear feet of water quality resource area, or 20 percent of the total linear feet of water quality resource area, whichever is greater.*

Comment: Not applicable. No such facilities, roads, driveways, or utilities are proposed.

*M. Structures. All buildings and structures in HCAs and riparian areas, including all exterior mechanical equipment, should be screened, colored, or surfaced so as to blend with the riparian environment. Surfaces shall be non-polished/reflective or at least expected to lose their luster within a year. In addition to the specific standards and criteria applicable to water-dependent uses (docks), all other provisions of this chapter shall apply to water dependent uses, and any structure shall be no larger than necessary to accommodate the use.*

Comment: The ramp will be non-polished aluminum.

*N. Water-permeable materials for hardscapes. The use of water-permeable materials for parking lots, driveways, patios, and paths as well as flow-through planters, box filters, bioswales and drought tolerant plants are strongly encouraged in all "a" and "b" land classifications and shall be required in all "c" and "d" land classifications. The only exception in the "c" and "d" classifications would be where it is demonstrated that water-permeable driveways/hardscapes could not structurally support the axle weight of vehicles or equipment/storage load using those areas. Flow through planters, box filters, bioswales, drought tolerant plants and other measures of treating and/or detaining runoff would still be required in these areas.*

Comment: Not applicable. No parking lots, driveways, patios, and paths, etc. are proposed.

*O. Signs and graphics. No sign or graphic display inconsistent with the purposes of the protection area shall have a display surface oriented toward or visible from the Willamette or Tualatin River. A limited number of signs may be allowed to direct public access along legal routes in the protection area.*

Comment: Not applicable. No signs or graphics are proposed.

*P. Lighting. Lighting shall not be focused or oriented onto the surface of the river except as required by the Coast Guard. Lighting elsewhere in the protection area shall be the minimum necessary and shall not create off-site glare or be omni-directional. Screens and covers will be required.*

Comment: Not applicable. No lighting is proposed.

*Q. Parking. Parking and unenclosed storage areas located within or adjacent to the protection area boundary shall be screened from the river in accordance with Chapter 46 CDC, Off-Street Parking, Loading and Reservoir Areas. The use of water-permeable material to construct the parking lot is either encouraged or required depending on HCA classification per CDC 28.110(N)(4).*

Comment: Not applicable. No parking is proposed in conjunction with the dock.

R. Views. Significant views of the Willamette and Tualatin Rivers shall be protected as much as possible as seen from the following public viewpoints: Mary S. Young Park, Willamette Park, Cedar Oak Park, Burnside Park, Maddox Park, Cedar Island, the Oregon City Bridge, Willamette Park, and Fields Bridge Park.

Where options exist in the placement of ramps and docks, the applicant shall select the least visually intrusive location as seen from a public viewpoint. However, if no options exist, then the ramp, pilings and dock shall be allowed at the originally proposed location.

Comment: Not applicable. No significant view of the Willamette River would be impacted by the proposed dock and access ramp.

S. Aggregate deposits. Extraction of aggregate deposits or dredging shall be conducted in a manner designed to minimize adverse effects on water quality, fish and wildlife, vegetation, bank stabilization, stream flow, visual quality, noise and safety, and to promote necessary reclamation.

Comment: Not applicable. No extraction of aggregate or dredging is proposed.

T. Changing the landscape/grading.

Comment: No changing of the landscape or grading is proposed.

U. Protect riparian and adjacent vegetation. Vegetative ground cover and trees upon the site shall be preserved, conserved, and maintained according to the following provisions:

Comment: As discussed previously, the ramp and dock will be brought seasonally to the site via barge from the river. The access ramp will be placed from the river via crane. Using this method will minimize the disturbance of the riparian area to only the immediate site of the concrete pads and access ramp.

## **28.160 MITIGATION PLAN**

*If any HCA is permanently disturbed as a result of the proposed development of any uses or structures, the applicant shall prepare and implement a revegetation and mitigation plan pursuant to the provisions of CDC [32.070](#) and [32.080](#). (Ord. 1576, 2008)*

Comment: Because the ramp and dock will be brought and placed via barge and crane from the river, there will be negligible impact to the HCA. As a result, no mitigation plan is required.



October 4, 2019

Eric Dye  
Ken's Floatation Services, Inc.

RE: Haladay Dock Floodway Rise  
18420 Old River Landing  
West Linn, Oregon

Eric:

This letter is in response to your request for an investigation of the Willamette River base flood water elevation rise due to the installation of a dock at the above referenced location. We have investigated the floodway elevation rise using a two-dimensional river section based on data from FEMA flood insurance maps for a 100-year flood. Based on our investigation using a two-dimensional cross-sectional analysis, we anticipate a negligible water elevation rise of the river cross section at the dock location. Please reference the following calculation.

If you have any questions, please do not hesitate to call.

Sincerely,

*Munzing Structural Engineering*

*Jeremy Gavelin*

Attachments:  
Base flood elevation rise calculations



Project  
MALADAY DOCK

Date

Subject  
FLOOD ELEVATION CHANGE

By  
JG



NEAREST CROSS SECTION : M

RIVER BED DEPTH = -100 ft

WIDTH = 578 ft

SECTION AREA = 37,630 ft<sup>2</sup>

FLOOD ELEVATION = 44.7 ft

AREA OF DOCK = 18 ft  $\times$  1/2 ft = 9 ft<sup>2</sup>

RAISE = 9 ft<sup>2</sup> / 578 ft<sup>2</sup> = 0.01557 ft = 0.187 in