



**US Army Corps
of Engineers®**

Seattle District

Notice of Preparation

Planning, Environmental and Cultural
Resources Branch
P.O. Box 3755
Seattle, WA 98124-3755
ATTN: Michael Scuderi (PMP-E)

Public Notice Date: 7 May 2019
Expiration Date: 6 June 2019

Reference: CFK-01-18
Name: Orchard Homes Levee
Rehabilitation

Interested parties are hereby notified that the U.S. Army Corps of Engineers, Seattle District (Corps) plans to prepare, pursuant to the National Environmental Policy Act (NEPA), an environmental assessment (EA) for proposed levee repairs to the Orchard Homes Levee, located on the Clark Fork River near the City of Missoula, Missoula County, Montana (Figure A-1). The repairs are intended to address damage caused by rapid snowmelt in April through June of 2018 that caused sustained high flows along the river. The purpose of this Notice of Preparation (NOP) is to solicit comments from interested persons, groups, and agencies on the Corps' proposed action under NEPA.

AUTHORITY

The proposed levee repairs are authorized by Public Law 84-99 (33 U.S. Code Section 701n). The Corps rehabilitation and restoration work under this authority is limited to the repair of flood control works damaged or destroyed by floods. The statute authorizes rehabilitation to the condition and level of protection exhibited by the flood control work prior to the damaging event. Missoula County is the levee owner and non-federal sponsor of the proposed project

PROJECT LOCATION AND DESCRIPTION

The Orchard Homes Levee is a flood control project located along the Clark Fork River in Missoula County, Montana. According to the National Levee Database, the levee was first constructed prior to the 1908 flood. Later, the Corps designed and constructed an armored levee along this same alignment in 1948. In 2007, the Orchard Homes levee became certified under the Federal Emergency Management Agency National Flood Insurance Program.

The levee is a complete system with the upstream end tying into high ground. The downstream end is a hydraulic tie. The levee embankment is constructed of silt, sand and gravel and is surfaced with crushed rock or grass. Crest width is typically 12 feet but as wide as 50 feet in some limited sections. Both riverward slopes and landward slopes vary between 2H:1V to 3H:1V. The riverward slope is typically armored with Class III riprap and depending on location has either a launchable or buried toe. Levee height ranges from 3 to 12 feet above the landward toe.

The Orchard Homes levee provides a 100 year level of flood protection to 380 acres, which includes approximately 140 residences and one elementary school.

NEED

The Clark Fork River exceeded flood stage in April, May, and June of 2018. Rapid snowmelt resulted in sustained river levels above flood stage for 31 days (April 29 to June 3). The event included 2 days above the major flood stage level.

Damages were observed at three sites along the levee. Site 1 is located near the upstream end of the levee between approximately Stations 53+05 to 56+65 (360 LF). At this location, the riverward toe and slope have been scoured, exposing quarry spalls and the embankment soil below. At Site 2, located between approximately Stations 40+25 to 44+35 (410 LF), scour has eroded the toe of the levee and steepened the upper slope, which is currently armored with concrete rubble. A large scour hole has formed in the upper slope along approximately 150 LF from Station 41+20 to 42+70. A longitudinal crack measuring ½-inch wide, 20-inches deep, and about 6 feet long was observed about 7 feet behind the levee crest at approximately Station 44+70 at the time of a site visit in July of 2018. At Site 3, located between Stations 35+60 to 35+95 (35 LF), the slope armor has been scoured, the upper slope is now steepened, and embankment material has been lost in several localized areas. Refer to Figure A-2 for an overview of the repair sites. Refer to Figures A-4 through A-9 for photos of the repair sites.

As a result of the 2018 flood event, the level of flood protection provided by the levee has been reduced from a 100 year flood event to a 1 year flood event. If the levee were to fail, the properties along the left bank of the Clark Fork River would flood, putting life and property at risk of injury or damage.

THE PURPOSE

The purpose of the proposed project is to restore the pre-damage level of flood protection prior to the 2018 flooding in order to protect lives and property from subsequent flooding.

ACTIONS ADDRESSED UNDER NEPA

For the prospective levee repair in 2019, four alternatives are being considered as follows:

- **Alternative 1 No Action.**

No project features would be implemented by the Corps under the No Action Alternative. The levee would be left in its damaged condition for the near future. The No Action Alternative would reduce the level of protection and increase

probability of a breach of the levee. The No Action Alternative poses an increased risk to health and safety due to the potential for additional flood injury or damage. This alternative does not restore flood protection and is not acceptable from a technical perspective, nor is it acceptable to the County.

- **Alternative 2 Repair in Kind**

At Site 1, the Repair In-Kind Alternative would reconstruct the armored slope at 2H:1V with an increased riprap size. Construction length would be approximately 360 LF, including any necessary transitions. This approach is considered the most technically acceptable, least costly alternative for this site and is acceptable to the County.

At Site 2, the Repair In-Kind Alternative would involve reconstructing the armored slope in the current location. Due to the geometry of the site, the resulting slope would likely be steeper than 2H:1V to permit construction of an adequately sized toe that does not extend into the river. The repair site is located on an outside bend in the river. For technical reasons, this approach is not preferred.

At Site 3, the Repair In-Kind Alternative would involve excavating the scoured embankment material and reconstructing the embankment with well-compacted, suitable embankment material at 2H:1V. A buried toe would be reconstructed, and the riverward slope would be re-armored with an increased riprap size. Construction length, including any necessary transitions, would be approximately 35 LF. This approach is considered the most technically acceptable, least costly alternative for this site and is acceptable to the County.

- **Alternative 2a Slope Layback (Site 2)**

The Slope Layback Alternative at Site 2 would consist of shifting the riverward edge of crest landward. The embankment prism is overbuilt at this site, with the crest width ranging from 36 to 52 feet, and can be narrowed while continuing to meet Corps levee standards. The steepened portions of the levee embankment would be graded back to 2H:1V and the slope would be armored with riprap including a launchable toe. This approach is considered the most technically acceptable, least costly alternative for this site and is acceptable to the County.

- **Alternative 3 Levee Setback**

The Levee Setback Alternative would shift the alignment of the levee embankment landward to minimize direct impacts by the river and provide additional conveyance. This alternative probably cannot be completed prior to the next flood season. At Site 1, obtaining additional real estate for a setback would be challenging due to adjacent single-family dwellings. At Site 2, the existing levee prism is wide enough to permit a modest setback on the order of 18 to 20 feet. However, the slope layback option was considered to a setback

and meets the technical requirements of the repair at lower cost. Site 3 is only 35 LF in length and a setback option cannot be constructed with adequate transitions over this length. For technical reasons, this setback alternative is not preferred for any of the 3 sites.

- **Alternative 4 Non-Structural**

This alternative consists of floodplain management strategies generally involving changes in land use offered by other federal and state programs. Such strategies would include: zoning, easements, flood warning, floodplain evacuation, and flood insurance. Nonstructural strategies involve acquisition, relocation, elevation, and flood proofing existing structures. The costs and timeframe for implementing this alternative makes it impractical. Furthermore, the County has not agreed to participate in executing a non-structural alternative.

The Corps proposes the Repair in Kind Alternative for Sites 1 and 3, and the Slope Layback Alternative for Site 2. All repairs will be conducted within the pre-damaged footprints. The recommended repairs are described further below and cross sections are included in the figures at the end of this document.

At Site 1, repairing the levee in-kind is recommended to restore the levee to its pre-damage level of protection. Sloughed material will be excavated from the scoured toe region. The levee will be armored with a 3-foot-thick blanket of Class III riprap (one class larger than the existing Class II rock) backed by 12 inches of quarry spalls as a filter layer. A launchable toe will be constructed within the existing footprint using Class III riprap and if possible the repair will be extended slightly upstream (approximately 10 feet) from a previous repair to better transition into the existing slopes and reduce scour potential. The downstream end will be smoothly transitioned into the existing slope. Work will require removal of intermittent streamside shrubs and vegetation but no trees would be affected. Total construction length is 360 LF.

At Site 2, the riverward slope will be decreased to 2H:1V. Sloughed material will be excavated from the scoured toe and the levee embankment. Concrete rubble currently lining the slope will be removed and disposed of offsite and replaced with a 3-foot-thick blanket of Class III riprap backed by 12 inches of quarry spalls. The launchable toe will be reconstructed. In the vicinity of the longitudinal crack, the embankment will be excavated to determine the depth of instability and subsequently reconstructed with suitable, well-compacted embankment fill. The upstream and downstream ends will be smoothly transitioned into the existing slopes. Work will require removal of streamside shrubs and trees. Total construction length is 410 LF.

At Site 3, the levee embankment will be excavated to remove sloughed and loosened material and reconstructed using suitable, well-compacted embankment fill. The slope will be re-armored with a 3-foot-thick blanket of Class III riprap backed by 12 inches of quarry spalls. The upstream and downstream ends will be smoothly transitioned into

the existing slopes. Work will require removal of streamside shrubs and trees. Total construction length is 35 LF.

Excavated materials, including concrete rubble, will be disposed off-site in an appropriate manner. All repairs will occur within the pre-damage footprint. Total construction length for all sites is approximately 805 LF, including any necessary transitions.

One lift of willow stakes will be planted at 1 foot above ordinary high water within the slope armor to provide shade and other habitat amenities to aquatic and terrestrial species. Willow stakes will be installed as a lift because in wet environments this technique has been demonstrated to have good survival if installation is done properly. Bundling willows is more appropriate for more arid environments, and will therefore, not be used. Bebb willow (*Salix bebbiana*), and sandbar willow (*S. exigua*) cuttings will be utilized as practicable. Willows will be planted within 8 inches of topsoil and spaced at 12 inches on center, along a continuous line which matches the lowest vegetation line (approximately 1 ft above OHW), using preexisting conditions and upstream and downstream vegetation as a guide. The soil for all plantings consists of engineered topsoil which has been sorted through a ½" sieve so that small rocks may be retained for soil structure. Approximately 80 percent of the length of each stake will be embedded in the topsoil.

In addition, offsite plantings are required to compensate for the temporal loss of the shade function. A 3:1 replacement ratio was used to calculate requirement planting acreage.

Thirty (30) black cottonwood (*Populus balsamifera*) poles or 1 gallon containers will be planted on the adjacent sandbar to compensate for temporal loss of vegetation cover on the riverward levee slope. The intent is that the planting site will be on a sandbar in channel adjacent to the project site. Cottonwood will be planted on 10-foot centers.

The Corps will coordinate with Missoula County (local sponsor) to ensure that the planting survival standard is met. The Corps will inform the sponsor that these plantings are part of the repair mitigation and should only be trimmed to the minimal amount necessary to retain adequate visual corridors for inspection. No trimming should be done to the off-site cottonwood plantings. The onsite and off-site plantings will be monitored for one year post construction to ensure 80% survival. If less than 80% survival, the dead willows and/or cottonwoods will be replaced (via mechanical installation or hand installation), and any replanted plantings will be monitored for an additional growing season.

The Corps has developed a list of conservation measures and incorporated these into the levee repair to reduce environmental impacts of the repair. For this project the measures are:

- Willow stakes, installation, maintenance, monitoring and adaptive management.

- Additional off-site planting of cottonwood to compensate for temporal loss of vegetation cleared due to construction.
- Hydro-seeding disturbed areas as provided below.
- In-water work will be limited to the in-water work window (July 1 to September 30).
- No loss of wetlands or sensitive aquatic sites will occur.

Best management practices will be employed to minimize project impacts. Project construction includes environmental enhancements to offset temporary construction impacts and long-term loss of vegetation on the levee slope. Environmental enhancements will be assessed further during the NEPA analysis, including full consideration of those proposed by agencies during NEPA coordination. Appropriate enhancements will be incorporated into the project during Engineering and Design. Environmental enhancements already incorporated into the design concept include best management practices to protect water quality.

IMPACTS OF THE PROJECT

Anticipated impacts are as follows:

Wetlands: Based on a site visit and an online query of the MTNHP Wetland and Riparian Mapping, wetlands exist in the project vicinity. Wetlands mapped by the MTNHP include a scrub-shrub wetland on the opposite side of the river channel from Site 2. The repair sites were visited on July 18, 2018, and observations of wetland conditions were noted. No wetlands were observed in the vicinity of Site 1. At Site 2, one small potential wetland area (approximately 315 sq. ft.) containing hydrophytic vegetation (sandbar willow [*Salix exigua*], reed canarygrass [*Phalaris arundinacea*]) was observed fringing the river within the repair footprint. At Site 3, one small potential wetland area (< 100 sq. ft.) containing hydrophytic vegetation (creeping spikerush [*Eleocharis palustris*], reed canarygrass) was observed fringing the river but is outside the repair footprint.

Based on analysis of wetland area being impacts it was determined that the total acreage that might be impacted is less than 0.1 acres and determined to be insignificant.

Water Quality: Short-term, localized project-related increases in background turbidity levels will likely occur as a result of in-water toe or bank excavation and rock placement. The maximum allowable increase above naturally occurring turbidity for class B-1 waters (i.e., the designation of the Clark Fork River) is 5 nephelometric units (NTU) under state law. (75-5-318 MCA).

Best management practices (BMPs) will be used to minimize erosion and sedimentation caused by runoff from disturbed soil areas. Quarry rock and spalls used for the repair will be clean and contaminant free. Turbidity will be monitored upstream and

downstream of the project site during construction, as required. If turbidity exceeds state water quality standards, particulate-generating activities will be halted and construction methods will be changed until these standards are met.

The anticipated removal of streamside trees and shrubs within the repair footprints could affect the primary constituent elements (PCEs) of listed endangered or threatened species, essential features of water quality (temperature) and natural cover such as shade and overhanging large wood for this designated critical habitat. Measures have been developed to offset this impact, such as on-site and off-site plantings.

Aquatic Resources: The Clark Fork River originates at the confluence of the Silver Bow Creek and Warm Springs Creek near Butte, Montana, and travels over 300 miles through Montana to Idaho. The river ends where it empties into Lake Pend Oreille, Idaho. The location of the proposed levee repair is just downstream of Missoula where the river changes from a primarily single channel to a braided, complex system. At the project location a vegetated island splits the river with a side channel running along the toe of the levee.

Projected impacts to aquatic resources from the proposed permanent repair action include possible displacement or injury due to excavation and placement of riprap along the slope of the levee, temporary degraded water quality associated with excavation, and potential impacts to fish migration.

Given the location of proposed repair, use of an open bucket excavator and the relatively slow speed of excavation, it is reasonably certain the risk of injury to aquatic species from the proposed excavation activities is low but not insignificant.

Short-term localized project-related increases in turbidity levels will likely occur as a result of in-water work but are not expected to result in long-term adverse effects to aquatic species or a significant net change in the function of the in-stream habitat.

Disturbance from vibration is possible from delivery and dumping of rock on land as it is staged for construction, rock placement along the riverward face of the levee, and from excavation. This will be minimized by working from the top of the bank, avoiding in-water excavation whenever possible, and placing rock individually or in small bucket loads (no end-dumping into the river). Following these construction techniques, it is reasonably certain that impacts to aquatic species resulting from equipment use or rock placement during construction will be minimal but not entirely insignificant or discountable for injury or long-term adverse behavioral effects.

Adult fish migrating upstream at the time of construction may be temporarily delayed at the construction site due to disturbance and/or turbidity. If construction does interfere with migration, breaks in the work during the day or overnight will allow migration to continue, minimizing any effect. The degree to which aquatic species use the specific project locations for spawning is unknown. The area affected will be limited to the

portion of the channel adjacent to the levee and the proposed actions will likely have no long-term effect on migrating or spawning fish species

Proposed levee vegetation removal may indirectly impact aquatic species by decreasing shade and large woody debris, reducing plant material, insects, and the quality of refugia. Vegetation removal will only occur within the repair sites. Measures will be implemented to offset these impacts, such as on and off-site plantings. These measures are described above in the “ACTIONS ADDRESSED UNDER NEPA” section.

Terrestrial Resources/Wildlife: The effects of the Repair In Kind alternative on wildlife will likely include the temporary displacement of birds and other small vertebrates as a result of construction due to noise and the presence of human activity. The construction itself may also result in the injury or death of reptiles and rodents. Loss of shrub vegetation during construction may affect wildlife habitat by reducing cover, perching, foraging, and nesting opportunities. This effect should not be significant given the availability of similar vegetation and habitat in adjacent areas for displaced animals and plantings that will be incorporated into the repair.

Construction of the project is likely to occur during the general breeding season for migratory birds (April 16–August 15). The Corps will coordinate with USFWS to ensure compliance with the Migratory Bird Treaty Act (MBTA) and impacts to nesting birds are minimized.

Threatened and Endangered Species: The following species are listed under the Endangered Species Act (ESA), and could potentially occur in the general project area:

- Canada lynx (*Lynx Canadensis*, threatened),
- Bull trout (*Salvelinus confluentus*, threatened),
- grizzly bear (*Ursus arctos horribilis*, threatened)
- yellow-billed cuckoo (*Coccyzus americanus*, threatened),
- wolverine (*Gulo gulo luscus*, proposed),

Due to lack of suitable habitat in the project area vicinity, it is unlikely that Grizzly bear, Canada lynx, and wolverine will be affected by the proposed action.

The Clark Fork River is designated as critical habitat for Bull trout. Limiting in-water work for the levee repair to a specific window, 1 July to 30 September, is a conservation measure that will be implemented to reduce impacts to species by avoiding key life cycle stages. The repair may cause short-term impacts to fish and wildlife during construction as previously identified and will result in the restoration of the levee which historically does not provide optimal conditions for aquatic life.

The proposed project is within the range of yellow-billed cuckoo (YBCU). Due to the availability of suitable migratory habitat, there is the potential for a transient YBCU to occur in the action area. Potential impacts on the YBCU would be restricted to

disturbance from in-air noise during construction and from a minor loss of suitable habitat during the removal of riparian vegetation for the proposed levee repair.

The Corps has prepared a biological assessment (BA) pursuant to Sec. 7(a)(2) of the Endangered Species Act (ESA) for consultation with the United States Fish and Wildlife Service (USFWS). There are no species or critical habitat under the purview of the National Marine Fisheries Service (NMFS) that are expected to occur in the action area and therefore consultation with NMFS is not anticipated.

Vegetation: Site 1 has an armored riverward slope but the back slope and crown are maintained as a lawn in a residential neighborhood. The riverward slope contains minimal vegetation consisting of intermittent shrubs, grasses, and weeds. Negligible impacts are anticipated to existing vegetation at Site 1. Site 2 will require removal of approximately 10 mature willows (*Salix* spp.) ranging from a 4 inches dbh to 10 inches dbh, in addition to many other smaller saplings and shrubs. At Site 3, removal of streamside shrubs and saplings will be required.

Vegetation removal at Sites 2 and 3 will temporarily decrease river shading and the supply of nutrient input into the river as well as the quality of refugia for fish during periods of high water. The removal of mature vegetation is minor in comparison to the surrounding riparian forest. Repair sites will be hydro-seeded with a native seed mix after construction. Planting native shrub willow species along the repair sites as well as cottonwoods offsite will address the temporary impacts to riparian vegetation resulting from the levee repair. These measures are described above in the “ACTIONS ADDRESSED UNDER NEPA” section. No significant long-term impact is expected to vegetation.

Cultural Resources: The Corps is currently taking actions to identify historic properties that may be affected by this levee repair as required by Section 106 of the National Historic Preservation Act. The Corps is consulting with the Montana State Historic Preservation Officer (SHPO), Indian tribes, and other consulting parties, and will complete identification and evaluation for historic properties as well as make agency findings of effect for Section 106.

Air Quality: Construction vehicles and heavy equipment used during the repair may result in a temporary and localized increase in gasoline and diesel exhaust fumes. The small area of construction and the short duration of the work will limit the impact to air quality which is expected to be well below the *de minimis* threshold and would therefore be exempt under 40 CFR Section 93.153(c)(2)(iv) from conformity determination requirements. The effect of carbon dioxide (CO₂) emissions on global climate change from the levee repair is anticipated to be insignificant.

Noise: the repair will slightly increase localized ambient noise levels during construction. However, given the location it is anticipated that any potential will be negligible. No long-term change in noise levels will occur as a result of the repair

Traffic: Construction-related traffic may have caused temporary increases to, and disruption of, local traffic. Flaggers and signs will be used, as needed, to direct traffic safely around the construction sites.

Cumulative Effects: The permanent repair action will not appreciably alter the baseline condition. Cumulative effects will be fully considered in the environmental documentation, as required under NEPA and ESA.

EVALUATION

The Corps has made a preliminary determination that the environmental impacts of the proposal can be adequately evaluated under the NEPA through preparation of an EA. Preparation of an EA addressing potential environmental impacts associated with the levee rehabilitation project is currently underway.

In accordance with Section 7(a)(2) of the ESA, the Corps has drafted a Biological Assessment and is consulting with USFWS regarding the impact of the repair on listed species and/or designated critical habitat. The Biological Assessment was submitted to USFWS on 1 March 2019.

The purpose of the Federal Water Pollution Control Act (33 U.S.C § 1252 et seq.), commonly referred to as Clean Water Act (CWA), is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing point and nonpoint pollution sources, providing assistance to publicly-owned treatment works for the improvement of wastewater treatment, and maintaining the integrity of wetlands.

The levee repair will involve a discharge of fill material into Waters of the United States but falls into the exemption under 33 USC 1344(f)(1)(B) which applies to repairs to maintain currently serviceable levees. The repair will be conducted within the pre-damaged levee footprint and will not change the character, scope, and size of the structure from the original fill design. Therefore, the repair should not require a Section 404 (b)(1) evaluation or Section 401 certification

The total repair footprint is estimated at 0.67 acre of land, which is below the one acre threshold requiring a Section 402 permit.

The Coastal Zone Management Act (CZMA) is not applicable since the levee repair is not in a coastal county and will not affect coastal resources.

In preparation of the environmental documentation for this project, coordination will be, has been conducted, or is ongoing with the following public agencies:

- (1) U.S. Fish and Wildlife Service;
- (2) U.S. Environmental Protection Agency;
- (3) Montana Department of Fish, Wildlife, and Parks;
- (4) Montana Department of Environmental Quality;

- (5) Natural Resources Conservation Service;
- (6) Montana State Historic Preservation Office;
- (7) Interested Tribes.

The repair will be analyzed for its effects on Tribal Treaty Rights or rights reserved to tribes through Executive Order or other legal instruments. The repair area is within the area of interest of the Confederated Salish and Kootenai Tribes of the Flathead Reservation (CSKT). The Corps will coordinate and consult with these tribes on the action. The Corps is consulting with SHPO, Indian tribes, and other consulting parties about the project in accordance with Section 106 of the National Historic Preservation Act as implemented in the regulations at 36 CFR Part 800.

COMMENT AND REVIEW PERIOD

The Corps invites submission of factual comment on the environmental impact of the repair from the public; Native American Nations or tribal governments; federal, state, and local agencies and officials; and other interested parties in order to consider and evaluate the repair. Comments are used to assess impacts on ESA listed species, historic/cultural properties, water quality, general environmental effects, as well as the other public interest factors listed above. The Corps will consider all submissions received before the expiration date of this notice. The nature or scope of the repair may be changed upon consideration of the comments received. The Corps will initiate an environmental impact statement (EIS) and afford the appropriate public participation opportunities attendant to an EIS if significant effects on the quality of the human environment are identified and cannot be mitigated.

COMMENTS TO THE CORPS OF ENGINEERS

Submit comments to this office, Attn: Planning, Environmental and Cultural Resources Branch, no later than *30 days after the posting of this notice* to ensure consideration. In addition to sending comments via mail to the above address, comments may be emailed to Michael.R.Scuderi@usace.army.mil. The NOP can be found online at the link below.

Project Name: Orchard Homes Levee Rehabilitation

<http://www.nws.usace.army.mil/Missions/Environmental/Environmental-Documents/>

Requests for additional information should be directed to Mr. Michael Scuderi at 206-764-7205 or the above email address.

PROJECT LOCATION AND DESIGN DATA, MAPS AND RELATED INFORMATION

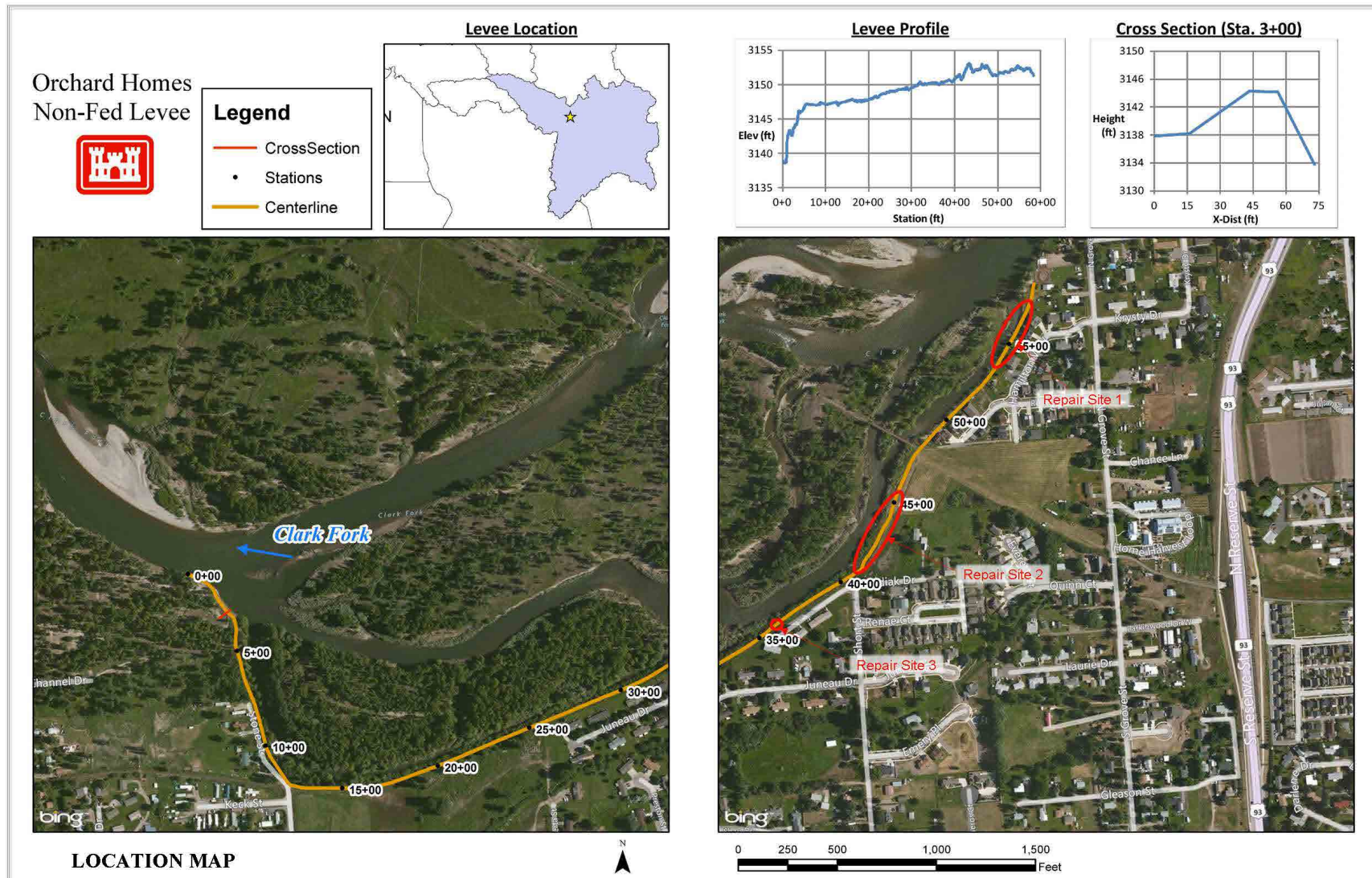


Figure A-1. General Project Location for the Orchard Homes Levee



Figure A-2. General Project Locations for the Orchard Homes Levee.



Figure A-3. Orchard Homes Levee Rehabilitation Showing Staging Area.



Figure A-4. Scour of levee toe and loss of embankment armor, Site 1 (Sta 56+50)



Figure A-5. Loss of slope armor with quarry spalls visible, Site 1 (Sta 56+00).



Figure A-6. Toe scour, Site 2 (Sta 41+25).



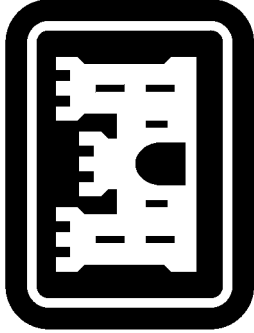
Figure A-7. Scour hole, Site 2 (Sta 41+50).



Figure A-8. Oversteepened slope, Site 2 (Sta 43+50).

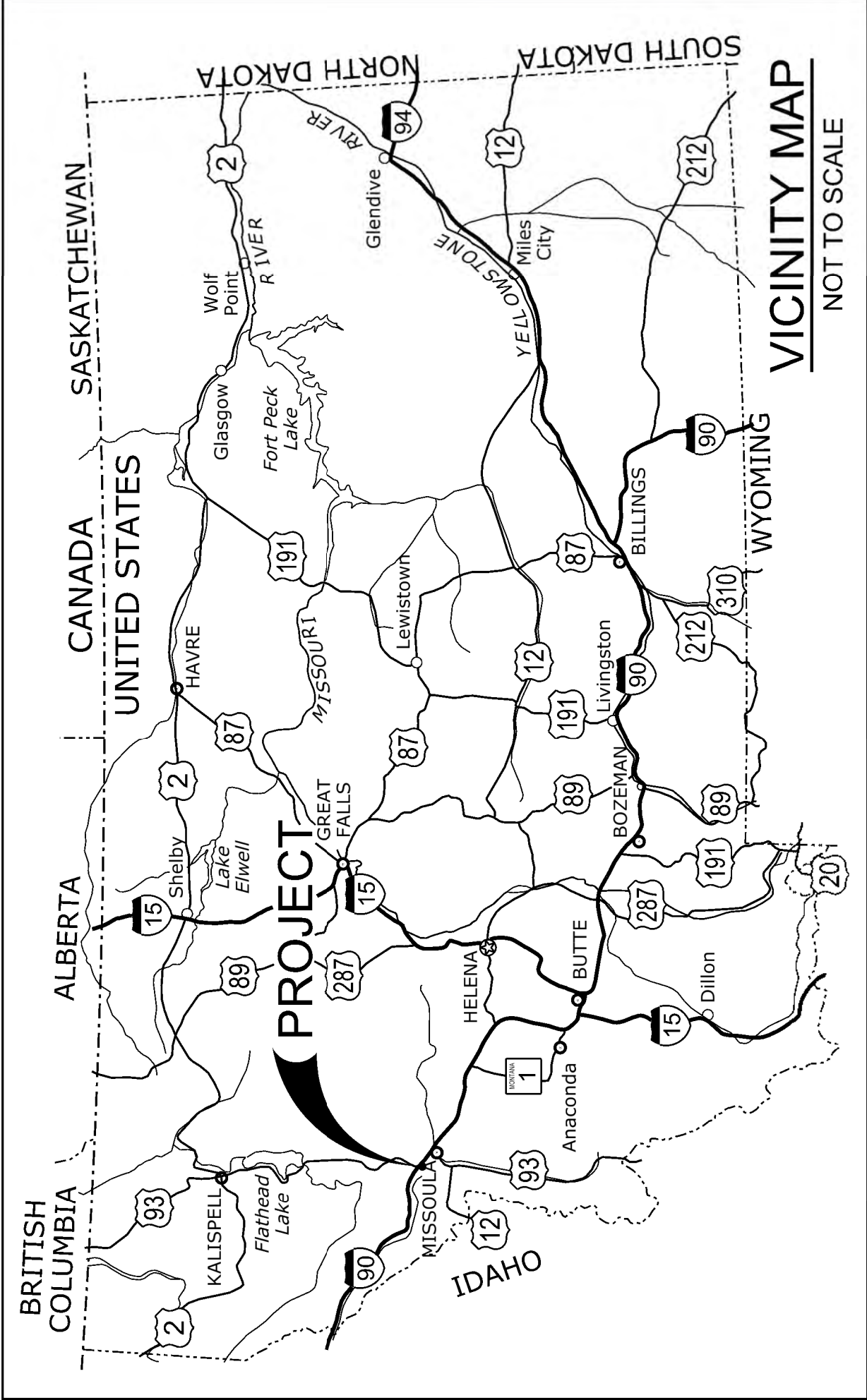


Figure A-9. Standing in 2-foot-deep erosional feature, Site 3 (Sta 36+40).



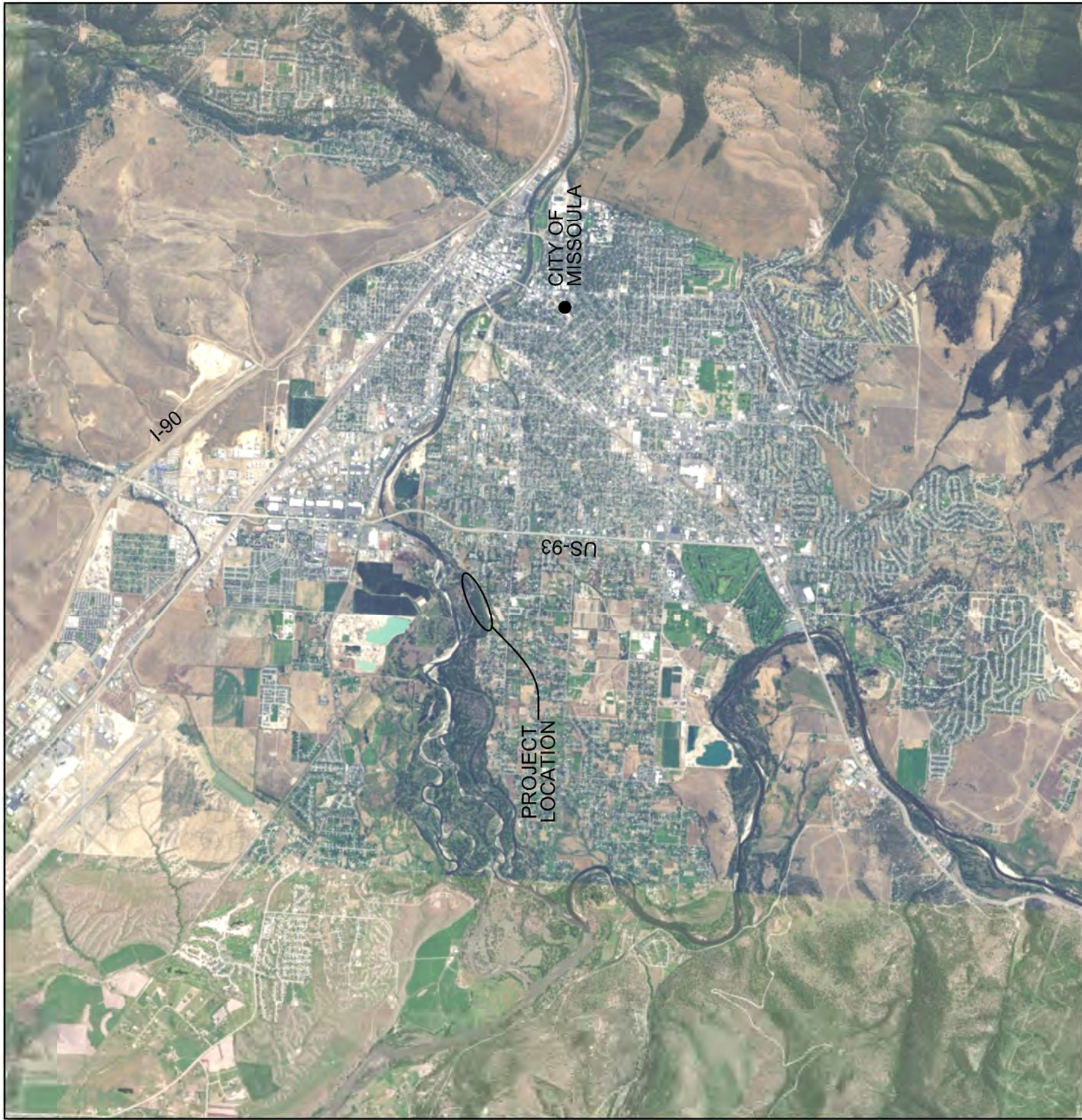
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FY18 LEVEE REHABILITATION CLARK FORK RIVER ORCHARD HOMES LEVEE CFK-01-18



PROJECT LOCATION

ADDED LANDSCAPE SHEETS TO INDEX

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1 ORCHARD HOMES SITES 2 AND 3 ACCESS AND STAGING

NOTES:

1. ACCESS SITES 2 AND 3 FROM US 93 (N. RESERVE STREET) VIA S. 3RD STREET W FOR 0.4 MILES TO SHORT STREET. TAKE SHORT STREET NORTH FOR 0.3 MILES, THEN ALONG THE LEVEE CREST.
2. SALVAGE CSBC FROM SITE 1 TO REHABILITATE ACCESS ROUTE TO SITE 3.

IF SHEET MEASURES LESS THAN 22"x34" IT IS A REDUCED PRINT. REDUCE SCALE ACCORDINGLY.

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U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT
SEATTLE, WASHINGTON

FY18 LEVEE REHABILITATION
K FORK RIVER, MISSOURIA COUNTY
ORCHARD HOMES LEVEE
CFK-01-18
SITES 2 AND 3 ACCESS
AND STAGING

Sheet number:

C-101
Sheet: 3 of 6



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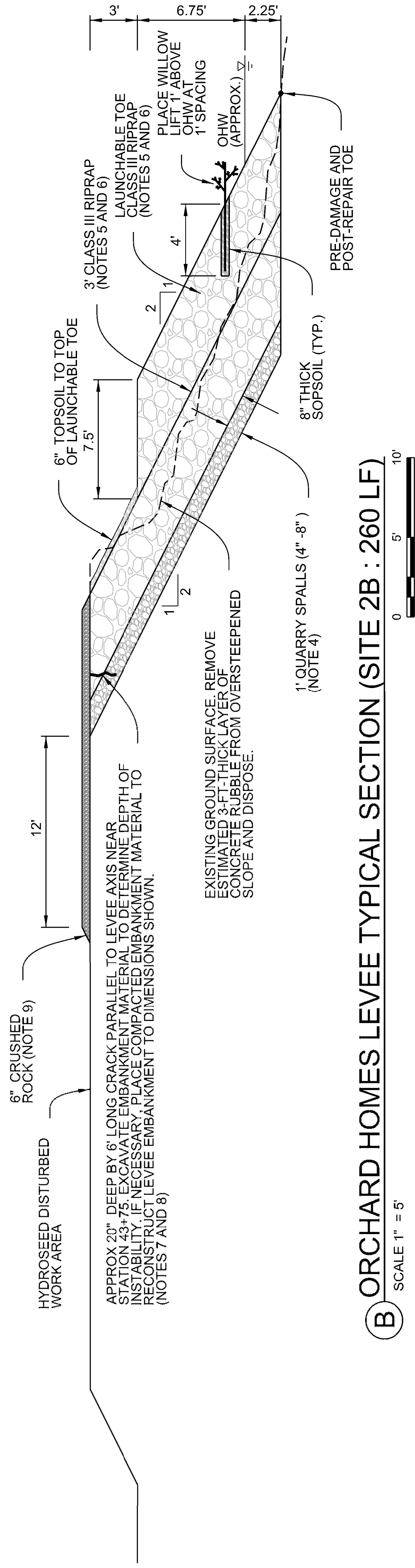
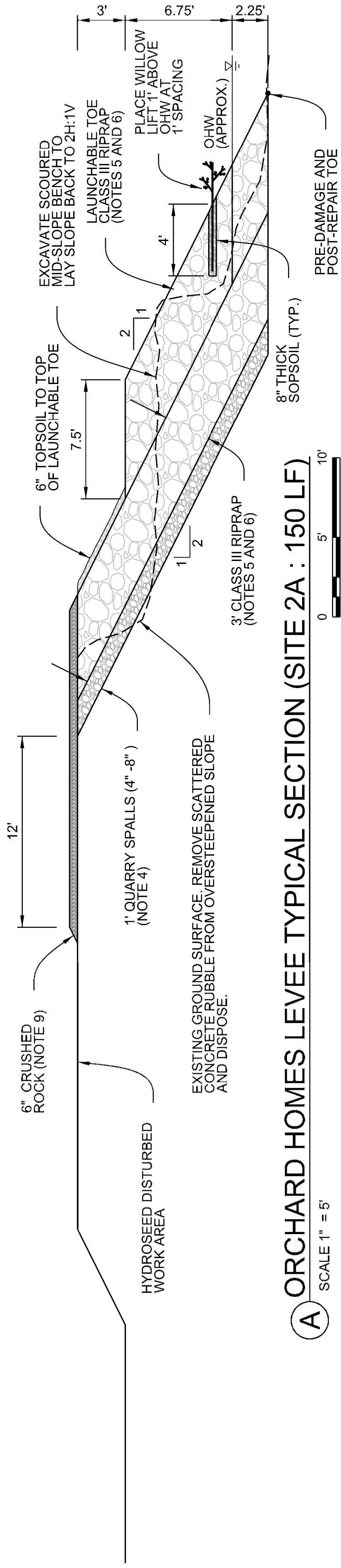
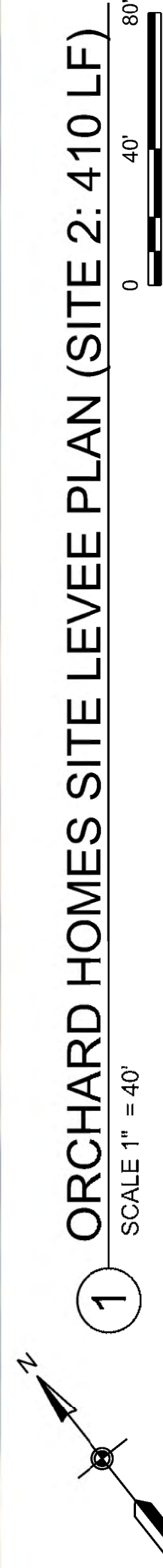
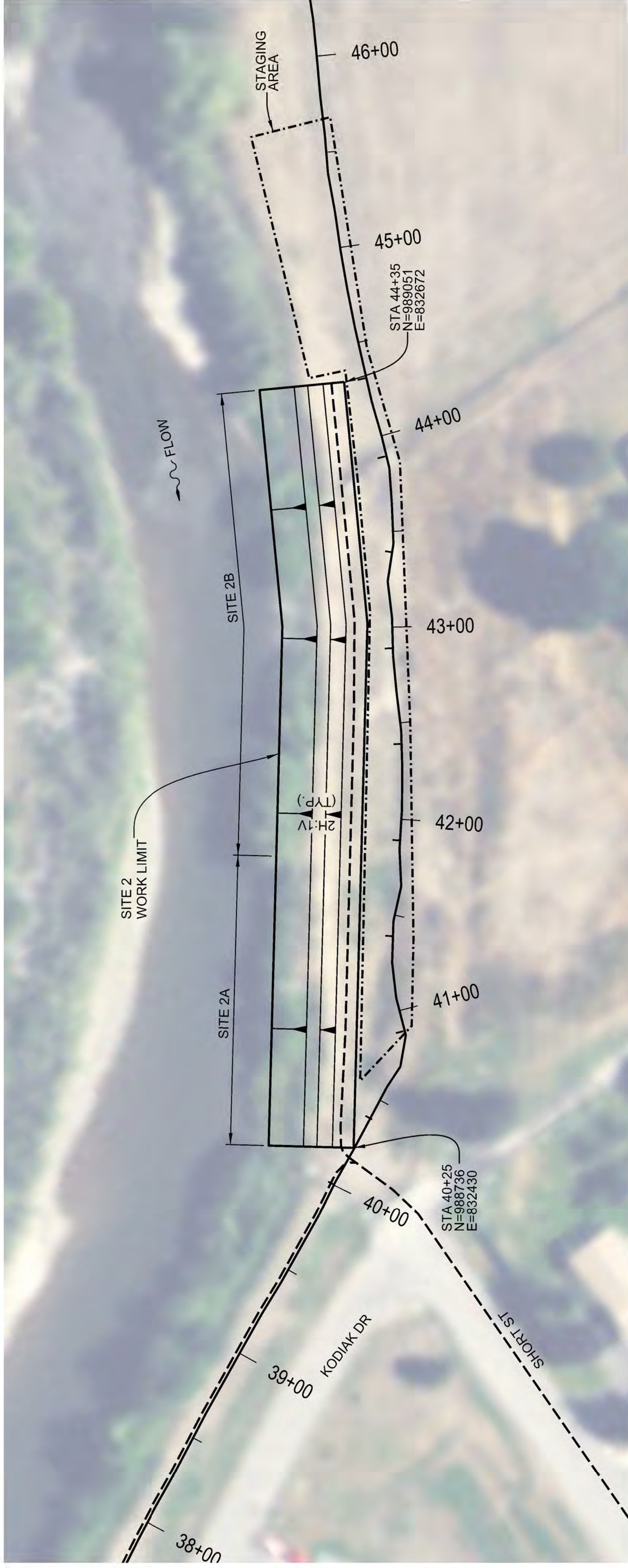
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LEGEND:

WORK AREA

STAGING AREA

ACCESS ROUTE

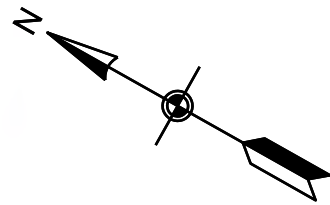
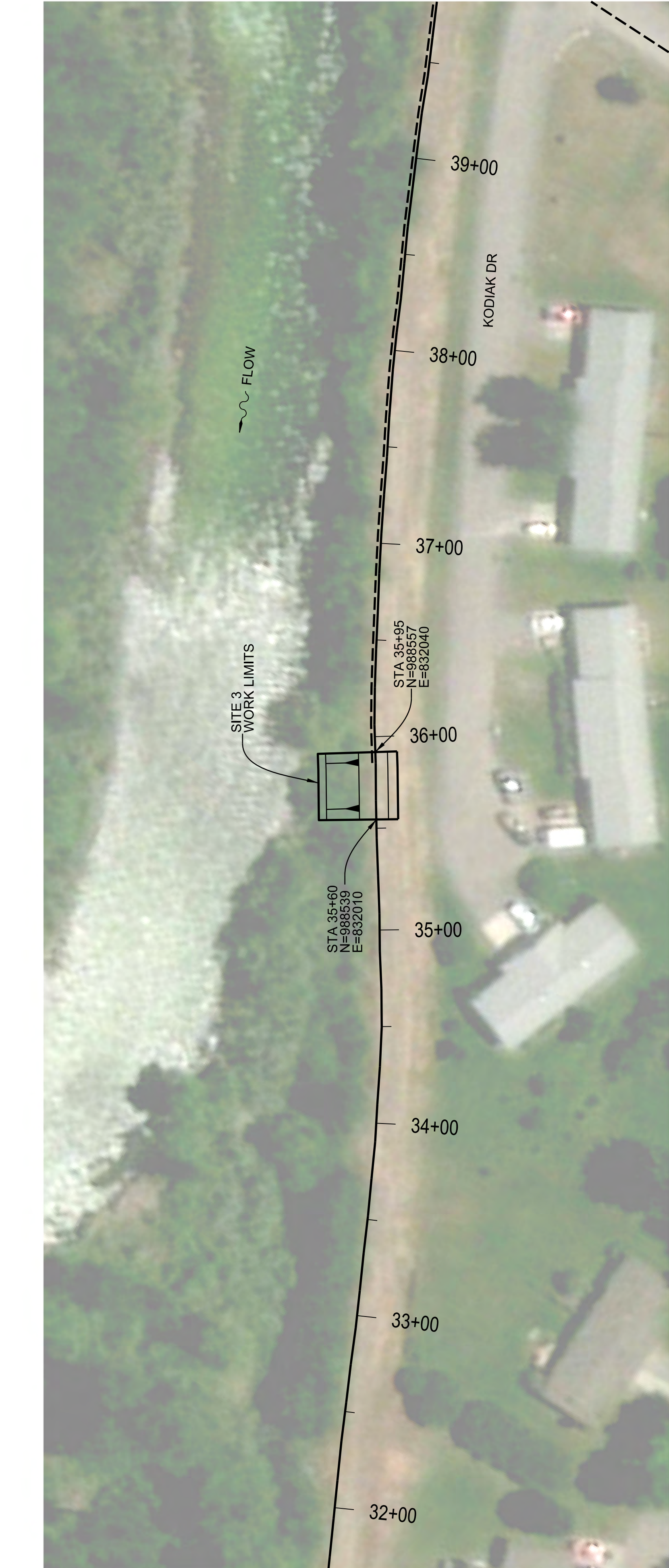


U.S. ARMY CORPS OF ENGINEERS	SEATTLE DISTRICT	DESIGNED BY: A. George	DATE: 21 DEC 16
		CONSTRUCTION NO.: BY: A. Kent	
		CONTRACT NO.:	
		FILE NUMBER:	
		FILE NAME:	
		SIZE:	2 X 34
		DATE:	17 DEC 16
		PROJECT:	Ordinary Holmes Repair-dm

FY18 LEVEE REHABILITATION
 CLARK FORK RIVER, MISSOULA COUNTY, MT
 ORCHARD HOMES LEVEE
 CFFK-01-18
 SITE 2
 PLAN AND SECTION

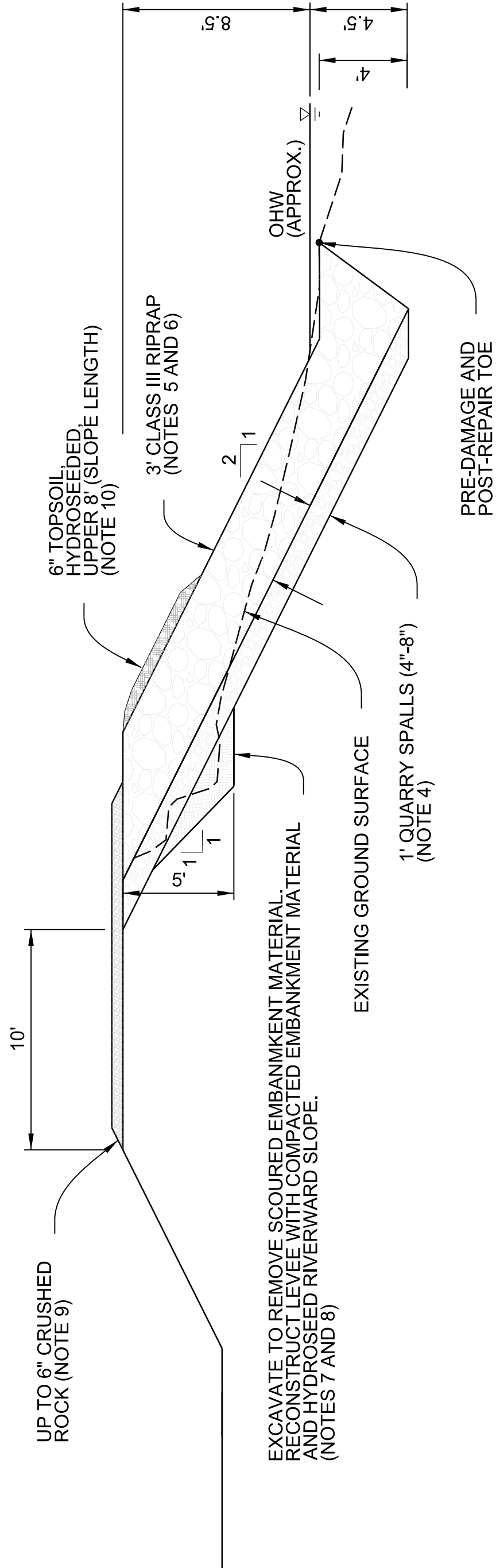
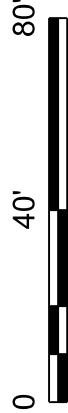
Sheet number:
C-103
Sheet: 5 of 6

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1 ORCHARD HOMES SITE LEVEE PLAN (SITE 3 : 35 LF)

SCALE 1" = 40'



A ORCHARD HOMES LEVEE TYPICAL SECTION (SITE 3 : 35 LF)

SCALE 1" = 5'



LEGEND:

- WORK AREA
- STAGING AREA
- ACCESS ROUTE

NOTES:

- HORIZONTAL DATUM IS MONTANA STATE PLANE COORDINATE SYSTEM NAD 83.
- VERTICAL DATUM BASED ON NAVD 1988.
- CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING UNDERGROUND AND OVERHEAD UTILITIES AS APPLICABLE PRIOR TO COMMENCING WORK.
- QUARRY SPALLS SHALL CONFORM TO GRADATION IN TABLE 1.
- CLASS III RIPRAP SHALL CONFORM TO GRADATION IN TABLE 2. STONE SHALL BE WASHED AND FREE FROM ALL OTHER ORGANIC MATERIAL, CONTAMINANTS, DEFECTS TENDING TO LEAD TO PREMATURE WEATHERING, SPECIFIC GRAVITY (BSSD) SHALL BE A MINIMUM OF 2.65, DETERMINED IN GENERAL ACCORDANCE WITH ASTM C127.
- EXISTING RIPRAP MAY BE SALVAGED FOR THIS USE IN THIS PROJECT. SALVAGED STONE MUST BE COMPETENT AND FREE OF CRACKING AND WEATHERING.
- EMBANKMENT MATERIAL SHALL CONFORM TO GRADATION IN TABLE 3. EMBANKMENT MATERIAL SHALL BE FREE FROM ALL OTHER ORGANIC MATERIAL, CONTAMINANTS, TRAILS, DEBRIS, FILL, AND OTHER DELETERIOUS MATERIALS. EXISTING EMBANKMENT MATERIAL MAY BE REUSED.
- EMBANKMENT MATERIAL SHALL BE COMPACTED TO AT LEAST 95% OF MAXIMUM DRY DENSITY PER ASTM D698 (STANDARD PROCTOR). MOISTURE CONTENT SHALL BE SUITABLE FOR COMPACTION. UNCOMPACTED LIFT THICKNESS SHALL NOT EXCEED 9".
- CRUSHED SURFACING BASE COURSE (CSBC) SHALL CONFORM TO THE WSDOT SPEC 933.9 (3). THE REQUIRED GRADATION IS SHOWN IN TABLE 4.
- TOPSOIL SHALL CONSIST OF A 75/25 MIXTURE OF ENGINEERED SOIL AND ORGANIC COMPOST, RESPECTIVELY. ENGINEERED SOIL SHALL CONFORM TO GRADATION IN TABLE 5, AND SHALL BE FREE OF ROOTS, CHEMICALS, GARBAGE, AND DEBRIS.
- IN WATER WORK WINDOW AT THIS LOCATION IS JULY 1 TO SEPTEMBER 30.

TABLE 1. QUARRY SPALL GRADATION

	8"	4"
100% SMALLER THAN		
100% LARGER THAN		

TABLE 2. RIPRAP GRADATIONS

DISTRIBUTION	CLASS III	
	SIZE (IN)	WEIGHT (LB)
100% SMALLER THAN	24	1,100
85% SMALLER THAN	15.5 - 18.5	310 - 510
50% SMALLER THAN	11.5 - 14.0	120 - 210
15% SMALLER THAN	7.3 - 10.5	32 - 93

TABLE 3. EMBANKMENT MATERIAL GRADATION

SIEVE SIZE	% PASSING BY WEIGHT
3"	100
2"	90-100
1"	70-90
0.5"	55-85
NO. 4	35-75
NO. 40	15-50
NO. 200	10-15

TABLE 4. CSBC GRADATION

SIEVE SIZE	% PASSING BY WEIGHT
1.25"	100
1"	80-100
5/8"	50-80
NO. 4	46-66
NO. 40	10-25
NO. 200	7 MAX

TABLE 5. ENGINEERED TOPSOIL GRADATION

SIEVE SIZE	% PASSING BY WEIGHT
1/2"	100
NO. 4	75-100
NO. 10	40-75
NO. 16	25-55
NO. 40	25-50
NO. 200	10-20

TABLE 6. EARTHWORK QUANTITIES

MATERIAL	VOL (CY)
WASTE EMBANKMENT	110
EMBANKMENT FILL	20
QUARRY SPALLS	40
CLASS III RIPRAP	120
CSBC	40
TOPSOIL	20

POTENTIAL REPAIR STEPS

- EXCAVATE SLOUGHED AND LOOSENEED EMBANKMENT MATERIAL FROM SLOPE.
- RECONSTRUCT EMBANKMENT USING SUITABLE, WELL-COMPACTED EMBANKMENT FILL.
- PLACE 12" BLANKET OF 4" TO 8" QUARRY SPALLS AGAINST SLOPE.
- RECONSTRUCT LAUNCHABLE TOE USING CLASS III RIPRAP. WORK LARGER ROCK TOWARD LEVEE TOE.
- PLACE 3" BLANKET OF CLASS III RIPRAP OVER SPALLS AT 2H:1V NOMINAL SLOPE.
- TRANSITION UPSTREAM AND DOWNSTREAM ENDS OF REPAIR TO SMOOTHLY TIE INTO EXISTING SLOPES, GRADES, ELEVATIONS, AND MATERIALS; CONSTRUCT TRANSITIONS WITHIN WORK LIMIT S.
- PLACE 6" TOPSOIL OVER RIPRAP ON THE UPPER 8' OF RIVERWARD SLOPE (SLOPE LENGTH).
- RESTORE 6" CSBC ON LEVEE CREST.
- HYDROSEED ALL EXPOSED OR DISTURBED SOIL; HYDROSEED MIX SHALL CONSIST OF NATIVE GRASS SPECIES AND MULCH.
- RESTORE STAGING AREAS AND ACCESS ROUTES, AS NECESSARY.

IF SHEET MEASURES LESS THAN 22"x34" IT IS A REDUCED PRINT. REDUCE SCALE ACCORDINGLY.



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MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY:	B. George
DWN BY:	A. Kosh
CKD BY:	A. Kosh
SOLUTION NO.:	
CONTRACT NO.:	
DATE:	21 DEC 18
FILE NAME:	Orchard Homes Repair.dgn
FILE NUMBER:	CF-1-S-5-115
PLT SCALE:	1" = 40'
PLOT DATE:	21 DEC 18
MARKED BY:	

U.S. ARMY CORPS OF ENGINEERS	SEATTLE DISTRICT	SEATTLE, WASHINGTON
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CLARK FORK RIVER, MISSOULA COUNTY, MT
ORCHARD HOMES LEVEE
CFK-01-18
SITE 3
PLAN AND SECTION

Sheet number:

C-104
Sheet: 6 of 6

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7
6
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4
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2
1



L1 ORCHARD HOMES - OFFSITE PLANTING PLAN

GENERAL NOTES:

1. PLANTING TO OCCUR WITHIN APPROXIMATE HATCHED AREA. LAND IS OWNED BY CITY OF MISSOULA.
LAT: 46°52'18.07"N
LONG: 114°34.41"W
2. SEE L-501 FOR PLANTING DETAILS.
3. 30 COTTONWOOD TREES SHALL BE SPACED MIN. 10 FEET.
4. TREES SHALL BE PLANTED MIN. 10 FEET AWAY FROM EDGE OF WATER AND ABOVE OHW.

LEGEND

-  COTTONWOOD TREE PLANTING AREAS

U.S. ARMY CORPS OF ENGINEERS		DESIGNED BY: B. FAIR	DATE: 28 MARCH 2019
SEATTLE DISTRICT		DRAWN BY: M. SCUDERI	SOLICITATION NO.:
SEATTLE, WASHINGTON		CONTRACT NO.:	
		SUBMITTED BY: D. DOWNING	FILE NUMBER: CF-1-3-5-115
		PLANT DATE: 3/29/2019	FILE NAME: Orchard Homes L-101 Planting Plan.dgn

PL 84-99 FY18 LEVEE REHABILITATION CLARK FORK RIVER, MISSOULA COUNTY, MT ORCHARD HOMES LEVEE CFK-01-18	OFFSITE PLANTING PLAN
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SHEET IDENTIFICATION L-101 OF SHEET



MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

