Memorandum

To: Chelsea Benner, Kittitas County CDS
Mark Cook (PE), Kittitas County Public Works Department

From: Paul Tappel

Date: May 21, 2019

Re: Addendum to SD-18-00001 Williams (Shoreline Development Permit Application)
GP-18-00018 Williams (Grading Permit Application)

I have modified all drawings (11 each) as follows:

- Bridge deck will be 16'-wide (open) between wood rails, and the entire proposed driveway will be 16'-wide.
- Bridge design drawings, and driveway site plan, profile & sections are all in one drawing set now, instead of split into two drawing sets.
- A few additional notes are listed on Drawing 2 (Basis of Design) to combine the proposed bridge with driveway design, floodplain considerations, etc.
- All drawings are dated April 2019, and this drawing set completely replaces previous drawing sets.

The revised bridge (now 16'-wide deck) and driveway design (16'-wide vehicle access per original design) should resolve the only remaining design uncertainty identified by Kittitas County. Bridge design modification to 16'-wide deck (vs. 14'-wide deck) was done because the originally proposed 14'-wide deck was not approved by the county during consideration of an application for variance.

I presume my technical memos February 15, 2019 (to both of you) sufficiently clarified and/or answered all other county questions for these permits.

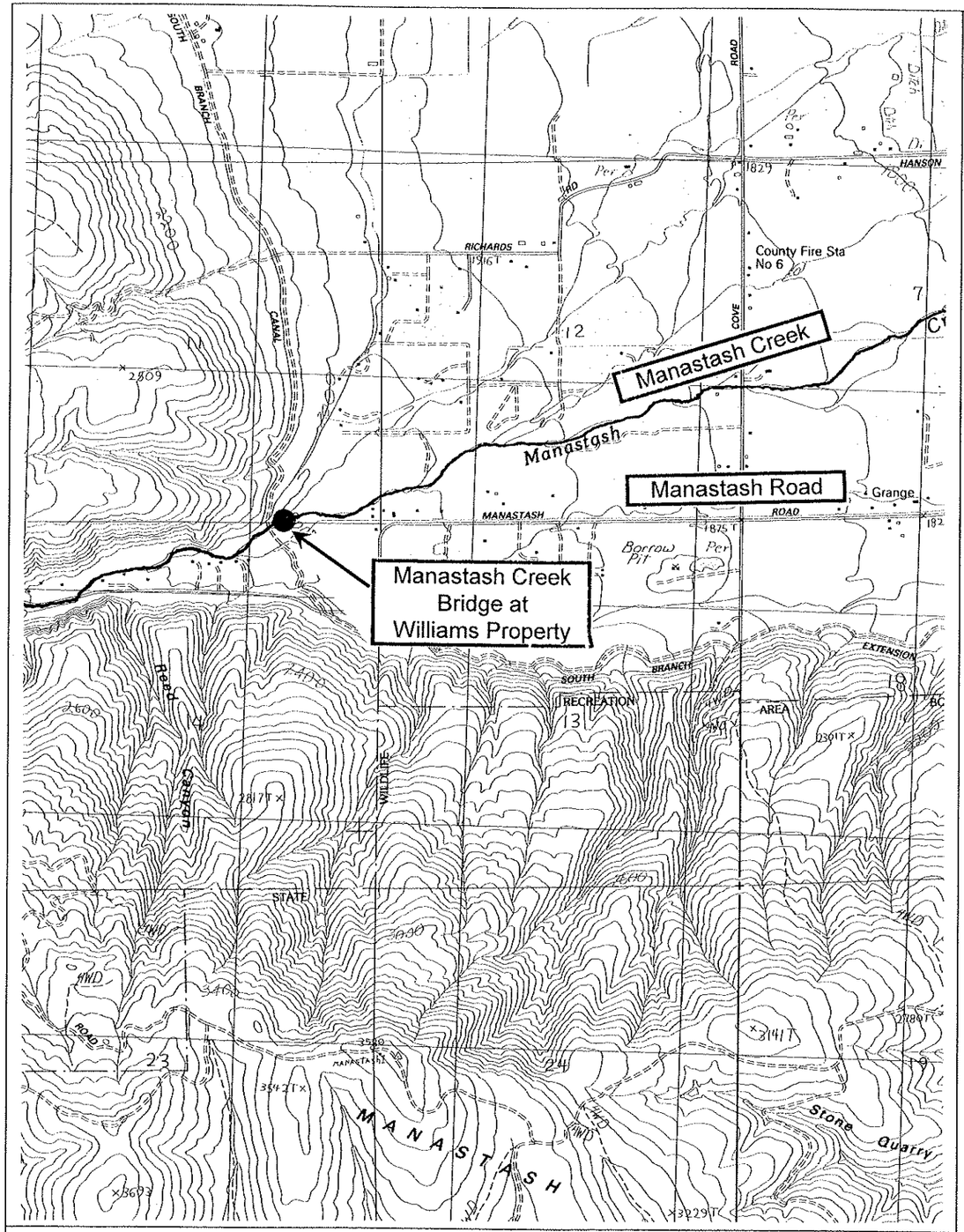
I checked back at my calculations and notes for estimates of disturbed areas, clearing, floodplain fill, net zero change for floodplain fill, etc. Since I had used a 16'-wide driveway for all previous estimates and calculations (see Drawing 11, dated March 2019), my calculations for net zero floodplain fill are exactly the same now, as with the previously proposed 14'-wide bridge deck.

The only changes from previous design submittals are that the bridge deck will be 16'-wide (vs. 14'-wide), this deck will cast a slightly larger shadow over Manastash Creek, and pre-cast concrete footings and backwalls are 2'-longer to support the wider bridge deck.

Please give me a call (or e-mail) if you have any questions or concerns, thank you !

Paul Tappel

Paul Tappel, PE

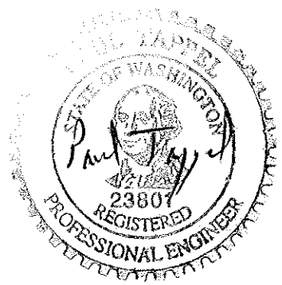


MANASTASH CREEK BRIDGE LOCATION IN NW ¼ SECTION 14, T17N, R17E, KITTITAS COUNTY. ACCESS TO THE SITE VIA DRIVEWAY AT 7501 MANASTASH ROAD. PROPOSED BRIDGE WILL BE ABOUT 70' DOWNSTREAM FROM A WOOD BRIDGE OWNED BY KITTITAS RECLAMATION DISTRICT ALONG SOUTH BRANCH CANAL. MAP SCALE: 1" = 2,000', USGS QUAD MAP 1:24,000 SCALE.

Manastash Creek Bridge & Driveway at Williams Property

Mitch and Julie Williams
7501 Manastash Road (site address)
P.O. Box 1702 (mailing address)
Ellensburg, WA 98926

509-899-0168 (cell)
mitch@mfwilliams.net



Drawing List:

1	Project Location & Drawing List
2	Basis of Design
3	Site Preparation & Water Control
4	Final Project Site Plan
5	Section at Upstream Edge Bridge
6	Stream Centerline Profile
7	Steel Bridge Requirements
8	Pre-cast Concrete Footings
9	Pre-cast Concrete Backwalls
10	Driveway & Bridge Site Plan
11	Driveway Profile & Sections

Certification and Statement (KCC Title 12.08.020):

These construction plans for Manastash Creek bridge and driveway at Williams property were prepared by Paul Tappel, PE (Washington PE No. 23801) in accordance with the requirements of the Kittitas County Road Standards.

Paul Tappel, Professional Engineer, who has prepared these plans, by execution and/or seal hereof does hereby affirm responsibility to the County, as a beneficiary of said engineer's work, for any errors and omissions contained in these plans, and approval of these plans by the Department of Public Works shall not relieve the engineer who has prepared these plans of any such responsibility.

APRIL 2019

PROJECT LOCATION IS ABOUT 6 MILES SOUTHWEST OF ELLENSBURG, WA

MITCH AND JULIE WILLIAMS (OWNER)
7501 MANASTASH ROAD
ELLENSBURG, WA 98926 509-899-0168

PAUL TAPPEL (ENGINEER)
3100 - 243rd STREET SW
BRIER, WA 98036 425-482-6420

MANASTASH CREEK BRIDGE AT WILLIAMS PROPERTY

PROJECT LOCATION & DRAWING LIST
DRAWING 1

These plans have been reviewed by Kittitas County Department of Public Works and have been accepted for complying with the requirements of Kittitas County Road Standards.

County Engineer _____ Date _____

Manastash Creek Bridge

Basis of Design

Project Objectives

Provide a functional and cost-effective bridge crossing of Manastash Creek and new driveway for vehicle access to one existing residence owned by Mitch and Julie Williams. Meet all requirements for flood flow conveyance, Emergency Vehicle Access (EVA), Kittitas County Code, fish passage and fisheries resources, floodplain development, etc.

Site Survey

A total station survey instrument (Leica TC800) was used to survey 0.4 acres surrounding the proposed bridge location. A 240'-long reach of Manastash Creek was surveyed to determine creek profile, cross-section dimensions, and other variables.

Geotechnical

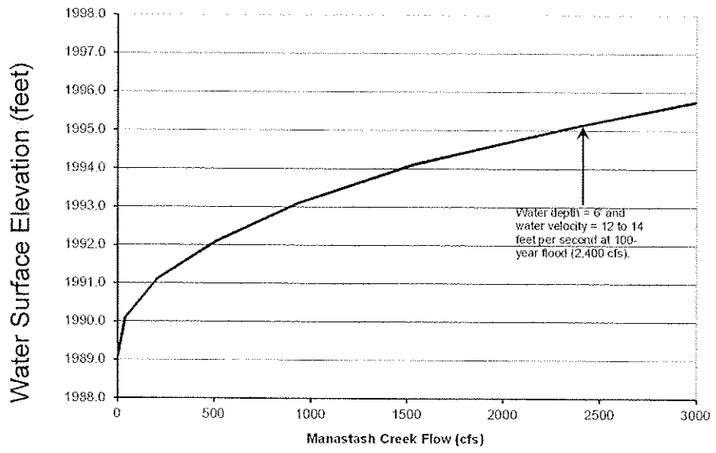
On-site soils were observed to be coarse mixtures of cobble, gravel & sand, which are a mixture of native alluvial materials and imported rock. Allowable bearing pressure for these types of soils are 3,000 pounds per square foot (International Building Code, Table 1804.2). Total bearing capacity under proposed bridge footing slabs will be almost 250,000 pounds, which will substantially exceed any possible combination of dead load (e.g. structures and road surfacing) and live load (e.g. vehicles and snow).

Hydrology and Hydraulic Design

The 100-year flood flow for Manastash Creek at the project site was estimated to be 2,600 cubic feet per second (cfs) using the USGS' most recent method for calculation of flood flows for ungaged streams and rivers in Washington (Mastin et al. 2017). It was assumed that 200 cfs would overtop from the mainstem creek upstream of the KRD canal. A peak flow rate = 2,400 cfs was used for bridge design.

A flow rating curve was developed to show the relationship between Manastash Creek flow and water surface elevation at the proposed bridge site (see below). Hydraulic conditions during a 100-year flood are estimated to be:

- Water depth 6' at the bridge location, with "standing waves" at least 1' high.
- Water velocity averaging 12 to 14 feet per second with high turbulence and whitewater.
- Substantial transport of large wood and bedload, turbid water conditions.



Rating curve for Manastash Creek at proposed 60'-span bridge for Williams property.

Bridge Structure

Superstructure to be a pre-fabricated modular weathering steel bridge 60'-span x 16'-wide deck for single-lane travel. Reinforced pre-cast concrete (WSDOT Class 4000) footings and backwalls to support each end of bridge. All bridge design to support HL-93 live load with deflection < L/300. HL-93 is a nominal (conceptual) 57-ton truck about 56'-long. The bridge structure will easily support fire apparatus as specified in KCC 20.02.050, for which the live load requirement is 75,000 pounds (37½ tons).

Structure Protection from Hydraulic Forces

Tractive force calculations and hydraulic conditions during the estimated 100-year flood were combined with the engineer's experience with design of stable stream channels, to select armor rocks 36" to 48"-size to wrap around concrete footings. Rock slopes will extend from above footing slabs to about 2' below the creek's lowest channel elevation (thalweg) to minimize the chances for footing scour and/or undermining.

Channel Characteristics, Open Area for Floods, etc.

Stream simulation design considerations (for culverts) were adapted to the proposed bridge location. Measured Ordinary High Water (analogous to Channel Bed Width or Bankfull Width) was 42', which would suggest a drainage structure with span at least 52'-wide for stream simulation (per WDFW method). The selected 60'-span bridge will allow all construction work to be completed outside the existing low-flow channel, which will remain undisturbed.

The 100-year flood flow was routed under the proposed bridge using Manning's equation, and the bridge was designed for 3' freeboard (minimum) between the bottom of bridge beams and the flood water level. Total open area under the bridge will be 2.8 times an existing KRD bridge immediately upstream. The proposed bridge will have essentially zero effects on the 100-year flood flow, transport of large wood, bedload passage, fish passage, and other aquatic resource considerations.

Bridge Site Preparation and Water Control

Clearing within the wooded riparian area for bridge construction will be limited to an area about 5' outside the perimeter of excavation and fill for bridge and driveway construction. Four cottonwood trees 12" to 18"-trunk diameter will be placed over Manastash Creek downstream of the bridge, for in-stream large wood habitat similar to natural windthrow.

All excavation and fill work will be separated from flowing water. Trashpump(s) will be used to remove turbid water from excavated trenches (for rock slope placement), to prevent turbid water from splashing into Manastash Creek.

Driveway Site Preparation

Total area within existing Manastash Creek floodplain to be cleared for driveway construction = 0.22-acre, with an additional 0.08-acre upland area cleared.

Net Zero Change in Floodplain Water Storage

Bridge approach fill will decrease flood water storage an estimated 130 cubic yards. A 220'-long driveway section will be countersunk into the floodplain 1'-deep which will increase flood water storage by 130 cubic yards. There will be "net zero" change in floodplain water storage capacity by the proposed bridge and driveway project.

PAUL TAPPEL
STATE OF WASHINGTON
23801
REGISTERED
PROFESSIONAL ENGINEER

APRIL 2019

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PAUL TAPPEL (ENGINEER)
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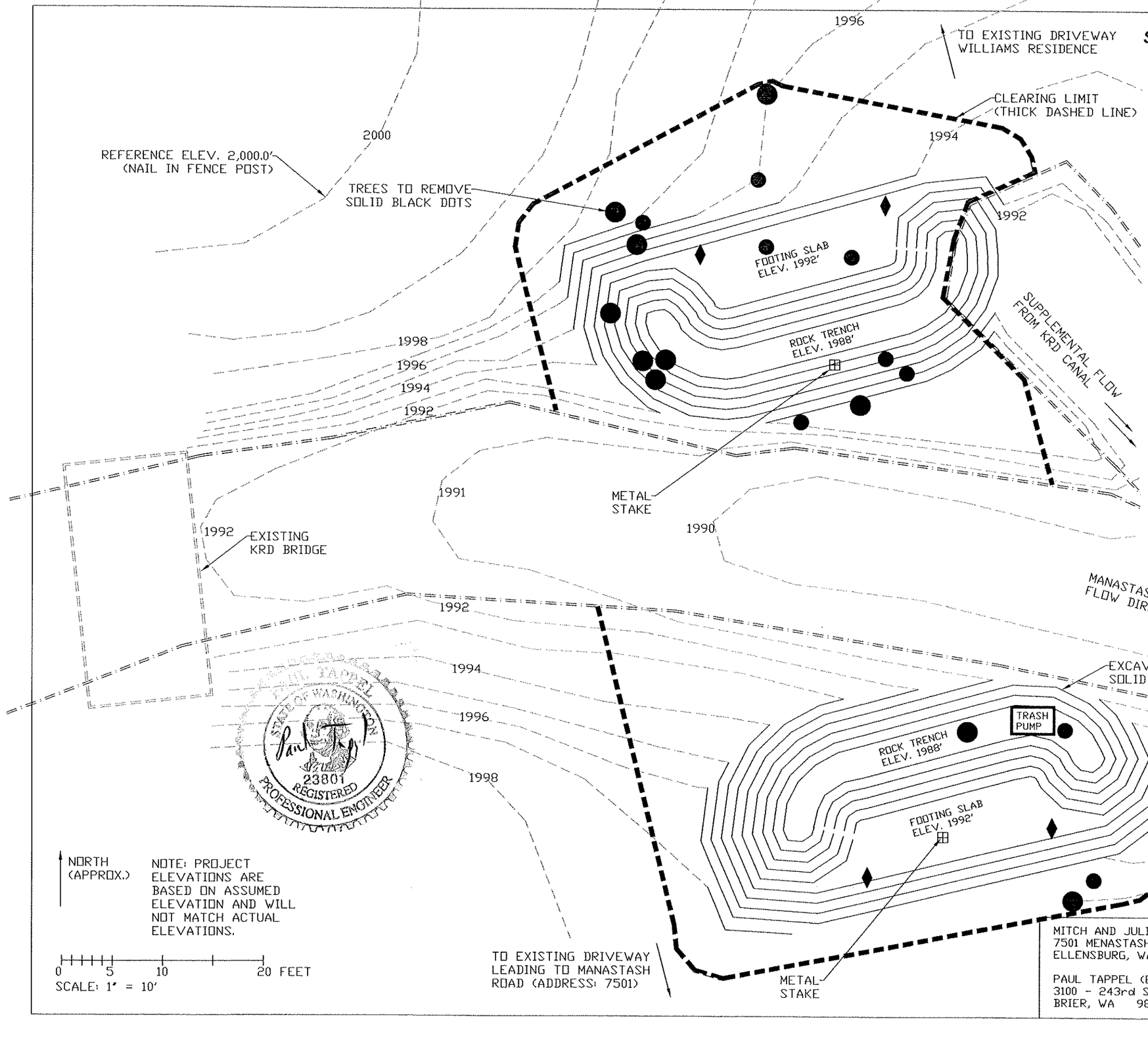
BRIER, WA 98036 425-482-6420

MANASTASH CREEK BRIDGE AT
WILLIAMS PROPERTY

BASIS OF DESIGN
DRAWING 2



Site Preparation & Water Control Notes:

1. Clearing shall be completed prior to other work. All plants within clearing limits to be entirely removed, including 19 cottonwood trees 8" to 24" trunk diameter (pull out stumps). Four cottonwood trees 12" to 18" trunk diameters to be removed in largest pieces practical, then carried downstream of new bridge location (within 60') to be cast across creek to resemble windthrow. All other clearing debris to be disposed on-site within 400' of bridge location, at an upland spot selected by landowner. Pile debris and mash down.
2. Engineer will set stakes at four outside footing corners for new bridge, shown as black diamonds this drawing, plus offset stakes to retain these locations during excavation.
3. There are no buried utilities at the project site.
4. Manastash Creek to remain within existing channel during entire bridge construction project (i.e. no creek bypass, no fish salvage needed). Approximate excavation contours shown this drawing would maintain separation of earthwork from flowing water. However, if minor site differences result in extension of excavation into shallow water areas, Contractor to place sandbag dam along creek bank to isolate excavation from flowing water.
5. Excavation to proceed from both sides of creek for placement of large rocks and footings. Separately stockpile cobble, gravel & sand materials from surface excavations, for streambed and bank backfill over rock slopes and underneath bridge (engineer will advise).
6. Engineer to lay out trenches for large rock placements, and will survey bottom elevations. Contractor to place several rows of large rocks (place largest rocks in bottom rows) to get above water level, then finish excavations for footing subgrades. Place pre-cast concrete footings, then backfill behind footings for equipment pads to finish placement of large rock slopes (see other drawings).
7. Contractor to supply and operate gas-powered trashpump(s) to remove muddy water from rock trenches, with discharge to flat ground (within 100') for infiltration into ground. Large rocks may be placed in shallow standing water, with trashpump(s) operated to prevent muddy water from splashing into creek.

NORTH (APPROX.)

NOTE: PROJECT ELEVATIONS ARE BASED ON ASSUMED ELEVATION AND WILL NOT MATCH ACTUAL ELEVATIONS.

0 5 10 20 FEET
SCALE: 1" = 10'

TO EXISTING DRIVEWAY LEADING TO MANASTASH ROAD (ADDRESS: 7501)

APRIL 2019

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MANASTASH CREEK BRIDGE AT WILLIAMS PROPERTY

SITE PREPARATION & WATER CONTROL
DRAWING 3

NOTE: AFTER BRIDGE CONSTRUCTION, SPREAD 2 lb. EROSION CONTROL SEEDS OVER DISTURBED SOILS, THEN SPREAD 12 BALES STRAW MULCH

16'-WIDE CRUSHED ROCK DRIVEWAY, SEE OTHER DRAWINGS

TO EXISTING DRIVEWAY WILLIAMS RESIDENCE

PROPOSED CONTOURS SOLID BLACK LINES

REFERENCE ELEV. 2,000.0' (NAIL IN FENCE POST)

2000

SECTION AT UPSTREAM EDGE BRIDGE, DWG. 5

1998
1996
1994
1992

SUPPLEMENTAL FLOW FROM KRD CANAL

1991

METAL STAKE

1990

1992 EXISTING KRD BRIDGE

60'-SPAN x 16'-WIDE WEATHERING STEEL BRIDGE w/ CRUSHED ROCK DECK

TYPICAL EDGE OF WATER

MANASTASH CREEK FLOW DIRECTION

1989

STREAM CENTERLINE PROFILE, DWG. 6

EXISTING CONTOURS LIGHT DASHED LINES

YEAR INDENT IN WINGWALL & LOAD RATING SIGN

ROCK SLOPE TO WRAP AROUND EACH BRIDGE FOOTING, SEE OTHER DWGS.

NORTH (APPROX.)

NOTE: PROJECT ELEVATIONS ARE BASED ON ASSUMED ELEVATION AND WILL NOT MATCH ACTUAL ELEVATIONS.

0 5 10 20 FEET
SCALE: 1" = 10'

TO EXISTING DRIVEWAY LEADING TO MENASTASH ROAD (ADDRESS: 7501)

METAL STAKE

APRIL 2019

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MANASTASH CREEK BRIDGE AT WILLIAMS PROPERTY

FINAL PROJECT SITE PLAN
DRAWING 4

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Streambank Notes:

1. For excavation of rock trenches and footing subgrades, remove surface layers cobble, gravel & sand to stockpile separately (engineer to advise). These relatively coarse (vs. silty) native materials will be used to fill over rock slopes, and to re-build Manastash Creek banks after footing placement.
2. Native cobble, gravel & sand materials to be spread over rock slopes, and around bridge footings as shown this drawing. Final streambank contours will be approximately the same as original bank contours in near vicinity to and under the new bridge.
3. Native cobble, gravel, & sand materials to be placed under and around bridge shall not be sorted. The natural assemblage of coarse particle sizes shall be spread over large rocks and along the bank, then roughly raked with excavator teeth for final streambanks.

Rock Slope Notes:

1. Engineer will assist with layout for rock slope trenches and rock placement.
2. Rocks to be 36" to 48"-size, with largest rocks placed in bottom rows.
3. Place rocks one at a time for single row, then backfill with native soils to top of rocks, tamp backfill, then place next row rocks. Top of rocks shall be at slope 1.5:1 approximately.
4. Bottom rows rocks may be placed in shallow standing water in trench. Pump water as required to prevent overflow into creek channel.
5. Top of rock slopes shall be at least 12" above top of pre-cast concrete footing slabs.

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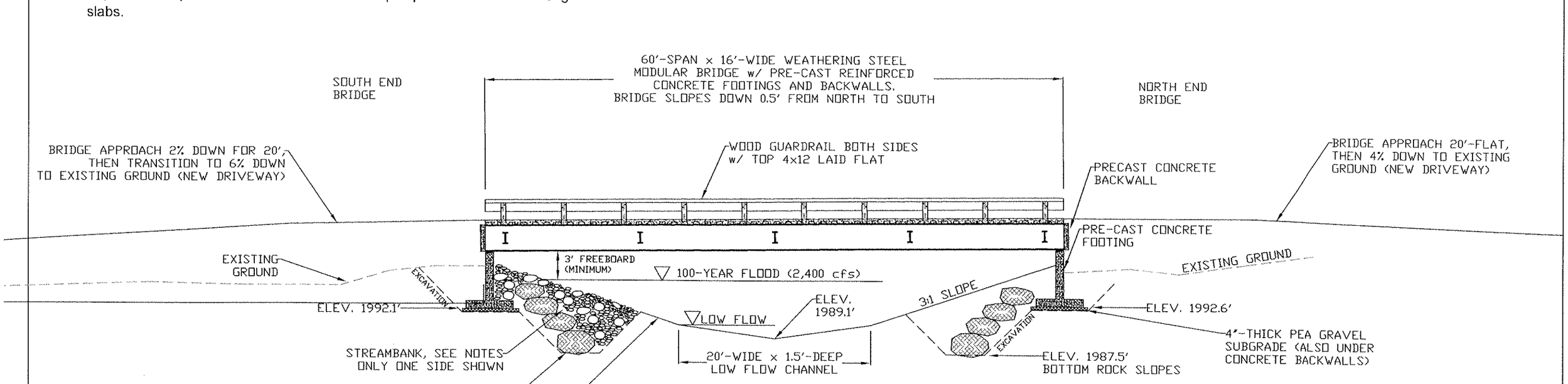
Bridge Elevation & Open Area Notes:

1. New bridge deck will be 1.5' to 2.0' higher than the existing KRD wood bridge's deck about 70' upstream. The higher deck elevation will provide 3' freeboard (minimum) over the estimated 100-year flood (2,400 cfs).
2. Open area under the new bridge for flood flow conveyance, wood and bedload transport, fish passage, and all fluvial processes will be 342 ft^2. Open area under the existing KRD wood bridge = 123 ft^2. The proposed bridge will have open area 2.8 times as large as the existing KRD bridge (which withstood the May 2011 flood), resulting in no obstruction to the 100-year flood, large wood transport, bedload passage, etc. for Manastash Creek.



SECTION AT UPSTREAM EDGE BRIDGE

APRIL 2019

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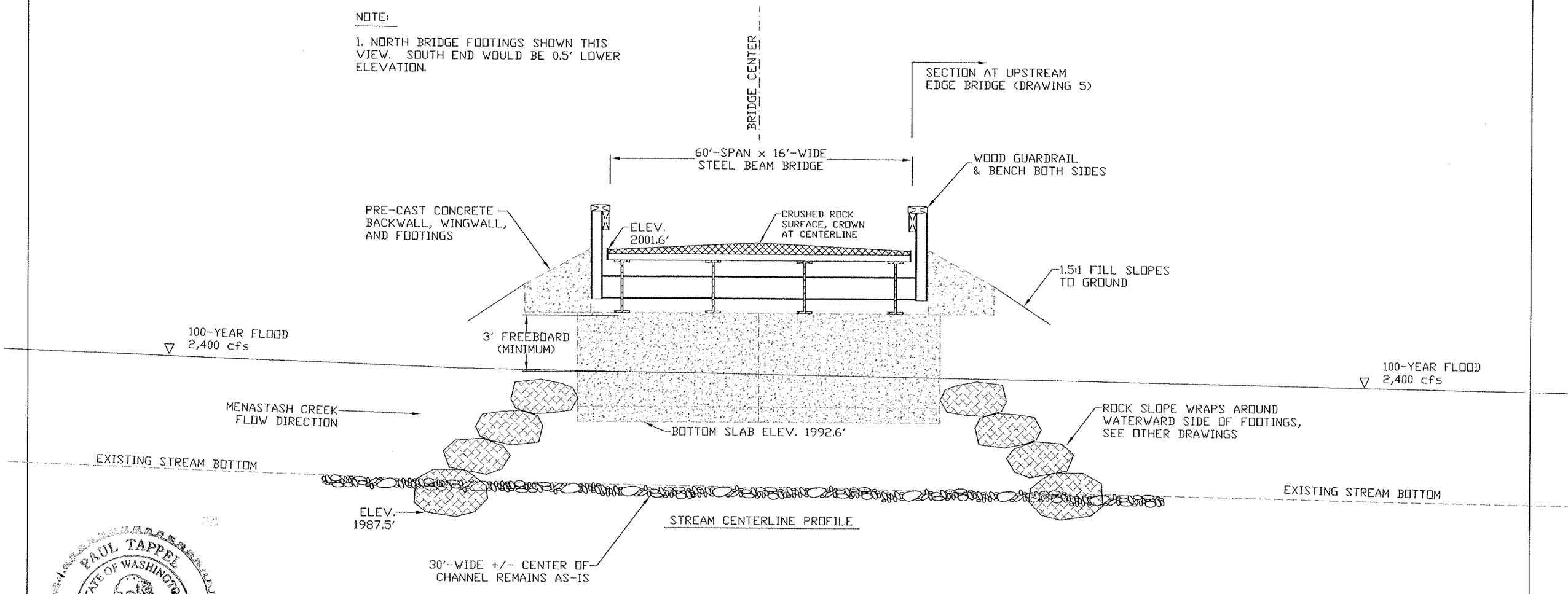
MANASTASH CREEK BRIDGE AT WILLIAMS PROPERTY

SECTION AT UPSTREAM EDGE BRIDGE
DRAWING 5

NOTE:

1. NORTH BRIDGE FOOTINGS SHOWN THIS VIEW. SOUTH END WOULD BE 0.5' LOWER ELEVATION.



STREAM CENTERLINE PROFILE

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0 5 10

SCALE: 1" = 5'

APRIL 2019

MITCH AND JULIE WILLIAMS (OWNER) 7501 MENASTASH ROAD ELLENSBURG, WA 98026 509-899-0168 PAUL TAPPEL (ENGINEER) 3100 - 243rd STREET SW BRIER, WA 98036 425-482-6420	MANASTASH CREEK BRIDGE AT WILLIAMS PROPERTY STREAM CENTERLINE PROFILE DRAWING 6

STEEL BRIDGE REQUIREMENTS:

1. 60'-SPAN (BEAM END-TO-END) BY 16'-WIDE (DECK WIDTH) MODULAR WEATHERING STEEL BEAM BRIDGE TO BE PRE-FABRICATED AND SHIPPED TO THE PROJECT SITE (6 MILES SOUTHWEST OF ELLENSBURG, WASHINGTON, ACCESSIBLE BY ROAD).

2. ALL ON-SITE WORK INCLUDING LIFTING THE BRIDGE OFF TRANSPORT TRUCK(S), PLACING BRIDGE ON BEARING PLATES, WELDING BEAMS TO PLATES, BOLT INSTALLATION ALONG BRIDGE CENTERLINE, AT BEARING PLATES, AND RAIL ASSEMBLY WILL BE ACCOMPLISHED BY ON-SITE CONTRACTOR.

3. WOOD RAIL MATERIALS (4x12's) AND RAIL HARDWARE TO BE SUPPLIED BY ON-SITE CONTRACTOR, AND ALL RAIL ASSEMBLY BY CONTRACTOR. METAL GUARDRAILS NOT NEEDED FROM BRIDGE SUPPLIER.

4. CONTRACT SPECIFICATION 6-03 INCLUDES DETAILED REQUIREMENTS FOR BRIDGE DESIGN AND SUPPLY. THIS DRAWING SUPPLEMENTS THIS SPECIFICATION.

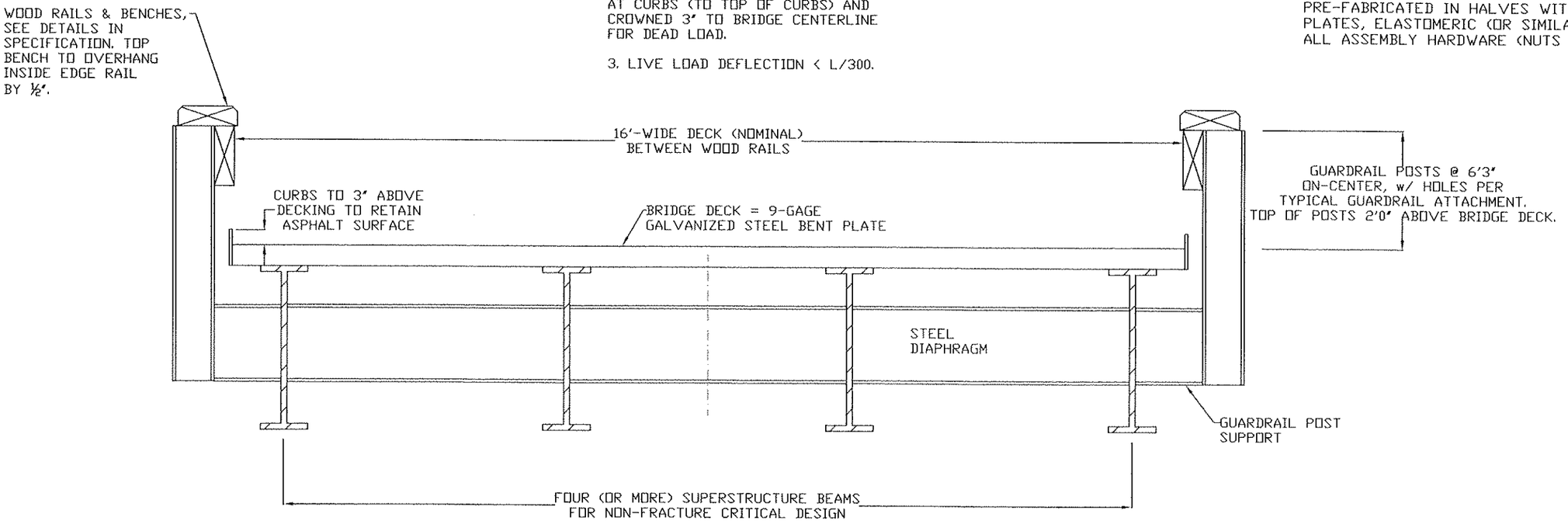
5. BRIDGE SUPPLIER TO PROVIDE BRIDGE SUPERSTRUCTURE PRE-FABRICATED IN HALVES WITH DECK MATERIAL ATTACHED, BEARING PLATES, ELASTOMERIC (OR SIMILAR) BEARING PADS, RAIL POSTS, AND ALL ASSEMBLY HARDWARE (NUTS AND BOLTS).

LOADS AND DEFLECTION:

1. LIVE LOAD = HL-93 (114,000 POUNDS = 57 TONS OVER 55.5'-LONG VEHICLE AXLES).

2. INCLUDE ASPHALT DECK 3"-THICK AT CURBS (TO TOP OF CURBS) AND CROWNED 3" TO BRIDGE CENTERLINE FOR DEAD LOAD.

3. LIVE LOAD DEFLECTION < L/300.



STEEL BRIDGE
SCHEMATIC CROSS-SECTION

THIS CROSS-SECTION SHOWS FOUR W33x BEAMS @ 4'-9" ON-CENTER; THESE BRIDGE ELEMENTS MAY VARY WITH FINAL DESIGN.

0 1 2 4 FEET
SCALE: 1/2" = 1'0"

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APRIL 2019

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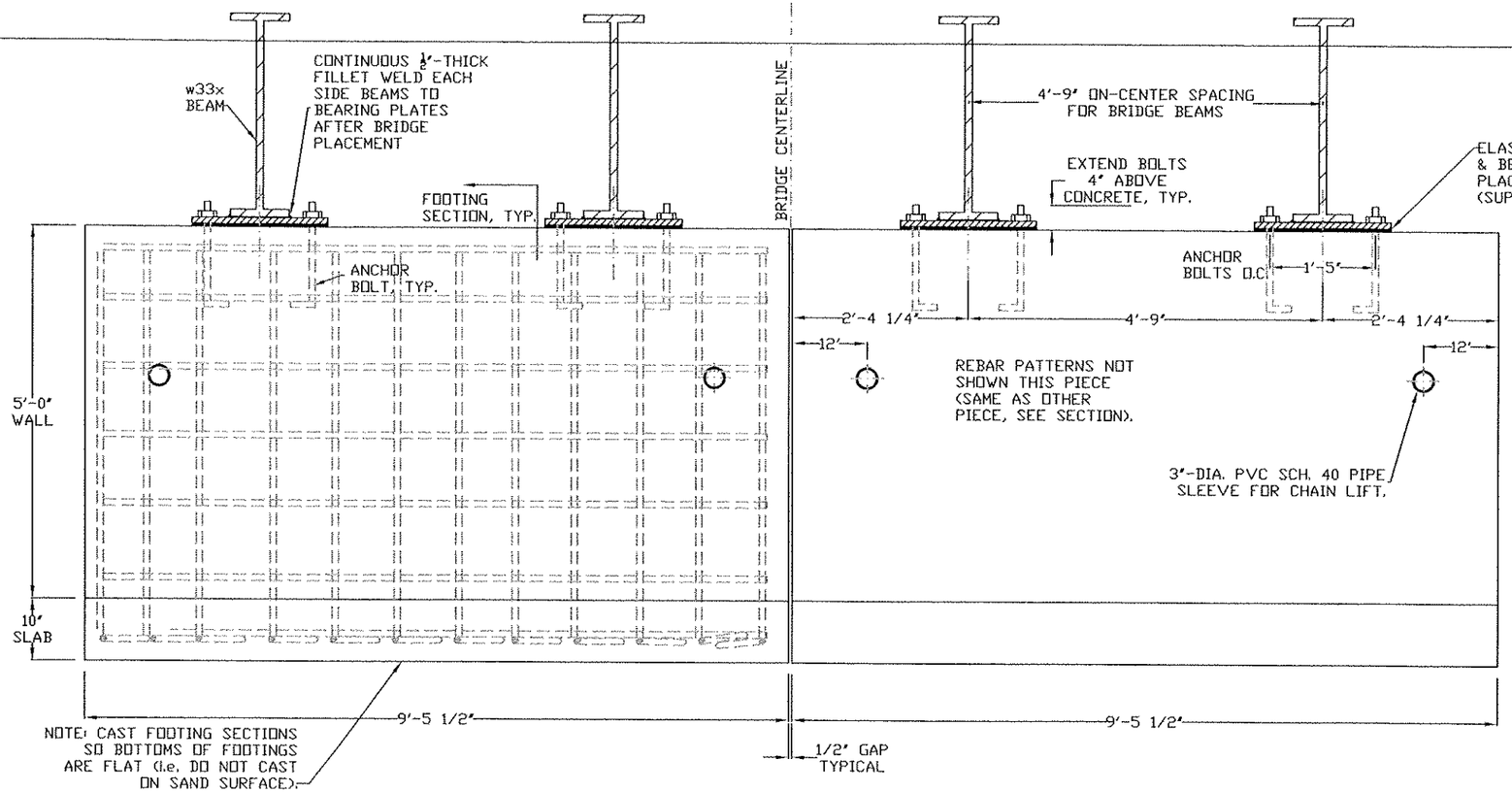
MANASTASH CREEK BRIDGE AT WILLIAMS PROPERTY

STEEL BRIDGE REQUIREMENTS
DRAWING 7



0 1 2 4 FEET

SCALE: 1/2" = 1'0"

NOTE: THIS DRAWING BASED ON ASSUMED BRIDGE BEAM SPACING AND BEARING PLATE SIZE. THE ENGINEER WILL REVIEW BRIDGE DESIGN SHOP DRAWINGS, AND WILL MAKE CHANGES TO PRE-CAST CONCRETE DRAWINGS (INCLUDING BACKWALLS), DEPENDING ON FINAL BRIDGE SUPERSTRUCTURE DESIGN.

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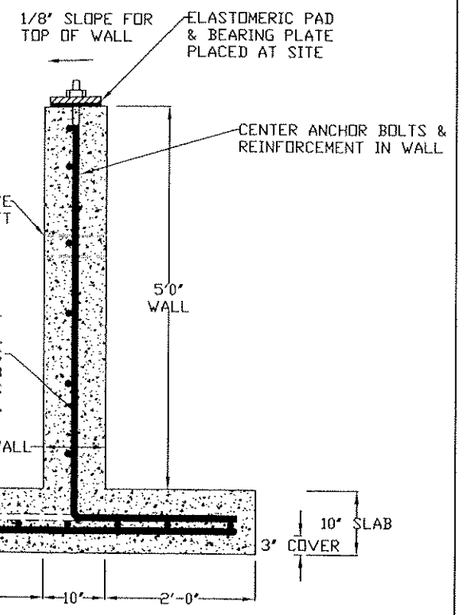
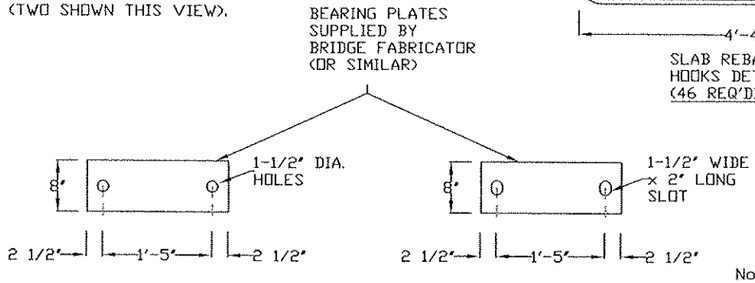


FOOTING SECTION, TYP.

FOOTING FRONT VIEW

NOTE: FOUR PRE-CAST CONCRETE FOOTING PIECES REQUIRED (TWO SHOWN THIS VIEW).

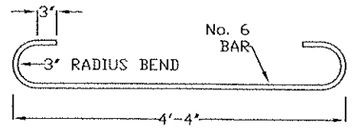


BEARING PLATE FOR NORTH END BRIDGE (4 REQUIRED)

NOTE: TIGHTEN NUTS TO BEARING PLATES AFTER BRIDGE PLACEMENT

BEARING PLATE FOR SOUTH END BRIDGE (4 REQUIRED)

NOTE: LEAVE 1/8" GAP BETWEEN NUTS AND BEARING PLATES



SLAB REBAR w/ HOOKS DETAIL (46 REQ'D)

PRE-CAST CONCRETE NOTES & SPECIFICATIONS:

1. PRE-CAST CONCRETE SUPPLIER MAY DESIGN AND INSTALL ALTERNATE LIFT SYSTEM FOR FOOTING PIECES, INSTEAD OF 3"-DIA. HOLES THROUGH FOOTING WALLS. THESE POSSIBLE CHANGES SHALL BE COORDINATED WITH ENGINEER (APPROVAL REQUIRED), AND ALL LIFTING HARDWARE (e.g. CLUTCHES) SHALL BE LOANED TO GENERAL CONTRACTOR FOR THE ON-SITE WORK.

2. CONCRETE - CLASS 4000, WSDOT SPEC. 6-02. REINFORCEMENT - GRADE 60 DEFORMED STEEL BARS, WSDOT SPEC. 9-07. THESE CONCRETE REQUIREMENTS APPLY TO FOOTINGS AND BACKWALLS.

3. ANCHOR BOLTS - 1.25"-DIA. x 16"-LONG APPROX. PLUS 4"-LONG "L", THREAD LENGTH 4", IMBED 12" IN CONCRETE, 4"-LENGTH THREADS (+/-) EXPOSED, SUPPLY NUT AND FLAT WASHER EACH BOLT, HOT-DIP GALVANIZE ALL HARDWARE AFTER FABRICATION (16 REQ'D).

4. PRE-CAST CONCRETE SUPPLIER TO SUPPLY FOUR PRE-CAST CONCRETE FOOTING PIECES ON-SITE w/ ANCHOR BOLTS & HARDWARE. BRIDGE SUPPLIER TO SUPPLY BEARING PLATES AND ELASTOMERIC PADS. PRE-CAST CONCRETE SUPPLIER ALSO TO SUPPLY FOUR BACKWALL PIECES ON-SITE.

5. ON-SITE GENERAL CONTRACTOR TO LIFT PRE-CAST FOOTING PIECES OFF TRUCK AND PLACE ON PEA GRAVEL SUBGRADE. FIELD WELD STEEL BEAMS TO EACH BEARING PLATE. PRE-CAST CONCRETE BACKWALLS REST ON TOP OF PEA GRAVEL BEDDING.

6. FOOTING PIECES = 11,800 LB. EACH (APPROX.).

APRIL 2019

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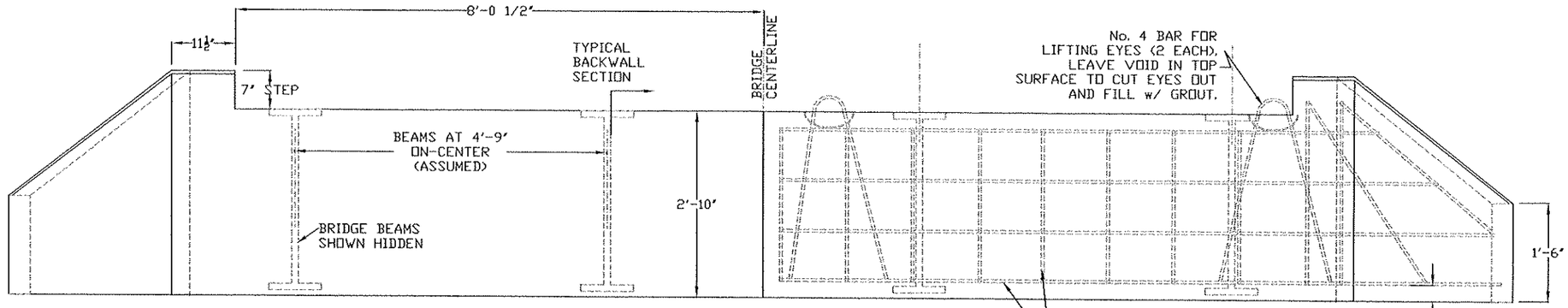
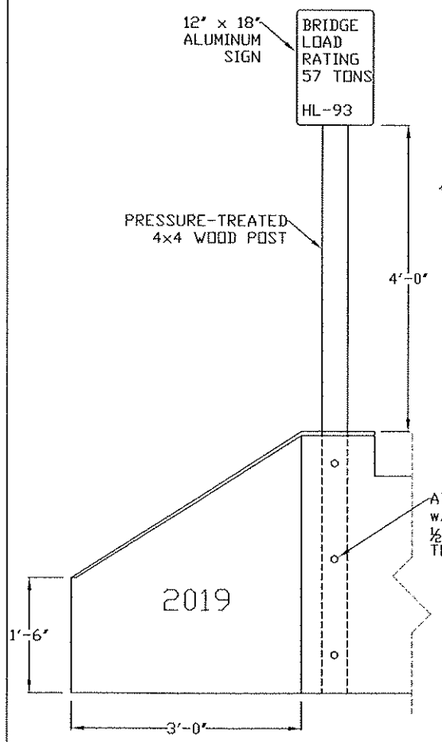
MANASTASH CREEK BRIDGE AT WILLIAMS PROPERTY

PRE-CAST CONCRETE FOOTINGS
DRAWING 8

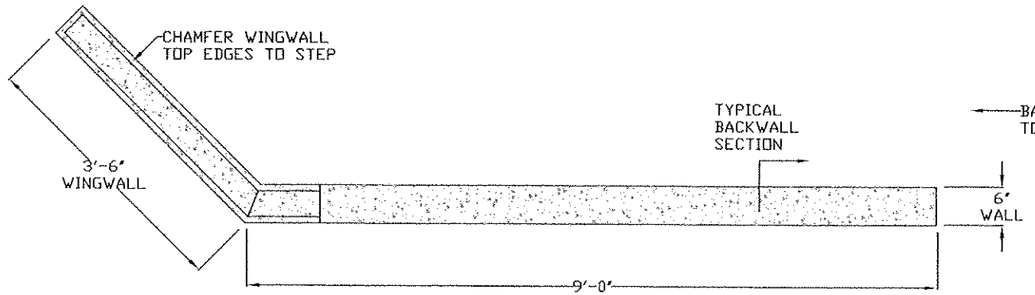


BACKWALL ELEVATION VIEW
(LOOKING LANDWARD)

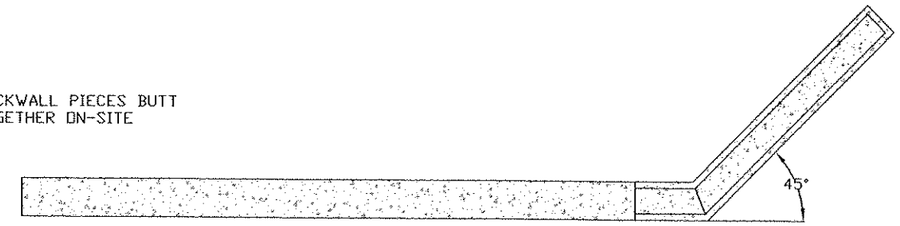
NOTE: LOAD RATING SIGN WOULD FACE OPPOSITE DIRECTION FROM DATE (TOWARDS VEHICLE INGRESS)

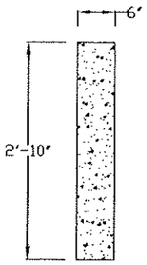


SCHEMATIC WINGWALL ELEVATION FOR SOUTHEAST BRIDGE CORNER TO SHOW DATE (INDENT INTO WINGWALL DOWNSTREAM SURFACE) & LOAD RATING SIGN (INGRESS RIGHT SHOULDER)



BACKWALL TOP VIEW





TYPICAL BACKWALL SECTION

PRE-CAST CONCRETE BACKWALL NOTES:

1. TWO PAIRS REQ'D AS SHOWN.

2. CHAMFER TOP AND END EDGES 1" ON OUTSIDE LENGTHS EACH BACKWALL & WINGWALL SECTION (TO STEP).

3. CUT OFF REBAR LIFT LOOPS AT LEAST 1/2" BELOW TOP OF BACKWALL, AND FILL HOLES w/ GROUT AFTER PLACEMENT.

4. INDENTURE DATE (YEAR) ON DOWNSTREAM FACE ONE WINGWALL, 3"-HIGH x 1-1/2" WIDE x ⅜"-DEEP NUMBERS (SEE SCHEMATIC).

0 1 2 4 FEET
SCALE: 1/2" = 1'0"

APRIL 2019

MITCH AND JULIE WILLIAMS (OWNER)
7501 MANASTASH ROAD
ELLENSBURG, WA 98926 509-899-0168

PAUL TAPPEL (ENGINEER)
3100 - 243rd STREET SW
BRIER, WA 98036 425-482-6420

MANASTASH CREEK BRIDGE AT WILLIAMS PROPERTY

PRE-CAST CONCRETE BACKWALLS
DRAWING 9

DRIVEWAY PROFILE (DRAWING 11)

90'-LONG NEW DRIVEWAY ALL ABOVE 100-YEAR FLOOD ELEV. (1995.2')

EXISTING ROAD (DRIVEWAY) TO WILLIAMS RESIDENCE

TYPICAL EDGE FOR MANASTASH CREEK

MANASTASH CREEK FLOW DIRECTION

REFERENCE ELEVATION NAIL IN POST (ELEV. 2,000.0')

PROPOSED 60'-SPAN x 16'-WIDE WEATHERING STEEL BRIDGE, SEE OTHER DRAWINGS

EXISTING KRD BRIDGE

EXISTING KRD ROAD

130'-LONG NEW DRIVEWAY w/ FILL IN 100-YEAR FLOODPLAIN

BRIDGE APPROACH FILL MEETS EXISTING FLOODPLAIN ELEV. 1994.5' (+/-)

NEW DRIVEWAY (CROSS-HATCH) w/ CRUSHED ROCK SURFACE 16'-WIDE

EXISTING KRD ROAD

220'-LONG NEW DRIVEWAY SLIGHTLY COUNTERSUNK INTO FLOODPLAIN FOR NET ZERO CHANGE IN FLOODPLAIN STORAGE

EXISTING CULVERT UNDER KRD ROAD (REFERENCE)

EXISTING HEADWORK IN KRD CANAL (REFERENCE)

NORTH (APPROX.)

NOTE: PROJECT ELEVATIONS ARE BASED ON ASSUMED ELEVATION AND WILL NOT MATCH ACTUAL ELEVATIONS.

0 50 100 FEET
SCALE: 1" = 50'

PAUL TAPPEL
STATE OF WASHINGTON
23801
REGISTERED
PROFESSIONAL ENGINEER

APRIL 2019

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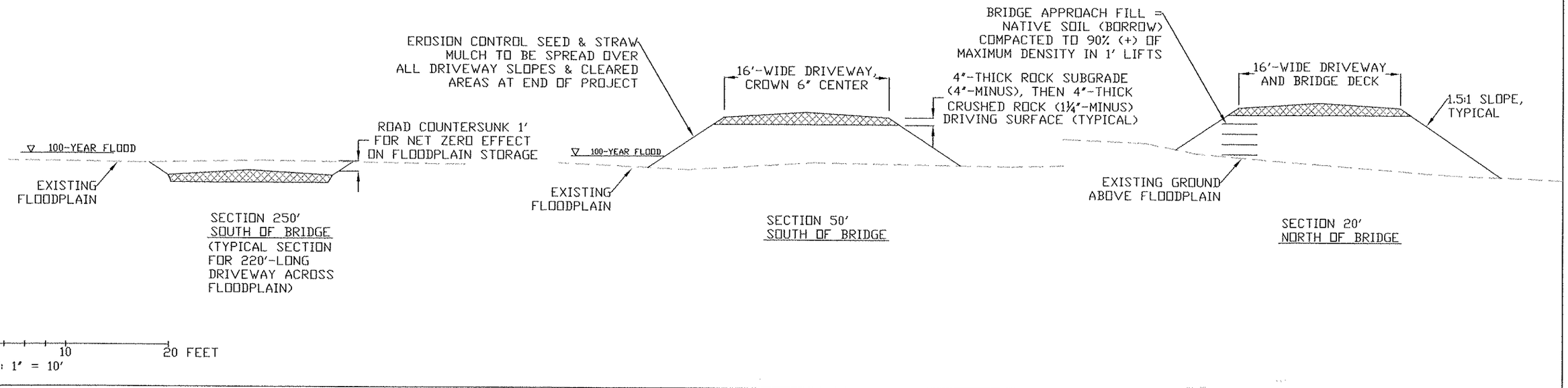
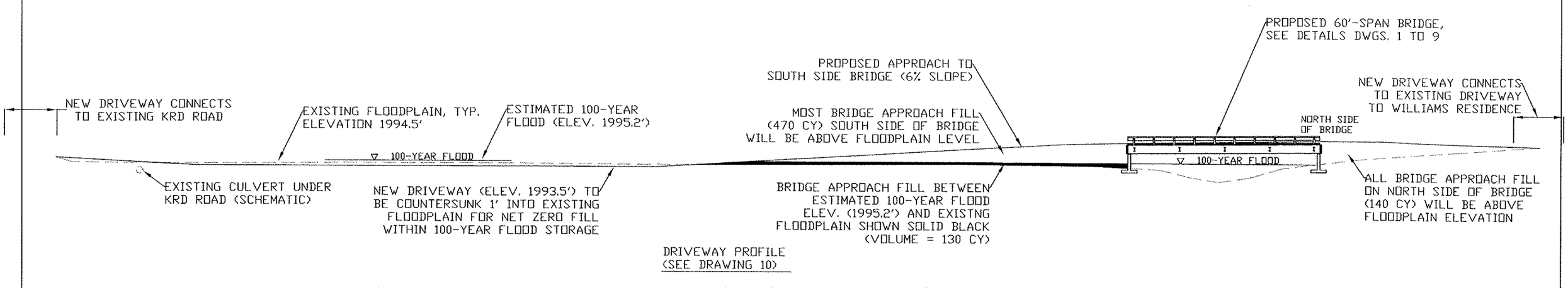
MANASTASH CREEK BRIDGE AT WILLIAMS PROPERTY

DRIVEWAY AND BRIDGE SITE PLAN
DRAWING 10





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MANASTASH CREEK BRIDGE AT WILLIAMS PROPERTY

DRIVEWAY PROFILE & SECTIONS
DRAWING 11