INDEX

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	PCG1 - PCG4	PRELOADING CONTOUR GRADING PLAN
	PRP1 - PRP4	PRELOADING ROADWAY PROFILE
	PSP1 - PSP4	PRELOADING TESC/SITE PREP PLAN
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	RP1 - RP4	ROADWAY PROFILES
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SHEET NO.	PLAN REFERENCE NO.	TITLE
	CS1 - CS5	CONSTRUCTION SEQUENCING
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	TC1 - TC5	TRAFFIC CONTROL

PLAN REFERENCE NO.

SHEET OF SHEETS

NOTE: ALL SHEET REFERENCES, FIRST NOS. OF STRUCTURE CODE DESIGNATIONS AND MATCH LINE SHEET REFERENCES, ETC., THROUGHOUT THE PLANS, REFER TO THE ENTRY IN THE PLAN REFERENCE NUMBER BOX.

60% REVIEW SUBMITTAL

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CHECKED BY	J. SAUGEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

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123 OHME GARDEN ROAD, SUITE 8
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800.615.9900

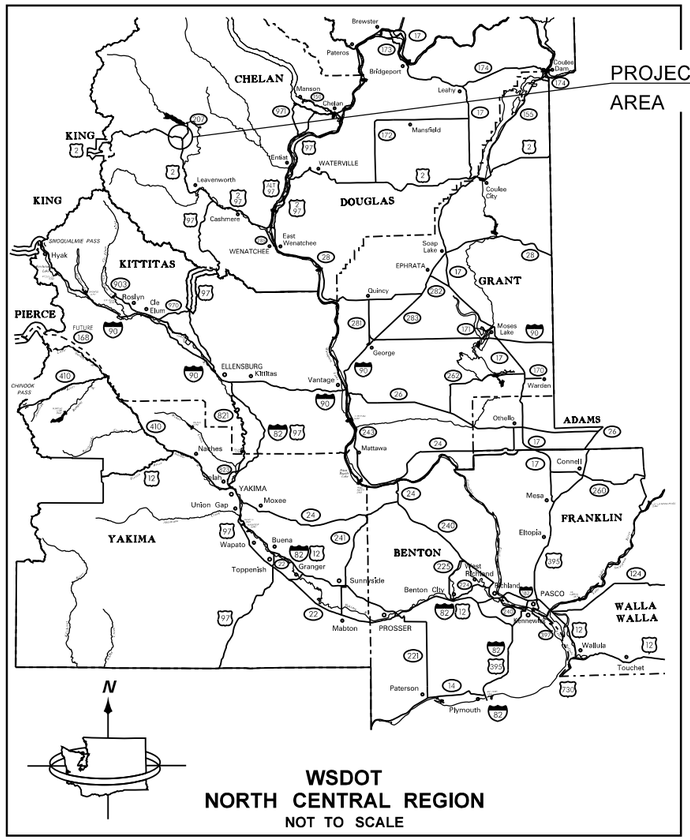
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT

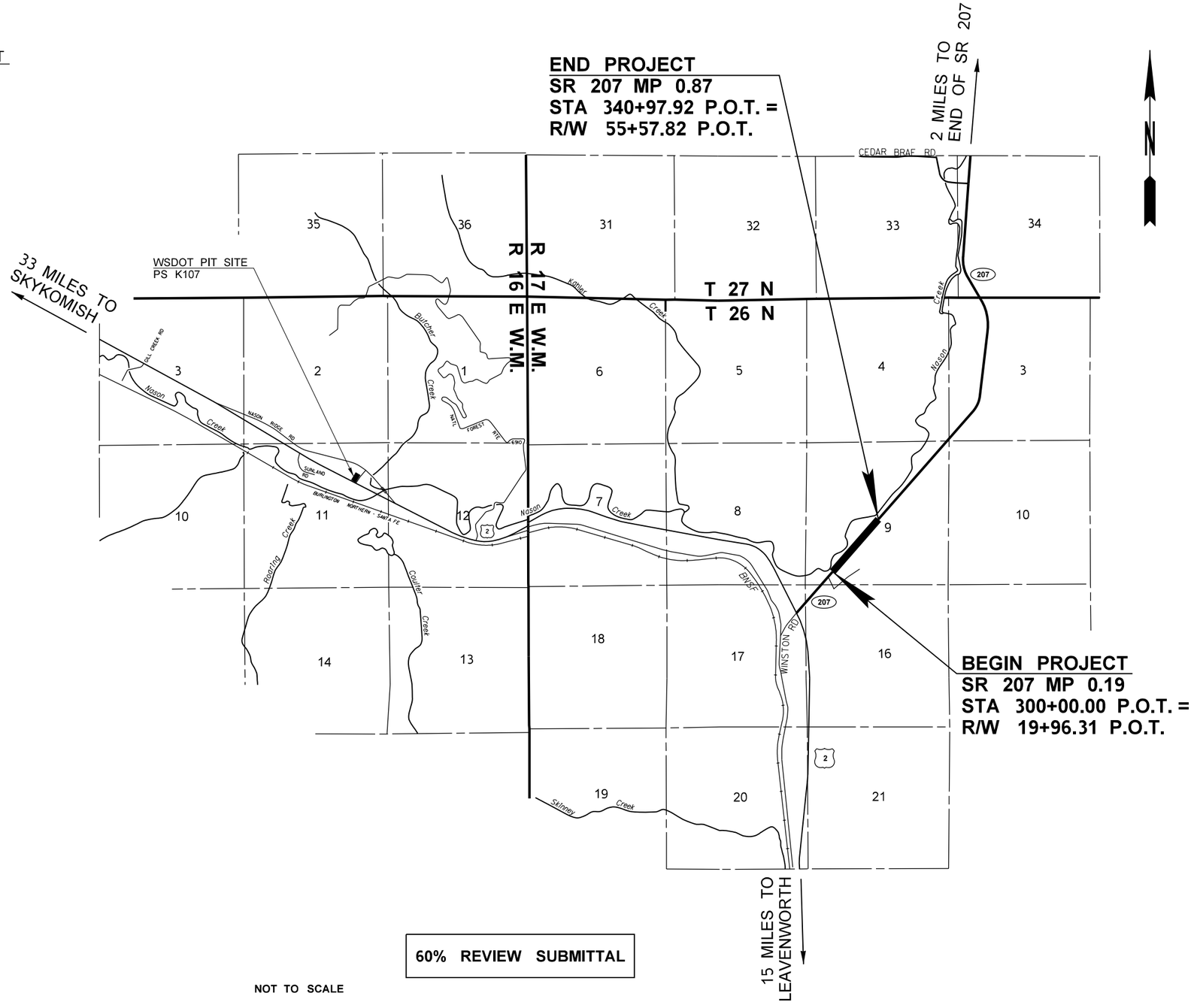
INDEX

Plot 2

PLAN REF. NO. IN1

SHEET OF SHEETS





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PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

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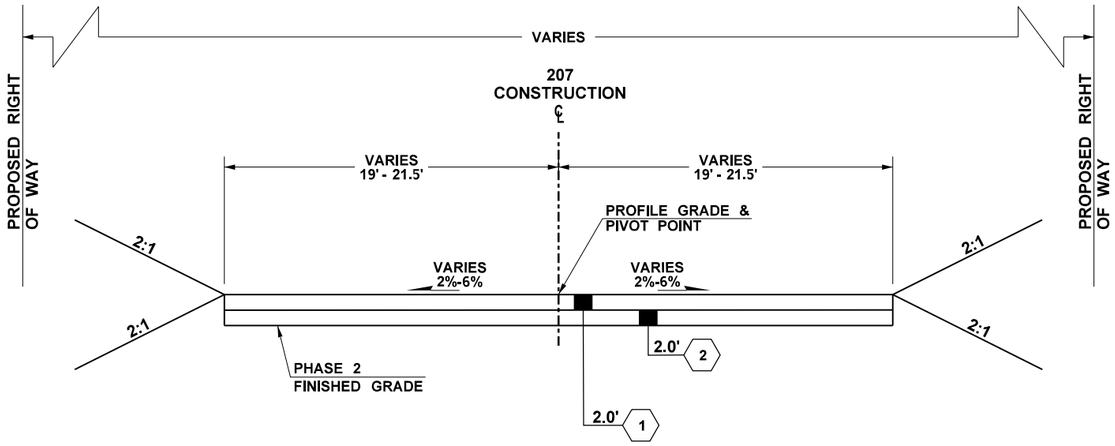
NASON CREEK FLOODPLAIN REALIGNMENT

VICINITY MAP

Plot 1

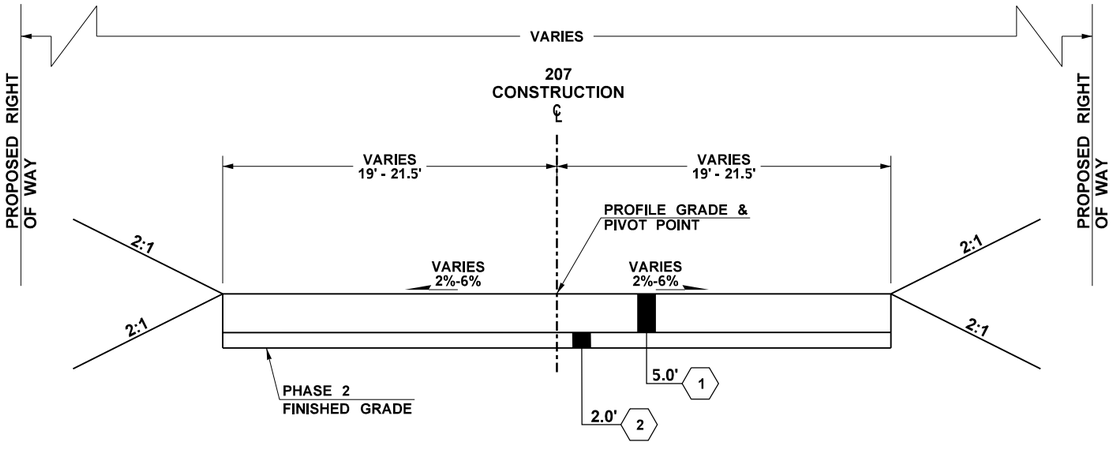
PLAN REF NO
VM1

SHEET
OF
SHEETS



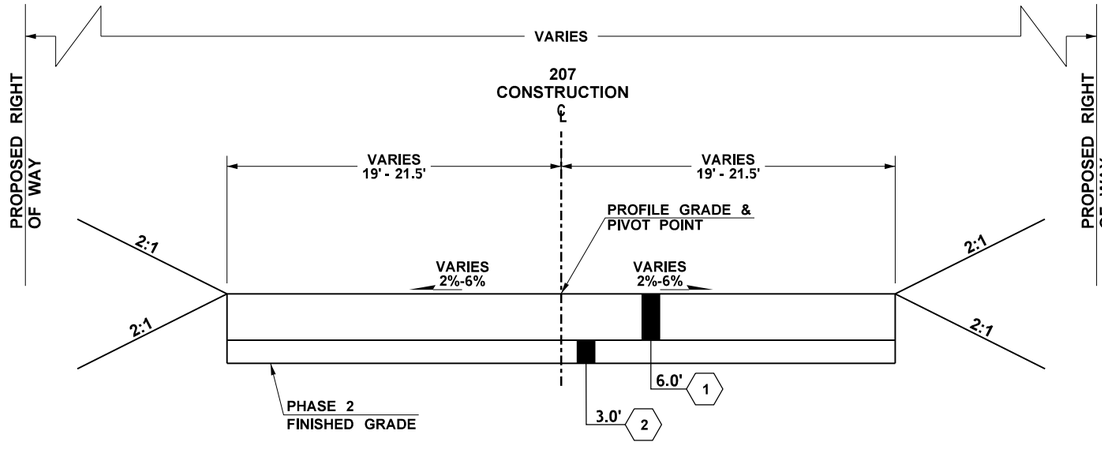
PRELOADING ZONE ROADWAY SECTION - 1

STA. 307+70 TO STA. 312+65



PRELOADING ZONE ROADWAY SECTION - 2

STA. 319+00 TO STA. 323+15



PRELOADING ZONE ROADWAY SECTION - 3

STA. 333+60 TO STA. 336+39

NOTES:

1) PER SPECIAL PROVISIONS, CONTRACTOR MAY USE NATIVE BORROW IN PLACE OF GRAVEL BORROW FOR SURCHARGE DEPTH.

LEGEND

1. NATIVE BORROW (SEE NOTE 1)
2. GRAVEL BORROW

60% REVIEW SUBMITTAL

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 1\20240107_PS_RS.dgn				REGION NO. / STATE	FED.AID PROJ.NO.
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CHECKED BY	R. CRAVEN					
PROJ. ENGR.	E. BORGES					
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

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NASON CREEK FLOODPLAIN
REALIGNMENT
PHASE 1

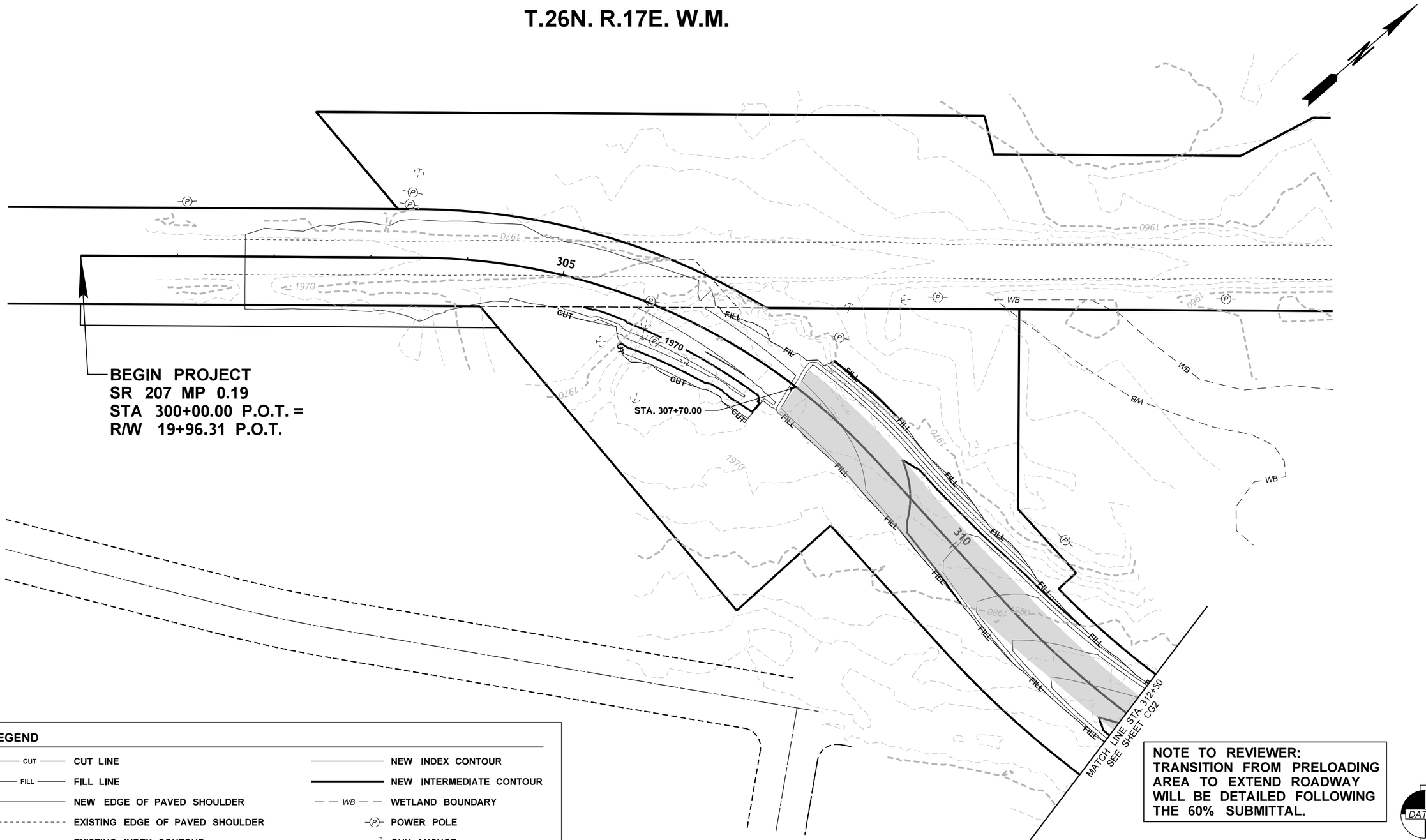
PRELOADING ROADWAY SECTIONS

Plot 1

PLAN REF NO
PRS1

SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

CUT — CUT LINE	NEW INDEX CONTOUR
FILL — FILL LINE	NEW INTERMEDIATE CONTOUR
NEW EDGE OF PAVED SHOULDER	WB — WETLAND BOUNDARY
EXISTING EDGE OF PAVED SHOULDER	POWER POLE
EXISTING INDEX CONTOUR	GUY ANCHOR
EXISTING INTERMEDIATE CONTOUR	

NOTE TO REVIEWER:
TRANSITION FROM PRELOADING AREA TO EXTEND ROADWAY WILL BE DETAILED FOLLOWING THE 60% SUBMITTAL.

60% REVIEW SUBMITTAL

DATUM
(NAVD) 88

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ENTERED BY	H. MCMASTER						
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PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

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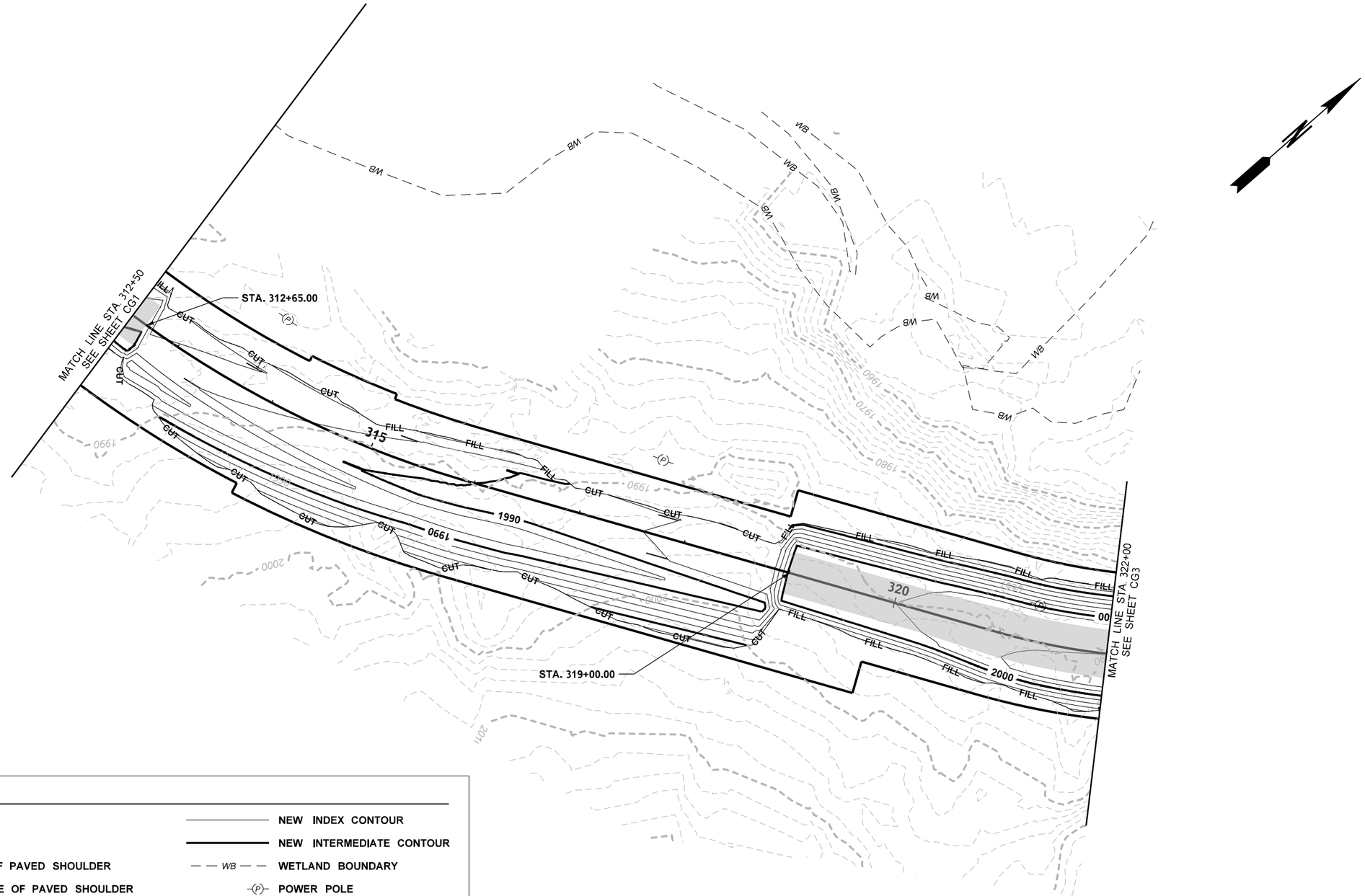
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 1

PRELOADING CONTOUR GRADING PLAN

Plot 1
PLAN REF NO
PCG1
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

CUT — CUT LINE	NEW INDEX CONTOUR
FILL — FILL LINE	NEW INTERMEDIATE CONTOUR
NEW EDGE OF PAVED SHOULDER	WB — WETLAND BOUNDARY
EXISTING EDGE OF PAVED SHOULDER	(P) POWER POLE
EXISTING INDEX CONTOUR	GUY ANCHOR
EXISTING INTERMEDIATE CONTOUR	PRELOADING ZONE

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

DATUM
(NAVD) 88

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 1\20240107_PS_CG.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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CHECKED BY	R. CRAVEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

EBORGES STATE OF WASHINGTON 22012272 REGISTERED PROFESSIONAL ENGINEER
DATE
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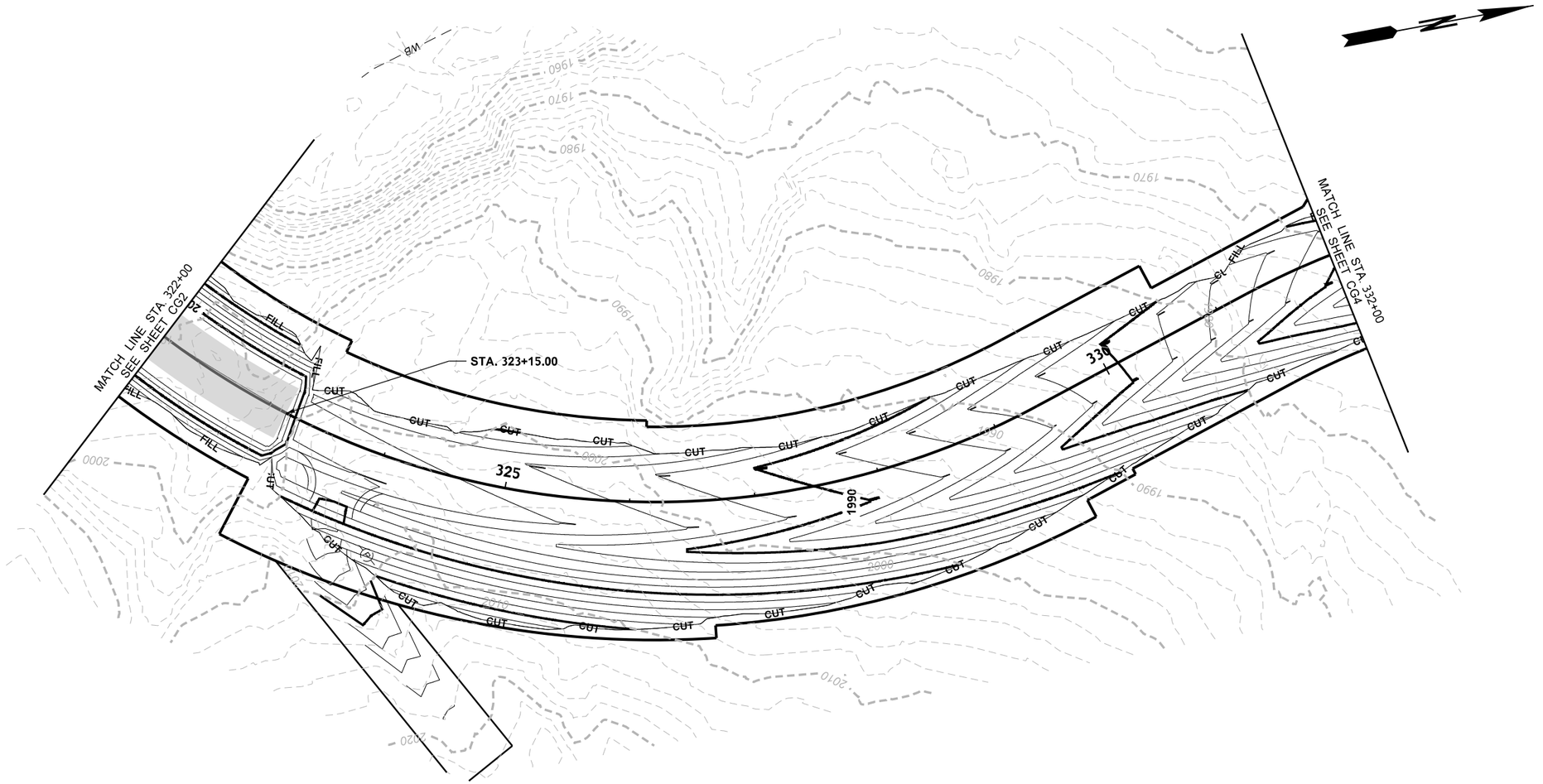
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 1

PRELOADING CONTOUR GRADING PLAN

Plot 2
PLAN REF NO
PCG2
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

CUT — CUT LINE	NEW INDEX CONTOUR
FILL — FILL LINE	NEW INTERMEDIATE CONTOUR
NEW EDGE OF PAVED SHOULDER	WB — WETLAND BOUNDARY
EXISTING EDGE OF PAVED SHOULDER	POWER POLE
EXISTING INDEX CONTOUR	GUY ANCHOR
EXISTING INTERMEDIATE CONTOUR	PRELOADING ZONE

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

DATUM
(NAVD) 88

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PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

EMILIE BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER
DATE
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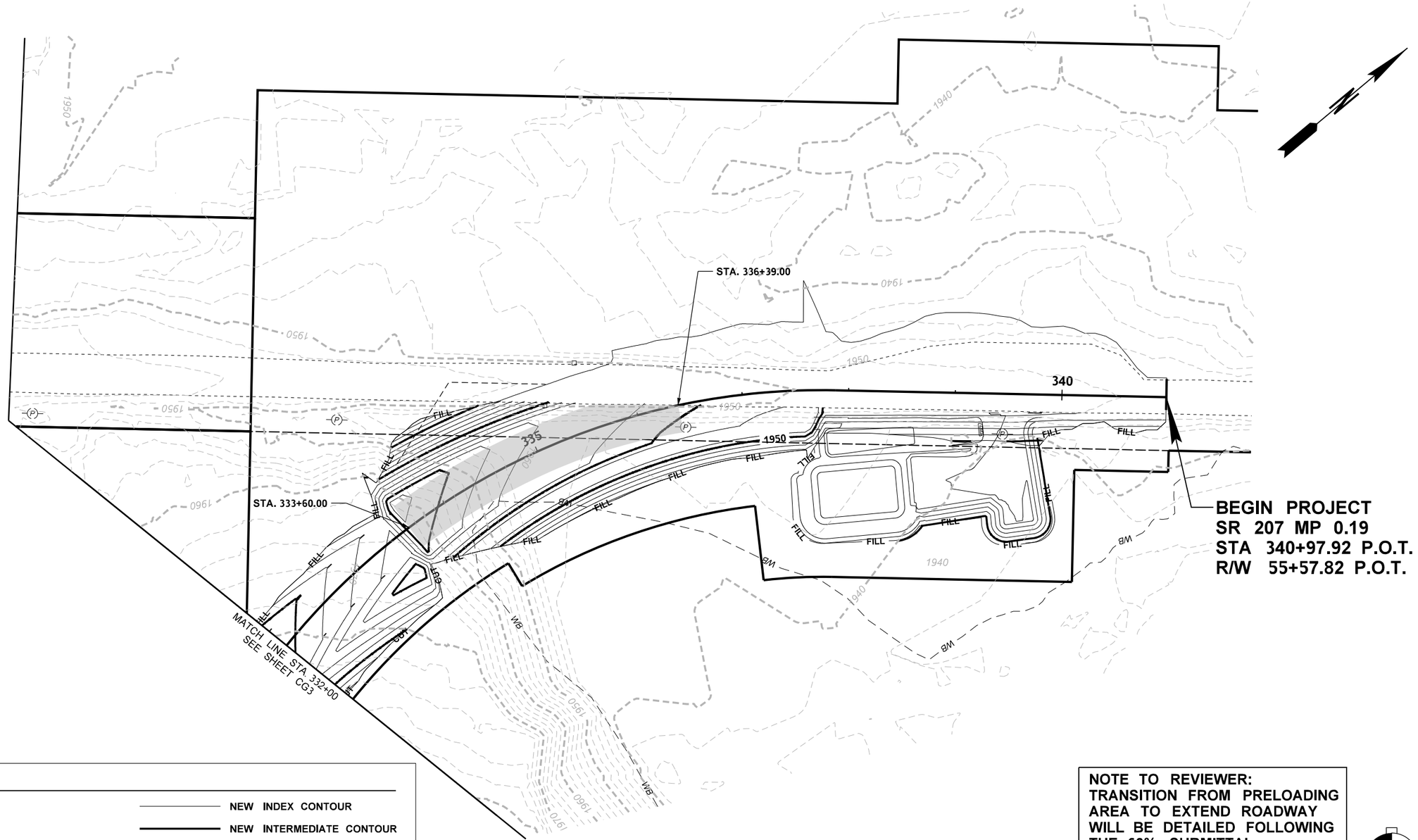
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 1

PRELOADING CONTOUR GRADING PLAN

Plot 3
PLAN REF NO
PCG3
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

CUT — CUT LINE	NEW INDEX CONTOUR
FILL — FILL LINE	NEW INTERMEDIATE CONTOUR
NEW EDGE OF PAVED SHOULDER	WB — WETLAND BOUNDARY
EXISTING EDGE OF PAVED SHOULDER	POWER POLE
EXISTING INDEX CONTOUR	GUY ANCHOR
EXISTING INTERMEDIATE CONTOUR	PRELOADING ZONE

NOTE TO REVIEWER:
TRANSITION FROM PRELOADING AREA TO EXTEND ROADWAY WILL BE DETAILED FOLLOWING THE 60% SUBMITTAL.

60% REVIEW SUBMITTAL

0 50 100
SCALE IN FEET

DATUM
(NAVD) 88

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PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

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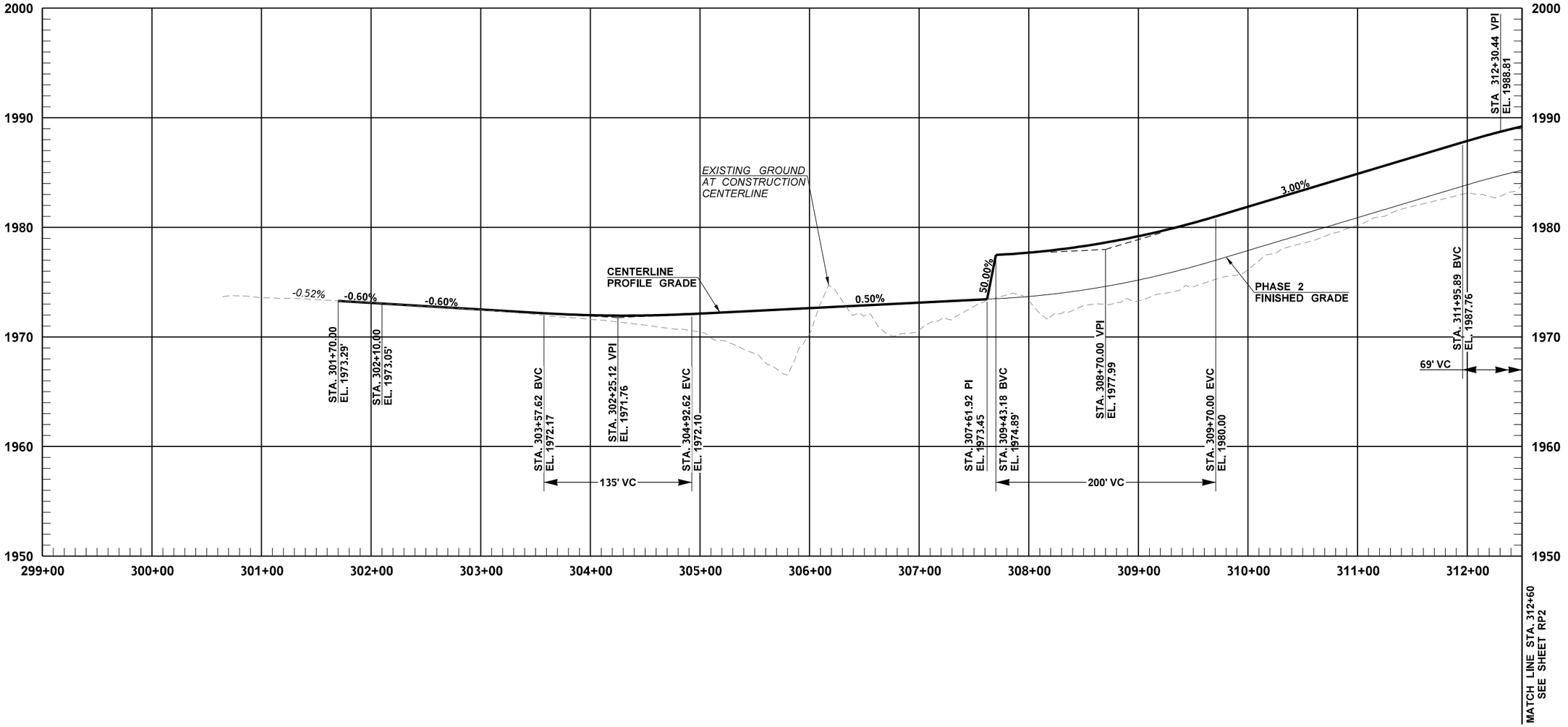
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 1

PRELOADING CONTOUR GRADING PLAN

Plot 4
PLAN REF NO
PCG4
SHEET
OF
SHEETS



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PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

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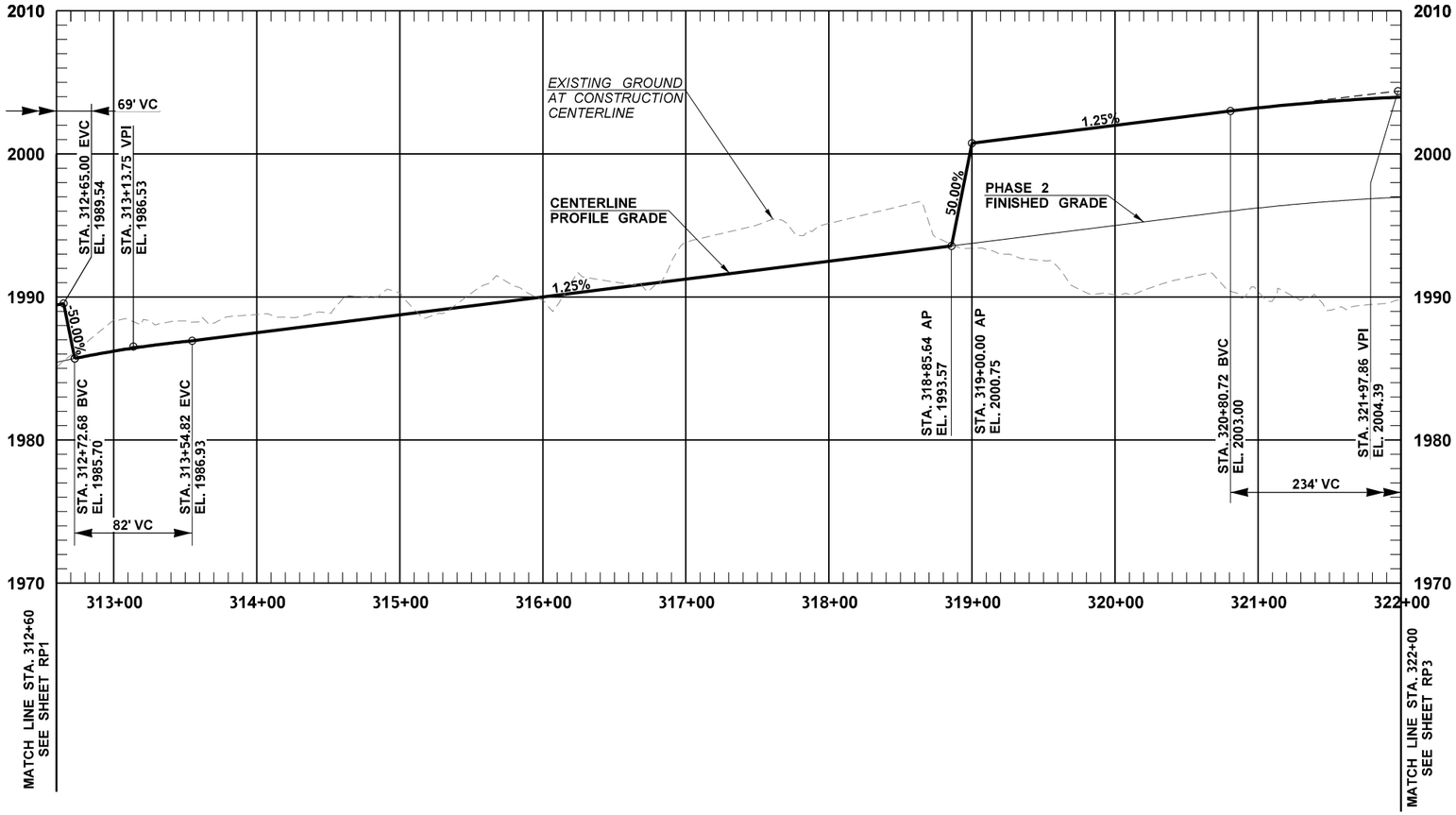
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 1

PRELOADING ROADWAY PROFILE

Plot 11

PLAN REF NO
PRP1

SHEET
OF
SHEETS



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PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

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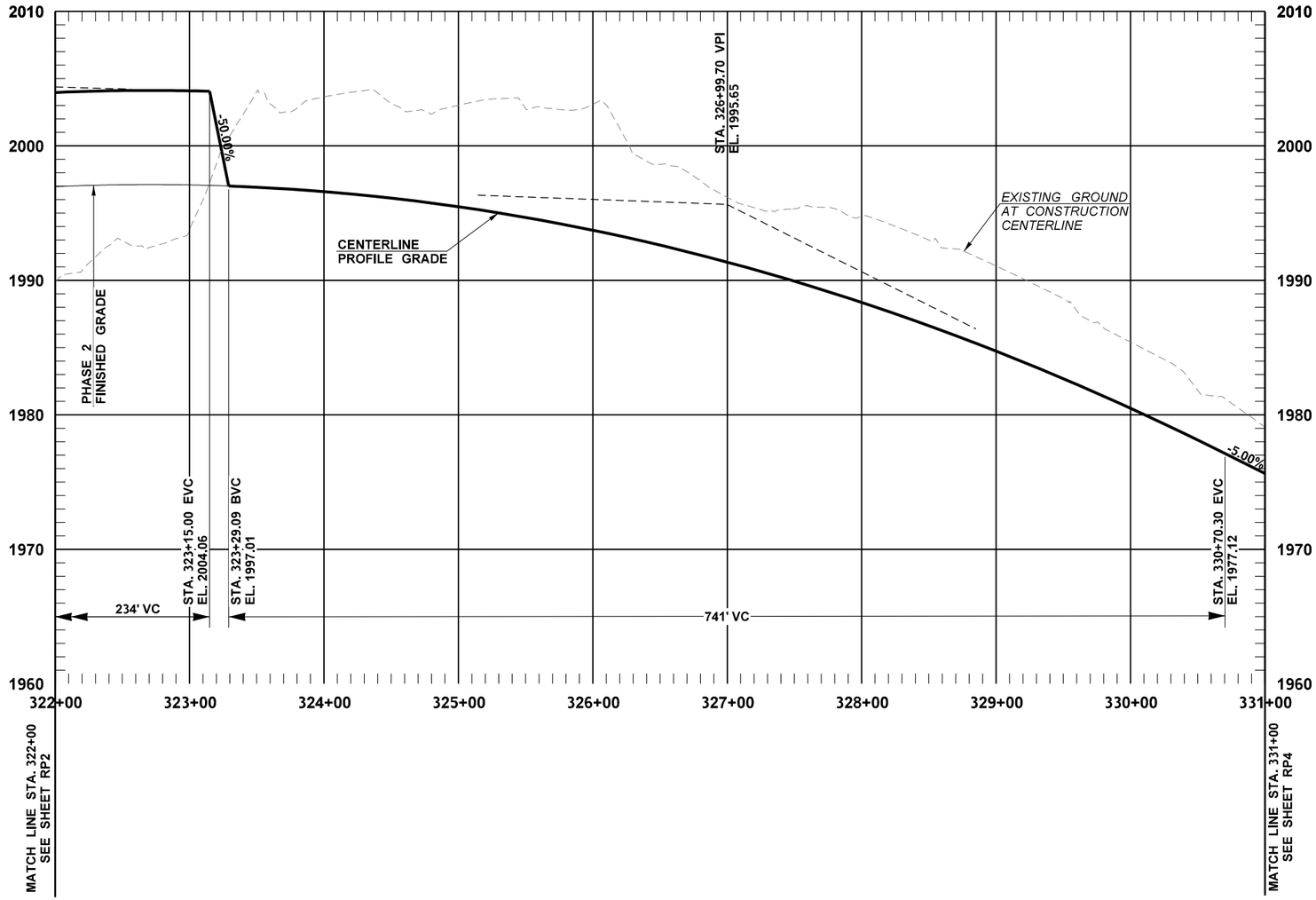
SR 207
NASON CREEK FLOODPLAIN
REALIGNMENT
PHASE 1

PRELOADING ROADWAY PROFILE

Plot 12

PLAN REF NO
PRP2

SHEET
OF
SHEETS



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PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

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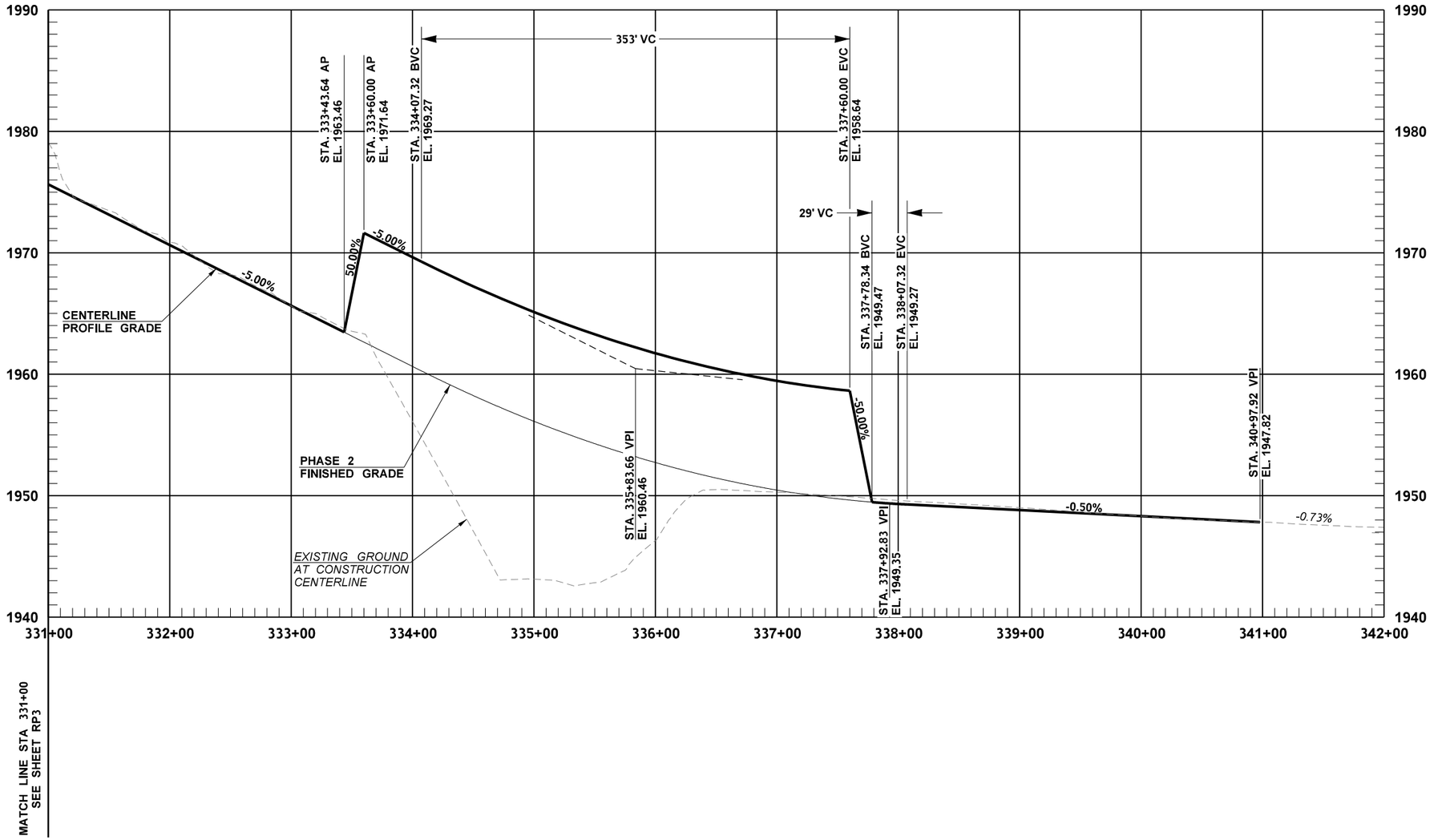
SR 207
NASON CREEK FLOODPLAIN
REALIGNMENT
PHASE 1

PRELOADING ROADWAY PROFILE

Plot 13

PLAN REF NO
PRP3

SHEET
OF
SHEETS



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PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

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NASON CREEK FLOODPLAIN
REALIGNMENT
PHASE 1

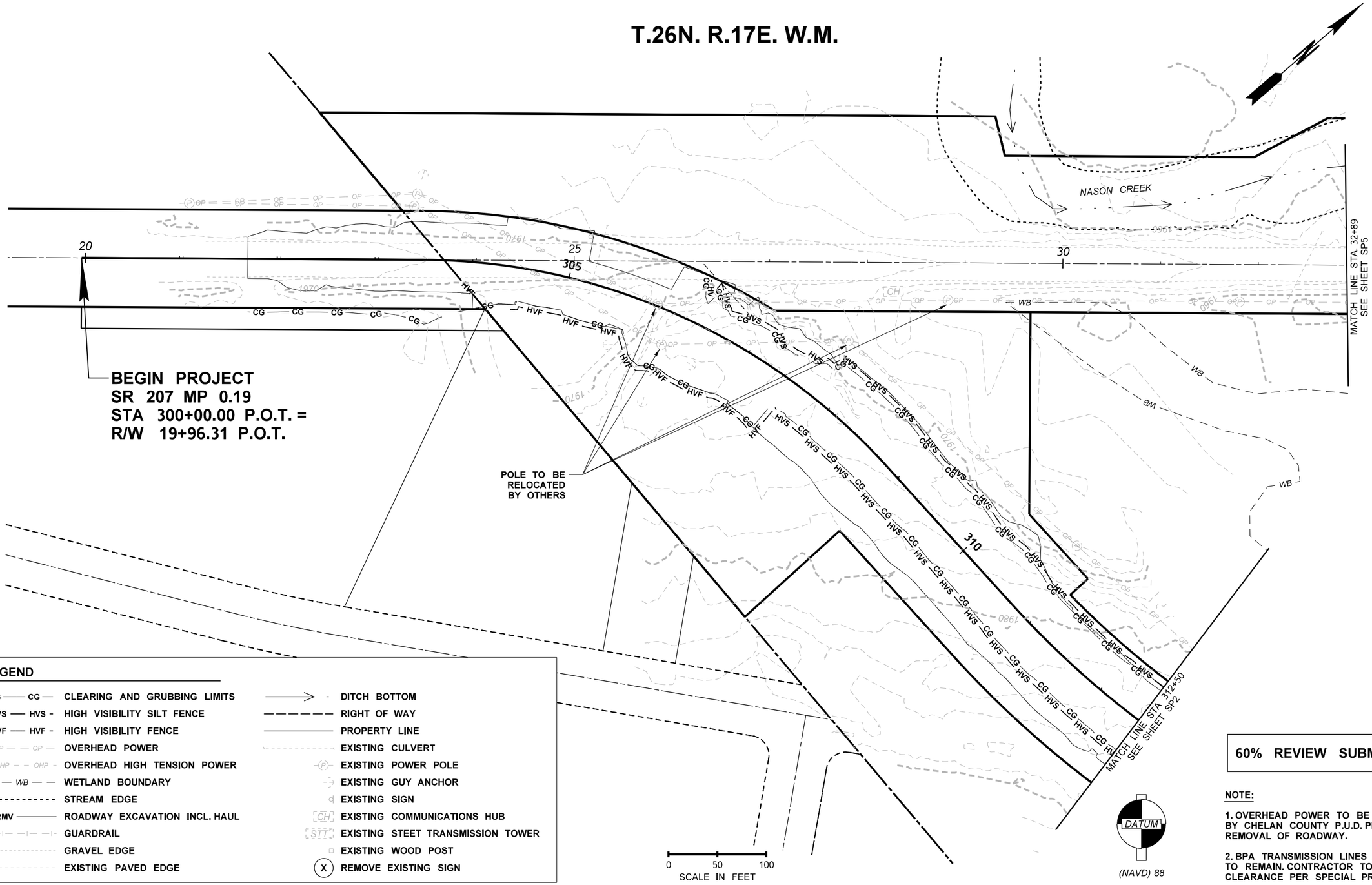
PRELOADING ROADWAY PROFILE

Plot 14

PLAN REF NO
PRP4

SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

CG — CG — CLEARING AND GRUBBING LIMITS	DITCH BOTTOM
HVS — HVS — HIGH VISIBILITY SILT FENCE	RIGHT OF WAY
HVF — HVF — HIGH VISIBILITY FENCE	PROPERTY LINE
OP — OP — OVERHEAD POWER	EXISTING CULVERT
OHP — OHP — OVERHEAD HIGH TENSION POWER	EXISTING POWER POLE
WB WETLAND BOUNDARY	EXISTING GUY ANCHOR
STREAM EDGE	EXISTING SIGN
RMV ROADWAY EXCAVATION INCL. HAUL	EXISTING COMMUNICATIONS HUB
GUARDRAIL	EXISTING STEET TRANSMISSION TOWER
GRAVEL EDGE	EXISTING WOOD POST
EXISTING PAVED EDGE	REMOVE EXISTING SIGN

60% REVIEW SUBMITTAL

NOTE:

1. OVERHEAD POWER TO BE RELOCATED BY CHELAN COUNTY P.U.D. PRIOR TO REMOVAL OF ROADWAY.
2. BPA TRANSMISSION LINES AND TOWERS TO REMAIN. CONTRACTOR TO PROVIDE ADEQUATE CLEARANCE PER SPECIAL PROVISIONS.

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ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PRELIMINARY — ERIC BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

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SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 1

PRELOADING TESC/SITE PREPARATION PLAN

Plot 1

PLAN REF NO
PSP1

SHEET
OF
SHEETS

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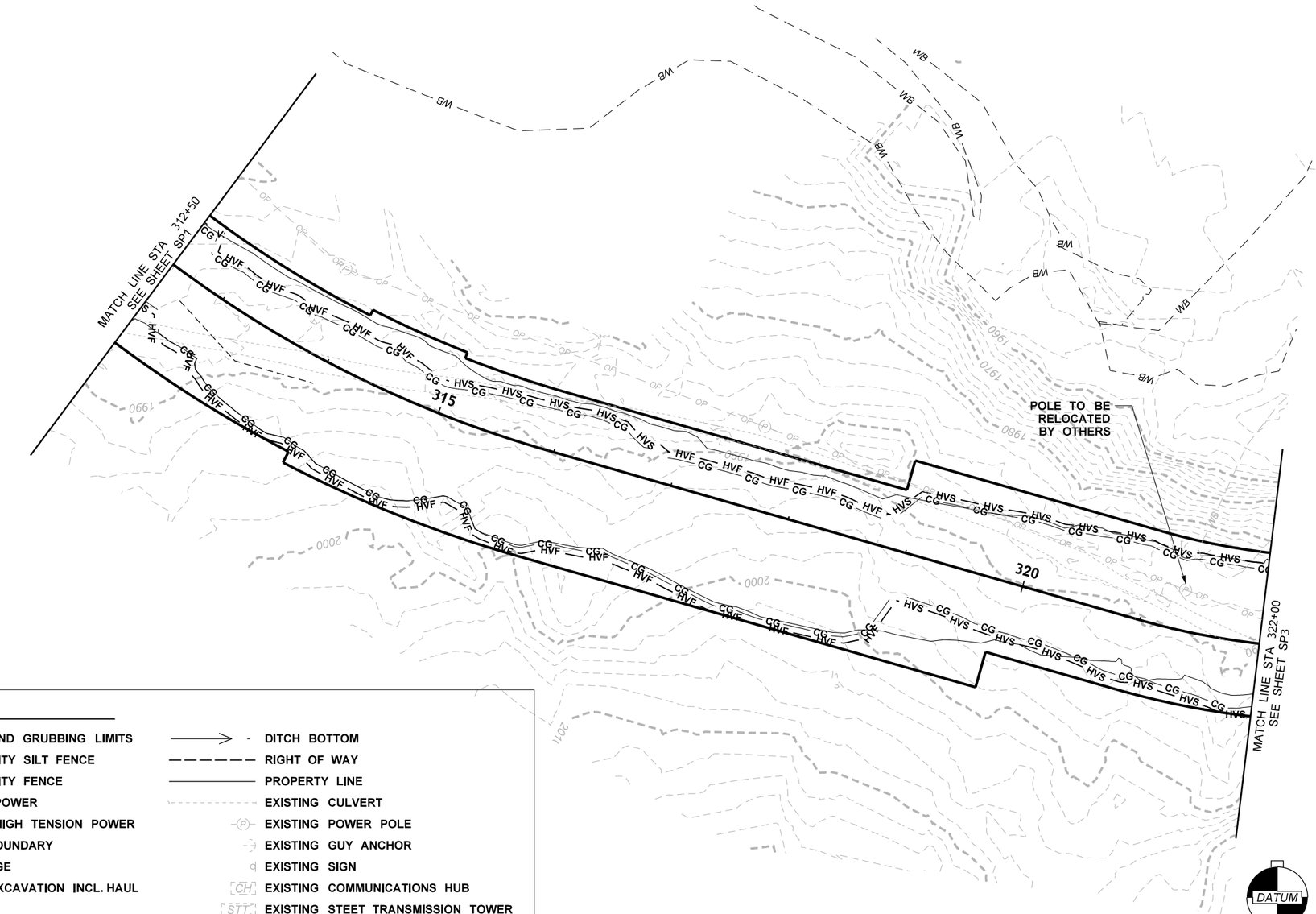


LEGEND

- CG —— CG — CLEARING AND GRUBBING LIMITS	——> - DITCH BOTTOM
- HVS —— HVS - HIGH VISIBILITY SILT FENCE	— — — — — RIGHT OF WAY
- HVF —— HVF - HIGH VISIBILITY FENCE	——— PROPERTY LINE
- OP — — OP — OVERHEAD POWER	- - - - - - - - EXISTING CULVERT
- OHP — - OHP - OVERHEAD HIGH TENSION POWER	-(P)- EXISTING POWER POLE
— — WB — — WETLAND BOUNDARY	-⊣- EXISTING GUY ANCHOR
---------- STREAM EDGE	◁ EXISTING SIGN
– RMV ——— ROADWAY EXCAVATION INCL. HAUL	[CH] EXISTING COMMUNICATIONS HUB
- —|— —|— —|- GUARDRAIL	[STT] EXISTING STEET TRANSMISSION TOWER
- - - - - - - - - - GRAVEL EDGE	▫ EXISTING WOOD POST
- - - - - - - - - - EXISTING PAVED EDGE	(X) REMOVE EXISTING SIGN

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

DATUM
(NAVD) 88

NOTE:

1. OVERHEAD POWER TO BE RELOCATED BY CHELAN COUNTY P.U.D. PRIOR TO REMOVAL OF ROADWAY.

2. BPA TRANSMISSION LINES AND TOWERS TO REMAIN. CONTRACTOR TO PROVIDE ADEQUATE CLEARANCE PER SPECIAL PROVISIONS.

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 1\20240107_PS_SP.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
TIME	4:14:07 PM				10	WASH	
DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	T. GIGLIO						
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN				CONTRACT NO.		LOCATION NO.
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PRELIMINARY
JACQUE BORGES
STATE OF WASHINGTON
23012272
REGISTERED
PROFESSIONAL ENGINEER
DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

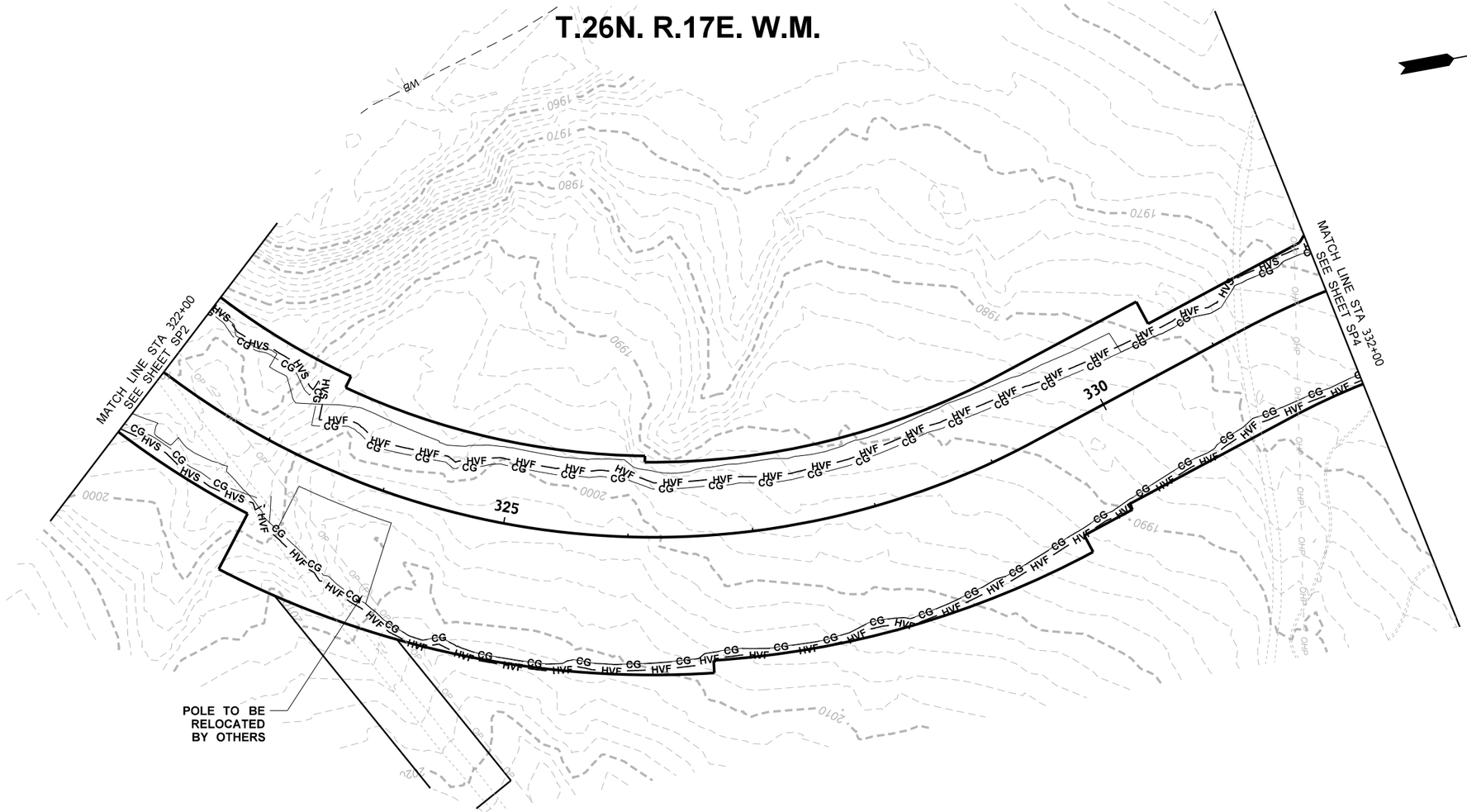
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 1

PRELOADING TESC/SITE PREPARATION PLAN

Plot 2
PLAN REF NO
PSP2
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

CG — CG — CLEARING AND GRUBBING LIMITS	DITCH BOTTOM
HVS — HVS — HIGH VISIBILITY SILT FENCE	RIGHT OF WAY
HVF — HVF — HIGH VISIBILITY FENCE	PROPERTY LINE
OP — OP — OVERHEAD POWER	EXISTING CULVERT
OHP — OHP — OVERHEAD HIGH TENSION POWER	EXISTING POWER POLE
WB WETLAND BOUNDARY	EXISTING GUY ANCHOR
STREAM EDGE	EXISTING SIGN
RMV ROADWAY EXCAVATION INCL. HAUL	EXISTING COMMUNICATIONS HUB
GUARDRAIL	EXISTING STEET TRANSMISSION TOWER
GRAVEL EDGE	EXISTING WOOD POST
EXISTING PAVED EDGE	REMOVE EXISTING SIGN

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

DATUM
(NAVD) 88

NOTE:

1. OVERHEAD POWER TO BE RELOCATED BY CHELAN COUNTY P.U.D. PRIOR TO REMOVAL OF ROADWAY.
2. BPA TRANSMISSION LINES AND TOWERS TO REMAIN. CONTRACTOR TO PROVIDE ADEQUATE CLEARANCE PER SPECIAL PROVISIONS.

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 1\20240107_PS_SP.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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DESIGNED BY	T. GIGLIO				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

EDWARD BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER
DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

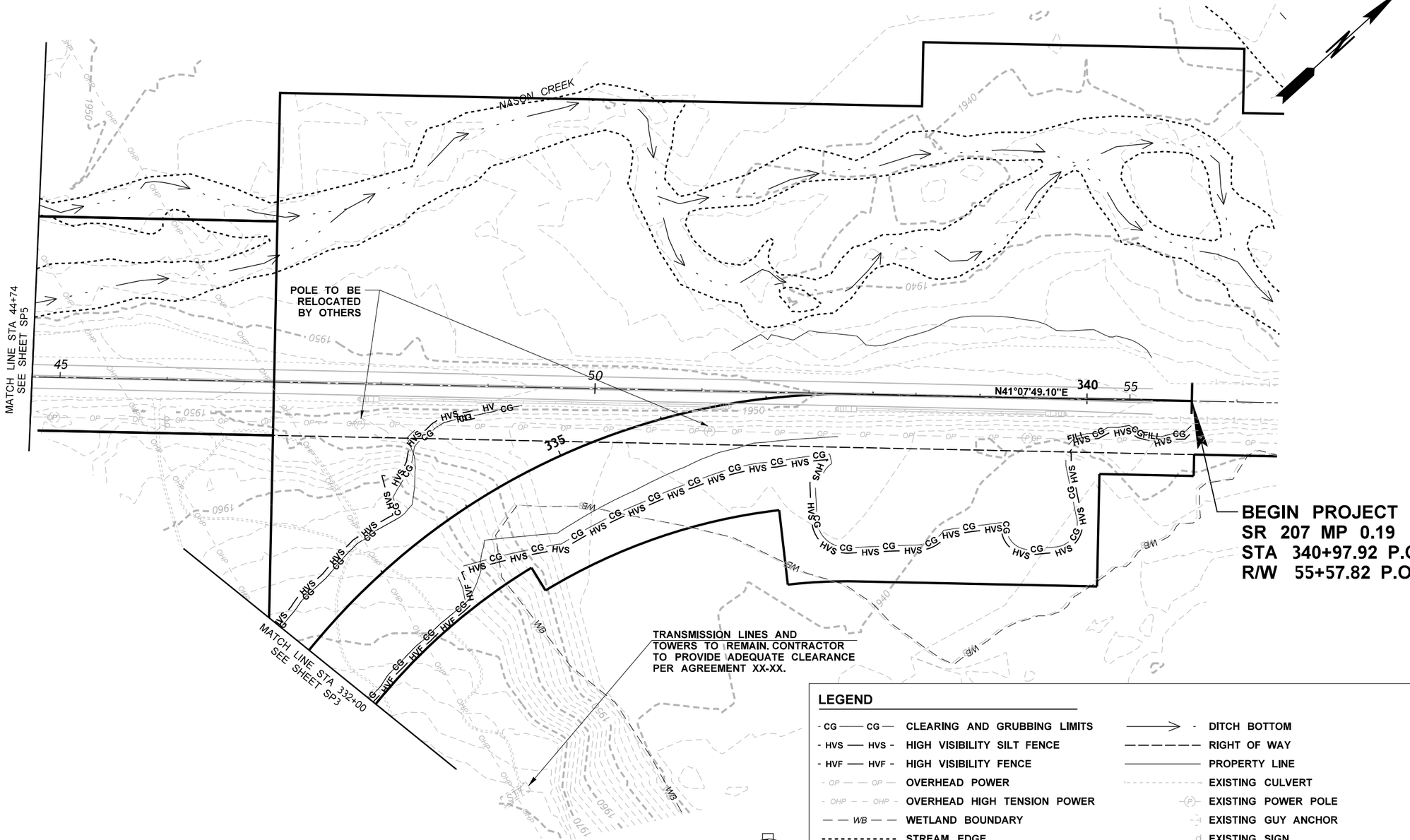
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 1

PRELOADING TESC/SITE PREPARATION PLAN

Plot 3
PLAN REF NO
PSP3
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



NOTE:

1. OVERHEAD POWER TO BE RELOCATED BY CHELAN COUNTY P.U.D. PRIOR TO REMOVAL OF ROADWAY.

2. BPA TRANSMISSION LINES AND TOWERS TO REMAIN. CONTRACTOR TO PROVIDE ADEQUATE CLEARANCE PER SPECIAL PROVISIONS.

60% REVIEW SUBMITTAL

0 50 100
SCALE IN FEET

LEGEND

CG —— CG —	CLEARING AND GRUBBING LIMITS
HVS —— HVS	HIGH VISIBILITY SILT FENCE
HVF —— HVF	HIGH VISIBILITY FENCE
OP —— OP	OVERHEAD POWER
OHP —— OHP	OVERHEAD HIGH TENSION POWER
—— WB ——	WETLAND BOUNDARY
----------	STREAM EDGE
RMV	ROADWAY EXCAVATION INCL. HAUL
	GUARDRAIL
	GRAVEL EDGE
	EXISTING PAVED EDGE
→	DITCH BOTTOM
— — — — —	RIGHT OF WAY
	PROPERTY LINE
	EXISTING CULVERT
(P)	EXISTING POWER POLE
	EXISTING GUY ANCHOR
	EXISTING SIGN
CH	EXISTING COMMUNICATIONS HUB
STT	EXISTING STEET TRANSMISSION TOWER
	EXISTING WOOD POST
X	REMOVE EXISTING SIGN

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 1\20240107_PS_SP.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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DESIGNED BY	T. GIGLIO						
ENTERED BY	H. MCMASTER				CONTRACT NO.		LOCATION NO.
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PROFESSIONAL ENGINEER — STATE OF WASHINGTON — 23012272 — REGISTERED — EMILIE BORGES
DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

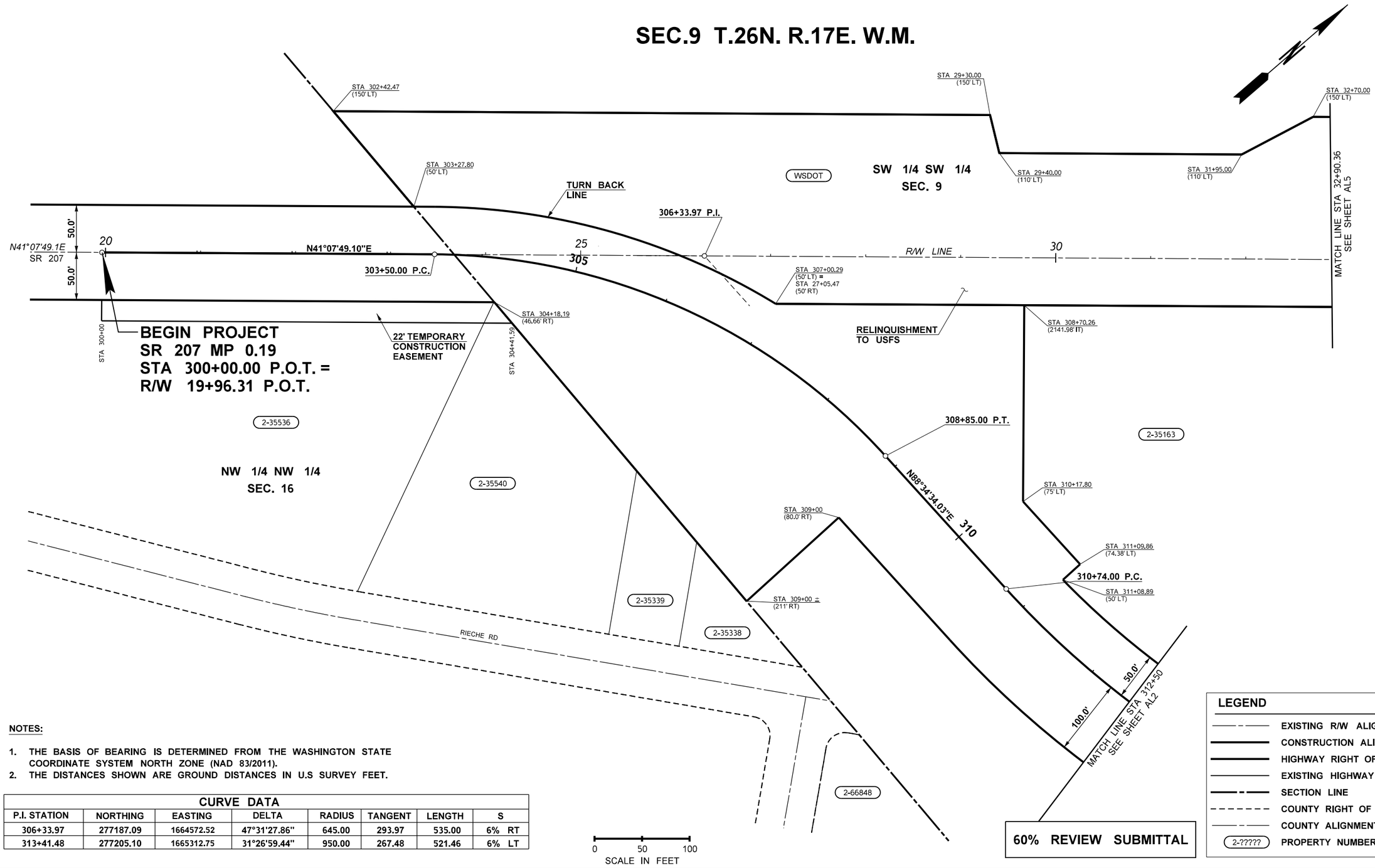
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 1

PRELOADING TESC/SITE PREPARATION PLAN

Plot 4
PLAN REF NO
PSP4
SHEET
OF
SHEETS

SEC.9 T.26N. R.17E. W.M.



NOTES:

1. THE BASIS OF BEARING IS DETERMINED FROM THE WASHINGTON STATE COORDINATE SYSTEM NORTH ZONE (NAD 83/2011).
2. THE DISTANCES SHOWN ARE GROUND DISTANCES IN U.S SURVEY FEET.

CURVE DATA							
P.I. STATION	NORTHING	EASTING	DELTA	RADIUS	TANGENT	LENGTH	S
306+33.97	277187.09	1664572.52	47°31'27.86"	645.00	293.97	535.00	6% RT
313+41.48	277205.10	1665312.75	31°26'59.44"	950.00	267.48	521.46	6% LT

0 50 100
SCALE IN FEET

LEGEND

- EXISTING R/W ALIGNMENT
- CONSTRUCTION ALIGNMENT
- HIGHWAY RIGHT OF WAY
- EXISTING HIGHWAY RIGHT OF WAY
- SECTION LINE
- COUNTY RIGHT OF WAY
- COUNTY ALIGNMENT
- 2-????? PROPERTY NUMBER

60% REVIEW SUBMITTAL

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_AL.dgn				REGION NO. / STATE	FED.AID PROJ.NO.
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DATE	3/3/2026				JOB NUMBER	
PLOTTED BY	hmcmaster					
DESIGNED BY	T. GIGLIO					
ENTERED BY	H. MCMASTER				CONTRACT NO.	LOCATION NO.
CHECKED BY	R. CRAVEN					
PROJ. ENGR.	E. BORGES					
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

P.E. STAMP BOX — DATE

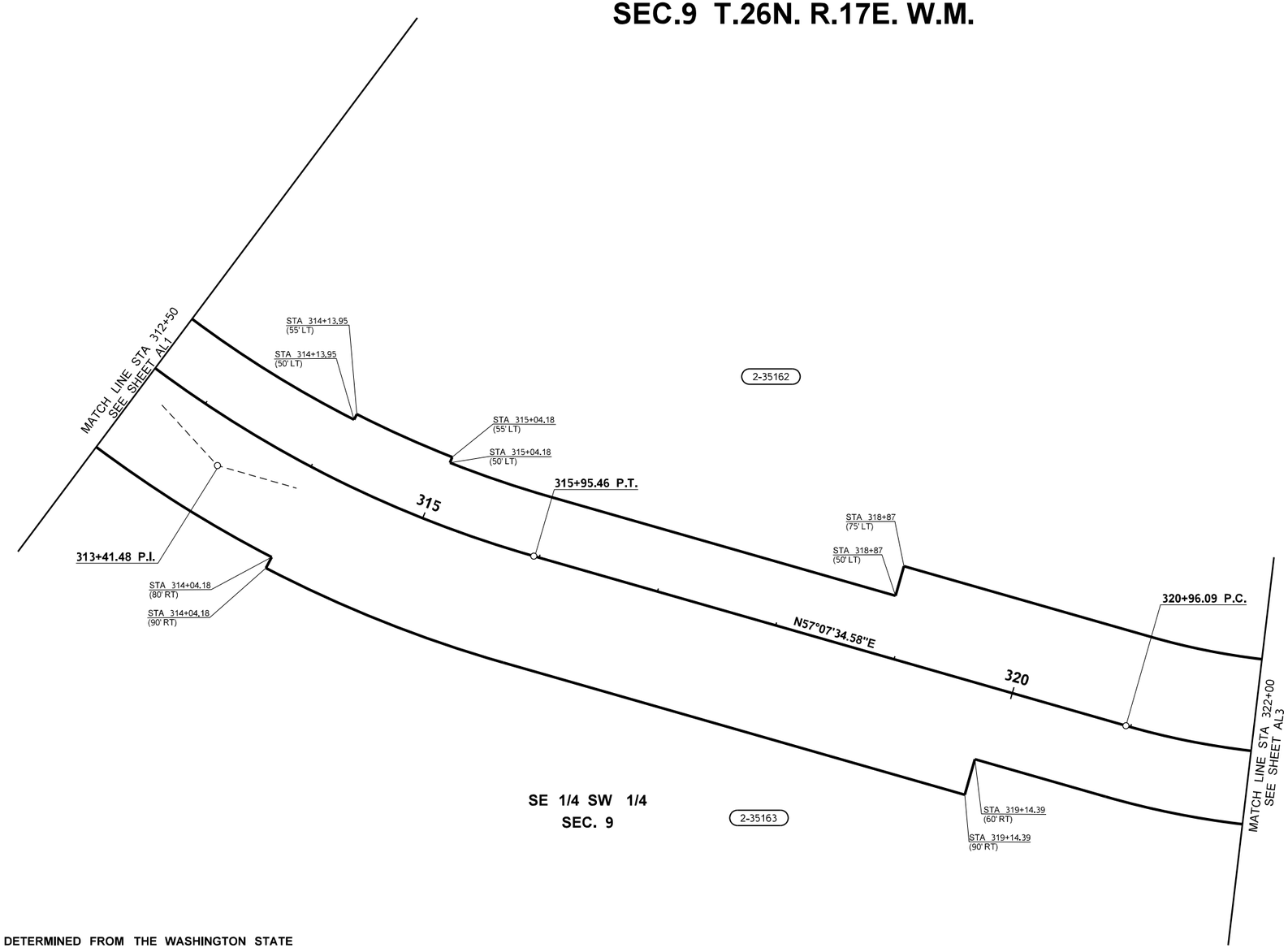
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

ALIGNMENT / RIGHT OF WAY PLAN

Plot 1
PLAN REF NO
AL1
SHEET
OF
SHEETS

SEC.9 T.26N. R.17E. W.M.



NOTES:

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2. THE DISTANCES SHOWN ARE GROUND DISTANCES IN U.S SURVEY FEET.

CURVE DATA

P.I. STATION	NORTHING	EASTING	DELTA	RADIUS	TANGENT	LENGTH	S
313+41.48	277205.10	1665312.75	31°26'59.44"	950.00	267.48	521.46	6% LT
325+88.53	277889.31	1666371.45	74°43'16.96"	645.00	492.44	841.17	6% LT

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

LEGEND

- EXISTING ALIGNMENT
- CONSTRUCTION ALIGNMENT
- HIGHWAY RIGHT OF WAY
- EXISTING HIGHWAY RIGHT OF WAY
- SECTION LINE
- COUNTY RIGHT OF WAY
- COUNTY ALIGNMENT
- 2-????? PROPERTY NUMBER

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TIME	4:14:53 PM
DATE	3/3/2026
PLOTTED BY	hmcmaster
DESIGNED BY	T. GIGLIO
ENTERED BY	H. MCMASTER
CHECKED BY	R. CRAVEN
PROJ. ENGR.	E. BORGES
REGIONAL ADM.	C. KEIFENHEIM

REVISION	DATE	BY

REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	
JOB NUMBER		
CONTRACT NO.	LOCATION NO.	

PROFESSIONAL ENGINEER — STATE OF WASHINGTON — 23012272 — REGISTERED
DATE
P.E. STAMP BOX

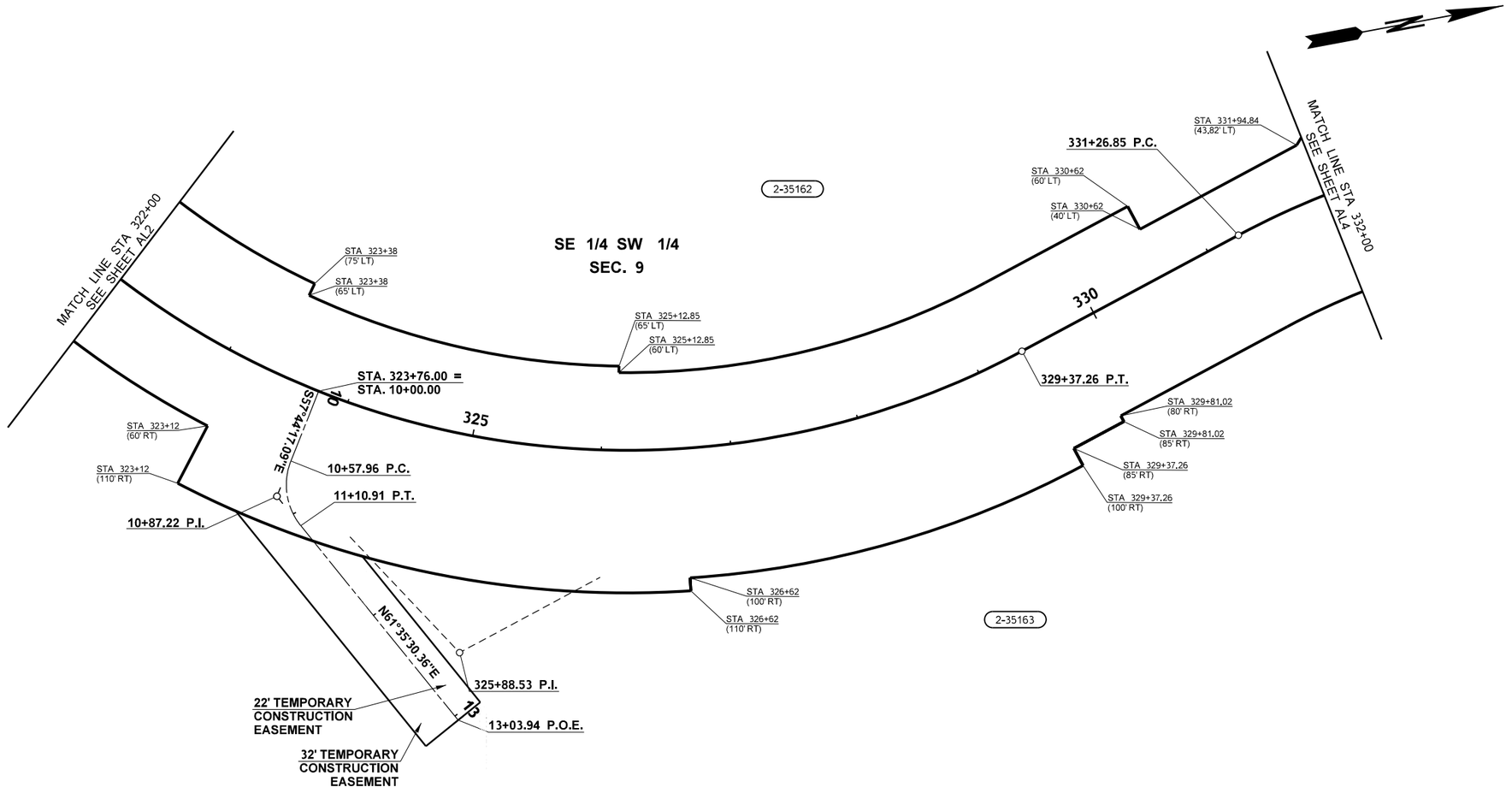
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

ALIGNMENT / RIGHT OF WAY PLAN

Plot 2
PLAN REF NO
AL2
SHEET
OF
SHEETS

SEC.9 T.26N. R.17E. W.M.



NOTES:

1. THE BASIS OF BEARING IS DETERMINED FROM THE WASHINGTON STATE COORDINATE SYSTEM NORTH ZONE (NAD 83/2011).
2. THE DISTANCES SHOWN ARE GROUND DISTANCES IN U.S SURVEY FEET.

CURVE DATA							
P.I. STATION	NORTHING	EASTING	DELTA	RADIUS	TANGENT	LENGTH	S
325+88.53	277889.31	1666371.45	74°43'16.93"	645.00	492.44	841.17	6% LT
10+87.22	277772.88	1666226.95	60°40'12.56"	50.00	29.26	52.94	

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

LEGEND

- EXISTING ALIGNMENT
- CONSTRUCTION ALIGNMENT
- HIGHWAY RIGHT OF WAY
- EXISTING HIGHWAY RIGHT OF WAY
- SECTION LINE
- COUNTY RIGHT OF WAY
- COUNTY ALIGNMENT
- 2-????? PROPERTY NUMBER

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DATE	3/3/2026					FED.AID PROJ.NO.
PLOTTED BY	hmcmaster				JOB NUMBER	
DESIGNED BY	T. GIGLIO					
ENTERED BY	H. MCMASTER				CONTRACT NO.	LOCATION NO.
CHECKED BY	R. CRAVEN					
PROJ. ENGR.	E. BORGES					
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

PAUL E. BORGES STATE OF WASHINGTON 23012272 REGISTERED PROFESSIONAL ENGINEER

DATE

P.E. STAMP BOX

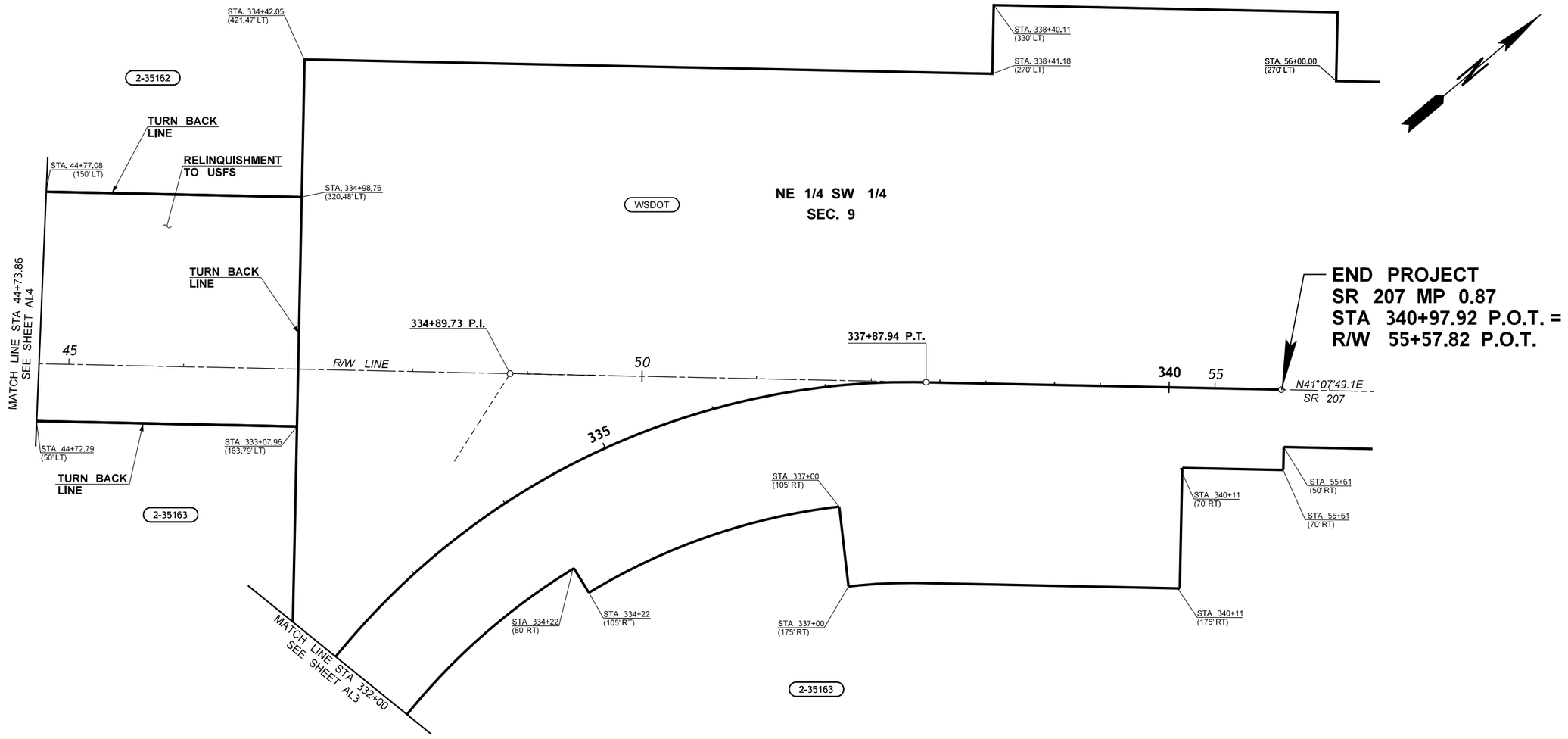
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

ALIGNMENT / RIGHT OF WAY PLAN

Plot 3
PLAN REF NO AL3
SHEET OF SHEETS

SEC.9 T.26N. R.17E. W.M.



NOTES:

1. THE BASIS OF BEARING IS DETERMINED FROM THE WASHINGTON STATE COORDINATE SYSTEM NORTH ZONE (NAD 83/2011).
2. THE DISTANCES SHOWN ARE GROUND DISTANCES IN U.S SURVEY FEET.

CURVE DATA							
P.I. STATION	NORTHING	EASTING	DELTA	RADIUS	TANGENT	LENGTH	S
334+89.73	277885.34	1666055.58	58°43'31.45"	645.00	362.89	661.09	6% RT

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

LEGEND

- EXISTING ALIGNMENT
- CONSTRUCTION ALIGNMENT
- HIGHWAY RIGHT OF WAY
- EXISTING HIGHWAY RIGHT OF WAY
- SECTION LINE
- COUNTY RIGHT OF WAY
- COUNTY ALIGNMENT
- 2-????? PROPERTY NUMBER

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_AL.dgn				REGION NO. / STATE	FED.AID PROJ.NO.
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DATE	3/3/2026				JOB NUMBER	
PLOTTED BY	hmcmaster					
DESIGNED BY	T. GIGLIO					
ENTERED BY	H. MCMASTER					
CHECKED BY	R. CRAVEN				CONTRACT NO.	LOCATION NO.
PROJ. ENGR.	E. BORGES					
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

PRELIMINARY — NOT FOR CONSTRUCTION — STATE OF WASHINGTON — 39012272 — REGISTERED PROFESSIONAL ENGINEER
DATE
P.E. STAMP BOX

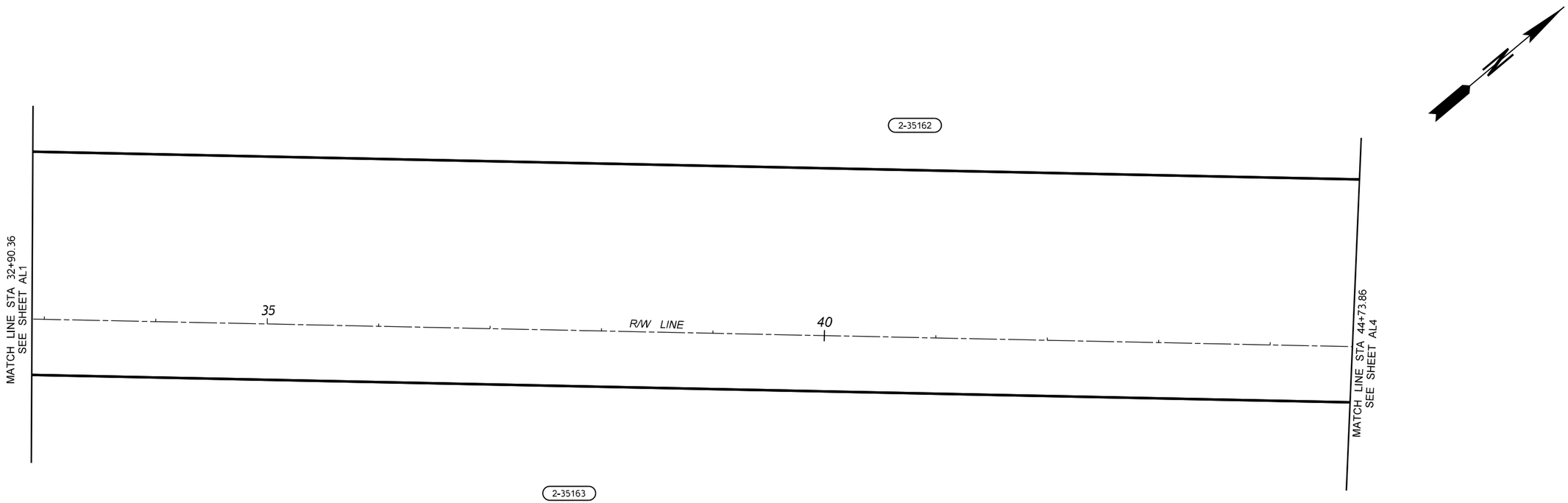
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

ALIGNMENT / RIGHT OF WAY PLAN

Plot 4
PLAN REF NO
AL4
SHEET
OF
SHEETS

SEC.9 T.26N. R.17E. W.M.



60% REVIEW SUBMITTAL

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DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	T. GIGLIO						
ENTERED BY	H. MCMASTER				CONTRACT NO.		LOCATION NO.
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

EDGOLF BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

DATE

P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

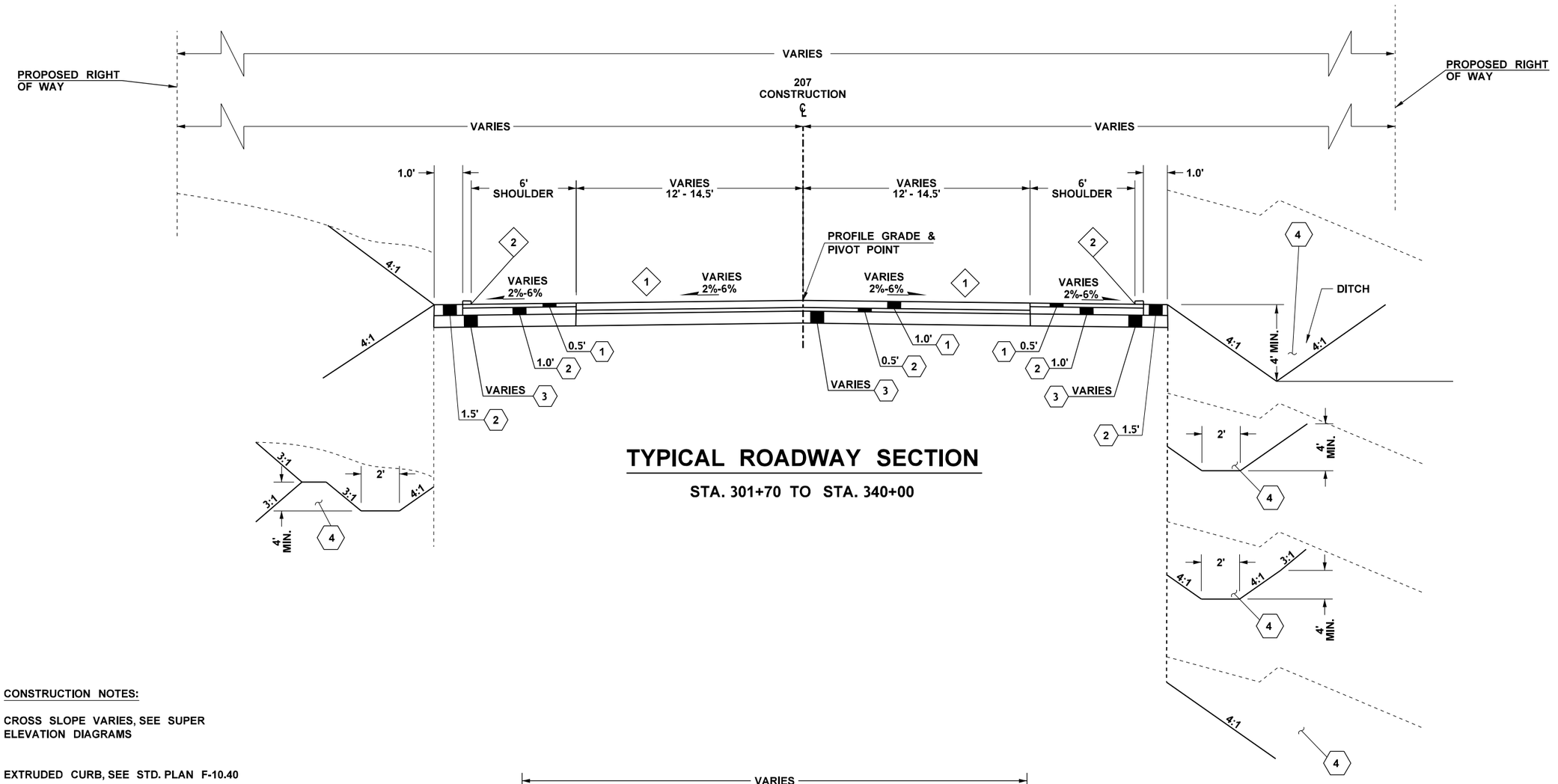
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

ALIGNMENT / RIGHT OF WAY PLAN

Plot 5

PLAN REF NO
AL5

SHEET
OF
SHEETS



TYPICAL ROADWAY SECTION

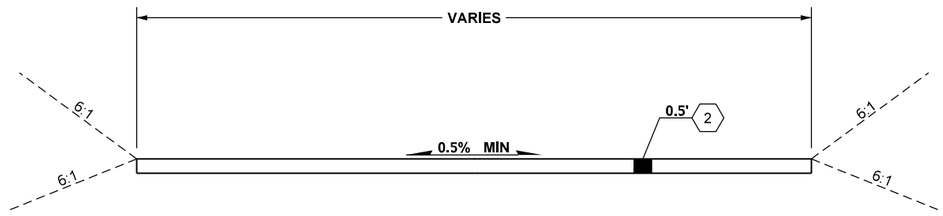
STA. 301+70 TO STA. 340+00

CONSTRUCTION NOTES:

1. CROSS SLOPE VARIES, SEE SUPER ELEVATION DIAGRAMS
2. EXTRUDED CURB, SEE STD. PLAN F-10.40

LEGEND

1. HMA CL. 3/8 IN. PG 64H-28
2. CRUSHED SURFACE BASE COURSE
3. GRAVEL BORROW INCL HAUL
4. ROADWAY EXCAVATION INCL. HAUL



TYPICAL GRAVEL DRIVEWAY APPROACH

NOT TO SCALE

NOTES:

1. ALL DEPTHS SHOWN ARE COMPACTED DEPTHS.
2. SEE PAVING PLAN FOR VARIABLE WIDTHS.
3. COMPACTED DEPTH OF ANY LIFT SHALL BE IN ACCORDANCE WITH SECTION 5.04 OF THE WSDOT STANDARD SPECIFICATIONS.

60% REVIEW SUBMITTAL

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_RS.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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DATE	3/3/2026				JOB NUMBER		
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DESIGNED BY	T. GIGLIO				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	J. SAUGEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PETROLE BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

DATE — P.E. STAMP BOX

DATE — P.E. STAMP BOX

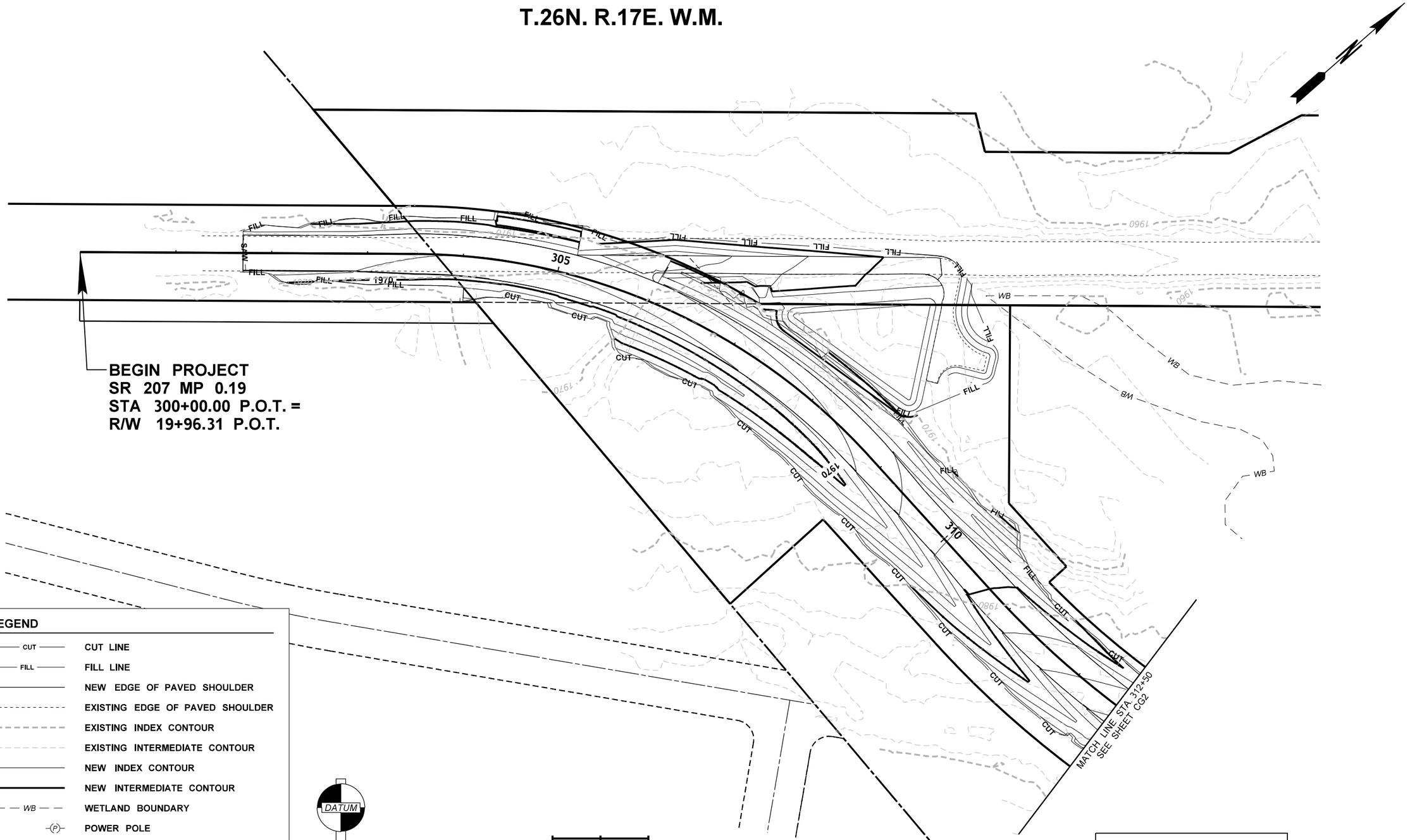
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

ROADWAY SECTION

Plot 1
PLAN REF NO
RS1
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

CUT	CUT LINE
FILL	FILL LINE
	NEW EDGE OF PAVED SHOULDER
	EXISTING EDGE OF PAVED SHOULDER
	EXISTING INDEX CONTOUR
	EXISTING INTERMEDIATE CONTOUR
	NEW INDEX CONTOUR
	NEW INTERMEDIATE CONTOUR
WB	WETLAND BOUNDARY
(P)	POWER POLE
	GUY ANCHOR

DATUM

(NAVD) 88

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

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DATE	3/3/2026
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DESIGNED BY	T. GIGLIO
ENTERED BY	H. MCMASTER
CHECKED BY	R. CRAVEN
PROJ. ENGR.	E. BORGES
REGIONAL ADM.	C. KEIFENHEIM

REVISION	DATE	BY

REGION NO.	STATE
10	WASH

JOB NUMBER

CONTRACT NO.

FED.AID PROJ.NO.

LOCATION NO.

EMILIE BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

DATE

P.E. STAMP BOX

DATE

P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

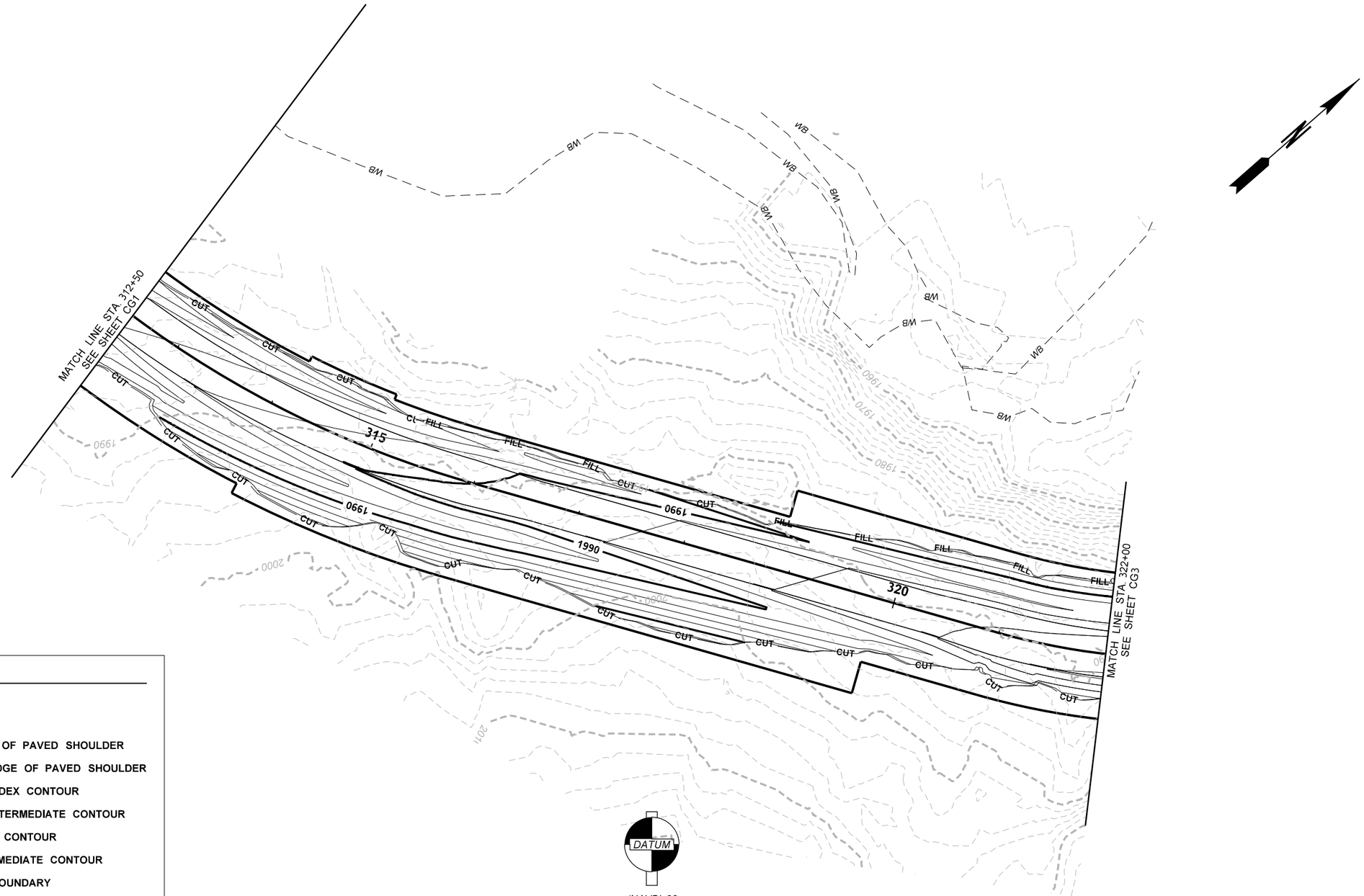
CONTOUR GRADING PLAN

Plot 1

PLAN REF NO
CG1

SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

- CUT LINE
- FILL LINE
- NEW EDGE OF PAVED SHOULDER
- EXISTING EDGE OF PAVED SHOULDER
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- NEW INDEX CONTOUR
- NEW INTERMEDIATE CONTOUR
- WETLAND BOUNDARY
- POWER POLE
- GUY ANCHOR

60% REVIEW SUBMITTAL

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_CG.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	T. GIGLIO				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PRELIMINARY — JOSEPH BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

DATE
P.E. STAMP BOX

DATE
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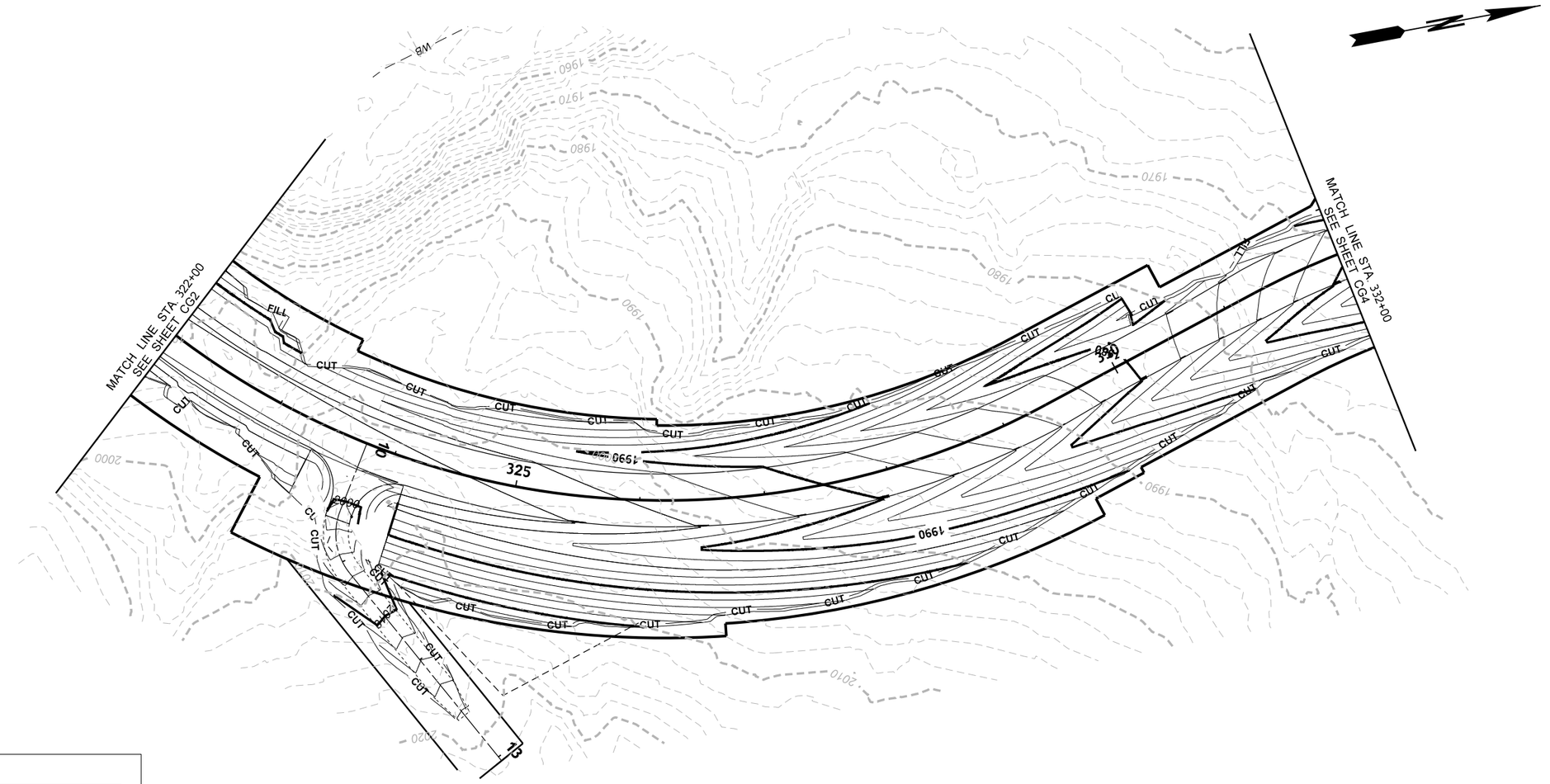
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

CONTOUR GRADING PLAN

Plot 2
PLAN REF NO
CG2
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

CUT	CUT LINE
FILL	FILL LINE
	NEW EDGE OF PAVED SHOULDER
	EXISTING EDGE OF PAVED SHOULDER
	EXISTING INDEX CONTOUR
	EXISTING INTERMEDIATE CONTOUR
	NEW INDEX CONTOUR
	NEW INTERMEDIATE CONTOUR
WB	WETLAND BOUNDARY
P	POWER POLE
	GUY ANCHOR

DATUM

(NAVD) 88

0 50 100

SCALE IN FEET

60% REVIEW SUBMITTAL

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_CG.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
TIME	4:15:34 PM				10	WASH	
DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	T. GIGLIO				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

EDWARD BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

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800.615.9900

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PHASE 2

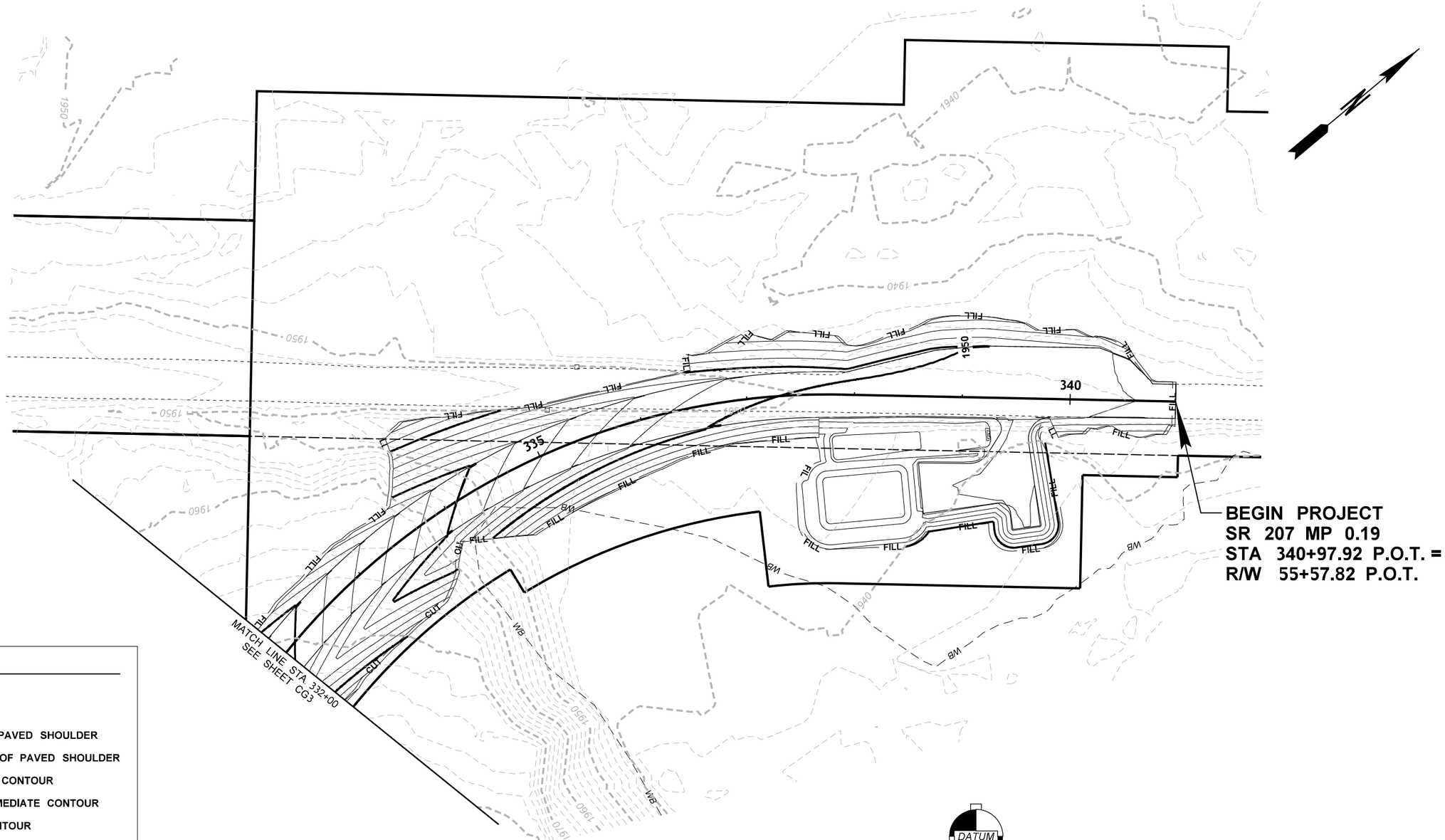
CONTOUR GRADING PLAN

Plot 3

PLAN REF NO
CG3

SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

- CUT LINE
- FILL LINE
- NEW EDGE OF PAVED SHOULDER
- EXISTING EDGE OF PAVED SHOULDER
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- NEW INDEX CONTOUR
- NEW INTERMEDIATE CONTOUR
- WETLAND BOUNDARY
- POWER POLE
- GUY ANCHOR

DATUM
(NAVD) 88

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_CG.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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DESIGNED BY	T. GIGLIO						
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN				CONTRACT NO.		LOCATION NO.
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PRELIMINARY — E. BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

DATE
P.E. STAMP BOX

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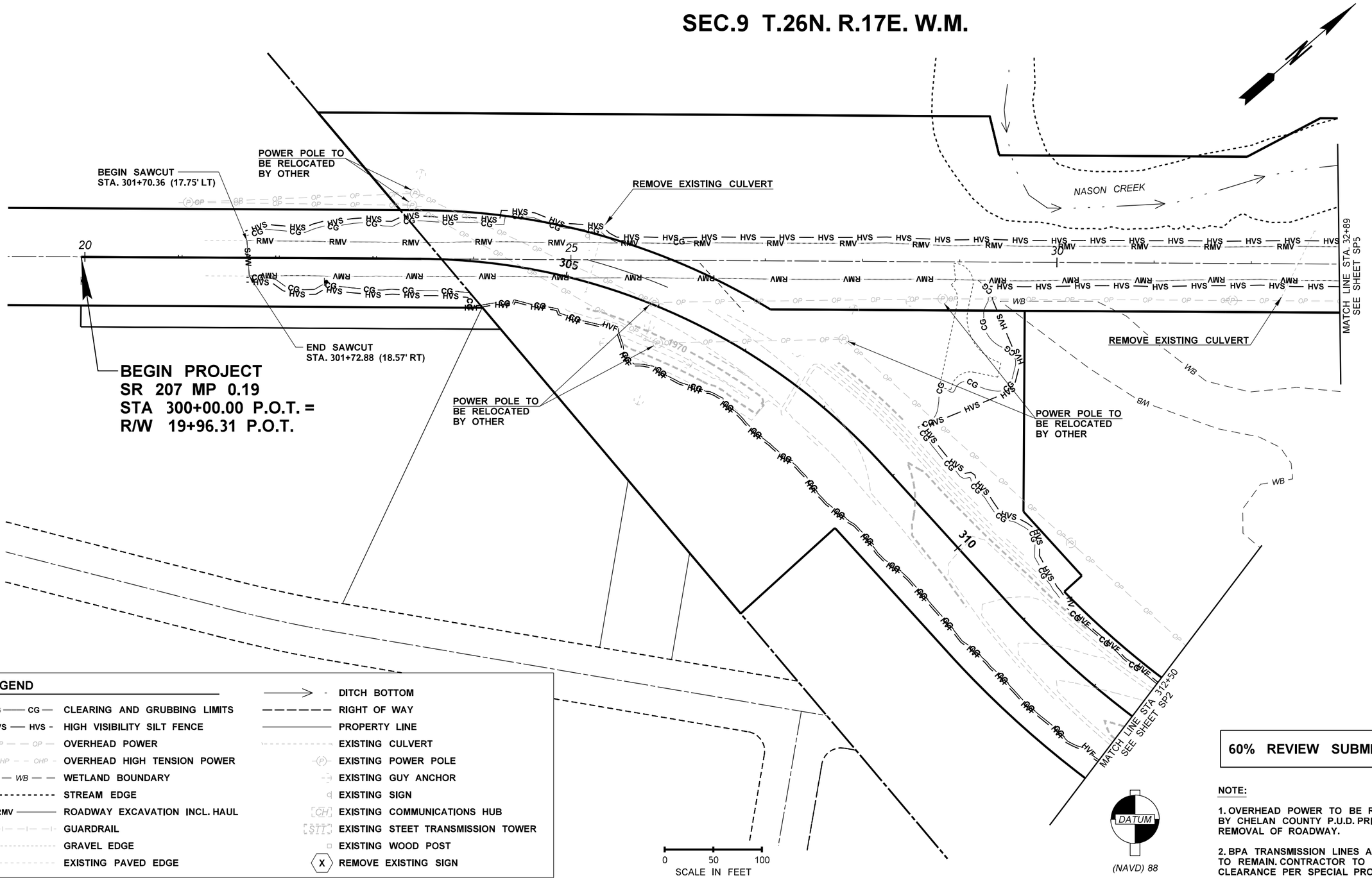
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

CONTOUR GRADING PLAN

Plot 4
PLAN REF NO
CG4
SHEET
OF
SHEETS

SEC.9 T.26N. R.17E. W.M.



LEGEND

CG — CG — CLEARING AND GRUBBING LIMITS	DITCH BOTTOM
HVS — HVS — HIGH VISIBILITY SILT FENCE	RIGHT OF WAY
OP — OP — OVERHEAD POWER	PROPERTY LINE
OHP — OHP — OVERHEAD HIGH TENSION POWER	EXISTING CULVERT
WB WETLAND BOUNDARY	EXISTING POWER POLE
STREAM EDGE	EXISTING GUY ANCHOR
RMV ROADWAY EXCAVATION INCL. HAUL	EXISTING SIGN
GUARDRAIL	EXISTING COMMUNICATIONS HUB
GRAVEL EDGE	EXISTING STEET TRANSMISSION TOWER
EXISTING PAVED EDGE	EXISTING WOOD POST
	REMOVE EXISTING SIGN

60% REVIEW SUBMITTAL

NOTE:

1. OVERHEAD POWER TO BE RELOCATED BY CHELAN COUNTY P.U.D. PRIOR TO REMOVAL OF ROADWAY.
2. BPA TRANSMISSION LINES AND TOWERS TO REMAIN. CONTRACTOR TO PROVIDE ADEQUATE CLEARANCE PER SPECIAL PROVISIONS.

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_SP.dgn
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DATE	3/3/2026
PLOTTED BY	hmcmaster
DESIGNED BY	T. GIGLIO
ENTERED BY	H. MCMASTER
CHECKED BY	R. CRAVEN
PROJ. ENGR.	E. BORGES
REGIONAL ADM.	C. KEIFENHEIM

REVISION	DATE	BY

REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	
JOB NUMBER		
CONTRACT NO.		LOCATION NO.

PRELIMINARY — ROLF E. BORGES — STATE OF WASHINGTON — 21012272 — REGISTERED PROFESSIONAL ENGINEER

DATE

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DATE

P.E. STAMP BOX

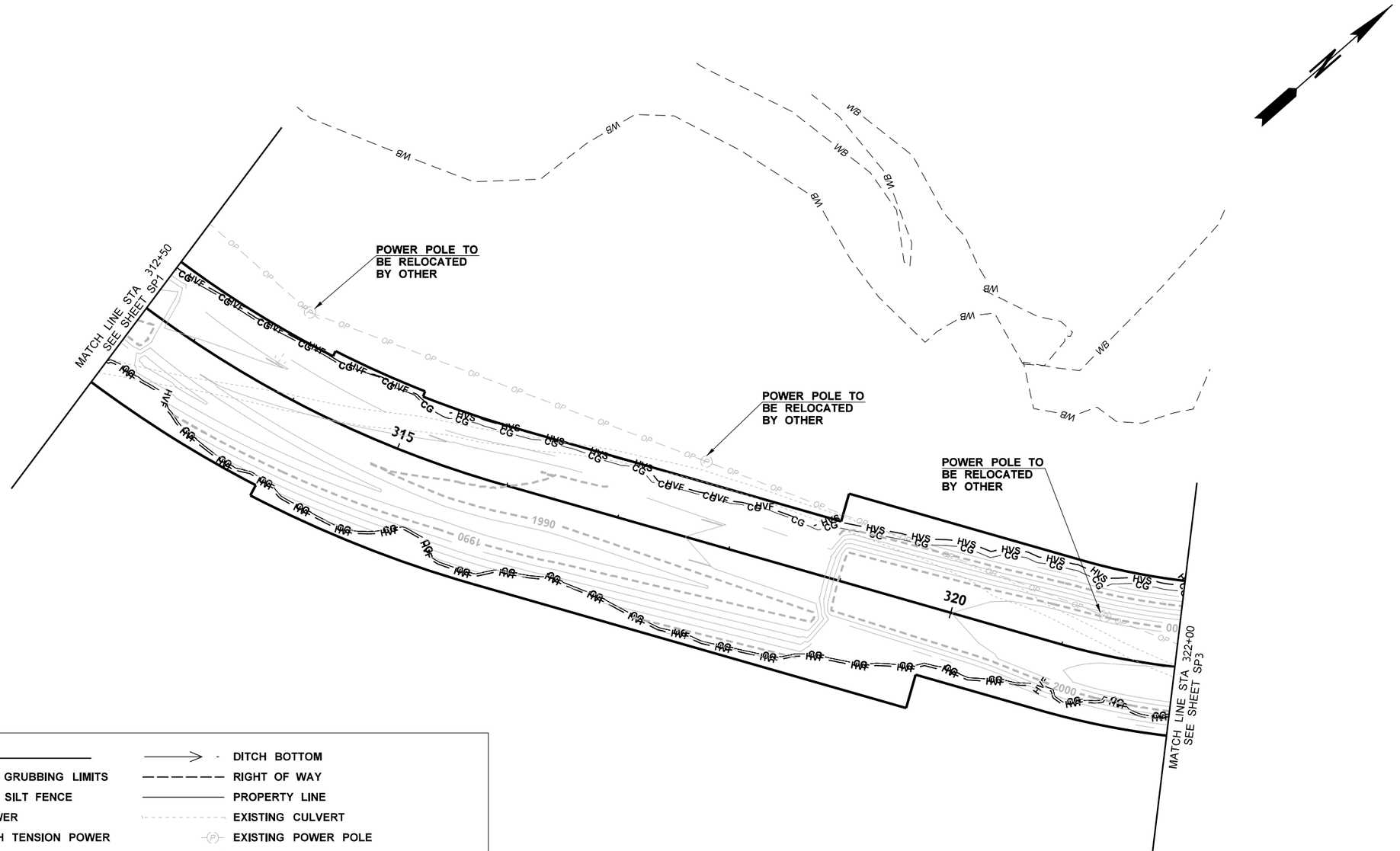
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

SITE PREPARATION PLAN

Plot 1	
PLAN REF NO	SP1
SHEET	
OF	
SHEETS	

SEC.9 T.26N. R.17E. W.M.



LEGEND

CG CLEARING AND GRUBBING LIMITS	DITCH BOTTOM
HVS HIGH VISIBILITY SILT FENCE	RIGHT OF WAY
OP OVERHEAD POWER	PROPERTY LINE
OHP OVERHEAD HIGH TENSION POWER	EXISTING CULVERT
WB WETLAND BOUNDARY	EXISTING POWER POLE
STREAM EDGE	EXISTING GUY ANCHOR
RMV ROADWAY EXCAVATION INCL. HAUL	EXISTING SIGN
GUARDRAIL	EXISTING COMMUNICATIONS HUB
GRAVEL EDGE	EXISTING STEET TRANSMISSION TOWER
EXISTING PAVED EDGE	EXISTING WOOD POST
	REMOVE EXISTING SIGN

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

DATUM
(NAVD) 88

NOTE:

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DESIGNED BY	T. GIGLIO				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PRELIMINARY — EDWARD BORGES — STATE OF WASHINGTON — 22012272 — REGISTERED PROFESSIONAL ENGINEER
DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

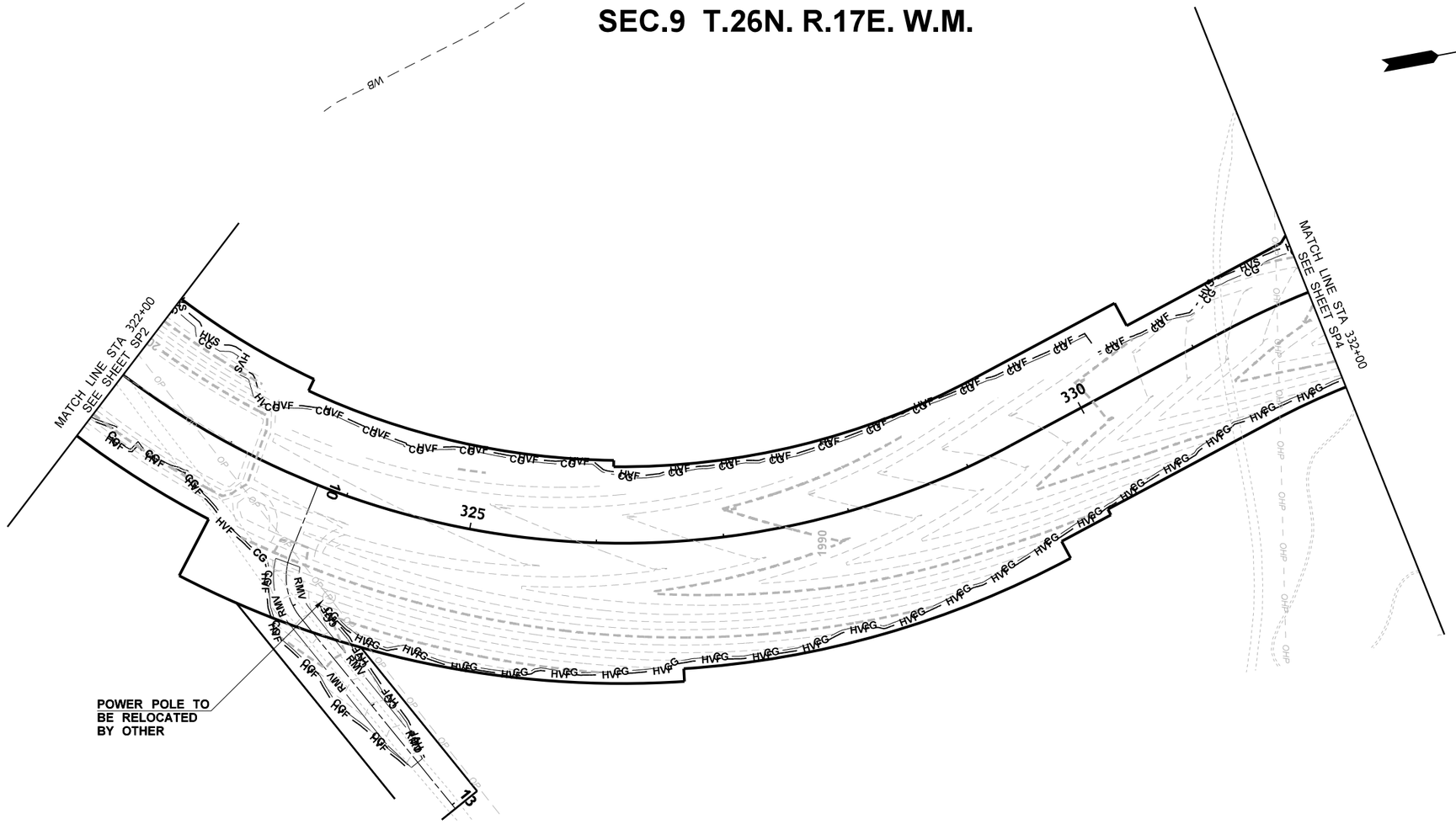
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

SITE PREPARATION PLAN

Plot 2
PLAN REF NO
SP2
SHEET
OF
SHEETS

SEC.9 T.26N. R.17E. W.M.



LEGEND

CG CLEARING AND GRUBBING LIMITS	DITCH BOTTOM
HVS HIGH VISIBILITY SILT FENCE	RIGHT OF WAY
OP OVERHEAD POWER	PROPERTY LINE
OHP OVERHEAD HIGH TENSION POWER	EXISTING CULVERT
WB WETLAND BOUNDARY	EXISTING POWER POLE
STREAM EDGE	EXISTING GUY ANCHOR
RMV ROADWAY EXCAVATION INCL. HAUL	EXISTING SIGN
GUARDRAIL	EXISTING COMMUNICATIONS HUB
GRAVEL EDGE	EXISTING STEET TRANSMISSION TOWER
EXISTING PAVED EDGE	EXISTING WOOD POST
	REMOVE EXISTING SIGN

0 50 100
SCALE IN FEET

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DATUM
(NAVD) 88

NOTE:

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ENTERED BY	H. MCMASTER			
CHECKED BY	R. CRAVEN			
PROJ. ENGR.	E. BORGES			
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY

REGION NO. 10 | STATE WASH | JOB NUMBER | CONTRACT NO. | FED.AID PROJ.NO. | LOCATION NO.

P.E. STAMP BOX — DATE

P.E. STAMP BOX — DATE

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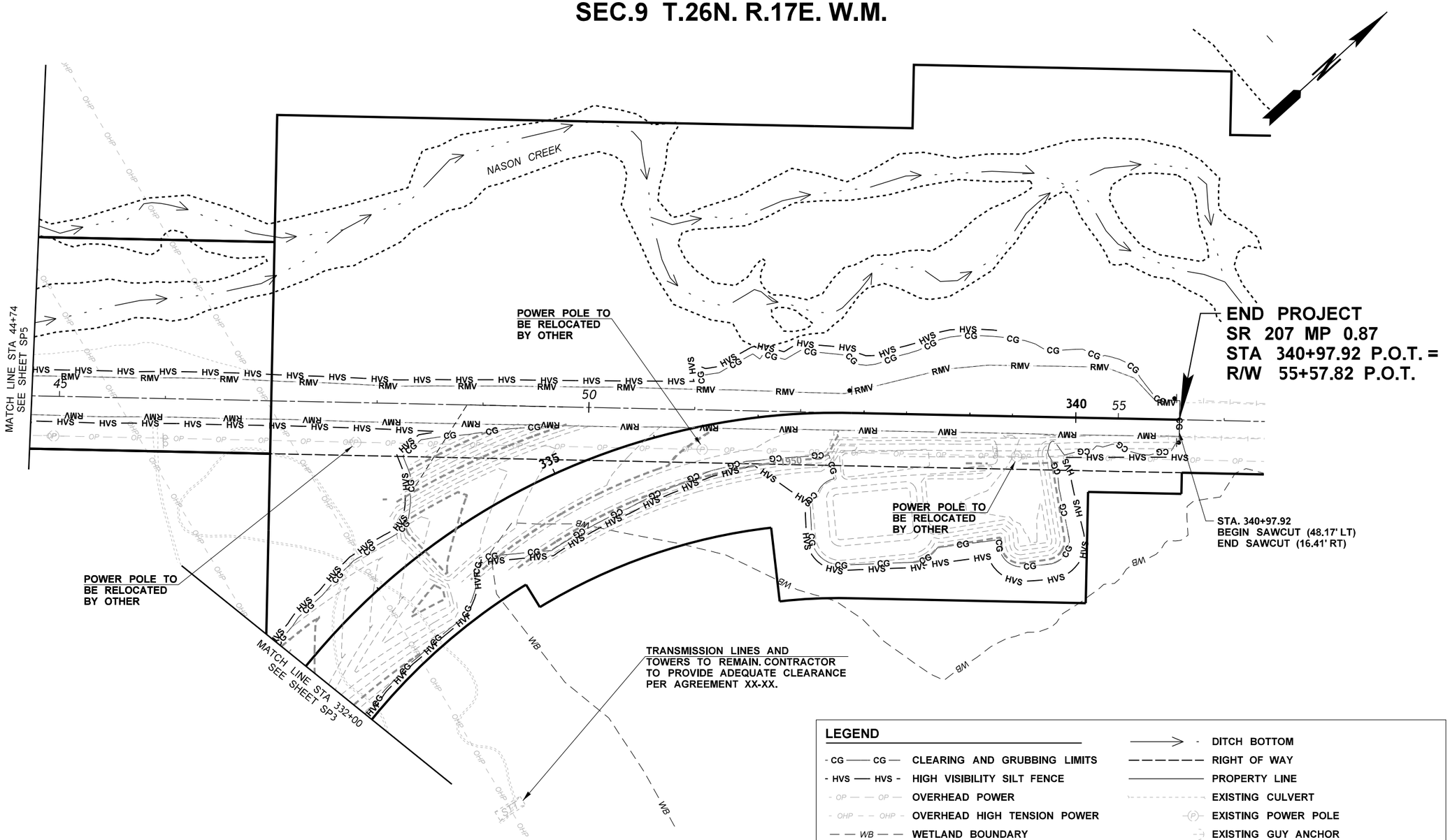
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

SITE PREPARATION PLAN

Plot 3
PLAN REF NO SP3
SHEET OF SHEETS

SEC.9 T.26N. R.17E. W.M.



NOTE:

1. OVERHEAD POWER TO BE RELOCATED BY CHELAN COUNTY P.U.D. PRIOR TO REMOVAL OF ROADWAY.

2. BPA TRANSMISSION LINES AND TOWERS TO REMAIN. CONTRACTOR TO PROVIDE ADEQUATE CLEARANCE PER SPECIAL PROVISIONS.

60% REVIEW SUBMITTAL

0 50 100
SCALE IN FEET

DATUM
(NAVD) 88

LEGEND

- CG —— CG —	CLEARING AND GRUBBING LIMITS
- HVS —— HVS -	HIGH VISIBILITY SILT FENCE
- OP — — OP —	OVERHEAD POWER
- OHP — — OHP -	OVERHEAD HIGH TENSION POWER
— — WB — —	WETLAND BOUNDARY
----------	STREAM EDGE
- RMV ———	ROADWAY EXCAVATION INCL. HAUL
- —|— —|— —|-	GUARDRAIL
----------	GRAVEL EDGE
----------	EXISTING PAVED EDGE
→ -	DITCH BOTTOM
— — — — —	RIGHT OF WAY
———	PROPERTY LINE
----------	EXISTING CULVERT
(P) -	EXISTING POWER POLE
-	EXISTING GUY ANCHOR
-	EXISTING SIGN
CH	EXISTING COMMUNICATIONS HUB
STT	EXISTING STEET TRANSMISSION TOWER
-	EXISTING WOOD POST
X	REMOVE EXISTING SIGN

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_SP.dgn
TIME	4:16:17 PM
DATE	3/3/2026
PLOTTED BY	hmcmaster
DESIGNED BY	T. GIGLIO
ENTERED BY	H. MCMASTER
CHECKED BY	R. CRAVEN
PROJ. ENGR.	E. BORGES
REGIONAL ADM.	C. KEIFENHEIM

REVISION	DATE	BY

REGION NO. 10 | STATE WASH | FED.AID PROJ.NO.
JOB NUMBER
CONTRACT NO. | LOCATION NO.

P.E. STAMP BOX — DATE

P.E. STAMP BOX — DATE

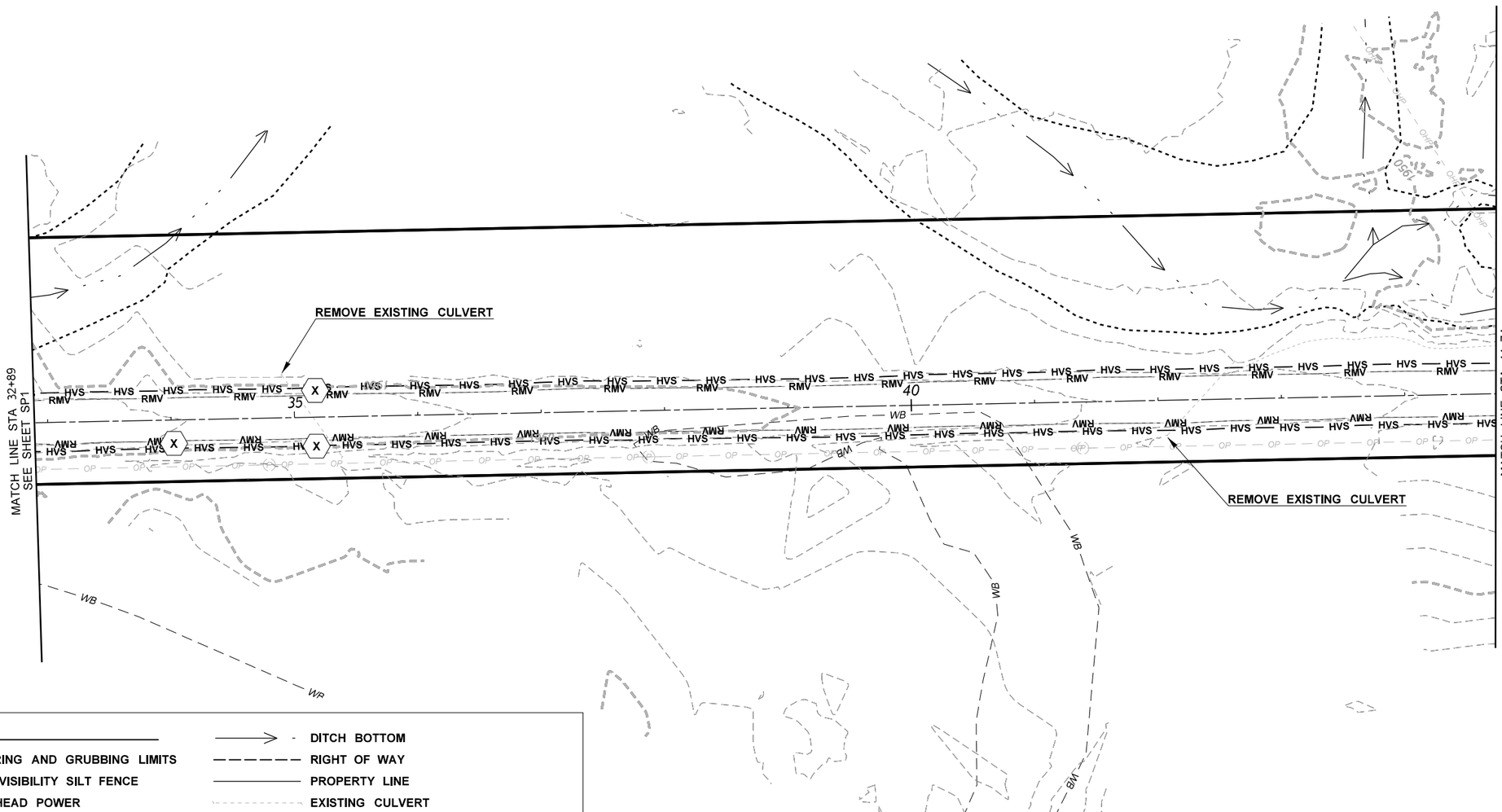
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

SITE PREPARATION PLAN

Plot 4
PLAN REF NO SP4
SHEET OF SHEETS

SEC.9 T.26N. R.17E. W.M.



LEGEND

CG — CG — CLEARING AND GRUBBING LIMITS	DITCH BOTTOM
HVS — HVS — HIGH VISIBILITY SILT FENCE	RIGHT OF WAY
OP — OP — OVERHEAD POWER	PROPERTY LINE
OHP — OHP — OVERHEAD HIGH TENSION POWER	EXISTING CULVERT
WB WETLAND BOUNDARY	(P) EXISTING POWER POLE
STREAM EDGE	EXISTING GUY ANCHOR
RMV ROADWAY EXCAVATION INCL. HAUL	EXISTING SIGN
GUARDRAIL	CH EXISTING COMMUNICATIONS HUB
GRAVEL EDGE	STT EXISTING STEET TRANSMISSION TOWER
EXISTING PAVED EDGE	EXISTING WOOD POST
	X REMOVE EXISTING SIGN

DATUM

(NAVD) 88

0 50 100

SCALE IN FEET

60% REVIEW SUBMITTAL

NOTE:

1. OVERHEAD POWER TO BE RELOCATED BY CHELAN COUNTY P.U.D. PRIOR TO REMOVAL OF ROADWAY.

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DESIGNED BY	T. GIGLIO						
ENTERED BY	H. MCMASTER				CONTRACT NO.		LOCATION NO.
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PETROLE BORGES
STATE OF WASHINGTON
23012272
REGISTERED
PROFESSIONAL ENGINEER

DATE

P.E. STAMP BOX

DATE

P.E. STAMP BOX

PERTEET

123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

SITE PREPARATION PLAN

Plot 5

PLAN REF NO
SP5

SHEET
OF
SHEETS

LEGEND

- EXISTING RIGHT-OF-WAY
- EXISTING DITCH
- EXISTING CULVERT
- EXISTING CULVERT
- EXISTING WETLAND (WB)
- WETLAND AND STREAM BUFFER
- ORDINARY HIGH WATER MARK — OHW —
- EXISTING ALIGNMENT
- EXISTING EDGE OF PAVEMENT
- PROPOSED ALIGNMNET
- PROPOSED RIGHT-OF-WAY
- PROPOSED GUARDRAIL
- PROPOSED CURB
- PROPOSED CUT LINE — CUT —
- PROPOSED FILL LINE — FILL —
- IMPACT AREA LINE
- TEMPORARY RESTRICTED ACCESS FENCE
- HIGH VISIBILITY FENCE PER WSDOT STD. PLAN I-30.40-01 — HVF —
- HIGH VISIBILITY SILT FENCE PER WSDOT STD. PLAN I-30.17-01 — HVS —
- NON-BIODEGRADEABLE CHECK DAM (NON-BIO)
- COMPOST FILTER SOCK PER WSDOT STD. PLAN I-30.40-02
- INLET PROTECTION PER WSDOT STANDARD PLAN I-40.20-00
- STABILIZED CONSTRUCTION ENTRANCE PER WSDOT STD. PLAN I-80.10-02
- SEDIMENT POND
- PROPOSED DITCH / NON-FISH BEARING STREAM CHANNEL
- PROPOSED DITCH BERM
- PROPOSED STORM DRAIN — S — ST —
- PROPOSED UNDERDRAIN — UD — UD —
- PROPOSED DRAIN PIPE — DP — DP —
- PROPOSED CATCH BASIN OR GRATE INLET
- PROPOSED MANHOLE
- PROPOSED CULVERT
- PROPOSED COMPOST AMENDED BIOFILTRATION SWALE (CABS)
- PROPOSED MEDIA FILTER DRAIN (MFD) — MFD —
- PROPOSED DETENTION POND
- PROPOSED OUTLET PROTECTION/ ENERGY DISSIPATOR
- TEMPORARY STORM PIPE

T.26N. R.17E. W.M.

TESC GENERAL NOTES

1. ALL FIELD STAFF WILL COMPLETE THE PROJECT SPECIFIC HEALTH, SAFETY, AND ENVIRONMENTAL TRAINING PRIOR TO PERFORMING WORK ON SITE. THE TRAINING SHALL COVER SITE CONDITIONS, PERMIT SPECIFICATIONS, AND TESC PLAN SPCC PLAN REQUIREMENTS.
2. STABILIZE EXPOSED SOILS AT THE END OF SHIFT WHEN A POTENTIAL RUNOFF PRODUCING RAIN EVENT IS FORECASTED OVERNIGHT.
3. ALL WASHOUT OF CONCRETE DELIVERY TRUCKS, PUMPING EQUIPMENT, AND TOOLS SHALL OCCUR AT THE DESIGNATED WASHOUT LOCATIONS. UNDER NO CONDITION SHALL WASH WATER BE ALLOWED TO DISCHARGE TO WATERS OF THE STATE.
4. NO PETROLEUM PRODUCTS, FRESH CONCRETE, LIME OR CONCRETE, CHEMICALS OR OTHER TOXIC OR DELETERIOUS MATERIAL SHALL BE ALLOWED TO DISCHARGE TO WATERS OF THE STATE.
5. THE CONTRACTOR SHALL NOT DISCHARGE UNTREATED DE-WATERING OR STORMWATER TO WATERS OF THE STATE OR PROJECT CONVEYANCE THAT DISCHARGES TO WATERS OF THE STATE UNTIL WATER QUALITY SAMPLING IS CONDUCTED AND CONFIRMS THAT PARAMETERS SPECIFIED IN PROJECT PERMITS ARE MET.
6. HAY OR STRAW MAY NOT BE USED WITHIN EXISTING SENSITIVE AREAS OR MITIGATED SITES SUCH AS LAKES, STREAMS, WETLANDS, AND THEIR BUFFERS. MULCH WITHIN THESE AREAS SHALL BE COMPOST OR WOOD CHIP MATERIAL OR CESCL APPROVED ALTERNATIVE.
7. ALL TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED ON A REGULAR BASIS, MAINTAINED, AND REPAIRED TO ENSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION.
8. SEDIMENT CONTROL MEASURES SHALL BE INSTALLED PRIOR TO BEGINNING OF GRADING. LIMITED GRADING REQUIRED TO INSTALL EROSION CONTROL BMPS IS ALLOWED.
9. EXPOSED SOILS SHALL E STABILIZED USING APPROPRIATE BMPS IF THEY REMAIN UNWORKED FOR:
   2-DAYS MAX. (OCT. 1 - APRIL 30) OR
   7-DAYS MAX (MAY 1 - SEPT. 30)
10. BELOW GRATE INLET PROTECTION SHALL BE INSTALLED IN OPEN GRATED CATCH BASINS (NEW AND EXISTING) IN ACCORDANCE WITH THE RFC TESC PLANS.
11. PROVIDE STABILIZED CONSTRUCTION ACCESS IN ACCORDANCE WITH THE RFC TESC PLANS AND THE WSDOT STANDARD SPECS.
12. CONSTRUCTION ACTIVITIES BEYOND THE HIGH VISIBILITY FENCE ARE PROHIBITED WITHOUT PRIOR AUTHORIZATION FROM THE ECM.
13. OFF SITE STORMWATER WILL BE TEMPORARILY DIVERTED THROUGH THE SITE VIA EXISTING AND PROPOSED CONVEYANCE SYSTEMS. OFF SITE STORMWATER RUNOFF IS CONSIDERED TO BE FREE FROM SEDIMENT, AND THEREFORE NO SEDIMENT LADEN WATER SHALL BE COMBINED WITH OFF SITE RUNOFF UNLESS TURBIDITY LEVELS MEET ACCEPTABLE LEVELS.

60% REVIEW SUBMITTAL

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_TESC.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
TIME	4:16:39 PM				10	WASH	
DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	N. HAHNE				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KEVIN MERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

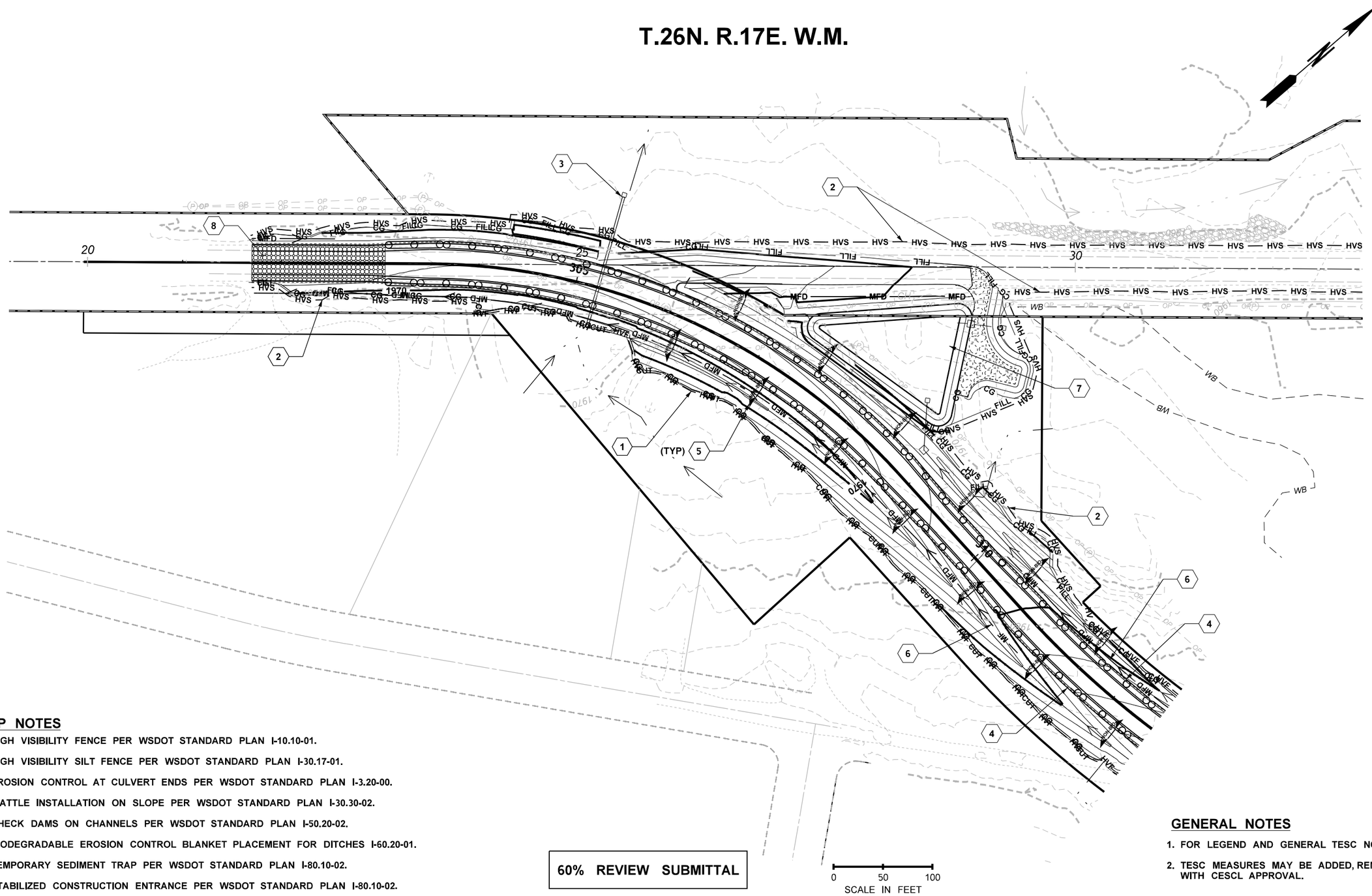
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

TESC LEGEND AND NOTES

Plot 1
PLAN REF NO
ECN01
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



BMP NOTES

1. HIGH VISIBILITY FENCE PER WSDOT STANDARD PLAN I-10.10-01.
2. HIGH VISIBILITY SILT FENCE PER WSDOT STANDARD PLAN I-30.17-01.
3. EROSION CONTROL AT CULVERT ENDS PER WSDOT STANDARD PLAN I-3.20-00.
4. WATTLE INSTALLATION ON SLOPE PER WSDOT STANDARD PLAN I-30.30-02.
5. CHECK DAMS ON CHANNELS PER WSDOT STANDARD PLAN I-50.20-02.
6. BIODEGRADABLE EROSION CONTROL BLANKET PLACEMENT FOR DITCHES I-60.20-01.
7. TEMPORARY SEDIMENT TRAP PER WSDOT STANDARD PLAN I-80.10-02.
8. STABILIZED CONSTRUCTION ENTRANCE PER WSDOT STANDARD PLAN I-80.10-02.

60% REVIEW SUBMITTAL

0 50 100
SCALE IN FEET

GENERAL NOTES

1. FOR LEGEND AND GENERAL TESC NOTES, SEE SHEET ECN01.
2. TESC MEASURES MAY BE ADDED, REMOVED, OR RELOCATED WITH CESCL APPROVAL.

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_TESC.dgn				REGION NO. / STATE	FED.AID PROJ.NO.
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DESIGNED BY	N. HAHNE				CONTRACT NO.	LOCATION NO.
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PROJ. ENGR.	K. MCGEE					
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

KERMERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

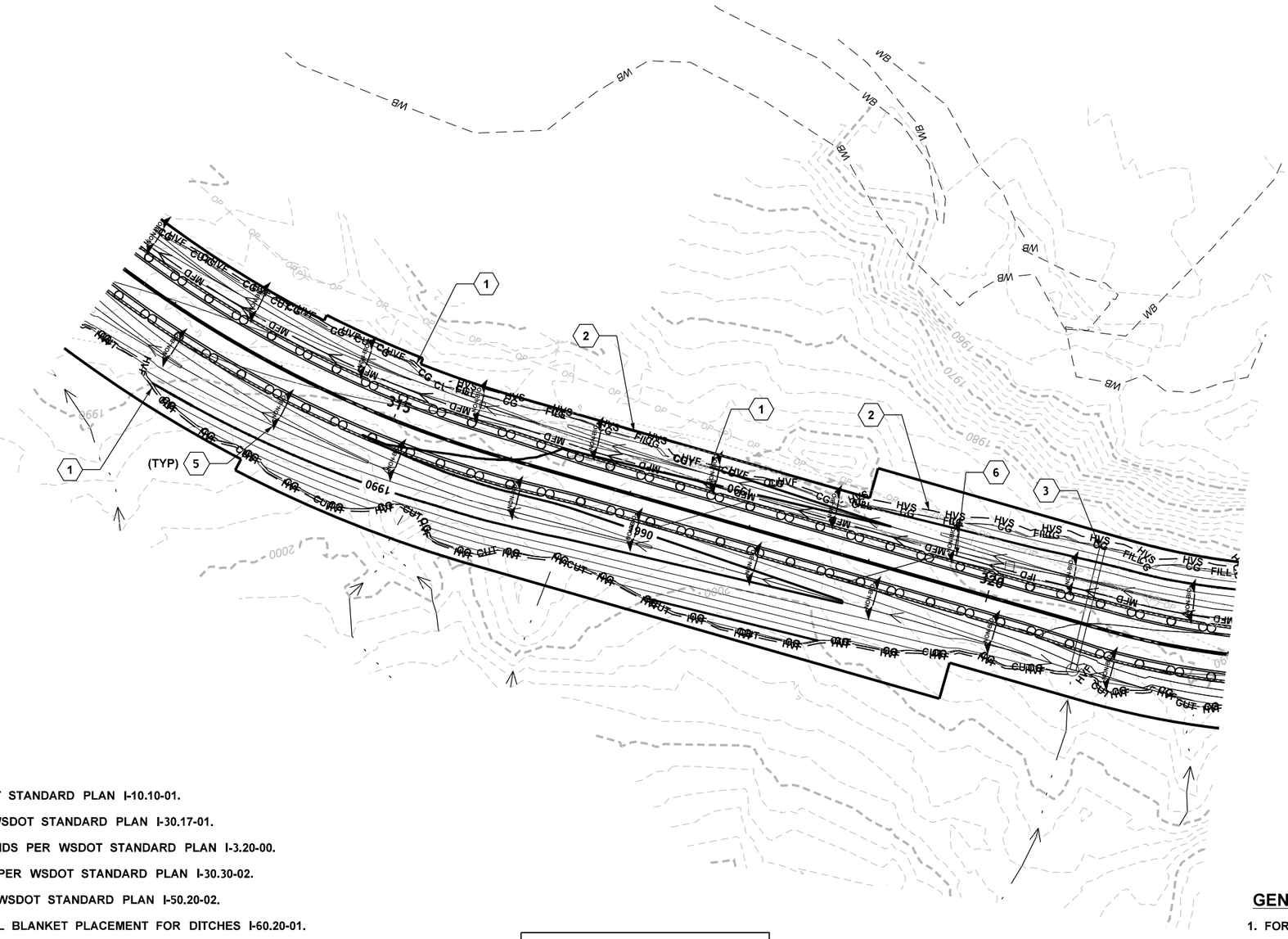
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

TESC PLAN

Plot 2
PLAN REF NO
TESC1
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



BMP NOTES

1. HIGH VISIBILITY FENCE PER WSDOT STANDARD PLAN I-10.10-01.
2. HIGH VISIBILITY SILT FENCE PER WSDOT STANDARD PLAN I-30.17-01.
3. EROSION CONTROL AT CULVERT ENDS PER WSDOT STANDARD PLAN I-3.20-00.
4. WATTLE INSTALLATION ON SLOPE PER WSDOT STANDARD PLAN I-30.30-02.
5. CHECK DAMS ON CHANNELS PER WSDOT STANDARD PLAN I-50.20-02.
6. BIODEGRADABLE EROSION CONTROL BLANKET PLACEMENT FOR DITCHES I-60.20-01.
7. TEMPORARY SEDIMENT TRAP PER WSDOT STANDARD PLAN I-80.10-02.
8. STABILIZED CONSTRUCTION ENTRANCE PER WSDOT STANDARD PLAN I-80.10-02.

60% REVIEW SUBMITTAL

0 50 100
SCALE IN FEET

GENERAL NOTES

1. FOR LEGEND AND GENERAL TESC NOTES, SEE SHEET ECN01.
2. TESC MEASURES MAY BE ADDED, REMOVED, OR RELOCATED WITH CESCL APPROVAL.

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_TESC.dgn				REGION NO. 10 / STATE WASH	FED.AID PROJ.NO.
TIME	4:16:41 PM				JOB NUMBER	
DATE	3/3/2026					
PLOTTED BY	hmcmaster					
DESIGNED BY	N. HAHNE					
ENTERED BY	H. MCMASTER					
CHECKED BY	R. CRAVEN				CONTRACT NO.	LOCATION NO.
PROJ. ENGR.	K. MCGEE					
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

KEVIN CAMERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY
DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

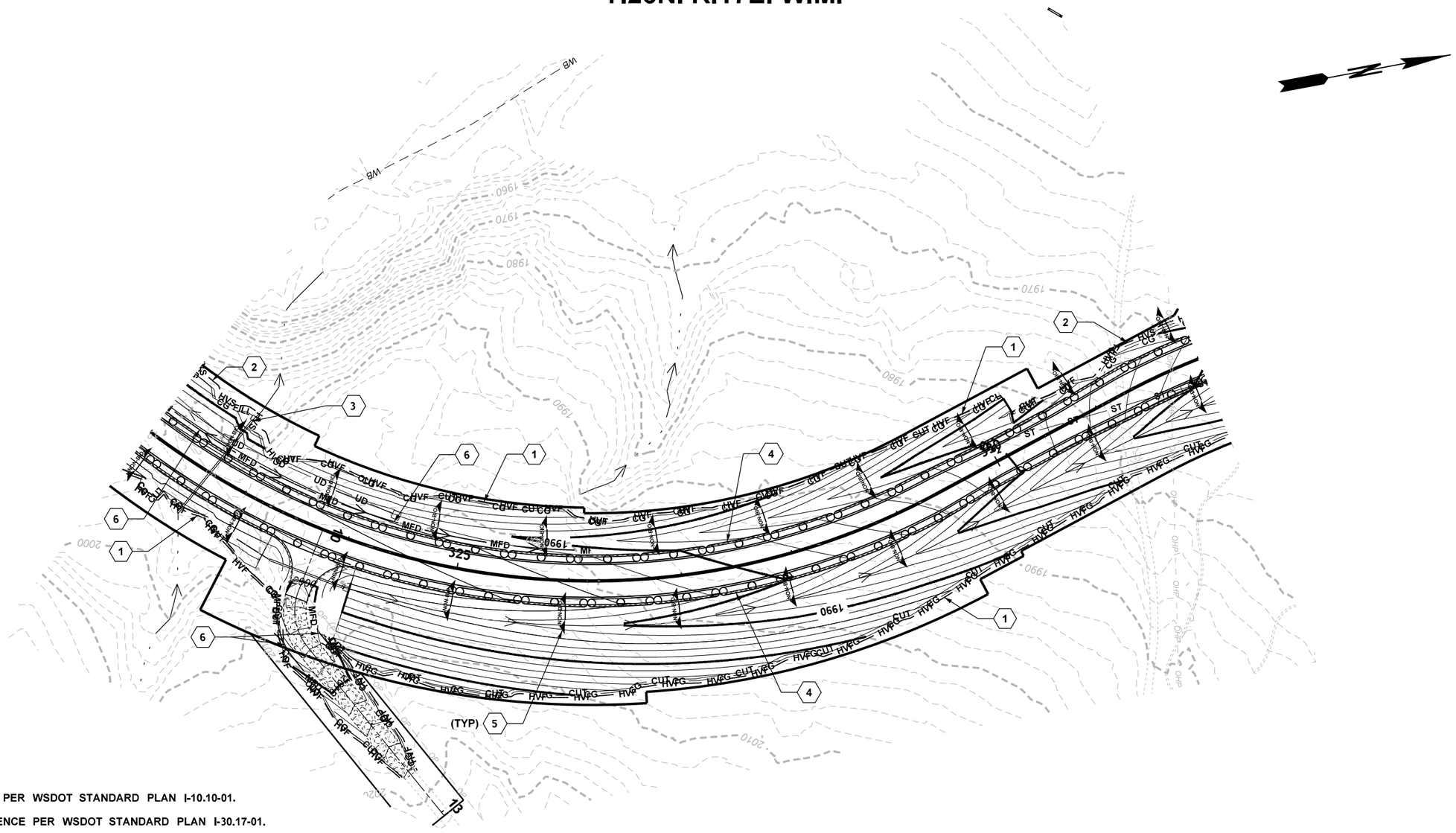
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

TESC PLAN

Plot 3
PLAN REF NO TESC2
SHEET OF SHEETS

T.26N. R.17E. W.M.



BMP NOTES

1. HIGH VISIBILITY FENCE PER WSDOT STANDARD PLAN I-10.10-01.
2. HIGH VISIBILITY SILT FENCE PER WSDOT STANDARD PLAN I-30.17-01.
3. EROSION CONTROL AT CULVERT ENDS PER WSDOT STANDARD PLAN I-3.20-00.
4. WATTLE INSTALLATION ON SLOPE PER WSDOT STANDARD PLAN I-30.30-02.
5. CHECK DAMS ON CHANNELS PER WSDOT STANDARD PLAN I-50.20-02.
6. BIODEGRADABLE EROSION CONTROL BLANKET PLACEMENT FOR DITCHES I-60.20-01.
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8. STABILIZED CONSTRUCTION ENTRANCE PER WSDOT STANDARD PLAN I-80.10-02.

60% REVIEW SUBMITTAL

0 50 100
SCALE IN FEET

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PLOTTED BY	hmcmaster					
DESIGNED BY	N. HAHNE					
ENTERED BY	H. MCMASTER					
CHECKED BY	R. CRAVEN				CONTRACT NO.	LOCATION NO.
PROJ. ENGR.	K. MCGEE					
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

KEIRAN MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER
DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

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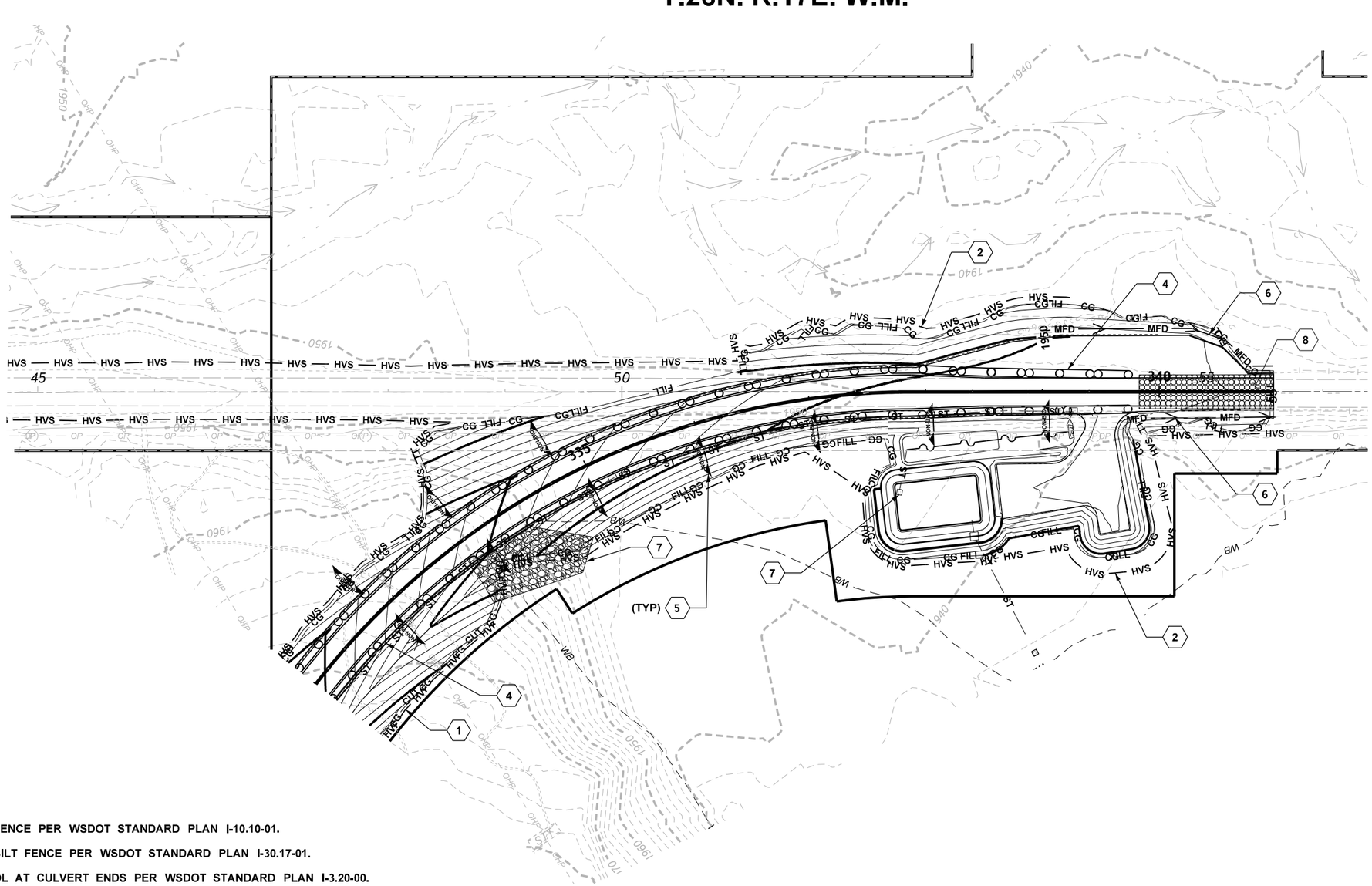
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

TESC PLAN

Plot 4
PLAN REF NO
TESC3
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



BMP NOTES

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60% REVIEW SUBMITTAL

0 50 100
SCALE IN FEET

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ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PRELIMINARY
KEITH CAMERON MCGEE
STATE OF WASHINGTON
21019074
REGISTERED
PROFESSIONAL ENGINEER

DATE
P.E. STAMP BOX

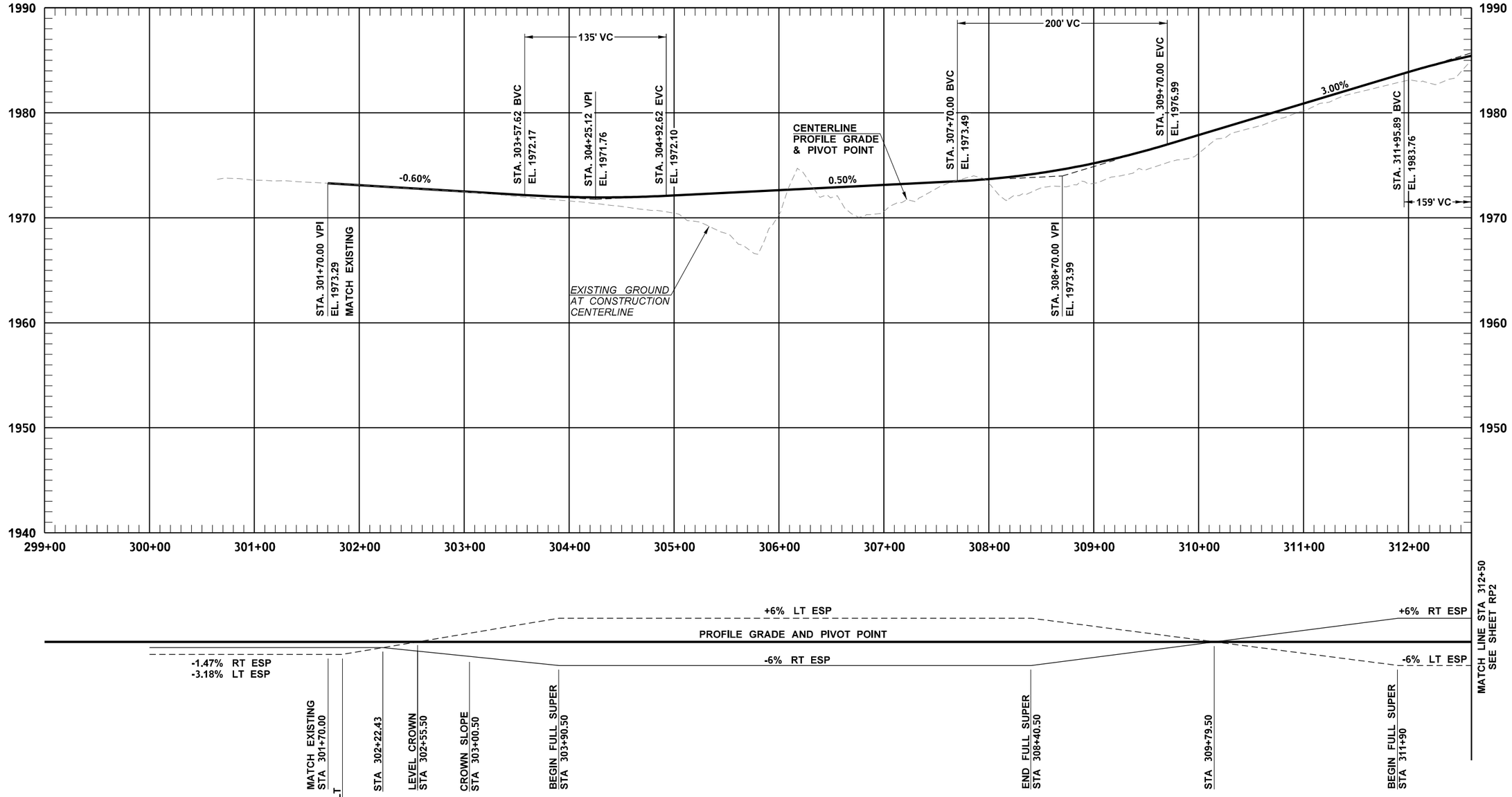
DATE
P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

TESC PLAN

Plot 5
PLAN REF NO
TESC4
SHEET
OF
SHEETS



LEGEND

EDGE OF SHOULDER PAVED (ESP) RT

EDGE OF SHOULDER PAVED (ESP) LT

60% REVIEW SUBMITTAL

DATUM

(NAVD) 88

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_PR.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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PLOTTED BY	hmcmaster						
DESIGNED BY	T. GIGLIO						
ENTERED BY	H. MCMASTER				CONTRACT NO.		LOCATION NO.
CHECKED BY	J. SAUGEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

P.E. STAMP BOX — DATE

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

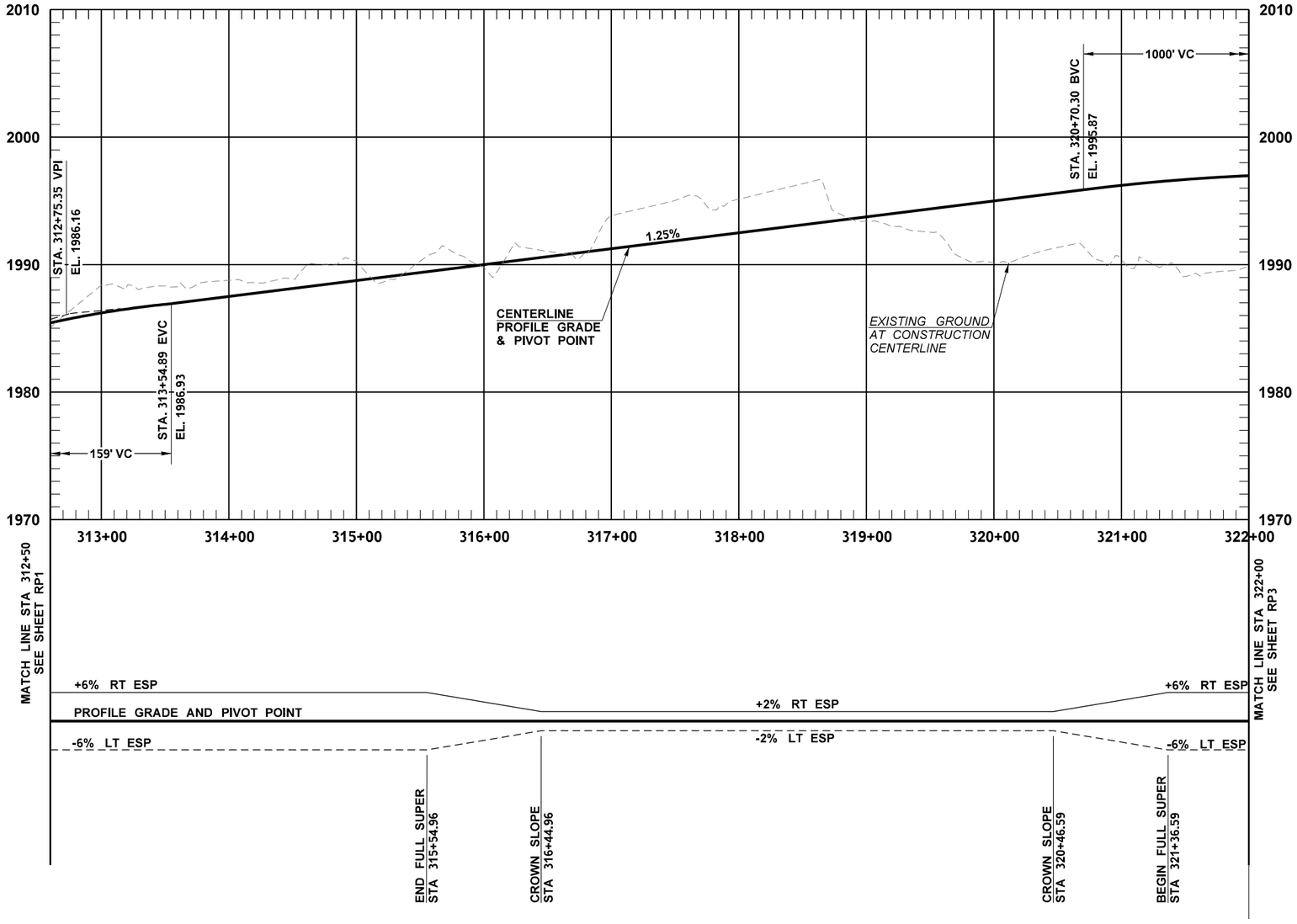
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

ROADWAY PROFILE

Plot 11

PLAN REF NO
RP1

SHEET
OF
SHEETS



LEGEND

EDGE OF SHOULDER PAVED (ESP) RT

EDGE OF SHOULDER PAVED (ESP) LT

60% REVIEW SUBMITTAL

DATUM

(NAVD) 88

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ENTERED BY	H. MCMASTER						
CHECKED BY	J. SAUGEN				CONTRACT NO.		LOCATION NO.
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PROFESSIONAL ENGINEER — ERIC BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED

DATE

P.E. STAMP BOX

PERTEET

123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

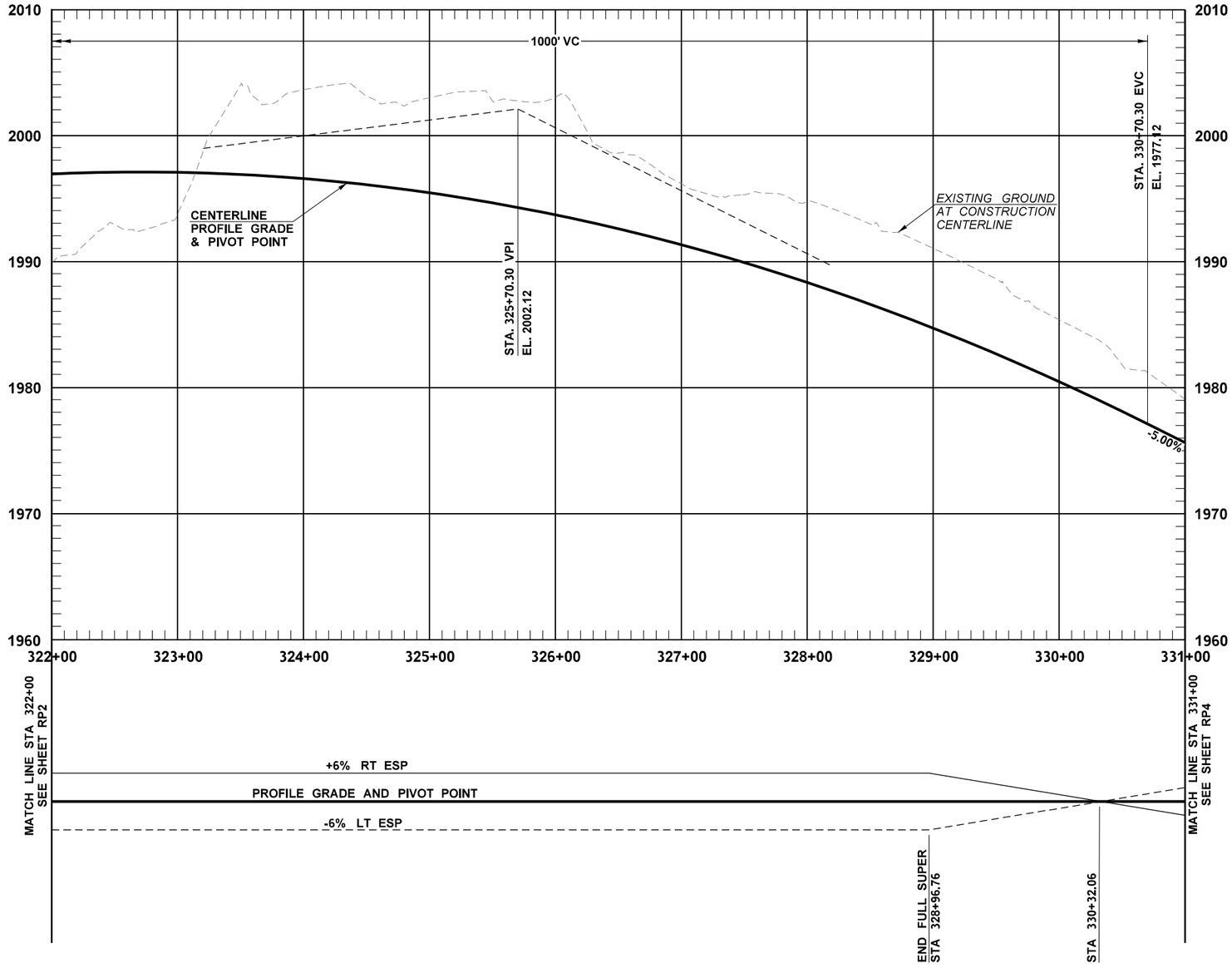
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

ROADWAY PROFILE

Plot 12

PLAN REF NO
RP2

SHEET
OF
SHEETS



LEGEND

EDGE OF SHOULDER PAVED (ESP) RT

EDGE OF SHOULDER PAVED (ESP) LT

60% REVIEW SUBMITTAL

DATUM

(NAVD) 88

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ENTERED BY	H. MCMASTER					
CHECKED BY	J. SAUGEN				CONTRACT NO.	LOCATION NO.
PROJ. ENGR.	E. BORGES					
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

PETER E. BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

DATE

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123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

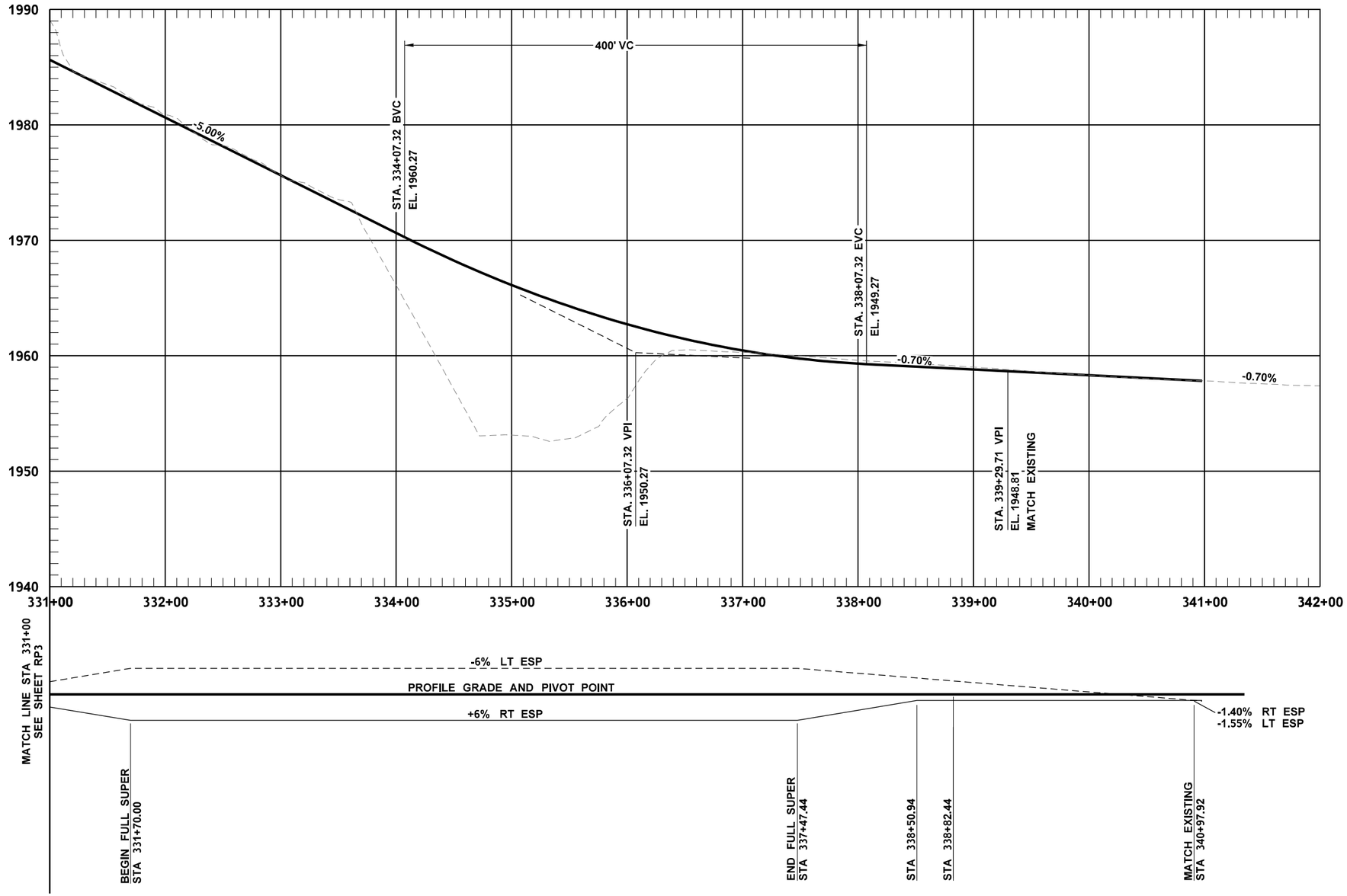
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

ROADWAY PROFILE

Plot 13

PLAN REF NO
RP3

SHEET
OF
SHEETS



LEGEND

——— EDGE OF SHOULDER PAVED (ESP) RT

- - - - EDGE OF SHOULDER PAVED (ESP) LT

60% REVIEW SUBMITTAL

DATUM

(NAVD) 88

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_PR.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
TIME	4:16:54 PM				10	WASH	
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DESIGNED BY	T. GIGLIO				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	J. SAUGEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

P.E. STAMP BOX — DATE

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

ROADWAY PROFILE

Plot 14

PLAN REF NO
RP4

SHEET
OF
SHEETS

T.26N. R.17E. W.M.

PROPOSED MFD TYPE 3
MFD 1-A
LENGTH = 85.5'

STA. 301+70.11 (24.67' LT)
BEGIN MFD TYPE 3

STA. 302+55.45 (24.8' LT)
END MFD TYPE 3

STA. 305+22.78 (75.88' LT)
IE: 1965.89
OUTFALL DISSIPATION PAD
SEE DRD4
HEADWALL WITH TYPE 2
SAFETY BARS

21 30" CPE CULVERT

STA. 306+90.3 (65.9' LT)
BEGIN MFD TYPE 3

PROPOSED MFD TYPE 3
MFD 1-B
LENGTH = 188.6'

STA. 308+18.6 (177.6' LT)
END MFD TYPE 3

NASON CREEK

STA. 308+22.98 (150.39' LT)
POND OUTLET

STA. 308+55.25 (178.46' LT)
IE: 1963.42
DISSIPATION PAD
SEE DRD4
FOR OUTFALL PIPE

STA. 301+72.09 (30.69' RT)
BEGIN MFD TYPE 3

BEGIN PROJECT
SR 207 MP 0.19
STA 300+00.00 P.O.T. =
R/W 19+96.31 P.O.T.

STA. 305+22.61 (53.36' RT)
IE: 1967.18
HEADWALLL WITH TYPE 2
SAFETY BARS

DETENTION POND 1-A
SEE DETAIL SHEET PD1

STA 308+67.73 (66.55' LT)
IE: 1965.00'
DISSIPATION PAD
SEE DRD4
FOR OUTFALL PIPE

STA. 310+21.26 (25.07' LT)
BEGIN MFD TYPE 3

PROPOSED MFD TYPE 3
MFD 1-C
LENGTH = 903.8'

STA. 308+84.65 (35.19' LT)
RIM: 1972.34
FL: 1968.84
TYPE 2 CB W/ DEBRIS CAGE

PROPOSED MFD TYPE 3
MFD 1-D
LENGTH = 1227.0'

STA. 310+99.88 (33.2' RT)
END MFD TYPE 3

MATCH LINE STA 312+50
SEE SHEET DR2

LEGEND

- NEW CULVERT PIPE, DIAM. VARIES
- EXISTING CULVERT
- NEW CATCH BASIN
- EXISTING DITCH BOTTOM
- NEW DITCH BOTTOM
- NEW DETENTION POND
- NEW CABS
- STRUCTURE NOTE CODE
- STRUCTURE NOTE CODE CONTINUED
- INLET / OUTLET PROTECTION
- WETLAND BOUNDARY
- NEW MFD
- NEW STORM SEWER LINE
- SECTION LINE
- HIGHWAY RIGHT OF WAY BOUNDARY
- PROPERTY LINE
- NEW CURB
- GRAVEL EDGE

DATUM
(NAVD) 88

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

GENERAL NOTES:

1. OUTFALL DISSIPATION PADS TO BE INSTALLED PER DETAIL ON SHEET DRD4.
2. INSTALL HEADWALLS PER WSDOT STD. PLAN B-75.20.
3. INSTALL TYPE 1 AND TYPE 2 SAFETY BARS PER WSDOT STD. PLANS B-75.50 AND B-75.60 RESPECTIVELY.
4. CULVERT PIPES SHALL BE CORRUGATED POLYETHYLENE CULVERT PIPE WITH A SMOOTH INTERIOR OR CORRUGATED POLYPROPYLENE CULVERT PIPE WITH A CORRUGATED INTERIOR, NOTED AS "CPE" AND "CPP" RESPECTIVELY.
5. PROPOSED MFDS TO BE INSTALLED PER DETAIL SHEET DRD4.

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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PLOTTED BY	hmcmaster						
DESIGNED BY	N. HAHNE				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PRELIMINARY — KERRY MERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

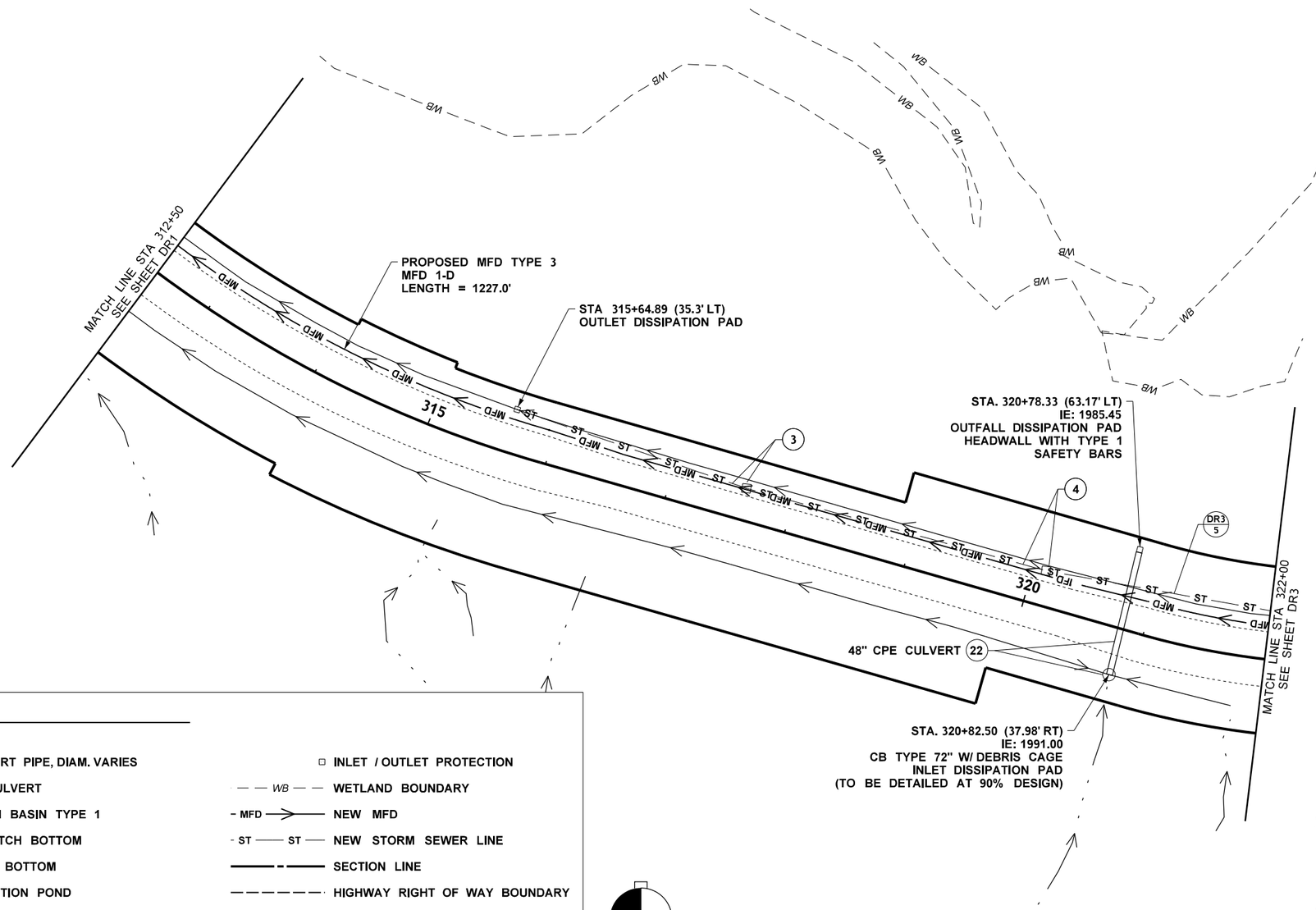
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

DRAINAGE PLAN

Plot 11
PLAN REF NO
DR1
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

- NEW CULVERT PIPE, DIAM. VARIES
- EXISTING CULVERT
- NEW CATCH BASIN TYPE 1
- EXISTING DITCH BOTTOM
- NEW DITCH BOTTOM
- NEW DETENTION POND
- NEW BIOSWALE
- (??) STRUCTURE NOTE CODE
- (??/??) STRUCTURE NOTE CODE CONTINUED
- INLET / OUTLET PROTECTION
- WB WETLAND BOUNDARY
- MFD NEW MFD
- ST ST NEW STORM SEWER LINE
- SECTION LINE
- HIGHWAY RIGHT OF WAY BOUNDARY
- PROPERTY LINE
- NEW CURB
- GRAVEL EDGE

DATUM (NAVD) 88

0 50 100 SCALE IN FEET

60% REVIEW SUBMITTAL

GENERAL NOTES:

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DATE	3/3/2026				JOB NUMBER	
PLOTTED BY	hmcmaster					
DESIGNED BY					CONTRACT NO.	LOCATION NO.
ENTERED BY	H. MCMASTER					
CHECKED BY	R. CRAVEN					
PROJ. ENGR.						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

KERRY CAMERON MCGEE, STATE OF WASHINGTON, 21019074, REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY

DATE — P.E. STAMP BOX

DATE — P.E. STAMP BOX

PERTEET
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800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

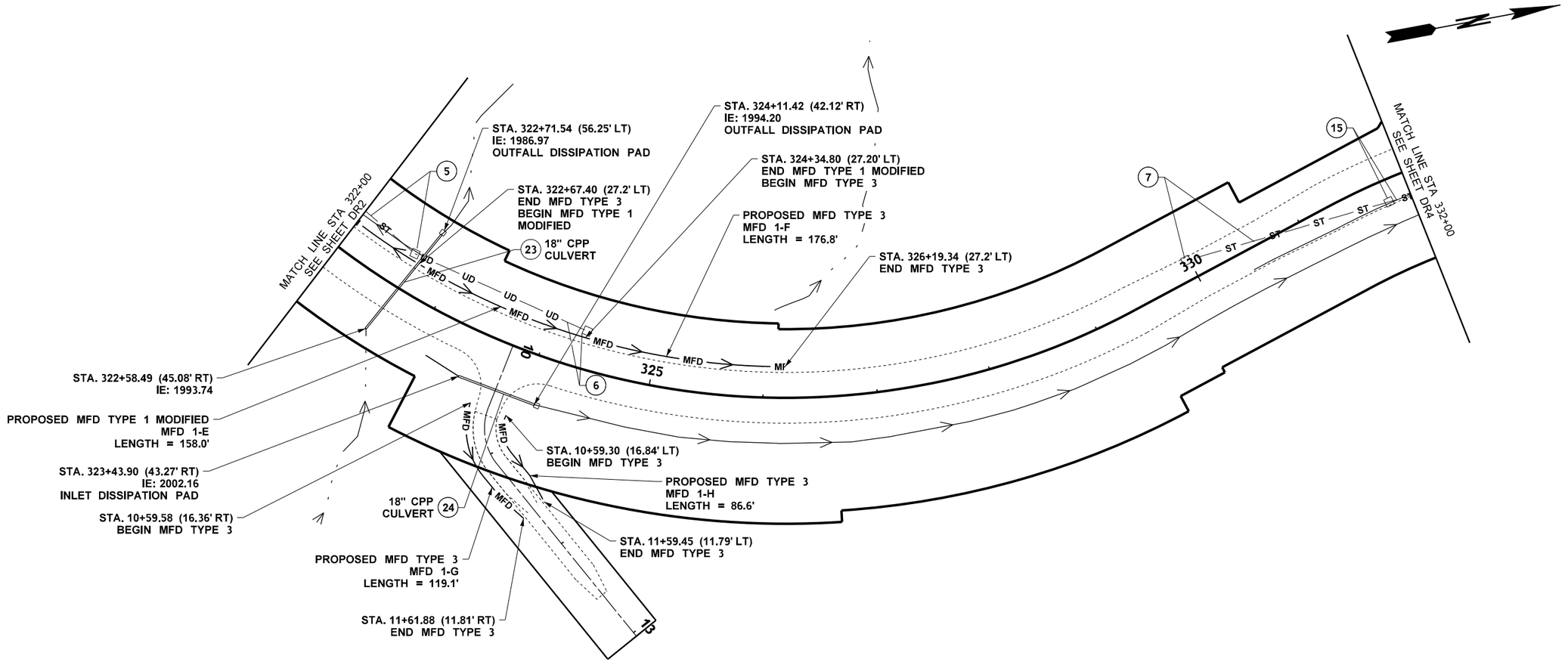
DRAINAGE PLAN

Plot 12

PLAN REF NO
DR2

SHEET
OF
SHEETS

T.26N. R.17E. W.M.



GENERAL NOTES:

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60% REVIEW SUBMITTAL

0 50 100
SCALE IN FEET

DATUM
(NAVD) 88

LEGEND

- NEW CULVERT PIPE, DIAM. VARIES
- EXISTING CULVERT
- NEW CATCH BASIN TYPE 1
- EXISTING DITCH BOTTOM
- NEW DITCH BOTTOM
- NEW DETENTION POND
- NEW BIOSWALE
- STRUCTURE NOTE CODE
- STRUCTURE NOTE CODE CONTINUED
- INLET / OUTLET PROTECTION
- WB WETLAND BOUNDARY
- MFD NEW MFD
- ST ST NEW STORM SEWER LINE
- SECTION LINE
- HIGHWAY RIGHT OF WAY BOUNDARY
- PROPERTY LINE
- NEW CURB
- GRAVEL EDGE

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO. 10	STATE WASH
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PLOTTED BY	hmcmaster					
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ENTERED BY	H. MCMASTER					
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PROJ. ENGR.	K. MCGEE					
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

KEVIN CAMERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER
DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

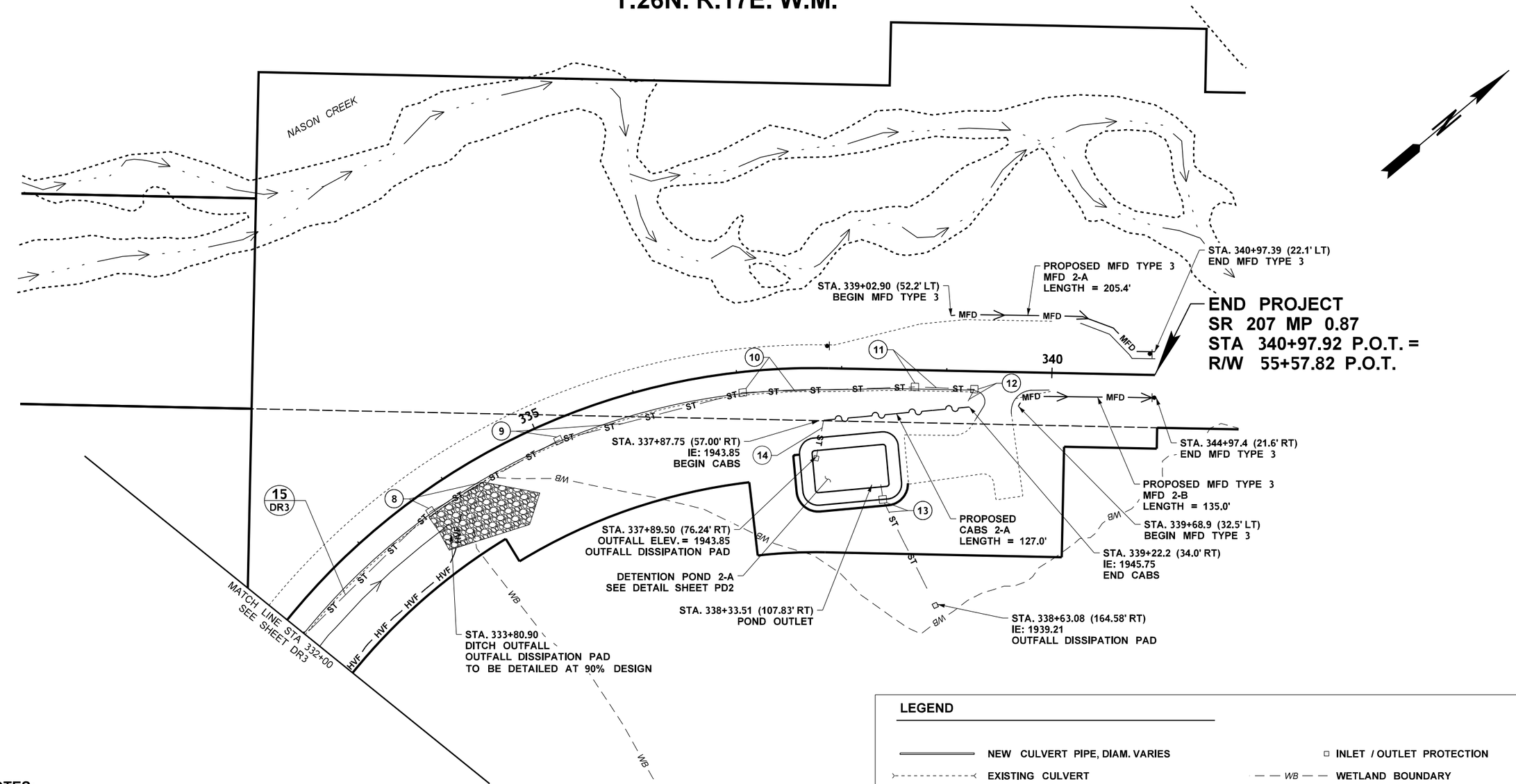
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

DRAINAGE PLAN

Plot 13
PLAN REF NO DR3
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



GENERAL NOTES:

1. OUTFALL DISSIPATION PADS TO BE INSTALLED PER DETAIL ON SHEET DRD4.
2. INSTALL HEADWALLS PER WSDOT STD. PLAN B-75.20.
3. INSTALL TYPE 1 AND TYPE 2 SAFETY BARS PER WSDOT STD. PLANS B-75.50 AND B-75.60 RESPECTIVELY.
4. CULVERT PIPES SHALL BE CORRUGATED POLYETHYLENE CULVERT PIPE WITH A SMOOTH INTERIOR OR CORRUGATED POLYPROPYLENE CULVERT PIPE WITH A CORRUGATED INTERIOR, NOTED AS "CPE" AND "CPP" RESPECTIVELY.
5. PROPOSED MFDS TO BE INSTALLED PER DETAIL SHEET DRD4.

60% REVIEW SUBMITTAL

0 50 100
SCALE IN FEET

DATUM
(NAVD) 88

LEGEND

- NEW CULVERT PIPE, DIAM. VARIES
- EXISTING CULVERT
- NEW CATCH BASIN TYPE 1
- EXISTING DITCH BOTTOM
- NEW DITCH BOTTOM
- NEW DETENTION POND
- NEW BIOSWALE
- STRUCTURE NOTE CODE
- STRUCTURE NOTE CODE CONTINUED
- INLET / OUTLET PROTECTION
- WETLAND BOUNDARY
- NEW MFD
- NEW STORM SEWER LINE
- SECTION LINE
- HIGHWAY RIGHT OF WAY BOUNDARY
- PROPERTY LINE
- NEW CURB
- GRAVEL EDGE

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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PLOTTED BY	hmcmaster						
DESIGNED BY	N. HAHNE				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KERRY CAMERON MCGEE
STATE OF WASHINGTON
21019074
REGISTERED
PROFESSIONAL ENGINEER
DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

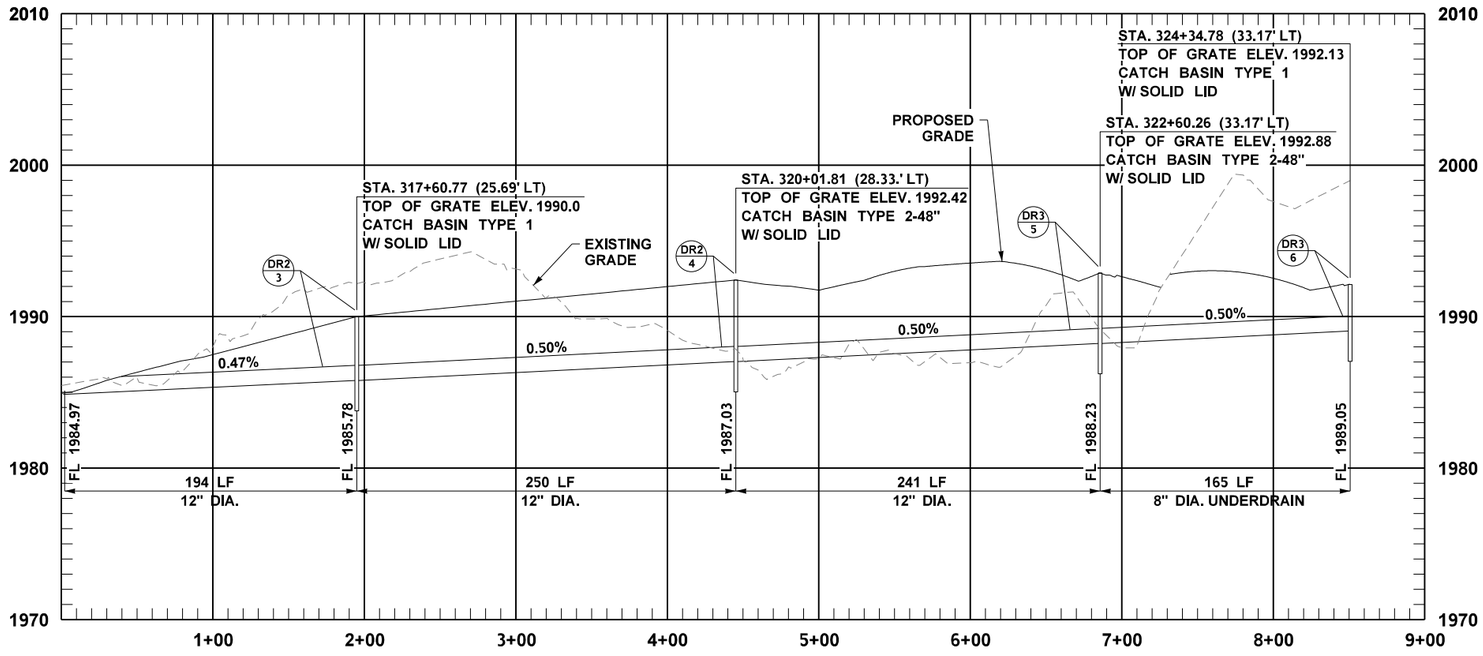
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

DRAINAGE PLANS

Plot 14

PLAN REF NO
DR4

SHEET
OF
SHEETS



NOTES:

1. ALL STORM DRAIN PIPES SHALL BE SCHEDULE A UNLESS OTHERWISE NOTED. CULVERT PIPES SHALL BE CORRUGATED POLYETHYLENE CULVERT PIPE WITH A SMOOTH INTERIOR OR CORRUGATED POLYPROPYLENE CULVERT PIPE WITH A CORRUGATED INTERIOR, NOTED AS "CPE" AND "CPP" RESPECTIVELY.

2. STRUCTURE OFFSET TO CENTER OF STRUCTURE, UNLESS NOTED OTHERWISE.

3. ALL CATCH BASIN GRATES TO BE VANED GRATE PER WSDOT STD. PLAN B-30.30 UNLESS NOTED OTHERWISE CATCH BASINS AT LOW POINTS WILL BE BI-DIRECTIONAL VANED GRATE PER WSDOT STD. PLAN B-30.40.

4. PIPE LENGTHS ARE MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE.

5. ALL SD MANHOLES SHALL BE CHANNELIZED.

6. STRUCTURES WITH SOLID LID SHALL BE BOLT DOWN TYPE WSDOT STD. PLAN B-30.70 FOR MANHOLES AND TYPE 2 CATCH BASINS, UNLESS NOTED OTHERWISE. THE LETTERING ON THE SOLID ROUND LID SHALL READ "STORM". FOR TYPE 1 AND TYPE 1L CATCH BASIN, SOLID LIDS SHALL BE BOLT DOWN TYPE PER WSDOT STD. PLAN B-30.20, UNLESS NOTED OTHERWISE.

SOUTH CONVEYANCE SYSTEM

DATUM

(NAVD) 88

FILE NAME	X:\Yakama Nation Fisherles\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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DATE	3/3/2026				JOB NUMBER		
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DESIGNED BY	N. HAHNE				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KURT A. HAMMER GOEHRUSE — STATE OF WASHINGTON — 23010072 — REGISTERED PROFESSIONAL ENGINEER

DATE

P.E. STAMP BOX

DATE

P.E. STAMP BOX

PERTEET

123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

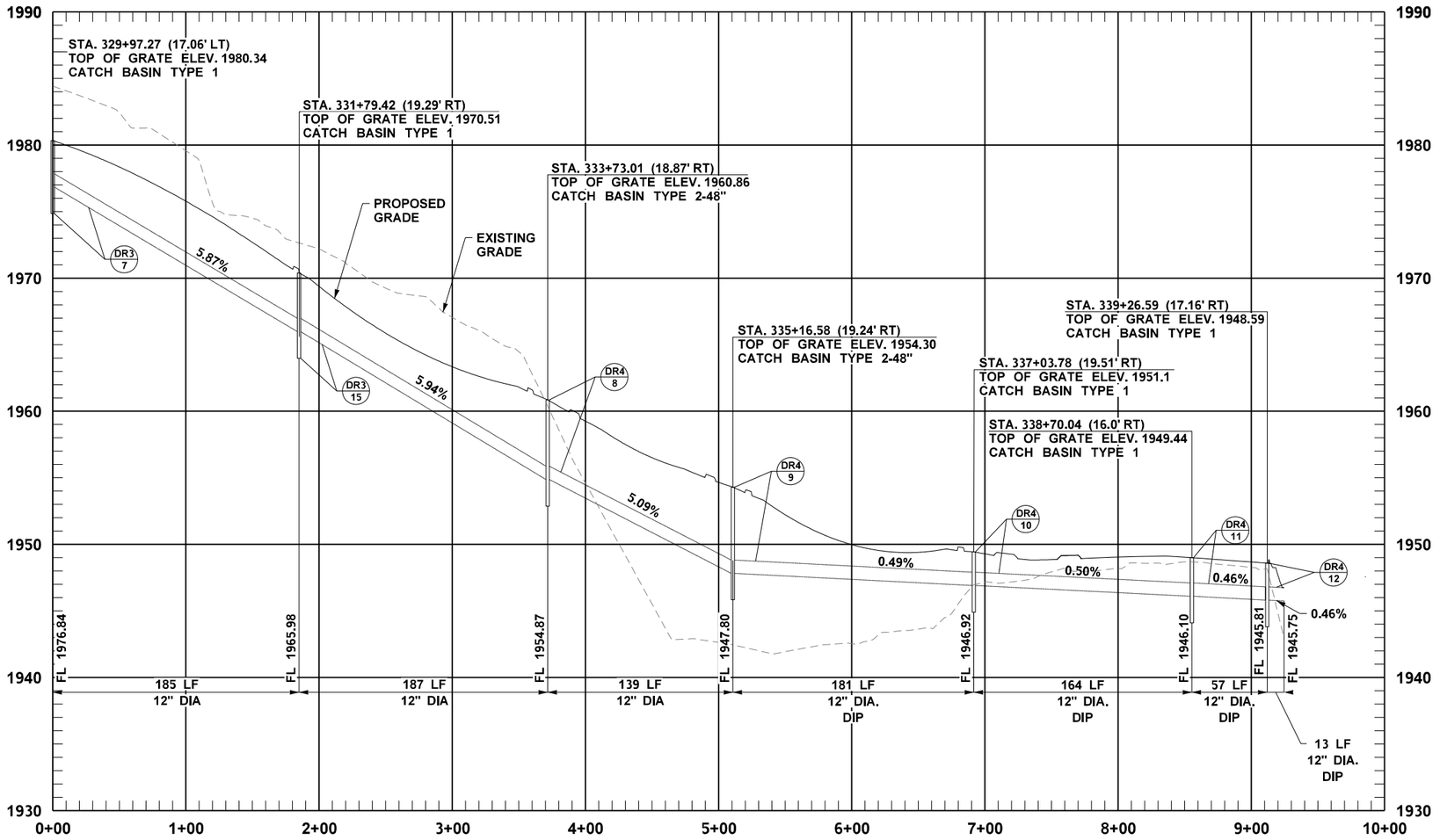
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

DRAINAGE PROFILE

Plot 15

PLAN REF NO
DP1

SHEET
OF
SHEETS



NOTES:

1. ALL STORM DRAIN PIPES SHALL BE SCHEDULE A UNLESS OTHERWISE NOTED. CULVERT PIPES SHALL BE CORRUGATED POLYETHYLENE CULVERT PIPE WITH A SMOOTH INTERIOR OR CORRUGATED POLYPROPYLENE CULVERT PIPE WITH A CORRUGATED INTERIOR, NOTED AS "CPE" AND "CPP" RESPECTIVELY.

2. STRUCTURE OFFSET TO CENTER OF STRUCTURE, UNLESS NOTED OTHERWISE.

3. ALL CATCH BASIN GRATES TO BE VANED GRATE PER WSDOT STD. PLAN B-30.30 UNLESS NOTED OTHERWISE CATCH BASINS AT LOW POINTS WILL BE BI-DIRECTIONAL VANED GRATE PER WSDOT STD. PLAN B-30.40.

4. PIPE LENGTHS ARE MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE.

5. ALL SD MANHOLES SHALL BE CHANNELIZED.

6. STRUCTURES WITH SOLID LID SHALL BE BOLT DOWN TYPE WSDOT STD. PLAN B-30.70 FOR MANHOLES AND TYPE 2 CATCH BASINS. UNLESS NOTED OTHERWISE. THE LETTERING ON THE SOLID ROUND LID SHALL READ "STORM". FOR TYPE 1 AND TYPE 1L CATCH BASIN, SOLID LIDS SHALL BE BOLT DOWN TYPE PER WSDOT STD. PLAN B-30.20, UNLESS NOTED OTHERWISE.

NORTH CONVEYANCE SYSTEM

DATUM

(NAVD) 88

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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DESIGNED BY	N. HAHNE				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KERRY CAMERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER

DATE

P.E. STAMP BOX

DATE

P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

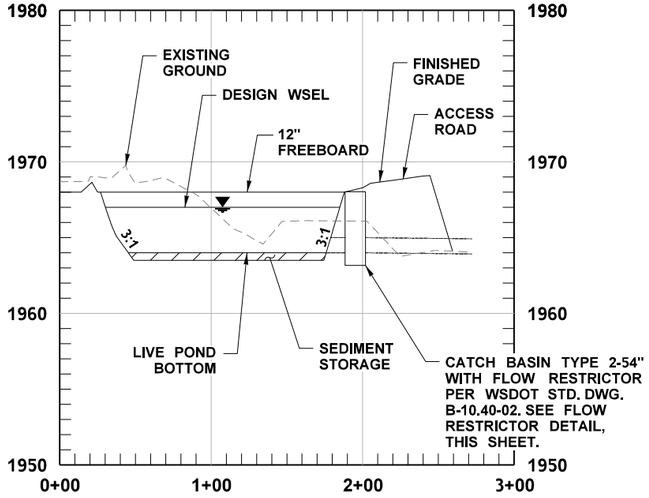
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

DRAINAGE PROFILE

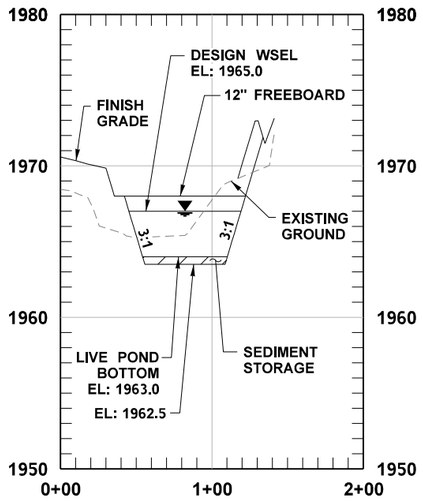
Plot 16

PLAN REF NO
DP2

SHEET
OF
SHEETS

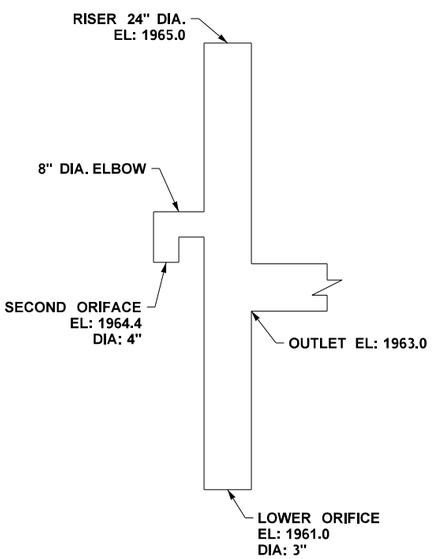


SECTION A-A



SECTION B-B

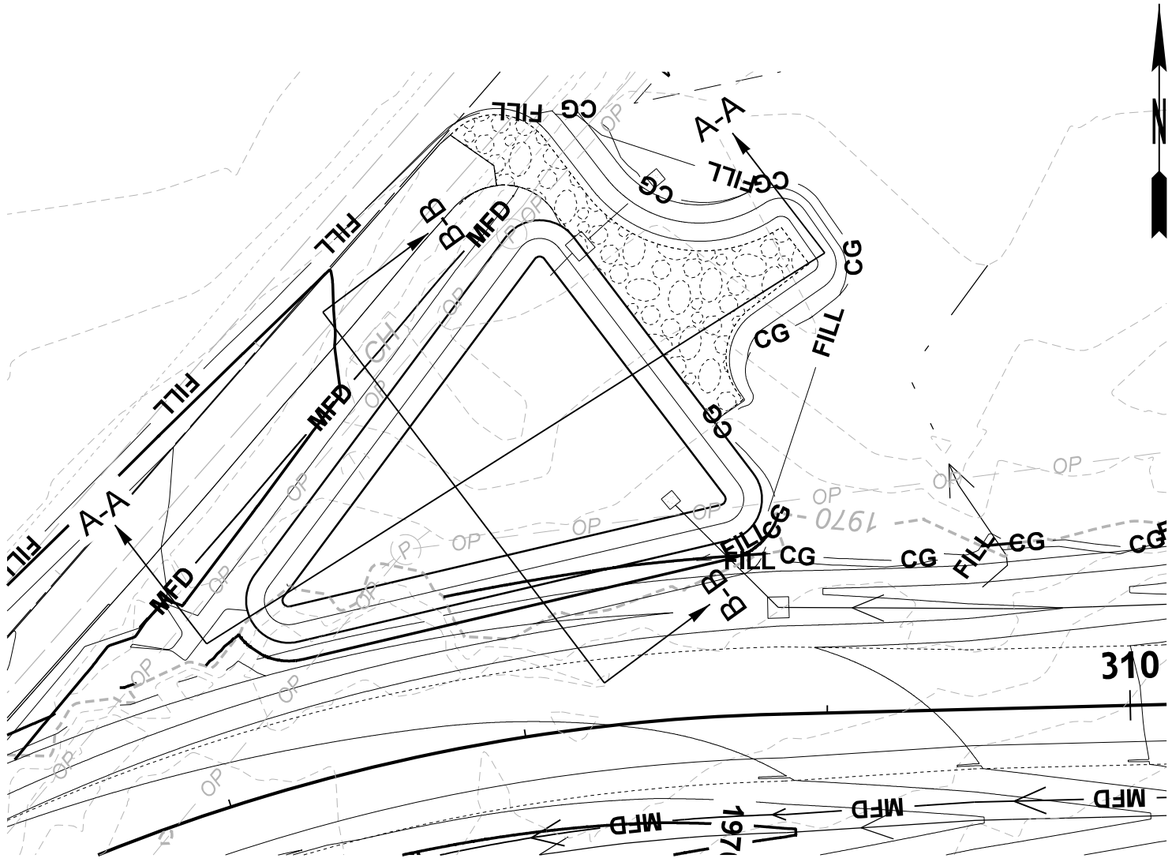
POND 1-A DETAILS	
DESIGN VOLUME AT RISER	14,442 CF
LIVE POND BOTTOM	1963.0 FT
DESIGN WSEL	1965.0 FT
PAVEMENT CATCHMENT AREA	1.501 AC



FLOW RESTRICTOR DETAIL

NOTE TO REVIEWER:
POND AND ACCESS ROAD CONTROL POINT TABLE TO BE PROVIDED AT 90% DESIGN. EMERGENCY OVERFLOW ELEMENTS TO BE ADDED AT 90% DESIGN.

60% REVIEW SUBMITTAL



STORMWATER FACILITY DETAILS
POND 1-A

DATUM
NAVD 88
0 25 50
SCALE IN FEET

NOTES:
1. SEE LEGEND ON SHEET DR1.
2. POND SLOPES ARE 3H:1V UP TO 1' ABOVE THE DESIGN WSEL UNLESS OTHERWISE NOTED.
3. POND IS GRADED TO INCLUDE A 6" SEDIMENT STORAGE DEPTH. THE DESIGN VOLUME AT RISER DOES NOT INCLUDE THE SEDIMENT STORAGE VOLUME.
4. POND INCLUDES 1' OF FREEBOARD ABOVE THE DESIGN WSEL.
5. CABS SIDE SLOPES ARE 3H:1V UP TO A DEPTH OF 1.5'.
6. CABS INCLUDE 1' OF FREEBOARD ABOVE THE DESIGN SWALE DEPTH.
7. FOR PLAN VIEW, SEE SHEETS DR1-DR4.

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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DESIGNED BY	N. HAHNE				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KERRY CAMERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER
DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

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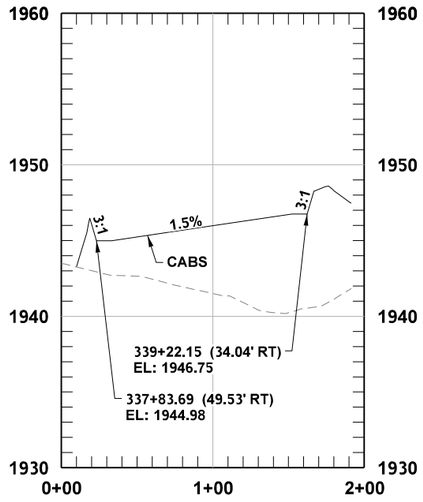
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

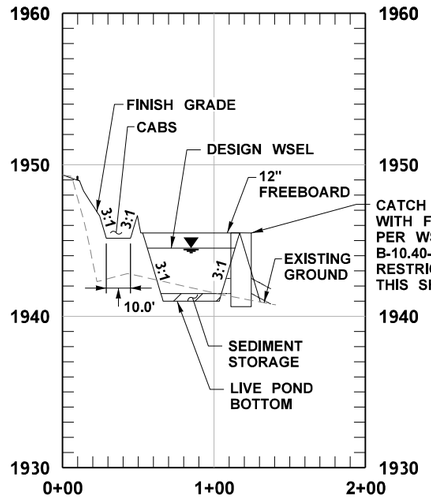
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

POND DETAIL

Plot 21
PLAN REF NO
PD1
SHEET
OF
SHEETS

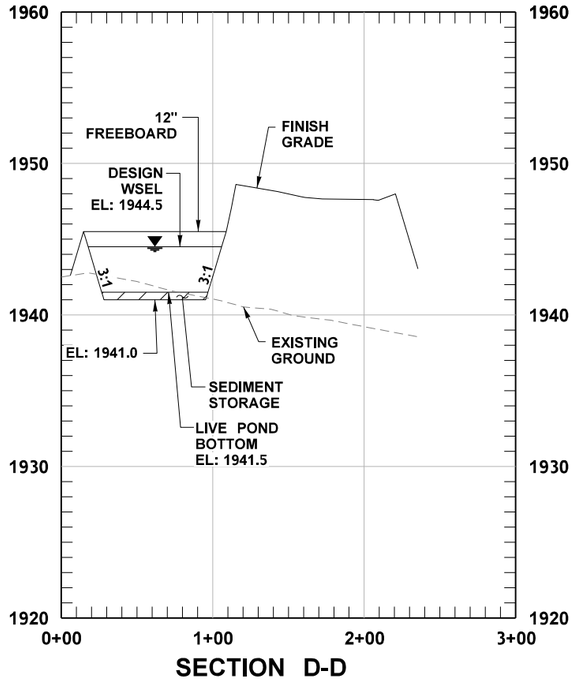


SECTION C-C

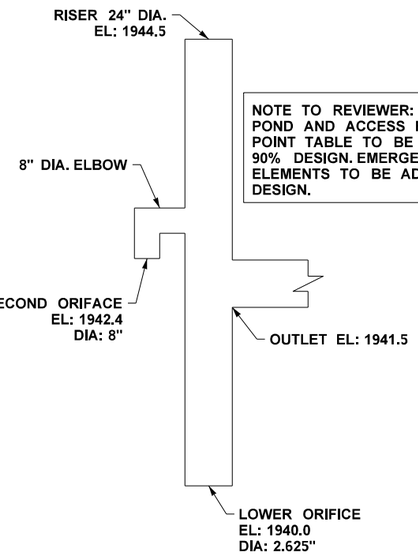


SECTION E-E

CATCH BASIN TYPE 2-54" WITH FLOW RESTRICTOR PER WSDOT STD. DWG. B-10.40-02. SEE FLOW RESTRICTOR DETAIL, THIS SHEET.

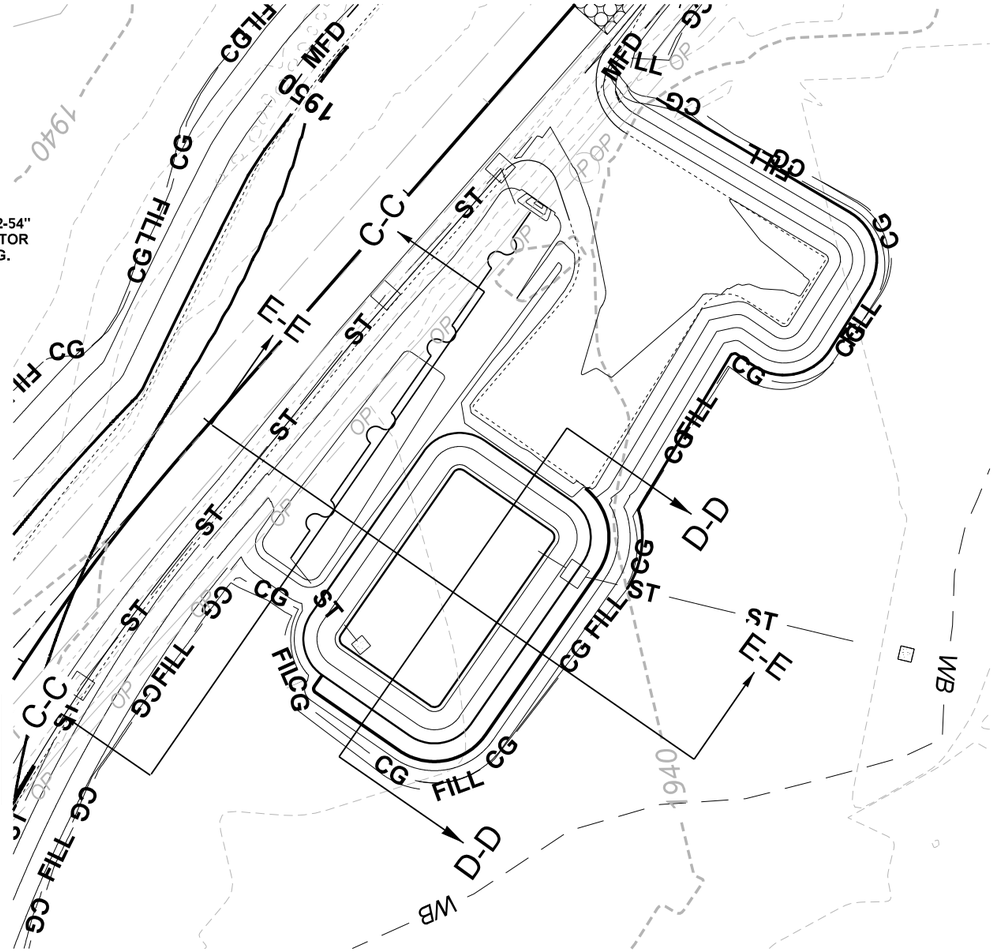


SECTION D-D



FLOW RESTRICTOR DETAIL

NOTE TO REVIEWER:
POND AND ACCESS ROAD CONTROL POINT TABLE TO BE PROVIDED AT 90% DESIGN. EMERGENCY OVERFLOW ELEMENTS TO BE ADDED AT 90% DESIGN.



CABS 2-A DETAILS	
CABS CELLS	1
TREATMENT LENGTH	127 FT
TOTAL BOTTOM WIDTH	10 FT
SWALE LONGITUDE SLOPE	1.5%
SWALE WQ DEPTH	0.33 FT
PGIS CATCHMENT AREA	1.356 AC

POND 2-A DETAILS	
DESIGN VOLUME AT RISER	22,248 CF
LIVE POND BOTTOM	1,941.5 FT
DESIGN WSEL	1,944.5 FT
PAVEMENT CATCHMENT AREA	1.356 AC

60% REVIEW SUBMITTAL

NOTES:
1. SEE LEGEND ON SHEET DR1.
2. POND SLOPES ARE 3H:1V UP TO 1' ABOVE THE DESIGN WSEL UNLESS OTHERWISE NOTED.
3. POND IS GRADED TO INCLUDE A 6" SEDIMENT STORAGE DEPTH. THE DESIGN VOLUME AT RISER DOES NOT INCLUDE THE SEDIMENT STORAGE VOLUME.
4. POND INCLUDES 1' OF FREEBOARD ABOVE THE DESIGN WSEL.
5. CABS SIDE SLOPES ARE 3H:1V UP TO A DEPTH OF 1.5'.
6. CABS INCLUDE 1' OF FREEBOARD ABOVE THE DESIGN SWALE DEPTH.
7. FOR PLAN VIEW, SEE SHEETS DR1-DR4.

STORMWATER FACILITY DETAILS
POND 2-A AND CABS 2-A

DATUM
NAVD 88

0 25 50
SCALE IN FEET

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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DESIGNED BY	N. HAHNE				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KERRY CAMERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER
DATE
P.E. STAMP BOX

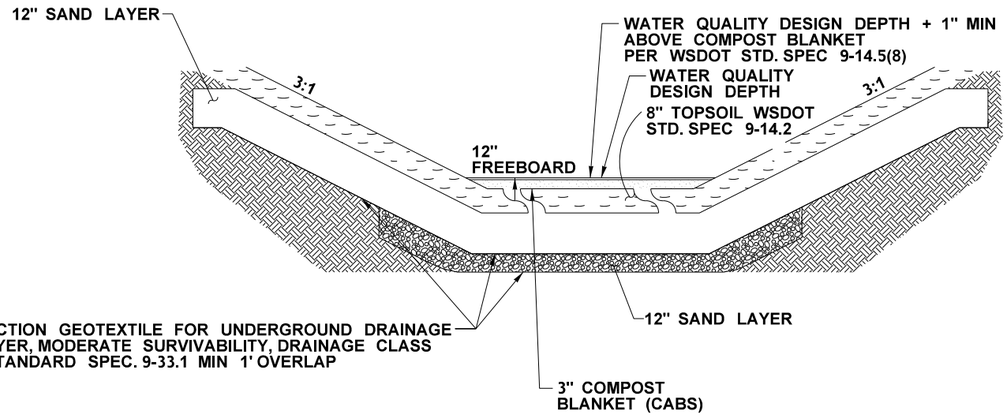
DATE
P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

POND DETAIL

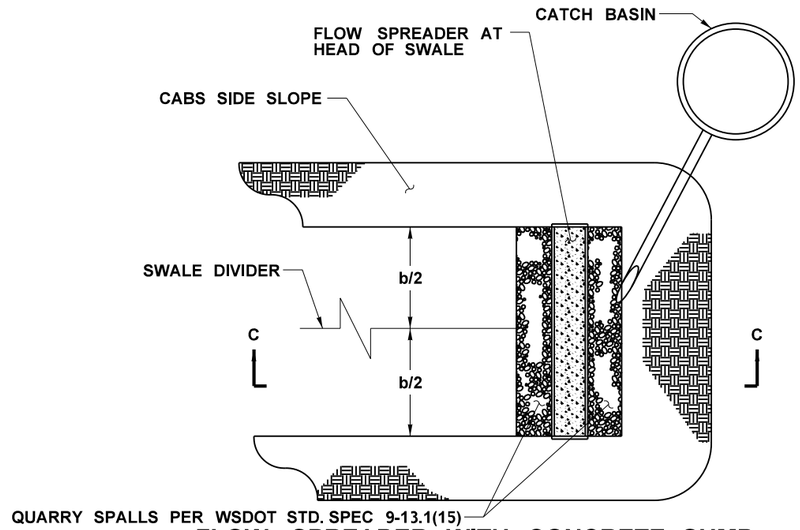
Plot 22
PLAN REF NO
PD2
SHEET
OF
SHEETS



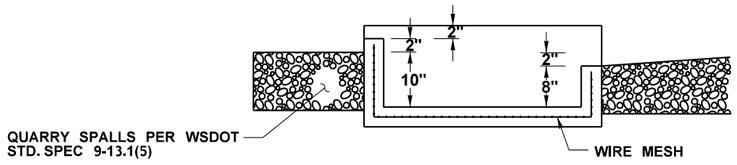
CABS SECTION VIEW
NTS

NOTES:

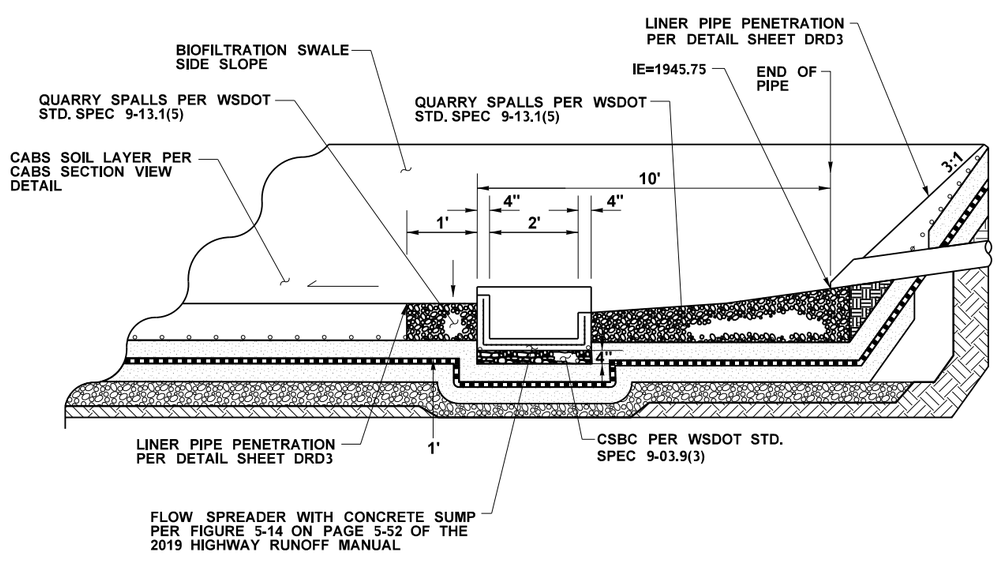
1. CABS LINER TO EXTEND 12" ABOVE FREEBOARD ELEVATION OF CABS.
2. NOT USED.
3. INSTALL LEVEL SPREADERS EVERY 50'. SEE FLOW SPREADER DETAIL, THIS SHEET.



FLOW SPREADER WITH CONCRETE SUMP
NTS



FLOW SPREADER WITH CONCRETE SUMP (DETAIL)
NTS



FLOW SPREADER WITH CONCRETE SUMP PROFILE DETAIL - SECTION C-C
NTS

60% REVIEW SUBMITTAL

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DESIGNED BY	N. HAHNE						
ENTERED BY	H. MCMASTER				CONTRACT NO.		LOCATION NO.
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KEIRAN CAMERON MCGEE, STATE OF WASHINGTON, 21019074, REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY

DATE
P.E. STAMP BOX

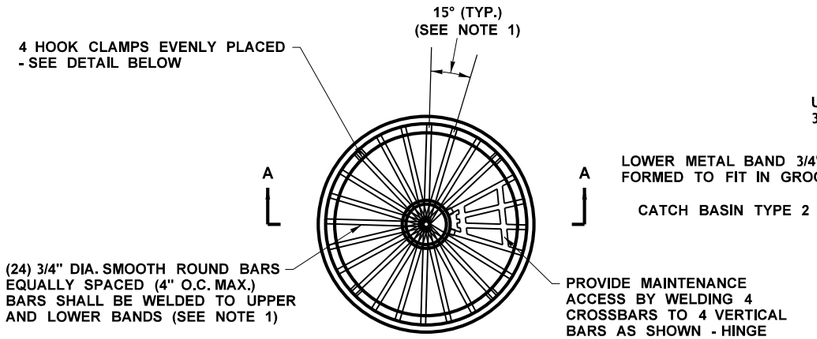
DATE
P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

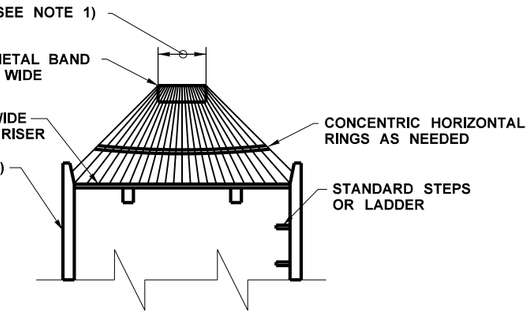
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

DRAINAGE DETAIL

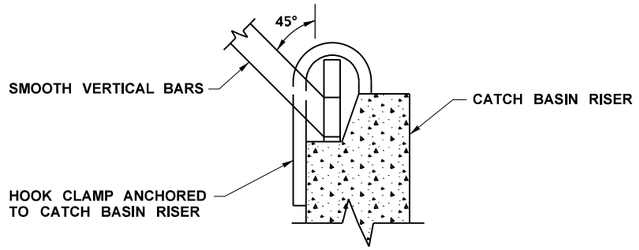
Plot 23
PLAN REF NO
DRD1
SHEET
OF
SHEETS



PLAN VIEW
NTS



SECTION A-A
NTS

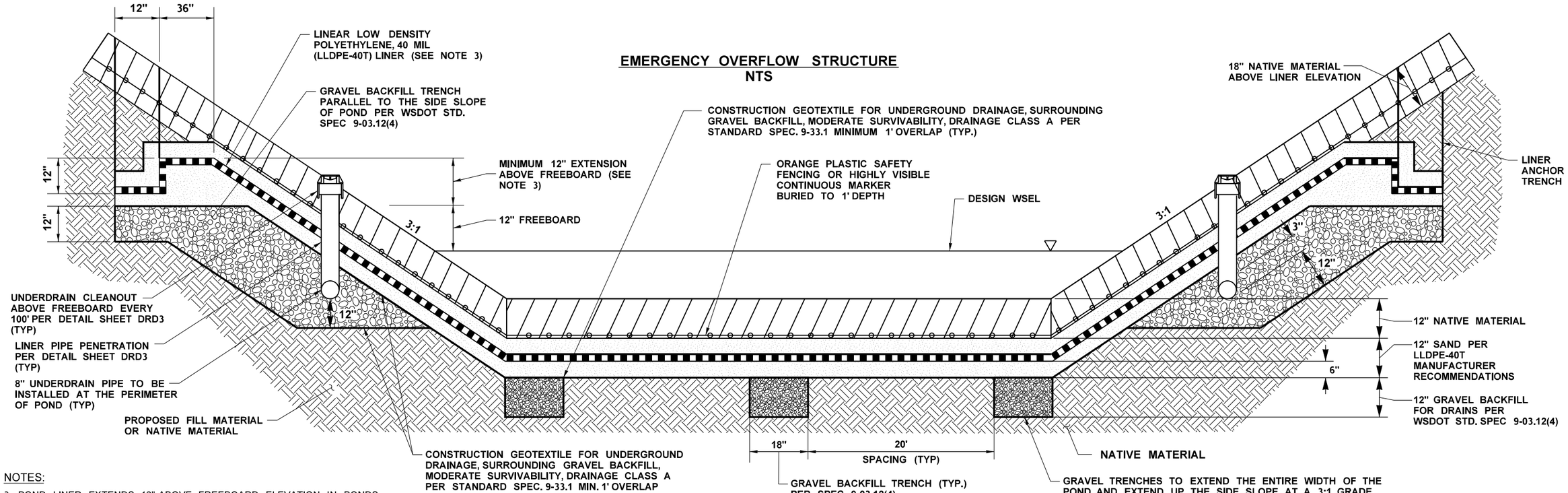


DETAIL HOOK CLAMP
NTS

NOTES:

1. DIMENSIONS ARE FOR 54" DIAM. CB, FOR DIFFERENT DIAM CB'S ADJUST TO MAINTAIN 45 DEGREE ANGLE ON "VERTICAL BARS" AND 7" O.C. MAXIMUM SPACING OF BARS AROUND LOWER METAL BAND. WHERE THE MAXIMUM OPENING BETWEEN VERTICAL BARS EXCEED 4", ADD CONCENTRIC HORIZONTAL RINGS AS NEEDED SO THAT OPENINGS DO NOT EXCEED 4" IN ONE DIRECTION.
2. METAL PARTS SHALL BE CORROSION RESISTANT; ALL STEEL BARS SHALL BE GALVANIZED AFTER FABRICATION

EMERGENCY OVERFLOW STRUCTURE
NTS



NOTES:

3. POND LINER EXTENDS 12" ABOVE FREEBOARD ELEVATION IN PONDS.
4. GRAVEL BACKFILL TRENCH FOR DRAINS IS CONTINUOUS ALONG THE PERIMETER OF PONDS, PARALLEL TO SIDE SLOPES.
5. PERFORATED UNDERDRAIN PIPE MATERIAL PER WSDOT STD. SPEC. 9-05.2(6).

TYPICAL POND AND POND LINER DETAIL
NTS

60% REVIEW SUBMITTAL

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DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	N. HAHNE						
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN				CONTRACT NO.		LOCATION NO.
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KERRY CAMERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY
DATE
P.E. STAMP BOX

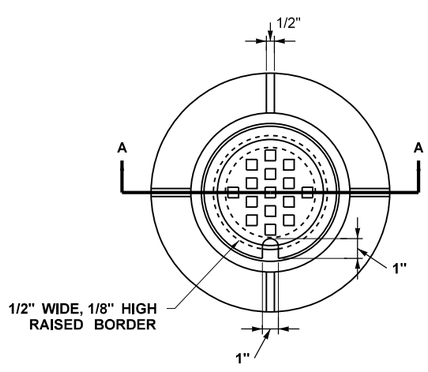
DATE
P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

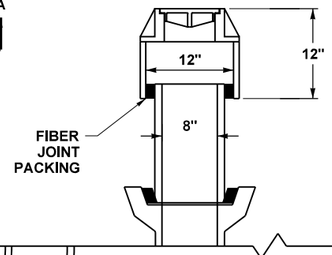
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

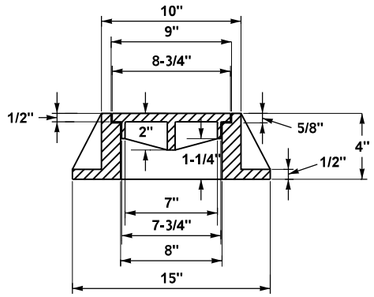
DRAINAGE DETAIL

Plot 24
PLAN REF NO
DRD2
SHEET
OF
SHEETS

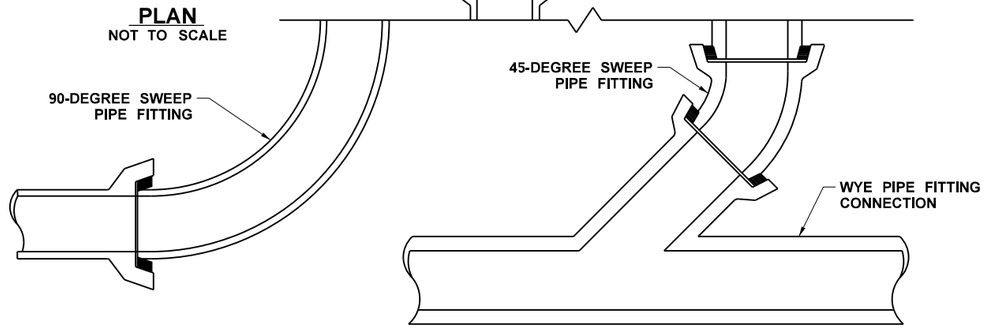


PLAN
NOT TO SCALE

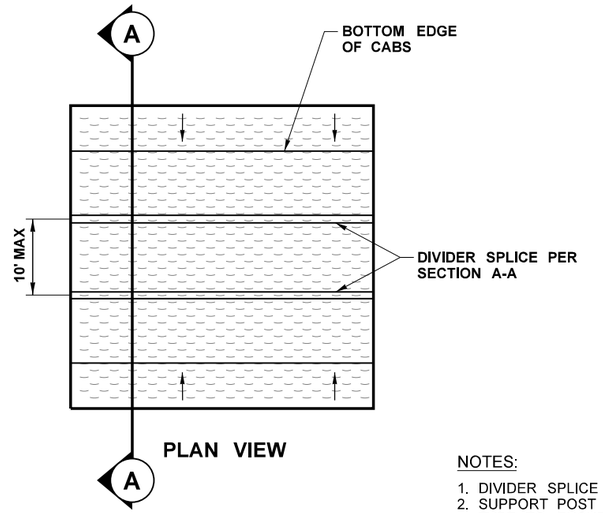




SECTION A-A
NOT TO SCALE



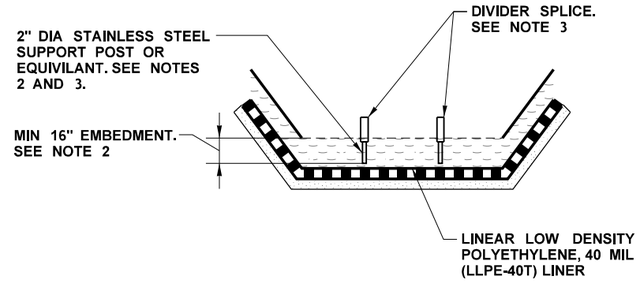
8-INCH CLEANOUT
NOT TO SCALE



PLAN VIEW

NOTES:

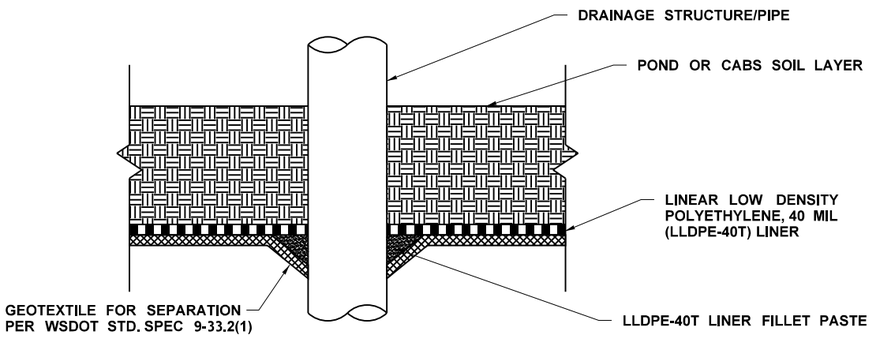
1. DIVIDER SPLICE MUST BE LEVEL WITH THE CABS.
2. SUPPORT POST SPACING AS REQUIRED BY MATERIAL TYPE TO ENSURE BOARD REMAINS LEVEL. POST SHALL NOT PUNCTURE LLDPE-40T LINER.
3. DIVIDER SPLICE SHALL BE A PLASTIC LUMBER FASTENED TO SUPPORT POST USING 1/4" SADDLES; ALLOW FOR ADJUSTMENTS FOR LEVELING THE DIVIDER SPLICE.



SECTION A-A

LEVEL SPREADER DETAIL

NOT TO SCALE



LINER STRUCTURE/PIPE PENETRATION DETAIL

NOT TO SCALE

60% REVIEW SUBMITTAL

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
TIME	4:18:01 PM				10	WASH	
DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	N. HAHNE				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KEREMERON MCGEE — STATE OF WASHINGTON — 71019074 — REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

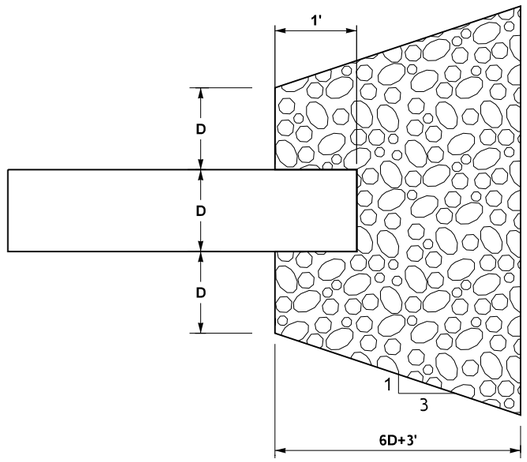
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

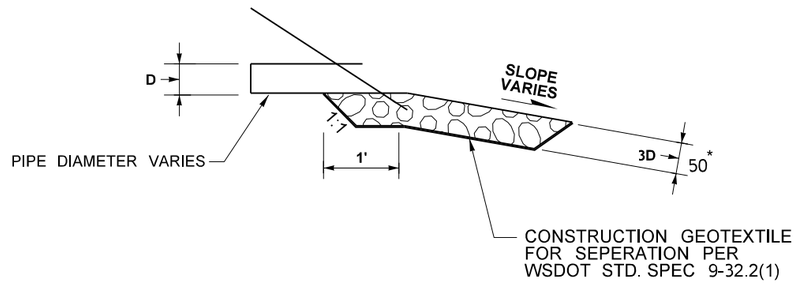
SR 207
NASON CREEK FLOODPLAIN
REALIGNMENT
PHASE 2

DRAINAGE DETAIL

Plot 25
PLAN REF NO
DRD3
SHEET
OF
SHEETS

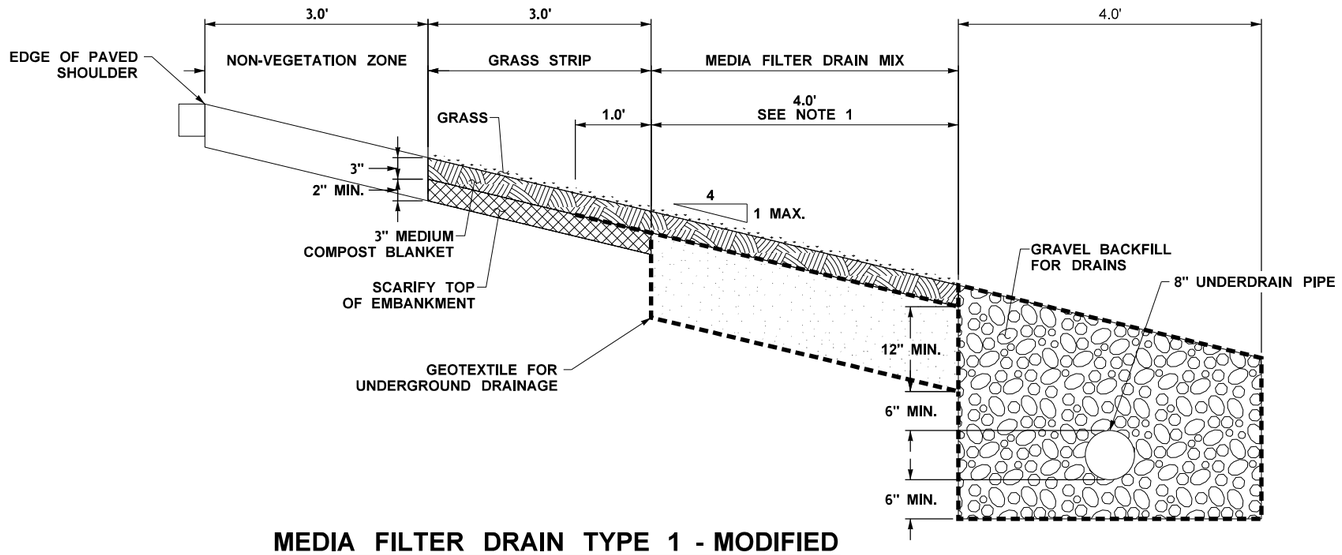
SHEET	PIPE ID	D_{50}	OUTFALL PROTECTION MATERIAL
DR1	21	4"	QUARRY SPALLS
DR2	22	22	RESP CLASS B
DR3	23	4"	QUARRY SPALLS
DR3	24	4"	QUARRY SPALLS
DR4	DITCH	TBD	TBD
DR1	1	4"	QUARRY SPALLS
DR1	2	4"	QUARRY SPALLS
DR4	13	4"	QUARRY SPALLS
DR4	14	4"	QUARRY SPALLS
DR2	3	4"	QUARRY SPALLS





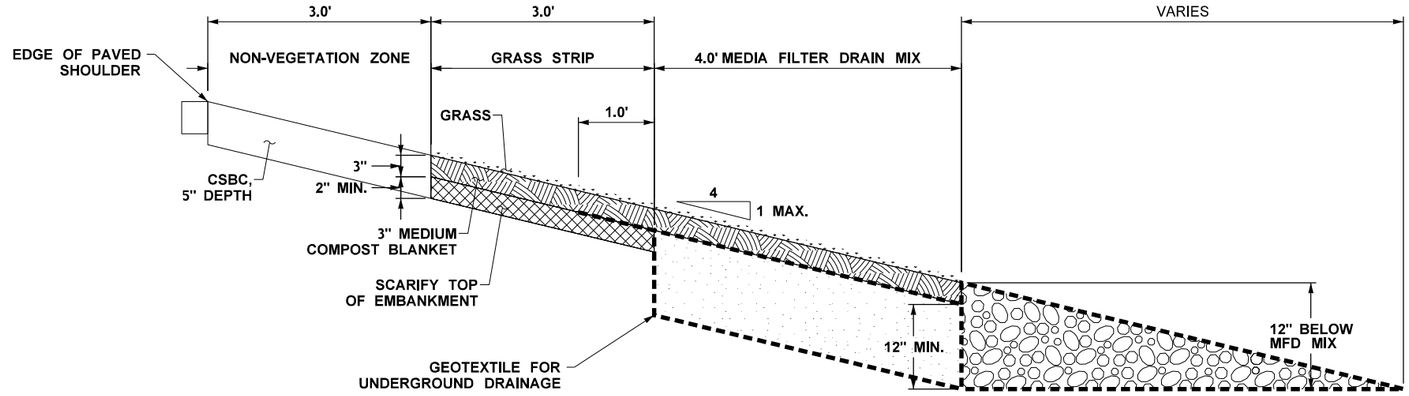
RIP RAP OUTFALL DISSIPATION PAD DETAIL

NOT TO SCALE



MEDIA FILTER DRAIN TYPE 1 - MODIFIED

NOT TO SCALE



MEDIA FILTER DRAIN TYPE 3

NOT TO SCALE

60% REVIEW SUBMITTAL

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO. / STATE	FED.AID PROJ.NO.	Plot 26
TIME	4:18:02 PM				10 / WASH		PLAN REF NO: DRD4
DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						SHEET OF SHEETS
DESIGNED BY	N. HAHNE						
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN				CONTRACT NO.	LOCATION NO.	
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PRELIMINARY — KERRY MERON MCGEE, STATE OF WASHINGTON, 21019074, REGISTERED PROFESSIONAL ENGINEER

DATE
P.E. STAMP BOX

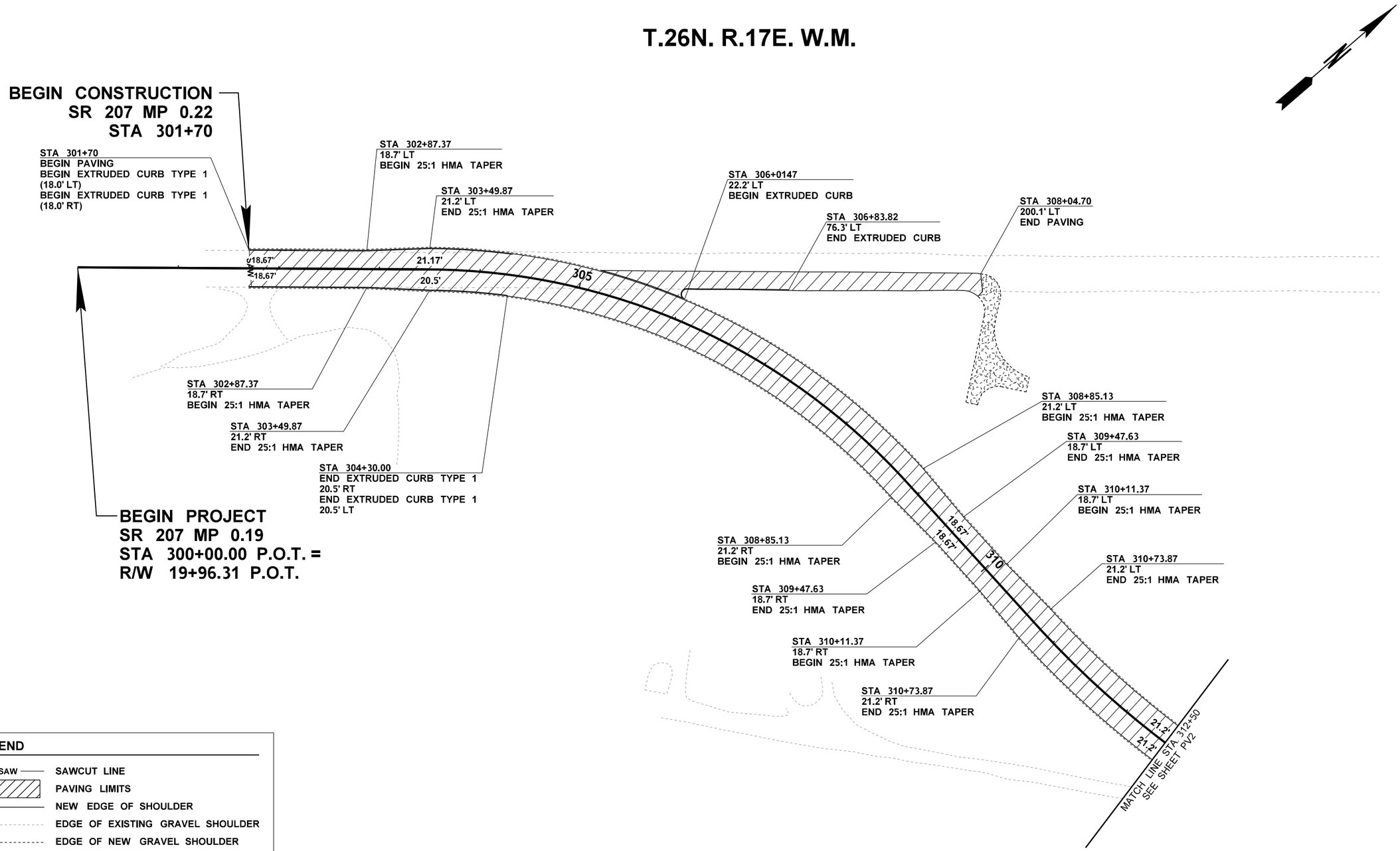
DATE
P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

DRAINAGE DETAIL

T.26N. R.17E. W.M.



LEGEND

- SAW — SAWCUT LINE
- PAVING LIMITS
- NEW EDGE OF SHOULDER
- EDGE OF EXISTING GRAVEL SHOULDER
- EDGE OF NEW GRAVEL SHOULDER
- EXISTING GUARDRAIL
- GRAVEL SURFACING

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_PV.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
TIME	4:18:16 PM				10	WASH	
DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	T. GIGLIO						
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN				CONTRACT NO.		LOCATION NO.
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PRELIMINARY — E. BORGES — STATE OF WASHINGTON — 21012272 — REGISTERED PROFESSIONAL ENGINEER

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

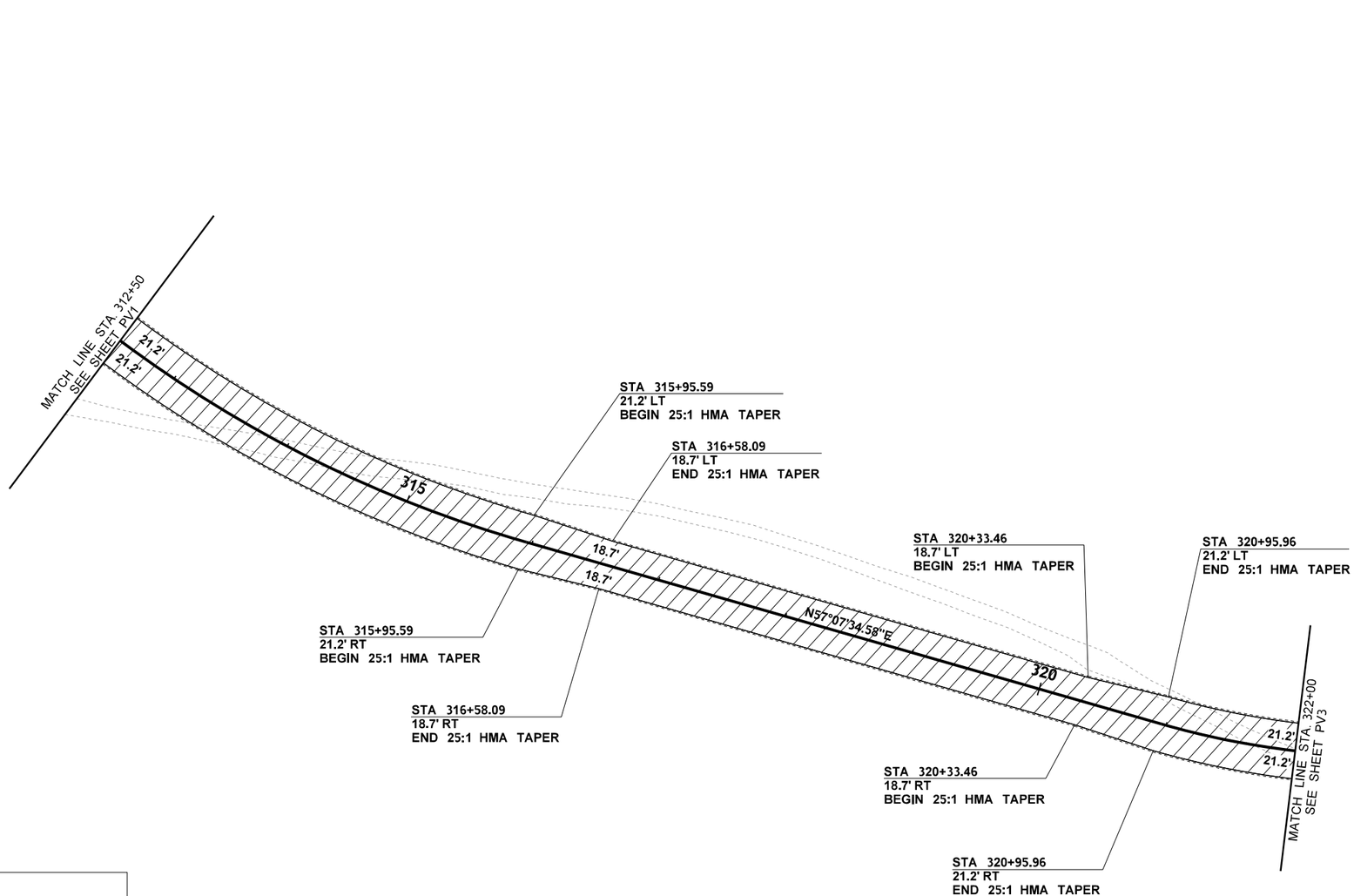
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

PAVING PLAN

Plot 1
PLAN REF NO
PV1
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

SAW	SAWCUT LINE
	PAVING LIMITS
	NEW EDGE OF SHOULDER
	EDGE OF EXISTING GRAVEL SHOULDER
	EDGE OF NEW GRAVEL SHOULDER
	EXISTING GUARDRAIL
	GRAVEL SURFACING

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_PV.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
TIME	4:18:16 PM				10	WASH	
DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	T. GIGLIO				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PROFESSIONAL ENGINEER — STATE OF WASHINGTON — 23012232 — REGISTERED — ENRIQUE BORGES

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

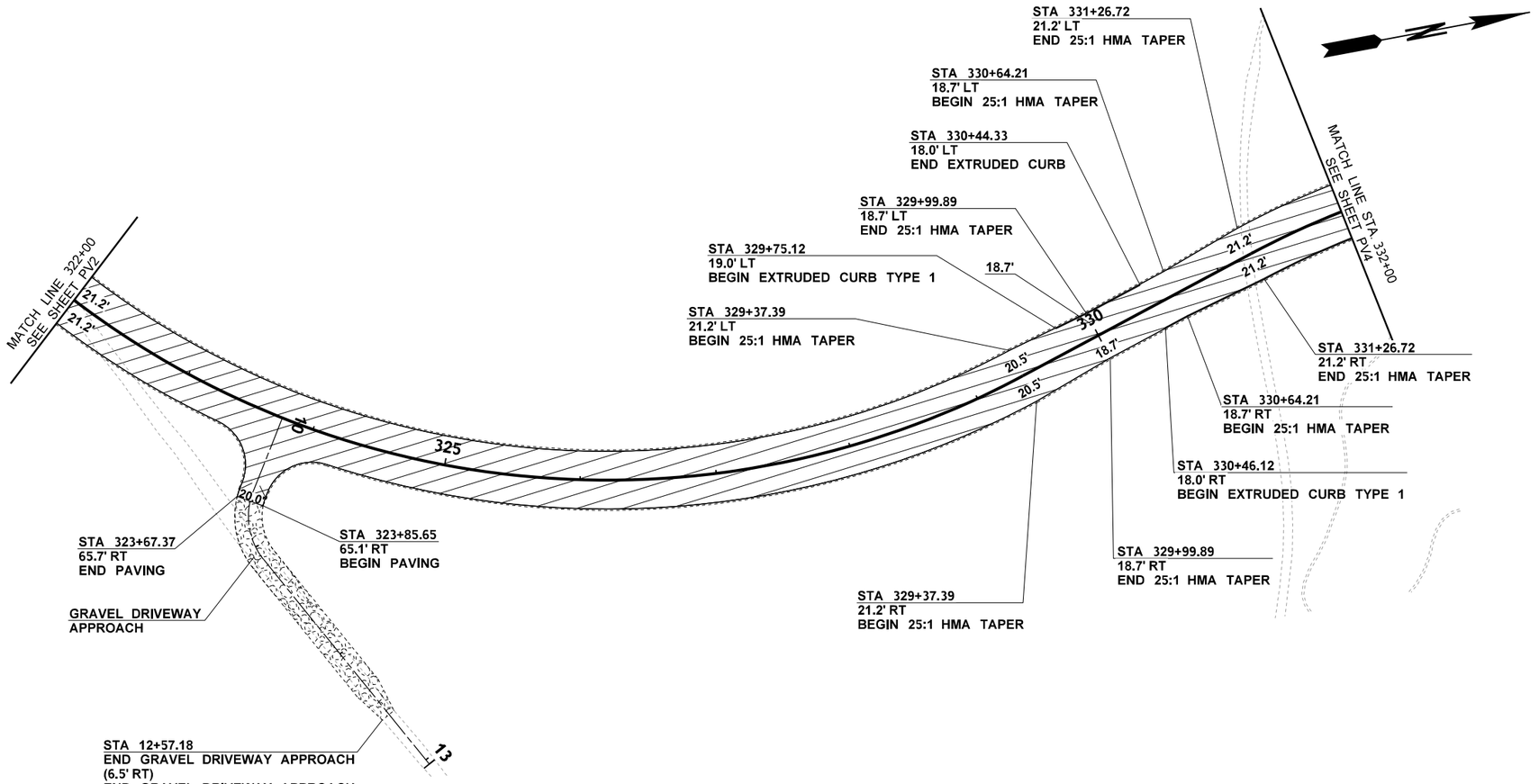
PAVING PLAN

Plot 2

PLAN REF NO
PV2

SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

- SAW — SAWCUT LINE
- PAVING LIMITS
- NEW EDGE OF SHOULDER
- EDGE OF EXISTING GRAVEL SHOULDER
- EDGE OF NEW GRAVEL SHOULDER
- EXISTING GUARDRAIL
- GRAVEL SURFACING

60% REVIEW SUBMITTAL

0 50 100
SCALE IN FEET

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_PV.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
TIME	4:18:17 PM				10	WASH	
DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	T. GIGLIO				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PROFESSIONAL ENGINEER — JACQUELINE BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

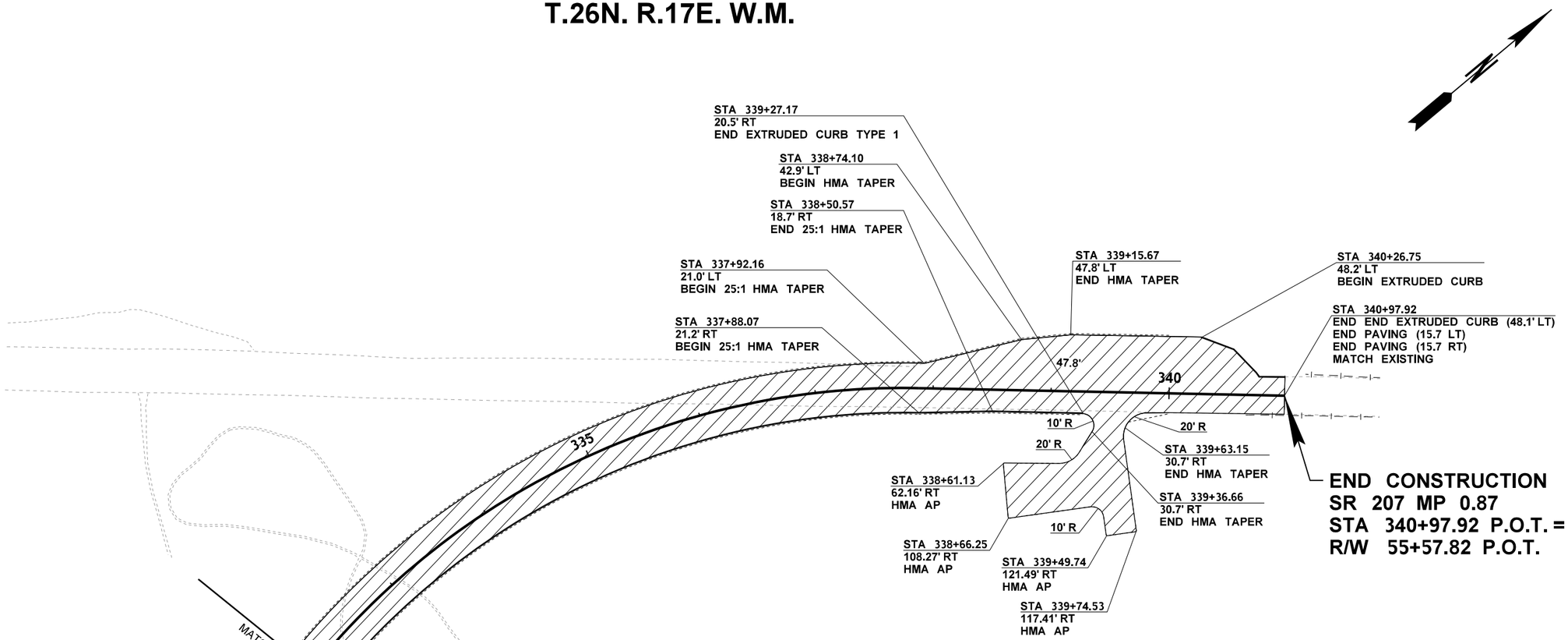
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

PAVING PLAN

Plot 3
PLAN REF NO
PV3
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

- SAW — SAWCUT LINE
- PAVING LIMITS
- NEW EDGE OF SHOULDER
- EDGE OF EXISTING GRAVEL SHOULDER
- EDGE OF NEW GRAVEL SHOULDER
- EXISTING GUARDRAIL
- GRAVEL SURFACING

60% REVIEW SUBMITTAL

0 50 100
SCALE IN FEET

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_PV.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
TIME	4:18:18 PM				10	WASH	
DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	T. GIGLIO						
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN				CONTRACT NO.		LOCATION NO.
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PETROLE BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

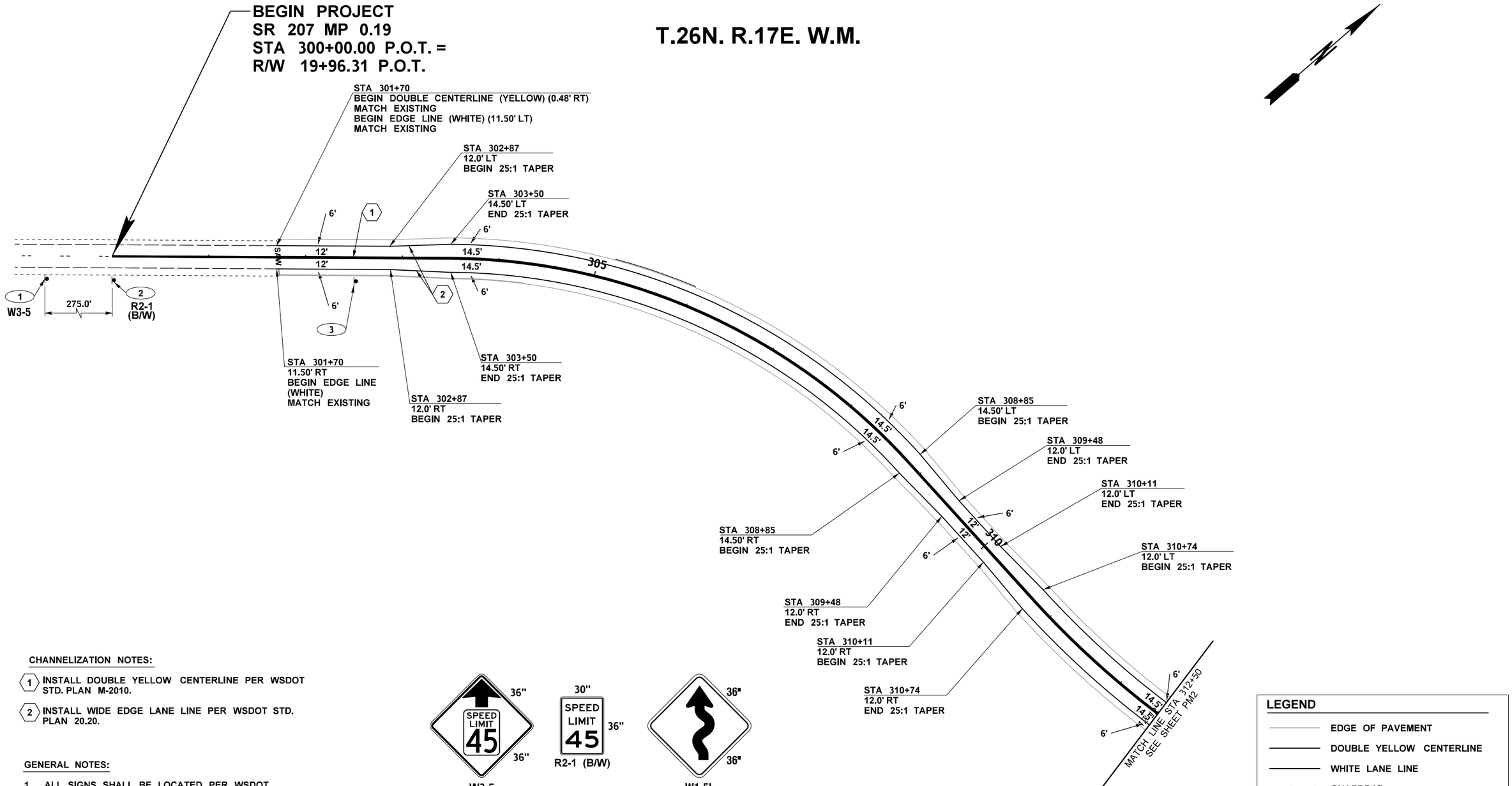
SR 207
NASON CREEK FLOODPLAIN
REALIGNMENT
PHASE 2

PAVING PLAN

Plot 4

PLAN REF NO
PV4

SHEET
OF
SHEETS



CHANNELIZATION NOTES:

1. INSTALL DOUBLE YELLOW CENTERLINE PER WSDOT STD. PLAN M-2010.
2. INSTALL WIDE EDGE LANE LINE PER WSDOT STD. PLAN 20.20.

GENERAL NOTES:

1. ALL SIGNS SHALL BE LOCATED PER WSDOT STD PLAN G-20.10.
2. ALL SIGN SUPPORTS SHALL BE INSTALLED PER WSDOT STD PLAN G-24.50.

W3-5

R2-1 (B/W)

W1-5L

NUMBER	SIGN CODE	SIZE	ALIGNMENT	STATION	OFFSET
1	W3-5	36"x36"	EX SR207	17+23.4	24.7' RT
2	R2-1	30"X36"	EX SR207	19+98.4	24.3' RT
3	W1-5L	36"X36"	EX SR207	22+48.6	24.7' RT

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

LEGEND

- EDGE OF PAVEMENT
- DOUBLE YELLOW CENTERLINE
- WHITE LANE LINE
- GUARDRAIL
- EDGE OF GRAVEL SHOULDER
- (X) SIGN INSTALLATION NOTE
- NEW SIGN
- NEW GATE

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_PM.dgn				
TIME	4:18:33 PM			REGION NO. 10	STATE WASH
DATE	3/3/2026			JOB NUMBER	FED.AID PROJ.NO.
PLOTTED BY	hmcmaster				
DESIGNED BY	T. GIGLIO				
ENTERED BY	H. MCMASTER				
CHECKED BY	R. CRAVEN			CONTRACT NO.	LOCATION NO.
PROJ. ENGR.	E. BORGES				
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY	

JACQUELINE BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER
DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

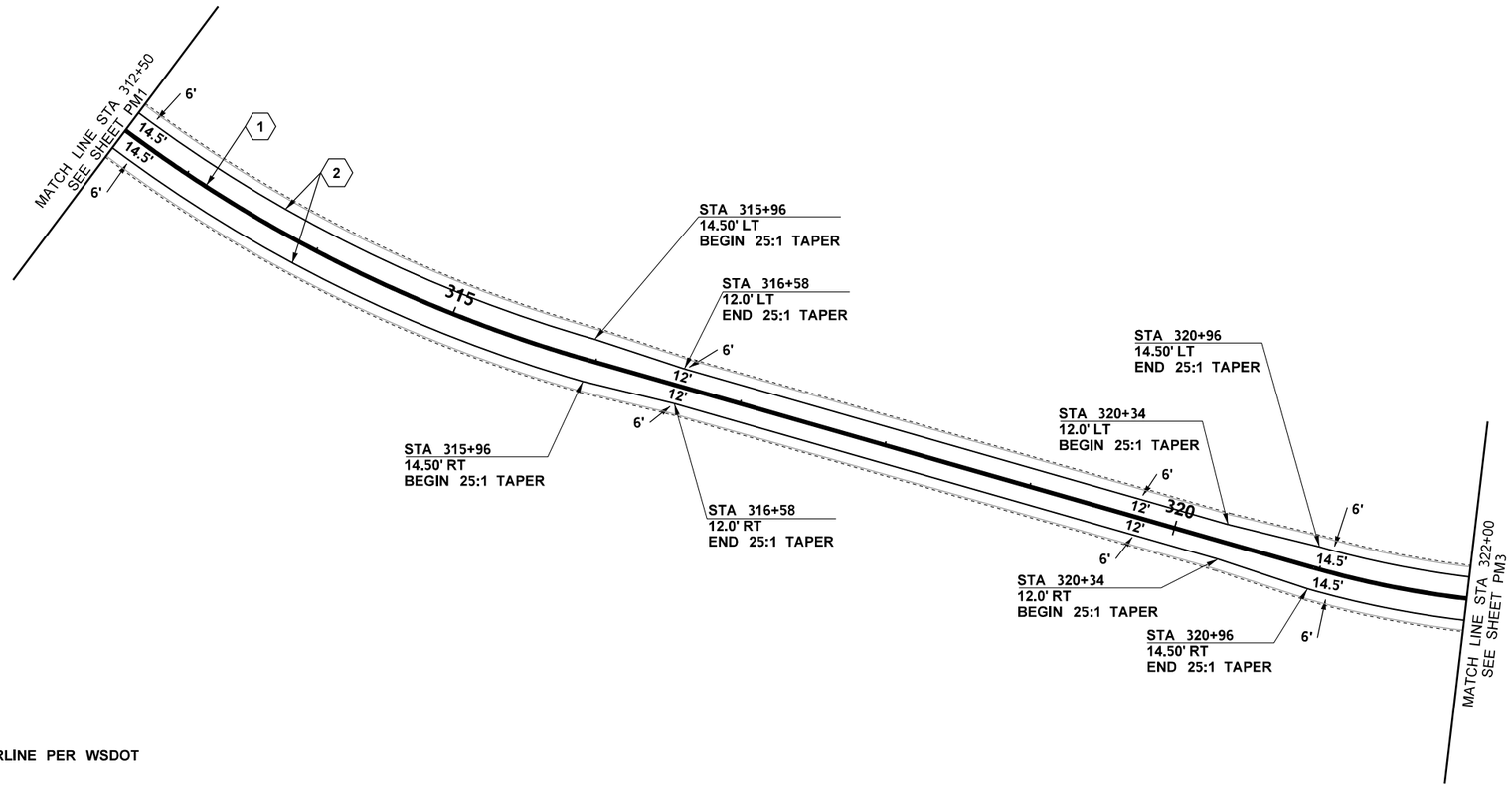
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

PAVEMENT MARKING / SIGNING PLAN

Plot 1
PLAN REF NO
PM1
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



CHANNELIZATION NOTES:

1. INSTALL DOUBLE YELLOW CENTERLINE PER WSDOT STD. PLAN M-2010.
2. INSTALL WIDE EDGE LANE LINE PER WSDOT STD. PLAN 20.20.

GENERAL NOTES:

1. ALL SIGNS SHALL BE LOCATED PER WSDOT STD PLAN G-20.10.
2. ALL SIGN SUPPORTS SHALL BE INSTALLED PER WSDOT STD PLAN G-24.50.

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

LEGEND

- EDGE OF PAVEMENT
- DOUBLE YELLOW CENTERLINE
- WHITE LANE LINE
- GUARDRAIL
- EDGE OF GRAVEL SHOULDER
- (X) SIGN INSTALLATION NOTE
- NEW SIGN
- NEW GATE

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_PM.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
TIME	4:18:33 PM				10	WASH	
DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	T. GIGLIO				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PRELIMINARY — EBERHOLE BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER
DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

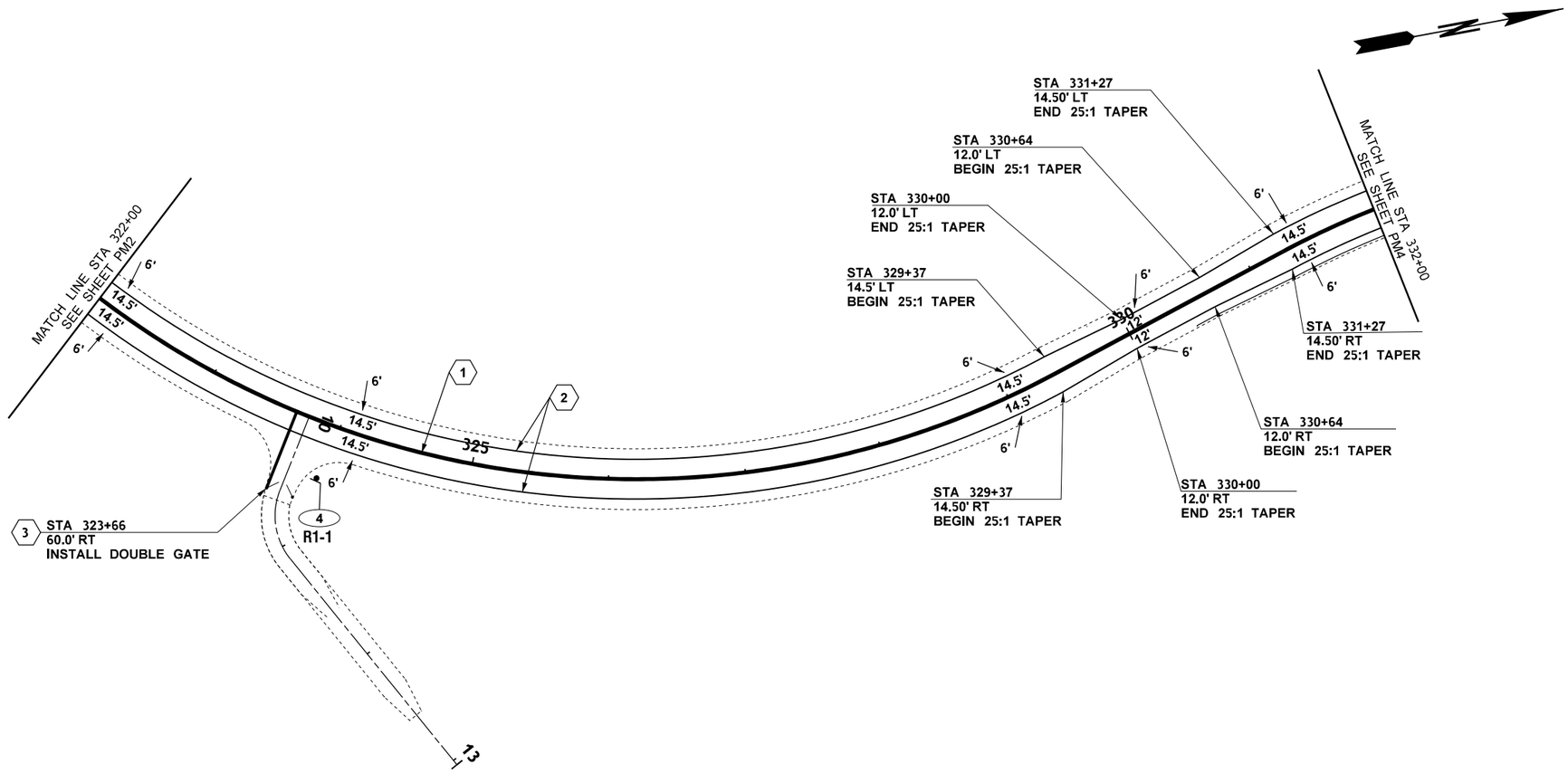
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

PAVEMENT MARKING / SIGNING PLAN

Plot 2
PLAN REF NO
PM2
SHEET
OF
SHEETS

T.26N. R.17E. W.M.

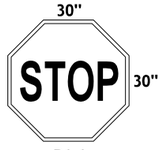


CHANNELIZATION NOTES:

1. INSTALL DOUBLE YELLOW CENTERLINE PER WSDOT STD. PLAN M-2010.
2. INSTALL WIDE EDGE LANE LINE PER WSDOT STD. PLAN 20.20.
3. INSTALL CHAIN LINK DOUBLE GATE PER WSDOT STD. PLAN L-30.10.

GENERAL NOTES:

1. ALL SIGNS SHALL BE LOCATED PER WSDOT STD PLAN G-20.10.
2. ALL SIGN SUPPORTS SHALL BE INSTALLED PER WSDOT STD PLAN G-24.50.



R1-1

NUMBER	SIGN CODE	SIZE	ALIGNMENT	STATION	OFFSET
4	R1-1	30"x30"	EX SR207	323+96.3	40.1' RT

0 50 100
SCALE IN FEET

60% REVIEW SUBMITTAL

LEGEND

- EDGE OF PAVEMENT
- DOUBLE YELLOW CENTERLINE
- WHITE LANE LINE
- GUARDRAIL
- EDGE OF GRAVEL SHOULDER
- (X) SIGN INSTALLATION NOTE
- NEW SIGN
- NEW GATE

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_PM.dgn				REGION NO. / STATE	FED.AID PROJ.NO.
TIME	4:18:34 PM				10 / WASH	
DATE	3/3/2026				JOB NUMBER	
PLOTTED BY	hmcmaster					
DESIGNED BY	T. GIGLIO					
ENTERED BY	H. MCMASTER					
CHECKED BY	R. CRAVEN				CONTRACT NO.	LOCATION NO.
PROJ. ENGR.	E. BORGES					
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

P.E. STAMP BOX — DATE

P.E. STAMP BOX — DATE

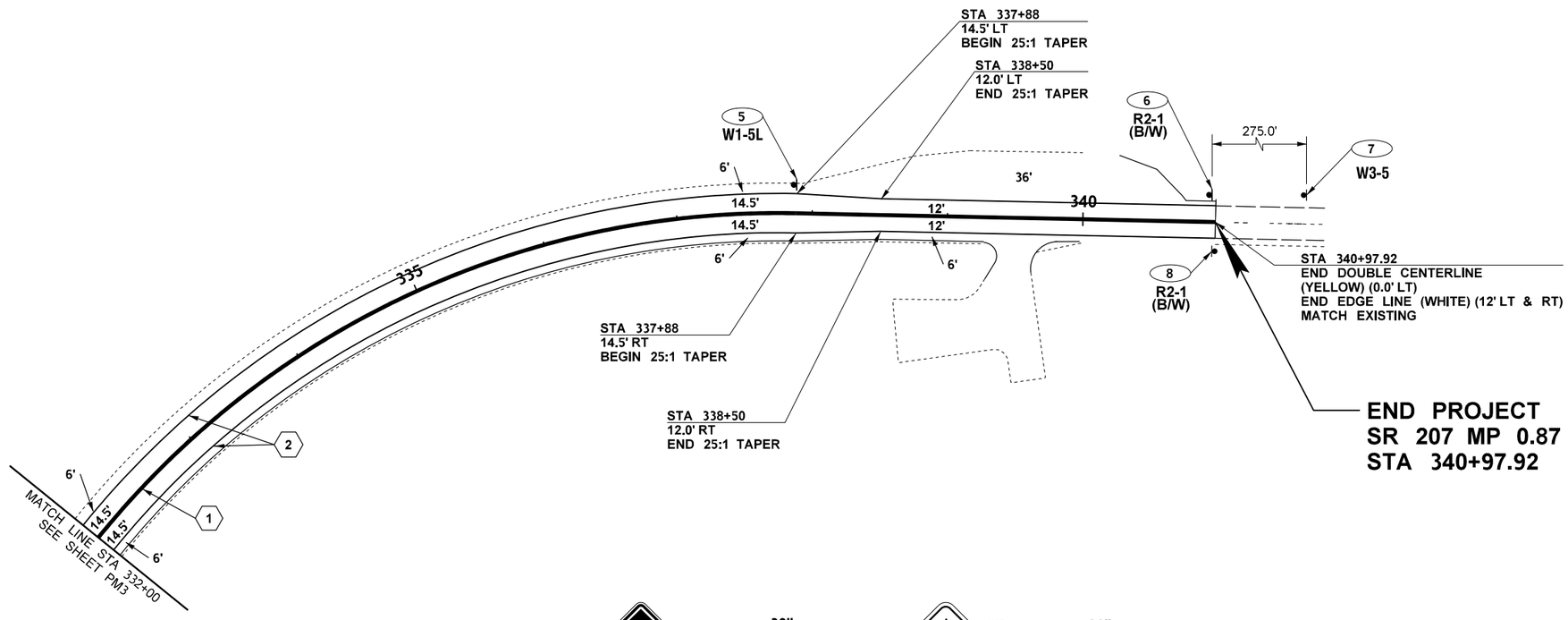
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

PAVEMENT MARKING / SIGNING PLAN

Plot 3
PLAN REF NO
PM3
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



CHANNELIZATION NOTES:

1. INSTALL DOUBLE YELLOW CENTERLINE PER WSDOT STD. PLAN M-2010.
2. INSTALL WIDE EDGE LANE LINE PER WSDOT STD. PLAN 20.20.

GENERAL NOTES:

1. ALL SIGNS SHALL BE LOCATED PER WSDOT STD PLAN G-20.10.
2. ALL SIGN SUPPORTS SHALL BE INSTALLED PER WSDOT STD PLAN G-24.50.

60% REVIEW SUBMITTAL

0 50 100
SCALE IN FEET

W3-5

R2-1 (B/W)

W1-5L

R2-1 (B/W)

NUMBER	SIGN CODE	SIZE	ALIGNMENT	STATION	OFFSET
5	W1-5L	36"X36"	EX SR207	52+52.0	21.6' LT
6	W2-1	30"X36"	EX SR207	56+50.6	20.1' LT
7	W3-5	36"X36"	EX SR207	59+25.6	20.1' LT
8	W2-1	30"X36"	EX SR207	56+50.6	20.1' RT

LEGEND

- EDGE OF PAVEMENT
- DOUBLE YELLOW CENTERLINE
- WHITE LANE LINE
- GUARDRAIL
- EDGE OF GRAVEL SHOULDER
- (X) SIGN INSTALLATION NOTE
- NEW SIGN
- NEW GATE

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_PM.dgn				
TIME	4:18:35 PM				
DATE	3/3/2026				
PLOTTED BY	hmcmaster				
DESIGNED BY	T. GIGLIO				
ENTERED BY	H. MCMASTER				
CHECKED BY	R. CRAVEN				
PROJ. ENGR.	E. BORGES				
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY	

REGION NO.	STATE
10	WASH

JOB NUMBER

CONTRACT NO.

FED.AID PROJ.NO.

LOCATION NO.

PETROLE BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

DATE

P.E. STAMP BOX

DATE

P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

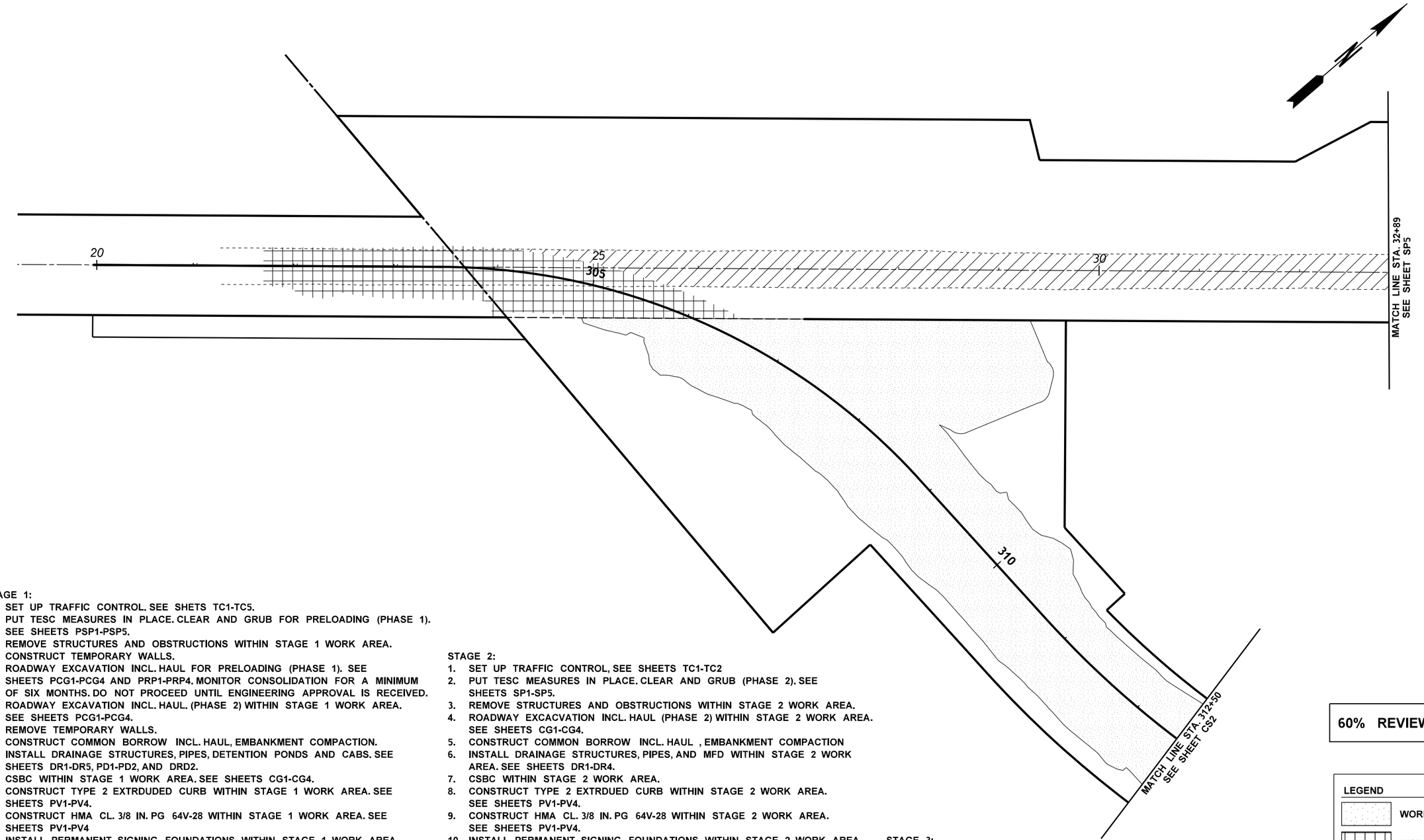
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

PAVEMENT MARKING / SIGNING PLAN

Plot 4

PLAN REF NO
PM4

SHEET
OF
SHEETS



STAGE 1:

1. SET UP TRAFFIC CONTROL. SEE SHETS TC1-TC5.
2. PUT TESC MEASURES IN PLACE. CLEAR AND GRUB FOR PRELOADING (PHASE 1). SEE SHEETS PSP1-PSP5.
3. REMOVE STRUCTURES AND OBSTRUCTIONS WITHIN STAGE 1 WORK AREA.
4. CONSTRUCT TEMPORARY WALLS.
5. ROADWAY EXCAVATION INCL. HAUL FOR PRELOADING (PHASE 1). SEE SHEETS PCG1-PCG4 AND PRP1-PRP4. MONITOR CONSOLIDATION FOR A MINIMUM OF SIX MONTHS. DO NOT PROCEED UNTIL ENGINEERING APPROVAL IS RECEIVED.
6. ROADWAY EXCAVATION INCL. HAUL. (PHASE 2) WITHIN STAGE 1 WORK AREA. SEE SHEETS PCG1-PCG4.
7. REMOVE TEMPORARY WALLS.
8. CONSTRUCT COMMON BORROW INCL. HAUL, EMBANKMENT COMPACTION.
9. INSTALL DRAINAGE STRUCTURES, PIPES, DETENTION PONDS AND CABS. SEE SHEETS DR1-DR5, PD1-PD2, AND DRD2.
10. CSBC WITHIN STAGE 1 WORK AREA. SEE SHEETS CG1-CG4.
11. CONSTRUCT TYPE 2 EXTRDUDED CURB WITHIN STAGE 1 WORK AREA. SEE SHEETS PV1-PV4.
12. CONSTRUCT HMA CL. 3/8 IN. PG 64V-28 WITHIN STAGE 1 WORK AREA. SEE SHEETS PV1-PV4
13. INSTALL PERMANENT SIGNING FOUNDATIONS WITHIN STAGE 1 WORK AREA. SEE SHEETS PM1-PM4.
14. INSTALL PERMANENT PAVEMENT MARKINGS WITHIN STAGE 1 WORK AREA. SEE SHEETS PM1-PM4.
15. REMOVE TESC AND TRAFFIC CONTROL MEASURES PUT IN PLACE EXCEPT FOR THOSE USED IN THE NEXT STAGE.

STAGE 2:

1. SET UP TRAFFIC CONTROL, SEE SHEETS TC1-TC2
2. PUT TESC MEASURES IN PLACE. CLEAR AND GRUB (PHASE 2). SEE SHEETS SP1-SP5.
3. REMOVE STRUCTURES AND OBSTRUCTIONS WITHIN STAGE 2 WORK AREA.
4. ROADWAY EXCACVATION INCL. HAUL (PHASE 2) WITHIN STAGE 2 WORK AREA. SEE SHEETS CG1-CG4.
5. CONSTRUCT COMMON BORROW INCL. HAUL , EMBANKMENT COMPACTION
6. INSTALL DRAINAGE STRUCTURES, PIPES, AND MFD WITHIN STAGE 2 WORK AREA. SEE SHEETS DR1-DR4.
7. CSBC WITHIN STAGE 2 WORK AREA.
8. CONSTRUCT TYPE 2 EXTRDUED CURB WITHIN STAGE 2 WORK AREA. SEE SHEETS PV1-PV4.
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12. REMOVE TESC AND TRAFFIC CONTROL MEASURES PUT IN PLACE EXCEPT FOR THOSE USED IN THE NEXT STAGE.

STAGE 3:

1. SET UP TRAFFIC CONTROL, SEE SHEETS TC#-TC#
2. PUT TESC MEASURES IN PLACE. DEMOLISH EXISTING ROADWAY. SEE SHEETS SP1-SP5.
3. CONSTRUCT SOUTHERN POND ACCESS ROAD. SEE SHEET PV1, DRD##
4. REMOVE TESC AND TRAFFIC CONTROL MEASURES.

60% REVIEW SUBMITTAL

LEGEND

- WORK AREA - STAGE 1
- WORK AREA - STAGE 2
- WORK AREA - STAGE 3

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_TC.dgn				REGION NO. / STATE	FED.AID PROJ.NO.
TIME	4:18:51 PM				10 / WASH	
DATE	3/3/2026				JOB NUMBER	
PLOTTED BY	hmcmaster					
DESIGNED BY	T. GIGLIO				CONTRACT NO.	LOCATION NO.
ENTERED BY	H. MCMASTER					
CHECKED BY	J. SAUGEN					
PROJ. ENGR.	E. BORGES					
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

PRELIMINARY — EMILIE BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

P.E. STAMP BOX — DATE

P.E. STAMP BOX — DATE

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

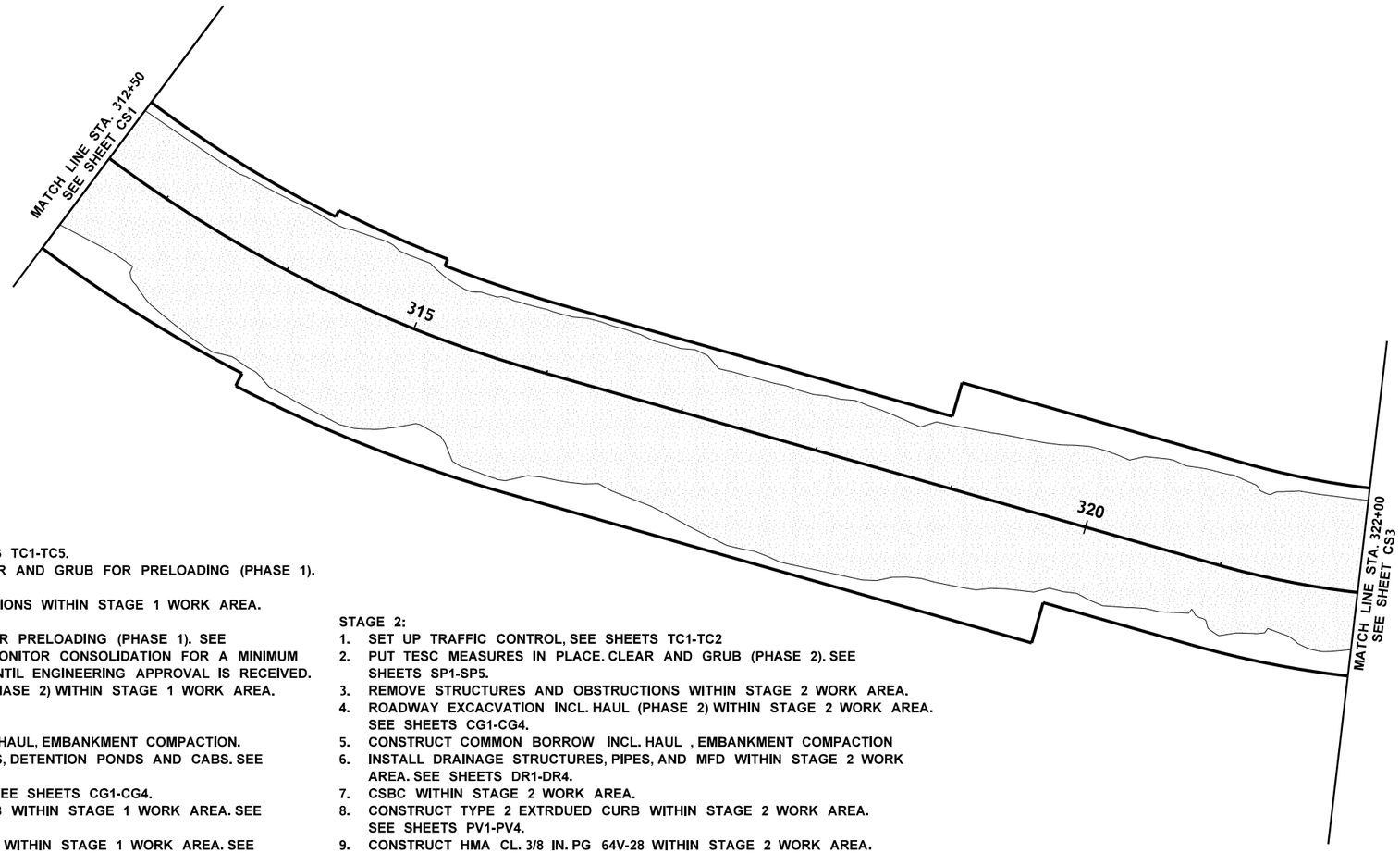
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT

CONSTRUCTION SEQUENCING

Plot 1

PLAN REF NO
CS1

SHEET
OF
SHEETS



STAGE 1:
1. SET UP TRAFFIC CONTROL. SEE SHETS TC1-TC5.
2. PUT TESC MEASURES IN PLACE. CLEAR AND GRUB FOR PRELOADING (PHASE 1). SEE SHEETS PSP1-PSP5.
3. REMOVE STRUCTURES AND OBSTRUCTIONS WITHIN STAGE 1 WORK AREA.
4. CONSTRUCT TEMPORARY WALLS.
5. ROADWAY EXCAVATION INCL. HAUL FOR PRELOADING (PHASE 1). SEE SHEETS PCG1-PCG4 AND PRP1-PRP4. MONITOR CONSOLIDATION FOR A MINIMUM OF SIX MONTHS. DO NOT PROCEED UNTIL ENGINEERING APPROVAL IS RECEIVED.
6. ROADWAY EXCAVATION INCL. HAUL. (PHASE 2) WITHIN STAGE 1 WORK AREA. SEE SHEETS PCG1-PCG4.
7. REMOVE TEMPORARY WALLS.
8. CONSTRUCT COMMON BORROW INCL. HAUL, EMBANKMENT COMPACTION.
9. INSTALL DRAINAGE STRUCTURES, PIPES, DETENTION PONDS AND CABS. SEE SHEETS DR1-DR5, PD1-PD2, AND DRD2.
10. CSBC WITHIN STAGE 1 WORK AREA. SEE SHEETS CG1-CG4.
11. CONSTRUCT TYPE 2 EXTRDUDED CURB WITHIN STAGE 1 WORK AREA. SEE SHEETS PV1-PV4.
12. CONSTRUCT HMA CL. 3/8 IN. PG 64V-28 WITHIN STAGE 1 WORK AREA. SEE SHEETS PV1-PV4
13. INSTALL PERMANENT SIGNING FOUNDATIONS WITHIN STAGE 1 WORK AREA. SEE SHEETS PM1-PM4.
14. INSTALL PERMANENT PAVEMENT MARKINGS WITHIN STAGE 1 WORK AREA. SEE SHEETS PM1-PM4.
15. REMOVE TESC AND TRAFFIC CONTROL MEASURES PUT IN PLACE EXCEPT FOR THOSE USED IN THE NEXT STAGE.

STAGE 2:
1. SET UP TRAFFIC CONTROL, SEE SHEETS TC1-TC2
2. PUT TESC MEASURES IN PLACE. CLEAR AND GRUB (PHASE 2). SEE SHEETS SP1-SP5.
3. REMOVE STRUCTURES AND OBSTRUCTIONS WITHIN STAGE 2 WORK AREA.
4. ROADWAY EXCACVATION INCL. HAUL (PHASE 2) WITHIN STAGE 2 WORK AREA. SEE SHEETS CG1-CG4.
5. CONSTRUCT COMMON BORROW INCL. HAUL , EMBANKMENT COMPACTION
6. INSTALL DRAINAGE STRUCTURES, PIPES, AND MFD WITHIN STAGE 2 WORK AREA. SEE SHEETS DR1-DR4.
7. CSBC WITHIN STAGE 2 WORK AREA.
8. CONSTRUCT TYPE 2 EXTRDUED CURB WITHIN STAGE 2 WORK AREA. SEE SHEETS PV1-PV4.
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12. REMOVE TESC AND TRAFFIC CONTROL MEASURES PUT IN PLACE EXCEPT FOR THOSE USED IN THE NEXT STAGE.

STAGE 3:
1. SET UP TRAFFIC CONTROL, SEE SHEETS TC#-TC#
2. PUT TESC MEASURES IN PLACE. DEMOLISH EXISTING ROADWAY. SEE SHEETS SP1-SP5.
3. CONSTRUCT SOUTHERN POND ACCESS ROAD. SEE SHEET PV1, DRD##
4. REMOVE TESC AND TRAFFIC CONTROL MEASURES.

60% REVIEW SUBMITTAL

LEGEND
- WORK AREA - STAGE 1
- WORK AREA - STAGE 2
- WORK AREA - STAGE 3

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TIME	4:18:52 PM				10	WASH	
DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	T. GIGLIO				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	J. SAUGEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PRELIMINARY — PATRICIA BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

DATE
P.E. STAMP BOX

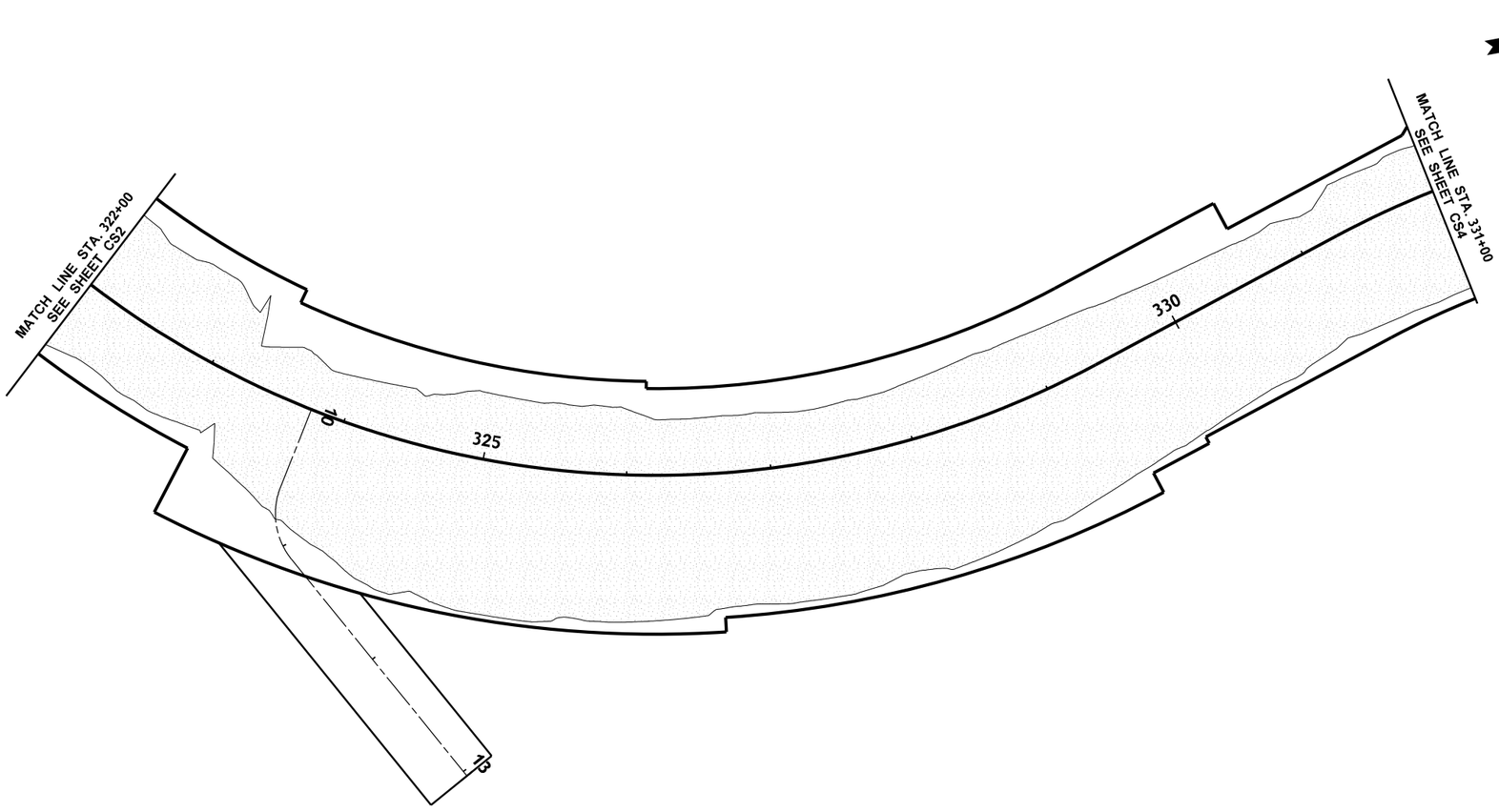
DATE
P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT

CONSTRUCTION SEQUENCING

Plot 2
PLAN REF NO
CS2
SHEET
OF
SHEETS



STAGE 1:

1. SET UP TRAFFIC CONTROL. SEE SHETS TC1-TC5.
2. PUT TESC MEASURES IN PLACE. CLEAR AND GRUB FOR PRELOADING (PHASE 1). SEE SHEETS PSP1-PSP5.
3. REMOVE STRUCTURES AND OBSTRUCTIONS WITHIN STAGE 1 WORK AREA.
4. CONSTRUCT TEMPORARY WALLS.
5. ROADWAY EXCAVATION INCL. HAUL FOR PRELOADING (PHASE 1). SEE SHEETS PCG1-PCG4 AND PRP1-PRP4. MONITOR CONSOLIDATION FOR A MINIMUM OF SIX MONTHS. DO NOT PROCEED UNTIL ENGINEERING APPROVAL IS RECEIVED.
6. ROADWAY EXCAVATION INCL. HAUL. (PHASE 2) WITHIN STAGE 1 WORK AREA. SEE SHEETS PCG1-PCG4.
7. REMOVE TEMPORARY WALLS.
8. CONSTRUCT COMMON BORROW INCL. HAUL, EMBANKMENT COMPACTION.
9. INSTALL DRAINAGE STRUCTURES, PIPES, DETENTION PONDS AND CABS. SEE SHEETS DR1-DR5, PD1-PD2, AND DRD2.
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14. INSTALL PERMANENT PAVEMENT MARKINGS WITHIN STAGE 1 WORK AREA. SEE SHEETS PM1-PM4.
15. REMOVE TESC AND TRAFFIC CONTROL MEASURES PUT IN PLACE EXCEPT FOR THOSE USED IN THE NEXT STAGE.

STAGE 2:

1. SET UP TRAFFIC CONTROL, SEE SHEETS TC1-TC2
2. PUT TESC MEASURES IN PLACE. CLEAR AND GRUB (PHASE 2). SEE SHEETS SP1-SP5.
3. REMOVE STRUCTURES AND OBSTRUCTIONS WITHIN STAGE 2 WORK AREA.
4. ROADWAY EXCACVATION INCL. HAUL (PHASE 2) WITHIN STAGE 2 WORK AREA. SEE SHEETS CG1-CG4.
5. CONSTRUCT COMMON BORROW INCL. HAUL , EMBANKMENT COMPACTION
6. INSTALL DRAINAGE STRUCTURES, PIPES, AND MFD WITHIN STAGE 2 WORK AREA. SEE SHEETS DR1-DR4.
7. CSBC WITHIN STAGE 2 WORK AREA.
8. CONSTRUCT TYPE 2 EXTRDUED CURB WITHIN STAGE 2 WORK AREA. SEE SHEETS PV1-PV4.
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12. REMOVE TESC AND TRAFFIC CONTROL MEASURES PUT IN PLACE EXCEPT FOR THOSE USED IN THE NEXT STAGE.

STAGE 3:

1. SET UP TRAFFIC CONTROL, SEE SHEETS TC#-TC#
2. PUT TESC MEASURES IN PLACE. DEMOLISH EXISTING ROADWAY. SEE SHEETS SP1-SP5.
3. CONSTRUCT SOUTHERN POND ACCESS ROAD. SEE SHEET PV1, DRD##
4. REMOVE TESC AND TRAFFIC CONTROL MEASURES.

60% REVIEW SUBMITTAL

LEGEND

- WORK AREA - STAGE 1
- WORK AREA - STAGE 2
- WORK AREA - STAGE 3

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TIME	4:18:53 PM				10	WASH	
DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	T. GIGLIO				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	J. SAUGEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

EVERETT BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

DATE

P.E. STAMP BOX

DATE

P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

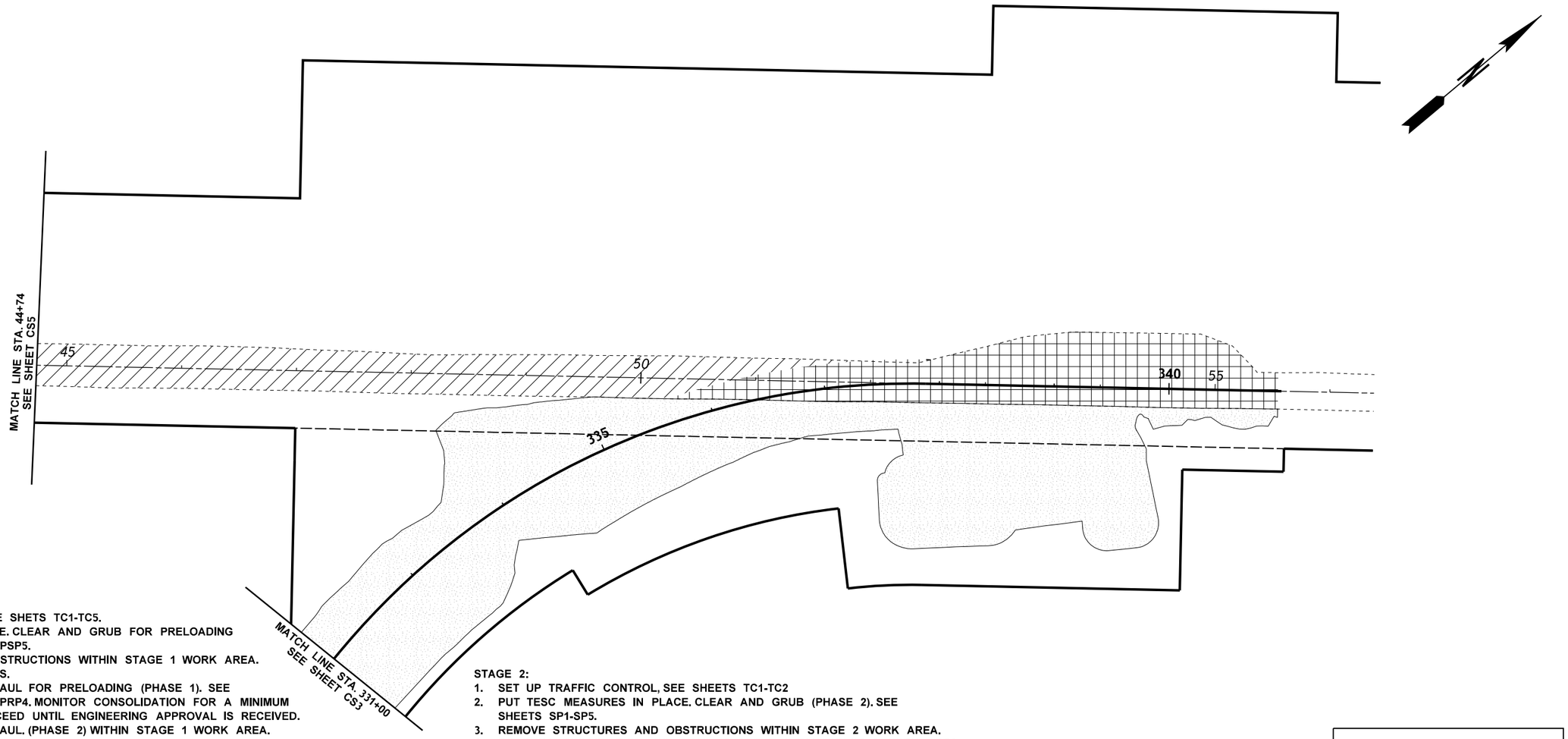
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT

CONSTRUCTION SEQUENCING

Plot 3

PLAN REF NO
CS3

SHEET
OF
SHEETS



STAGE 1:
1. SET UP TRAFFIC CONTROL. SEE SHETS TC1-TC5.
2. PUT TESC MEASURES IN PLACE. CLEAR AND GRUB FOR PRELOADING (PHASE 1). SEE SHEETS PSP1-PSP5.
3. REMOVE STRUCTURES AND OBSTRUCTIONS WITHIN STAGE 1 WORK AREA.
4. CONSTRUCT TEMPORARY WALLS.
5. ROADWAY EXCAVATION INCL. HAUL FOR PRELOADING (PHASE 1). SEE SHEETS PCG1-PCG4 AND PRP1-PRP4. MONITOR CONSOLIDATION FOR A MINIMUM OF SIX MONTHS. DO NOT PROCEED UNTIL ENGINEERING APPROVAL IS RECEIVED.
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9. INSTALL DRAINAGE STRUCTURES, PIPES, DETENTION PONDS AND CABS. SEE SHEETS DR1-DR5, PD1-PD2, AND DRD2.
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15. REMOVE TESC AND TRAFFIC CONTROL MEASURES PUT IN PLACE EXCEPT FOR THOSE USED IN THE NEXT STAGE.

STAGE 2:
1. SET UP TRAFFIC CONTROL, SEE SHEETS TC1-TC2
2. PUT TESC MEASURES IN PLACE. CLEAR AND GRUB (PHASE 2). SEE SHEETS SP1-SP5.
3. REMOVE STRUCTURES AND OBSTRUCTIONS WITHIN STAGE 2 WORK AREA.
4. ROADWAY EXCACVATION INCL. HAUL (PHASE 2) WITHIN STAGE 2 WORK AREA. SEE SHEETS CG1-CG4.
5. CONSTRUCT COMMON BORROW INCL. HAUL , EMBANKMENT COMPACTION
6. INSTALL DRAINAGE STRUCTURES, PIPES, AND MFD WITHIN STAGE 2 WORK AREA. SEE SHEETS DR1-DR4.
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12. REMOVE TESC AND TRAFFIC CONTROL MEASURES PUT IN PLACE EXCEPT FOR THOSE USED IN THE NEXT STAGE.

STAGE 3:
1. SET UP TRAFFIC CONTROL, SEE SHEETS TC#-TC#
2. PUT TESC MEASURES IN PLACE. DEMOLISH EXISTING ROADWAY. SEE SHEETS SP1-SP5.
3. CONSTRUCT SOUTHERN POND ACCESS ROAD. SEE SHEET PV1, DRD##.
4. REMOVE TESC AND TRAFFIC CONTROL MEASURES.

60% REVIEW SUBMITTAL

LEGEND
- WORK AREA - STAGE 1
- WORK AREA - STAGE 2
- WORK AREA - STAGE 3

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DATE	3/3/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	T. GIGLIO				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	J. SAUGEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

P.E. STAMP BOX — DATE

P.E. STAMP BOX — DATE

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

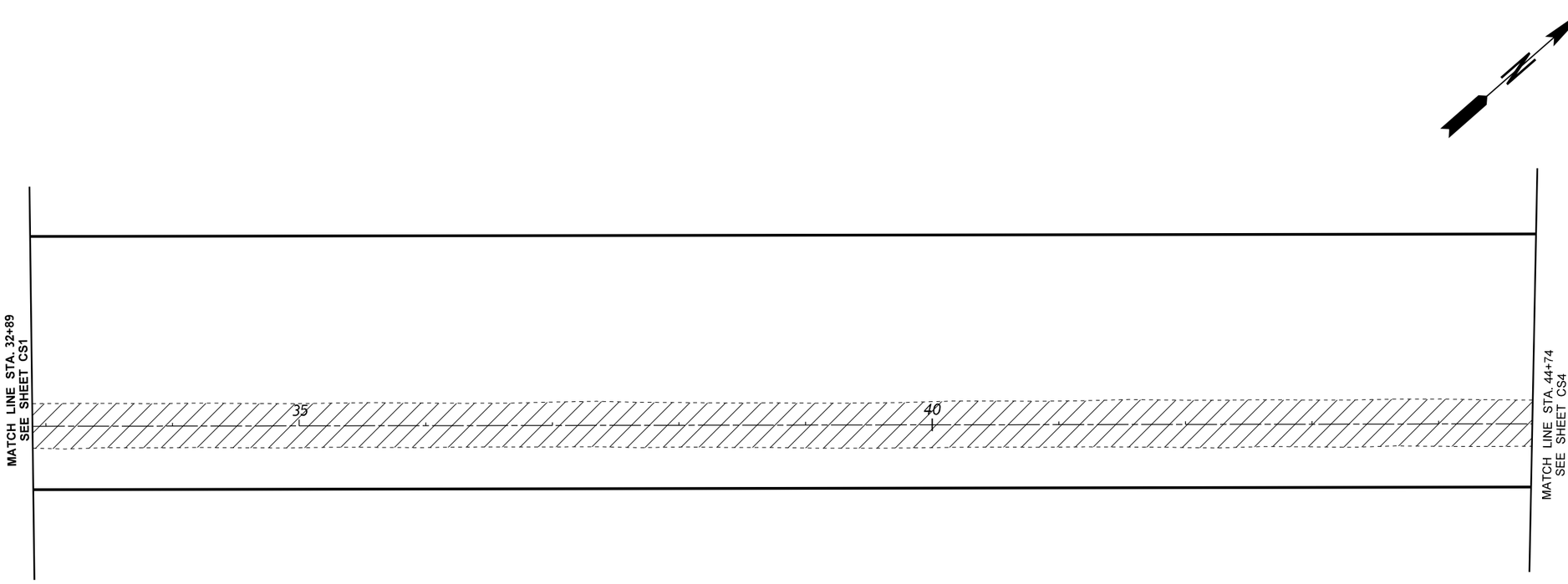
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT

CONSTRUCTION SEQUENCING

Plot 4

PLAN REF NO
CS4

SHEET
OF
SHEETS



STAGE 1:

1. SET UP TRAFFIC CONTROL. SEE SHETS TC1-TC5.
2. PUT TESC MEASURES IN PLACE. CLEAR AND GRUB FOR PRELOADING (PHASE 1). SEE SHEETS PSP1-PSP5.
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15. REMOVE TESC AND TRAFFIC CONTROL MEASURES PUT IN PLACE EXCEPT FOR THOSE USED IN THE NEXT STAGE.

STAGE 2:

1. SET UP TRAFFIC CONTROL, SEE SHEETS TC1-TC2
2. PUT TESC MEASURES IN PLACE. CLEAR AND GRUB (PHASE 2). SEE SHEETS SP1-SP5.
3. REMOVE STRUCTURES AND OBSTRUCTIONS WITHIN STAGE 2 WORK AREA.
4. ROADWAY EXCACVATION INCL. HAUL (PHASE 2) WITHIN STAGE 2 WORK AREA. SEE SHEETS CG1-CG4.
5. CONSTRUCT COMMON BORROW INCL. HAUL , EMBANKMENT COMPACTION
6. INSTALL DRAINAGE STRUCTURES, PIPES, AND MFD WITHIN STAGE 2 WORK AREA. SEE SHEETS DR1-DR4.
7. CSBC WITHIN STAGE 2 WORK AREA.
8. CONSTRUCT TYPE 2 EXTRDUED CURB WITHIN STAGE 2 WORK AREA. SEE SHEETS PV1-PV4.
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STAGE 3:

1. SET UP TRAFFIC CONTROL, SEE SHEETS TC#-TC#
2. PUT TESC MEASURES IN PLACE. DEMOLISH EXISTING ROADWAY. SEE SHEETS SP1-SP5.
3. CONSTRUCT SOUTHERN POND ACCESS ROAD. SEE SHEET PV1, DRD##
4. REMOVE TESC AND TRAFFIC CONTROL MEASURES.

60% REVIEW SUBMITTAL

LEGEND

- WORK AREA - STAGE 1
- WORK AREA - STAGE 2
- WORK AREA - STAGE 3

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DESIGNED BY	T. GIGLIO					
ENTERED BY	H. MCMASTER					
CHECKED BY	J. SAUGEN				CONTRACT NO.	LOCATION NO.
PROJ. ENGR.	E. BORGES					
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

PRELIMINARY — PERRY BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

P.E. STAMP BOX — DATE

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PERTEET
123 OHME GARDEN ROAD, SUITE 8
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800.615.9900

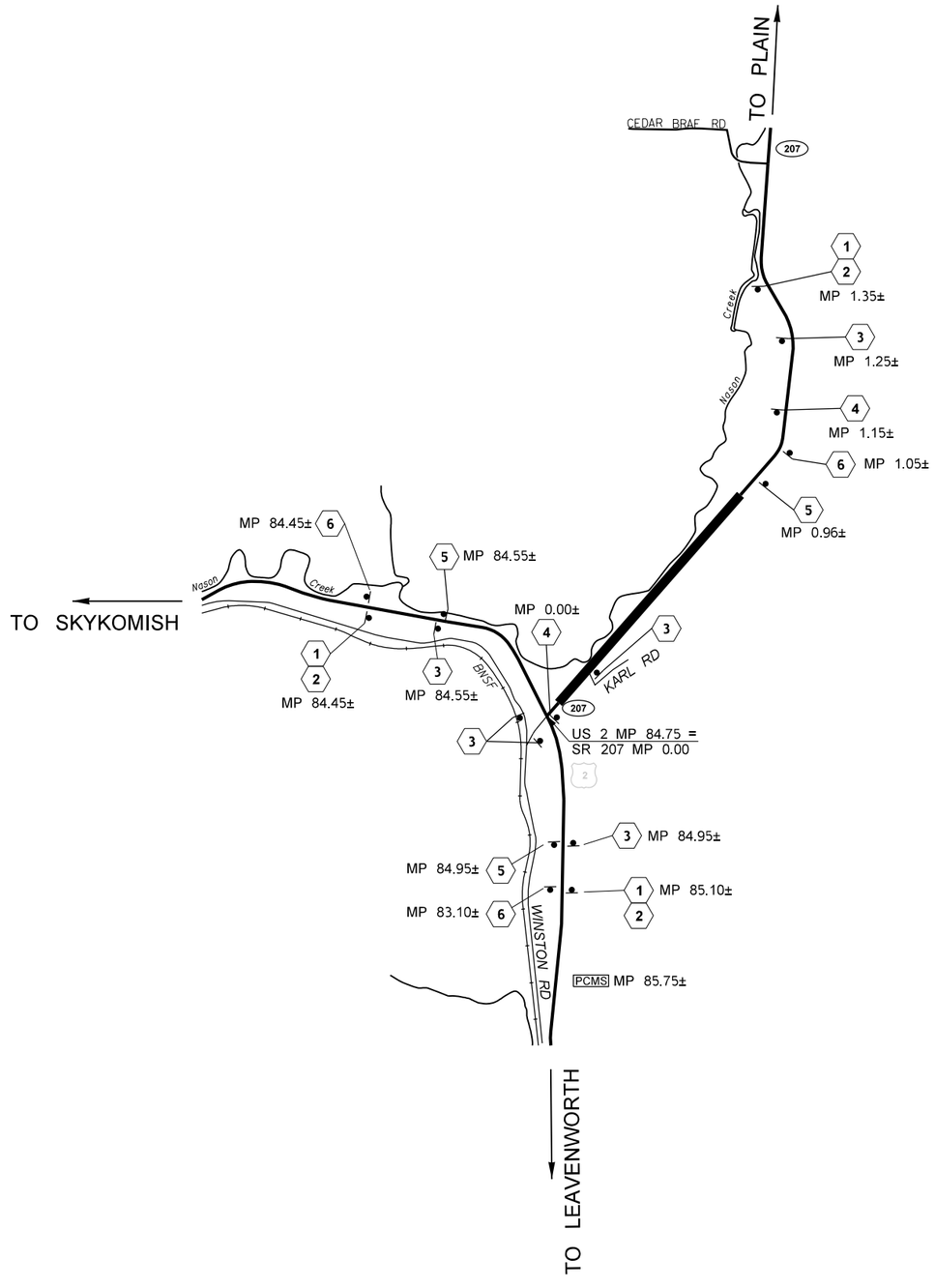
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT

CONSTRUCTION SEQUENCING

Plot 5

PLAN REF NO CS5

SHEET OF SHEETS



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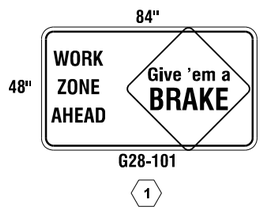

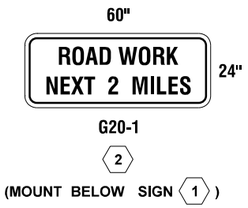

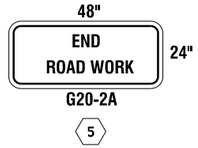

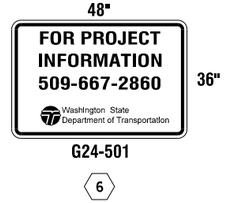

GENERAL NOTE:

1. SEE TC1 FOR TRAFFIC CONTROL NOTES, LEGEND, AND TABLES.

PCMS	
1	2
ROAD WORK AHEAD	MO/DAY - MO/DAY
2.0 SEC	2.0 SEC

LOCATE PCMS PER WSDOT STANDARD SPEC. 1-10.3(3)C.

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DATE	3/3/2026				JOB NUMBER	
PLOTTED BY	hmcmaster					
DESIGNED BY	T. GIGLIO				CONTRACT NO.	LOCATION NO.
ENTERED BY	H. MCMASTER					
CHECKED BY	R. CRAVEN					
PROJ. ENGR.	E. BORGES					
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

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SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 1

CONSTRUCTION SIGNING PLAN

Plot 11

PLAN REF NO
TCS1

SHEET
OF
SHEETS

L = WS S = 55 MPH	
W (FEET)	L (FEET)
1	55
2	110
3	165
4	220
5	275
6	330
7	385
8	440

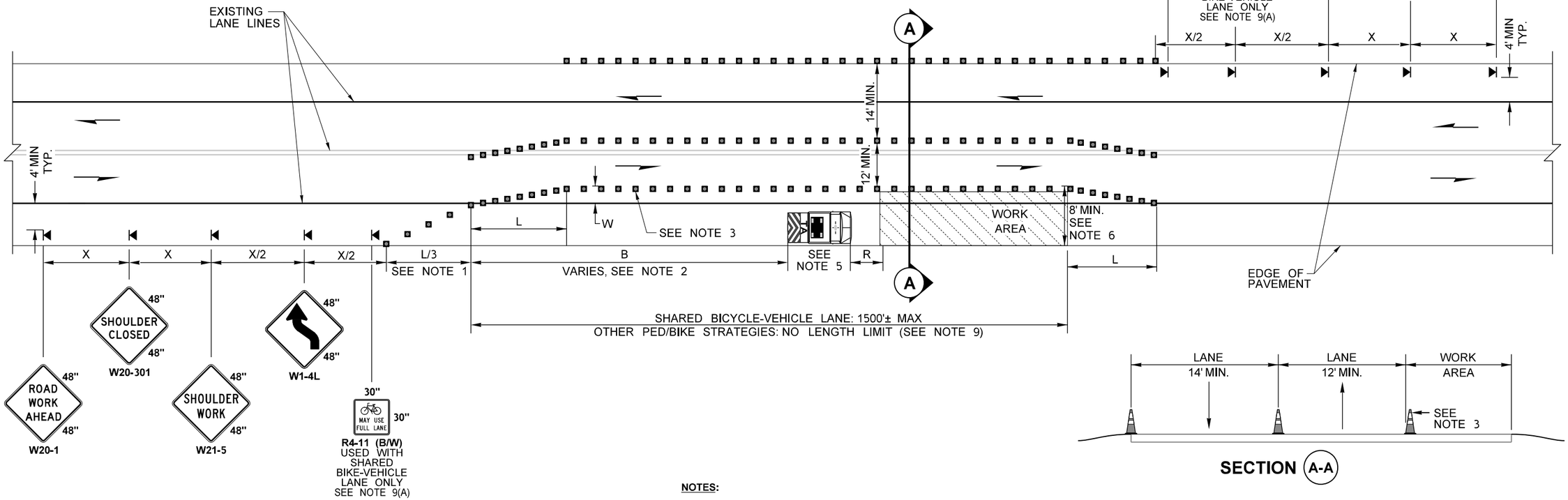
LONGITUDINAL BUFFER SPACE = B					
SPEED (MPH)	45	50	55	60	65
B (feet)	360	425	495	570	645
Buffer space may be adjusted (±) based on field conditions.					

SHOULDER CLOSURE TAPER LENGTH = L/3						
SHOULDER WIDTH	SPEED (MPH)	45	50	55	60	65
< 8'	L/3 (feet)	USE LANE CLOSURE INSTEAD				
8'		120	160	160	160	200
10'		150	200	200	200	240

MAXIMUM CHANNELIZATION DEVICE SPACING (feet)		
MPH	TAPER	TANGENT
50 - 65	40	80
45	30	60

STATIONARY TRANSPORTABLE ATTENUATOR ROLL AHEAD DISTANCE = R			
HOST VEHICLE WEIGHT LESS THAN 22,000 lbs.		HOST VEHICLE WEIGHT 22,000+ lbs.	
45-55 MPH	60+ MPH	45-55 MPH	60+ MPH
123'	172'	100'	150'

RECOMMENDED SIGN SPACING = X (1)		
RURAL ROADS	45-55 MPH	500'±
(1) ALL SPACING MAY BE ADJUSTED TO ACCOMMODATE INTERCHANGE RAMPS, AT-GRADE INTERSECTIONS AND DRIVEWAYS.		



SECTION (A-A)

NOTES:

1. IF FEASIBLE, AVOID PLACING SHOULDER CLOSURE TAPER WITHIN OR IMMEDIATELY FOLLOWING HORIZONTAL AND VERTICAL CREST CURVES.
2. DISTANCE INCREASES AS WORK AREA MOVES DOWNSTREAM.
3. 28" TRAFFIC CONE, 36" TRAFFIC CONES, 42" TALL CHANNELIZING DEVICES, OR TRAFFIC SAFETY DRUMS ALLOWED ON TAPERS AND TANGENTS. ENCROACHMENT INTO ADJACENT OPEN LANE PROHIBITED (BASE WEIGHT MAY ENCROACH). USE 5' MIN MOUNTING HEIGHT ON TEMPORARY SIGNS PLACED BEHIND TRAFFIC SAFETY DRUMS.
4. FOR SIGNS PLACED BEHIND TRAFFIC SAFETY DRUMS, USE 5-FOOT MOUNTING HEIGHT.
5. RED/WHITE OR BLACK/YELLOW CHEVRON PATTERN OK. ADDITIONAL TRANSPORTABLE ATTENUATORS MAY BE ADDED BEHIND EACH WORK CREW.
6. IF PAVED WORK AREA IS LESS THAN 8 FEET WIDE AT TRANSPORTABLE ATTENUATORS AND WORK AREA, THEN A LANE CLOSURE SHALL BE IMPLEMENTED.
7. SIGNS ARE BLACK ON ORANGE UNLESS OTHERWISE INDICATED.
8. PLAN IS APPLICABLE TO SHOULDER CLOSURES OF 7 DAYS OR LESS.
9. BICYCLIST ACCOMMODATIONS, WHERE FACILITY OPEN TO BICYCLES:
   (A) SHARED BICYCLE-VEHICLE LANE. ADD W11-15 MOD & R4-11 SIGNS.
   (B) BICYCLES PROHIBITED VIA R5-601 (IF EXIT-RAMP PRESENT) & R5-6 SIGNS. PROVIDE SIGNED DETOUR OR ALTERNATIVE ROUTE.
   (C) BICYCLES PROHIBITED VIA R5-6 SIGN(S). PROVIDE FREE SHUTTLE (WORK TRUCK, VAN, OR BUS OK) + CONTACT INFORMATION/PHONE BOX/LABORER.
   (D) STOP WORK OPS. & ESCORT BICYCLISTS THROUGH SHOULDER CLOSURE.
   (E) ENGINEER TO ACCEPT ANY ALTERNATIVE STRATEGIES.

LEGEND:

- TEMPORARY SIGN LOCATION (1' MIN HEIGHT)
- CHANNELIZING DEVICE (SEE NOTE 3)
- TRANSPORTABLE ATTENUATOR (TL-3)

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NOT TO SCALE

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DESIGNED BY	T. GIGLIO						
ENTERED BY	H. MCMASTER				CONTRACT NO.		LOCATION NO.
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

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SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 1

TRAFFIC CONTROL PLAN

Plot 12

PLAN REF NO
TC1

SHEET
OF
SHEETS

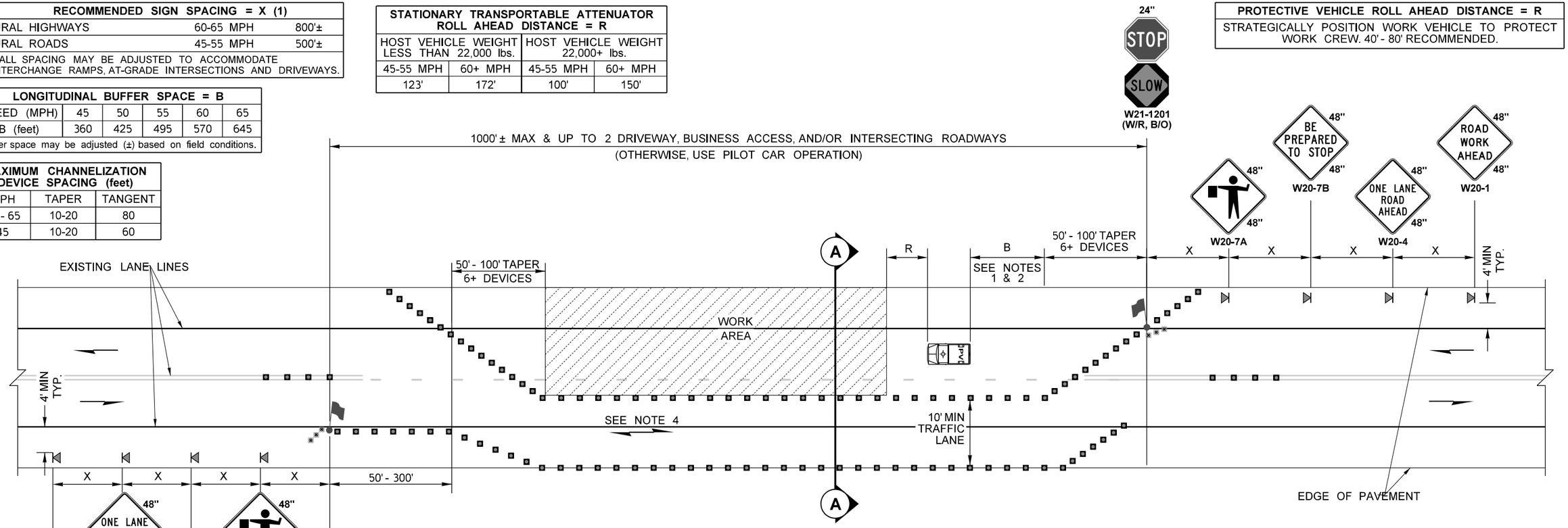
RECOMMENDED SIGN SPACING = X (1)		
RURAL HIGHWAYS	60-65 MPH	800'±
RURAL ROADS	45-55 MPH	500'±
(1) ALL SPACING MAY BE ADJUSTED TO ACCOMMODATE INTERCHANGE RAMPS, AT-GRADE INTERSECTIONS AND DRIVEWAYS.		

LONGITUDINAL BUFFER SPACE = B					
SPEED (MPH)	45	50	55	60	65
B (feet)	360	425	495	570	645
Buffer space may be adjusted (±) based on field conditions.					

MAXIMUM CHANNELIZATION DEVICE SPACING (feet)		
MPH	TAPER	TANGENT
50 - 65	10-20	80
45	10-20	60

STATIONARY TRANSPORTABLE ATTENUATOR ROLL AHEAD DISTANCE = R			
HOST VEHICLE WEIGHT LESS THAN 22,000 lbs.		HOST VEHICLE WEIGHT 22,000+ lbs.	
45-55 MPH	60+ MPH	45-55 MPH	60+ MPH
123'	172'	100'	150'

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R
STRATEGICALLY POSITION WORK VEHICLE TO PROTECT WORK CREW. 40' - 80' RECOMMENDED.



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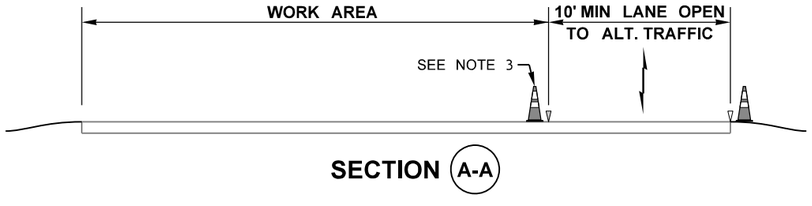
LEGEND:

- TEMPORARY SIGN LOCATION
- 28" REFLECTIVE TRAFFIC CONE (SEE NOTE 3)
- OPTIONAL CHANNELIZATION DEVICE
- PROTECTIVE VEHICLE (SEE NOTE 2)
- FLAGGER



SECTION A-A

NOT TO SCALE

NOTES:

1. AVOID PLACING LANE CLOSURE TAPERS WITHIN OR IMMEDIATELY FOLLOWING HORIZONTAL & VERTICAL CURVES BY ADJUSTING LONGITUDINAL BUFFER SPACE.
2. **IF LONGITUDINAL BUFFER SPACE REDUCED** FROM DISTANCES LISTED IN TABLE, UPGRADE PROTECTIVE VEHICLE (PV) TO A TRANSPORTABLE ATTENUATOR (TA). ADDITIONAL PV/TAs MAY BE ADDED AT SEPARATE WORK CREWS.
3. MAY SHIFT LATERALLY. 36" TRAFFIC CONES, 42" TALL CHANNELIZATION DEVICES, OR TRAFFIC SAFETY DRUMS OK.
4. PEDESTRIAN & BICYCLIST ACCOMMODATIONS (ENGINEER TO ACCEPT ANY ALTERNATIVE STRATEGIES):
   (A) ALLOW PEDESTRIANS TO USE THE PAVED SHOULDER OR ADJACENT PATH OPPOSITE THE WORK AREA
   (B) COMBINE BIKES & VEHICULAR TRAFFIC. BIKES TO CLEAR PRIOR TO RELEASING ONCOMING TRAFFIC
   (C) PROVIDE FREE SHUTTLE (WORK TRUCK, VAN, OR BUS MAY BE USED)
5. SEE STANDARD SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS:
   1-07.8(1) HIGH-VISIBILITY APPAREL
   1-10.3(1)A FLAGGERS AND NIGHTTIME ILLUMINATION
   1-10.3(2)A TRAFFIC CONTROL PROCEDURES
   9-35.1 24-INCH STOP/SLOW PADDLE SIZE
6. FOR PROJECT-SPECIFIC REQUIREMENTS, SEE SPECIAL PROVISIONS.
7. SIGNS ARE BLACK ON ORANGE UNLESS OTHERWISE INDICATED.
8. EXISTING PAVEMENT MARKINGS MAY VARY.

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ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PRELIMINARY — EDWARD BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

DATE
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DATE
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WENATCHEE, WA 98801
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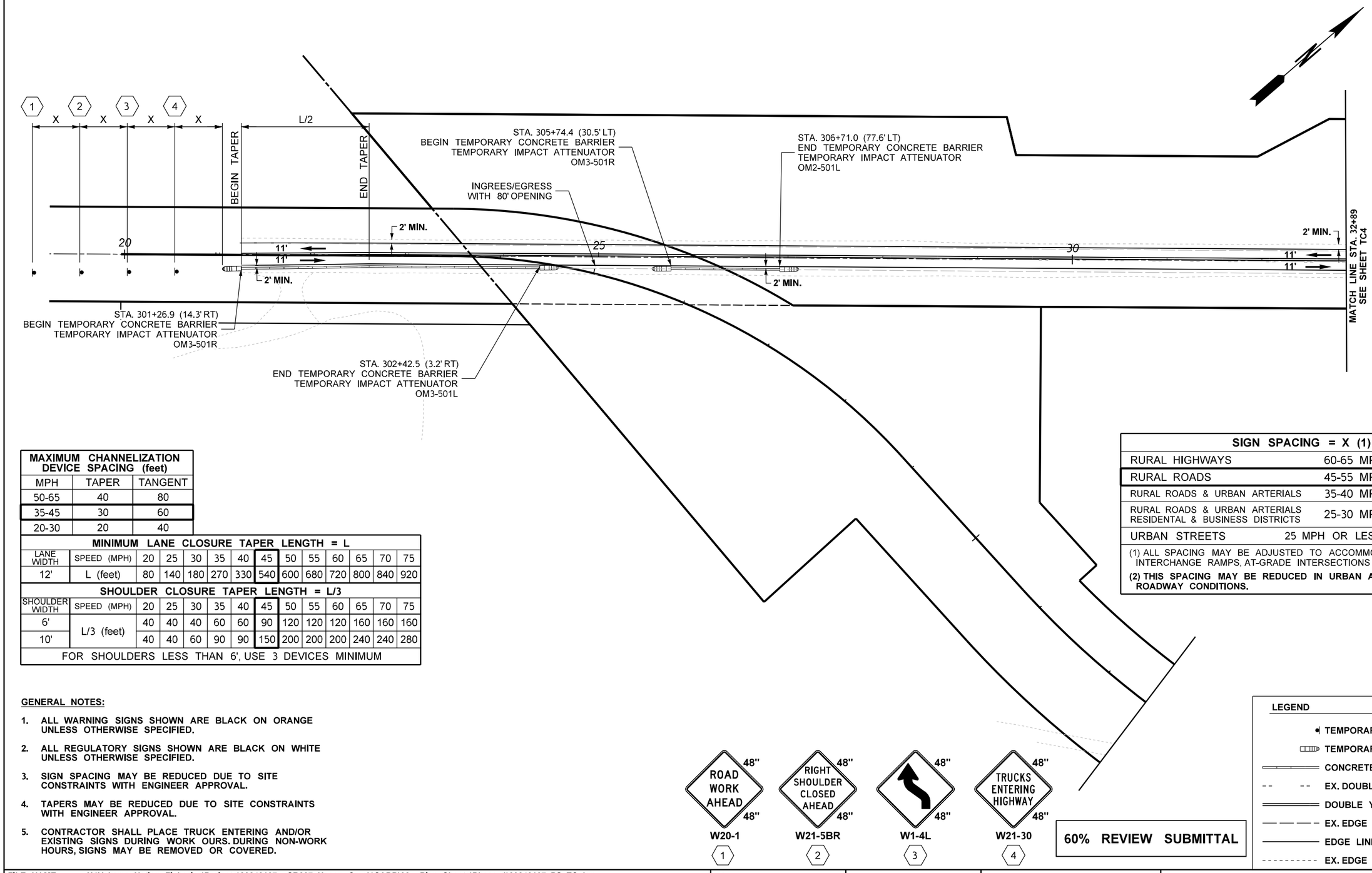
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 1

TRAFFIC CONTROL PLAN

Plot 13

PLAN REF NO
TC2

SHEET
OF
SHEETS



SIGN SPACING = X (1)		
RURAL HIGHWAYS	60-65 MPH	800' +/-
RURAL ROADS	45-55 MPH	500' +/-
RURAL ROADS & URBAN ARTERIALS	35-40 MPH	350' +/-
RURAL ROADS & URBAN ARTERIALS RESIDENTAL & BUSINESS DISTRICTS	25-30 MPH	**200' +/- (2)**
URBAN STREETS	25 MPH OR LESS	**100' +/- (2)**

(1) ALL SPACING MAY BE ADJUSTED TO ACCOMMODATE INTERCHANGE RAMPS, AT-GRADE INTERSECTIONS AND DRIVEWAYS.

(2) THIS SPACING MAY BE REDUCED IN URBAN AREAS TO FIT ROADWAY CONDITIONS.

MAXIMUM CHANNELIZATION DEVICE SPACING (feet)		
MPH	TAPER	TANGENT
50-65	40	80
35-45	30	60
20-30	20	40

MINIMUM LANE CLOSURE TAPER LENGTH = L													
LANE WIDTH	SPEED (MPH)	20	25	30	35	40	45	50	55	60	65	70	75
12'	L (feet)	80	140	180	270	330	540	600	680	720	800	840	920

SHOULDER CLOSURE TAPER LENGTH = L/3													
SHOULDER WIDTH	SPEED (MPH)	20	25	30	35	40	45	50	55	60	65	70	75
6'	L/3 (feet)	40	40	40	60	60	90	120	120	120	160	160	160
10'		40	40	60	90	90	150	200	200	200	240	240	280

FOR SHOULDERS LESS THAN 6', USE 3 DEVICES MINIMUM

GENERAL NOTES:

1. ALL WARNING SIGNS SHOWN ARE BLACK ON ORANGE UNLESS OTHERWISE SPECIFIED.
2. ALL REGULATORY SIGNS SHOWN ARE BLACK ON WHITE UNLESS OTHERWISE SPECIFIED.
3. SIGN SPACING MAY BE REDUCED DUE TO SITE CONSTRAINTS WITH ENGINEER APPROVAL.
4. TAPERS MAY BE REDUCED DUE TO SITE CONSTRAINTS WITH ENGINEER APPROVAL.
5. CONTRACTOR SHALL PLACE TRUCK ENTERING AND/OR EXISTING SIGNS DURING WORK OURS. DURING NON-WORK HOURS, SIGNS MAY BE REMOVED OR COVERED.

60% REVIEW SUBMITTAL

LEGEND

- TEMPORARY SIGN LOCATION
- TEMPORARY IMPACT ATTENUATOR
- CONCRETE BARRIER
- EX. DOUBLE YELLOW CENTERLINE
- DOUBLE YELLOW CENTERLINE
- EX. EDGE LINE
- EDGE LINE
- EX. EDGE OF PAVEMENT

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REGIONAL ADM.	C. KEIFENHEIM

REVISION	DATE	BY

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10	WASH

JOB NUMBER

CONTRACT NO.

FED.AID PROJ.NO.

LOCATION NO.

PROFESSIONAL ENGINEER — STATE OF WASHINGTON — 23012272 — REGISTERED — EVERETT BORGES

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SR 207
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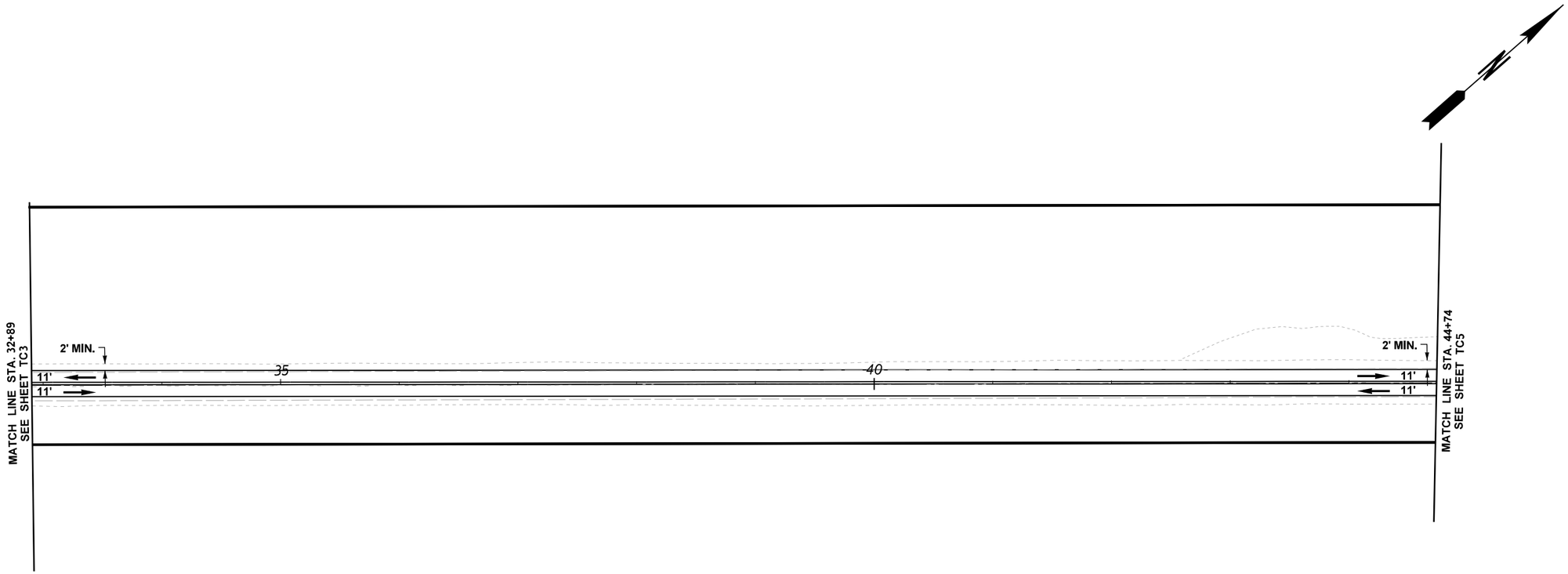
TRAFFIC CONTROL PLAN

Plot 1

PLAN REF NO
TC3

SHEET
OF
SHEETS



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60% REVIEW SUBMITTAL

LEGEND

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- EX. DOUBLE YELLOW CENTERLINE
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- EDGE LINE
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REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PRELIMINARY — ERIK OLE BORGES — STATE OF WASHINGTON — 23012272 — REGISTERED PROFESSIONAL ENGINEER

DATE

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SR 207
NASON CREEK FLOODPLAIN REALIGNMENT

TRAFFIC CONTROL PLAN

Plot 5

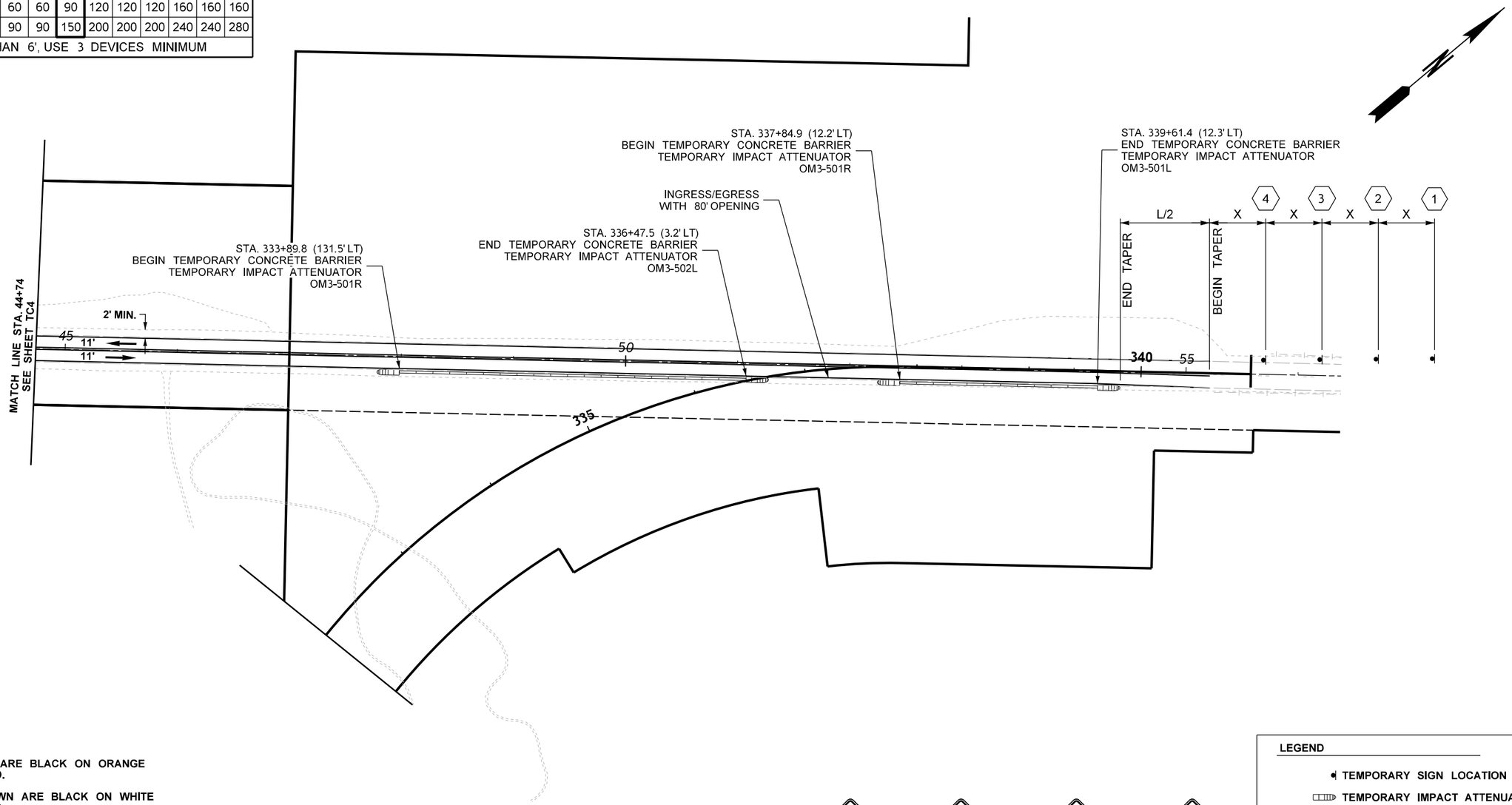
PLAN REF NO
TC4

SHEET
OF
SHEETS

MINIMUM LANE CLOSURE TAPER LENGTH = L													
LANE WIDTH	SPEED (MPH)	20	25	30	35	40	45	50	55	60	65	70	75
12'	L (feet)	80	140	180	270	330	540	600	680	720	800	840	920

SHOULDER CLOSURE TAPER LENGTH = L/3													
SHOULDER WIDTH	SPEED (MPH)	20	25	30	35	40	45	50	55	60	65	70	75
6'	L/3 (feet)	40	40	40	60	60	90	120	120	120	160	160	160
10'		40	40	60	90	90	150	200	200	200	240	240	280
FOR SHOULDERS LESS THAN 6', USE 3 DEVICES MINIMUM													

MAXIMUM CHANNELIZATION DEVICE SPACING (feet)		
MPH	TAPER	TANGENT
50-65	40	80
35-45	30	60
20-30	20	40



GENERAL NOTES:

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2. ALL REGULATORY SIGNS SHOWN ARE BLACK ON WHITE UNLESS OTHERWISE SPECIFIED.
3. SIGN SPACING MAY BE REDUCED DUE TO SITE CONSTRAINTS WITH ENGINEER APPROVAL.
4. TAPERS MAY BE REDUCED DUE TO SITE CONSTRAINTS WITH ENGINEER APPROVAL.
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60% REVIEW SUBMITTAL

LEGEND

- TEMPORARY SIGN LOCATION
- TEMPORARY IMPACT ATTENUATOR
- CONCRETE BARRIER
- EX. DOUBLE YELLOW CENTERLINE
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CHECKED BY	R. CRAVEN				CONTRACT NO.		LOCATION NO.
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

PERJOUE BORGES — STATE OF WASHINGTON — 23012222 — REGISTERED PROFESSIONAL ENGINEER

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SR 207
NASON CREEK FLOODPLAIN REALIGNMENT

TRAFFIC CONTROL PLAN

Plot 4

PLAN REF NO
TC5

SHEET
OF
SHEETS

DRAFT TYPE A PRELIMINARY HYDRAULIC REPORT

Nason Creek/SR 207 Realignment

Project Number: 20240107

February 2026

Submitted to:

Washington State Department of Transportation

Nason Creek/SR 207 Realignment

Project:	20240107 SR 207 (MP 0.19 to MP 0.87) DRAFT Type A Preliminary Hydraulic Report
Date:	February 2026
Civil Engineer:	Perteet Inc. 123 Ohme Garden Road, Suite 8 Wenatchee, Washington 98801 Phone #: 800.615.9900

Stormwater Lead: Kern McGee, PE (HRM Certification #191165)

Stormwater Engineer: Nathan Hahne, EIT (HRM Certification #191566)

Regional Administrator: Chris Keifenheim

PRELIMINARY

AMERICANS WITH DISABILITIES ACT (ADA) INFORMATION

Materials can be made available in an alternative format by emailing the WSDOT Diversity/ADA Affairs Team at wsdotada@wsdot.wa.gov or by calling toll free: 855-362-4ADA (4232). Persons who are deaf or hard of hearing may contact that number via the Washington Relay Service at 7-1-1.

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It is Washington State Department of Transportation (WSDOT) policy to ensure no person shall, on the grounds of race, color, national origin, or sex, as provided by Title VI of the Civil Rights Act of 1964, be excluded from participation in, be denied the benefits of, or be otherwise discriminated against under any of its federally funded programs and activities. Any person who believes his/her Title VI protection has been violated may file a complaint with WSDOT's Office of Equal Opportunity (OEO). For Title VI complaint forms and advice, please contact OEO's Title VI Coordinator at 360-705-7082 or 509-324-6018.

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1.0 PROJECT OVERVIEW

The State Route (SR) 207 realignment project is a design-bid-build project that is the result of a partnership between Yakima Nation Fisheries and WSDOT to address habitat, river health issues, and roadway infrastructure degradation. The project proposes to realign approximately one mile of the highway, shifting the alignment approximately two thirds of a mile southeasterly upslope. Nason Creek meanders through the valley, running northeast in the same general direction as SR 207. At the project location, Nason Creek has a sharp meander that pushes waters perpendicular to the highway (see Figure 1 below for the Vicinity Map). Nason Creek has repeatedly damaged the highway embankment in multiple locations during flood events, which has required the Washington State Department of Transportation (WSDOT) to perform emergency repairs and to designate three locations along the highway as Chronic Environmental Deficiencies (CEDs). Three roadway repairs have been completed in the last ten years. This project is expected to give Nason Creek more space to naturally meander over time, while still keeping SR 207 out of the Nason Creek floodplain to continue to provide local access to the mostly unincorporated residential areas to the northeast of the project site. The proposed roadway alignment is outside the 25-year, 50-year, and 100-year inundations of Nason Creek and the wetlands' flood zones, .

The regulatory agency for this project is WSDOT, so the project will follow all applicable WSDOT standards. The stormwater design and analysis were done per the WSDOT Highway Runoff Manual (HRM). For conveyance standards and other design topics not covered by the HRM, the WSDOT Hydraulics Manual will be used. This Hydraulic Report documents the drainage design for the project area and summarizes the stormwater requirements. Three types of BMPs are planned for this project, including media filter drains (MFDs), compost-amended biofiltration swales (CABS), and detention ponds.

1.1 Site Location

The project site is located at SR 207 just northeast of the SR 207 and US-2 intersection at Coles Corner. The project begins at approximate milepost 0.28 and ends at approximate milepost 0.84. The improvements for this project will occur within Section 9 of Township 26N Range 17E in Chelan County, Washington.

1.2 Vicinity Map

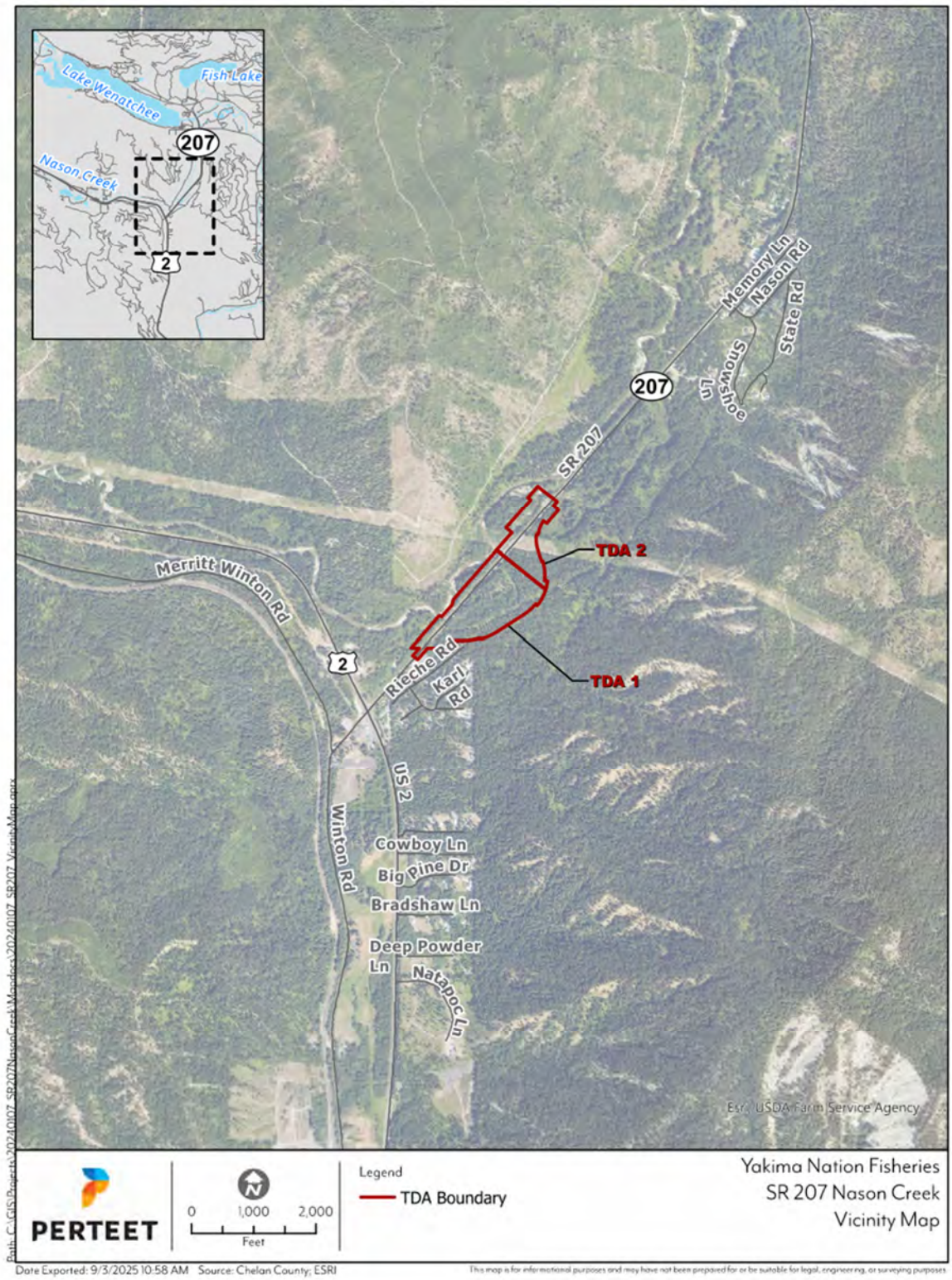


Figure 1. Vicinity Map.

1.3 Stormwater and Hydraulic Scope of Work

The project will maintain the roadway section of SR 207 but reroute the road up the forested slope to the southeast around and between several wetland areas, and then back down the slope to connect back in with the current straight alignment of SR 207. Stormwater management facilities for the project will include a combination of culverts, ditches, MFDs, CABS, and detention ponds. The project will also involve reverting the old roadway alignment to the natural forested land cover. The project includes two Threshold Discharge Areas (TDAs). See the Downstream Map in Appendix A-2.5 for the TDA locations.

Table 1. BMP Summary Table.

TDA	BMP Type	Facility Size
1	MFD Type 3	Varies
2	MFD Type 1 modified	165 LF
1	Detention Pond	14,442 CF
2	Detention Pond	22,248 CF
2	CABS	127 LF

2.0 SITE ASSESSMENT

The following sections describe the existing conditions in and surrounding the project site. Descriptions of the topography, surface coverage, soils, drainage basins, drainage patterns, water quality, and sensitive areas are provided based on available information. Site visit and survey data were reviewed to determine existing site conditions. See Table 2 below for a summary of the information reviewed as part of the site assessment.

Table 2. Information Sources Consulted.

Item #	Source Reviewed	Findings
1	Land Cover Types and Area	GIS mapping from project documents and Chelan County were reviewed to become familiar with the project area as well as adjacent off-site areas. Site reconnaissance was also performed.
2	GIS Data	GIS Data from Chelan County was reviewed for items such as road features, vegetation, and topography.
3	Topography (USGS Maps)	The project site was surveyed, and this information is readily available in CAD and various design drawings. Topographic information was also reviewed through GIS data.
4	Existing Stormwater Outfalls	Project survey data and site reconnaissance were used to identify all existing outfalls associated with the existing drainage system. These outfalls primarily consist of the culverts along the existing SR 207 alignment.
5	Traffic Data	According to the WSDOT Traffic Count data, the AADT for SR 207 is approximately 2,000, based on several counts near the project limits.

2.1 Existing Project Site Conditions

Existing project site conditions were obtained and evaluated using survey, aerial imagery, GIS data, and by performing a site visit.

Survey data obtained shows that the existing roadway along SR 207 is crowned. The running slope on SR 207 is approximately 0.76% sloping downhill to the northeast. SR 207 is a two-lane highway with asphalt shoulders and gravel embankments. Nason Creek runs alongside the highway on the northwest side of the road, and eventually receives all runoff from the surrounding area, including the project site. The river bends close to the highway in several locations, so rock armoring has been installed on the roadway embankments to prevent the river from meandering into the roadway.

There are several existing wetlands within and adjacent to the project site.

A site visit was performed by Perteet staff on December 19, 2025, to confirm and observe the existing conditions in and around the project site. The weather was cold with snow on the ground (see Section 3.8.1 for several site photos).

The project is located within the Wenatchee River watershed, Washington Resource Inventory Area (WRIA) number 45. Nason Creek terminates at the Wenatchee River to the north of the project site, just east of Lake Wenatchee. The Wenatchee River continues to flow towards the Columbia River to the east. See Figure 2 for the map of the site location within the basin.

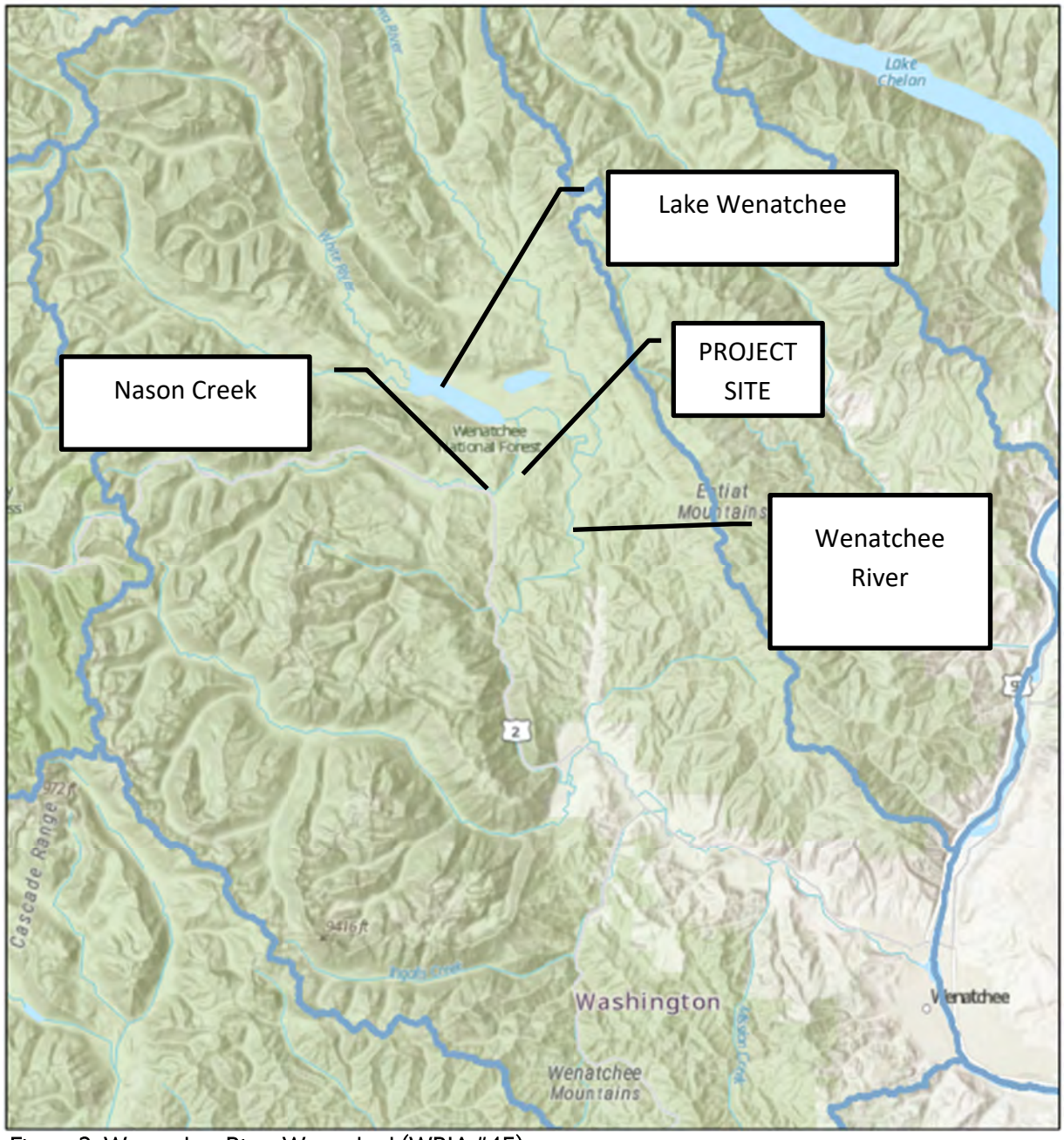


Figure 2. Wenatchee River Watershed (WRIA #45).

2.2 Existing Hydraulic Features

SR 207 currently has stormwater conveyance features that are typical of a rural highway. Runoff on the north side of the roadway mostly sheet-flows directly to Nason Creek, or to forested areas adjacent to Nason Creek. The south side of the roadway has some culverts and ditches that collect runoff and convey it under the road in culverts towards the creek. In addition to capturing runoff from the south side of the road, the ditch and culvert system collects runoff coming off the upstream forested areas to the southeast.

Major existing hydraulic features include several wetlands along the length of the project, and a 12-foot diameter culvert crossing a branch of Nason Creek at the north end of the project. The BMP designs for the project will be coordinated with the existing wetland hydrology. There are no known runoff treatment or flow control BMPs currently on-site, besides for the mitigation that the vegetation adjacent to the road provides. See Figures A-2.9-A-2.13 in Appendix 2 for the Existing Drainage Conditions maps.

2.2.1 Existing Culverts

There are five total existing culverts within the project limits along the existing roadway alignment. Four of these culverts are part of the existing culvert and ditch conveyance system sending runoff under the roadway towards Nason Creek. They will be abandoned unless needed to facilitate downstream drainage past the reverted roadway. The fifth is the 12-foot diameter, corrugated metal culvert that conveys a branch of Nason Creek into a wetland on the southeast side of the road. This culvert (part of the TDA 2 downstream flow path and pictured in Section 3.8.1) is located after the proposed roadway alignment ties back into the existing alignment, so this culvert will not be modified.

2.2.2 Existing Ditches

There are existing conveyance ditches along the southeast side of the road between the roadway and the existing wetland areas. Their observed function is to convey water to the existing culverts described in Section 2.2.1. Along the northwest side of the road, runoff has been observed to primarily be sheet flow into Nason Creek. No existing ditches were observed on that side of the road.

2.2.3 Existing Wetlands

There are two existing wetlands within and adjacent to the project site. They are both classified as Category III wetlands. There is one wetland within the project site surrounded by the proposed roadway alignment and existing roadway alignment. Its extents will not be altered as part of this project. This wetland is an oxbow wetland that was an old side channel of Nason Creek. It is labeled as Wetland A in the attached wetland assessment dated January 2022 detailing the wetland assessment performed in November 2021 (Appendix E).

The second wetland is at the north end of TDA 2, partially within the TDA. It is connected to a side channel of Nason Creek that flows through the large culvert just north of the project. The proposed roadway grading will cut through the wetland, so as a part of the project, the wetland will be expanded to minimize impact to the wetland's environmental function within the immediate surrounding area. This wetland is classified as Wetland E in the attached wetland assessment dated January 2021 detailing the wetland assessment performed in August 2020 (Appendix E).

2.3 Threshold Discharge Areas (TDAs)

The project has a total of two Threshold Discharge Areas (TDAs). It was determined through the TDA threshold analysis that both TDAs must satisfy Minimum Requirements 5 and 6 individually, in addition to the project-wide requirements. The applicability of the minimum requirements is described in Section 3.2.7. The existing drainage conditions are shown in Figures A-2.9-A-2.13 in Appendix 2.

2.3.1 TDA 1

TDA 1 encompasses the south side of the project. The TDA extends from the existing right-of-way boundary to the west, to the proposed right-of-way boundary to the south and east, and the end of the project to the south on SR 207. Moving from southwest to northeast it begins at approximate SR 207 milepost 0.25 and borders TDA 2 at approximate SR 207 milepost 0.64 just north of the proposed roadway high point, with the border following existing contours. TDA 1 includes parts of the Nason Creek channel because the existing right-of-way line extends into the current main channel of the creek. The proposed roadway alignment in TDA 1 bends east from the existing roadway alignment and cuts through USFS Road 6603 before bending back north near the boundary with TDA 2. See the Downstream Map in Appendix A-2.5 for the TDA limits.

2.3.2 TDA 2

TDA 2 encompasses the north side of the project. The TDA extends from the existing right-of-way boundary to the west, to the proposed right-of-way boundary to the east, and the end of the project to the south on SR 207. Moving from southwest to northeast it begins at approximate SR 207 milepost 0.64 and extends to approximate SR 207 milepost 0.89. TDA 2 also includes a part of the Nason Creek channel at its northernmost corner where the existing right-of-way extends into the main channel of the river. TDA 2 includes a side channel of Nason Creek that joins the main channel at the northwest corner near milepost 0.89. See the Downstream Map in Appendix A-2.5 for the TDA limits.

2.4 Soils

The on-site soils were analyzed by HWA in the Geotechnical Report (see Appendix C) and were taken from the National Resources Conservation Service (NRCS) website and are shown on the Soils Map (see Appendix A-2.6). Where there are differences between the NRCS data and the findings of the Geotechnical Report, the Report shall control.

2.4.1 pH and Resistivity

Resistance or “N-value” results can be seen in the Geotechnical Report Appendix A, in Appendix A-7 of this report. Potential Hydrogen (pH) was not tested.

2.4.2 Soil Borings

The geotechnical exploration included the drilling of nine machine-drilled borings and completion of twelve hand borings. In Phase 1 of the exploration, the shallow hand borings, HH-1 through HH-12, were completed at depths ranging from 0.7 to 9.2 feet below ground surface. Phase 2 of the exploration included four machine-drilled borings, BH-1 through BH-4. These borings were conducted on Forest Service Road 6603 since the proposed roadway alignment was not accessible for the drill rig. Phase 3 included BH-5, BH-7, and BH-9 through BH-11. The other two planned borings, BH-6 and BH-8, were not performed due to accessibility issues.

2.4.3 Soil Types

Per the NRCS website (see the Soils Map in Appendix A-2.6), there are five types of soils in the project limits: Wintoner silt loam (3-8% slopes), Wintoner silt loam (8-15% slopes), Peoh silt loam, Beverly gravelly fine sandy loam, and Brief gravelly sandy loam (0-3% slopes).

Per the Geotechnical Report, topsoil consisting of clayey or silty sand was found in several of the borings at depths of 0.25 to 1.5 feet below ground surface. Fill consisting of clayey sand or sandy clay was encountered at several borings at depths of 2 to 5 feet below ground surface. Alluvium consisting of silty sand, clayey sand, or sandy clay was found at depths extending to 35 feet below ground surface at most of the borings. In some of the borings, buried creek bed was found, consisting of dense to very dense sand and gravel. The gravel was observed to be weathered.

2.4.4 Soil Infiltration Rates

Per the Geotechnical Report, an average infiltration rate of 0.2 in/hr between three handhole borings (HH-1, HH-3, and HH8) was determined. The report goes on to say that this would result in a design infiltration rate less than 0.05 in/hr. This means that infiltration is infeasible at the project site. See Geotechnical Report in Appendix C for more information.

Given the low infiltration rate of the soil this would be classified as a hydrologic group soil Type C. Soil hydrologic groups are outlined in Section 2-8.1.2 of the WSDOT Hydraulics Manual.

2.4.5 Well Monitoring and Groundwater Levels

There are no domestic wells in the vicinity of the project. HWA installed groundwater monitoring wells in BH-5 and BH-11, 15 and 20 feet down respectively. Groundwater in these two borings was discovered at 10.51 and 3.17 feet below ground surface, respectively. Groundwater was also found at BH-1 and BH-3 at depths ranging from 30-40 feet below ground surface. See Appendix C for more information.

2.4.6 Unsuitable Material

The soil investigation found no unsuitable material with the project limits.

2.4.7 Hazardous Material

No hazardous materials have been identified within project limits.

2.5 Stormwater Discharge Point Inventory

According to the WSDOT Stormwater Discharge Points map, there are no existing mapped discharge points at or near the project site. The proposed discharge points are summarized in Table 3 below. More details such as stations and offsets and milepost numbers will be added at the next iteration of this Hydraulic Report.

Table 3. Discharge Point Summary.

Point	Proposed Discharge Point Location/Description
1	TDA 1 detention pond outfall
2	TDA 2 detention pond outfall
3	Culvert DR1-21 outfall
4	Culvert DR2-22 outfall
5	Culvert DR3-23 outfall
6	Culvert DR3-24 outfall
7	TDA 2 ditch outfall to wetland

2.6 Existing Utilities

The only existing utilities known to be on site are overhead dry utilities owned by Chelan County PUD crossing the proposed roadway alignment in several spots and following the existing roadway alignment. The roadway profile has been designed for adequate clearance from these lines.

3.0 DESIGN STANDARDS

3.1 Design Frequency

The project is in Climate Region 1 as described in the HRM. The storm events used for the project are summarized in Table 4 below.

For conveyance elements, there is more variation in the appropriate storm that the HM and HRM recommend. The project had a varying design storm selection depending on the characteristics of the basin. For the smaller on-site basins with impervious surfaces, the short-duration storm was used to capture the high intensity, short-duration storms that produce more runoff for small basins with little attenuation. For the off-site forested basins, the long-duration storm produced a larger flow rate, so it was selected as the more conservative design.

Table 4. Applicable Storm Events.

Category	Recurrence Interval	Design Storm	Model
Runoff Treatment (upstream of flow control facility)	6-month 3-hour	Short-duration storm (5-minute time steps)	StormShed3G SCS WSDOT MFD Spreadsheet
Flow Control	Match ½ of the 2-year predeveloped peak flow rate, and match the 25-year predeveloped peak flow rate	Climate Region 1 long-duration storm	StormShed3G SCS
Conveyance (on-site flow)	2-year 3-hour peak flow rate	Short-duration storm (5-minute time steps)	StormShed3G SBUH
Culverts and Ditches (off-site flow)	25-year peak flow rate for ditches (10-year required, 25-year used) 25-year and 100-year peak flow rates were both analyzed for culverts.	Climate Region 1 long-duration storm	StormShed3G SBUH HY-8 (Culvert Headwaters)
Ditches (on-site flow)	2-year 3-hour peak flow rate	Short-duration storm (5-minute time steps)	StormShed3G SBUH

3.2 Stormwater Management Guidelines

See the Stormwater Design Documentation Spreadsheet in Appendix A-1 for a summary of which Minimum Requirements apply. Land cover disturbance is discussed in Section 3.2.5. Minimum Requirements based on land cover disturbances are discussed in Section 3.2.7.

3.2.1 Step 1 – Define the Boundaries of the Project Site

The boundaries of the project are the existing right-of-way on the Nason Creek side (northwest side), the project extents on SR 207 at the southwest and northeast ends of the project, and the proposed right-of-way adjacent to the proposed roadway alignment.

3.2.2 Step 2 – Identify the Type of Project

This project is a roadway project.

3.2.3 Step 3 – Identify the Receiving Water and Downstream Conveyance

Downstream conveyance is primarily sheet flow and flow within the receiving water body, Nason Creek, which is directly adjacent to the project site.

3.2.4 Step 4 – Perform Site Assessment and Planning

A site visit was performed by Perteet staff on December 19, 2025. Survey data was also used.

3.2.5 Steps 5 and 6 – Calculate Land Disturbing Activity and Calculate Target Surfaces

Land disturbing activity was calculated for each TDA. The area breakdowns are shown in Table 5 below. See Table 6 below for the target surfaces resulting from the proposed roadway realignment.

Table 5. Existing and Proposed Areas.

	Existing TDA 1 (SF)	Proposed TDA 1 (SF)	Existing TDA 2 (SF)	Proposed TDA 2 (SF)
Existing PGIS	93,879	N/A	50,156	N/A
New PGIS	N/A	92,637	N/A	46,319
Replaced PGIS	N/A	23,239	N/A	22,884
New NPGIS	N/A	0	N/A	0
Replaced NPGIS	N/A	0	N/A	0
Reverted Impervious Area (Existing PGIS-Natural Vegetation)	N/A	70,442	N/A	27,353

Table 6. Target Surface Areas in Each TDA.

	TDA 1 (SF)	TDA 2 (SF)
A. New PGIS (Runoff Treatment)	92,637	46,319
B. New Impervious Area	92, 637	46,319
C. Replaced Impervious Area	23,239	22,884
D. Reverted Impervious Area	70,442	27,353
Target Flow Control Surface (B + C – D)	45,434	41,850

3.2.6 Step 7 – Determine Which Minimum Requirements Apply

The flow charts below, taken from Chapter 3 of the HRM, outline the Minimum Requirements applicable at both the project and TDA levels. The Minimum Requirements can also be seen in the Stormwater Design Documentation Spreadsheet in Appendix A-1.

On a project level, Minimum Requirements 1-4 apply to new and replaced impervious surfaces and land disturbed, Minimum Requirement 5 applies to new and replaced PGIS, and Minimum Requirements 6-9 apply to new and replaced impervious surfaces and converted pervious surfaces. On a TDA level, Minimum Requirement 5 applies to effective PGIS and PGPS surfaces, and Minimum Requirement 6 (flow control) applies to effective impervious surfaces.

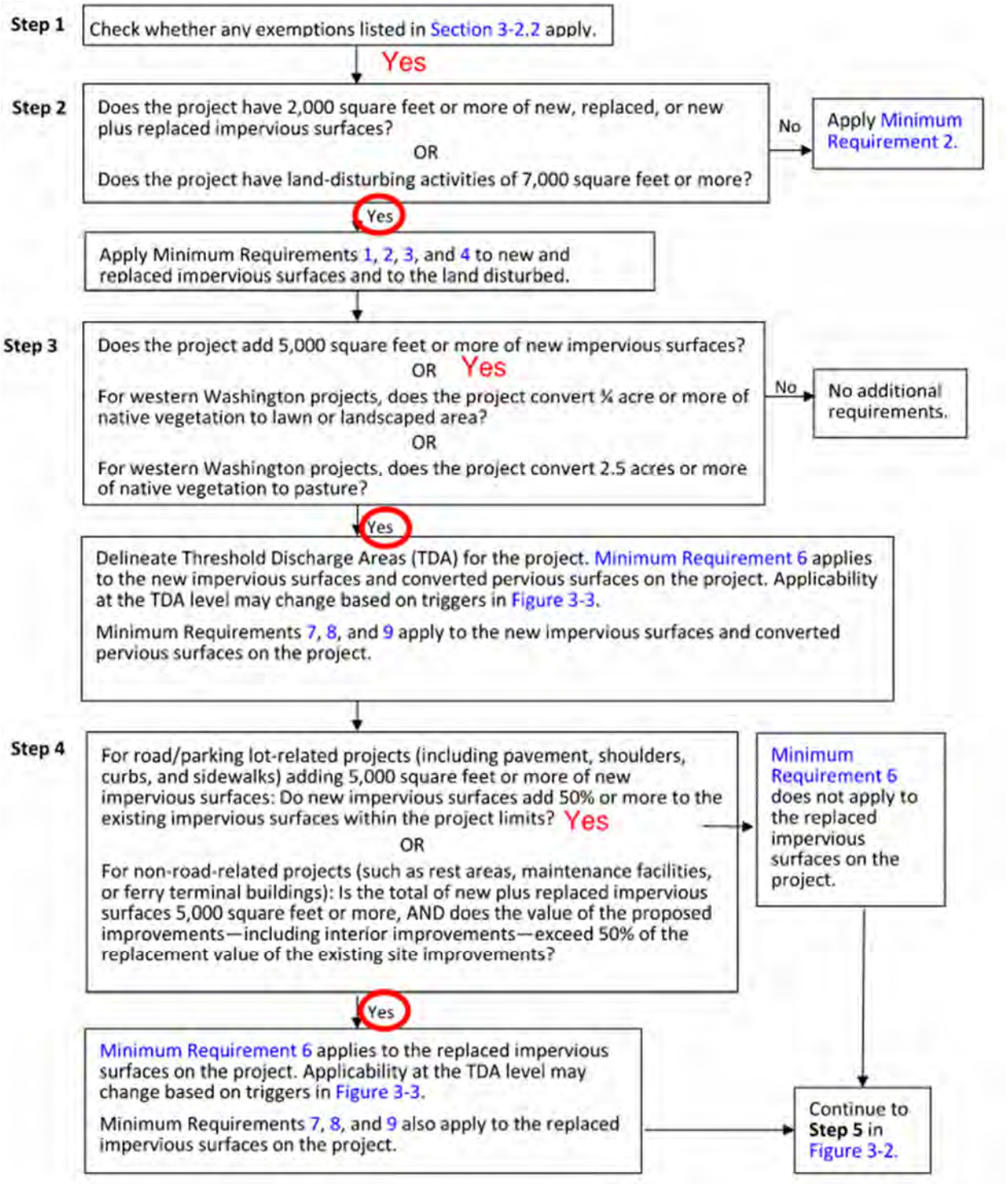


Figure 3. Minimum Requirements at a Project Level (Part 1).

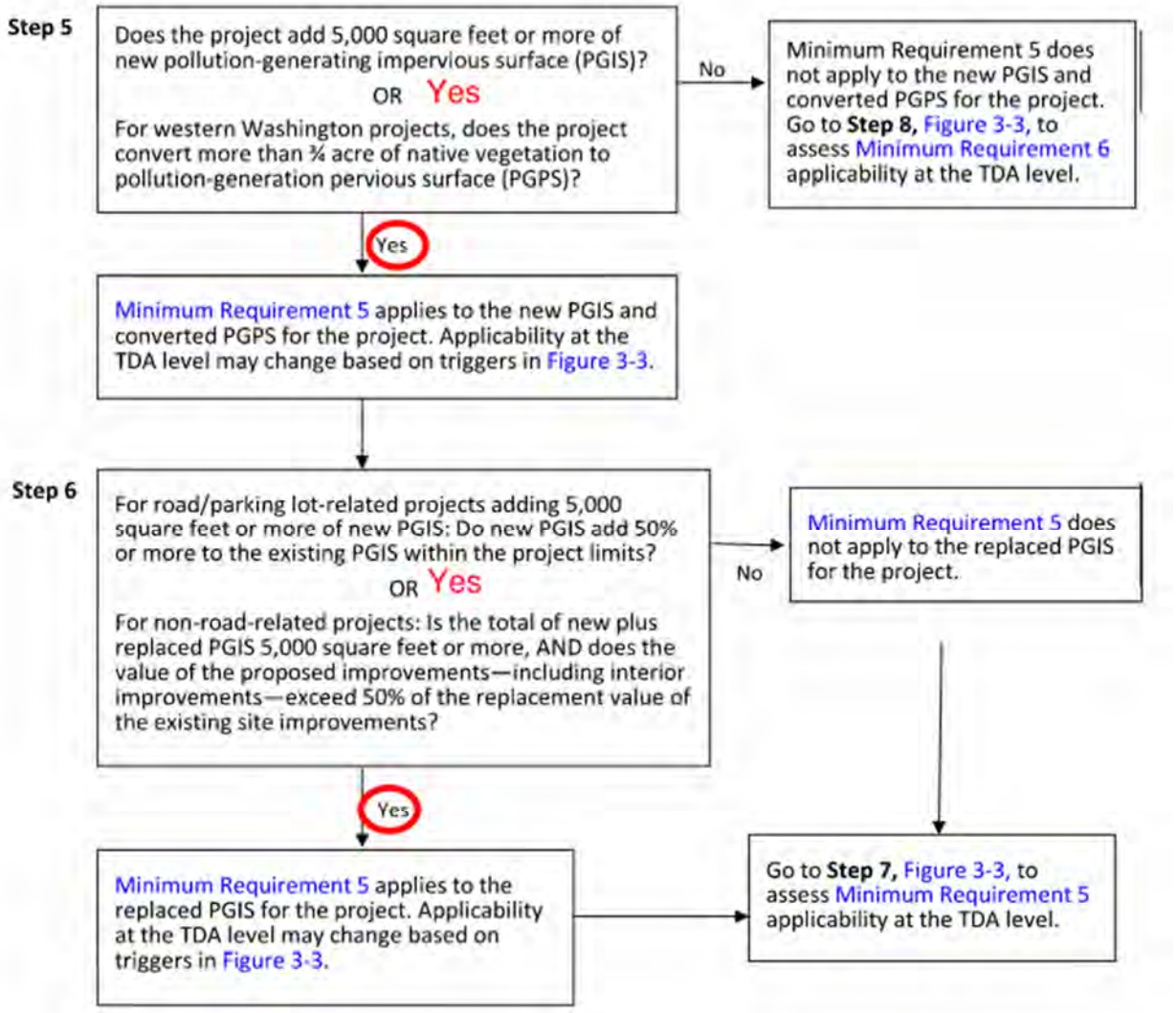


Figure 4. Minimum Requirements at a Project Level (Part 2).

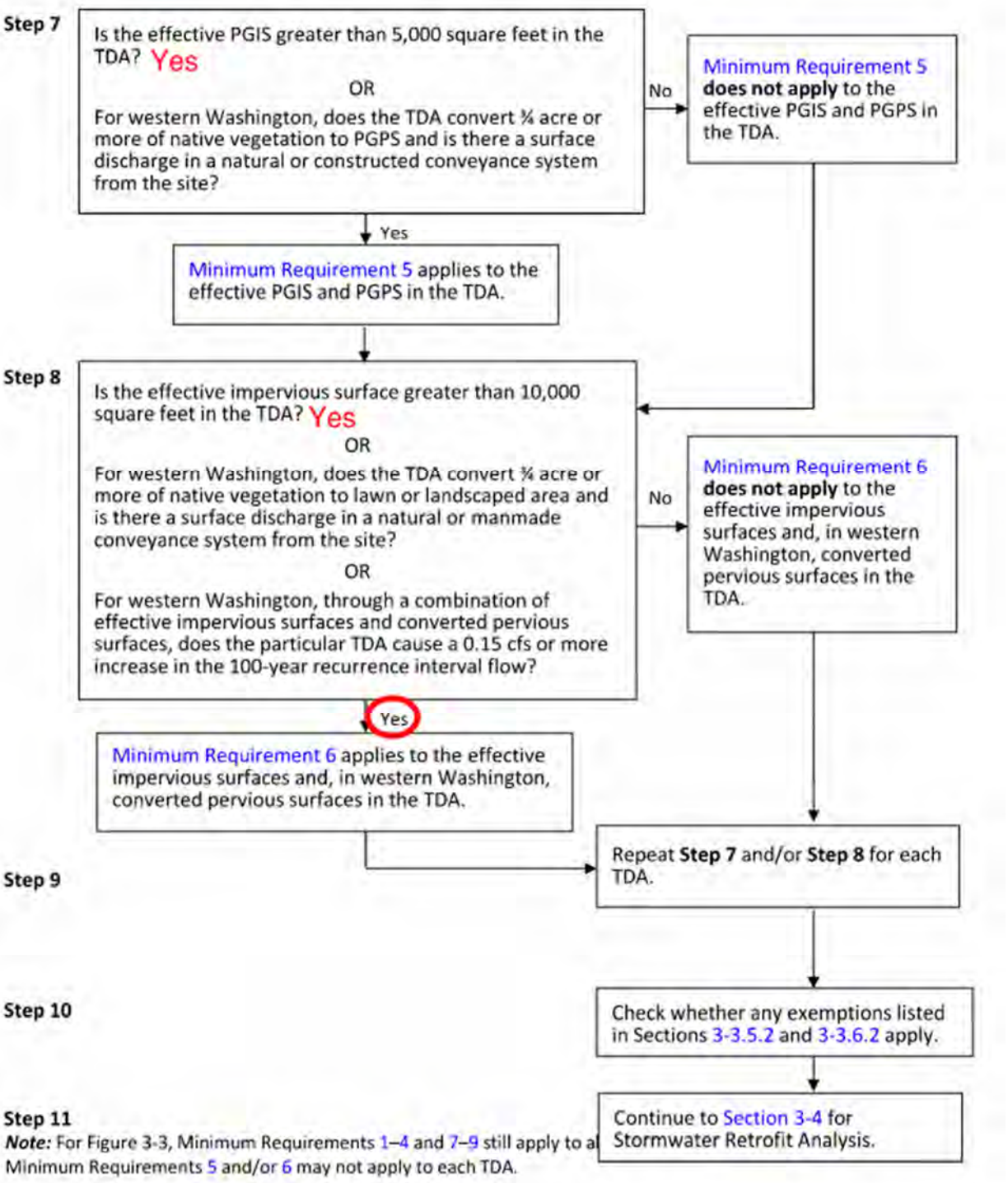


Figure 5. Minimum Requirements at a TDA Level.

Minimum Requirement 1 – Stormwater Planning

Proposed drainage design in Appendix A-4, this report, and the Stormwater Pollution Prevention Plan (SWPPP) are included in stormwater planning.

Minimum Requirement 2 – Construction Stormwater Pollution Prevention

A WSDOT Stormwater Pollution Prevention Plan (SWPPP) will be prepared by the contractor. Erosion and sediment control measures, as needed, are to be shown on the Temporary Erosion and Sediment Control (TESC) plans and will be included with future submittal.

Minimum Requirement 3 – Source Control of Pollutants

Source control (erosion control and spill prevention) applies to the entire project. Operational BMPs are non-structural practices that prevent or reduce pollutants from entering stormwater. Structural BMPs are physical, structural, or mechanical devices or facilities intended to prevent pollutants from entering stormwater. BMPs for Streets/Highways are discussed in S406 in the Washington State Department of Ecology Manual in Section 2.2: Pollutant Source-Specific BMPs. Applicable BMPs for Streets/Highway projects include:

- Select de- and anti-icers that cause the least adverse environmental impact. Apply only as needed using minimum quantities.
- Where practicable use roadway deicers, such as calcium magnesium acetate, potassium acetate, or similar materials, that cause less adverse environmental impact than urea, and sodium chloride.
- Store and transfer de and anti-icing materials on an impervious containment pad in accordance with BMP Storage or Transfer (Outside) of Solid Raw Materials, By-Products, or Finished Products.
- Sweep/clean up accumulated de and anti-icing materials and grit from roads as soon as possible after the road surface clears.

Minimum Requirement 4 – Maintaining the Natural Drainage System

The natural drainage patterns will be maintained as much as is feasible. Runoff from the hillside will be conveyed under the proposed road to Nason Creek via culverts, and flow from the project's BMPs will also be directed towards the creek.

Minimum Requirement 5 – Runoff Treatment

The two TDAs both contain more than 5,000 SF of effective pollution generating impervious surfaces, therefore, TDAs 1 and 2trigger runoff treatment.

The project is located outside the UGA and the ADT for SR207 per the WSDOT Traffic Counts map is 1,900. Per Table 3-1 in the Highway Runoff Manual and the WSDOT Stormwater Design Documentation Spreadsheet (See Appendix A-1), the project is subject to Basic Treatment.

Oil Control

Per Table 3-1 in the Highway Runoff Manual, oil control does not apply because AADT of the intersecting roads is far below the threshold of 30,000 for Eastern Washington roadways.

Phosphorous Control

Per Table 3-1 in the Highway Runoff Manual, phosphorous control does not apply because there is not a basin plan that requires phosphorus control.

Minimum Requirement 6 – Flow Control
Flow control is triggered if more than 10,000 SF of effective impervious surfaces are proposed (Figure 3-3 from the Highway Runoff Manual). The project triggers flow control on a project level for TDAs 1 and 2 for new and replaced impervious surfaces.

Minimum Requirement 7 – Wetlands
There are several wetlands associated with this project, described in Section 2.2.3. Per Section 3-3.7.3.2 of the HRM which describes wetland protection requirement for eastern Washington, runoff must be treated and controlled as dictated by Minimum Requirements 5 and 6 prior to entering the wetlands. Runoff from TDA 2 will be discharged to the wetland on the north end of the project (Wetland E). Runoff from the roadway in TDA 1 will be routed around the wetland in the center of the project site (Wetland A), because that wetland did not accept runoff from the impervious roadway surface previously, since it was upstream of the road. The upstream runoff flowing from the southeast off the hillside will bypass the roadway through proposed culverts and enter the wetland as it did before.

Minimum Requirement 8 – Incorporating Approved Basin Plans into Stormwater
There are no basin plans in this area that have been approved by the Department of Ecology.

Minimum Requirement 9 – Operations and Maintenance
Operations and maintenance for the catch basins, storm pipes, detention ponds, compost-amended biofiltration swales (CABS), media filter drains, and ditches shall be performed per the Department of Ecology or WSDOT standard practices as applicable with each element or BMP.

3.3 Stormwater Retrofit Analysis

Due to the project site topography and other factors, it is difficult to provide any retrofit for runoff treatment or flow control beyond the mitigation that is proposed to meet the minimum requirements.

3.4 Other Requirements

No additional requirements have been identified as part of this project.

3.5 Hydraulics Manual Deviations

The 2024 Hydraulics Manual (HM) was used for hydraulic design for this project. No deviations from the HM have been recommended as part of this project.

3.6 Highway Runoff Manual Deviations

The 2019 Highway Runoff Manual (HRM) was used for stormwater design for this project. No deviations from the HRM have been recommended as part of this project.

3.7 Pipe Alternatives

No pipe alternatives have been identified.

3.8 Upstream and Downstream Analysis

A downstream analysis includes a review of resources, a visual inspection of storm conveyance systems for evident erosion, sedimentation, and other drainage issues and a discussion of the possible effects due to proposed project improvements. Photos taken at various locations along the downstream route are included in the narrative below. The downstream routes were delineated and are shown on the Downstream Map in Appendix A-2.5.

Prior to performing field reconnaissance, information about the project site and its surrounding area was analyzed to become familiar with the site topography, TDAs, the receiving water body (Nason Creek), and various other site related information.

3.8.1 TDA Downstream Flow Paths

The TDA quarter-mile downstream flow paths are detailed below. There are two TDAs identified for the project, see Section 2.3 above. See Appendix A-2.5 for the Downstream Map with the most direct quarter-mile flow paths for each discharge point of each TDA. Given the fact that Nason Creek and its nearby side channel are partially within the TDA, the TDA delineation was not straightforward for this project. The routes considered for the TDA delineation were determined to be the best approximation of the downstream flow paths.

TDA 1

TDA 1 has two downstream flow paths. The first flow path, designated Flow Path 1 on the Downstream Map. Runoff sheet flows off the existing roadway and discharges from the TDA to the northwest and continues flowing overland for about 400 feet until reaching the creek. The runoff continues downstream for roughly 500 feet before re-entering the TDA at the right-of-way boundary. Since the flow path re-enters the TDA, this flow path was not counted as a downstream route for the purposes of TDA delineation but is described for context, since it was initially considered a downstream route early in the TDA delineation process.

The second flow path, designated as Flow Path 2, begins in Nason Creek in the portion that is inside the right-of-way line. There are two flow directions here. Flow could either enter the main stem of Nason Creek flowing north or enter a side channel that flows northeast. It was decided that most flow will continue in the main channel. Flow from this discharge point reaches the quarter-mile point in the main channel of Nason Creek and continues past the TDA 2 portion of the project.

Photo 1. Looking west from SR 207 at Nason Creek bend.

TDA 2

TDA 2 also has two downstream flow paths. One (Flow Path 3) begins in the side channel of Nason Creek at the north edge of TDA 2. Waters exit the TDA and enter a large culvert that crosses SR207 and outfalls in the side channel on the east side of SR 207. Flow continues to the east until the quarter-mile mark.

The second flow path (Flow Path 4) begins as runoff sheet flowing from the TDA down a steep hill to join the same channel as Flow Path 3. The two flow paths combine prior to Flow Path 3's quarter-mile point.

Photo 2. Looking north at existing side channel crossing under SR 207 at a large CMP culvert.

3.8.2 Inspection of Drainage Conveyance

A site visit was conducted on December 19, 2025. There are currently no developed drainage systems in the area except for culverts that cross the existing roadway to allow runoff to enter Nason Creek. There are roadside ditches along the east side of the road conveying flow to the existing culverts. The west side of the road sheet flows directly to Nason Creek.

3.8.3 Upstream Analysis and Mitigation

An analysis of off-site drainage effects was completed during the site visit on December 19, 2025. The intent is for all runoff coming from upstream areas onto the project site to be intercepted by a ditch on the south side of the road. Culverts will collect runoff from the ditch and convey it under the proposed roadway. It is intended that no upstream runoff impacts the proposed roadway. The upstream basin is primarily forested, but quite large, so a bypass ditch and culvert system was deemed to be crucial. It is also important to keep this relatively clean water from mixing with the stormwater flowing off the road.

4.0 DEVELOPED CONDITIONS

The proposed roadway realignment of SR 207 will significantly alter the drainage conditions of the project site. This section of roadway will now be upstream of the wetland areas that are on the southeast side of the current roadway alignment. Upstream runoff will hit the proposed roadway and needs to be directed in the same drainage flow path as existing conditions to the maximum extent feasible. Runoff from the new roadway surface will be treated through a combination of media filter drains (MFDs) and compost-amended biofiltration swales (CABS) and flow control will be provided using detention ponds, one in each TDA. See Tables 7 and 8 for the list of BMPs and areas that they mitigate.

4.1 Drainage Basins

Drainage basins on the project vary in size, slope, and land cover. On-site basins primarily collecting runoff from impervious areas into a conveyance feature. These basins vary in slope along the length of the road, with flatter slopes at the center of the project near the highpoint and at the north and south ends of the project. The slopes will be steeper in the sections either side of the highpoint. The roadway is generally superelevated to the west side, so on-site conveyance systems such as conveyance pipes and structures or roadside ditches catch all the flow on the west side, or downhill side of the project. The cleaner natural flow from the forested hillside off-site to the east is captured and conveyed past the on-site waters.

The off-site basins discharge into either one of the four bypass culverts proposed to send runoff past the project site, or to the off-site interceptor ditch in TDA 2 which flows to the existing Nason Creek side channel/wetland. These basins consist of primarily forested land cover but are dotted with some other features such as access trails and the existing forest road (Rieche Road) that traverses the hillside. The hillside contours are displayed in Appendix A-2.4, the Culvert Catchment Areas map. The slopes range from high slopes of 30% or more near the top of the ridge, to slopes of 5-10% or flatter at the bottom of the hill near the proposed roadway location. Slopes flatten out in the two existing wetlands adjacent to the existing roadway.

The proposed Flow Control Areas and Conveyance Areas can be seen in Appendices A-2.2 and A-2.3, respectively. See the Culvert Catchment Areas map in Appendix A-2.4 for a delineation of the off-site areas tributary to the culverts and off-site interceptor ditches.

4.2 Post-Developed Drainage Patterns

The post-developed drainage patterns within the project area are proposed to mimic existing conditions to the maximum extent practicable. The upstream flows will bypass the project and enter the wetlands as in the existing condition. The roadway runoff will be discharged to the wetland adjacent to TDA 2, but in TDA 1 roadway runoff will bypass the wetland in TDA 1 and be directed towards Nason Creek. The main change that the project will make is that the roadway in the realigned portion will no longer be discharged to Nason Creek in as direct a fashion (at least until Nason Creek meanders since it will no longer be restricted like it is in the existing condition). The runoff will be mitigated prior to discharge into Nason Creek, which was previously not the case as there are currently no BMPs on site.

4.3 Flow Control

The proposed design includes two detention ponds, one in each TDA. See Table 7 below for a summary of the contributing areas to each pond. See Appendix A-2.2 in Appendix A-2 for contributing areas to BMP facilities.

Appendix A-3 contains pond sizing calculations. See Appendix A-4 for the drainage plans to see where the ponds are located on the project.

Table 7. Summary of Detention Facilities.

Pond	Total Flow Control Area (Acres)	Impervious Area (Acres)
TDA 1	2.54	1.50
TDA 2	1.48	1.36
Total	4.02	2.86

4.4 Runoff Treatment

The proposed design will provide runoff treatment for 4.17 acres of PGIS. See Table 8 below for a summary of runoff treatment BMP facilities for the project. See Appendix A-2.2 in Appendix A-2 for contributing areas to BMP facilities. Appendix A-3 contains the runoff treatment BMP sizing calculations. See Appendix A-4 for the drainage plans to see where the BMPs are located on the project.

Table 8. Summary of Runoff Treatment BMP Facilities.

BMP Facility Type	Total BMP Runoff Treatment Area (Acres)	PGIS Area (Acres)
MFD Type 1 (TDA 1)	0.26	0.18
MFD Type 3 (both TDAs)	3.46	2.63
CABS (TDA 2)	1.48	1.36
Total	5.20	4.17

5.0 HYDROLOGIC AND HYDRAULIC DESIGN

A key aspect of stormwater management is to assess stormwater impacts resulting from the proposed roadway improvements and implement an effective drainage design to best mitigate the impacts by following the requirements in the WSDOT HRM and WSDOT Hydraulics Manual. The following section outlines the hydrologic and hydraulic design criteria and assumptions used for the sizing and modeling runoff treatment facilities. Supporting calculations are included in Appendix A-3, BMP contributing exhibits are included in Exhibit A-2.7, and proposed drainage design are provided in Appendix A-4.

The design of stormwater facilities is based on requirements outlined in the WSDOT HRM and WSDOT Hydraulics Manual.

5.1 Flow Control

The project impacts the surrounding area by realigning the highway and triggers flow control. The project consists of two TDAs separated by a highpoint and proposes two detention ponds to mitigate increases to downstream flow rates. Based on calculations provided in Appendix A-3, the resulting ponds are summarized in Table 9 below:

Table 9. Detention Pond Parameters.

TDA	Live Storage Volume					
	Bottom Area (SF)	Live WSEL (FT)	Minimum Volume (CF)	Side Slopes (H:V)	Minimum Depth w/ Freeboard (FT)	Volume Provided (CF)
1	7,320	1963.0	10,874	3:1	3	14,442
2	2,801	1941.5	6,570	3:1	4	22,248

Modeling utilized the SCS method to estimate runoff of a Region 1, 36-hour storm for the flow control design. Based on the presence of wetlands and a review of the NRCS WSS, Perteet assumed soils were classified as hydrologic soil group C and an antecedent moisture condition (AMC) of 3 (wet soils) was modeled. See Appendix A.3 for additional information and assumptions.

5.2 Runoff Treatment

The project proposes a combination of media filter drains (MFDs) and compost amended biofiltration swales (CABS) to achieve runoff treatment for all new and replaced pollution generating areas. Flow rates were modeled with the SBUH method in StormShed3G using the six-month short-duration design storm. Perteet assumed soils were classified as hydrologic soil group C and an antecedent moisture condition (AMC) of 3 (wet soils) was modeled.

5.2.1 Compost Amended Biofiltration Swale (CABS) Design

The CABS in TDA 2 was designed per the WSDOT HRM and using the WSDOT CABS design spreadsheet. The statistics for the CABS are summarized in Table 10 below. The CABS calculations are included in Appendix A-3.

Table 10. TDA 2 CABS Statistics.

Bottom Width (ft)	Length (LF)	Long. Slope (ft/ft)	Side Slopes (H:V)	WQ Design Depth (ft)	Depth w/ Freeboard (ft)
10	126	0.015	3:1	0.33	1.07

5.2.2 Media Filter Drain (MFD) Design

The MFDs on the project were designed per the WSDOT HRM and using the WSDOT MFD design spreadsheet. The statistics for the MFDs are summarized in Table 11 below. The MFD calculations are included in Appendix A-3.

Table 11. MFD Statistics.

MFD	Minimum Pavement Width (ft)	Maximum Pavement Width (ft)	Contributing Area to MFD (ac)	Length of MFD (ft)
1-A	18.7	18.7	0.04	85.5
1-B	17.7	17.7	0.43	188.6
1-C	42.5	17.7	0.84	903.8
1-D	37.9	42.5	1.22	1227.0
1-E	42.4	42.5	0.15	158.0
1-F	42.5	42.5	1.76	176.8
1-G	10.0	10.0	0.08	119.1
1-H	10.0	10.0	0.02	86.6
2-A	16.1	47.8	0.17	205.4
2-B	16.7	16.7	0.06	135.0

5.3 Conveyance

Stormwater plan and profile sheets are shown on the drainage plan sheets found in Appendix B, including proposed pipe networks and ditches. This section covers key assumptions and design considerations relating to conveyance design.

Conveyance sizing calculations were performed using StormShed3G and are included in Appendix A-3. The SBUH method was used to calculate the runoff for areas tributary to the on-site conveyance. The eastern Washington short-duration design storm was used to calculate the flow rates to the conveyance system, since it produces greater flow than the Region 1 long-duration storm when applied to smaller impervious basins.

The project includes several conveyance systems, one in each TDA. The TDA 1 system takes runoff from an MFD Type 1 and directs it to the roadside ditch on the west side of the road, which conveys the west-side MFD flows to the TDA 1 detention pond. The TDA 2 system conveys roadway runoff to the TDA 2 CABS, which is upstream of the TDA 2 detention pond.

The results of the calculations showed that 12" pipes have adequate capacity for the calculated flow rates. See Appendix A-3 for the full results of the conveyance calculations. One consideration to note is that the proposed pipe cover is low for several pipes on the project. Ductile iron pipe is specified as the pipe material to ensure structural integrity and durability under shallow cover conditions.

5.3.1 Inlet Analysis

Inlet spacing analysis was completed for the project to confirm the proposed spread is less than the allowable spread and that flow bypass at the end of the gutter line does not exceed 0.1 CFS. The inlet spacing spreadsheet, sag calcs, and catchment areas are included in Appendix A-3.4. Inlet analysis was completed for both sections of the roadway either side of the high point in the center of the project (labeled as North and South). This analysis confirms that catch basins and curb cuts are properly located and that the design meets the criteria for spread and flow bypass.

5.3.2 Ditch Design

There are several ditches proposed on this project to convey runoff both from the project site itself, and to convey off-site runoff through the project site. An SBUH model in StormShed3G was used to confirm the sizing of each ditch. The on-site ditches have been designed using the short duration 2-year, 3-hour storm. The interceptor ditches to catch off-site flow have been designed using the 25-year Region 1 long duration 36-hour storm. Table 5.1 in the WSDOT TESC Manual and the WDOT Hydraulic Toolbox were used to set the channel armoring.

5.3.3 Culvert Analysis and Design

The project proposes to add a total of four culverts to convey upstream forested runoff downstream across the proposed roadway. The culverts were sized in FHWA's HY-8 program, which is preferred by WSDOT for culvert design. The hydrologic flow rate calculations were performed in StormShed3G using the SBUH method, and then flow rates were transferred to FHWA for the culvert sizing. For the calculation of off-site flow rates, the Region 1 long-duration design storm was used. The Region 1 long-duration storm is a 36-hour hyetograph specific to Region 1 (eastern slopes of the Cascades) in the WSDOT HRM.

The two relevant storm recurrence intervals for culvert design are the 25-year and 100-year storms. Below are the two key design standards relating to the relevant flow rates:

- For the 25-year storm, the ratio of headwater (HW) to diameter (D) during the 25-year event should be less than 1.25 (HW/D < 1.25).
- The 100-year flow must be passed without overtopping the roadway.

See Table 12 below for a summary of the sizes obtained from the HY-8 culvert analysis. For the full culvert flow calculations and sizing calculations, see Appendix A-3. See Appendix A-2.4 for the Culvert Catchment Area Map.

Table 12. Culvert Sizes and Materials.

Culvert ID	Material Option in HY-8	Manning's Roughness (n)	Actual Material Recommended	Diameter (inches)
DR1-21	Smooth HDPE	0.012	CPE*	30"
DR2-22	Smooth HDPE	0.012	CPE*	48"
DR3-23	Corr. PE	0.024	CPP*	18"
DR3-24	Corr. PE	0.024	CPP*	18"

**A standard WSDOT thermoplastic pipe item was selected that would correspond to the modeled n-value. Corrugated polyethylene (CPE) refers to a dual-wall polyethylene pipe with a corrugated outer wall and smooth*

interior. Corrugated polypropylene (CPP) refers to a dual-wall polypropylene pipe with a corrugated outer wall and corrugated interior.

Another factor considered in the culvert design is the inlet and outlet protection required at culverts. For end treatment, headwalls are required for certain materials and diameters per the HM. For this project, only Culverts DR2-22 and DR1-21 require headwalls. For outlet protection, an energy dissipator (typically a rock pad/basin) must be designed per Section 3-4.7 of the HM. See the design plans in Appendix A-4 for the required sizing of outfall protection pads for each culvert and see Section 5.4 below.

5.4 Outfall Protection

Conveyance and culvert outfalls were designed with energy dissipation rock pads as required in accordance with WSDOT HM and consider erosion and maintenance of the system. Energy dissipation at the piped conveyance systems and culvert outfalls are shown in the proposed drainage plan in Appendix A-4.

Each outfall is summarized in Table 13 below. Each outfall will include a minimum pad depth of 12 inches to effectively manage flow energy and prevent erosion. The depth and size/type of rock installed at each pad will depend on the diameter of the pipe at the outfall and the velocity at the outlet of the pipe. Pipe flow velocities at the outfalls are calculated in the culvert, ditch, and conveyance calculations included in Appendix A-3.

Table 13. Outfall Protection Summary.

	Outlet Velocity (fps)	Outlet Protection Material Required	D50 of Material	Depth of Pad
DR1-21	8.18	RESP Cl. A	0.67	2
DR2-22	11.67	RESP Cl. B	1.33	4
DR3-23	5.94	Quarry Spalls	0.33	1
DR3-24	4.49	Quarry Spalls	0.33	1
TDA 2 Off-Site Ditch	7.33	RESP Cl. A	0.67	2
DR2-03	1.98	Quarry Spalls	0.33	1
DR1-02	Assumed <7	Quarry Spalls	0.33	1
DR1-01	Assumed <7	Quarry Spalls	0.33	1
DR4-14	Assumed <7	Quarry Spalls	0.33	1
DR4-13	Assumed <7	Quarry Spalls	0.33	1

6.0 PERMITS AND ASSOCIATED REPORTS

The following sections discuss the permits and associated reports for this project.

6.1 Environmental Issues, Fish, and Other Endangered Habitat

The environmental issue to be solved by the project is the current restriction of Nason Creek's natural movement. Allowing Nason Creek to meander naturally will promote habitat and floodplain connection. An environmental review was completed by Perteet in August 2021 and is included in Appendix E.

6.1.1 Receiving Water Bodies

The site is adjacent to Nason Creek and existing wetlands which drain into Nason Creek. The project will maintain discharges to each to the maximum extent feasible and all post-project waters will reach Nason Creek.

6.1.2 Floodplains

This project is near the existing Nason Creek floodplain and prevents Nason Creek from moving and connecting to its historic floodplain. This project proposed to realign SR 207 to mitigate this issue and to enhance natural wetland and floodplain processes.

6.1.3 Stream Crossings

The project does not have stream crossings within project limits.

6.1.4 Wetlands

The project is adjacent to existing wetlands. The wetlands are described in Section 2.2.3 of this report and detailed further in Appendix E. The project will maintain flows to these wetlands to the maximum extent feasible. The project will propose to revert existing highway pavement to be abandoned into natural vegetation, enhance existing wetlands, mitigate increases to flow rates, and achieve runoff treatment. Based on Section 3-3.7.3.2 and discussions with WSDOT and Interfluve, meeting flow control and runoff treatment requirements in the HRM will meet Minimum Requirement 7 – Wetland Protection.

6.1.5 Steep Slopes

The project realigns SR 207 onto existing moderate-to-steep slope forest and will be adjacent to steep slopes. BMPs that are infeasible near steep slopes are not proposed.

6.1.6 Other Sensitive Areas

The Department of Health Source Water Assessment Program (SWAP) mapping application identifies one wellhead protection area at the southern end of the site. Because a road with stormwater control would likely be considered a low intensity land use and because the site has low soil permeability according to the US Department of Agriculture Web Soil Survey, the potential designation of aquifer recharge area should not be a limiting factor.

Because the proposed roadway may be located near the wellhead, precautions should be taken to avoid well impacts.

6.1.7 Fish Surveys

According to WDFW SalmonScape map, Nason Creek is home to Spring-Run Chinook Salmon and Winter Steelhead. In addition, Nason Creek supports:

- Rainbow Trout
- Westslope Cutthroat
- Dolly Varden/Bull Trout

6.1.8 Endangered and Threatened Species

Nason Creek supports habitat for Chinook Salmon (endangered) and Steelhead (threatened). The project proposes to enhance habitats for these species to improve rearing and spawning. The PHS map identifies the upland project areas as masked for Spotted Owl, mule deer fawning, and elk calving.

6.1.9 Fish Passage

There are no identified stream crossings along the proposed roadway alignment.

6.1.10 Impaired Water Bodies

There are no known 303(d) water quality impairments and the project proposed to mitigate flow control and runoff treatment impacts.

6.2 Permits/Approvals

Permits and Approvals have been obtained for the project and have been documented under a separate cover.

- NPDES – Construction Stormwater General Permit Notice of Intent
- State Environmental Policy Act (SEPA)
- National Environmental Policy Act (NEPA)
- Hydraulic Project Approval (HPA).
- National Historic Preservation Act (NHPA) Section 106
- Endangered Species Act (ESA) Section 7
- Endangered Species Act Biological Assessment
- US Army Corps of Engineers Clean Water Act Section 404.
- Joint Aquatic Resources Permit Application (JARPA)
- Floodplain Development Permit

6.3 Easements

ROW easements are required to realign the highway through US Forest Service Property

6.4 Additional Reports or Studies

Additional reports and studies prepared for this project are listed below:

- Critical Areas Report
- Geotechnical Report (Appendix C)
- Noise Analysis
- NOAA Restoration Center's Programmatic Environmental Impact Statement
- Supplemental Environmental Assessment
- Wetland Assessments (Appendix E)

7.0 MAINTENANCE SUMMARY

A BMP's Owner's Operation and Maintenance Manual for each of the BMPs constructed by the project is included in Appendix D of this report. WSDOT's North Central Region Maintenance Area 2 will be responsible for maintaining and operating the constructed stormwater facilities of the project. Maintenance procedures outlined in the WSDOT HRM and the WSDOT Maintenance Manual will be followed. See below for the type of facilities that will require inspection and maintenance.

- Detention Ponds
- CABS
- MFD
- Catch Basins and Pipes
- Energy Dissipation
- Ditches

APPENDIX A-1

WSDOT Stormwater Design Documentation Spreadsheet

Project Title:	**Nason Creek/SR207 Realignment**
WSDOT Region:	North Central
WIN:	
PIN(s):	
Design Manual Used:	Highway Runoff Manual
Manual Publication Year:	2019
Job Number:	

2019 HRM Spreadsheet Version 6.3

Is this project in western Washington? **NO**

Existing Impervious Surface

Total Project Area (ft^2)	143,918
acres =	3.304

New Impervious Surface

Total Project Area (ft^2)	155,615
acres =	3.572

Conversion of Native Vegetation to Lawn or Landscaped

Total Project Area (ft^2)	N/A

Conversion of Native Vegetation to Pasture

Total Project Area (ft^2)	N/A

Replaced Impervious Surface

Total Project Area (ft^2)	46,123
acres =	1.059

Land Disturbing Activity

Total Project Area (ft^2)	280,874
acres =	6.448

Is this project a "non-road-related" project? (See HRM Glossary for definition) **NO**

Set the box to the right to NO -----> **NO**

Description	Project Area	Threshold Area Triggers	HRM Figure 3-1 Step #	Decision Response	HRM Minimum Requirements
New and replace impervious surfaces added to Project	201,738	≥ 2,000 ft^2	2	YES	Apply MR 1-4 to the new and replaced impervious surfaces and land disturbed on the Project
Land disturbing activity for the Project	280,874	≥ 7,000 ft^2	2	YES	Apply MR 1-4 to new and replaced impervious surfaces and land disturbed on the Project
New impervious surface added to Project	155,615	≥ 5,000 ft^2	3	YES	Apply MR 6-9 for new impervious surfaces and converted pervious surfaces on the Project
Conversion of native vegetation to lawn or landscaped area	N/A	≥ 32,670 ft^2 (3/4 acres)	3	N/A	N/A
Conversion of native vegetation to pasture	N/A	≥ 108,900 ft^2 (2.5 acres)	3	N/A	N/A
New impervious surfaces add 50% or more to the existing impervious surfaces within the Project limit	108%	New impervious ≥ 5,000 sq. ft AND (New Impervious surface) ≥ 1/2 (Exist Impervious surface)	4	YES	Apply MR 6-9 to replaced impervious surfaces on the Project
For non-road-related Projects, proposed value of improvements greater than replacement value	See HRM Figure 3-1 for complete threshold. Non-road-related project generally refers to rest area, ferry terminals, and maintenance facility Projects.	(New impervious + replaced impervious) ≥ 5,000 sq. ft AND (Proposed value of improvements) ≥ 1/2 (replacement value of existing site)	4	N/A	Check road-related project threshold above

Summary of All Minimum Requirements:

Apply MR 1-4 to New and Replaced impervious surfaces and land disturbed on the Project
Apply MR 6-9 to New impervious surfaces and Converted pervious surfaces on Project
Apply MR 6-9 to Replaced imperious surfaces on Project
Complete the Level of Retrofit Tab
Go To the 'Step 5 and 6' tab

MR #	Minimum Requirements	MR #	Minimum Requirements
1	Stormwater Planning	6	Flow Control (Quantity)
2	Construction Stormwater Pollution Prevention	7	Wetlands Protection
3	Source Control of Pollutants	8	Incorporating Approved Basin Plans into Stormwater Management
4	Maintaining the Natural Drainage System	9	Operation and Maintenance
5	Runoff Treatment (quality)		

Project Title: Nason Creek/SR207 Realignment
WSDOT Region: North Central
WIN:
PIN(s):
Design Manual Used: Highway Runoff Manual
Manual Publication Year: 2019
Job Number:

2019 HRM Spreadsheet Version 6.3

Is this project in western Washington? NO

Existing PGIS

Total Project Area (ft^2)	143,918
acres =	3.304

New PGIS

Total Project Area (ft^2)	136,956
acres =	3.144

Conversion of Native Vegetation to PGPS

Total Project Area (ft^2)	N/A

Replaced PGIS

Total Project Area (ft^2)	46,123
acres =	1.059

Is this project a "non-road-related" project? (See HRM Glossary for definition) NO

Description	Project Area (ft^2)	Threshold Area (ft^2)	HRM Figure 3-2 Step #	Decision Response	HRM Minimum Requirements
New PGIS added to Project	136,956	≥ 5,000	5	YES	Apply MR 5 for new PGIS and converted PGPS on the Project
Conversion of Native Vegetation to PGPS	NA	≥ 32,670 (3/4 acres)	5	N/A	N/A
New PGIS add 50% or more to the existing PGIS within the Project limit	95%	New PGIS ≥ 5,000 AND (New PGIS) ≥ 1/2 (Exist PGIS)	6	YES	Apply MR 5 to Replaced PGIS on Project
For non-road-related Projects, proposed value of improvements greater than replacement value	See HRM Figure 3-1 for complete threshold. Non-road-related Project generally refers to rest area, ferry terminals, and maintenance facility projects.	(New PGIS + replaced PGIS) ≥ 5,000 AND (Proposed value of improvements) ≥ 1/2 (replacement value of existing site)	6	N/A	Check road-related project threshold above

Summary of All Minimum Requirements:

Apply MR 5 to New PGIS and converted PGPS the on Project
Apply MR 5 to Replaced PGIS on the Project
Complete the Level of Retrofit Tab
Go to Step 7 RT tab

MR #	Minimum Requirements	MR #	Minimum Requirements
1	Stormwater Planning	6	Flow Control (Quantity)
2	Construction Stormwater Pollution Prevention	7	Wetlands Protection
3	Source Control of Pollutants	8	Incorporating Approved Basin Plans into Stormwater Management
4	Maintaining the Natural Drainage System	9	Operation and Maintenance
5	Runoff Treatment (quality)		

Project Title: Nason Creek/SR207 Realignment
WSDOT Region: North Central
WIN:
PIN(s):
Design Manual Used: Highway Runoff Manual
Manual Publication Year: 2019
Job Number:

2019 HRM Spreadsheet Version 6.3

Refer to HRM Figure 3-3 Step 7
Are the replaced PGIS applicable to the project per HRM Figure 3-2 Step 6? YES
Are there any existing runoff treatment Stormwater BMPs within the project limits? <---Choose YES or NO

Is this project in western Washington? NO

Does the project have retrofit requirements for discharges to Puget Sound? NO

TDA Description	Description	New PGIS Area (ft^2)	Replaced PGIS Area (ft^2)	Non-Effective PGIS Area (ft^2)	Effective PGIS Area (ft^2)	Converted PGPS Area (ft^2)	RT needed for TDA based on Effective PGIS? *Flow Chart Step 7* (Yes/No)	RT needed for TDA based on PGPS? *Flow Chart Step 7* (Yes/No)	RT needed for TDA? PGIS Area (ft^2)	RT needed for TDA? Converted PGPS Area (ft^2)	If RT needed, what is ADT of roadway in TDA? (ADT)	Is Roadway inside Urban Growth Area? (Yes/No)	Does the Roadway Have Full or Partially Controlled Limited Access? (Yes/No)	Enhanced RT or Basic RT?	Oil Control (Yes/No)	Phosphorus Control? (Yes/No)	Comments
1	South TDA	90,637	23,239		113,876		YES	N/A	113,876	N/A	1,900	NO	NO	Basic RT	NO	NO	
2	North TDA	46,319	22,884		69,203		YES	N/A	69,203	N/A	1,900	NO	NO	Basic RT	NO	NO	

Project Title: Nason Creek/SR207 Realignment
WSDOT Region: North Central
WIN:

PIN(s):

Design Manual Used: Highway Runoff Manual
Manual Publication Year: 2019
Job Number:

2019 HRM Spreadsheet Version 6.3

Refer to HRM Figure 3-3 Step 8
Are the replaced Impervious surfaces applicable to the project per HRM Figure 3-1 Step 4? YES
Are there any existing flow control stormwater BMPs within the project limits? NO

Is this project in western Washington? NO

Does the project have retrofit requirements for discharges to Puget Sound? NO

TDA Description	Description		New Impervious Surface Area (ft^2)	Reverted Impervious Surface** Area (ft^2)	Net-New Impervious Surface Area (ft^2)	Replaced Impervious Surface Area (ft^2)	Non-Effective Impervious Surface Area (ft^2)	Effective Impervious Surface Area (ft^2)	Conversion of Native Vegetation to Lawn or Landscape per TDA Area (ft^2)	Increase of 0.15 cfs in 100-year Recurrence Interval Flow for TDA?*** (Yes/No)	FC Needed for TDA based on Effective Impervious surface threshold? (Yes/No)	FC needed for TDA based on Native Vegetation Conversion? (Yes/No)	FC needed for TDA based on 0.15 cfs increase in flow? (Yes/No)	FC needed for TDA? Effective Impervious Area (ft^2)	FC needed for TDA? Converted Pervious Surfaces Area (ft^2)	Comments
1	South TDA	90,637	70,442	20,195	23,239	0		43,434	0	NO	YES	N/A	N/A	43,434	N/A	
2	North TDA		46,319	27,353	18,966	22,884	0	41,850	0	NO	YES	N/A	N/A	41,850	N/A	

Project Title: **Nason Creek/SR207 Realignment**
WSDOT Region: North Central
WIN:
PIN(s):
Design Manual Used: Highway Runoff Manual
Manual Publication Year: 2019
Job Number:

2019 HRM Spreadsheet Version 6.3

Is this a WSDOT project initiated by WSDOT (i.e., this isn't a project initiated by a developer, local agency, or other state agency)?**	NO	
Does any part of the project drain to Puget Sound AND does any TDA in the project exceed runoff treatment or flow control thresholds?		
Are the replaced Impervious surfaces applicable to the project per HRM Figure 3-2 Step 5?	YES	
Are the replaced PGIS applicable to the project per HRM Figure 3-2 Step 6?	YES	
Was there any retrofitting of existing impervious surfaces and/or existing PGIS done by the project (including offsite in-kind retrofitting)?	NO	
Choose N/A ---------->	N/A	
Choose N/A ---------->	N/A	
Choose N/A ---------->	N/A	
Leave Blank ---------->		acres
Leave Blank ---------->		acres
Leave Blank ---------->		acres
Leave Blank ---------->		acres
Leave Blank ---------->		acres
Leave Blank ---------->		acres
Leave Blank ---------->		acres
Choose N/A ---------->	N/A	
Choose N/A ---------->	N/A	
Leave Blank ---------->		
Were any new permanent stormwater BMPs constructed by the project OR were any existing stormwater BMPs modified by the project?	YES	

Goto the 'BMPs_New_or_Modified' and 'BMPs_Removed_or_Modified' tabs and enter in the permenant stormwater BMP information.

Project Title:	**Nason Creek/SR207 Realignment**
WSDOT Region:	**North Central**
CN WIN:	
PIN:	
Design Manual Used:	**Highway Runoff Manual**
Manual Publication Year:	**2019**
Job Number:	
CN Contract Number:	
SubstantiallyCompleteOperationallyComplete Date:	
CNPhaseEndPlanned Date:	
CNPhaseEndActual Date:	
Is the project within the WSDOT NPDES permit area?	
CN PE:	

2019 HRM Spreadsheet Version 6.3

State Route	Begin MP	Begin Latitude** (in Decimal Degrees)	Begin Longitude** (in Decimal Degrees)	End MP	End Latitude** (in Decimal Degrees)	End Longitude** (in Decimal Degrees)	TDA Name	Stormwater BMP Type	Is this an existing BMP to be modified by project or is this a new BMP?	Will this BMP be owned and operated by WSDOT?	Will this BMP be maintained by WSDOT?	List the old WSDOT Feature Number*** (existing BMPs that will be modified by the project will be given a new Feature Number)	List the new WSDOT Feature Number*** (existing BMPs that will be modified by the project will be given a new Feature Number)	Is this BMP designed to full or partial HRM standards?****	List the amount of Effective Impervious Surface (flow control) mitigated by the new or modified BMP (Acres)	List the amount of Effective PGIS (runoff treatment) mitigated by the new or modified BMP (Acres)	If retrofitting existing impervious surfaces, list the amount of existing impervious surface mitigated by the new or modified BMP for flow control (Acres)	If retrofitting existing PGIS, list the amount of existing PGIS mitigated by the new or modified BMP for runoff treatment (Acres)	Comments

Project Title:	**Nason Creek/SR207 Realignment**
WSDOT Region:	**North Central**
CN WIN:	
PIN:	
Design Manual Used:	**Highway Runoff Manual**
Manual Publication Year:	**2019**
Job Number:	
CN Contract Number:	
SubstantiallyCompleteOperationallyComplete Date:	
CNPhaseEndPlanned Date:	
CNPhaseEndActual Date:	
Is the project within the WSDOT NPDES permit area?	
CN PE:	

2019 HRM Spreadsheet Version 6.3

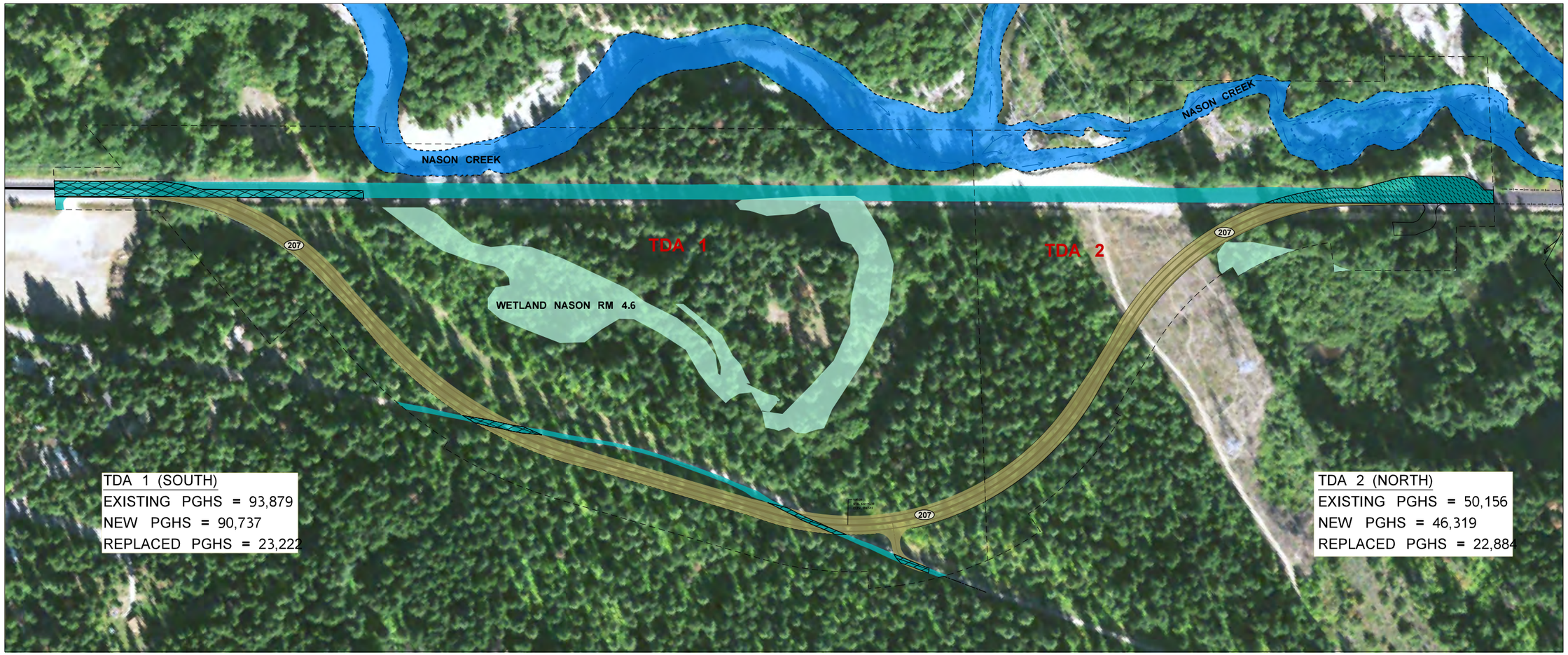
State Route	Begin MP	Begin Latitude** (in Decimal Degrees)	Begin Longitude** (in Decimal Degrees)	End MP	End Latitude** (in Decimal Degrees)	End Longitude** (in Decimal Degrees)	TDA Name	Existing Stormwater BMP Type	Is this an existing BMP going to be modified or completely removed by project?	Existing WSDOT Feature Number (See WSDOT HATS*** web application to determine Feature Number)	If this is an existing BMP being modified, please describe the proposed modification	List the amount of existing Impervious surface (flow control) mitigated by the existing BMP before the project (Acres)	List the amount of existing PGIS (runoff treatment) mitigated by the existing BMP before the project (Acres)	Is the amount of existing impervious surface and PGIS receiving treatment and flow control re-established by a new or modified BMP?	Comments
															ADF

To be incorporated at 90% design development.

APPENDIX A-2

Exhibits

Figures A-2.1:	Proposed Impervious Areas
Figure A-2.2:	Flow Control and Runoff Treatment Areas
Figure A-2.3:	Conveyance Areas
Figure A-2.4:	Off-Site Culvert and Ditch Areas
Figure A-2.5:	Downstream Map
Figure A-2.6:	Soils Map
Figure A-2.7:	Upstream Basin
Figure A-2.8:	Wetland Map
Figures A-2.9-A-2.13	Existing Conditions Maps



LEGEND

- TDA BOUNDARY
- EXISTING IMPERVIOUS AREA
- NEW PGIS AREA
- REPLACED IMPERVIOUS AREA
- RIVER
- WETLAND
- EDGE OF LANE

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\05 - Exhibits\00_Drainage Exhibits\202512 DR Exhibits\20240107_EXH_DR.dgn				REGION NO. / STATE	FED.AID PROJ.NO.	Plot 1
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DESIGNED BY	J. WALKER						OF
ENTERED BY	H. STACY						SHEETS
CHECKED BY	K. MCGEE				CONTRACT NO.	LOCATION NO.	
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

P.E. STAMP BOX — DATE

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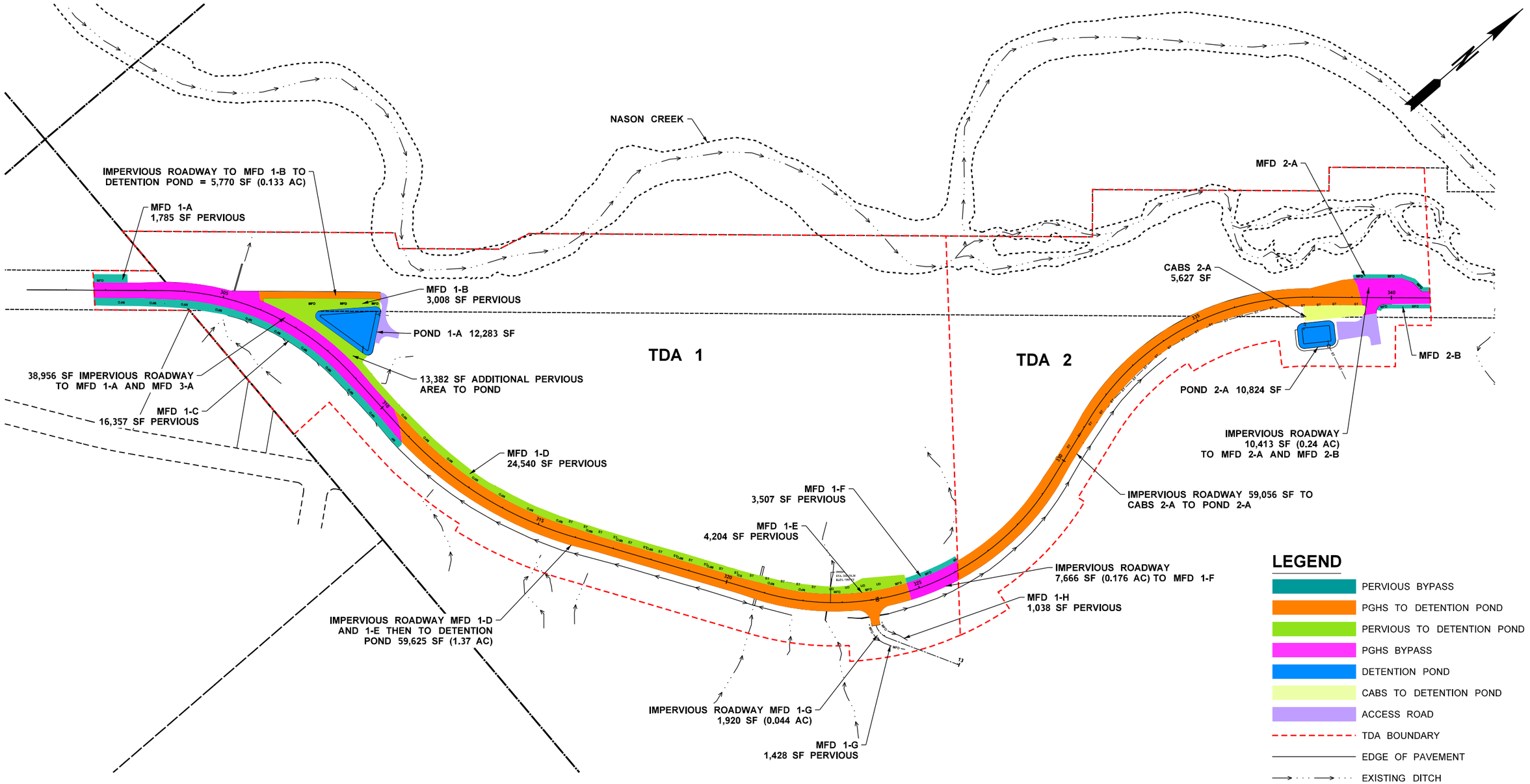
Washington State Department of Transportation

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT

TDA PGIS IMPERVIOUS



TDA 1
IMPERVIOUS TO FLOW CONTROL = 65,395 SF (1.501 AC)
PERVIOUS TO FLOW CONTROL = 45,134 SF (1.036 AC)
IMPERVIOUS TO TREATED = 113,937 SF (2.616 AC)

TDA 2
IMPERVIOUS TO FLOW CONTROL = 59,056 SF (1.356 AC)
PERVIOUS TO FLOW CONTROL = 5,627 SF (0.129 AC)
IMPERVIOUS TO TREATED = 69,469 SF (1.595 AC)

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ENTERED BY	H. STACY				CONTRACT NO.		LOCATION NO.
CHECKED BY	K. MCGEE						
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

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SR 207
NASON CREEK FLOODPLAIN REALIGNMENT

FLOW CONTROL

Plot 2

PLAN REF NO **A-2.2**

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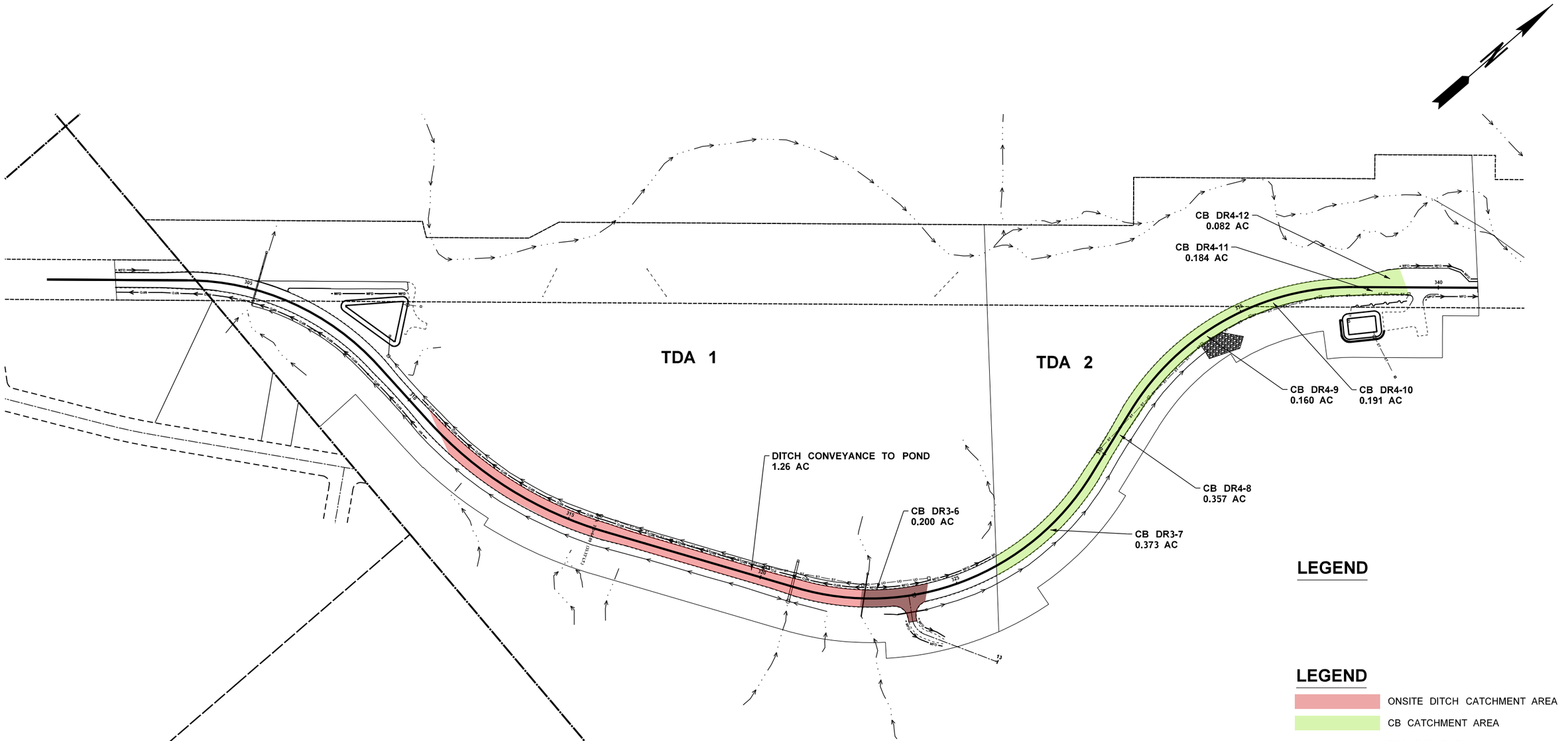

LEGEND

LEGEND

- ONSITE DITCH CATCHMENT AREA
- CB CATCHMENT AREA
- TDA BOUNDARY
- EDGE OF PAVEMENT
- EXISTING DITCH
- PROPOSED DITCH
- PROPOSED STORM DRAIN
- PROPOSED UNDER DRAIN
- MFD
- EDGE OF RIVER

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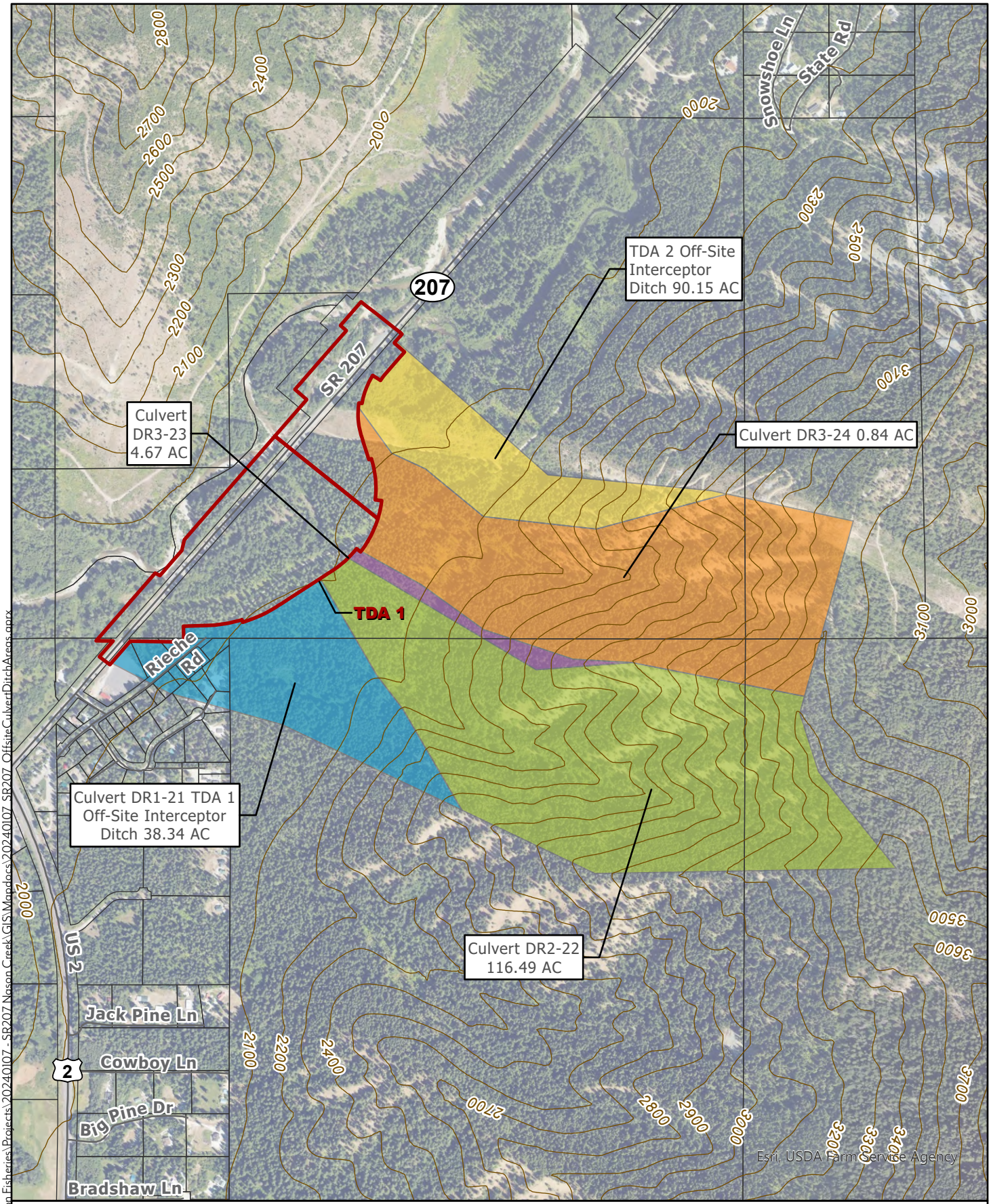
DESIGNED BY	J. WALKER				CONTRACT NO.	LOCATION NO.	SHEETS
ENTERED BY	H. STACY						
CHECKED BY	K. MCGEE				P.E. STAMP BOX / DATE	P.E. STAMP BOX / DATE	
PROJ. ENGR.	E. BORGES						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY	Washington State Department of Transportation	SR 207 NASON CREEK FLOODPLAIN REALIGNMENT	CONVEYANCE



PERTEET

0 500 1,000
Feet

Legend
TDA Boundary
Contours
Parcels

Yakima Nation Fisheries
SR 207 Nason Creek
A-2.4 Offsite Culvert/Ditch Areas

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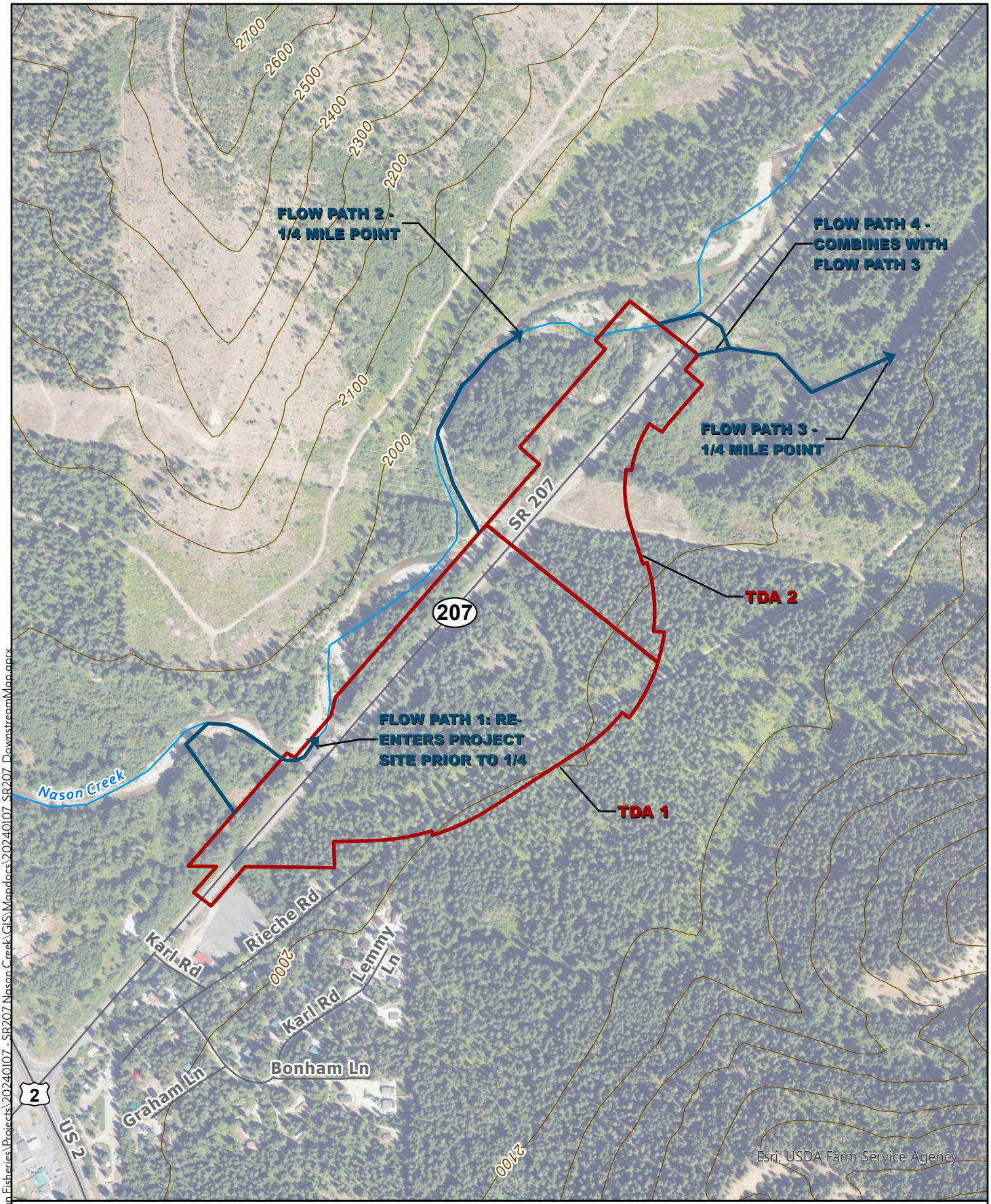

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Legend

TDA Boundary

Downstream Flow Path

Contours

Yakima Nation Fisheries
SR 207 Nason Creek
A-2.5 Downstream Map

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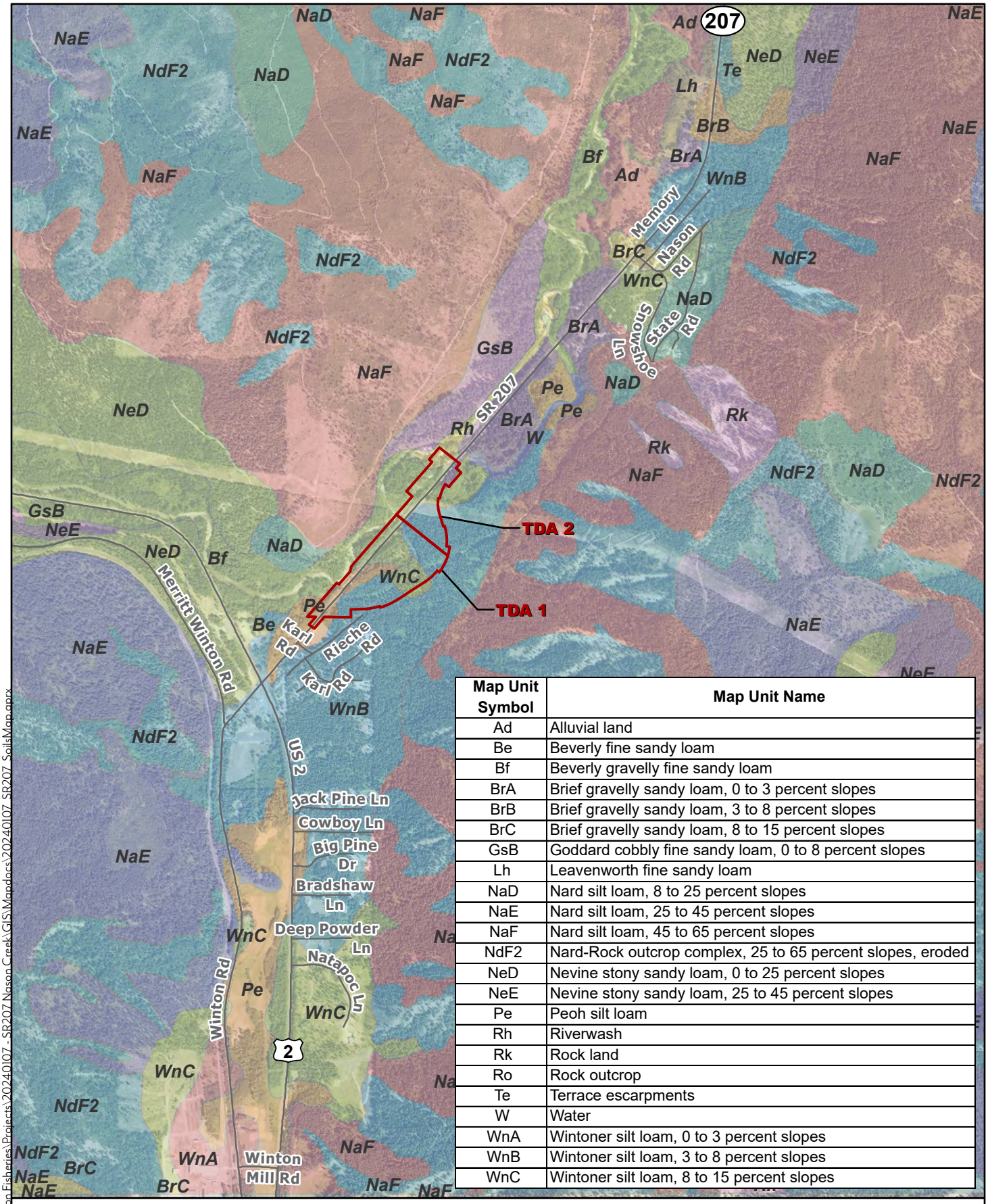

Map Unit Symbol	Map Unit Name
Ad	Alluvial land
Be	Beverly fine sandy loam
Bf	Beverly gravelly fine sandy loam
BrA	Brief gravelly sandy loam, 0 to 3 percent slopes
BrB	Brief gravelly sandy loam, 3 to 8 percent slopes
BrC	Brief gravelly sandy loam, 8 to 15 percent slopes
GsB	Goddard cobbly fine sandy loam, 0 to 8 percent slopes
Lh	Leavenworth fine sandy loam
NaD	Nard silt loam, 8 to 25 percent slopes
NaE	Nard silt loam, 25 to 45 percent slopes
NaF	Nard silt loam, 45 to 65 percent slopes
NdF2	Nard-Rock outcrop complex, 25 to 65 percent slopes, eroded
NeD	Nevine stony sandy loam, 0 to 25 percent slopes
NeE	Nevine stony sandy loam, 25 to 45 percent slopes
Pe	Peoh silt loam
Rh	Riverwash
Rk	Rock land
Ro	Rock outcrop
Te	Terrace escarpments
W	Water
WnA	Wintoner silt loam, 0 to 3 percent slopes
WnB	Wintoner silt loam, 3 to 8 percent slopes
WnC	Wintoner silt loam, 8 to 15 percent slopes

PERTEET

0 1,000 2,000
Feet

Legend
TDA Boundary

Yakima Nation Fisheries
SR 207 Nason Creek
A-2.6 NRCS Soils Map

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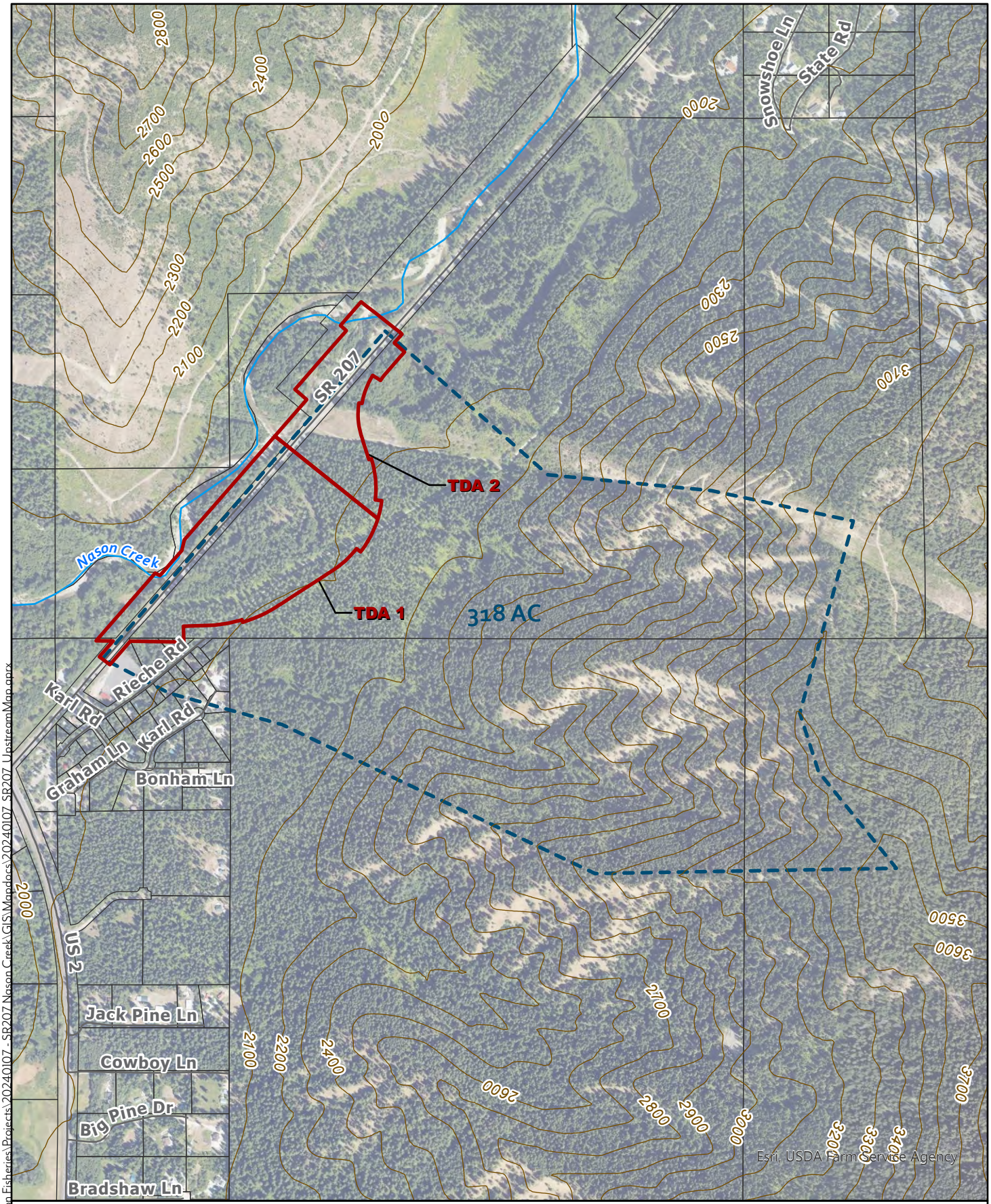

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0 500 1,000
Feet

Legend

TDA Boundary
Upstream Basin
Parcels
Contours

Yakima Nation Fisheries
SR 207 Nason Creek
A-2.7 Upstream Map

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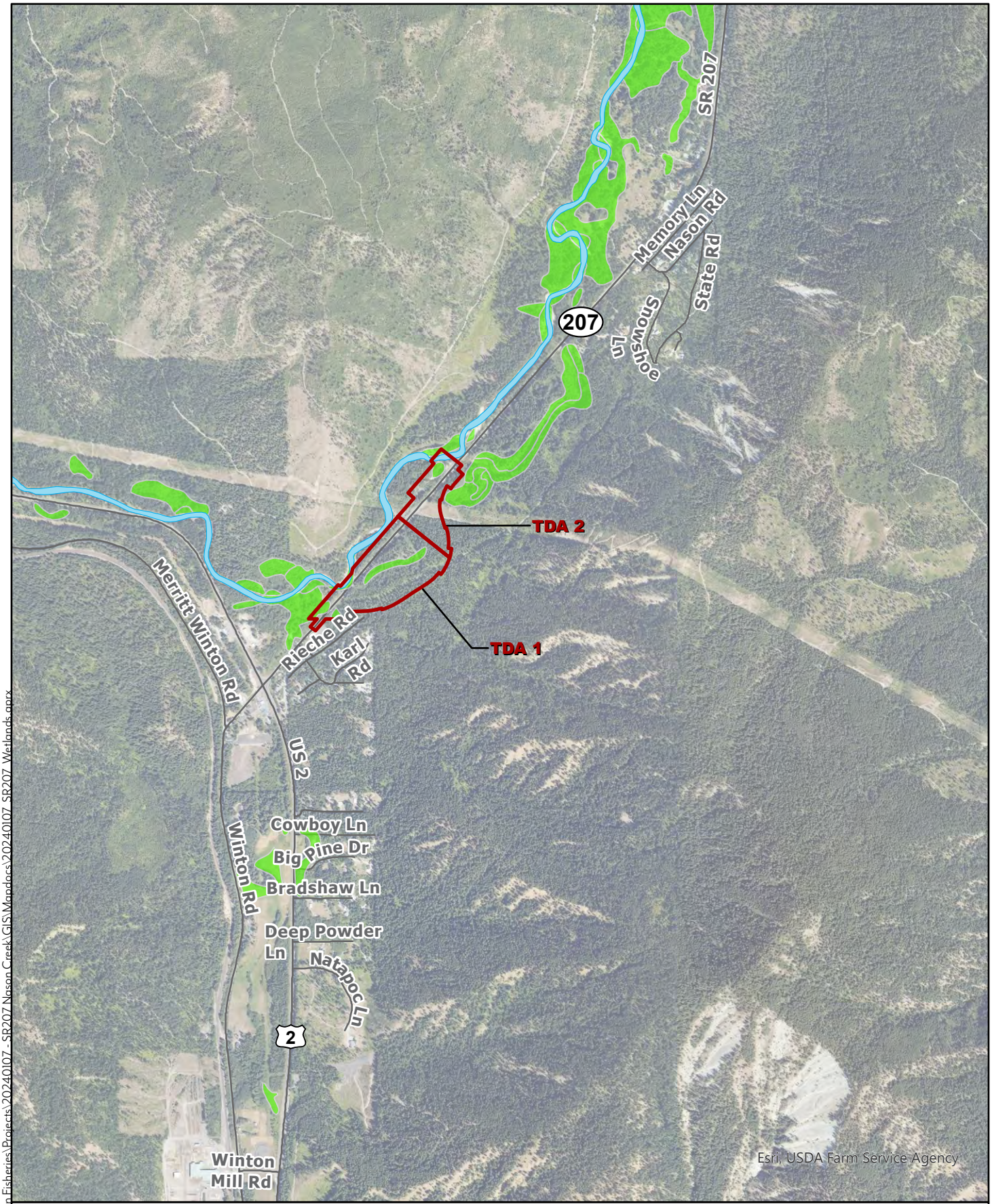

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Legend
TDA Boundary
Wetlands
Waterbodies

Yakima Nation Fisheries
SR 207 Nason Creek
A-2.8 Wetland Map

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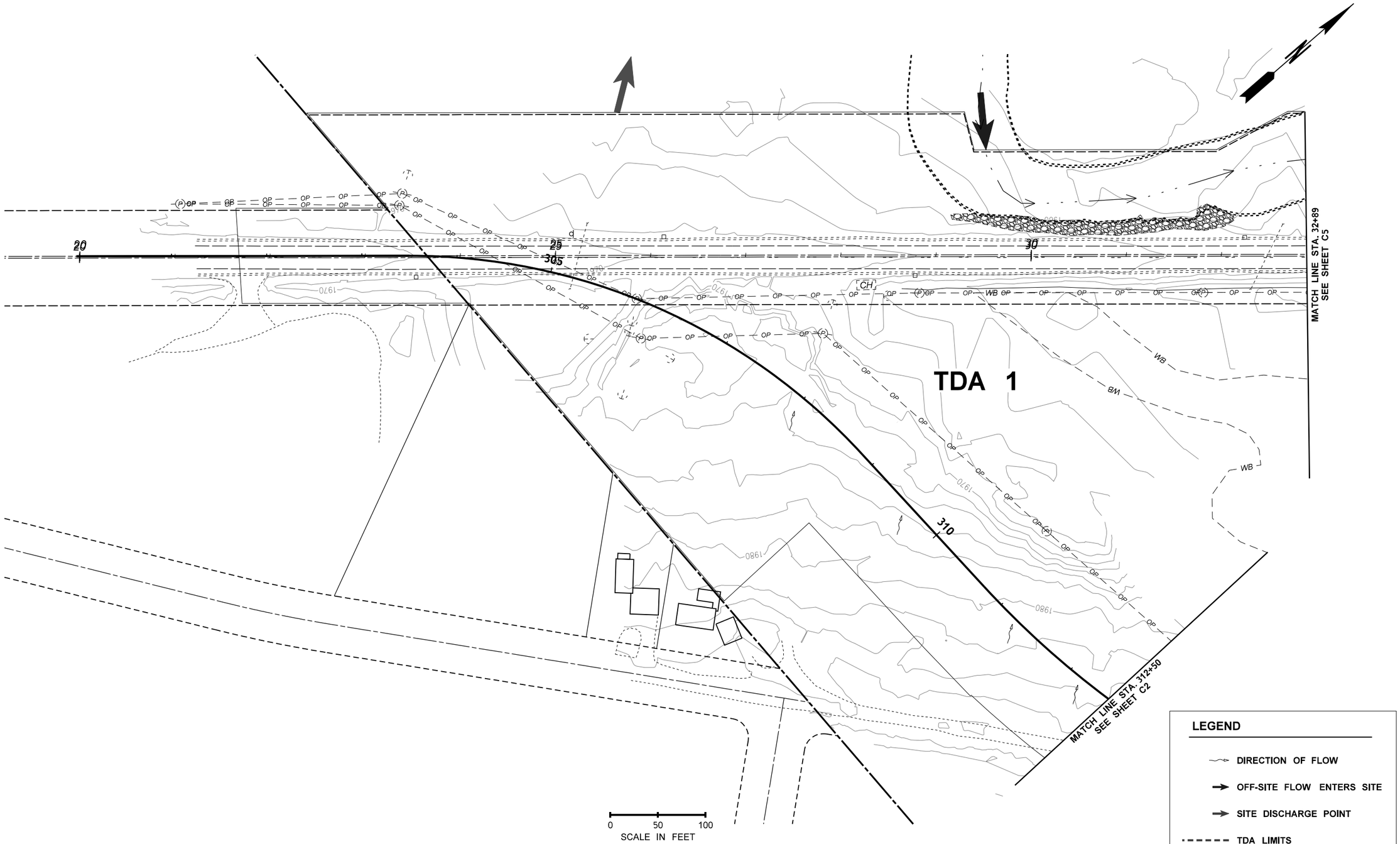

LEGEND

- DIRECTION OF FLOW
- OFF-SITE FLOW ENTERS SITE
- SITE DISCHARGE POINT
- TDA LIMITS

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DESIGNED BY	T. GIGLIO				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. STACY						
CHECKED BY	B. ROSS						
PROJ. ENGR.							
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

JEFFREY D. SAUGEN — STATE OF WASHINGTON — 47016 — REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY

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SR 207
NASON CREEK FLOODPLAIN REALIGNMENT

EXISTING CONDITIONS

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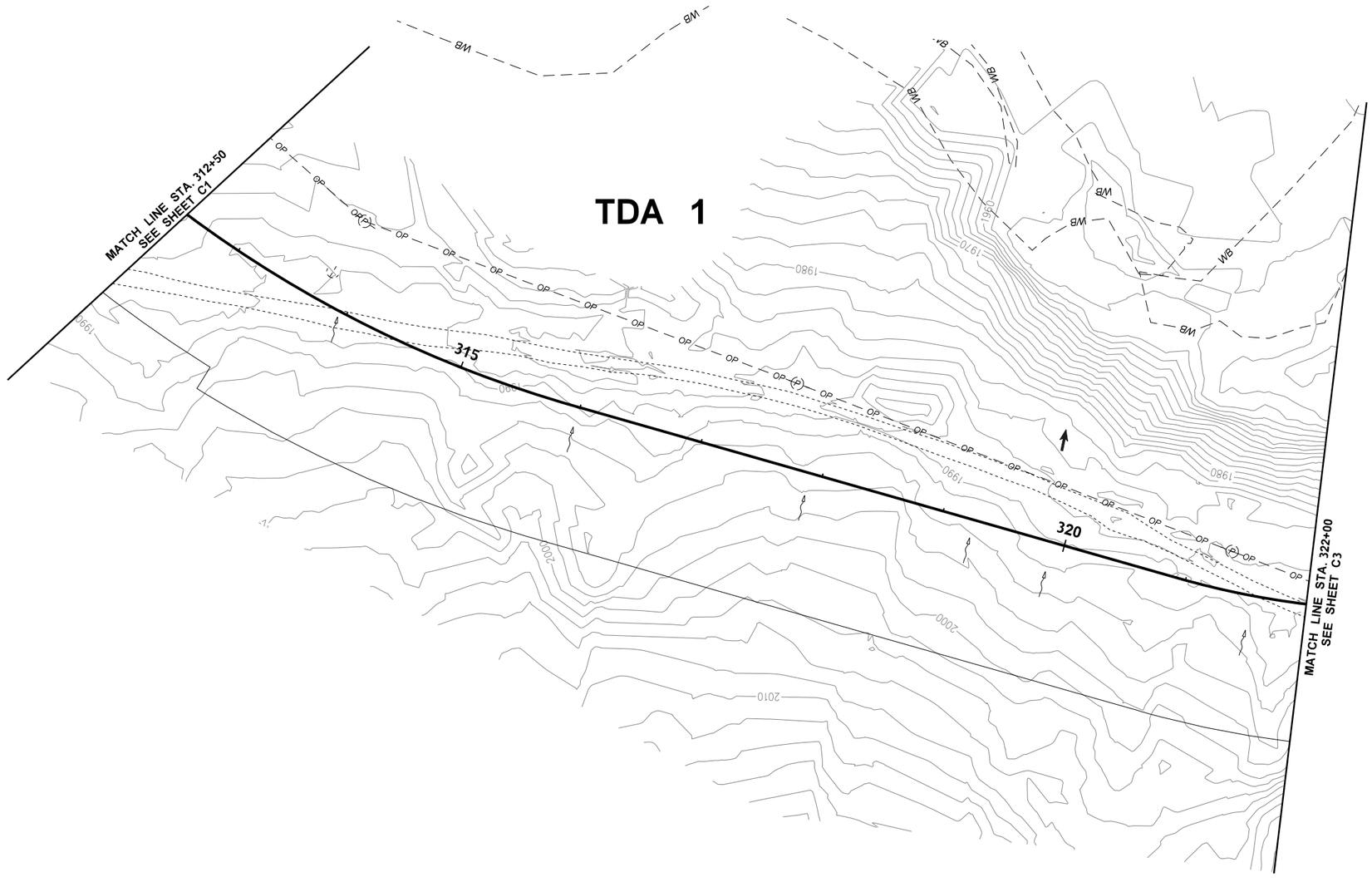

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- DIRECTION OF FLOW
- OFF-SITE FLOW ENTERS SITE
- SITE DISCHARGE POINT
- TDA LIMITS

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PROJ. ENGR.							
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

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NASON CREEK FLOODPLAIN REALIGNMENT

EXISTING CONDITIONS

Plot 2

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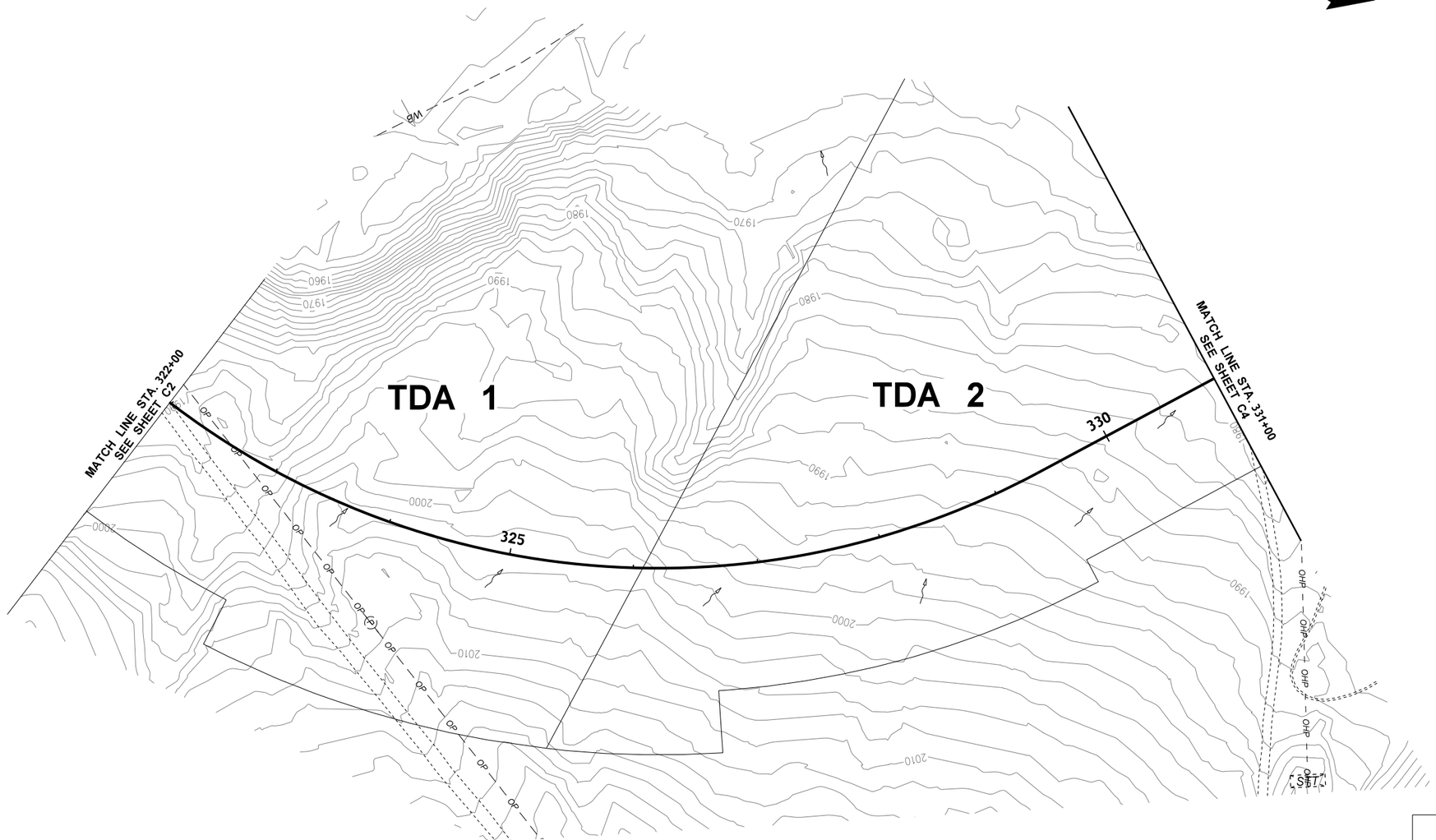

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- DIRECTION OF FLOW
- OFF-SITE FLOW ENTERS SITE
- SITE DISCHARGE POINT
- TDA LIMITS

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ENTERED BY	H. STACY				CONTRACT NO.		LOCATION NO.
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PROJ. ENGR.							
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

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PRELIMINARY

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NASON CREEK FLOODPLAIN REALIGNMENT

EXISTING CONDITIONS

Plot 3
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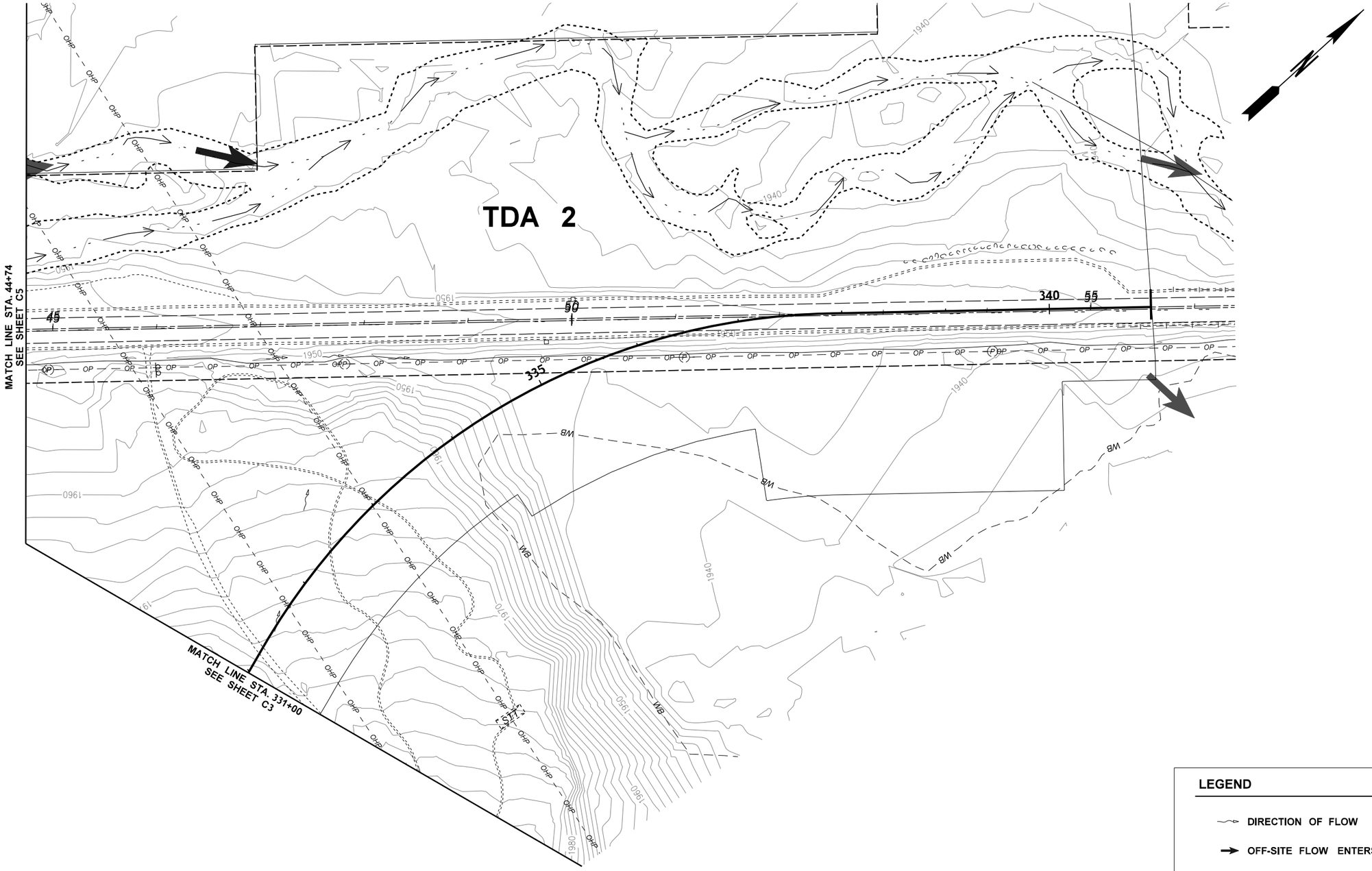

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- OFF-SITE FLOW ENTERS SITE
- SITE DISCHARGE POINT
- TDA LIMITS

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PROJ. ENGR.							
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

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SR 207
NASON CREEK FLOODPLAIN REALIGNMENT

EXISTING CONDITIONS

Plot 4

PLAN REF NO
A-2.12

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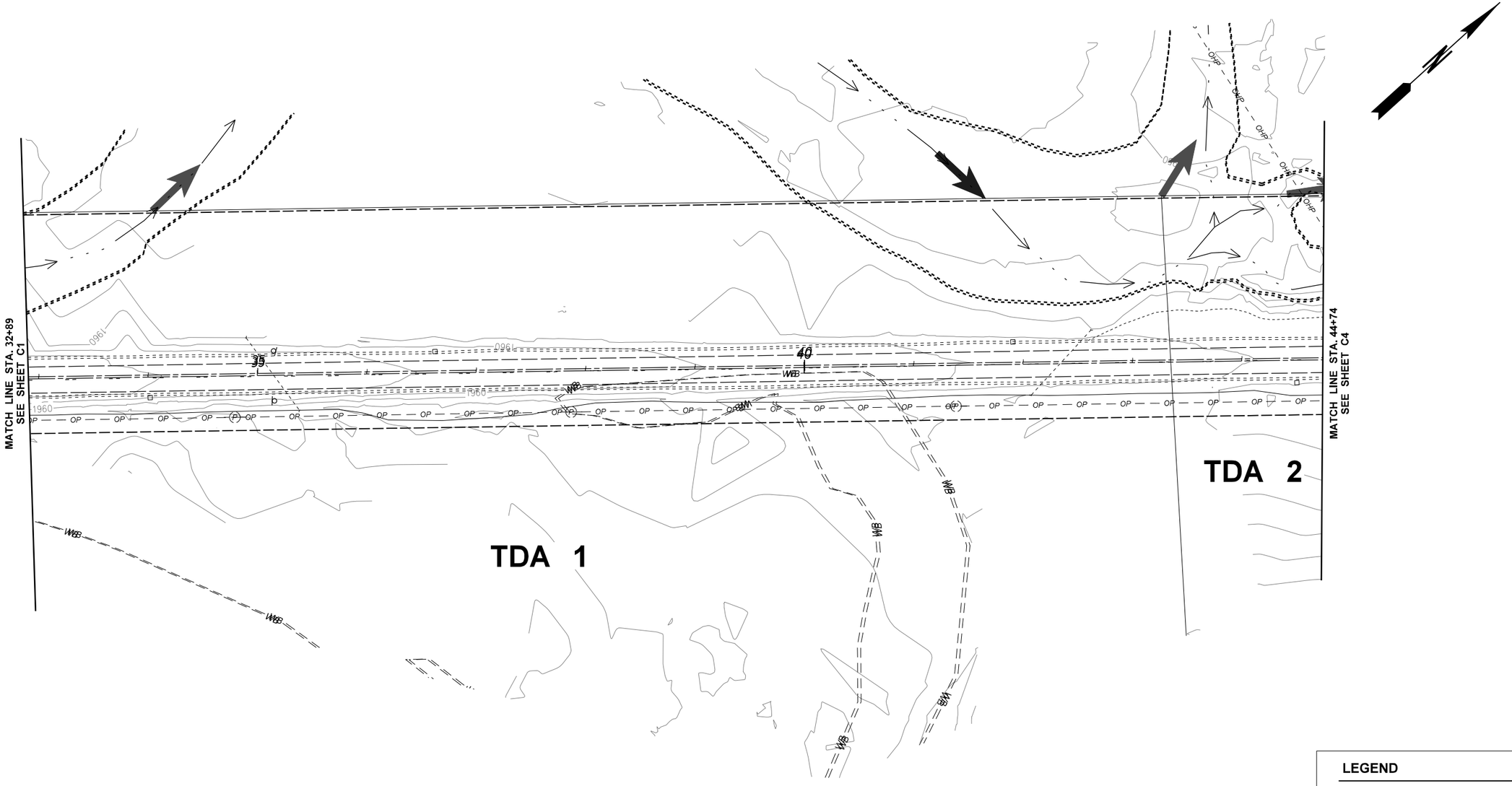

LEGEND

- DIRECTION OF FLOW
- OFF-SITE FLOW ENTERS SITE
- SITE DISCHARGE POINT
- TDA LIMITS

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DATE	2/27/2026						
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DESIGNED BY	T. GIGLIO						
ENTERED BY	H. STACY				CONTRACT NO.	LOCATION NO.	
CHECKED BY	B. ROSS						
PROJ. ENGR.							
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

JENNIFER D. SAUGEN — STATE OF WASHINGTON — 21700 — REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY

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800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT

EXISTING CONDITIONS

Plot 5

PLAN REF NO
A-2.13

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OF
SHEETS

APPENDIX A-3

Calculations

20240107 – SR 207 Nason Creek

CALCULATION REPORT	
Calculated by: Kern McGee, PE	Date: 01/22/2026
Checked By: Steven Keith, PE	Date: 01/23/2026

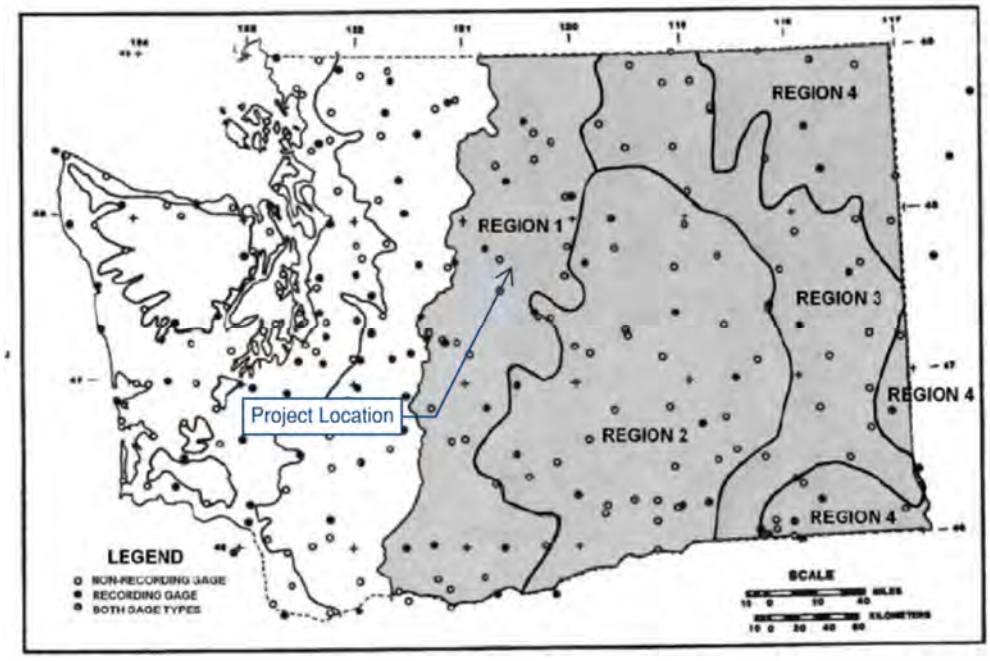
Flow Control Design

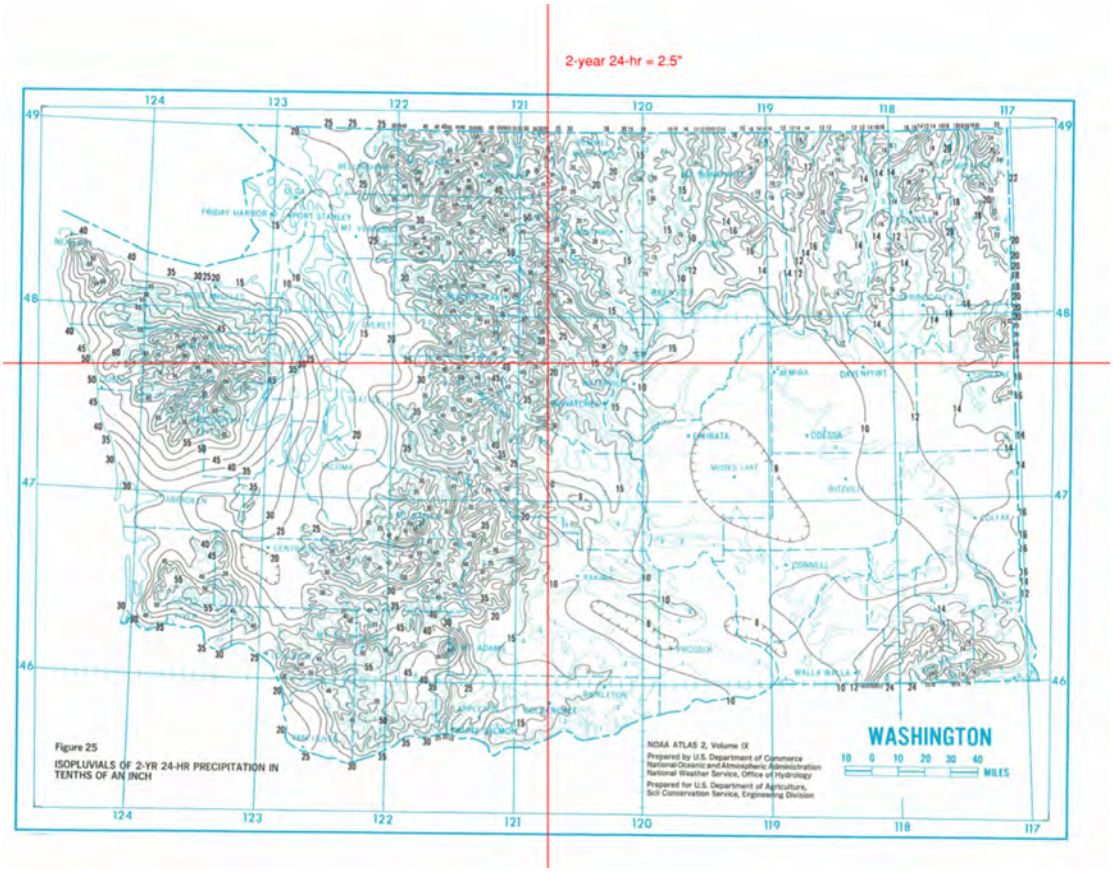
Objective: The purpose of this analysis is to:

1. Design detention ponds for TDAs 1 and 2 (Ponds 1-A and 2-A) than meet the flow control standard in Eastern Washington in accordance with the WSDOT Highway Runoff Manual

Key Design Factors and Assumptions:

- Hydrologic analysis was performed using StormShed3G software, a single event simulation model.
- According to the NRCS Web Soil Survey, site soils are predominantly HSG C.
- The SCS model was used for rainfall with the following project-specific characteristics (HRM, Appendix 4C):
    - The project is located in Region 1 and this model uses the Region 1-36hr storm.



- According to Table 4C-6, 24-hour precipitation rates are multiplied by 1.16 to attain 36-hour precipitation rates.
    - 2-year 36-hour precipitation = 2.5” * 1.16 = 2.9”
    - 25-year 36-hour precipitation = 4” * 1.16 = 4.64”
    - 100-year 36-hour precipitation = 5.5” *1.16 = 6.38”
- 

25-year 24-hr = 4.0"

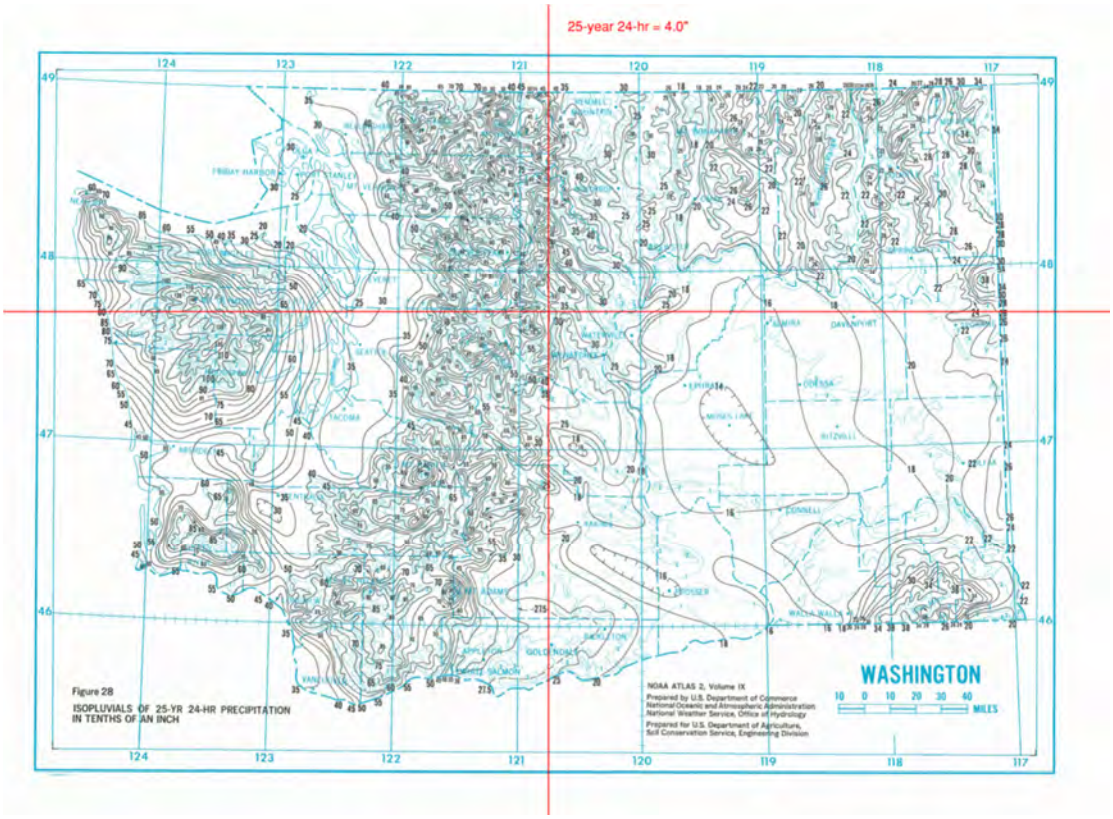


Figure 28
ISOPLUVIALS OF 25-YR 24-HR PRECIPITATION
IN TENTHS OF AN INCH

100-year 24-hr = 5.5"

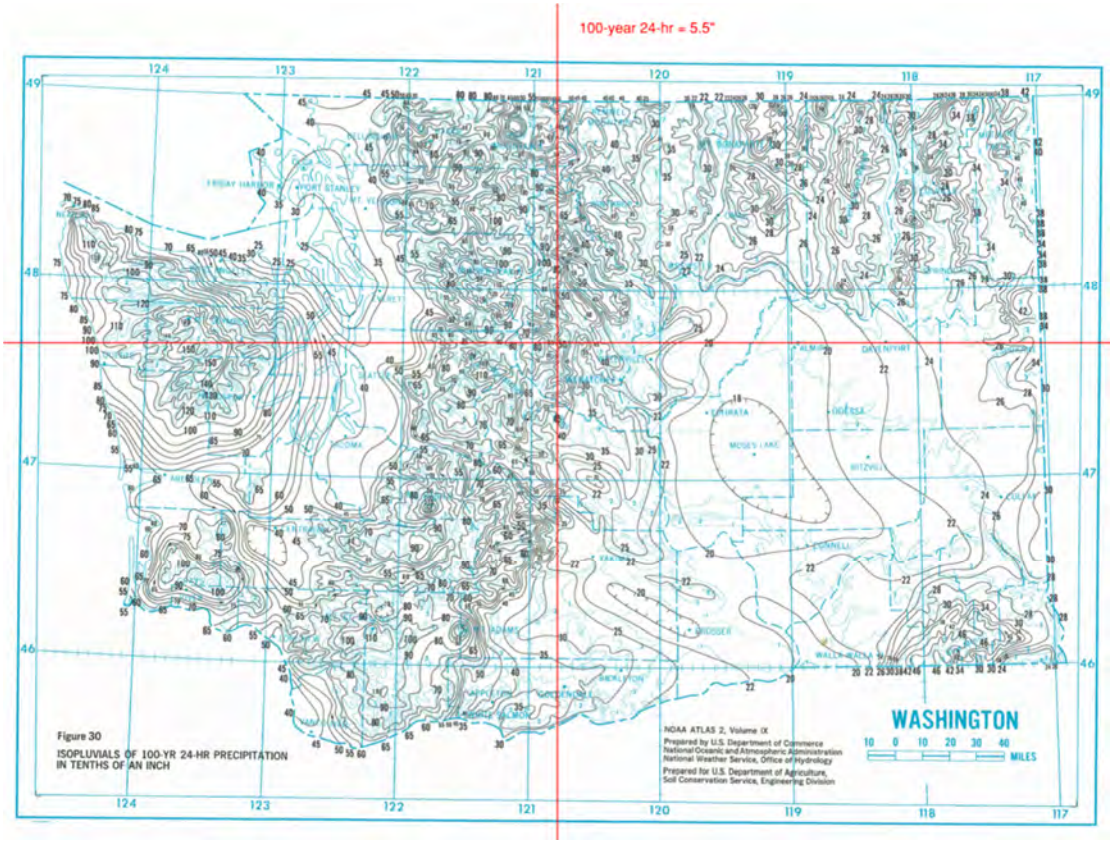


Figure 30
ISOPLUVIALS OF 100-YR 24-HR PRECIPITATION
IN TENTHS OF AN INCH

- The Antecedent Moisture Content (AMC) was determined by multiplying the 25-year 36-hour rainfall by 0.28 and comparing to the values in Table 4C-2.
  - 4.64" * 0.28 = 1.30"
  - AMC III applies where the value exceeds 1.1", so AMC III was used for this project.

- The ponds shall provide storage volume required to match ½ of the 2-year predeveloped peak flow rate and match the predeveloped 25-year peak flow rate and check the 100-year peak flow for property damage.
  - Each pond utilizes bypass flows. To size the outfall structure in each pond, flow control targets were reduced by the Bypassed flow rates and a new match ratio was established as summarized in the table below:
  - TDA 1 Pond (1A)

Design Storm	Peak Flow (CFS)	Bypass Flow (CFS)	Adjusted Match Flow (CFS)	Adjusted Match Ratio
2-year 36-hour	0.7946	0.1146	0.2827*	35.58%
25-year 26-hour	1.5957	0.1955	1.4002	87.75%

*For the 2-year storm, ½ of the peak flow is the match flow.

  - TDA 2 Pond (2-A)

Design Storm	Peak Flow (CFS)	Bypass Flow (CFS)	Adjusted Match Flow (CFS)	Adjusted Match Ratio
2-year 36-hour	0.4221	0.0278	0.1832*	43.40%
25-year 36-hour	0.8478	0.0446	0.8032	94.73%

*For the 2-year storm, ½ of the peak flow is the match flow.

- Predeveloped surface conditions were assumed as forest.
- Detailed pond grading can be found in the design plans. See Appendix B.

<u>Summary of Results</u>:

1. The pond in TDA 1 (1-A) has the following stage storage values to meet the flow control standard. See Stormshed output below for outlet design, peak flows, and water surface elevations.

Stage (feet)	Volume (CF)

1963	0.00
1964	6,639.00
1965	14,442.00

2. Postdeveloped flows from TDA 2, including areas shifted from TDA 1, are reduced relative to predeveloped flows.

Stage	Volume
1941.5	0.00
1942.5	6360.00
1943.5	13752.00
1944.5	22248.00

Pond 1-A

Appended on: Thursday, January 22, 2026 1:04:48 AM

Bypass Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2 yr 24 hr	0.0959	15.0072	0.0683	0.435	SCS
2 yr 36 hr	0.1146	15.0013	0.0823	0.435	SCS
10 year 36 hr	0.1687	15.0013	0.1234	0.435	SCS
25 year 36 hr	0.1955	15.0013	0.1441	0.435	SCS
100 year 36 hr	0.2752	15.0013	0.2066	0.435	SCS
Flows computed based on adjustment of the composite CN to **AMC3**.					
All results based on storm duration of **36.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect					

Record Id: Bypass

Design Method	SCS	**Rainfall type**	region 1-36hr.rac
Hyd Intv	30.00 min	**Peaking Factor**	484.00
Storm Duration	36.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	0.435 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	94.13
Pervious TC	0.00 min	**DC TC**	5.00 min
DCI - CN Calc			

Description	SubArea	Sub cn
Bypass Landscape	0.417 ac	87.00
Bypass Pavement	0.018 ac	98.00
DC Composited CN (AMC 2)		87.4552

DCI - TC Calc

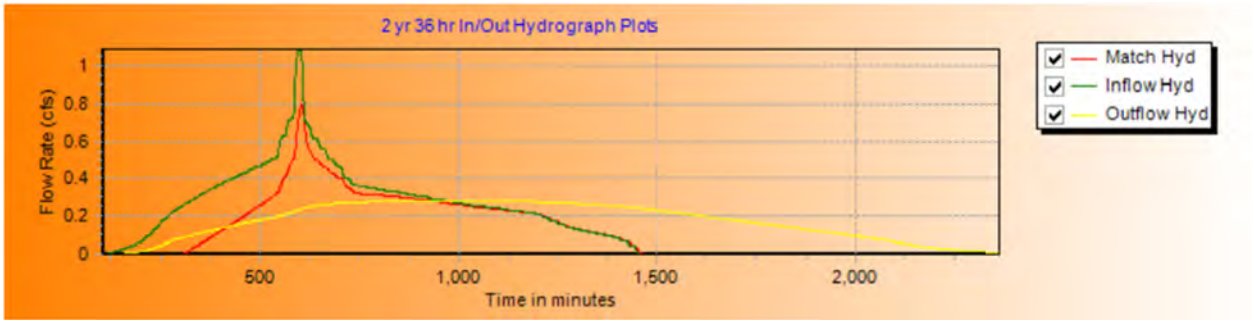
Type	Description	Length	Slope	Coeff	Misc	TT
Sheet	Smooth Surfaces. 0.011	36.00 ft	4.7%	0.011	2.50 in	0.4301 min
Shallow	Paved	300.00 ft	3.0%	0.01		1.4201 min
Int Channel	Grassed (n=0.030)	200.00 ft	0.5%	0.03		2.7753 min
Pervious TC						4.6255 min

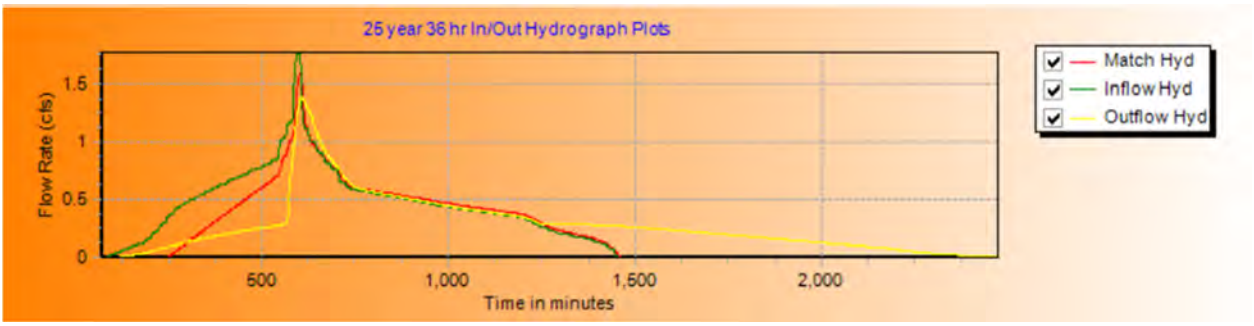
Appended on: Thursday, January 22, 2026 1:33:57 AM

LPOOLCOMPUTE [Pond Pool] SUMMARY using Puls, 24 hr Storm Event

Start of live storage:1963 ft

Event	Match Q (cfs)	Peak Q (cfs)	Max Depth (ft)	Vol (cf)	Vol (acft)	Time to Empty (hr)
2 yr 36 hr	0.2827	0.2826	1.3395	9288.1657	0.2132	14.9935
25 year 36 hr	1.4003	1.3906	1.5428	10874.0965	0.2496	16.8294
100 year 36 hr	2.4127	2.4083	1.6203	11479.0837	0.2635	17.4605





Summary Report of all Detention Pond Data

Project Precips

Event	Precip (in)
2 yr 24 hr	2.50
2 yr 36 hr	2.90
10 year 36 hr	4.06
25 year 36 hr	4.64
100 year 36 hr	6.38

BASLIST2

[Existing South Basin] Using [region 1-36hr.rac] As [2 yr 36 hr] [240]

[Proposed South Basin] Using [region 1-36hr.rac] As [2 yr 36 hr] [240]

[Existing South Basin] Using [region 1-36hr.rac] As [25 year 36 hr] [240]

[Proposed South Basin] Using [region 1-36hr.rac] As [25 year 36 hr] [240]

[Existing South Basin] Using [region 1-36hr.rac] As [100 year 36 hr] [240]

[Proposed South Basin] Using [region 1-36hr□rac] As [100 year 36 hr] [24□0]
LSTEND

BasinID	Event	Peak Q (cfs)	Peak T (hrs)	Peak Vol (ac-cf)	Area (ac)	Method/Loss	Raintype
Existing South Basin	2 yr 36 hr	0□7946	10□06	0□3941	2□972	SCS	region 1-36hr□rac
Proposed South Basin	2 yr 36 hr	1□0872	10□01	0□5438	2□537	SCS	region 1-36hr□rac
Existing South Basin	25 year 36 hr	1□5957	10□06	0□7809	2□972	SCS	region 1-36hr□rac
Proposed South Basin	25 year 36 hr	1□7768	10□01	0□9102	2□537	SCS	region 1-36hr□rac
Existing South Basin	100 year 36 hr	2□4127	10□06	1□1882	2□972	SCS	region 1-36hr□rac
Proposed South Basin	100 year 36 hr	2□4609	10□01	1□2778	2□537	SCS	region 1-36hr□rac

BASLIST
[Existing South Basin] [Proposed South Basin]
LSTEND

Record Id: Existing South Basin

Design Method	SCS	Rainfall type	region 1-36hr□rac
Hyd Intv	30□00 min	Peaking Factor	484□00
Storm Duration	36□00 hrs	Abstraction Coeff	0□20
Pervious Area	2□972 ac	DCIA	0□00 ac

Pervious CN (as AMC3)	**86□15**	**DC CN (as AMC3)**	**0□00**
Pervious TC	**14□6729 min**	**DC TC**	**0□00 min**

Pervious CN Calc		
Description	**SubArea**	**Sub cn**
Woods (fair hydrologic condition)	**2□972 ac**	**73□00**
Pervious Composited CN (AMC 2)		**73□00**

Pervious TC Calc						
Type	**Description**	**Length**	**Slope**	**Coeff**	**Misc**	**TT**
Int Channel	**Grassed (n=0□030)**	**1500□00 ft**	**5□0%**	**0□03**		**6□5822 min**
Sheet	**Woods or forest with dense underbrush□0□80**	**20□00 ft**	**5□0%**	**0□8**	**0□00 in**	**8□0907 min**
Pervious TC						**14□6729 min**

Record Id: Proposed South Basin

Design Method	**SCS**	**Rainfall type**	**region 1-36hr□rac**
Hyd Intv	**30□00 min**	**Peaking Factor**	**484□00**
Storm Duration	**36□00 hrs**	**Abstraction Coeff**	**0□20**
Pervious Area	**0□00 ac**	**DCIA**	**2□537 ac**
Pervious CN (as AMC3)	**0□00**	**DC CN (as AMC3)**	**97□07**
Pervious TC	**0□00 min**	**DC TC**	**8□0921 min**

DCI - CN Calc		
Description	**SubArea**	**Sub cn**
Impervious surfaces (pavements, roofs, etc)	**1.501 ac**	**98.00**
Herbaceous (Poor)	**1.036 ac**	**87.00**
DC Composited CN (AMC 2)		**93.5081**

DCI - TC Calc						
Type	**Description**	**Length**	**Slope**	**Coeff**	**Misc**	**TT**
Sheet	**Smooth Surfaces.0.011**	**36.00 ft**	**4.7%**	**0.011**	**2.50 in**	**0.4301 min**
Shallow	**Paved**	**300.00 ft**	**3.0%**	**0.01**		**1.4201 min**
Int Channel	**Concrete pipe (n=0.012)**	**1975.00 ft**	**5.0%**	**0.012**		**3.4666 min**
Int Channel	**Grassed (n=0.030)**	**200.00 ft**	**0.5%**	**0.03**		**2.7753 min**
Pervious TC						**8.0921 min**

HYDLIST SUMMARY

[2 yr 36 hr out] [25 year 36 hr out] [100 year 36 hr out]

LSTEND

HydID	Peak Q (cfs)	Peak T (hrs)	Peak Vol (ac-ft)	Cont Area (ac)
2 yr 36 hr out	**0.2826**	**16.10**	**0.5418**	**2.537**
25 year 36 hr out	**1.3906**	**10.12**	**0.9082**	**2.537**
100 year 36 hr out	**2.4083**	**10.05**	**1.2758**	**2.537**

STORLIST

[Pond Void]
LSTEND

Record Id: Pond Void

Descrip:	**Prototype Record**	**Increment**	**0?10 ft**
Start El?	**1963?00 ft**	**Max El?**	**1965?00 ft**
Void Ratio	**100?00**		
Stage (ft)		**Volume (cf)**	
0?00		**0?00**	
1?00		**6639?00**	
2?00		**14442?00**	
Stage-Storage Type Node			

DISCHLIST
[Outfall Riser]
LSTEND

Record Id: Outfall Riser

Multiple Orifice			
Descrip:	**Orifice outlet**	**Increment**	**0?10 ft**
Start El?	**1963?00 ft**	**Max El?**	**1965?00 ft**
Orif Coeff	**0?62**	**Lowest Orif El?**	**1961?50 ft**
Lowest Diam	**3?00 in**	**Dist to next**	**1?40 ft**

D2	**10.375 in**	**Dist to next**	**0.20 ft**
D3	**20.50 in**	**Dist to next**	**0.10 ft**

Pond 2-A

Appended on: Thursday, January 22, 2026 1:52:40 AM

Bypass Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2 yr 24 hr	0.024	15.0013	0.0188	0.094	SCS
2 yr 36 hr	0.0278	15.0013	0.0219	0.094	SCS
10 year 36 hr	0.039	15.0013	0.031	0.094	SCS
25 year 36 hr	0.0446	15.0013	0.0356	0.094	SCS
100 year 36 hr	0.0614	15.0013	0.0493	0.094	SCS
Flows computed based on adjustment of the composite CN to AMC3.					
All results based on storm duration of 360 hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect					

Record Id: Bypass

Design Method	SCS	Rainfall type	region 1-36hr.rac
Hyd Intv	30.00 min	Peaking Factor	484.00
Storm Duration	36.00 hrs	Abstraction Coeff	0.20
Pervious Area	0.00 ac	DCIA	0.094 ac
Pervious CN (as AMC3)	0.00	DC CN (as AMC3)	99.12
Pervious TC	0.00 min	DC TC	5.00 min
DCI - CN Calc			

Description	SubArea	Sub cn
Bypass	0.094 ac	98.00
DC Composited CN (AMC 2)		98.00

DCI - TC Calc

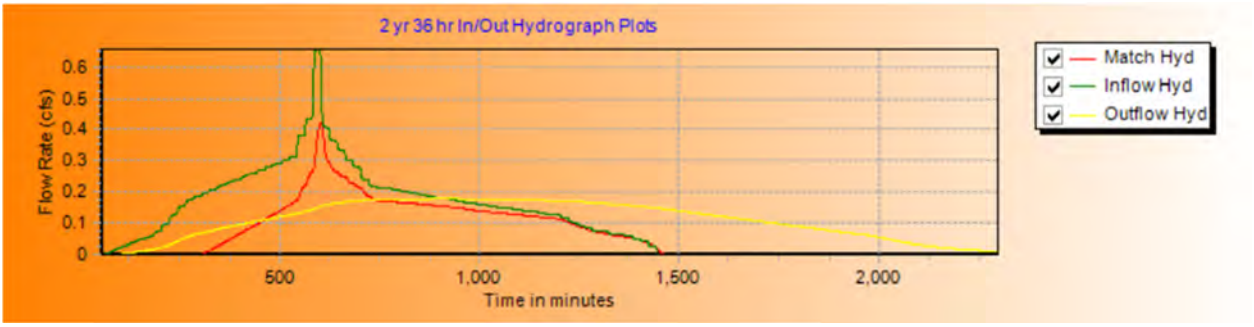
Type	Description	Length	Slope	Coeff	Misc	TT
Sheet	Smooth Surfaces 0.011	42.00 ft	4.7%	0.011	0.00 in	0.4866 min
Shallow	Paved	277.00 ft	3.0%	0.01		1.3112 min
Pervious TC						1.7978 min

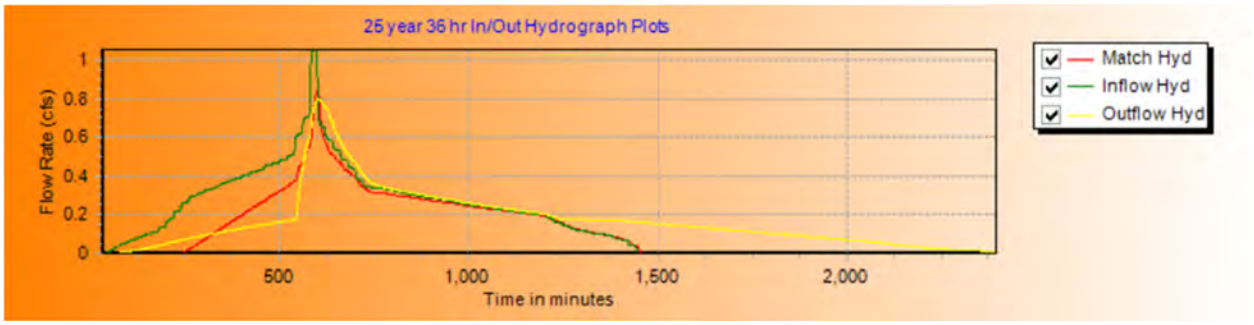
Appended on: Thursday, January 22, 2026 1:59:56 AM

LPOOLCOMPUTE [Pond Water Surface] SUMMARY using Puls, 24 hr Storm Event

Start of live storage:1941.5 ft

Event	Match Q (cfs)	Peak Q (cfs)	Max Depth (ft)	Vol (cf)	Vol (acft)	Time to Empty (hr)
2 yr 36 hr	0.1832	0.1799	0.9004	5726.8233	0.1315	14.1091
25 year 36 hr	0.8031	0.8036	1.0285	6570.6731	0.1508	15.6689
100 year 36 hr	1.2818	1.0096	1.1201	7247.6233	0.1664	16.3129





Summary Report of all Detention Pond Data

Project Precips

Event	Precip (in)
2 yr 24 hr	2.50
2 yr 36 hr	2.90
10 year 36 hr	4.06
25 year 36 hr	4.64
100 year 36 hr	6.38

BASLIST2

[Existing North Basin] Using [region 1-36hr.rac] As [2 yr 36 hr] [240]

[Proposed North Basin] Using [region 1-36hr.rac] As [2 yr 36 hr] [240]

[Existing North Basin] Using [region 1-36hr.rac] As [25 year 36 hr] [240]

[Proposed North Basin] Using [region 1-36hr.rac] As [25 year 36 hr] [240]

[Existing North Basin] Using [region 1-36hr rac] As [100 year 36 hr] [24 0]
[Proposed North Basin] Using [region 1-36hr rac] As [100 year 36 hr] [24 0]
LSTEND

BasinID	Event	Peak Q (cfs)	Peak T (hrs)	Peak Vol (ac-cf)	Area (ac)	Method/Loss	Raintype
Existing North Basin	2 yr 36 hr	0 4222	10 06	0 2094	1 579	SCS	region 1-36hr rac
Proposed North Basin	2 yr 36 hr	0 6563	10 00	0 3406	1 485	SCS	region 1-36hr rac
Existing North Basin	25 year 36 hr	0 8478	10 06	0 4149	1 579	SCS	region 1-36hr rac
Proposed North Basin	25 year 36 hr	1 0553	10 00	0 5561	1 485	SCS	region 1-36hr rac
Existing North Basin	100 year 36 hr	1 2818	10 06	0 6313	1 579	SCS	region 1-36hr rac
Proposed North Basin	100 year 36 hr	1 4533	10 00	0 7718	1 485	SCS	region 1-36hr rac

BASLIST
[Existing North Basin] [Proposed North Basin]
LSTEND

Record Id: Existing North Basin

Design Method	SCS	Rainfall type	region 1-36hr rac
Hyd Intv	30 00 min	Peaking Factor	484 00
Storm Duration	36 00 hrs	Abstraction Coeff	0 20
Pervious Area	1 579 ac	DCIA	0 00 ac

Pervious CN (as AMC3)	**86.15**	**DC CN (as AMC3)**	**0.00**
Pervious TC	**14.6729 min**	**DC TC**	**5.00 min**

Pervious CN Calc

Description	SubArea	Sub cn
Woods (fair hydrologic condition)	**1.579 ac**	**73.00**
Pervious Composited CN (AMC 2)		**73.00**

Pervious TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Int Channel	**Grassed (n=0.030)**	**1500.00 ft**	**5.0%**	**0.03**		**6.5822 min**
Sheet	**Woods or forest with dense underbrush.0.80**	**20.00 ft**	**5.0%**	**0.8**	**0.00 in**	**8.0907 min**
Pervious TC						**14.6729 min**

DCI - TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet	**Smooth Surfaces.0.011**	**43.00 ft**	**2.0%**	**0.011**	**0.00 in**	**0.6978 min**
Shallow	**Smooth Surfaces.0.011**	**150.00 ft**	**3.5%**	**0.011**		**0.4579 min**
Int Channel	**Concrete pipe (n=0.012)**	**1000.00 ft**	**3.5%**	**0.012**		**2.0979 min**
Pervious TC						**3.2537 min**

Record Id: Proposed North Basin

Design Method	SCS	Rainfall type	region 1-36hr rac
Hyd Intv	30.00 min	Peaking Factor	484.00
Storm Duration	36.00 hrs	Abstraction Coeff	0.20
Pervious Area	0.00 ac	DCIA	1.485 ac
Pervious CN (as AMC3)	0.00	DC CN (as AMC3)	98.69
Pervious TC	0.00 min	DC TC	5.00 min

DCI - CN Calc

Description	SubArea	Sub cn
Impervious surfaces (pavements, roofs, etc)	1.356 ac	98.00
Herbaceous (Poor)	0.129 ac	87.00
DC Composited CN (AMC 2)		97.0444

DCI - TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet	Smooth Surfaces 0.011	42.00 ft	4.7%	0.011	0.00 in	0.4866 min
Shallow	Paved	277.00 ft	3.0%	0.01		1.3112 min
Int Channel	Concrete pipe (n=0.012)	400.00 ft	5.0%	0.012		0.7021 min
Int Channel	Concrete pipe (n=0.012)	450.00 ft	0.5%	0.012		2.4978 min
Pervious TC						4.9976 min

HYDLIST SUMMARY
[2 yr 36 hr out] [25 year 36 hr out] [100 year 36 hr out]
LSTEND

HydID	Peak Q (cfs)	Peak T (hrs)	Peak Vol (ac-ft)	Cont Area (ac)
2 yr 36 hr out	0.1799	15.11	0.3382	1.485
25 year 36 hr out	0.8036	10.07	0.5537	1.485
100 year 36 hr out	1.0096	10.10	0.7693	1.485

STORLIST
[Pond Void]
LSTEND

Record Id: Pond Void

Descrip:	Prototype Record	Increment	0.10 ft
Start El.	1941.50 ft	Max El.	1944.50 ft
Void Ratio	100.00		

Stage (ft)	Volume (cf)
0.00	0.00
1.00	6360.00
2.00	13752.00
3.00	22248.00
Stage-Storage Type Node	

DISCHLIST
[Outfall Riser]
LSTEND

Record Id: Outfall Riser

Multiple Orifice			
Descrip:	**Orifice outlet**	**Increment**	**0.10 ft**
Start El.	**1941.50 ft**	**Max El.**	**1944.50 ft**
Orif Coeff	**0.62**	**Lowest Orif El.**	**1940.00 ft**
Lowest Diam	**2.625 in**	**Dist to next**	**0.90 ft**
D2	**8.00 in**	**Dist to next**	**0.00 ft**

CALCULATION REPORT		
Calculated By:	Jason Walker, PE	Date: 12/05/2025
Checked By:	Kern McGee, PE	Date: 2/06/2026

Objective:

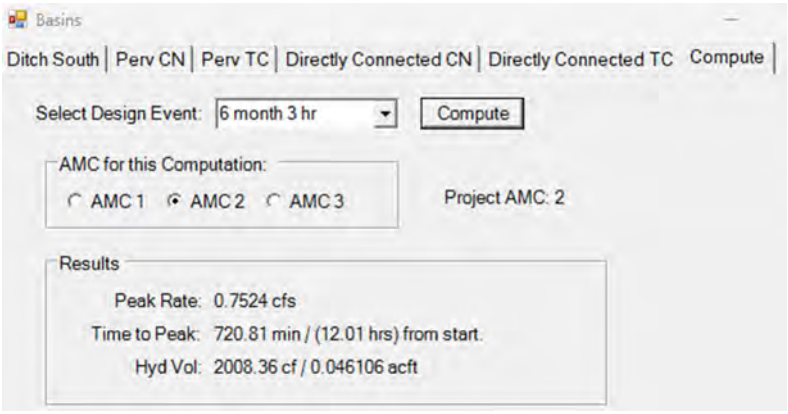
The purpose of this analysis is to:

- Determine the size of Media Filter Drains for both TDA 1 (South TDA) and TDA 2 (North TDA) The MFDs are sized to meet the runoff requirements of the 2019 Highway Runoff Manual (HRM)

Calculation Methodology:

- Determine the widest area contributing to an MFD, and the longest MFD.
- Determine short duration storm using formula in HRM.

Inputs:

- Design storm is short duration storm 0.555 in /hr (Psds = Csds(P2yr2hr)
    - Csds = 0.74 (Table 4C-12)
    - P 2yr2hr = 0.75 (2yr 2 hr Isopluvial Map)
    - 

- Maximum width of contributing pavement is 47.8 feet.
- Longest MFD is 1227 LF
- Largest area to an MFD is 1.67 acres
- Embankment slope is 4H:1V
- Long Term Infiltration Rate is 10 in/hr

MFD	Min Pavement Width (ft)	Maximum Pavement Width (ft)	Contributing Area to MFD (ac)	Length of MFD (ft)
	18.7	18.7	0.04	85.5
	17.7	17.7	0.43	188.6
	42.5	17.7	0.84	903.8
	37.9	42.5	1.22	1227.0
	42.4	42.5	0.15	158.0
	42.5	42.5	1.76	176.8
	10.0	10.0	0.08	119.1
	10.0	10.0	0.02	86.6
	16.1	47.8	0.17	205.4
	16.7	16.7	0.06	135

Summary of Results:

There are ten total Media Filter Drains (MFDs) proposed for the project. Using the most conservative numbers the MFD width W needs to be 1.37 ft wide. Per Table 5-6 of the HRM for a pavement width greater than 35 feet the minimum width for the MFD needs to be 4 feet. As such all MFDs have a minimum width of 4 ft with an overall width of 12 feet.

MFD Spreadsheet

PERTEET

Project Number: 20240107
Project Name: SR 207 Nason Creek

2707 Colby Avenue,
Suite 900, Everett, WA 98201 | P 425.252.7700

Input Cell
Solve Cell

MFD Name:	All	
MFD Length:	1227	LF
Max. Width of Contributing Pavement:	47.8	LF
Min. Width of Contributing Pavement:	16	LF
Roadway Embankment Slope:	4H:1V	
Total MFD Pavement Catchment Area:	1.50	acres

Design Requirement from HRM

For runoff treatment, base the sizing of the MFD mix bed on the requirement that the runoff treatment flow rate from the pavement area, $Q_{Highway}$, cannot exceed the long-term infiltration capacity of the MFD, $Q_{Infiltration}$:

$$Q_{Highway} \leq Q_{Infiltration} \quad \text{(E-17)}$$

For western Washington, $Q_{Highway}$ is the flow rate at or below which 91% of the runoff volume for the developed TDA will be treated, based on a 15-minute time step (see Section 4-3.1.1), and can be determined using the water quality data feature in MGSFlood. For eastern

Base the long-term infiltration capacity of the MFD on the following equation:

$$\frac{LTIR \times L \times W}{C \times SF} = Q_{Infiltration} \quad \text{(E-18)}$$

where:
- $LTIR$ = Long-term infiltration rate of the media filter drain mix (use 10 inches per hour for design) (in/hr)
- L = Length of media filter drain (parallel to roadway) (ft)
- W = Width of the media filter drain mix bed (ft)
- C = Conversion factor of 43200 ((in/hr)/(ft/sec))
- SF = Safety Factor (equal to 1.0, unless unusually heavy sediment loading is expected)

Assuming that the length of the MFD is the same as the length of the contributing pavement, solve for the width of the media filter drain:

$$W \geq \frac{Q_{Highway} \times C \times SF}{LTIR \times L} \quad \text{(E-19)}$$

Media Filter Drain Mix Bed Sizing

$Q_{highway}$ =	0.7524	cfs	6 month WQ flow rate from Stormshed/SSA
LTIR =	10	in/hr	
L =	1227	LF	
C =	43200		
SF =	1		

Conclusion

Design, W =	2.65	ft	
Min. Requirement, W =	4	ft	per HRM Table 5-6 for pavement width > 35 ft

CALCULATION REPORT		
Calculated By:	Jason Walker, PE	Date: 12/05/2025
Checked By:	Kern McGee, PE	Date: 2/4/2026

Objective:

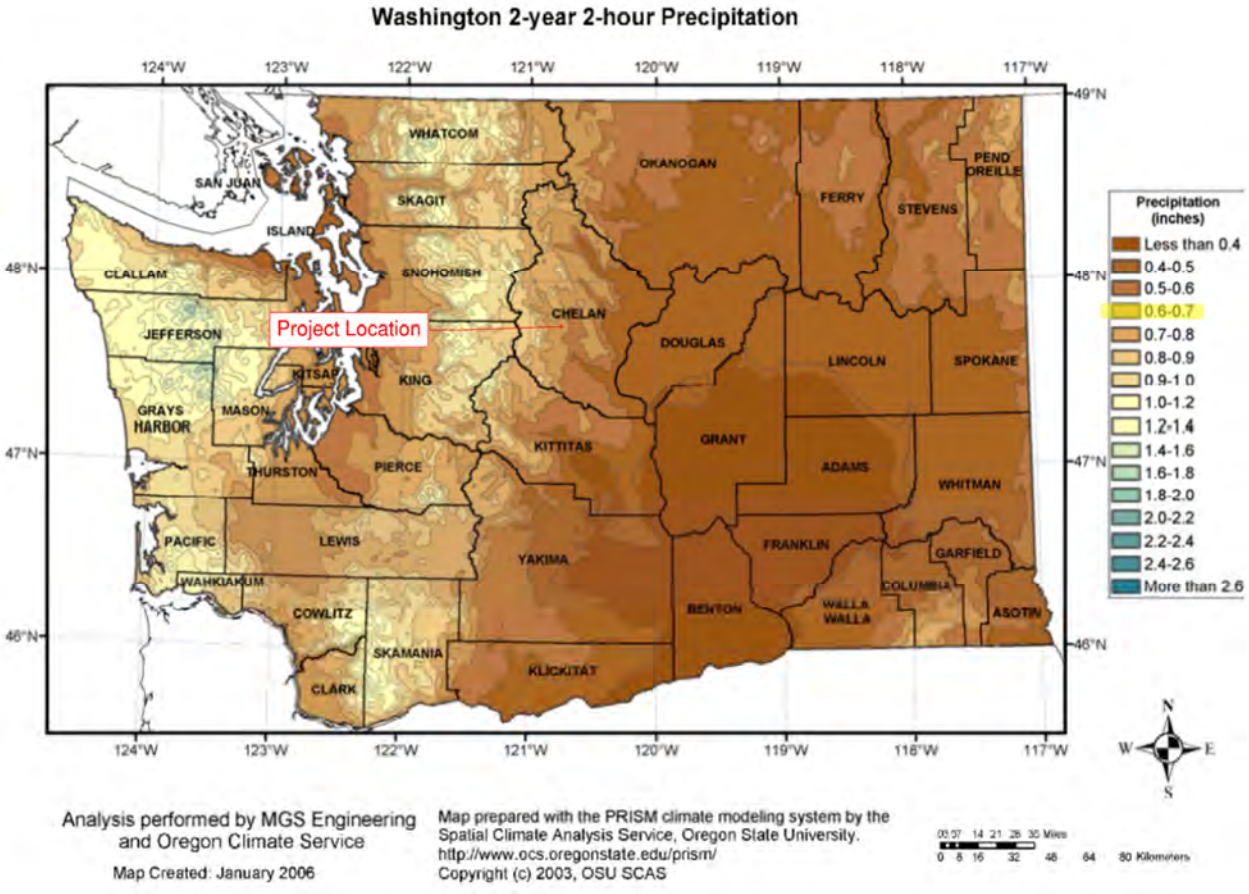
The purpose of this analysis is to:

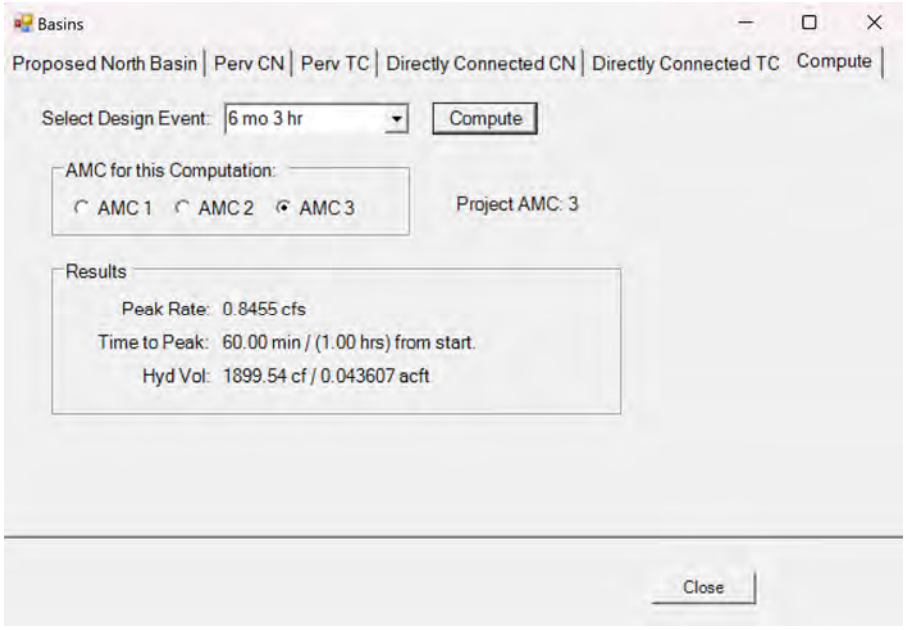
- Determine the size of Compost Amended Bio-Swale for TDA 2 (CABS 2-A). The CABS was sized to meet the runoff requirements of the 2019 Highway Runoff Manual (HRM)

Calculation Methodology:

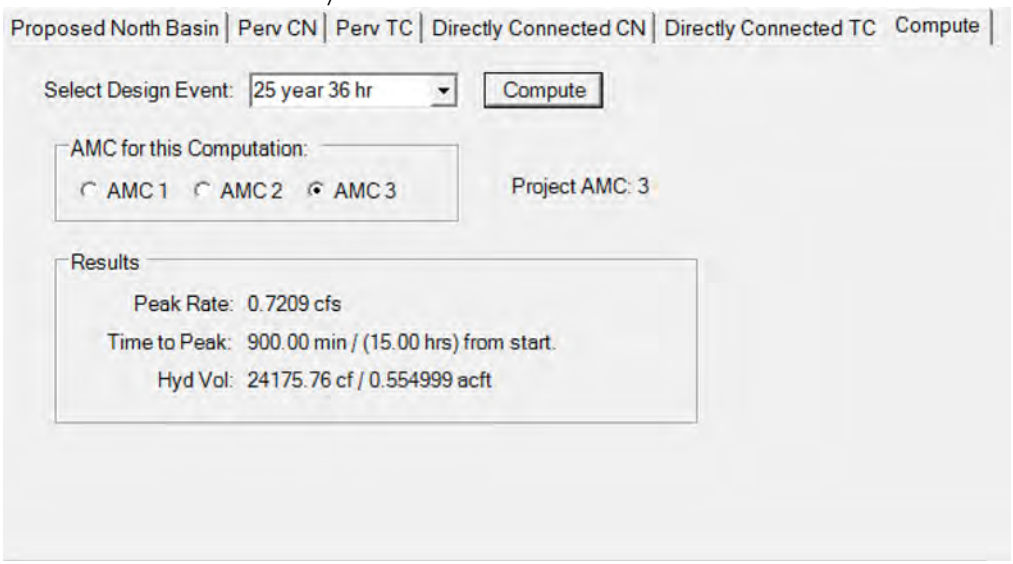
- Create an SBUH model in StormShed3G
- Determine short duration storm using formula in HRM to convert the 2-year 2-hour precipitation to 6-month 3-hours.
- AMC = III (see pond design for justification)
- Use design flow in WSDOT CABS design spreadsheet.

Inputs:

- 

- Design storm is short duration storm 0.481 in /hr (Psds = Csds(P2yr2hr)
    - Csds = 0.74 (Table 4C-12)
    - P 2yr2hr = 0.65 (2yr 2 hr Isopluvial Map)
    - 

- See catchment area map for areas tributary to the CABS.
- Freeboard check uses the 25-year storm:



Summary of Results:

From the WSDOT CABS Design Spreadsheet:

Final Swale Dimensions		
Swale Length	126.12	ft
Bottom Width	10.0	ft
Swale Longitudinal Slope	0.015	ft/ft
$Z_{foreslope}$	3.0	
$Z_{backslope}$	3.0	
WQ Depth	0.33	ft
Swale Depth (includes 1 ft Freeboard)	1.07	ft

Stomshed3G Output
And
CABS Spreadsheet

Appended on: Wednesday, February 4, 2026 3:01:40 PM

Proposed North Basin Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
6 mo 3 hr	0.8455	1.00	0.0436	1.485	SBUH
Flows computed based on adjustment of the composite CN to **AMC3**.					
All results based on storm duration of **3.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect					

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
25 year 36 hr	0.7209	15.00	0.555	1.485	SBUH
Flows computed based on adjustment of the composite CN to **AMC3**.					
All results based on storm duration of **36.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect					

Record Id: Proposed North Basin

Design Method	SBUH	**Rainfall type**	EWash-3hr.rac
Hyd Intv	15.00 min	**Peaking Factor**	484.00
Storm Duration	3.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	1.485 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	98.69
Pervious TC	0.00 min	**DC TC**	5.00 min

DCI - CN Calc		
Description	**SubArea**	**Sub cn**
Impervious surfaces (pavements, roofs, etc)	1.356 ac	98.00
Herbaceous (Poor)	0.129 ac	87.00
DC Composited CN (AMC 2)		97.0444

DCI - TC Calc						
Type	**Description**	**Length**	**Slope**	**Coeff**	**Misc**	**TT**
Sheet	Smooth Surfaces. 0.011	42.00 ft	4.7%	0.011	0.00 in	0.4866 min
Shallow	Paved	277.00 ft	3.0%	0.01		1.3112 min

Int Channel	Concrete pipe (n=0.012)	400.00 ft	5.0%	0.012		0.7021 min
Int Channel	Concrete pipe (n=0.012)	450.00 ft	0.5%	0.012		2.4978 min
Pervious TC						4.9976 min

RT.04 - Basic Biofiltration Swale and Compost Amended Biofiltration Swale

Project:	SR 207 Nason Creek	Designed By:	JLW
Description:	CABS 2-A	Checked By:	KCM

BASIC BIOSWALE AND COMPOST AMENDED BIOSWALE SPREADSHEET VERSION 2.1

Design Steps

D-1 Determine runoff treatment design flow rate Q_{wq}

Q_{wq} 0.846 Runoff treatment design flow rate from MGS Flood OR SBUH; MGSFlood reports an online and offline flow rate, please enter the applicable design flow rate

D-2 Determine the biofiltration design flow rate (Q_{biofil})

Is the bioswale in eastern WA? Yes Qwq=Qbiofil

N/A

Is bioswale online or offline? online

Q_{biofil} 0.846 runoff treatment design flow rate

D-3 Determine the longitudinal slope of the proposed biofiltration swale (ft/ft)

s 0.015 ft/ft

D-4 Select a soil and vegetation cover suitable for the biofiltration swale

soil/veg Grass-legume mix on lightly compacted topsoil with 3-inch medium compost blanket (CABS) <--Use pull down box

Manning's n= 0.35 From HRM Table 5-3

D-5 Select the design depth of flow y (see HRM Table 5-4)

y 0.33 (ft) design depth of flow; for basic biofiltration swale and CABS = 4" max (0.33 ft max) for WQ event

D-6 Select a trapezoidal swale cross-sectional shape.

D-7 Use Manning's Eq and first approximations relating hydraulic radius and dimensions to get width for trapezoidal cross section

$$Q_{biofil} = \frac{1.49 A R^{\frac{2}{3}} s^{\frac{1}{2}}}{n} \qquad AR^{.67} = \frac{Q_{biofil}\, n}{1.49\, s^{0.5}}$$ <--manning's changed

HRM Chapter 5 Equation E-11

Use Excel Solver

D-7a

Q_{biofil}	0.846	cfs - runoff treatment design flow rate
A	3.620	ft2 - wetted area
R	0.300	ft - hydraulic radius
s	0.015	ft/ft longitudinal slope of swale
n	0.35	Manning's coefficient
b	9.98	ft - bioswale bottom width
$z_{foreslope}$	3.00	horizontal number of bioswale slope i.e. 1V:3H, z=3 in this instance
$z_{backslope}$	3.00	horizontal number of bioswale slope i.e. 1V:3H, z=3 in this instance
y	0.330	ft - design depth flow = maximum depth of flow

Q_{biofil} 0.846 cfs - use goal seek under "What-If Analysis" in the "DATA" menu to set this cell equal to Q_{biofil} above changing the "b" value

Note: Depth of flow for basic biofiltration swale and CABS = 4" max (0.33 ft max) for WQ event

D-7b If the swale calculations above give a swale width less than 2 feet wide, re-run calculations with 2 foot wide swale, solve for depth y Or if redesigning swale with different dimensions, use below calculator and use Excel Goal Seek to determine new depth of flow.

Q_{biofil}	0.846	cfs - runoff treatment design flow rate
A	0.186	ft2 - wetted area
R	0.118	ft - hydraulic radius
s	0.015	ft/ft longitudinal slope of swale
n	0.35	Manning's coefficient
b		ft - enter new bottom width if applicable (2 foot is minimum)
$z_{foreslope}$	3.00	horizontal number of bioswale slope i.e. 1V:3H, z=3 in this instance
$z_{backslope}$	3.00	horizontal number of bioswale slope i.e. 1V:3H, z=3 in this instance
y	0.249	ft - design depth flow

Q_{biofil} 0.023 cfs - use goal seek under "What-If Analysis" in the "DATA" menu to set this cell equal to Q_{biofil} above changing the "y" value

Note: Depth of flow for basic biofiltration swale and CABS = 4" max (0.33 ft max) for WQ event

Minimum bioswale bottom width is 2 feet

D-8 **Enter Final Bioswale Dimensions from the calculations in Step D-7a or D-7b**

Enter Final Swale Area	3.620	ft2 - Wetted Area
Enter Final Swale R	0.300	ft - hydraulic radius
Enter Final Swale slope s	0.015	ft/ft longitudinal slope of swale
Enter Final Swale n	0.350	Manning's coefficient
Enter Final Swale bottom width b	9.980	ft - swale bottom width
Enter Final Swale $z_{foreslope}$	3.000	horizontal number of bioswale slope i.e. 1V:3H, z=3 in this instance
Enter Final Swale $z_{backslope}$	3.000	horizontal number of bioswale slope i.e. 1V:3H, z=3 in this instance
Enter Final Swale flow depth y	0.330	ft - design depth flow

D-9 **Computer the flow velocity at Q_{biofil}**

$$V_{biofil} = \frac{Q_{biofil}}{A}$$ HRM Chapter 5 Equation E-12

V_{biofil} 0.23 ft/sec - flow velocity; 1 ft/sec maximum

Flow veloicty is OK since it is less than 1 ft/sec

D-10 **Compute Swale Length L (ft)**

$$L = V_{biofil} \times t$$

t 540 seconds - 9 minutes (540 seconds) for CABS, Basic, and Wet bioswale

L 126.12 ft - required length of bioswale; If swale is less than 100 feet, make swale have narrower bottom width (2 foot minimum) and repeat Steps D-7 - D-10 and recalculate to get length over 100 feet or keep swale bottom width make swale length 100 feet minimum

D-11 Does the bioswale need to be redesigned to fit within the provided right of way?

No Continue to Step FC-1

Freeboard Check (Online Swales Only)

FC-1 Q25yr 0.72 cfs - If in Eastern Washington, use the 25 year storm event

1.00 Safety Factor - For SBUH or SCS, use 1.0

Q_{convey} 0.72 cfs - Q25yr x saftey factor

FC-2 n 0.03 (lowest possible Manning's from HRM)

FC-3 depth y 0.07 ft - design depth flow

A 0.71 ft2 - wetted area

R 0.068 ft - hydraulic radius

S 0.015 ft/ft longitudinal slope of swale

b 9.98 ft - swale bottom width

$z_{foreslope}$ 3.00 horizontal number of bioswale slope i.e. 1V:3H, z=3 in this instance

$z_{backslope}$ 3.00 horizontal number of bioswale slope i.e. 1V:3H, z=3 in this instance

Q_{convey} 0.72 cfs - use goal seek under "What-If Analysis" in the "DATA" menu to set this cell equal to Q_{convey} above changing the "y" value

FC-4 $D_{(total)}$ 1.07 ft, total required swale depth. Does not take into account design standards for minimum ditch depth from the Design Manual (roadway sections)

Final Swale Dimensions		
Swale Length	126.12	ft
Bottom Width	10.0	ft
Swale Longitudinal Slope	0.015	ft/ft
$z_{foreslope}$	3.0	
$z_{backslope}$	3.0	
WQ Depth	0.33	ft
Swale Depth (includes 1 ft Freeboard)	1.07	ft

SR207 Nason Creek – 20240107

Culvert Calculations

CALCULATION REPORT

Calculated By: Nathan Hahne, EIT Date: 2/3/2026

Checked By: Steven Keith, PE Date: 2/5/2026

Objective:

- To use calculated flow rate to determine headwater, required diameter, and the velocities at each culvert outlet.

Key Design Factors and Assumptions:

StormShed3G

- StormShed3G is used for determining flow rates using the SBUH method.
- Minimum Tc = 5.00 min.
- Culverts are analyzed for flowrates corresponding to the 25-year and 100-year storm events.
- Rainfall Type is the Region 1 Long Duration Storm (36-hour storm) for the SBUH method.
- For SBUH method, the antecedent moisture condition is set to AMC 3, due to the presence of saturated soils.

HY-8

- HY-8 was used for culvert headwater calculations.
- Tailwater was set to 0 unless the culvert outfalls into a channel (i.e. a proposed drainage ditch)
- The material selections Smooth HDPE and Corr. PE were used as the culvert materials (Manning's n values 0.012 and 0.024 respectively) were used for the calculations.
- The higher roughness material was used to keep the outlet velocity down where headwater requirements could still be met even with a higher n-value increasing the headwater.
- The StormShed3G flow rates (25 and 100-year flow rates) were entered into the HY-8 program for each culvert.
- Culverts were sized to ensure that the 100-year flow did not overtop the roadway crest elevation, and so that the 25-year headwater did not exceed 1.25x the HW/D ratio (per WSDOT HM requirements)

B_DR1-21 Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2 year 24 hour	3.8116	15.1667	4.0032	38.34	SBUH
25-year 36-hour	14.0774	15.1667	13.8076	38.34	SBUH
100-year 36-hour	17.3266	15.1667	16.9952	38.34	SBUH
Flows computed based on adjustment of the composite CN to **AMC3**.					
All results based on storm duration of **36.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect					

Record Id: B_DR1-21

Design Method	SBUH	**Rainfall type**	region 1-36hr.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	36.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	38.34 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	84.91
Pervious TC	0.00 min	**DC TC**	53.899 min

DCI - CN Calc

Description	SubArea	Sub cn
Woods (good hydrologic condition)	36.34 ac	70.00
Gravel Roads & Parking Lots	2.00 ac	89.00
DC Composited CN (AMC 2)		70.9911

DCI - TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet	Woods or forest with light underbrush. 0.40	300.00 ft	30.0%	0.4	0.00 in	19.4204 min
Shallow	Forest w/ heavy ground litter & meadows (n=0.10)	2100.00 ft	10.0%	0.1		34.4785 min
Pervious TC						53.899 min

B_DR2-22 Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2 year 24 hour	12.4586	15.1667	11.7728	116.49	SBUH
25-year 36-hour	46.2788	15.1667	41.3115	116.49	SBUH
100-year 36-hour	56.9893	15.1667	50.9554	116.49	SBUH
Flows computed based on adjustment of the composite CN to **AMC3**.					
All results based on storm duration of **36.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect					

Record Id: B_DR2-22

Design Method	SBUH	**Rainfall type**	region 1-36hr.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	36.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	116.49 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	84.29
Pervious TC	0.00 min	**DC TC**	34.7815 min

DCI - CN Calc

Description	SubArea	Sub cn
Woods (good hydrologic condition)	116.49 ac	70.00
DC Composited CN (AMC 2)		70.00

DCI - TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet	Woods or forest with light underbrush. 0.40	300.00 ft	30.0%	0.4	0.00 in	19.4204 min
Shallow	Forest w/ heavy ground litter & meadows (n=0.10)	1300.00 ft	25.0%	0.1		13.499 min
Cont Channel	Rock-lined stream (n=0.035)	1000.00 ft	15.0%	0.035		1.862 min
Pervious TC						34.7815 min

B_DR3-23 Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2 year 24 hour	0.486	15.1667	0.472	4.67	SBUH
25-year 36-hour	1.8139	15.1667	1.6561	4.67	SBUH
100-year 36-hour	2.2349	15.1667	2.0428	4.67	SBUH
Flows computed based on adjustment of the composite CN to **AMC3**.					
All results based on storm duration of **36.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect					

Record Id: B_DR3-23

Design Method	SBUH	**Rainfall type**	region 1-36hr.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	36.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	4.67 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	84.29
Pervious TC	0.00 min	**DC TC**	39.1224 min

DCI - CN Calc

Description	SubArea	Sub cn
Woods (good hydrologic condition)	4.67 ac	70.00
DC Composited CN (AMC 2)		70.00

DCI - TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet	Woods or forest with light underbrush. 0.40	300.00 ft	30.0%	0.4	0.00 in	19.4204 min
Shallow	Forest w/ heavy ground litter & meadows (n=0.10)	1200.00 ft	10.0%	0.1		19.702 min
Pervious TC						39.1224 min

B_DR3-24 Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2 year 24 hour	0.096	15.1667	0.0849	0.84	SBUH
25-year 36-hour	0.3573	15.00	0.2979	0.84	SBUH
100-year 36-hour	0.44	15.00	0.3674	0.84	SBUH
Flows computed based on adjustment of the composite CN to **AMC3**.					
All results based on storm duration of **36.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect					

Record Id: B_DR3-24

Design Method	SBUH	**Rainfall type**	region 1-36hr.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	36.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	0.84 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	84.29
Pervious TC	0.00 min	**DC TC**	24.3459 min

DCI - CN Calc

Description	SubArea	Sub cn
Woods (good hydrologic condition)	0.84 ac	70.00
DC Composited CN (AMC 2)		70.00

DCI - TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet	Woods or forest with light underbrush. 0.40	300.00 ft	30.0%	0.4	2.60 in	19.4204 min
Shallow	Forest w/ heavy ground litter & meadows (n=0.10)	300.00 ft	10.0%	0.1		4.9255 min
Pervious TC						24.3459 min

HY-8 Culvert Analysis Report

Table 1 - Project Headwater Table

Crossing Name	Culvert Name	Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Outlet Velocity (ft/s)
DR1-21	DR1-21	100 year	17.33	17.33	1969.29	2.11	0.625	0.84	1.12	1.41	1.12	8.18
DR2-22	DR2-22	100 year	56.99	56.99	1995.25	3.25	0.0*	0.81	0.94	2.27	1.01	22.98
DR3-23	DR3-23	100 year	2.23	2.23	1994.48	0.74	0.0*	0.49	0.40	0.56	0.40	5.94
DR3-24	DR3-24	100 year	0.44	0.44	2002.46	0.30	0.0*	0.20	0.16	0.25	0.16	4.49

* Full Flow Headwater elevation is below inlet invert.

Crossing Input: DR1-21

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Recurrence	
Discharge List	Define...	
TAILWATER DATA		
Channel Type	Enter Constant Tailwater Elevation	
Channel Invert Elevation	1965.890	ft
Constant Tailwater Elevation	1965.890	ft
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	0.000	ft
Crest Length	41.840	ft
Crest Elevation	1970.390	ft
Roadway Surface	Paved	
Top Width	41.840	ft

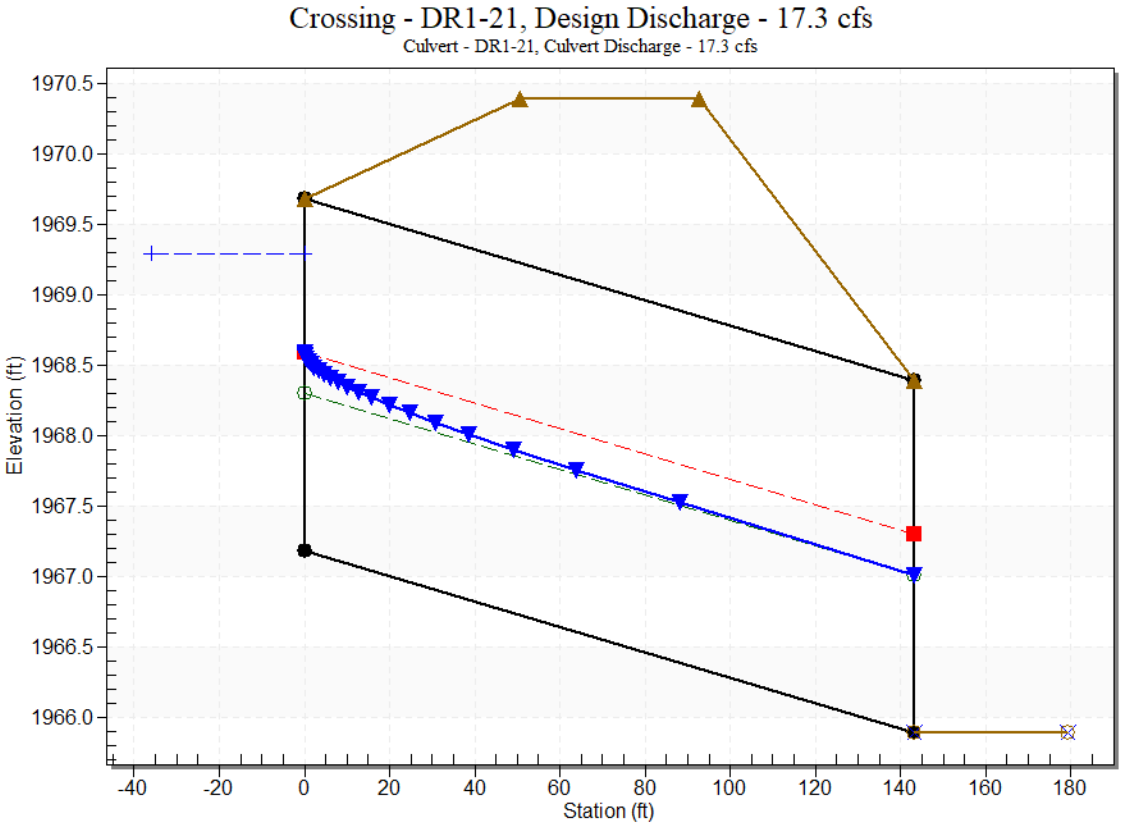
Culvert Input: DR1-21

Parameter	Value	Units
CULVERT DATA		
Name	DR1-21	
Shape	Circular	
Material	Smooth HDPE	
Diameter	2.500	ft
Embedment Depth	0.000	in
Manning's n	0.012	
Culvert Type	Straight	
Inlet Configuration	Square Edge with Headwall (Ke=0.5)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	1967.180	ft
Outlet Station	143.380	ft
Outlet Elevation	1965.890	ft
Number of Barrels	1	
Computed Culvert Slope	0.008997	ft/ft

Table 2 - Culvert Summary Table: DR1-21

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
25 year	14.08	14.08	1969.04	1.86	0.308	0.74	1-S2n	0.99	1.26	0.99	0.00	7.74	0.00
100 year	17.33	17.33	1969.29	2.11	0.625	0.84	1-S2n	1.12	1.41	1.12	0.00	8.18	0.00
Overtopping	34.66	31.45	1970.48	3.30	2.585	1.32	5-S2n	1.61	1.91	1.62	0.00	9.33	0.00

Water Surface Profile Plot for Culvert: DR1-21



Crossing Input: DR2-22

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Recurrence	
Discharge List	Define...	
TAILWATER DATA		
Channel Type	Enter Constant Tailwater Elevation	
Channel Invert Elevation	1980.000	ft
Constant Tailwater Elevation	1980.000	ft
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	17.000	ft
Crest Length	42.000	ft
Crest Elevation	1996.980	ft
Roadway Surface	Paved	
Top Width	42.000	ft

Culvert Input: DR2-22

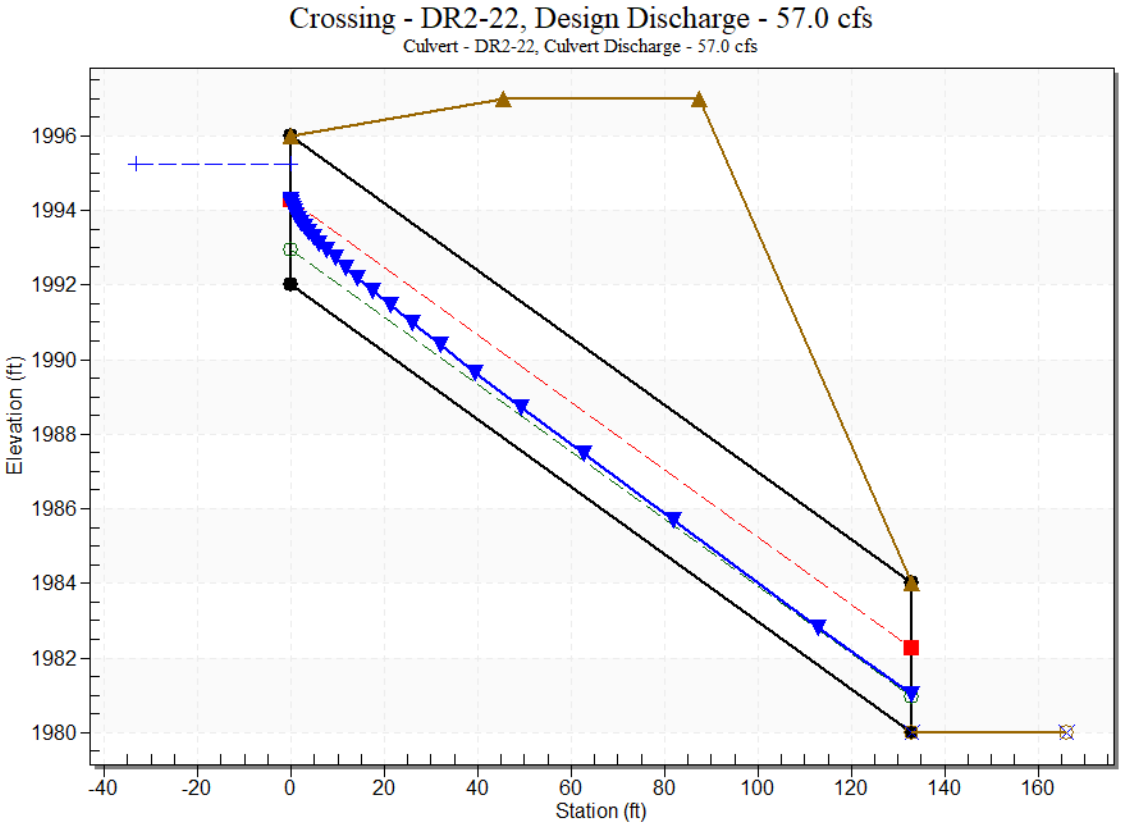
Parameter	Value	Units
CULVERT DATA		
Name	DR2-22	
Shape	Circular	
Material	Smooth HDPE	
Diameter	4.000	ft
Embedment Depth	0.000	in
Manning's n	0.012	
Culvert Type	Straight	
Inlet Configuration	Square Edge with Headwall (Ke=0.5)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	1992.000	ft
Outlet Station	132.930	ft
Outlet Elevation	1980.000	ft
Number of Barrels	1	
Computed Culvert Slope	0.090273	ft/ft

Table 3 - Culvert Summary Table: DR2-22

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
25 year	46.28	46.28	1994.84	2.84	0.0*	0.71	1-S2n	0.85	2.04	0.89	0.00	22.16	0.00
100 year	56.99	56.99	1995.25	3.25	0.0*	0.81	1-S2n	0.94	2.27	1.01	0.00	22.98	0.00
Overtopping	113.98	103.09	1997.18	5.18	0.0*	1.29	5-S2n	1.27	3.07	1.42	0.00	25.75	0.00

* Full Flow Headwater elevation is below inlet invert.

Water Surface Profile Plot for Culvert: DR2-22



Crossing Input: DR3-23

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Recurrence	
Discharge List	Define...	
TAILWATER DATA		
Channel Type	Enter Constant Tailwater Elevation	
Channel Invert Elevation	1986.970	ft
Constant Tailwater Elevation	1986.970	ft
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	0.000	ft
Crest Length	45.000	ft
Crest Elevation	1997.120	ft
Roadway Surface	Paved	
Top Width	45.000	ft

Culvert Input: DR3-23

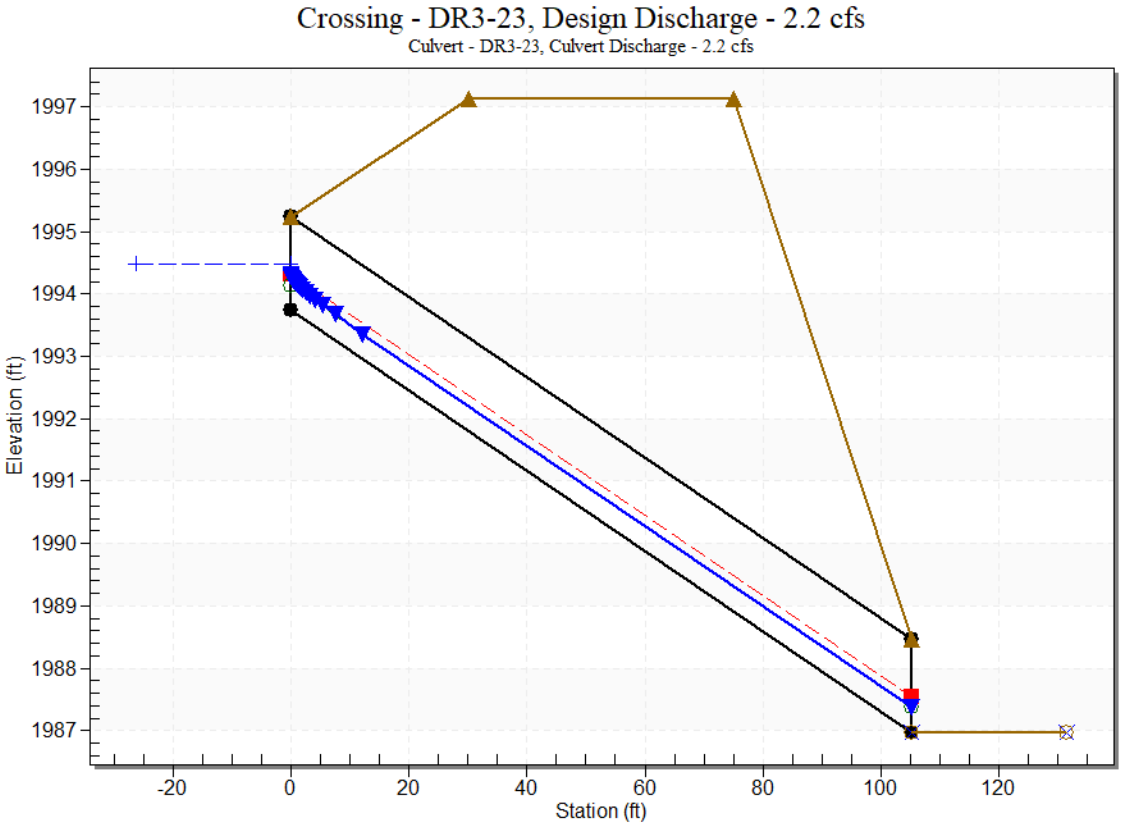
Parameter	Value	Units
CULVERT DATA		
Name	DR3-23	
Shape	Circular	
Material	Corrugated PE	
Diameter	1.500	ft
Embedment Depth	0.000	in
Manning's n	0.024	
Culvert Type	Straight	
Inlet Configuration	Square Edge with Headwall (Ke=0.5)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	1993.740	ft
Outlet Station	105.230	ft
Outlet Elevation	1986.970	ft
Number of Barrels	1	
Computed Culvert Slope	0.064335	ft/ft

Table 4 - Culvert Summary Table: DR3-23

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
25 year	1.81	1.81	1994.40	0.66	0.0*	0.44	1-S2n	0.36	0.51	0.36	0.00	5.59	0.00
100 year	2.23	2.23	1994.48	0.74	0.0*	0.49	1-S2n	0.40	0.56	0.40	0.00	5.94	0.00
Overtopping	14.50	14.07	1997.14	3.40	2.563	2.27	5-S2n	1.19	1.38	1.19	0.00	9.32	0.00

* Full Flow Headwater elevation is below inlet invert.

Water Surface Profile Plot for Culvert: DR3-23



Crossing Input: DR3-24

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Recurrence	
Discharge List	Define...	
TAILWATER DATA		
Channel Type	Triangular Channel	
Side Slope (H:V)	3.000	_:1
Channel Slope	0.0100	ft/ft
Manning's n (channel)	0.030	
Channel Invert Elevation	1994.200	ft
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	0.000	ft
Crest Length	27.750	ft
Crest Elevation	2007.620	ft
Roadway Surface	Paved	
Top Width	27.750	ft

Culvert Input: DR3-24

Parameter	Value	Units

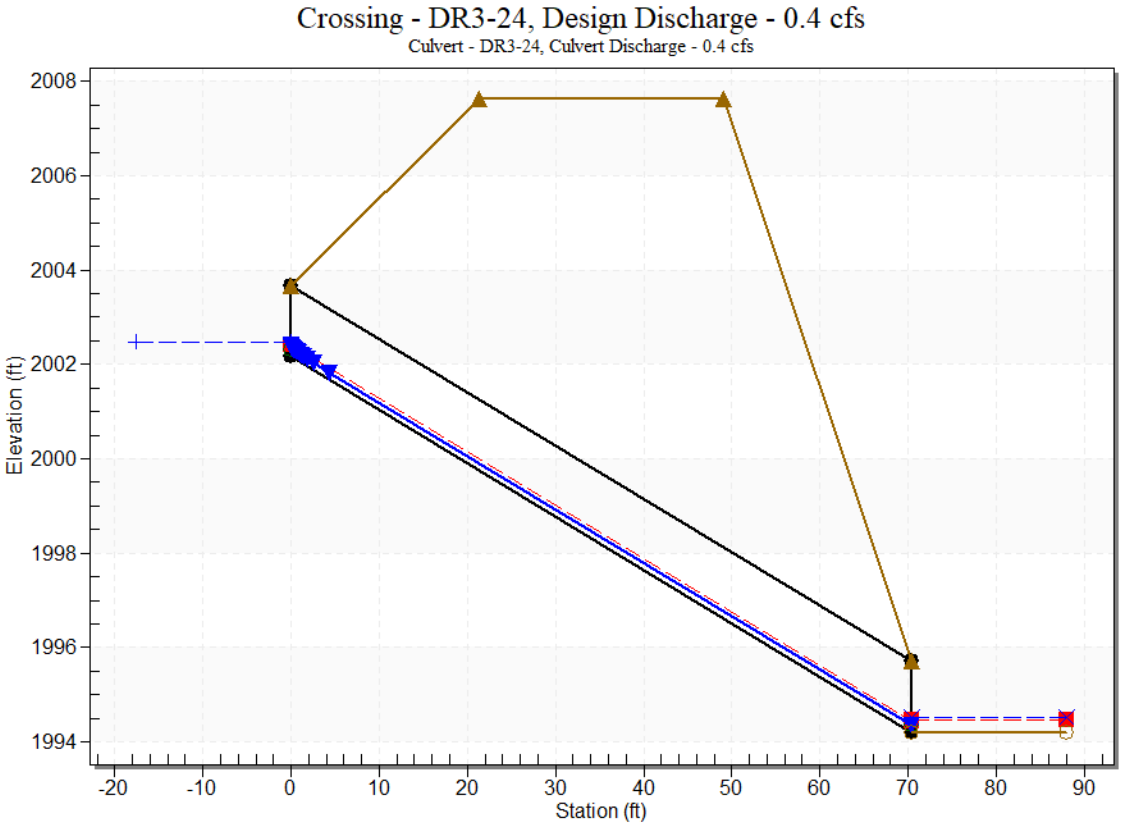
CULVERT DATA		
Name	DR3-24	
Shape	Circular	
Material	Corrugated PE	
Diameter	1.500	ft
Embedment Depth	0.000	in
Manning's n	0.024	
Culvert Type	Straight	
Inlet Configuration	Square Edge with Headwall (Ke=0.5)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	2002.160	ft
Outlet Station	70.410	ft
Outlet Elevation	1994.200	ft
Number of Barrels	1	
Computed Culvert Slope	0.113052	ft/ft

Table 5 - Culvert Summary Table: DR3-24

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
25 year	0.36	0.36	2002.43	0.27	0.0*	0.18	1-S2n	0.14	0.22	0.14	0.30	4.25	1.35
100 year	0.44	0.44	2002.46	0.30	0.0*	0.20	1-S2n	0.16	0.25	0.16	0.32	4.49	1.42
Overtopping	19.14	19.09	2007.63	5.47	4.190	3.64	5-S2n	1.22	1.50	1.22	1.32	12.36	3.63

* Full Flow Headwater elevation is below inlet invert.

Water Surface Profile Plot for Culvert: DR3-24



SR207 Nason Creek – 20240107

Conveyance Calculations

CALCULATION REPORT

Calculated By: Nathan Hahne, EIT Date: 2/27/2026

Checked By: Kern McGee, PE Date: 2/27/2026

Objective:

To analyze the hydraulic grade line and check conveyance capacity of the project's piped conveyance systems during the 25-year storm event.

Key Design Factors and Assumptions:

- Stormshed 3G model is used for analyzing the system.
- Minimum Time of Concentration (TC) is set to 5 minutes.
- The SBUH method was used.
- The Short Duration Storm (Eastern WA 2-year 3-hour) was used as the Rainfall Type.
- Smooth wall pipe with manning's coefficients of 0.013 is used for this analysis.
- "Max El" corresponds to rim elevation at the structure or pipe crown.
- "Start El" corresponds to the lowest pipe invert in a particular structure or outfall elevation.
- Tailwater is set to the crown of the outlet pipe.
- Precipitation values used:

Event	Precip (in)
2-year 3-hour	0.80
2 year 24 hour	2.60
25 year	5.20
100 year	6.10

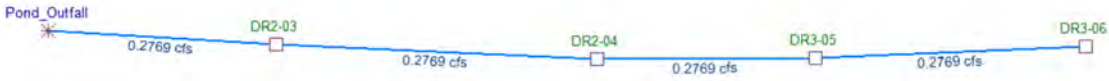
Summary of Results:

Flow Rates

Event Frequency	Flow Rate TDA 1 (CFS)	Flow Rate TDA 2 (CFS)
2-Year 3-hour	0.28	1.86

Layout Report: TDA 1 MFD Outfall

Node and Reach Labels



Nodes and Flow Rates

ROUTEHYD [] THRU [TDA 1 Conveyance] USING [2-year 3-hour] AND [EWash-3hr.rac] NOTZERO RELATIVE SCS/SBUH

Gravity Analysis using 3 hr duration storm

Reach ID	Area (ac)	Flow (cfs)	Full Q (cfs)	Full ratio	nDepth (ft)	Depth ratio	Size	nVel (ft/s)	fVel (ft/s)	Infil Vol (cf)	CBasin / Hyd
DR3-06	0.20	0.2769	2.5185	0.1099	0.2237	0.2237	12 in Diam	2.1103	3.2066	0.00	TDA 1 Conveyance
DR3-05	0.20	0.2769	2.5208	0.1098	0.2236	0.2236	12 in Diam	2.1119	3.2095	0.00	
DR2-04	0.20	0.2769	2.5261	0.1096	0.2233	0.2233	12 in Diam	2.1156	3.2163	0.00	
DR2-03	0.20	0.2769	6.8259	0.0406	0.2062	0.1375	18 in Diam	1.8909	3.8627	0.00	

HGL Analysis

From Node	To Node	HG El (ft)	App (ft)	Bend (ft)	Junct Loss (ft)	Adjusted HG El (ft)	Max El (ft)
							1985.1762
DR2-03	Pond_Outfall	1986.0528	0.0695	0.0004	------	1985.9837	1990.5000
DR2-04	DR2-03	1987.3367	0.0693	0.0009	------	1987.2683	1992.9200
DR3-05	DR2-04	1988.5367	0.0692	0.0007	------	1988.4682	1993.3800
DR3-06	DR3-05	1989.3567	------	------	------	1989.3567	1993.3800

Conduit Notes

Reach	HW Depth (ft)	HW/D ratio	Q (cfs)	TW Depth (ft)	Dc (ft)	Dn (ft)	Comment
DR2-03	0.2728	0.1819	0.28	0.2062	0.1939	0.2062	Outlet Control M1 Backwater
DR2-04	0.3067	0.3067	0.28	0.2233	0.2165	0.2233	Outlet Control M1 Backwater
DR3-05	0.3067	0.3067	0.28	0.2383	0.2165	0.2236	Outlet Control M1 Backwater
DR3-06	0.3067	0.3067	0.28	0.2382	0.2165	0.2237	Outlet Control M1 Backwater

Reach Records

Record Id: DR2-03

Section Shape:	Circular		
Uniform Flow Method:	Manning's	**Coefficient:**	0.013
Routing Method:	Travel Time Shift	**Contributing Hyd**	
DnNode	Pond_Outfall	**UpNode**	DR2-03
Material	unspecified	**Size**	18 in Diam
Ent Losses	Groove End w/Headwall		
Length	194.00 ft	**Slope**	0.42%
Up Invert	1985.78 ft	**Dn Invert**	1984.97 ft

Conduit Constraints				
Min Vel	**Max Vel**	**Min Slope**	**Max Slope**	**Min Cover**
2.00 ft/s	15.00 ft/s	0.50%	2.00%	3.00 ft

Drop across MH	0.00 ft	**Ex/Infil Rate**	0.00 in/hr

Record Id: DR2-04

Section Shape:	Circular		
Uniform Flow Method:	Manning's	**Coefficient:**	0.013
Routing Method:	Travel Time Shift	**Contributing Hyd**	
DnNode	DR2-03	**UpNode**	DR2-04
Material	unspecified	**Size**	12 in Diam
Ent Losses	Groove End w/Headwall		
Length	250.00 ft	**Slope**	0.50%
Up Invert	1987.03 ft	**Dn Invert**	1985.78 ft

Conduit Constraints				
Min Vel	**Max Vel**	**Min Slope**	**Max Slope**	**Min Cover**
2.00 ft/s	15.00 ft/s	0.50%	2.00%	3.00 ft

Drop across MH	0.00 ft	**Ex/Infil Rate**	0.00 in/hr

Record Id: DR3-05

Section Shape:	Circular		
Uniform Flow Method:	Manning's	**Coefficient:**	0.013
Routing Method:	Travel Time Shift	**Contributing Hyd**	
DnNode	DR2-04	**UpNode**	DR3-05
Material	unspecified	**Size**	12 in Diam
Ent Losses	Groove End w/Headwall		
Length	241.00 ft	**Slope**	0.50%
Up Invert	1988.23 ft	**Dn Invert**	1987.03 ft

Conduit Constraints				
Min Vel	**Max Vel**	**Min Slope**	**Max Slope**	**Min Cover**
2.00 ft/s	15.00 ft/s	0.50%	2.00%	3.00 ft

Drop across MH	0.00 ft	**Ex/Infil Rate**	0.00 in/hr

Record Id: DR3-06

Section Shape:	Circular		
Uniform Flow Method:	Manning's	**Coefficient:**	0.013
Routing Method:	Travel Time Shift	**Contributing Hyd**	
DnNode	DR3-05	**UpNode**	DR3-06
Material	unspecified	**Size**	12 in Diam
Ent Losses	Groove End w/Headwall		
Length	165.00 ft	**Slope**	0.50%
Up Invert	1989.05 ft	**Dn Invert**	1988.23 ft

Conduit Constraints				
Min Vel	**Max Vel**	**Min Slope**	**Max Slope**	**Min Cover**
2.00 ft/s	15.00 ft/s	0.50%	2.00%	3.00 ft

Drop across MH	0.00 ft	**Ex/Infil Rate**	0.00 in/hr

Node Records

Record Id: DR2-03

Descrip:		Increment	0.10 ft
Start El.	1985.78 ft	Max El.	1990.50 ft
Void Ratio	100.00		
Condition	Proposed	Structure Type	CB-TYPE 1
		Channelization	No Special Shape
Catch	0.00 ft	Bottom Area	3.97 sf
MH/CB Type Node			

Record Id: DR2-04

Descrip:		Increment	0.10 ft
Start El.	1987.03 ft	Max El.	1992.92 ft
Void Ratio	100.00		
Condition	Proposed	Structure Type	CB-TYPE 2-48
		Channelization	No Special Shape
Catch	0.00 ft	Bottom Area	12.5664 sf
MH/CB Type Node			

Record Id: DR3-05

Descrip:		Increment	0.10 ft
Start El.	1988.23 ft	Max El.	1993.38 ft
Void Ratio	100.00		
Condition	Proposed	Structure Type	CB-TYPE 1
		Channelization	No Special Shape
Catch	0.00 ft	Bottom Area	3.97 sf
MH/CB Type Node			

Record Id: DR3-06

Descrip:		Increment	0.10 ft
Start El.	1989.05 ft	Max El.	1993.38 ft
Void Ratio	100.00		

Condition	Proposed	Structure Type	CB-TYPE 1
		Channelization	No Special Shape
Catch	0.00 ft	Bottom Area	3.97 sf
MH/CB Type Node			

Record Id: Pond_Outfall

Descrip:		Increment	0.10 ft
Start El.	1984.87 ft	Max El.	1985.87 ft
Void Ratio	100.00		
Dummy Type Node			

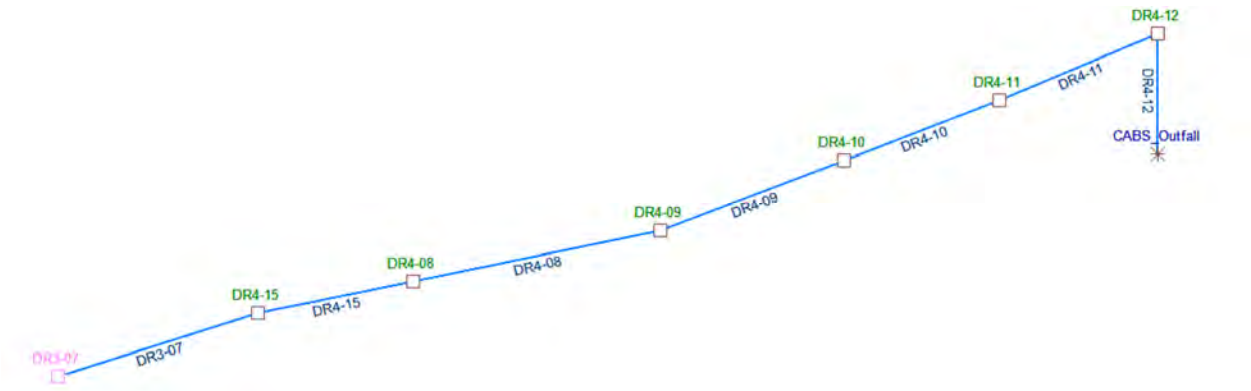
Contributing Drainage Areas

Record Id: TDA 1 Conveyance

Design Method	SBUH	**Rainfall type**	EWash-3hr.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	3.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	0.20 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	99.12
Pervious TC	0.00 min	**DC TC**	0.00 min

DCI - CN Calc		
Description	**SubArea**	**Sub cn**
Impervious surfaces (pavements, roofs, etc)	0.20 ac	98.00
DC Composited CN (AMC 2)		98.00

Layout Report: TDA 2 Conveyance to CABS



Node and Reach Labels

Nodes and Flow Rates

ROUTEHYD [] THRU [TDA 2 Conveyance] USING [2-year 3-hour] AND [EWash-3hr.rac] NOTZERO RELATIVE SCS/SBUH

Gravity Analysis using 3 hr duration storm

Reach ID	Area (ac)	Flow (cfs)	Full Q (cfs)	Full ratio	nDepth (ft)	Depth ratio	Size	nVel (ft/s)	fVel (ft/s)	Infil Vol (cf)	CBasin / Hyd
DR3-07	0.373	0.5163	8.6554	0.0597	0.1656	0.1656	12 in Diam	6.0557	11.0205	0.00	B_DR3-07
DR4-15	0.373	0.5163	351.07	0.0015	0.1145	0.0286	48 in Diam	5.044	27.937	0.00	
DR4-08	0.73	1.0105	8.0597	0.1254	0.2391	0.2391	12 in Diam	7.0096	10.2619	0.00	B_DR4-08
DR4-09	0.89	1.232	2.5007	0.4927	0.4958	0.4958	12 in Diam	3.1714	3.184	0.00	B_DR4-09
DR4-10	1.081	1.4964	2.5261	0.5924	0.554	0.554	12 in Diam	3.3504	3.2163	0.00	B_DR4-10
DR4-11	1.265	1.7511	2.5512	0.6864	0.6088	0.6088	12 in Diam	3.498	3.2483	0.00	B_DR4-11
DR4-12	1.347	1.8646	2.4229	0.7696	0.6583	0.6583	12 in Diam	3.4007	3.085	0.00	B_DR4-12

HGL Analysis

From Node	To Node	HG El (ft)	App (ft)	Bend (ft)	Junct Loss (ft)	Adjusted HG El (ft)	Max El (ft)
							1946.4083
DR4-12	CABS_Outfall	1946.6838	0.1900	0.3904	------	1946.8842	1948.5900
DR4-11	DR4-12	1947.1130	0.0564	0.0005	------	1947.0571	1949.4400
DR4-10	DR4-11	1947.6832	0.1562	0.0007	------	1947.5277	1951.1000
DR4-09	DR4-10	1948.4832	0.7630	0.0304	------	1947.7506	1954.3000
DR4-08	DR4-09	1955.4392	------	0.0014	------	1955.4406	1960.8600
DR4-15	DR4-08	1966.1359	------	0.0144	------	1966.1503	1970.5100
DR3-07	DR4-15	1977.2194	------	------	------	1977.2194	1980.3400

Conduit Notes

Reach	HW Depth (ft)	HW/D ratio	Q (cfs)	TW Depth (ft)	Dc (ft)	Dn (ft)	Comment
DR4-12	0.8738	0.8738	1.86	0.6583	0.5821	0.6583	Outlet Control M2 Backwater
DR4-11	1.3037	1.3037	1.75	1.0742	0.5633	0.6088	Outlet Control
DR4-10	0.7632	0.7632	1.50	0.9571	0.5187	0.5540	Outlet Control M1 Backwater
DR4-09	0.6832	0.6832	1.23	0.6077	0.4683	0.4958	Outlet Control M1 Backwater
DR4-08	0.5692	0.5692	1.01	0.4224	0.4224	0.2391	SuperCrit flow, Inlet end controls
DR4-15	0.1559	0.0390	0.52	0.5706	0.2048	0.1145	SuperCrit flow, Inlet end controls
DR3-07	0.3794	0.3794	0.52	0.2981	0.2981	0.1656	SuperCrit flow, Inlet end controls

Reach Records

Record Id: DR3-07

Section Shape:	Circular		
Uniform Flow Method:	Manning's	**Coefficient:**	0.013
Routing Method:	Travel Time Shift	**Contributing Hyd**	
DnNode	DR4-15	**UpNode**	DR3-07
Material	unspecified	**Size**	12 in Diam
Ent Losses	Groove End w/Headwall		
Length	185.00 ft	**Slope**	5.87%
Up Invert	1976.84 ft	**Dn Invert**	1965.98 ft

Conduit Constraints				
Min Vel	**Max Vel**	**Min Slope**	**Max Slope**	**Min Cover**
2.00 ft/s	15.00 ft/s	0.50%	2.00%	3.00 ft

Drop across MH	0.00 ft	**Ex/Infil Rate**	0.00 in/hr

Record Id: DR4-08

Section Shape:	Circular		
Uniform Flow Method:	Manning's	**Coefficient:**	0.013
Routing Method:	Travel Time Shift	**Contributing Hyd**	
DnNode	DR4-09	**UpNode**	DR4-08
Material	unspecified	**Size**	12 in Diam
Ent Losses	Groove End w/Headwall		
Length	139.00 ft	**Slope**	5.09%
Up Invert	1954.87 ft	**Dn Invert**	1947.80 ft

Conduit Constraints				
Min Vel	**Max Vel**	**Min Slope**	**Max Slope**	**Min Cover**
2.00 ft/s	15.00 ft/s	0.50%	2.00%	3.00 ft

Drop across MH	0.00 ft	**Ex/Infil Rate**	0.00 in/hr

Record Id: DR4-09

Section Shape:	Circular		
Uniform Flow Method:	Manning's	**Coefficient:**	0.013
Routing Method:	Travel Time Shift	**Contributing Hyd**	
DnNode	DR4-10	**UpNode**	DR4-09
Material	unspecified	**Size**	12 in Diam
Ent Losses	Groove End w/Headwall		
Length	181.00 ft	**Slope**	0.49%
Up Invert	1947.80 ft	**Dn Invert**	1946.92 ft

Conduit Constraints				
Min Vel	**Max Vel**	**Min Slope**	**Max Slope**	**Min Cover**
2.00 ft/s	15.00 ft/s	0.50%	2.00%	3.00 ft

Drop across MH	0.00 ft	**Ex/Infil Rate**	0.00 in/hr

Record Id: DR4-10

Section Shape:	Circular		
Uniform Flow Method:	Manning's	**Coefficient:**	0.013
Routing Method:	Travel Time Shift	**Contributing Hyd**	
DnNode	DR4-11	**UpNode**	DR4-10
Material	unspecified	**Size**	12 in Diam
Ent Losses	Groove End w/Headwall		
Length	164.00 ft	**Slope**	0.50%
Up Invert	1946.92 ft	**Dn Invert**	1946.10 ft

Conduit Constraints				
Min Vel	**Max Vel**	**Min Slope**	**Max Slope**	**Min Cover**
2.00 ft/s	15.00 ft/s	0.50%	2.00%	3.00 ft

Drop across MH	0.00 ft	**Ex/Infil Rate**	0.00 in/hr

Record Id: DR4-11

Section Shape:	Circular		
Uniform Flow Method:	Manning's	**Coefficient:**	0.013

Routing Method:	Travel Time Shift	**Contributing Hyd**	
DnNode	DR4-12	**UpNode**	DR4-11
Material	unspecified	**Size**	12 in Diam
Ent Losses	Groove End w/Headwall		
Length	57.00 ft	**Slope**	0.51%
Up Invert	1946.10 ft	**Dn Invert**	1945.81 ft

Conduit Constraints				
Min Vel	**Max Vel**	**Min Slope**	**Max Slope**	**Min Cover**
2.00 ft/s	15.00 ft/s	0.50%	2.00%	3.00 ft

Drop across MH	0.00 ft	**Ex/Infil Rate**	0.00 in/hr

Record Id: DR4-12

Section Shape:	Circular		
Uniform Flow Method:	Manning's	**Coefficient:**	0.013
Routing Method:	Travel Time Shift	**Contributing Hyd**	
DnNode	CABS_Outfall	**UpNode**	DR4-12
Material	unspecified	**Size**	12 in Diam
Ent Losses	Groove End w/Headwall		
Length	13.00 ft	**Slope**	0.46%
Up Invert	1945.81 ft	**Dn Invert**	1945.75 ft

Conduit Constraints				
Min Vel	**Max Vel**	**Min Slope**	**Max Slope**	**Min Cover**
2.00 ft/s	15.00 ft/s	0.50%	2.00%	3.00 ft

Drop across MH	0.00 ft	**Ex/Infil Rate**	0.00 in/hr

Record Id: DR4-15

Section Shape:	Circular		
Uniform Flow Method:	Manning's	**Coefficient:**	0.013
Routing Method:	Travel Time Shift	**Contributing Hyd**	
DnNode	DR4-08	**UpNode**	DR4-15

Material	unspecified	**Size**	48 in Diam
Ent Losses	Groove End w/Headwall		
Length	187.00 ft	**Slope**	5.94%
Up Invert	1965.98 ft	**Dn Invert**	1954.87 ft

Conduit Constraints				
Min Vel	**Max Vel**	**Min Slope**	**Max Slope**	**Min Cover**
2.00 ft/s	15.00 ft/s	0.50%	2.00%	3.00 ft

Drop across MH	0.00 ft	**Ex/Infil Rate**	0.00 in/hr

Node Records

Record Id: CABS_Outfall

Descrip:		Increment	0.10 ft
Start El.	1945.75 ft	Max El.	1946.75 ft
Void Ratio	100.00		
Dummy Type Node			

Record Id: DR3-07

Descrip:		Increment	0.10 ft
Start El.	1976.84 ft	Max El.	1980.34 ft
Void Ratio	100.00		
Condition	Proposed	Structure Type	CB-TYPE 1
		Channelization	No Special Shape
Catch	0.00 ft	Bottom Area	3.97 sf
MH/CB Type Node			

Record Id: DR4-08

Descrip:		Increment	0.10 ft
Start El.	1954.87 ft	Max El.	1960.86 ft

Void Ratio	100.00		
Condition	Proposed	Structure Type	CB-TYPE 2-48
		Channelization	No Special Shape
Catch	0.00 ft	Bottom Area	12.5664 sf
MH/CB Type Node			

Record Id: DR4-09

Descrip:		Increment	0.10 ft
Start El.	1947.80 ft	Max El.	1954.30 ft
Void Ratio	100.00		
Condition	Proposed	Structure Type	CB-TYPE 2-48
		Channelization	No Special Shape
Catch	0.00 ft	Bottom Area	12.5664 sf
MH/CB Type Node			

Record Id: DR4-10

Descrip:		Increment	0.10 ft
Start El.	1946.92 ft	Max El.	1951.10 ft
Void Ratio	100.00		
Condition	Proposed	Structure Type	CB-TYPE 1
		Channelization	No Special Shape
Catch	0.00 ft	Bottom Area	3.97 sf
MH/CB Type Node			

Record Id: DR4-11

Descrip:		Increment	0.10 ft
Start El.	1946.10 ft	Max El.	1949.44 ft
Void Ratio	100.00		
Condition	Proposed	Structure Type	CB-TYPE 1
		Channelization	No Special Shape

Catch	0.00 ft	Bottom Area	3.97 sf
MH/CB Type Node			

Record Id: DR4-12

Descrip:		Increment	0.10 ft
Start El.	1945.81 ft	Max El.	1948.59 ft
Void Ratio	100.00		
Condition	Proposed	Structure Type	CB-TYPE 1
		Channelization	No Special Shape
Catch	0.00 ft	Bottom Area	3.97 sf
MH/CB Type Node			

Record Id: DR4-15

Descrip:		Increment	0.10 ft
Start El.	1965.98 ft	Max El.	1970.51 ft
Void Ratio	100.00		
Condition	Proposed	Structure Type	CB-TYPE 1
		Channelization	No Special Shape
Catch	0.00 ft	Bottom Area	3.97 sf
MH/CB Type Node			

Contributing Drainage Areas

Record Id: B_DR3-07

Design Method	SBUH	**Rainfall type**	EWash-3hr.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	3.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	0.373 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	99.12
Pervious TC	0.00 min	**DC TC**	0.00 min

DCI - CN Calc		
Description	**SubArea**	**Sub cn**
Impervious surfaces (pavements, roofs, etc)	0.373 ac	98.00
DC Composited CN (AMC 2)		98.00

Record Id: B_DR4-08

Design Method	SBUH	**Rainfall type**	EWash-3hr.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	3.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	0.357 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	99.12
Pervious TC	0.00 min	**DC TC**	0.00 min

DCI - CN Calc		
Description	**SubArea**	**Sub cn**
Impervious surfaces (pavements, roofs, etc)	0.357 ac	98.00
DC Composited CN (AMC 2)		98.00

Record Id: B_DR4-09

Design Method	SBUH	**Rainfall type**	EWash-3hr.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	3.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	0.16 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	99.12
Pervious TC	0.00 min	**DC TC**	0.00 min

DCI - CN Calc		
Description	**SubArea**	**Sub cn**
Impervious surfaces (pavements, roofs, etc)	0.16 ac	98.00
DC Composited CN (AMC 2)		98.00

Record Id: B_DR4-10

Design Method	SBUH	**Rainfall type**	EWash-3hr.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	3.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	0.191 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	99.12
Pervious TC	0.00 min	**DC TC**	0.00 min

DCI - CN Calc

Description	SubArea	Sub cn
Impervious surfaces (pavements, roofs, etc)	0.191 ac	98.00
DC Composited CN (AMC 2)		98.00

Record Id: B_DR4-11

Design Method	SBUH	**Rainfall type**	EWash-3hr.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	3.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	0.184 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	99.12
Pervious TC	0.00 min	**DC TC**	0.00 min

DCI - CN Calc

Description	SubArea	Sub cn
Impervious surfaces (pavements, roofs, etc)	0.184 ac	98.00
DC Composited CN (AMC 2)		98.00

Record Id: B_DR4-12

Design Method	SBUH	**Rainfall type**	EWash-3hr.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	3.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	0.082 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	99.12

Pervious TC	0.00 min	**DC TC**	0.00 min

DCI - CN Calc		
Description	**SubArea**	**Sub cn**
Impervious surfaces (pavements, roofs, etc)	0.082 ac	98.00
DC Composited CN (AMC 2)		98.00

SR207 Nason Creek – 20240107

Ditch Calculations

CALCULATION REPORT

Calculated By: Nathan Hahne, EIT Date: 2/6/2026

Checked By: Kern McGee, PE Date: 2/6/2026

Objective:

- To determine if proposed roadway and off-site interceptor ditches have sufficient capacity.

Key Design Factors and Assumptions:

StormShed3G

- StormShed3G is used for determining flow rates using the SBUH method.
- Minimum Tc = 5.00 min.
- For roadway conveyance ditches, Rainfall Type is set to Eastern WA short duration storm (2-year 3-hour) for the SBUH method.
- For offsite interceptor ditches, Rainfall Type is set to the Region 1 Long Duration Storm (36-hour storm). The 25-year recurrence interval is used for these calculations.
- For SBUH method, the antecedent moisture condition is set to AMC 3, due to the presence of saturated soils.
- The flow rates for "TDA 1 Offsite" are taken from the Culvert DR1-21 flow rate calculation.

Hydraulic Toolbox

- The FHWA Hydraulic Toolbox was used to perform Manning's equation ditch calculations.
- The Manning's roughness coefficient, n, was set to 0.035, assuming a vegetated ditch.
- Cross sections were entered based on the proposed ditch cross-section at the location that the ditch calc was done.

B_DR1-21 Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2-year 3-hour	0.2051	26.50	0.2844	38.34	SBUH
2 year 24 hour	3.8116	15.1667	4.0032	38.34	SBUH
25 year	11.5174	15.1667	11.3254	38.34	SBUH
25-year 36-hour	14.0774	15.1667	13.8076	38.34	SBUH
100 year	14.2938	15.1667	14.0187	38.34	SBUH
100-year 36-hour	17.3266	15.1667	16.9952	38.34	SBUH
Flows computed based on adjustment of the composite CN to **AMC3**.					
All results based on storm duration of **36.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect					

Record Id: B_DR1-21

Design Method	SBUH	**Rainfall type**	region 1-36hr.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	36.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	38.34 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	84.91
Pervious TC	0.00 min	**DC TC**	53.899 min

DCI - CN Calc

Description	SubArea	Sub cn
Woods (good hydrologic condition)	36.34 ac	70.00
Gravel Roads & Parking Lots	2.00 ac	89.00
DC Composited CN (AMC 2)		70.9911

DCI - TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet	Woods or forest with light underbrush. 0.40	300.00 ft	30.0%	0.4	0.00 in	19.4204 min
Shallow	Forest w/ heavy ground litter & meadows (n=0.10)	2100.00 ft	10.0%	0.1		34.4785 min
Pervious TC						53.899 min

TDA 1 Conveyance Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2-year 3-hour	1.7442	1.00	0.0738	1.26	SBUH
2 year 24 hour	5.9962	1.00	0.2621	1.26	SBUH
25-year 36-hour	14.0035	1.00	0.6218	1.26	SBUH
100-year 36-hour	16.4498	1.00	0.7319	1.26	SBUH
Flows computed based on adjustment of the composite CN to **AMC3**.					
All results based on storm duration of **3.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect					

Record Id: TDA 1 Conveyance

Design Method	SBUH	**Rainfall type**	EWash-3hr.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	3.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	1.26 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	99.12
Pervious TC	0.00 min	**DC TC**	0.00 min

DCI - CN Calc		
Description	**SubArea**	**Sub cn**
Impervious surfaces (pavements, roofs, etc)	1.26 ac	98.00
DC Composited CN (AMC 2)		98.00

TDA 2 Offsite Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2-year 3-hour	0.4457	27.50	0.5989	90.15	SBUH
2 year 24 hour	9.671	15.1667	9.1108	90.15	SBUH
25-year 36-hour	35.9048	15.1667	31.9704	90.15	SBUH
100-year 36-hour	44.2117	15.1667	39.4337	90.15	SBUH
Flows computed based on adjustment of the composite CN to **AMC3**.					
All results based on storm duration of **36.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect					

Record Id: TDA 2 Offsite

Design Method	SBUH	**Rainfall type**	region 1-36hr.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	36.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	90.15 ac
Pervious CN (as AMC3)	0.00	**DC CN (as AMC3)**	84.29
Pervious TC	0.00 min	**DC TC**	34.3012 min

DCI - CN Calc

Description	SubArea	Sub cn
Woods (good hydrologic condition)	90.15 ac	70.00
DC Composited CN (AMC 2)		70.00

DCI - TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet	Woods or forest with light underbrush. 0.40	300.00 ft	30.0%	0.4	0.00 in	19.4204 min
Shallow	Forest w/ heavy ground litter & meadows (n=0.10)	800.00 ft	30.0%	0.1		7.5833 min
Cont Channel	Rock-lined stream (n=0.035)	3200.00 ft	10.0%	0.035		7.2975 min
Pervious TC						34.3012 min

Hydraulic Analysis Report

Project Data

Project Title: SR207 Ditch Calcs

Designer:

Project Date: Friday, January 16, 2026

Project Units: U.S. Customary Units

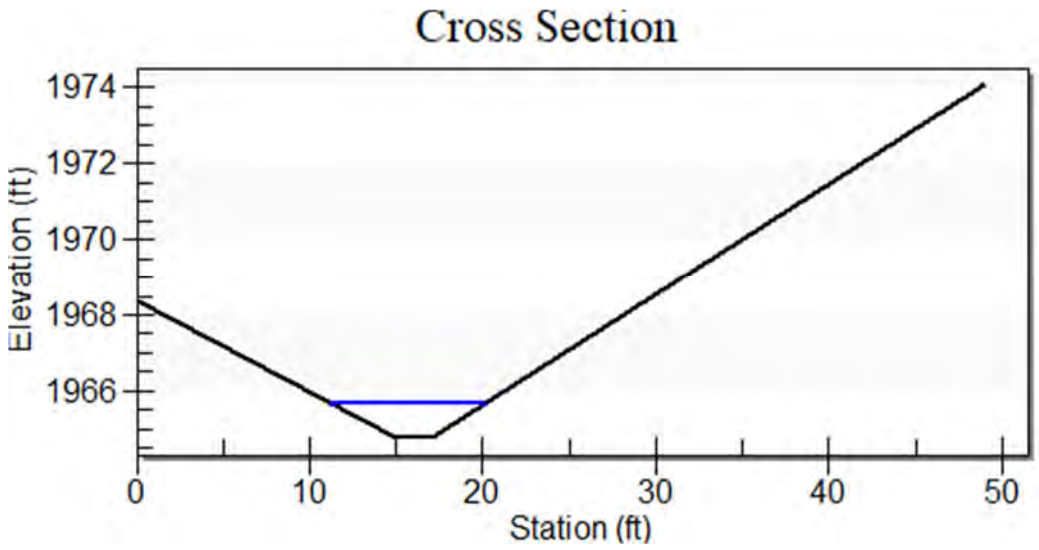
Notes:

Channel Analysis: TDA 2 Offsite - DS end

Notes:

Input Parameters

Channel Type: Custom Cross Section



Cross Section Data

Station (ft	Elevation (ft)	Manning's n
0.00	1968.38	0.0300
15.00	1964.79	0.0300
17.00	1964.79	0.0300
49.00	1974.06	-----

Longitudinal Slope: 0.0500 ft/ft

Flow 35.9200 cfs

Result Parameters

Depth 0.9014 ft

Area of Flow 4.9025 ft^2

Wetted Perimeter 9.1121 ft

Hydraulic Radius 0.5380 ft

Average Velocity 7.3268 ft/s

Top Width 8.8778 ft

Froude Number: 1.7375

Critical Depth 1.1734 ft

Critical Velocity 4.7266 ft/s

Critical Slope: 0.0154 ft/ft

Critical Top Width 10.95 ft

Calculated Max Shear Stress 2.8123 lb/ft^2

Calculated Avg Shear Stress 1.6786 lb/ft^2

Composite Manning's n Equation: Lotter method

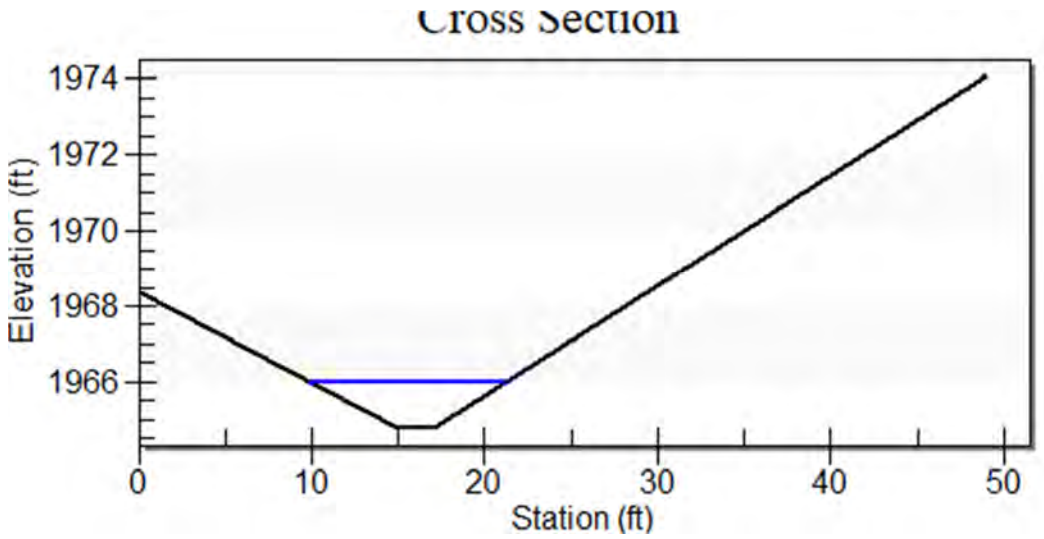
Manning's n: 0.0300

Channel Analysis: TDA 2 Offsite - US end

Notes:

Input Parameters

Channel Type: Custom Cross Section



Cross Section Data

Station (ft	Elevation (ft)	Manning's n
0.00	1968.38	0.0300
15.00	1964.79	0.0300
17.00	1964.79	0.0300
49.00	1974.06	-----

Longitudinal Slope: 0.0140 ft/ft

Flow 35.9000 cfs

Result Parameters

Depth 1.1976 ft

Area of Flow 7.8666 ft^2

Wetted Perimeter 11.4490 ft

Hydraulic Radius 0.6871 ft

Average Velocity 4.5636 ft/s

Top Width 11.1377 ft

Froude Number: 0.9569

Critical Depth 1.1731 ft

Critical Velocity 4.7261 ft/s

Critical Slope: 0.0154 ft/ft

Critical Top Width 10.95 ft

Calculated Max Shear Stress 1.0462 lb/ft^2

Calculated Avg Shear Stress 0.6003 lb/ft^2

Composite Manning's n Equation: Lotter method

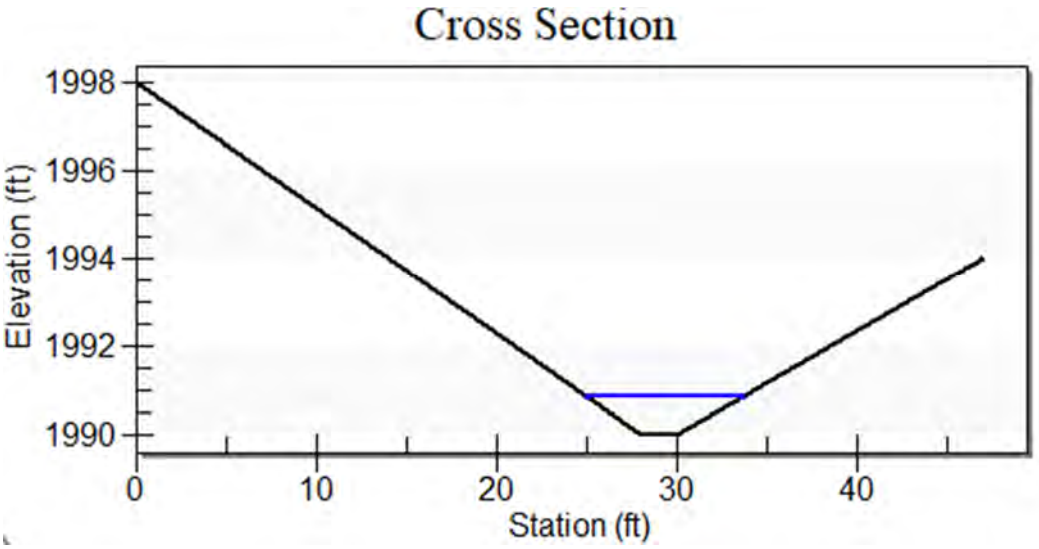
Manning's n: 0.0300

Channel Analysis: TDA 1 Offsite - US end

Notes:

Input Parameters

Channel Type: Custom Cross Section



Cross Section Data

Station (ft	Elevation (ft)	Manning's n
0.00	1998.00	0.0350
28.00	1990.00	0.0350
30.00	1990.00	0.0350
47.00	1994.00	-----

Longitudinal Slope: 0.0125 ft/ft

Flow 14.0800 cfs

Result Parameters

Depth 0.8620 ft

Area of Flow 4.6037 ft^2

Wetted Perimeter 8.9016 ft

Hydraulic Radius 0.5172 ft

Average Velocity 3.0584 ft/s

Top Width 8.6809 ft

Froude Number: 0.7401

Critical Depth 0.7435 ft

Critical Velocity 3.8800 ft/s

Critical Slope: 0.0238 ft/ft

Critical Top Width 7.76 ft

Calculated Max Shear Stress 0.6724 lb/ft^2

Calculated Avg Shear Stress 0.4034 lb/ft^2

Composite Manning's n Equation: Lotter method

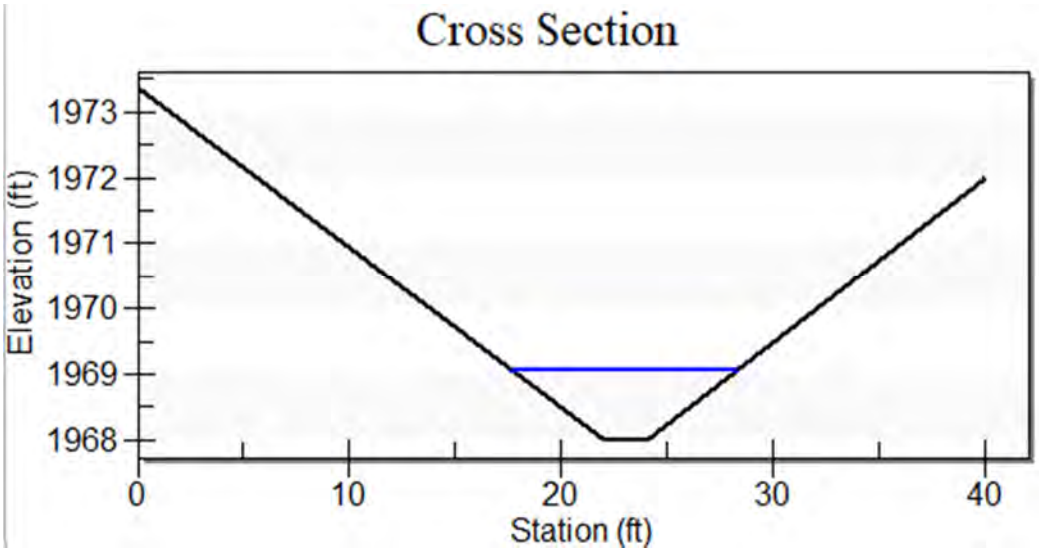
Manning's n: 0.0350

Channel Analysis: TDA 1 Offsite - DS end

Notes:

Input Parameters

Channel Type: Custom Cross Section



Cross Section Data

Station (ft	Elevation (ft)	Manning's n
0.00	1973.35	0.0350
22.00	1968.00	0.0350

24.00	1968.00	0.0350
40.00	1972.00	-----

Longitudinal Slope: 0.0050 ft/ft

Flow 14.0800 cfs

Result Parameters

Depth 1.0463 ft

Area of Flow 6.5334 ft^2

Wetted Perimeter 10.7423 ft

Hydraulic Radius 0.6082 ft

Average Velocity 2.1551 ft/s

Top Width 10.4881 ft

Froude Number: 0.4812

Critical Depth 0.7348 ft

Critical Velocity 3.8476 ft/s

Critical Slope: 0.0238 ft/ft

Critical Top Width 7.96 ft

Calculated Max Shear Stress 0.3265 lb/ft^2

Calculated Avg Shear Stress 0.1898 lb/ft^2

Composite Manning's n Equation: Lotter method

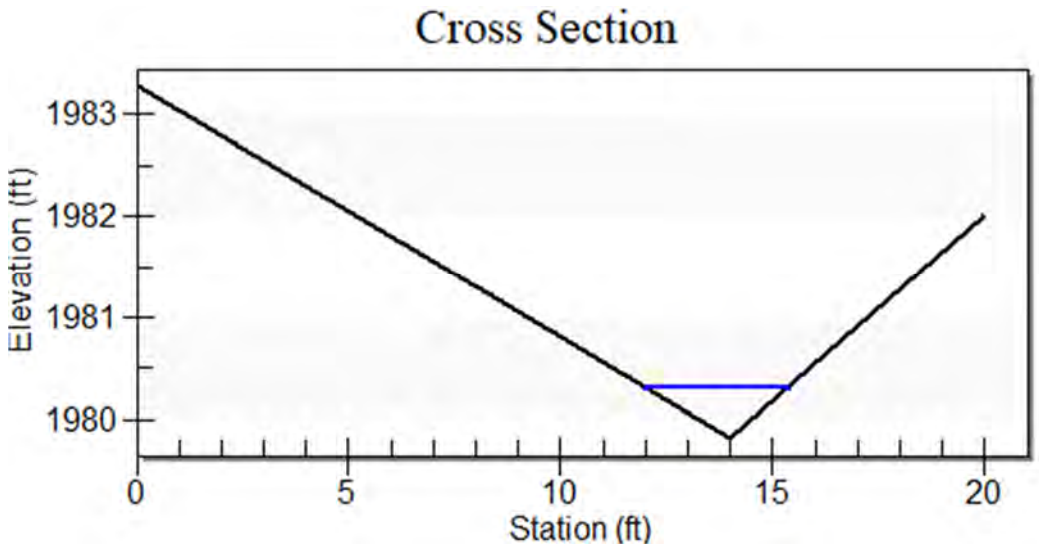
Manning's n: 0.0350

Channel Analysis: TDA 1 Roadway Ditch to Pond - DS end

Notes:

Input Parameters

Channel Type: Custom Cross Section



Cross Section Data

Station (ft	Elevation (ft)	Manning's n
0.00	1983.28	0.0350
14.00	1979.82	0.0350
20.00	1982.00	-----

Longitudinal Slope: 0.0176 ft/ft

Flow 1.7400 cfs

Result Parameters

Depth 0.4890 ft

Area of Flow 0.8129 ft^2

Wetted Perimeter 3.4703 ft

Hydraulic Radius 0.2343 ft

Average Velocity 2.1404 ft/s

Top Width 3.3247 ft

Froude Number: 0.7628

Critical Depth 0.4388 ft

Critical Velocity 2.6582 ft/s

Critical Slope: 0.0314 ft/ft

Critical Top Width 2.98 ft

Calculated Max Shear Stress 0.5371 lb/ft^2

Calculated Avg Shear Stress 0.2573 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0350

Roadside Ditch Stability Spreadsheet

PERTEET

Project Number: 20240107
Project Name: SR207 Nason Creek Realignment

2707 Colby Avenue,
Suite 900, Everett, WA 98201 | P 425.252.7700

Input Cells

Location: TDA 2 Offsite Ditch Upstream End

Design for Ditch Stability after Excavation:

25-year Flow Rate (Q):	35.92
Ditch Slope (s):	0.014
Depth of Flow (d):	0.90

Check Shear Stress

Note: Shear Stress = WHG = (Weight of Water) X (Height of Water) X (Channel Gradient) = 62.4 x d X s

Calculated Shear Stress = 0.79 lb/ft^2

From Table 5-1 , 2019 WSDOT TESC Manual

		Premissible Shear Stress		Results	
Liner Category	Liner Type	Low	High	Check Low End	Check High End
Bare Soil - No Liner					
	Noncohesive Soil	0.01	0.04	ERODE	ERODE
	Cohesive Soil	0.10	0.80	ERODE	O.K.
Erosion Control Blanket (Temporary/Permanent)					
	Jute	0.45	1.00	ERODE	O.K.
	Curlex Wood or Straw	1.00	2.50	O.K.	O.K.
	Coir	2.00	4.00	O.K.	O.K.
	Organic, Synthetic, or Mix	10.00	12.00	O.K.	O.K.
Vegetative (varies w/ type and density of grass stand)					
	Uncut Stand	2.10	3.70	O.K.	O.K.
	Cut Stand	0.60	1.00	ERODE	O.K.
Gravel/Rip-Rap					
	1-inch		0.33		ERODE
	2-inch		0.67		ERODE
	6-inch		2.00		O.K.
	12-inch		4.00		O.K.

TDA	Ditch Location	Result
2	TDA 2 Offsite Ditch Upstream End	Vegatative (Uncut Stand)

Roadside Ditch Stability Spreadsheet

PERTEET

Project Number: 20240107
Project Name: SR207 Nason Creek Realignment

2707 Colby Avenue,
Suite 900, Everett, WA 98201 | P 425.252.7700

Input Cells

Location: TDA 2 Offsite Ditch Downstream End

Design for Ditch Stability after Excavation:

25-year Flow Rate (Q):	35.92
Ditch Slope (s):	0.050
Depth of Flow (d):	0.90

Check Shear Stress

Note: Shear Stress = WHG = (Weight of Water) X (Height of Water) X (Channel Gradient) = 62.4 x d X s

Calculated Shear Stress = 2.81 lb/ft^2

From Table 5-1 , 2019 WSDOT TESC Manual

		Premissible Shear Stress		Results	
Liner Category	Liner Type	Low	High	Check Low End	Check High End
Bare Soil - No Liner					
	Noncohesive Soil	0.01	0.04	ERODE	ERODE
	Cohesive Soil	0.10	0.80	ERODE	ERODE
Erosion Control Blanket (Temporary/Permanent)					
	Jute	0.45	1.00	ERODE	ERODE
	Curlex Wood or Straw	1.00	2.50	ERODE	ERODE
	Coir	2.00	4.00	ERODE	O.K.
	Organic, Synthetic, or Mix	10.00	12.00	O.K.	O.K.
Vegetative (varies w/ type and density of grass stand)					
	Uncut Stand	2.10	3.70	ERODE	O.K.
	Cut Stand	0.60	1.00	ERODE	ERODE
Gravel/Rip-Rap					
	1-inch		0.33		ERODE
	2-inch		0.67		ERODE
	6-inch		2.00		ERODE
	12-inch		4.00		O.K.

TDA	Ditch Location	Result
2	TDA 2 Offsite Ditch Downstream End	Rip-Rap 12-inch

Roadside Ditch Stability Spreadsheet

PERTEET

Project Number: 20240107
Project Name: SR207 Nason Creek Realignment

2707 Colby Avenue,
Suite 900, Everett, WA 98201 | P 425.252.7700

Input Cells

Location: TDA 1 Offsite Ditch Upstream End

Design for Ditch Stability after Excavation:

25-year Flow Rate (Q):	14.08
Ditch Slope (s):	0.013
Depth of Flow (d):	0.86

Check Shear Stress

Note: Shear Stress = WHG = (Weight of Water) X (Height of Water) X (Channel Gradient) = 62.4 x d X s

Calculated Shear Stress = 0.67 lb/ft^2

From Table 5-1 , 2019 WSDOT TESC Manual

		Premissible Shear Stress		Results	
Liner Category	Liner Type	Low	High	Check Low End	Check High End
Bare Soil - No Liner					
	Noncohesive Soil	0.01	0.04	ERODE	ERODE
	Cohesive Soil	0.10	0.80	ERODE	O.K.
Erosion Control Blanket (Temporary/Permanent)					
	Jute	0.45	1.00	ERODE	O.K.
	Curlex Wood or Straw	1.00	2.50	O.K.	O.K.
	Coir	2.00	4.00	O.K.	O.K.
	Organic, Synthetic, or Mix	10.00	12.00	O.K.	O.K.
Vegetative (varies w/ type and density of grass stand)					
	Uncut Stand	2.10	3.70	O.K.	O.K.
	Cut Stand	0.60	1.00	ERODE	O.K.
Gravel/Rip-Rap					
	1-inch		0.33		ERODE
	2-inch		0.67		ERODE
	6-inch		2.00		O.K.
	12-inch		4.00		O.K.

TDA	Ditch Location	Result
1	TDA 1 Offsite Ditch Upstream End	Vegatative (Uncut Stand)

Roadside Ditch Stability Spreadsheet

PERTEET

Project Number: 20240107
Project Name: SR207 Nason Creek Realignment

2707 Colby Avenue,
Suite 900, Everett, WA 98201 | P 425.252.7700

Input Cells

Location: TDA 1 Offsite Ditch Downstream End

Design for Ditch Stability after Excavation:

25-year Flow Rate (Q):	14.08
Ditch Slope (s):	0.005
Depth of Flow (d):	1.04

Check Shear Stress

Note: Shear Stress = WHG = (Weight of Water) X (Height of Water) X (Channel Gradient) = 62.4 x d X s

Calculated Shear Stress = 0.32 lb/ft^2

From Table 5-1 , 2019 WSDOT TESC Manual

		Premissible Shear Stress		Results	
Liner Category	Liner Type	Low	High	Check Low End	Check High End
Bare Soil - No Liner					
	Noncohesive Soil	0.01	0.04	ERODE	ERODE
	Cohesive Soil	0.10	0.80	ERODE	O.K.
Erosion Control Blanket (Temporary/Permanent)					
	Jute	0.45	1.00	O.K.	O.K.
	Curlex Wood or Straw	1.00	2.50	O.K.	O.K.
	Coir	2.00	4.00	O.K.	O.K.
	Organic, Synthetic, or Mix	10.00	12.00	O.K.	O.K.
Vegetative (varies w/ type and density of grass stand)					
	Uncut Stand	2.10	3.70	O.K.	O.K.
	Cut Stand	0.60	1.00	O.K.	O.K.
Gravel/Rip-Rap					
	1-inch		0.33		O.K.
	2-inch		0.67		O.K.
	6-inch		2.00		O.K.
	12-inch		4.00		O.K.

TDA	Ditch Location	Result
1	TDA 1 Offsite Ditch Downstream End	Vegatative (Cut Stand)

Roadside Ditch Stability Spreadsheet

PERTEET

Project Number: 20240107
Project Name: SR207 Nason Creek Realignment

2707 Colby Avenue,
Suite 900, Everett, WA 98201 | P 425.252.7700

Input Cells

Location: TDA 1 Roadway Ditch Downstream End

Design for Ditch Stability after Excavation:

25-year Flow Rate (Q):	1.74
Ditch Slope (s):	0.018
Depth of Flow (d):	0.49

Check Shear Stress

Note: Shear Stress = WHG = (Weight of Water) X (Height of Water) X (Channel Gradient) = 62.4 x d X s

Calculated Shear Stress = 0.54 lb/ft^2

From Table 5-1 , 2019 WSDOT TESC Manual

		Premissible Shear Stress		Results	
Liner Category	Liner Type	Low	High	Check Low End	Check High End
Bare Soil - No Liner					
	Noncohesive Soil	0.01	0.04	ERODE	ERODE
	Cohesive Soil	0.10	0.80	ERODE	O.K.
Erosion Control Blanket (Temporary/Permanent)					
	Jute	0.45	1.00	ERODE	O.K.
	Curlex Wood or Straw	1.00	2.50	O.K.	O.K.
	Coir	2.00	4.00	O.K.	O.K.
	Organic, Synthetic, or Mix	10.00	12.00	O.K.	O.K.
Vegetative (varies w/ type and density of grass stand)					
	Uncut Stand	2.10	3.70	O.K.	O.K.
	Cut Stand	0.60	1.00	O.K.	O.K.
Gravel/Rip-Rap					
	1-inch		0.33		ERODE
	2-inch		0.67		O.K.
	6-inch		2.00		O.K.
	12-inch		4.00		O.K.

TDA	Ditch Location	Result
1	TDA 1 Roadway Ditch Downstream End	Vegatative (Cut Stand)

2707 Colby Avenue, Suite 900, Everett, WA 98201 | P 425.252.7700

SR207 Outlet and Inlet Protection Calculations

Project Description: SR207 Nason Creek Realignment	Client: Yakima Nation Fisheries
Corridor Section:	Date: 2/9/2026
Location: Chelan County, WA	Calculated By/Entered By: NFH
	Checked By:

Rock Protection Sizing, Headwall evaluation

Pipe/Ditch Statistics

	Diameter	Model Material Input	Thermoplastic?	Headwall? (plastic)*	Headwall? (general)**	Outlet Velocity (fps)	Outlet Protection Material Required	D50 of Material	Depth of Pad	Safety Bars	Notes:
DR1-21	2.50	Smooth HDPE	Yes	Yes	No	8.18	RESP Cl. A	0.67	2	Type 2	Headwall and safety bars
DR2-22	4.00	Smooth HDPE	Yes	Yes	Yes	11.67	RESP Cl. B	1.33	4	Type 1	drop inlet, beehive grate and rock protection, headwall on downstream end.
DR3-23	1.50	Corr. PE	Yes	No	No	5.94	Quarry Spalls	0.33	1	none	18", does not need headwall, safety bars
DR3-24	1.50	Corr. PE	Yes	No	No	4.49	Quarry Spalls	0.33	1	none	18", does not need headwall, safety bars
TDA 2 Offsite Ditch	0.00	N/A	No	No	No	7.33	RESP Cl. A	0.67	2	none	
DR2-03	1.00	Sch. A	No	No	No	1.98	Quarry Spalls	0.33	1	none	12" conveyance system
DR1-02	1.00	Sch. A	No	No	No	Assumed <7	Quarry Spalls	0.33	1	none	12" pond outlet
DR1-01	1.00	Sch. A	No	No	No	Assumed <7	Quarry Spalls	0.33	1	none	12" pond inlet
DR4-14	1.00	Sch. A	No	No	No	Assumed <7	Quarry Spalls	0.33	1	none	12" pond outlet
DR4-13	1.00	Sch. A	No	No	No	Assumed <7	Quarry Spalls	0.33	1	none	12" pond inlet

*: headwall is required for all culvert pipes greater than 48" diameter

**: headwall is required for all plastic culvert pipes greater than 30" diameter

Rock Classes Depending on Velocity (from Table 3-3 in HM)

Velocity (fps)		D50 (ft)
Up to 7	Quarry Spalls	0.33
7 to 10	RESP Cl. A	0.67
10 to 15	RESP Cl. B	1.33
15+	RESP Cl. C	1.83

CALCULATION REPORT

Calculated By: [Jason Walker], PE Date: [12/05/2025]

Checked By: [NAME], EIT/PE Date: [XX/XX/XXXX]

Objective:

The purpose of this analysis is to:

- Determine the required inlet spacing for the TDA 1 (North TDA) The inlets are spaced in accordance with requirements of the 20190 Highway Runoff Manual (HRM)

Calculation Methodology:

- WSDOT Inlet spacing spreadsheet.

Inputs:

- Time of Concentration = 5 min
- Runoff Coefficient = 0.9
- Rainfall intensity = 2.67 in/ hr.
- Roadway width is between 42.5 up to 64 ft

Summary of Results:

It was determined that inlet spacing will governed by spacing the inlets to get around the curve in the upper reach. At the lower reach near Sta 338+70 an extra inlet was needed to meet the design requirements. This is a result of the slopes being much more shallow near the end.

Inlet Spreadsheet.

2019 INLET SPACING - CURB AND GUTTER SPREADSHEET (ENGLISH UNITS)

Fill in the data for the ***grey shaded areas*** only

Tc =	5.00
C =	0.90
I =	2.67
m=	6.47
n=	0.55

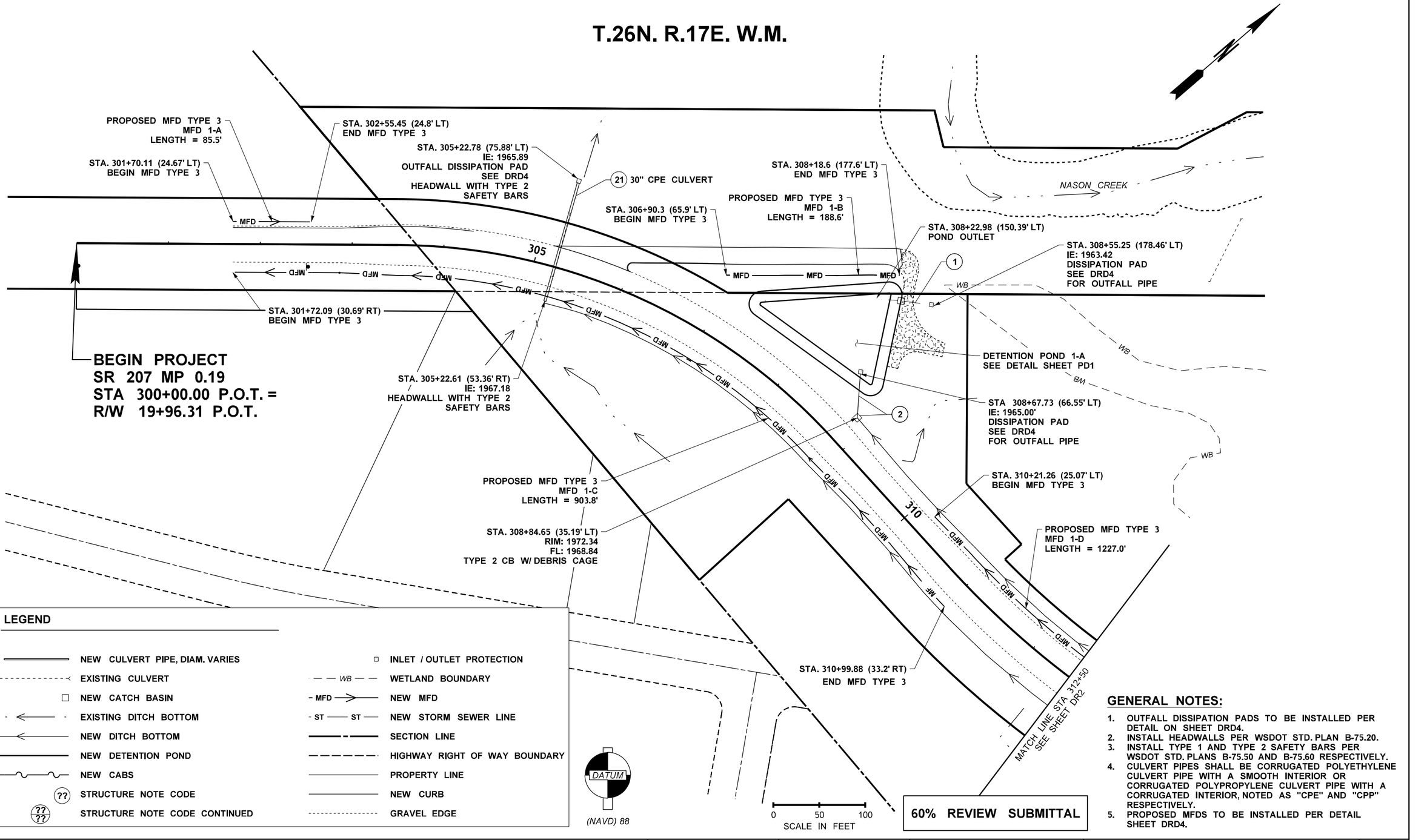
Project Name: Nason Creek SR 207 Realignment
Project #: 20240107
S.R.: 207
Designed By: Jason Walker
Date: December 12, 2025

Structure ID	Station	Distance (ft)	Width (ft)	Area (ft2)	Δ Q cfs (cfs)	Σ Q (cfs)	Slope L (ft/ft)	Super T (ft/ft)	Grate Type HM Figure 5-11	GRATE WIDTH (ft)	GRATE LENGTH (ft)	Roadway Classification	Enter Requested Information		Allowable Spread Policy	Driving Lane Width (ft)	Shoulder Width (ft)	Allowable Zd (ft)	Calculated Z_d (ft)	Depth of Flow at Face of Curb d (inches)	Manning's n for Street and Pavement Gutter	Velocity fo Gutter Flow (ft/sec)	Ratio of Frontal Flow to Total Gutter Flow E_o	Splash-Over Velocity V_o (ft/sec)	Ratio of Frontal Flow Intercepted to Full Frontal Flow R_f	Ratio of Side Flow Intercepted to Total Side Flow R_s	Effiency of Grate E	Q_i (cfs)	Q_{bp} (cfs)	Z_d Check	Q_{bp} Check	Comments (L/R)
	326+19.34		42.50						NO GRATE			Interstate, Principal, Minor Arterial, or Divided	Enter Speed (mph) ---------->	45	Shoulder	12.00	6.00	6.00													North TDA starts here
	329+97.27	377.93	42.50		0.89	0.89	0.034	0.047	Standard Plan B-30.30-03 Rectangular Vaned Grate	1.67	2.00	Interstate, Principal, Minor Arterial, or Divided	Enter Speed (mph) ---------->	45	Shoulder	12.00	6.00	6.00	3.22	1.82	0.016	3.61	0.86	4.60	1.00	0.13	0.88	0.78	0.11	Zd Allowable > Zd Design		This station the slope switches to NB side
	333+73.01	375.74	42.50		0.88	0.99	0.051	0.058	Standard Plan B-30.30-03 Rectangular Vaned Grate	1.67	2.00	Interstate, Principal, Minor Arterial, or Divided	Enter Speed (mph) ---------->	45	Shoulder	12.00	6.00	6.00	2.73	1.90	0.016	4.57	0.92	4.60	1.00	0.11	0.93	0.92	0.07	Zd Allowable > Zd Design		
	335+16.58	143.57	42.50		0.34	0.41	0.040	0.058	Standard Plan B-30.30-03 Rectangular Vaned Grate	1.67	2.00	Interstate, Principal, Minor Arterial, or Divided	Enter Speed (mph) ---------->	45	Shoulder	12.00	6.00	6.00	2.04	1.42	0.016	3.34	0.99	4.60	1.00	0.18	0.99	0.40	0.00	Zd Allowable > Zd Design		
	337+03.78	187.20	42.50		0.44	0.44	0.060	0.015	Standard Plan B-30.30-03 Rectangular Vaned Grate	1.67	2.00	Interstate, Principal, Minor Arterial, or Divided	Enter Speed (mph) ---------->	45	Shoulder	12.00	6.00	6.00	4.62	0.82	0.016	2.80	0.70	4.60	1.00	0.07	0.72	0.32	0.12	Zd Allowable > Zd Design		
	337+92.00	88.22	42.50		0.21	0.33	0.007	0.021	NO GRATE	1.67	2.00	Interstate, Principal, Minor Arterial, or Divided	Enter Speed (mph) ---------->	45	Shoulder	12.00	6.00	6.00	4.96	1.25	0.016	1.28	0.67	0.00	0.88	0.31	0.69	0.23	0.10	Zd Allowable > Zd Design		
	338+70.00	78.00	60.00		0.26	0.36	0.007	0.021	Standard Plan B-30.30-03 Rectangular Vaned Grate	1.67	2.00	Interstate, Principal, Minor Arterial, or Divided	Enter Speed (mph) ---------->	45	Shoulder	12.00	6.00	6.00	5.12	1.29	0.016	1.30	0.65	4.60	1.00	0.30	0.76	0.27	0.09	Zd Allowable > Zd Design		
	339+26.60	56.60	64.00		0.20	0.29	0.007	0.021	Standard Plan B-30.30-03 Rectangular Vaned Grate	1.67	2.00	Interstate, Principal, Minor Arterial, or Divided	Enter Speed (mph) ---------->	45	Shoulder	12.00	6.00	6.00	4.71	1.19	0.016	1.23	0.69	4.60	1.00	0.32	0.79	0.23	0.06	Zd Allowable > Zd Design	Qbp < 0.1 CFS	

APPENDIX B

Plans

T.26N. R.17E. W.M.



LEGEND

NEW CULVERT PIPE, DIAM. VARIES	INLET / OUTLET PROTECTION
EXISTING CULVERT	WETLAND BOUNDARY
NEW CATCH BASIN	NEW MFD
EXISTING DITCH BOTTOM	NEW STORM SEWER LINE
NEW DITCH BOTTOM	SECTION LINE
NEW DETENTION POND	HIGHWAY RIGHT OF WAY BOUNDARY
NEW CABS	PROPERTY LINE
STRUCTURE NOTE CODE	NEW CURB
STRUCTURE NOTE CODE CONTINUED	GRAVEL EDGE

GENERAL NOTES:

1. OUTFALL DISSIPATION PADS TO BE INSTALLED PER DETAIL ON SHEET DRD4.
2. INSTALL HEADWALLS PER WSDOT STD. PLAN B-75.20.
3. INSTALL TYPE 1 AND TYPE 2 SAFETY BARS PER WSDOT STD. PLANS B-75.50 AND B-75.60 RESPECTIVELY.
4. CULVERT PIPES SHALL BE CORRUGATED POLYETHYLENE CULVERT PIPE WITH A SMOOTH INTERIOR OR CORRUGATED POLYPROPYLENE CULVERT PIPE WITH A CORRUGATED INTERIOR, NOTED AS "CPE" AND "CPP" RESPECTIVELY.
5. PROPOSED MFDS TO BE INSTALLED PER DETAIL SHEET DRD4.

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DATE	3/1/2026				JOB NUMBER		
PLOTTED BY	hmcmaster						
DESIGNED BY	N. HAHNE				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KERRY MERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY COPY

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

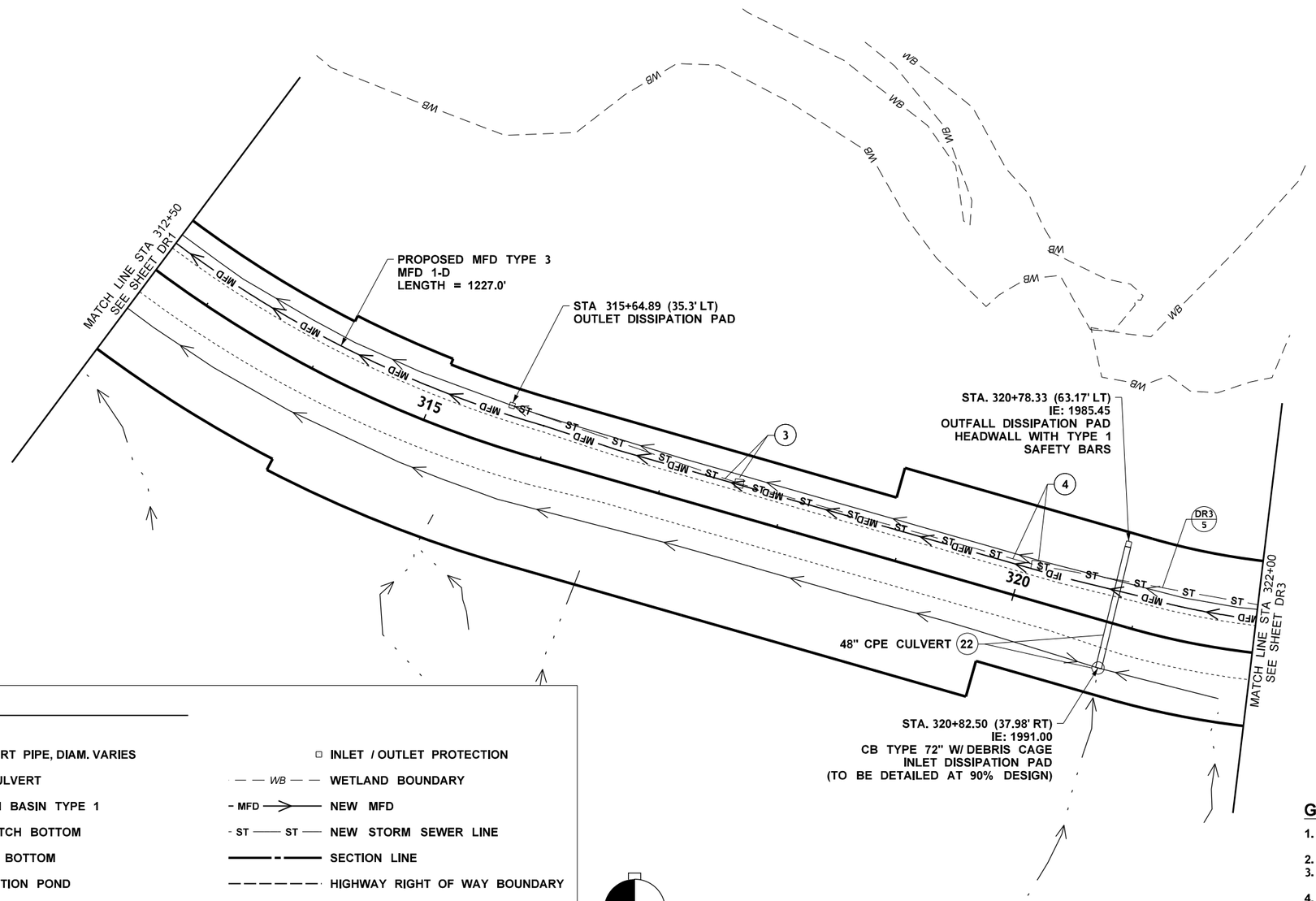
PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

DRAINAGE PLAN

Plot 11
PLAN REF NO
DR1
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



LEGEND

- NEW CULVERT PIPE, DIAM. VARIES
- EXISTING CULVERT
- NEW CATCH BASIN TYPE 1
- EXISTING DITCH BOTTOM
- NEW DITCH BOTTOM
- NEW DETENTION POND
- NEW BIOSWALE
- (??) STRUCTURE NOTE CODE
- (??/??) STRUCTURE NOTE CODE CONTINUED
- INLET / OUTLET PROTECTION
- WB WETLAND BOUNDARY
- MFD NEW MFD
- ST ST NEW STORM SEWER LINE
- SECTION LINE
- HIGHWAY RIGHT OF WAY BOUNDARY
- PROPERTY LINE
- NEW CURB
- GRAVEL EDGE

DATUM (NAVD) 88

0 50 100 SCALE IN FEET

60% REVIEW SUBMITTAL

GENERAL NOTES:

1. OUTFALL DISSIPATION PADS TO BE INSTALLED PER DETAIL ON SHEET DRD4.
2. INSTALL HEADWALLS PER WSDOT STD. PLAN B-75.20.
3. INSTALL TYPE 1 AND TYPE 2 SAFETY BARS PER WSDOT STD. PLANS B-75.50 AND B-75.60 RESPECTIVELY.
4. CULVERT PIPES SHALL BE CORRUGATED POLYETHYLENE CULVERT PIPE WITH A SMOOTH INTERIOR OR CORRUGATED POLYPROPYLENE CULVERT PIPE WITH A CORRUGATED INTERIOR, NOTED AS "CPE" AND "CPP" RESPECTIVELY.
5. PROPOSED MFDS TO BE INSTALLED PER DETAIL SHEET DRD4.

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DATE	3/1/2026				JOB NUMBER	
PLOTTED BY	hmcmaster					
DESIGNED BY					CONTRACT NO.	LOCATION NO.
ENTERED BY	H. MCMASTER					
CHECKED BY	R. CRAVEN					
PROJ. ENGR.						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

KERRY CAMERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY

DATE

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DATE

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800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

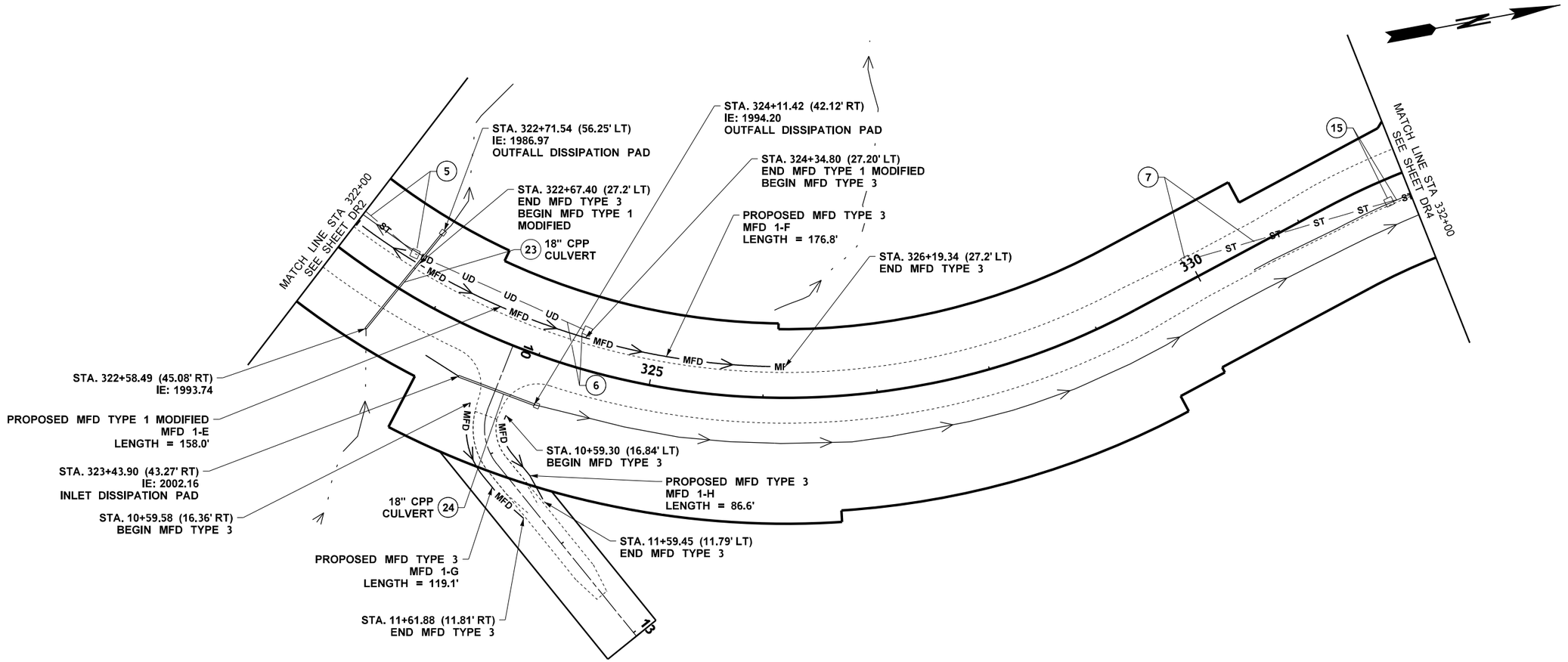
DRAINAGE PLAN

Plot 12

PLAN REF NO
DR2

SHEET
OF
SHEETS

T.26N. R.17E. W.M.



GENERAL NOTES:

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5. PROPOSED MFDS TO BE INSTALLED PER DETAIL SHEET DRD4.

60% REVIEW SUBMITTAL

0 50 100
SCALE IN FEET

DATUM
(NAVD) 88

LEGEND

- NEW CULVERT PIPE, DIAM. VARIES
- EXISTING CULVERT
- NEW CATCH BASIN TYPE 1
- EXISTING DITCH BOTTOM
- NEW DITCH BOTTOM
- NEW DETENTION POND
- NEW BIOSWALE
- STRUCTURE NOTE CODE
- STRUCTURE NOTE CODE CONTINUED
- INLET / OUTLET PROTECTION
- WB WETLAND BOUNDARY
- MFD NEW MFD
- ST ST NEW STORM SEWER LINE
- SECTION LINE
- HIGHWAY RIGHT OF WAY BOUNDARY
- PROPERTY LINE
- NEW CURB
- GRAVEL EDGE

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PLOTTED BY	hmcmaster					
DESIGNED BY	N. HAHNE				CONTRACT NO.	LOCATION NO.
ENTERED BY	H. MCMASTER					
CHECKED BY	R. CRAVEN					
PROJ. ENGR.	K. MCGEE					
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY		

KEITH CAMERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER
DATE
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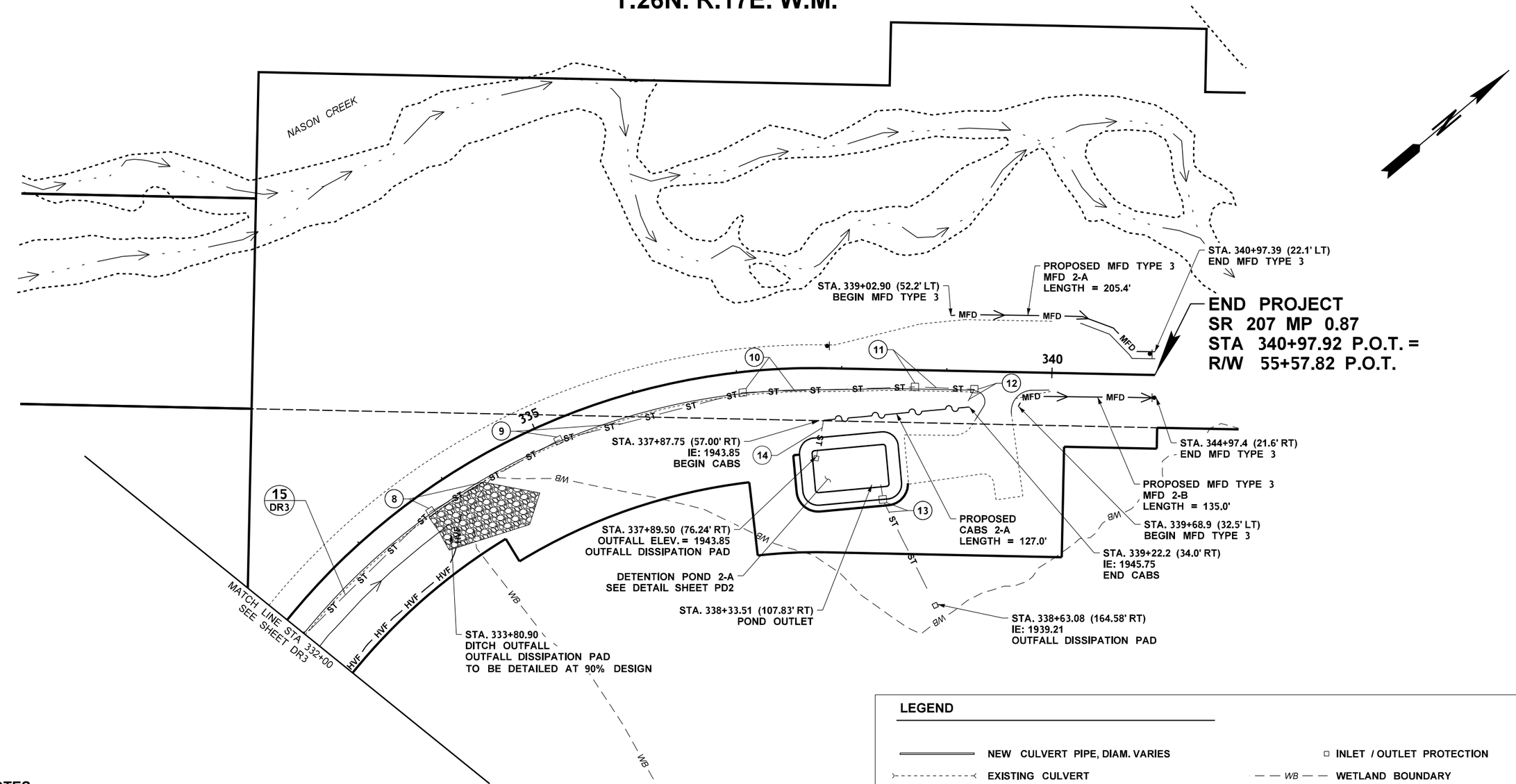
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

DRAINAGE PLAN

Plot 13
PLAN REF NO DR3
SHEET
OF
SHEETS

T.26N. R.17E. W.M.



GENERAL NOTES:

1. OUTFALL DISSIPATION PADS TO BE INSTALLED PER DETAIL ON SHEET DRD4.
2. INSTALL HEADWALLS PER WSDOT STD. PLAN B-75.20.
3. INSTALL TYPE 1 AND TYPE 2 SAFETY BARS PER WSDOT STD. PLANS B-75.50 AND B-75.60 RESPECTIVELY.
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5. PROPOSED MFDS TO BE INSTALLED PER DETAIL SHEET DRD4.

60% REVIEW SUBMITTAL

0 50 100
SCALE IN FEET

DATUM
(NAVD) 88

LEGEND

- NEW CULVERT PIPE, DIAM. VARIES
- EXISTING CULVERT
- NEW CATCH BASIN TYPE 1
- EXISTING DITCH BOTTOM
- NEW DITCH BOTTOM
- NEW DETENTION POND
- NEW BIOSWALE
- (??) STRUCTURE NOTE CODE
- (??/??) STRUCTURE NOTE CODE CONTINUED
- INLET / OUTLET PROTECTION
- WB WETLAND BOUNDARY
- MFD NEW MFD
- ST ST NEW STORM SEWER LINE
- SECTION LINE
- HIGHWAY RIGHT OF WAY BOUNDARY
- PROPERTY LINE
- NEW CURB
- GRAVEL EDGE

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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PLOTTED BY	hmcmaster						
DESIGNED BY	N. HAHNE				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KERRY CAMERON MCGEE
STATE OF WASHINGTON
21019074
REGISTERED
PROFESSIONAL ENGINEER
DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

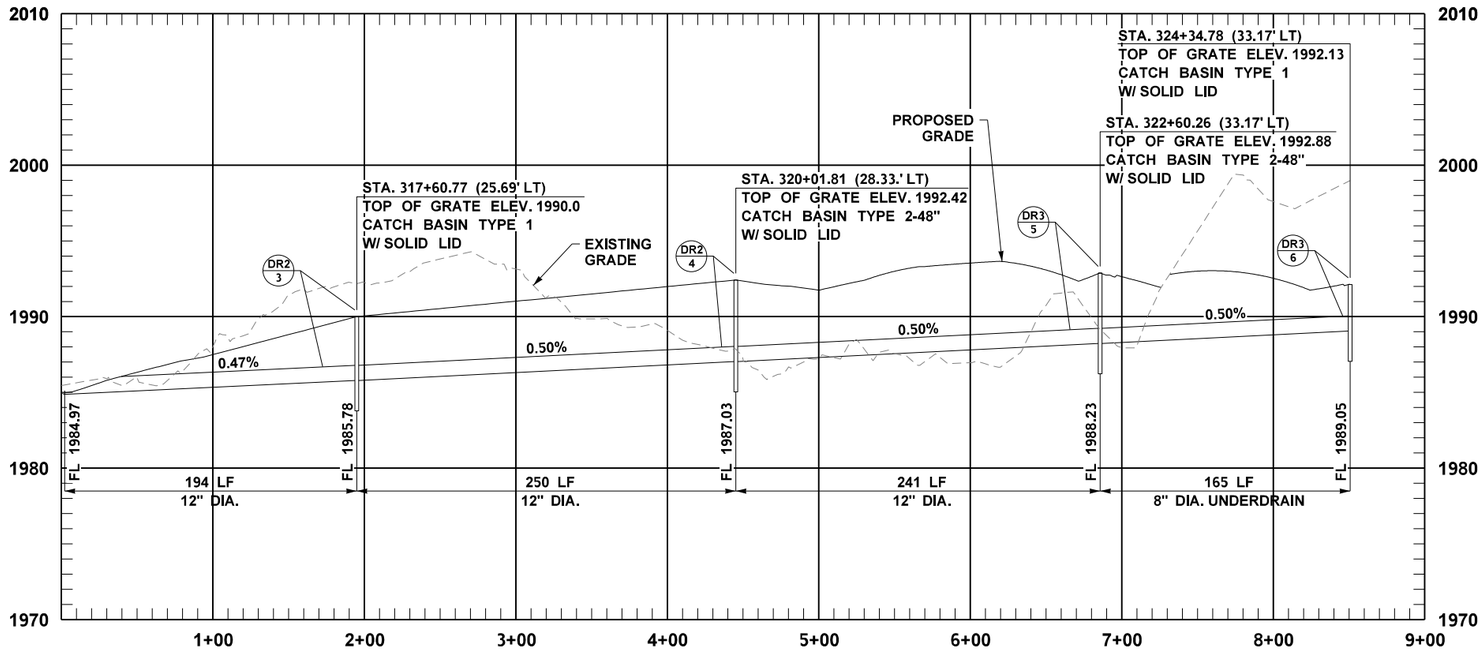
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

DRAINAGE PLANS

Plot 14

PLAN REF NO
DR4

SHEET
OF
SHEETS



NOTES:

1. ALL STORM DRAIN PIPES SHALL BE SCHEDULE A UNLESS OTHERWISE NOTED. CULVERT PIPES SHALL BE CORRUGATED POLYETHYLENE CULVERT PIPE WITH A SMOOTH INTERIOR OR CORRUGATED POLYPROPYLENE CULVERT PIPE WITH A CORRUGATED INTERIOR, NOTED AS "CPE" AND "CPP" RESPECTIVELY.

2. STRUCTURE OFFSET TO CENTER OF STRUCTURE, UNLESS NOTED OTHERWISE.

3. ALL CATCH BASIN GRATES TO BE VANED GRATE PER WSDOT STD. PLAN B-30.30 UNLESS NOTED OTHERWISE CATCH BASINS AT LOW POINTS WILL BE BI-DIRECTIONAL VANED GRATE PER WSDOT STD. PLAN B-30.40.

4. PIPE LENGTHS ARE MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE.

5. ALL SD MANHOLES SHALL BE CHANNELIZED.

6. STRUCTURES WITH SOLID LID SHALL BE BOLT DOWN TYPE WSDOT STD. PLAN B-30.70 FOR MANHOLES AND TYPE 2 CATCH BASINS, UNLESS NOTED OTHERWISE. THE LETTERING ON THE SOLID ROUND LID SHALL READ "STORM". FOR TYPE 1 AND TYPE 1L CATCH BASIN, SOLID LIDS SHALL BE BOLT DOWN TYPE PER WSDOT STD. PLAN B-30.20, UNLESS NOTED OTHERWISE.

SOUTH CONVEYANCE SYSTEM

DATUM

(NAVD) 88

FILE NAME	X:\Yakama Nation Fisherles\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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PLOTTED BY	hmcmaster						
DESIGNED BY	N. HAHNE						
ENTERED BY	H. MCMASTER				CONTRACT NO.		LOCATION NO.
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KIRK A. KRAMER GOLDSMITH — STATE OF WASHINGTON — 23010072 — REGISTERED PROFESSIONAL ENGINEER

DATE

P.E. STAMP BOX

DATE

P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

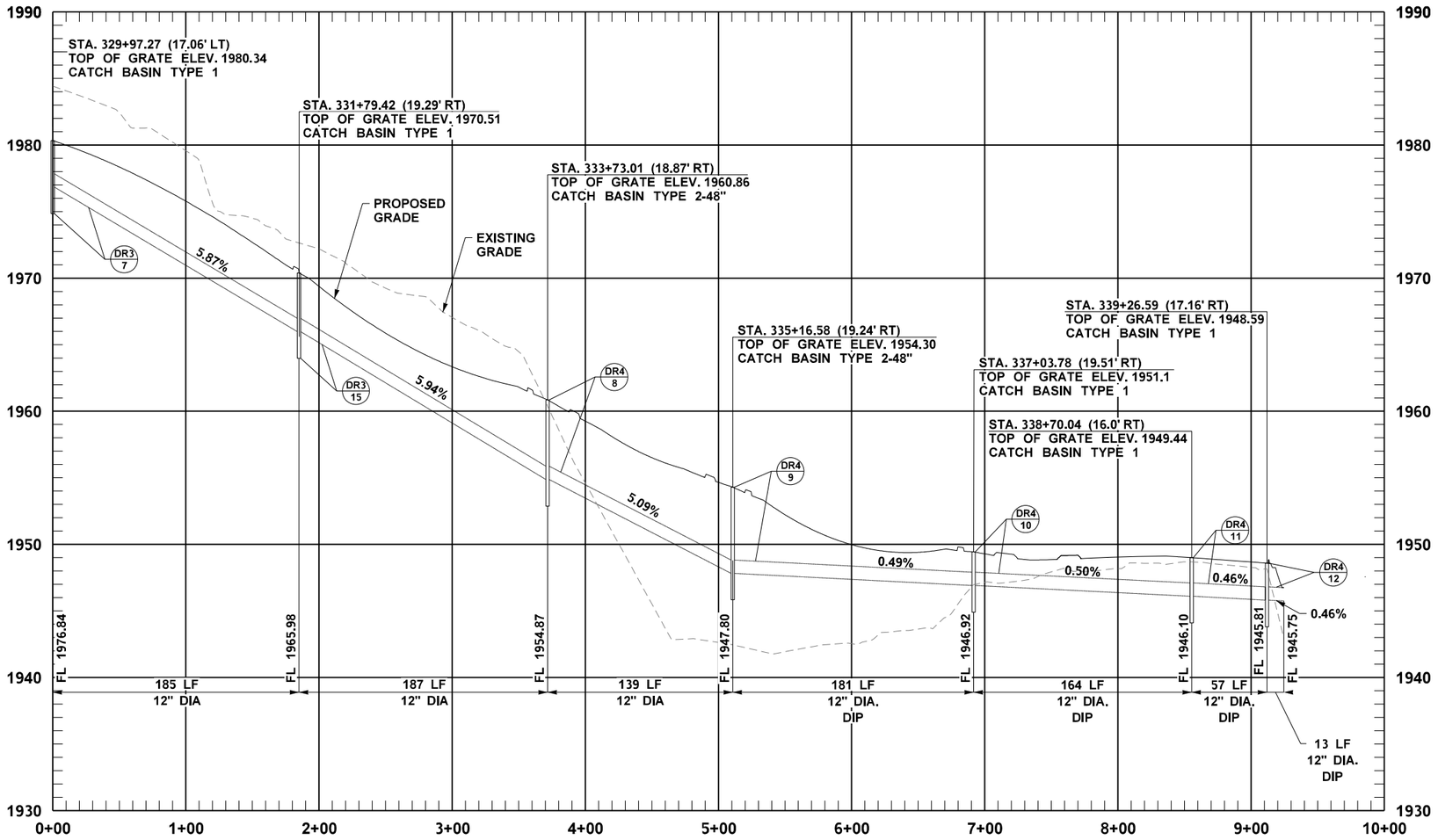
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

DRAINAGE PROFILE

Plot 15

PLAN REF NO
DP1

SHEET
OF
SHEETS



NOTES:

1. ALL STORM DRAIN PIPES SHALL BE SCHEDULE A UNLESS OTHERWISE NOTED. CULVERT PIPES SHALL BE CORRUGATED POLYETHYLENE CULVERT PIPE WITH A SMOOTH INTERIOR OR CORRUGATED POLYPROPYLENE CULVERT PIPE WITH A CORRUGATED INTERIOR, NOTED AS "CPE" AND "CPP" RESPECTIVELY.

2. STRUCTURE OFFSET TO CENTER OF STRUCTURE, UNLESS NOTED OTHERWISE.

3. ALL CATCH BASIN GRATES TO BE VANED GRATE PER WSDOT STD. PLAN B-30.30 UNLESS NOTED OTHERWISE CATCH BASINS AT LOW POINTS WILL BE BI-DIRECTIONAL VANED GRATE PER WSDOT STD. PLAN B-30.40.

4. PIPE LENGTHS ARE MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE.

5. ALL SD MANHOLES SHALL BE CHANNELIZED.

6. STRUCTURES WITH SOLID LID SHALL BE BOLT DOWN TYPE WSDOT STD. PLAN B-30.70 FOR MANHOLES AND TYPE 2 CATCH BASINS. UNLESS NOTED OTHERWISE. THE LETTERING ON THE SOLID ROUND LID SHALL READ "STORM". FOR TYPE 1 AND TYPE 1L CATCH BASIN, SOLID LIDS SHALL BE BOLT DOWN TYPE PER WSDOT STD. PLAN B-30.20, UNLESS NOTED OTHERWISE.

NORTH CONVEYANCE SYSTEM

DATUM

(NAVD) 88

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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DESIGNED BY	N. HAHNE				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KERRY CAMERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER

DATE

P.E. STAMP BOX

DATE

P.E. STAMP BOX

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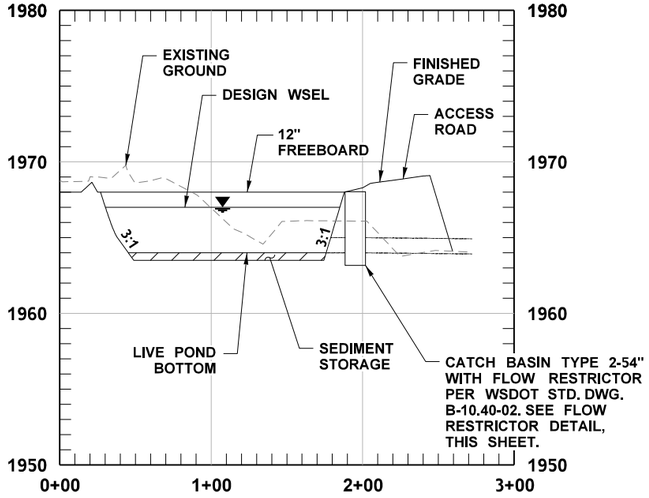
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

DRAINAGE PROFILE

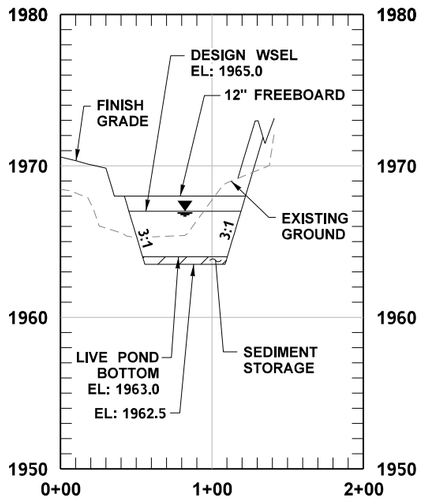
Plot 16

PLAN REF NO
DP2

SHEET
OF
SHEETS



SECTION A-A



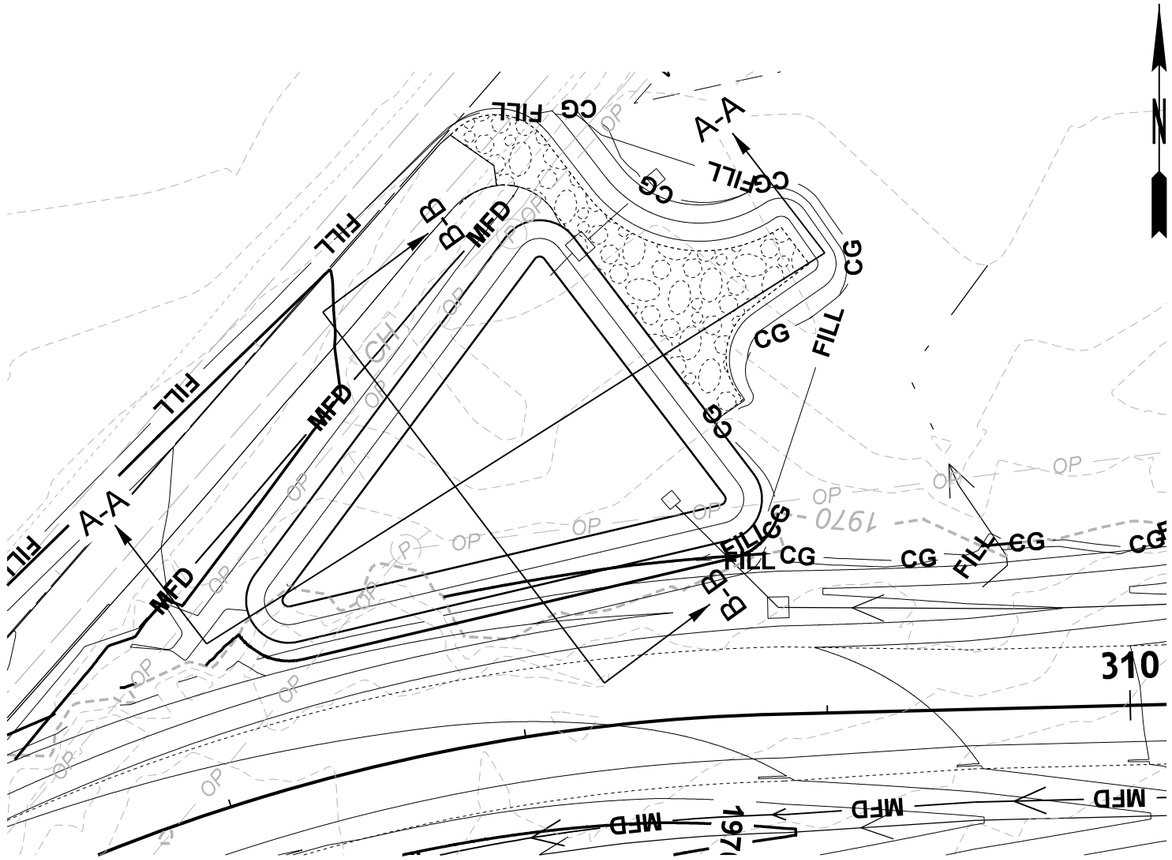
SECTION B-B

POND 1-A DETAILS	
DESIGN VOLUME AT RISER	14,442 CF
LIVE POND BOTTOM	1963.0 FT
DESIGN WSEL	1965.0 FT
PAVEMENT CATCHMENT AREA	1.501 AC

FLOW RESTRICTOR DETAIL

NOTE TO REVIEWER:
POND AND ACCESS ROAD CONTROL POINT TABLE TO BE PROVIDED AT 90% DESIGN. EMERGENCY OVERFLOW ELEMENTS TO BE ADDED AT 90% DESIGN.

60% REVIEW SUBMITTAL



STORMWATER FACILITY DETAILS
POND 1-A

DATUM
NAVD 88
0 25 50
SCALE IN FEET

NOTES:
1. SEE LEGEND ON SHEET DR1.
2. POND SLOPES ARE 3H:1V UP TO 1' ABOVE THE DESIGN WSEL UNLESS OTHERWISE NOTED.
3. POND IS GRADED TO INCLUDE A 6" SEDIMENT STORAGE DEPTH. THE DESIGN VOLUME AT RISER DOES NOT INCLUDE THE SEDIMENT STORAGE VOLUME.
4. POND INCLUDES 1' OF FREEBOARD ABOVE THE DESIGN WSEL.
5. CABS SIDE SLOPES ARE 3H:1V UP TO A DEPTH OF 1.5'.
6. CABS INCLUDE 1' OF FREEBOARD ABOVE THE DESIGN SWALE DEPTH.
7. FOR PLAN VIEW, SEE SHEETS DR1-DR4.

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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DATE	3/1/2026				JOB NUMBER		
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DESIGNED BY	N. HAHNE				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KERRY CAMERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY
DATE
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123 OHME GARDEN ROAD, SUITE 8
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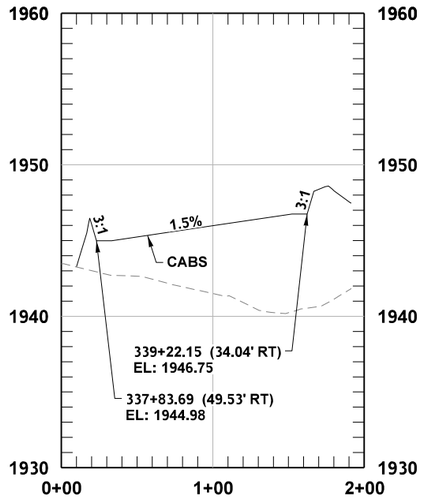
800.615.9900

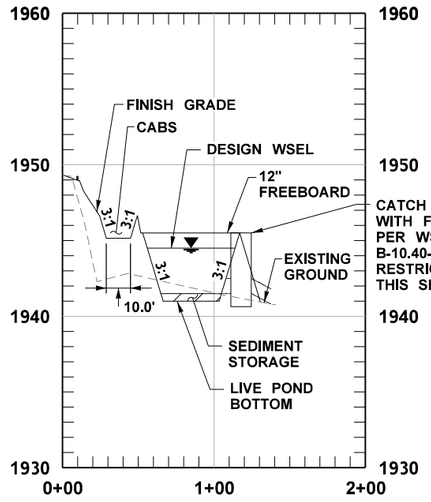
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

POND DETAIL

Plot 21
PLAN REF NO
PD1
SHEET
OF
SHEETS



SECTION C-C



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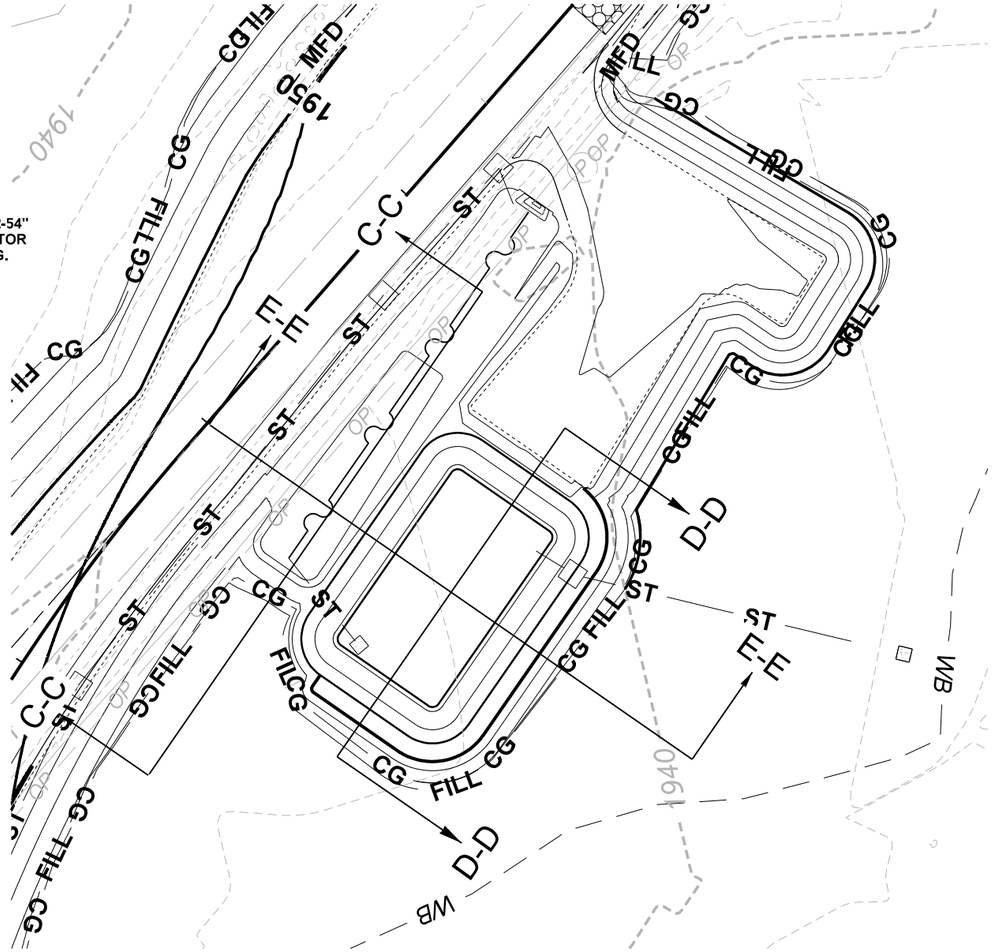
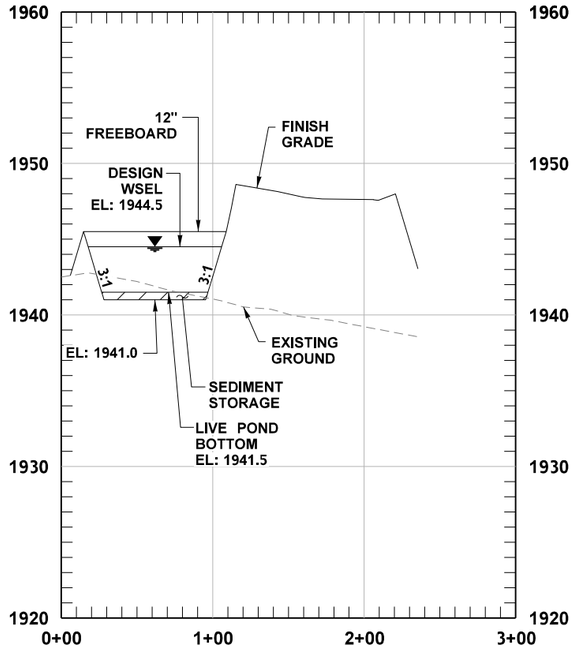
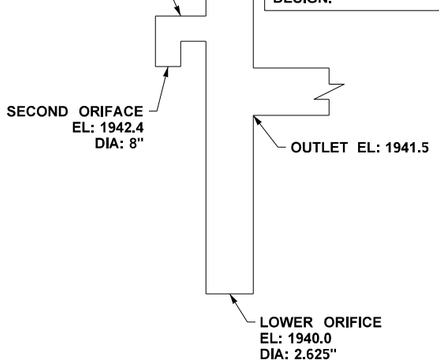




SECTION D-D



FLOW RESTRICTOR DETAIL

NOTE TO REVIEWER:
POND AND ACCESS ROAD CONTROL POINT TABLE TO BE PROVIDED AT 90% DESIGN. EMERGENCY OVERFLOW ELEMENTS TO BE ADDED AT 90% DESIGN.

CABS 2-A DETAILS	
CABS CELLS	1
TREATMENT LENGTH	127 FT
TOTAL BOTTOM WIDTH	10 FT
SWALE LONGITUDE SLOPE	1.5%
SWALE WQ DEPTH	0.33 FT
PGIS CATCHMENT AREA	1.356 AC

POND 2-A DETAILS	
DESIGN VOLUME AT RISER	22,248 CF
LIVE POND BOTTOM	1,941.5 FT
DESIGN WSEL	1,944.5 FT
PAVEMENT CATCHMENT AREA	1.356 AC

60% REVIEW SUBMITTAL

STORMWATER FACILITY DETAILS
POND 2-A AND CABS 2-A

DATUM
NAVD 88

0 25 50
SCALE IN FEET

NOTES:
1. SEE LEGEND ON SHEET DR1.
2. POND SLOPES ARE 3H:1V UP TO 1' ABOVE THE DESIGN WSEL UNLESS OTHERWISE NOTED.
3. POND IS GRADED TO INCLUDE A 6" SEDIMENT STORAGE DEPTH. THE DESIGN VOLUME AT RISER DOES NOT INCLUDE THE SEDIMENT STORAGE VOLUME.
4. POND INCLUDES 1' OF FREEBOARD ABOVE THE DESIGN WSEL.
5. CABS SIDE SLOPES ARE 3H:1V UP TO A DEPTH OF 1.5'.
6. CABS INCLUDE 1' OF FREEBOARD ABOVE THE DESIGN SWALE DEPTH.
7. FOR PLAN VIEW, SEE SHEETS DR1-DR4.

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DESIGNED BY	N. HAHNE				CONTRACT NO.		LOCATION NO.
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KERRY CAMERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER
DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

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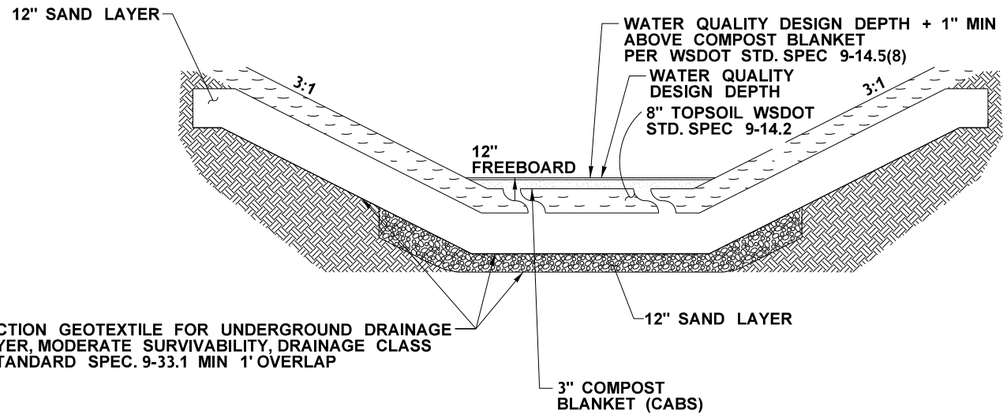
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

POND DETAIL

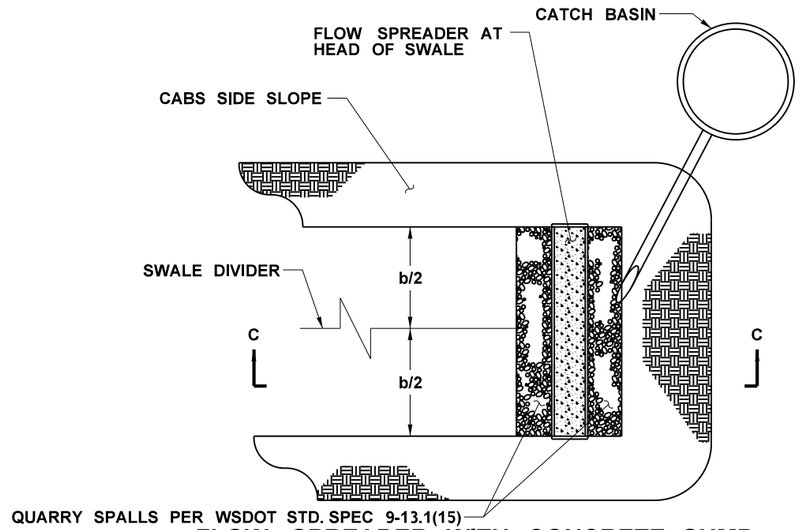
Plot 22
PLAN REF NO
PD2
SHEET
OF
SHEETS



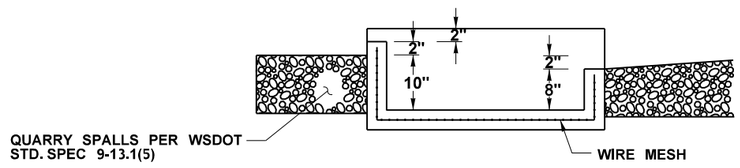
CABS SECTION VIEW
NTS

NOTES:

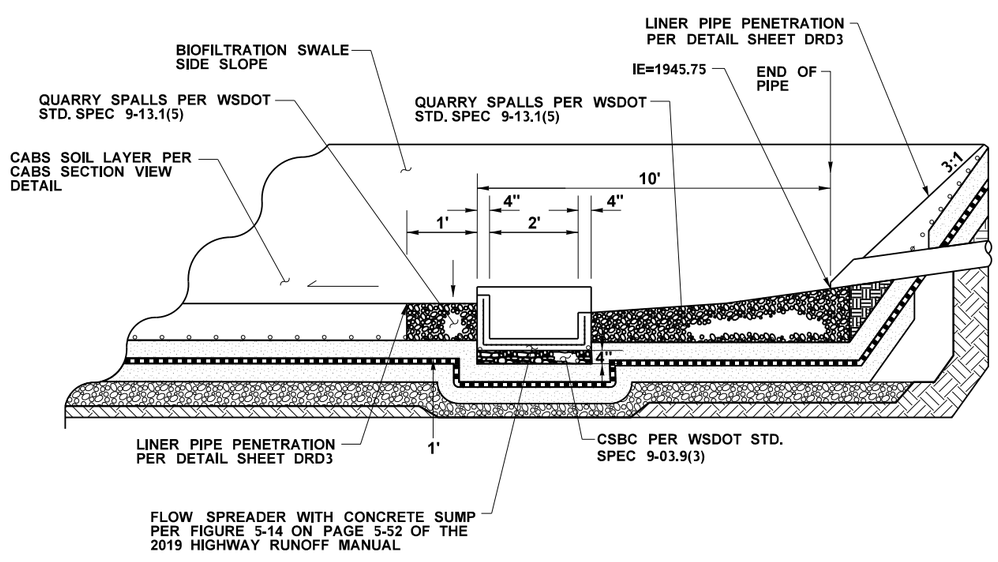
1. CABS LINER TO EXTEND 12" ABOVE FREEBOARD ELEVATION OF CABS.
2. NOT USED.
3. INSTALL LEVEL SPREADERS EVERY 50'. SEE FLOW SPREADER DETAIL, THIS SHEET.



FLOW SPREADER WITH CONCRETE SUMP
NTS



FLOW SPREADER WITH CONCRETE SUMP (DETAIL)
NTS



FLOW SPREADER WITH CONCRETE SUMP PROFILE DETAIL - SECTION C-C
NTS

60% REVIEW SUBMITTAL

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DESIGNED BY	N. HAHNE						
ENTERED BY	H. MCMASTER				CONTRACT NO.		LOCATION NO.
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KEIRAN CAMERON MCGEE, STATE OF WASHINGTON, 21019074, REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY

DATE
P.E. STAMP BOX

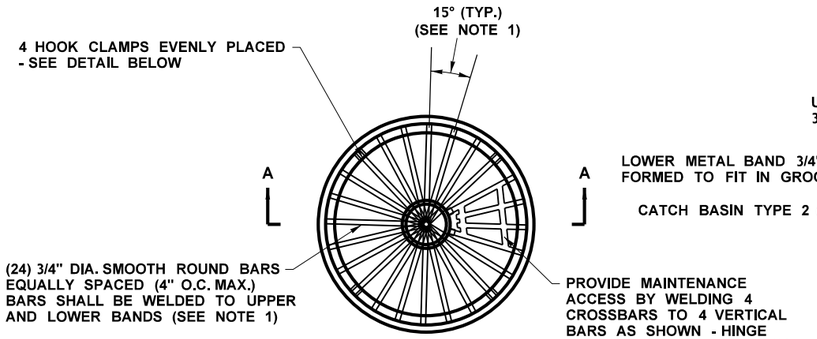
DATE
P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

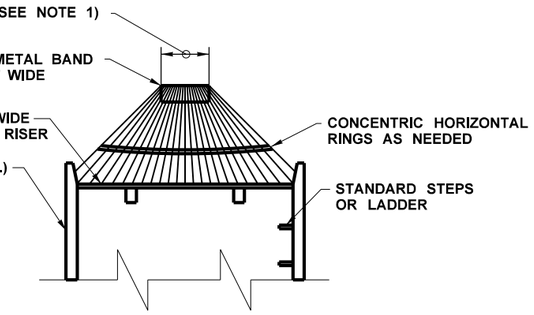
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

DRAINAGE DETAIL

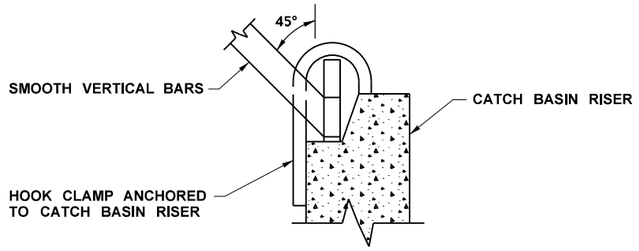
Plot 23
PLAN REF NO
DRD1
SHEET
OF
SHEETS



PLAN VIEW
NTS



SECTION A-A
NTS

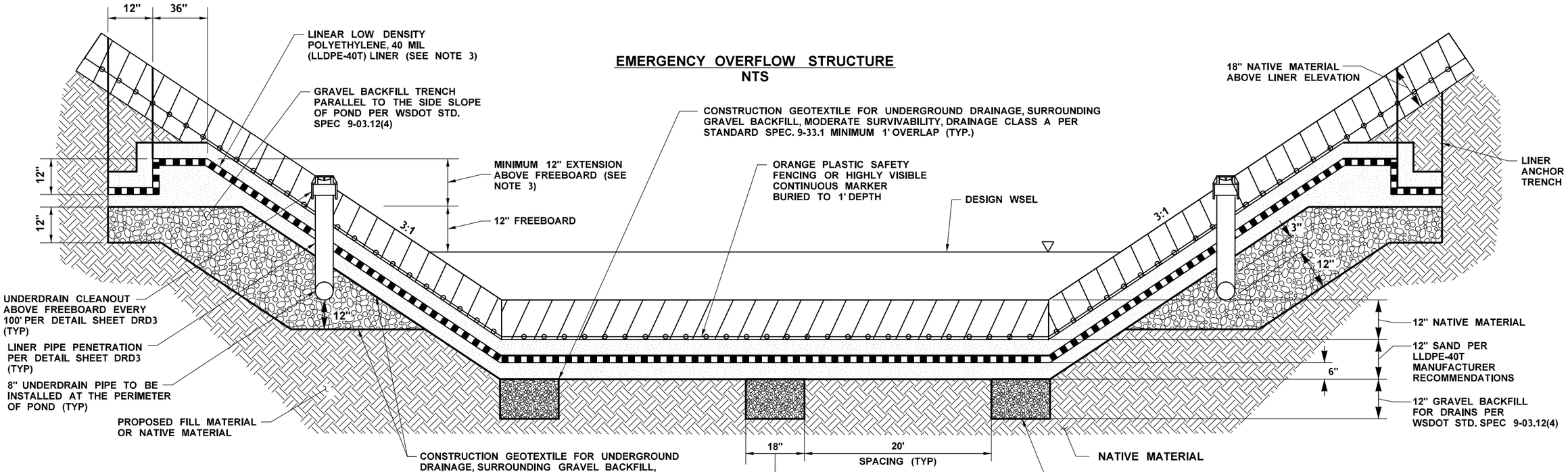


DETAIL HOOK CLAMP
NTS

NOTES:

1. DIMENSIONS ARE FOR 54" DIAM. CB, FOR DIFFERENT DIAM CB'S ADJUST TO MAINTAIN 45 DEGREE ANGLE ON "VERTICAL BARS" AND 7" O.C. MAXIMUM SPACING OF BARS AROUND LOWER METAL BAND. WHERE THE MAXIMUM OPENING BETWEEN VERTICAL BARS EXCEED 4", ADD CONCENTRIC HORIZONTAL RINGS AS NEEDED SO THAT OPENINGS DO NOT EXCEED 4" IN ONE DIRECTION.
2. METAL PARTS SHALL BE CORROSION RESISTANT; ALL STEEL BARS SHALL BE GALVANIZED AFTER FABRICATION

EMERGENCY OVERFLOW STRUCTURE
NTS



NOTES:

3. POND LINER EXTENDS 12" ABOVE FREEBOARD ELEVATION IN PONDS.
4. GRAVEL BACKFILL TRENCH FOR DRAINS IS CONTINUOUS ALONG THE PERIMETER OF PONDS, PARALLEL TO SIDE SLOPES.
5. PERFORATED UNDERDRAIN PIPE MATERIAL PER WSDOT STD. SPEC. 9-05.2(6).

TYPICAL POND AND POND LINER DETAIL
NTS

60% REVIEW SUBMITTAL

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
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DESIGNED BY	N. HAHNE						
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN				CONTRACT NO.		LOCATION NO.
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KERRY CAMERON MCGEE, STATE OF WASHINGTON, 21019074, REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY

DATE
P.E. STAMP BOX

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123 OHME GARDEN ROAD, SUITE 8
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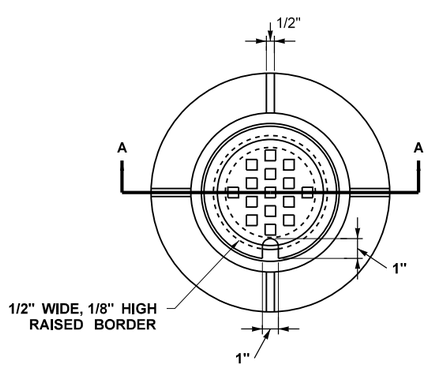
800.615.9900

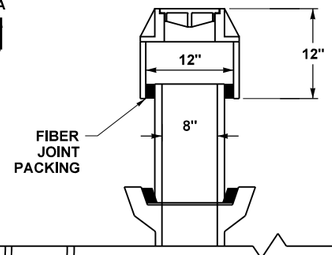
SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

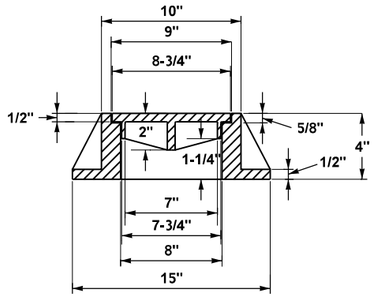
DRAINAGE DETAIL

Plot 24
PLAN REF NO
DRD2
SHEET
OF
SHEETS

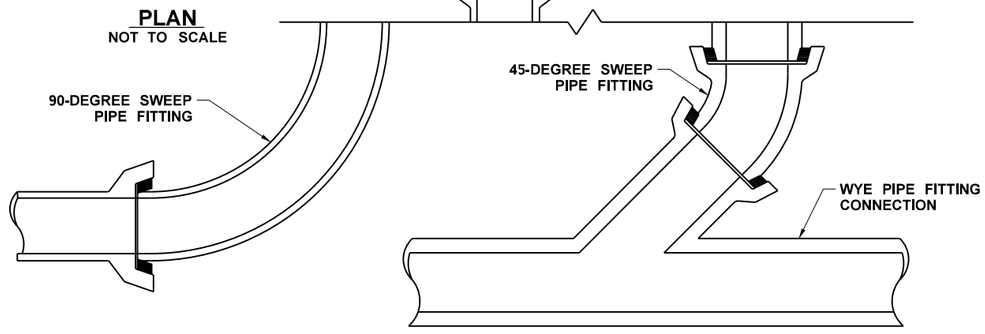


PLAN
NOT TO SCALE

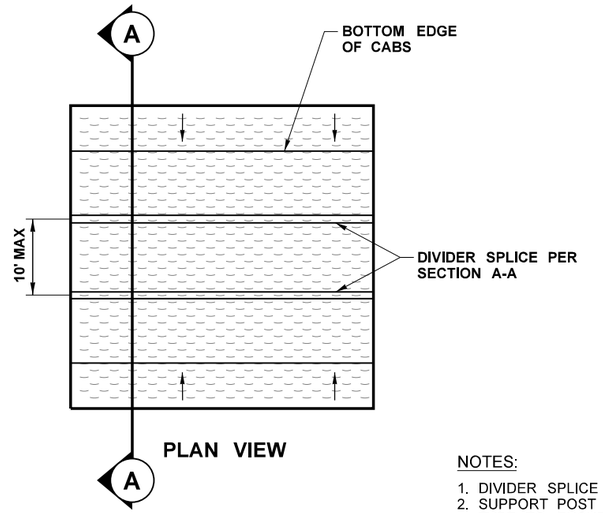




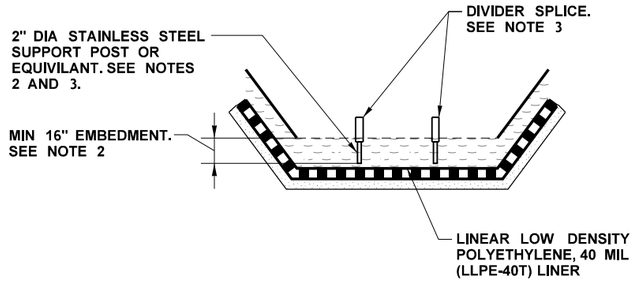
SECTION A-A
NOT TO SCALE



8-INCH CLEANOUT
NOT TO SCALE



PLAN VIEW



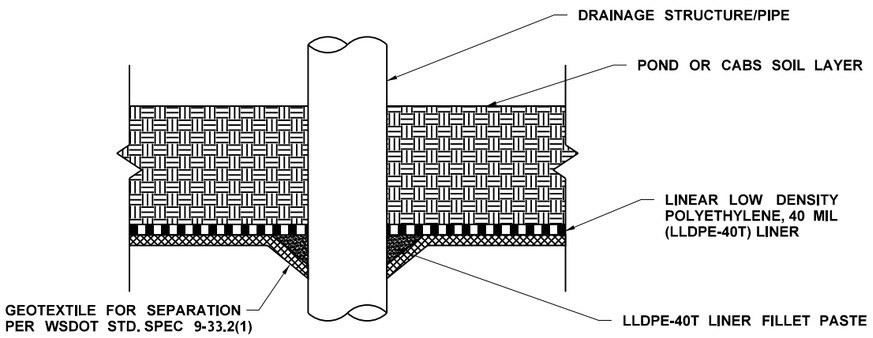
SECTION A-A

NOTES:

1. DIVIDER SPLICE MUST BE LEVEL WITH THE CABS.
2. SUPPORT POST SPACING AS REQUIRED BY MATERIAL TYPE TO ENSURE BOARD REMAINS LEVEL. POST SHALL NOT PUNCTURE LLDPE-40T LINER.
3. DIVIDER SPLICE SHALL BE A PLASTIC LUMBER FASTENED TO SUPPORT POST USING 1/4" SADDLES; ALLOW FOR ADJUSTMENTS FOR LEVELING THE DIVIDER SPLICE.

LEVEL SPREADER DETAIL

NOT TO SCALE



LINER STRUCTURE/PIPE PENETRATION DETAIL

NOT TO SCALE

60% REVIEW SUBMITTAL

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PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KERMERON MCGEE — STATE OF WASHINGTON — 71019074 — REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

PERTEET
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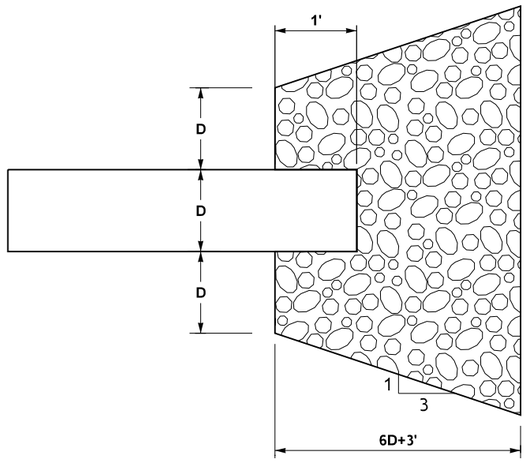
800.615.9900

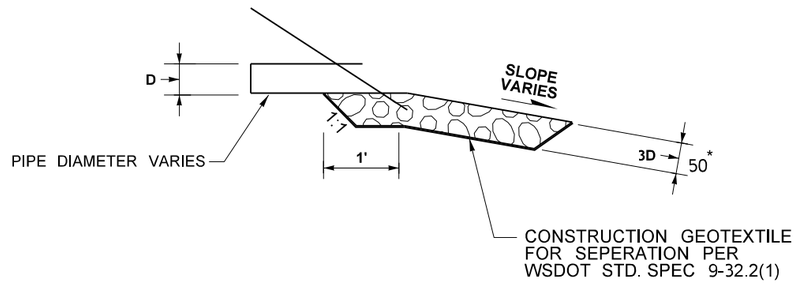
SR 207
NASON CREEK FLOODPLAIN
REALIGNMENT
PHASE 2

DRAINAGE DETAIL

Plot 25
PLAN REF NO
DRD3
SHEET
OF
SHEETS

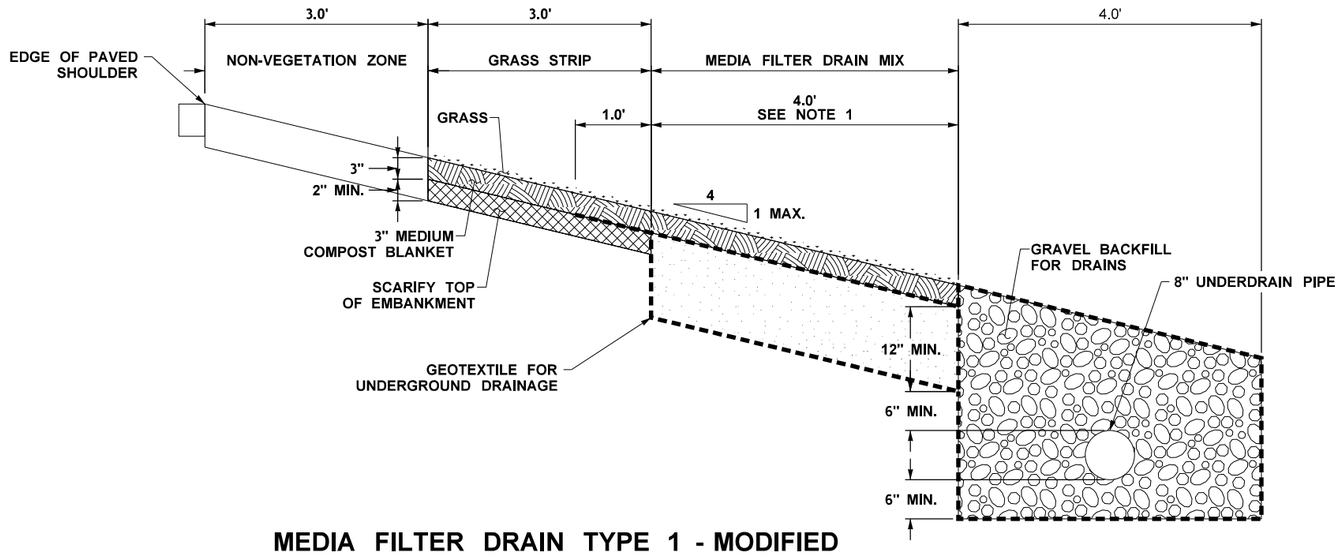
SHEET	PIPE ID	D_{50}	OUTFALL PROTECTION MATERIAL
DR1	21	4"	QUARRY SPALLS
DR2	22	22	RESP CLASS B
DR3	23	4"	QUARRY SPALLS
DR3	24	4"	QUARRY SPALLS
DR4	DITCH	TBD	TBD
DR1	1	4"	QUARRY SPALLS
DR1	2	4"	QUARRY SPALLS
DR4	13	4"	QUARRY SPALLS
DR4	14	4"	QUARRY SPALLS
DR2	3	4"	QUARRY SPALLS





RIP RAP OUTFALL DISSIPATION PAD DETAIL

NOT TO SCALE



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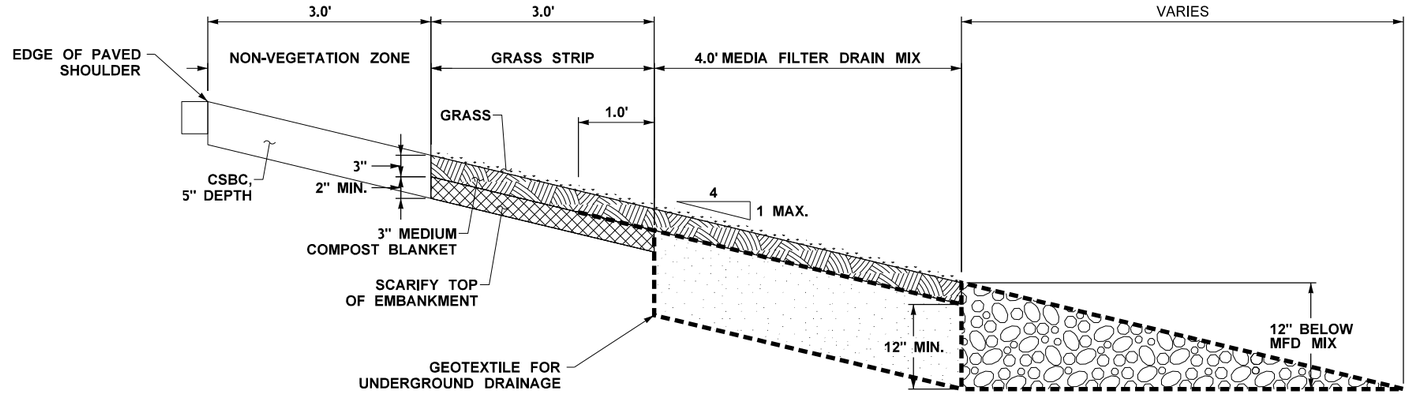

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NOT TO SCALE

60% REVIEW SUBMITTAL

FILE NAME	X:\Yakama Nation Fisheries\Projects\20240107 - SR207 Nason Creek\CADD\02 - Plan Sheets\Phase 2\20240107_PS_DR.dgn				REGION NO. / STATE	FED.AID PROJ.NO.	
TIME	1:17:49 PM				10 / WASH		
DATE	3/1/2026				JOB NUMBER		
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DESIGNED BY	N. HAHNE				CONTRACT NO.	LOCATION NO.	
ENTERED BY	H. MCMASTER						
CHECKED BY	R. CRAVEN						
PROJ. ENGR.	K. MCGEE						
REGIONAL ADM.	C. KEIFENHEIM	REVISION	DATE	BY			

KERMIT MERON MCGEE — STATE OF WASHINGTON — 21019074 — REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

PERTEET
123 OHME GARDEN ROAD, SUITE 8
WENATCHEE, WA 98801
800.615.9900

SR 207
NASON CREEK FLOODPLAIN REALIGNMENT
PHASE 2

DRAINAGE DETAIL

Plot 26
PLAN REF NO
DRD4
SHEET
OF
SHEETS

APPENDIX C

Geotechnical Report

DRAFT GEOTECHNICAL REPORT
YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

HWA Project No. 2022-144-21

January 17, 2025

Prepared for:

Yakama Nation

&

Perteet

HWA GEOSCIENCES INC.

HWA GeoSciences Inc.
DBE/MWBE

January 17, 2025
HWA Project No. 2022-144-21

Perteet
2707 Colby Avenue, Suite 900
Everett, WA 98201

Attention: Jennifer Saugen P.E.

Subject: **DRAFT GEOTECHNICAL REPORT**
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

Dear Ms. Saugen:

As requested, HWA GeoSciences Inc. (HWA) has completed a geotechnical engineering study for the proposed State Route (SR) 207 Reroute adjacent to the Nason Creek Floodplain in Chelan County, Washington. This report presents the results of our field explorations, laboratory testing, and geotechnical engineering analysis and recommendations.

We appreciate the opportunity to provide geotechnical services on this project. If you have any questions regarding this report or require additional information or services, please contact the undersigned at your convenience.

Sincerely,

HWA GEOSCIENCES INC.

Donald Huling, P.E.
Geotechnical Engineer, Principal

Brett O'Brien, P.E.
Geotechnical Engineer

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DRAFT GEOTECHNICAL REPORT
YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

1.0 INTRODUCTION

1.1 GENERAL

This report summarizes the results of a geotechnical engineering study performed by HWA GeoSciences Inc. (HWA) for the Yakama Nation Nason Creek Floodplain SR 207 Reroute project (Project) in Chelan County, Washington. The approximate location of the project site is shown on the Site and Vicinity Map, Figure 1, and on the Site and Exploration Plan, Figure 2. Our field work consisted of three phases of exploration. Phase 1 included advancing twelve (12) handhole explorations, Phase 2 included drilling four (4) machine-drilled borings, and Phase 3 included drilling five (5) machine-drilled borings. Phases 1 and 2 were completed in 2023 in support of the preliminary investigation. Phase 3 was completed in 2024 in support of the final design. Laboratory testing was conducted on selected soil samples to determine relevant engineering properties for the subsurface soils. The purpose of this study was to evaluate the soil and groundwater conditions along the proposed roadway alignment to provide geotechnical engineering recommendations for the proposed improvements.

1.2 PROJECT UNDERSTANDING

We understand the project will include rerouting SR 207 in the vicinity of milepost (MP) 0.15 to MP 1.00 (Nason Creek river mile 3.2 to 4.6) around the historic Nason Creek floodplain, south from the current alignment. The purpose of this project is to improve aquatic habitat conditions and protect roadway infrastructure. The Yakama Nation Upper Columbia Habitat Restoration Project and Washington State Department of Transportation have partnered for this project.

1.3 SITE DESCRIPTION

The Project area is located in, and adjacent to, the historic Nason Creek floodplain in Chelan County, Washington. It initiates approximately 0.15 miles northeast of the intersection of US 2 and SR 207, and extends 0.85 miles along SR 207 to MP 1.00. SR 207 trends roughly northeast/southwest within the Project area and bisecting the historic floodplain in a straight line. The existing roadway is constructed with hot mix asphalt on a fill berm ranging in height from about 4 to 10 feet, and consists of two 12.5-foot-wide lanes, one each northbound and southbound, with 6-foot-wide shoulders. The roadway has minimal slope.

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The main channel of Nason Creek is located west of SR 207 and flows generally north to Lake Wenatchee. The creek channel is constrained by Nason Ridge to the west, a bedrock ridge generally consisting of Chumstick Formation sedimentary rock. The historic floodplain extends beyond SR 207 to the east and contains multiple historic overflow and/or abandoned Nason Creek channels, visible in Figure 3. There are wetlands located at the north and south ends of the Project area associated with these overflow channels.

East of SR 207 and the historic floodplain the topography slopes up gently, with a grade ranging from 8% to 12%, to Rieche Road/USFS Road 6603, and beyond to the base of Natapoc Ridge, another bedrock ridge consisting of Chumstick Formation sedimentary bedrock. USFS Road 6603 is a closed, one-lane forest service road that generally parallels SR 207 within the Project area and is primarily unpaved. Discrete areas of hot mix asphalt pavement are visible on USFS Road 6603, indicating it was likely paved when originally constructed. The roadway slopes up gently from south to north until Project Station 319+00, where the slope becomes steep. The slope from SR 207 to the base of Natapoc Ridge is heavily vegetated with evergreen trees, vine maple and shrubs.

Within the Project area a Chelan County PUD 115 kV aboveground pole line extends from SR 207 to Rieche Road, then parallels USFS Road 6603 to the north. Near the north end of the Project area is a Bonneville Power Administration (BPA) transmission line corridor containing three extra high voltage transmission lines. These lines trend generally east/west, crossing Nason Creek and SR 207 on two sets of lattice towers. This corridor has been cleared of vegetation, apart from grass and scattered small shrubs.

2.0 FIELD INVESTIGATION

2.1 SUBSURFACE EXPLORATION

Our geotechnical exploration program included surface reconnaissance of the alignment, drilling a total of nine (9) machine-drilled borings and completion of twelve (12) shallow hand borings over the course of three phases of work, as described below. The approximate locations of these borings are shown on the Site and Exploration plan, Figure 2. Logs for the borings are presented in Appendix A of this report.

> **Phase 1:** Phase 1 of our field exploration program consisted of advancing twelve shallow hand borings, designated HH-1 through HH-12. Borings were advanced approximately equidistance apart within the proposed reroute alignment to depths ranging from about 0.7 to 9.2 feet below ground surface (bgs). Dynamic cone penetrometer (DCP) data was collected at eleven (11) boring locations to depths ranging from about 5.4 to 12.4 feet bgs. No DCP data was collected at HH-9 due to remote location and heavy vegetation access issues that made transportation of DCP equipment prohibitively

difficult. These explorations were conducted in support of investigation of subsurface soil and groundwater conditions on the proposed Project alignment. In addition, reconnaissance of the adjacent slopes and floodplain were conducted to better understand site geology, soil, and rock types present in the vicinity of the Project alignment. Phase 1 was completed on May 16 through 18, 2023, by HWA geologists using hand operated drilling and sampling equipment.

For the handholes conducted in Phase 1, Dynamic Cone Penetrometer (DCP) testing was performed at most boring locations to assess subsurface soil and groundwater conditions. The DCP equipment consists of a steel extension shaft assembly, with a 60-degree hardened steel cone tip attached to one end, which is driven into the soil by means of a sliding drop hammer. The base diameter of the cone is 20 mm (0.79 inches). The diameter of the shaft is 8 mm (~0.315 inches) less than the cone, to reduce rod friction at shallow penetration depths. The DCP is driven by repeatedly dropping an 8-kg (~17.6-pound) sliding hammer from a fixed height of 575 mm (~22.6 inches). The depth of cone penetration is measured after each hammer drop and the in-situ shear strength of the soil is reported in terms of the DCP index. The index is based on the average penetration depth resulting from 1 blow of the 8-kg (17.6-pound) hammer and is reported as millimeters per blow (mm/blow). The data obtained from the DCP tests was then correlated to Standard Penetration Test (SPT) N-value (blows/foot), to evaluate the strength of the subgrade soils. The DCP data, converted to SPT N-value (blows/foot), is plotted on Figures A-11 through A-22 for the hand auger borings.

Phase 2: Phase 2 of our field exploration program consisted of drilling four machine-drilled borings, designated BH-1 through BH-4. Borings were drilled within the United States Forest Service (USFS) Road 6603 road prism to depths ranging from about 36 to 41½ feet bgs. Borings were conducted on USFS Road 6603 due to accessibility issues for the drill rig on the proposed Project alignment. Samples were collected at approximate 2½-foot intervals to 20 feet, then approximate 5-foot intervals to the termination depths of the borings. These explorations were conducted in support of investigation of subsurface soil and groundwater conditions in the vicinity of the proposed Project alignment. Phase 2 was performed on June 19 and June 26, 2023 by Holocene Drilling of Puyallup, Washington, under subcontract to HWA using a track-mounted Diedrich D-50 tracked drill rig. The machine-drilled boring logs completed for Phase 2 are presented in Figures A-2 through A-5.

Standard Penetration Testing (SPT) was performed in each boring for Phase 2 using a 2-inch outside diameter, split-spoon sampler driven by a 140-pound automatic hammer. During the test, a sample was obtained by driving the sampler 18 inches into the soil with the hammer free-falling 30 inches. The number of blows required for each 6 inches of sampler penetration was recorded. The N-value (or resistance in terms of blows per foot)

is defined as the number of blows recorded to drive the sampler the final 12 inches. If a total of 50 blows was recorded within a single 6-inch interval, the test was terminated, and the blow count was recorded as 50 blows for the number of inches of penetration achieved. This resistance, or N-value, provides an indication of the relative density of granular soils and the relative consistency of cohesive soils.

Additionally, a larger 3-inch outside diameter, Modified California sampler was utilized at specific depths during Phase 2 exploration program in order to collect ring samples to conduct direct shear tests. The sample collected with this sampler (HWA-1, S-3) has blow counts that do not reflect standardized values as they utilized the larger Modified California sampler with the standard 140-lb hammer. These values have been adjusted in our analyses to reflect standard SPT N-value blow counts for the purpose of our design.

Two relatively undisturbed samples were obtained in Shelby tubes from two of the borings (BH-2, S-5 and BH-4, S-2) in order to collect samples for direct shear and consolidation testing. Sampling with a Shelby tube consists of pushing a 3-inch O.D., thin-walled steel tube (bolted to the bottom of the sampling rods) 30 inches into undisturbed soil below the bottom of the borehole using drill rig hydraulics. The sample tube is allowed to equilibrate for a few minutes before retrieval to promote adequate recovery. Due to the method of sample collection, no SPT-N values or correlating SPT-N values are available for these samples.

Phase 3: Phase 3 of our field exploration program consisted of drilling five machine-drilled borings, designated BH-5, BH-7 and BH-9 through BH-11. Borings were drilled approximately equidistance apart within the proposed reroute alignment to depths ranging from about 15.5 to 22 feet below ground surface (bgs). Two additional borings, designated BH-6 and BH-8, were planned for this phase, but the boring locations were not accessible using available drill equipment. Therefore, these two locations were not completed. Samples were collected at approximately 2½-foot intervals to the termination depths of the borings, unless drilling conditions dictated otherwise. Monitoring wells were installed to depths of 15 feet and 20 feet in BH-5 and BH-11 respectively. These explorations were conducted in support of investigation of subsurface soil and groundwater conditions in the vicinity of the proposed Project alignment. Phase 3 was performed on October 22 and 23, 2024 by Geologic Drill Partners Inc, of Fall City, Washington, under subcontract to HWA using a track-mounted Mini-Bobcat drill rig. The Phase 3 machine-drilled boring logs are presented in Figures A-6 through A-10.

Standard Penetration Testing (SPT) was performed in each boring for Phase 3 using a 2-inch outside diameter, split-spoon sampler driven by a 140-pound rope and cathead hammer. During the test, a sample was obtained by driving the sampler 18 inches into the soil with the hammer free-falling 30 inches. The number of blows required for each 6 inches of sampler penetration was recorded. The N-value (or resistance in terms of blows

per foot) is defined as the number of blows recorded to drive the sampler the final 12 inches. If a total of 50 blows was recorded within a single 6-inch interval, the test was terminated, and the blow count was recorded as 50 blows for the number of inches of penetration achieved. This resistance, or N-value, provides an indication of the relative density of granular soils and the relative consistency of cohesive soils.

A geologist from HWA logged the explorations and recorded pertinent information, including sample depths, stratigraphy, soil engineering characteristics, and groundwater occurrence. Soil samples obtained from the explorations were classified in the field and representative portions were placed in plastic bags. These soil samples were then taken to our Bothell, Washington, laboratory for further examination and testing.

The stratigraphic contacts shown on the exploration logs represent the approximate boundaries between soil types; actual transitions may be more gradual. The soil and groundwater conditions depicted are only for the specific date and location reported and, therefore, are not necessarily representative of other locations and times.

2.2 LABORATORY TESTING

Laboratory tests were conducted on selected samples retrieved from our explorations to characterize relevant engineering and index parameters of the soils encountered at the site. The tests included visual classifications, determination of natural moisture contents, Atterberg Limits, hydrometer, grain size distributions, direct shear, and consolidation. All tests were conducted in the HWA laboratory in general accordance with appropriate American Society for Testing and Materials (ASTM) standards. A brief description of laboratory test methodology is presented in Appendix B. The test results are presented in Appendix B and displayed on the boring logs in Appendix A, as appropriate.

3.0 GEOLOGIC AND SUBSURFACE CONDITIONS

3.1 GENERAL GEOLOGY

According to the *Geologic Map of Chelan 30-Minute by 60-Minute Quadrangle, Washington* (Tabor et al., 1987), the project area is underlain by Quaternary alluvium (Qa). This unit is defined as poorly sorted cobbles, gravel and sand. The ridges that define the width of the Nason Creek floodplain consist of the Nahahum Canyon Member of the Eocene Chumstick Formation (Tcn). This unit is defined as micaceous laminated shales and sandstones. Qa was deposited by running water and/or overbank flow from Nason Creek. Tcn rocks are composed of clay, silt and sand grains that were deposited in as still water body, such as a lake, then subsequently lithified. In general, the Tcn unit is easily erodible. A portion of the geologic map is presented in Figure 4.

The Project area is located within the Wenatchee River watershed basin. Nason Creek originates approximately 18 miles west of the Project area at Lake Valhalla, near Stevens Pass. Nason Creek continues to flow north from the Project area, converging with the Wenatchee River near the south end of Lake Wenatchee. The Wenatchee River roughly parallels Nason Creek in the vicinity of the Project area, but flows on the east side of Natapoc Ridge, with said ridge creating a natural barrier between the two waterways.

3.2 SUBSURFACE CONDITIONS

Our explorations encountered topsoil, fill, alluvium, and buried creek bed. In general, the alluvium was more fine-grained than the geologic map unit description indicates, and is likely a mix of colluvium eroded from the Tcn rock above, and overbank deposits from Nason Creek. The borings terminated in alluvium more similar to the map unit description, and are differentiated from the atypical alluvium deposits as being buried creek bed. the Units interpreted from the boring logs are described below. Geologic Cross-Sections A-A' through C-C' showing our interpretation of the soil profile at selected critical sections are presented in Figures 5A through 5C, respectively.

- **Topsoil:** Topsoil was encountered in HH-1 through HH-6, HH-9, HH-10, HH-12, BH-5, and BH-7 from ground surface to depths ranging from about ¼ to 1½ feet bgs. In general, the topsoil consisted of loose to medium dense, clayey or silty sand with varying percentages of gravel and abundant organics and roots.

- **Fill:** Fill was encountered at the ground surface or below the topsoil in HH-11, BH-1 through BH-4, BH-9 and BH-10 extending to depths ranging from 2 to 5 feet bgs. In general, the fill consisted of medium dense or medium stiff, clayey sand or sandy clay. Fill soils were similar to native soils, and we expect they are reworked soils placed during construction of USFS Road 6603 (BH-1 through BH-4) or the BPA transmission line corridor (HH-11, BH-9 and BH-10).

- **Alluvium:** Alluvium was encountered underlying the fill or topsoil in HH-1 through HH-11, and BH-1 through BH-5, BH-7, BH-9, and BH-10. The alluvium extends to depths of up to 35 bgs and to the termination depths of most of the borings. Alluvium was encountered at ground surface in BH-11, and extended to 2.5 feet bgs. In general, the alluvium consisted of loose to medium dense, or medium stiff, silty sand, clayey sand, or sandy clay. Alluvium soils are emplaced by running water. The high fine-grained soil content implies that this unit is likely representative of overbank flood deposits of Nason Creek. The soils consist of sediment similar to what we observed in Chumstick Formation sedimentary rock upslope on Natapoc Ridge, and colluvium from this source is likely also present in this unit. Observed bedding implies that the main depositional environment is alluvial.

- **Buried Creek bed:** Buried creek bed was encountered underlying the topsoil or alluvium in HH-12, BH-1 through BH-3, BH-5, BH-10 and BH-11, extending to the termination depths of the borings, when encountered. In general, the buried creek bed consisted of dense to very dense sand and gravel. Much of the sand observed in BH-1 through BH-3 was angular, and appeared to be disaggregated weathered gravel that had been broken apart during drilling and/or sampling. The sand and gravel in this unit would have also been emplaced by running water and is considered alluvium; however, HWA feels the emplacement conditions are different enough to warrant a separate unit. This soil would have been placed in an active-flowing channel, implying that the main Nason Creek channel has migrated from east to west over time, and the abandoned channel has since been buried in the overbank flood deposit alluvium described above. The gravel and sand minerology observed in this unit is primarily associated with metamorphic crystalline bedrock, present upstream and in surrounding areas, and is not similar to the observed Chumstick Formation sedimentary rocks upslope.

3.3 GROUNDWATER CONDITIONS

Groundwater was encountered in BH-1 through BH-3, BH-5 and BH-11 at depths ranging from about 3.17 to 40 feet below ground surface. For BH-1 through BH-3 and groundwater was observed at the time of drilling at depths ranging from 30-40 feet below ground surface. Within borings BH-5 and BH-11 groundwater was measured at 10.51 feet bgs and 3.17 feet bgs, respectively on October 23, 2024. When encountered, the groundwater was located within the buried creek bed soil. The depth of observed groundwater increased with added elevation, and was generally encountered at about the same elevation as the main Nason Creek channel. Groundwater was also encountered in HH-12 at 0.6 feet bgs in the buried creek bed soils. HH-12 was advanced in the mapped wetlands at the north extent of the Project area, at approximately the same elevation as the main Nason Creek channel.

HWA installed groundwater transducers in piezometers BH-5 and BH-11 on October 23, 2024, and collected groundwater transducer data on December 12, 2024. The data was corrected using barometric pressure data when calculating groundwater depth. Groundwater depths at BH-5 fluctuated between 9.8 and 10.6 feet below ground surface (bgs) between October and December 2024, with the depth generally decreasing over time, as shown on Figure 6A.

Groundwater depth at BH-11 fluctuated between 2.9 and 3.2 feet bgs between October and December 2024. While groundwater depth also generally decreased over time, the transducer data recorded within BH-11 produced more groundwater peaks than BH-5. These groundwater peaks manifest as individual data spikes where groundwater levels rise and fall rapidly. We compared United States Geological Survey (USGS) stream gage data for the same timeframe from Wenatchee River stream gage 12457000, located in Plain, Washington, to the BH-11 groundwater data. Stream gage data was accessed from the USGS website (https://waterdata.usgs.gov) on December 15, 2024. Stream gage 12457000 is located

approximately 3 miles east of the project area and represents the geographically closest stream height data within the Wenatchee River watershed basin. Both BH-11 groundwater data and stream gage 12457000 data are shown for comparison in Figure 6B. While not a direct correlation, the peaks in BH-11 groundwater depth roughly align with the peaks in the Wenatchee River gage height, implying that the groundwater at BH-11 is affected by the general water height trends within the Wenatchee River watershed basin, which includes the Nason River water height in the main channel west of SR 207.

The data from both piezometer locations are consistent with the expected trend during the wet season, which typically extends from approximately October to March. Due to the origin and location of Nason Creek, we anticipate that high ground water conditions would continue through the snow melt season into early summer. Groundwater conditions can vary over time and distance, and what we encountered during our explorations might not be representative across the Project area. Contractors should be prepared to encounter varying groundwater conditions during construction and excavation.

3.4 SITE RECONNAISSANCE

Site conditions were observed on May 16 through 18, June 20, and June 26 by an HWA geologist or geotechnical engineer. Ground surface and slope observations were made within the Project area from SR 207 to the base of Natapoc Ridge to document geomorphology, vegetation patterns and conditions, soil exposures, and surface water. Site observations are broken up by zones based on similar conditions. Four zones were identified and designated Zone 1 through Zone 4. Zone extents are shown on the Site and Exploration Plan, Figure 2.

3.4.1 Zone 1 (STA. 302+20 to 311+00)

Zone 1 extends from project stationing STA. 302+20 to 311+00 and contains explorations HH-1 through HH-3, and BH-5. The proposed new SR 207 alignment begins at STA. 305+00 and crosses a small wetland area that is part of the historic Nason Creek floodplain. The wetland area is at the base of a steep slope that is about 10 feet tall. No signs of slope instability were noted during our site reconnaissance, but the wetland was heavily vegetated with trees and shrubs that limited visibility. Zone 1 slopes up gently to the east with an average aspect ratio of approximately 30 Horizontal to 1Vertical (30H:1V), but localized areas with steeper or more shallow aspect ratios are possible. We noted no signs of slope instability in Zone 1.

Zone 1 contains a cleared Chelan County PUD utility corridor containing the 115kV line mentioned above. The corridor extends from the edge of the wetland and parallels SR 207 to STA. 310, then defines the north Zone 1 boundary to USFS Road 6603. Outside this corridor, the remaining area within Zone 1 is heavily forested with evergreens and vine maple.

3.4.2 Zone 2 (STA. 311+00 to 324+25)

Zone 2 extends from STA. 311+00 to 324+25 and contains HH-4 though HH-7, BH-1 through BH-4, and BH-7. This zone contains a large portion of the historic floodplain located east of SR 207, and a portion of the USFS Road 6603 alignment.

The historic floodplain is located at approximately the same elevation as the main Nason Creek Channel, and historic and/or abandoned channels can be seen in Figure 3. There is a steepened slope separating the historic floodplain from the higher-elevation area where the proposed realignment would be located. This steepened slope is the creek bank from when the channels contained flowing water, and was difficult to observe due to heavy tree, vine maple, and brush undergrowth, but we did not note any visible signs of slope instability at the time of our site visits. A portion of the historic floodplain is not vegetated and can be seen in Figure 2, which we identified as a sand and gravel creek bed. This creek bed was dry during our reconnaissance, but the ditch on the east edge of SR 207 contained a significant amount of water and was difficult to cross. According to the Washington State Department of Ecology records for the Nason Creek stream gage station 45J070, located downstream near the Nason Creek mouth, the Nason Creek stage was approximately 4.6 feet during our May site visit, and water levels in the creek during May were the highest recorded for the 2022 water year to date. In comparison, the stage during our June visits was approximately 1.5 feet. No flood stage has been established for Nason Creek, but based on the lack of vegetation we anticipate that during times of high flow the dry creek bed could contain water.

As described above, USFS Road 6603 was primarily an unpaved dirt road, with discrete areas where asphalt pavement was still in place. The road is in relatively decent condition considering the fact that is closed and likely gets minimal maintenance. There were no signs of settlement, and minimal rutting. Multiple large potholes have formed, the largest of which was approximately 10 feet by 10 feet, and 1-foot deep. Water that collected in these potholes was slow to drain, and we observed that potholes would remain nearly full up to a day after rain, implying that the infiltration rate in the subgrade soil is low in the Project area.

The slope east of USFS Road 6603 slopes gently up to Natapoc Ridge, with an average aspect ratio of approximately 8H:1V, and is heavily vegetated with evergreen trees, vine maple, and brush undergrowth. Observations of the ground surface were difficult to make under these conditions, but in general surface conditions were uneven and the ground surface undulated. It is possible the uneven surface is due in part to prehistoric mass wasting deposits and colluvium sourced from the Chumstick Formation sedimentary rock off Natapoc Ridge, but we noted no signs of current slope instability or failure.

3.4.3 Zone 3 (STA. 324+25 to 331+00)

Zone 3 extends from STA. 324+25 to 331+00 and contains HH-8 though HH-10. This zone contains little historic floodplain, and primarily consists of a gentle, heavily vegetated slope with an average aspect ratio of approximately 10H:1V. No concerns were noted in this zone.

3.4.4 Zone 4 (STA. 331+00 to 338+60)

Zone 4 extends from STA. 331+00 to 338+50 and contains HH-11, HH-12, and BH-9 through BH-11. This zone contains the BPA transmission line corridor and a portion of a mapped wetland. Adjacent to the north is a large section of historic floodplain, located at approximately the same elevation as the main Nason Creek channel. Surface water was observed near HH-12 during our investigation. Our Google Earth imagery search indicates that there is often surface water in the channels of the historic flood plain to the north, with water transferring from the main Nason Creek Channel through a culvert, located under SR 207 at approximately and into the historic floodplain channels east of SR 207.

The BPA transmission line corridor extends from SR 207 to the top of Natapoc Ridge. It is an approximately 200-foot-wide linear cleared path vegetated with grass and small shrubs. The average aspect ratio is approximately 10H:1V. On the north edge of the transmission line corridor there is a narrow band of trees, then a steep drop down to the historic floodplain and wetland, which can be seen in Figure 3. Where the proposed new alignment is planned to rejoin the current SR 207 ROW there is an approximately 14-foot-tall, exposed soil slope with an average aspect ratio of 4H:1V. This soil appeared to be similar to the alluvium encountered in our explorations and was easily excavated. Approximately 600 feet east of SR 207 there is a large arcuate feature with an average aspect ratio of 0.6H:1V that spans across most of the cleared corridor. We interpret these steep slopes to the north to be creek banks related to previously active Nason Creek channels observed in the historic floodplain in Figure 3. We did not observe signs of slope instability during our site reconnaissance; however, our observations imply that these soils are readily erodible, and could present issues during and after construction if left unmitigated.

4.0 CONCLUSIONS & RECOMMENDATIONS

4.1 GENERAL

Our subsurface exploration and site reconnaissance indicate that construction of the proposed realignment of SR 207 is feasible from a geotechnical perspective. However, the presence of compressible, soft/loose alluvial soils along the proposed alignment will need to be considered during design and construction of the proposed improvements. The alluvial soils overlying the buried creek bed deposits are generally compressible and will settle under the proposed service

loads. We expect that significant consolidation settlement will occur in the fine-grained alluvial layers when embankment fills are placed to construct the new roadway. Settlements are expected to be differential in nature, with estimated maximum total settlement on the order of 18 inches where proposed fills are thickest. HWA recommends that a preloading program be implemented prior to roadway construction to reduce anticipated future settlements.

Assuming the proposed cut and fill slopes are constructed at a maximum slope of 3H :1V, our stability analysis indicates that the proposed roadway embankment will be stable under static and seismic loading conditions.

Due to the depth of the groundwater table and the consistency of the subsurface soils, we expect the potential for liquefaction of the subsurface soils to be low.

The near surface soils along the alignment consist of fine-grained alluvium that possess low infiltration capacity. Given the sloping nature of the site and the low expected infiltration rate, we expect that the use of onsite infiltration could result in increased erosion. If possible, we recommend that other means of stormwater management be considered.

4.2 SEISMIC DESIGN CONSIDERATIONS

4.2.1 Seismic Design Parameters

Earthquake loading for the project was developed in accordance with the General Procedure provided in Section 3.10 of the *AASHTO Guide Specifications for LRFD Seismic Bridge Design*, 9th Edition, 2020. For seismic analysis, the Site Class is required to be established and is determined based on the average soil properties in the upper 100 feet below the ground surface. Based on our subsurface explorations and understanding of site geology, it is our opinion that the site is underlain by soils that are consistent with Site Class D. The mapped seismic design coefficients for the design level event, which has a probability of exceedance of 7 percent in 75 years (equal to an approximate return period of approximately 1033 years), were obtained using the USGS Unified Hazard Tool to incorporate the probabilistic seismic hazard parameters from the 2014 updates to the National Hazard Maps (Peterson, et al., 2014). The recommended seismic coefficients for the design event are provided in Table 1. Site Coefficients were obtained from Tables 3.10.3.2-1 through 3.10.3.2-3 (AASHTO, 2020).

Table 1. AASHTO Guide Specifications calculated by USGS Seismic Hazard Map

Site Class	Peak Horizontal Bedrock Acceleration PBA, (g)	Spectral Bedrock Acceleration at 0.2 sec S_S, (g)	Spectral Bedrock Acceleration at 1.0 sec S_1, (g)	Site Coefficients			Peak Horizontal Acceleration PGA (A_S), (g)
				F_{pga}	F_a	F_v	
D	0.1782	0.3996	0.1179	1.44	1.3	2.33	0.257

Based on the above parameters the Peak Ground Acceleration, PGA (As) for Site Class D at the site is 0.257 g. Based on the parameters calculated and shown in Table 1 the AASHTO Seismic Performance Zone for the site is 2.

4.2.2 Liquefaction

Liquefaction is a temporary loss of soil shear strength due to earthquake shaking. Loose, saturated cohesionless soils are susceptible to earthquake-induced liquefaction; however, recent experience and research has shown that certain silts and low-plasticity clays are also susceptible. Primary factors controlling the development of liquefaction include the intensity and duration of strong ground motions, the characteristics of subsurface soils, in-situ stress conditions and the depth to groundwater.

Our explorations suggest that the water table across the site is suppressed within the very dense buried stream bed deposits underlying the project alignment. Due to the very dense nature of these soils, we expect the potential for liquefaction to occur along the project alignment to be low.

4.3 Slope Stability Analysis

HWA performed global slope stability analysis along geologic profiles A-A', B-B', and C-C' based on the proposed roadway geometry. Geologic profile A-A' (presented in Figure 5A) was selected as a critical section for analysis due to the proposed fills and presence of an existing 3H:1V slope near the east edge of the new embankment. Geologic profile B-B'(presented in Figure 5B) was selected as a critical section with respect to the proposed cut geometry. Geologic profile C-C' (presented in Figure 5C) was selected as a critical section based on the proposed embankment heights, with fills approaching 19 feet above existing grade. The location and orientation of these profiles can be seen on the Site and Exploration Plan, Figure 2. Global slope stability was analyzed under static loading and pseudo-static earthquake loading. Soil strength parameters and ground water conditions for this analysis were developed based on field exploration observations and laboratory test results.

Limit equilibrium analyses were performed using the computer program SLIDE 5.0. Global factors of safety with respect to potential deep-seated failure surfaces were determined under the two load cases. The factor of safety computed is the ratio of the summation of the driving forces to the summation of the resisting forces. Where the factor of safety is less than 1.0, instability is predicted. For global slope stability design, minimum acceptable factors of safety under static loading conditions are commonly taken as 1.3 for slopes not supporting structures or walls. The minimum acceptable factors of safety for the pseudo-static loading is 1.1.

4.3.1 Static Loading Condition

The proposed roadway embankment geometries, assuming maximum cut and fill slopes of 3H:1V, at the locations of Geologic Profiles A-A', B-B', and C-C' were found to be stable under the static loading condition with factors of safety significantly greater than 1.5. Therefore, static slope instability is not expected under the proposed grading geometries along the alignment. Static stability for the temporary embankment preload condition was also checked which also produced a factor of safety greater than 1.5.

4.3.2 Seismic Stability

Seismic stability along the proposed alignment was evaluated using a pseudo-static horizontal acceleration of 0.129g, which is equal to half of the peak ground acceleration (PGA) associated with the 1,033-year design earthquake for the project location. From our analyses, we conclude that, under the design earthquake scenario, a factor of safety for global stability greater than 1.1 exists at the locations of Geologic Profiles A-A', B-B' and C-C'. Therefore, in the event of a design-level earthquake, slope failure is not expected to occur along the proposed grading geometries provided cut and fill slopes are 3H:1V or flatter.

4.4 EMBANKMENT SETTLEMENT ANALYSIS

The project alignment is underlain by fine-grained alluvial deposits. This soil is considered compressible and will undergo consolidation settlement in response to the proposed embankment construction. Consolidation settlement results from the application of static loading on compressible soil deposits that have not previously experienced similar loading conditions. Consolidation settlement occurs as both primary consolidation and secondary consolidation. Both mechanisms are described below.

Primary consolidation initiates immediately upon the application of load and is a result of pore water being expelled from the void space within the soil unit. As load is applied, the pore water pressure increases within the soil unit and slowly decreases as the pore water is expelled from the soil. Through this process the void space is reduced and the volume of the soil deposit decreases. This decrease in volume results in a reduction in the thickness of the soil unit which

manifests as settlement at the ground surface. The magnitude of primary consolidation settlement is dependent on the properties and thickness of the compressible soil unit, and the magnitude and geometry of the applied load.

Secondary compression is a settlement phenomenon that occurs in soil deposits after completion of the primary consolidation stage and can continue for many years. The magnitude of secondary compression settlement is difficult to predict but is typically a small fraction (5 to 10%) of the settlement that occurs as primary consolidation for most mineral soils.

Based on a review of preliminary plans provided by Perteet, we expect that major grade increases and embankment fill placement is proposed between proposed roadway Stations 319+00 and 323+20, and Stations 331+00 and 337+00. Placement of this embankment fill is expected to load the underlying soils and induce consolidation settlements. HWA has conducted preliminary settlement evaluations along this portion of the proposed roadway. Our evaluations were completed using the computer software Settle3D (Rocscience, Inc., 2022). Embankment geometry was assumed based on the preliminary layout and roadway profile provided by Perteet and consolidation parameters for the alluvial soils were identified from laboratory testing conducted on relatively undisturbed samples collected during our Phase 2 exploration program. Our analysis indicates that construction of the proposed roadway embankment, assuming conventional construction methods, between Station 319+00 and 323+20 could result in up to 11 inches of primary consolidation settlement within the alluvial soil deposits, with the maximum settlement occurring at approximate Station 322+00. The results indicate that the embankment fills proposed Station 331+00 and 337+00 could result in up to 21 inches of primary consolidation settlement, with the maximum settlement occurring at approximate Station 335+00. We expect that long-term secondary consolidation could result in an additional 1-2 inches of settlement over the design life of the roadway. Total settlement along the fill embankments is expected to be variable and differential in nature due to the variation of fill heights and soil conditions along the alignment. The estimated magnitude of total settlement with respect to roadway Station within the proposed fill areas are shown in Figures 7A (STA 319+00 to 323+20) and 7B (STA 331+00 to 337+00).

As shown in Figures 7A and 7B, substantial and differential primary consolidation settlements are expected to result from construction of the proposed roadway. The anticipated settlement should be considered as the design of the proposed realignment progresses. Implementation of settlement mitigation measures should be considered to achieve the desired long-term performance of the roadway.

4.5 SETTLEMENT MITIGATION ALTERNATIVES

There are several settlement mitigation measures that are commonly used to reduce or eliminate potential settlements along new roadways. These mitigation options include do nothing, over-

excavation and replacement, preloading, and placement of lightweight fill. A description of each of these possible options is provided below.

- **Do Nothing:** Yakama Nation could choose to reconstruct the roadway without addressing the subsurface conditions. With this option, the proposed roadway from Station 319+00 to 323+20, and from Station 331+00 to 337+00, would be expected to undergo significant differential settlements. We expect these differential settlements would result in localized sags in the roadway vertical alignment and variable pavement distress. In addition to pavement distress, we expect that the settlement geometry associated with doing nothing could result in stormwater ponding associated with changes in the anticipated flow path of stormwater over time. We do not recommend proceeding with no settlement mitigation measures implemented.

- **Over-Excavation and Replacement:** Over excavation of compressible soils and replacement with compacted structural fill is a mitigation measure often implemented to eliminate the potential of future settlements along new roadways. This may be a viable option in areas of localized wetland crossings, where the depth of required excavation is minimal. However, subsurface investigations indicate that the base of the compressible alluvium, in the vicinity of the largest fill embankments, is approximately 30 feet below ground surface. Therefore, over-excavation and replacement would require very deep excavations that would require significant shoring. Due to the anticipated cost of over-excavation and replacement, we do not believe that it is a viable settlement mitigation option for the project.

- **Preloading:** Preloading is often a viable way to reduce future settlements. Preloading involves placing a specified amount of soil or weight over a given area and allowing the weight to consolidate the underlying compressible or weak soils prior to construction of the proposed improvements. Preloading has been used successfully on similar projects in the past. However, the viability of preloading requires time. Preloading would be a viable option to reduce anticipated settlements if the project construction schedule has sufficient time available to allow for the preload to be in place.

- **Lightweight Fill:** Lightweight material could be used to reduce the load on the underlying compressible soils, reducing anticipated future settlements. This would be achieved by excavating existing soils and replacing them with lightweight materials. The depth of excavation would depend on the type of lightweight materials. The use of lightweight materials would need to extend across the entire roadway.

  Several lightweight fill materials are available and have been used on past projects with success. These materials include Geofoam, bottom ash, volcanic rock, glass cutlet and lightweight cellular concrete. Geofoam consists of proprietary lightweight Styrofoam blocks that are readily available to contractors and have been used successfully on numerous road projects. Some drawbacks in transportation related applications are that

Geofoam blocks require encapsulation with a gasoline resistant geomembrane and they have densities significantly lighter than water and thus hydrostatic uplift pressures would need to be considered if groundwater levels are able to rise above the base of the geofoam blocks. Bottom Ash is a byproduct of coal fired power plants and weighs between 45 and 75 pounds per cubic foot. Bottom ash has been used on several road projects but is becoming hard to obtain. Volcanic rock has been used as lightweight fill in the past. Volcanic rock generally weighs approximately 45 to 60 pounds per cubic foot. However, there are no readily available sources of volcanic rock in Washington State. Therefore, the cost associated with importing the material would be prohibitive for this project. Lastly, lightweight cellular concrete could be used for this project.

Lightweight cellular concrete is a proprietary product that can be manufactured onsite to a wide range of unit weights (36 to 120 pcf) and compressive strengths to match project requirements. Cellular concrete is widely available in Washington State and has been used successfully on road projects. Cellular concrete can be excavated for future utility crossings if needed.

Lightweight fill could be designed to reduce anticipated future settlements; however, the cost associated with using lightweight fill as a settlement mitigation measure is expected to be significant. Therefore, we do not expect that the use of lightweight material is a viable settlement mitigation option for this project.

Given the soil geometry and location of the project site, most of the above-described mitigation options present significant challenges that make them less favorable for this project. If settlement mitigation methods are to be implemented, we recommend the use of preloading.

4.6 EMBANKMENT PRELOAD

Based on our communications with the project team, we understand that preloading the roadway embankment is the preferred settlement mitigation option for the project. This can be accomplished by first constructing the roadway embankment per plan, then placing an additional preload surcharge above the embankment to increase the applied load and thereby decrease the time required to reach the end of primary (EOP) consolidation that will occur under the service loads.

The onset of consolidation settlement will occur as soon as embankment construction begins, thus it is necessary to construct the surcharge to a design thickness rather than an absolute elevation. For the fill embankment between Stations 319+00 and 323+20, we recommend placing a surcharge of compacted soil that extends 7 feet above the roadway finished grade. For the fill embankment between Stations 331+00 and 337+00, we recommend placing a surcharge of compacted soil that extends 10 feet above finished grade. The full height surcharge should extend from shoulder to shoulder of the proposed roadway and should taper at a 2H:1V slope

both laterally to the sides of the embankment and longitudinally at the terminal ends of the embankment. The top surface of the surcharge should be crowned or inclined slightly to promote surface drainage.

We anticipate that the recommended preload surcharges will induce approximately 4 to 6 inches of additional consolidation settlement across the roadway alignment, resulting in an estimated maximum total settlement (at EOP) of 16 inches at approximate Station 322+00, and 25 inches at approximate Station 335+00. This settlement will result in an overall lowering of the preload and surcharge causing the top of the embankment to drop below finished grade. To account for this, the base of the surcharge should be placed as compacted structural fill per the specifications of the permanent roadway embankment. From Station 319+00 to 323+20, the planned embankment and the bottom 2 feet of the surcharge should be placed as permanent structural fill, the remaining 5 feet of surcharge material (surcharge expected to be removed at the end of preloading) may consist of native borrow. From Station 331+00 to 337+00 the proposed embankment and bottom 3 feet of the surcharge should be placed as permanent structural fill, the remaining 7 feet may consist of native borrow.

Based on the proposed roadway realignment, the limits of the fill embankment between approximate Stations 335+00 and 337+00 will extend into the existing SR 207 right-of-way. To decrease the footprint of the embankment and minimize disruption of traffic flow, we recommend placing a temporary ecology block wall, or a similar system, along the inside (north) shoulder of the new roadway to retain fills for the embankment and surcharge throughout the duration of the preload program. The required height of ecology block walls will depend on wall location and final height of the proposed preload. Design of the temporary ecology block wall should be provided by the wall manufacturer or a qualified structural engineer. It should be noted that placing a preload directly adjacent to the SR 207 roadway shoulder is expected to result in some pavement distress in the vicinity of the preload. We recommend that the design assume that repair of this portion of the roadway will be required as part of the project.

It is expected that the excavated soils generated from cut portions of the alignment (from Stations 306+00 to 308+20, 317+00 to 319+00, and 323+20 to 326+50) will generally be suitable as native borrow for temporary embankment surcharge applications. Native borrow soils should be placed such that a minimum bulk density of 120 pounds per cubic foot (pcf) is achieved. We anticipate that this will require compacting the soils to at least 90% of the maximum dry density (MDD) as determined for the material by test method ASTM D 1557 (Modified Proctor).

Note that surficial failures, i.e. sloughing of the preload may occur throughout the duration of the preload period, which may require periodic repair over localized areas. Plastic sheeting may be used to cover the preload to prevent instability and erosion.

4.7 SETTLEMENT MONITORING

After the recommended preload configuration for the embankment has been constructed, consolidation settlement will occur gradually over time. We anticipate that the construction will be performed in phases, with clearing and grubbing beginning in early spring followed by grading and construction of embankment fills and the preload surcharge throughout the summer months. With the expectation that the preload construction would be completed by late summer or early fall, we anticipate that removal of the preload and final construction could proceed sometime during the following spring or early summer. Based on the results of our consolidation analysis, we anticipate that 90 percent of the primary consolidation will be realized after a preload period of approximately 6 months. It is our opinion that this degree of consolidation will be sufficient to limit long-term, post-construction settlement to within acceptable project tolerances.

To monitor settlement during the preload program, we recommend installing settlement plates at locations where maximum fills are placed. A typical detail for the recommended settlement plate geometry is shown in Figure 8. At a minimum, settlement plates should be installed along the roadway centerline at 100-foot spacings, with one settlement plate installed near Station 322+00 and another near Station 335+00. Settlement plates should be installed on firm ground or on sand pads if needed for stability. Plates should be installed at or slightly below the current ground surface immediately following clearing of surface vegetation, and prior to placing any fill. The preload surcharge should not be removed until analysis of settlement data indicates that sufficient settlement has occurred.

Initial elevation readings should be taken on all settlement plates prior to placing any fill. Settlement plates should be monitored daily during fill placement, weekly for the first month after fill placement, biweekly for the next 3 months, and monthly thereafter. All readings should be taken through the center of the steel rods, at the level of the plate. The elevation of the adjacent fill surface should also be noted at each reading. Settlement plate readings should be to the nearest 0.01 foot; fill elevations should be measured to the nearest 0.1 foot. All elevations should be referenced to a benchmark located on stable ground at least 200 feet from the preload embankment.

4.8 STORMWATER MANAGEMENT

We understand that the design team would like to consider the use of onsite infiltration as a means of stormwater management for the project. The following sections discuss stormwater-related design recommendations.

4.8.1 Stormwater Infiltration Feasibility

Our subsurface explorations encountered fine-grained alluvial soils underlying the entirety of the project. These soils are not expected to possess an appreciable degree of infiltration potential.

The lack of infiltration potential of the onsite alluvial soils is supported by the observations of significant ponding along the forest service road during our site reconnaissance, days after the last rainfall.

Initial saturated hydraulic conductivity (K_{sat}) rates were estimated using the results of laboratory testing and the grain-size methodology procedure outlined in Section 5.4 of the Department of Ecology Stormwater Management Manual for Western Washington (DOE, 2019). The initial K_{sat} values used to evaluate preliminary design infiltration rates for the alluvial soils are summarized in Table 2.

Table 2.
Infiltration Screening Based on Grain Size Analysis

Boring		HH-1	HH-4	HH-8
Depth	ft	1.5	4.2	2.4
USCS Classification		CL	ML	CL
D10	mm	0.001	0.0035	0.001
D60	mm	0.06	0.074	0.062
D90	mm	0.3	0.28	0.31
f_{fines}	%	64.7	60.9	64.8
K_{sat}	in/hr	**0.18**	**0.21**	**0.21**

Based on an average K_{sat} value of approximately 0.2 inches per hour for the samples collected within the fine-grained alluvial deposits, we estimate that the controlling design infiltration rate for the project would be less than 0.05 inches per hour after applying the appropriate correction factors. Given the sloping site and very limited infiltration potential, we recommend other means of stormwater management be considered for this project. HWA does not recommend any further infiltration testing at this site.

4.8.2 Detention Pond Recommendations

Due to the use of onsite infiltration not being feasible along the project alignment, it is our understanding that the design team proposes to construct two detention ponds along the project alignment for flow control. The location of these ponds are shown in Figure 2 at the north and south ends of the project.

Boring BH-5 was drilled in the vicinity of the proposed detention pond to be constructed at the south end of the project alignment. This boring encountered approximately 10 feet of high fines alluvium underlain by courser grained and saturated buried creek bed deposits. The groundwater at this location was recorded as varying from 9.8 feet below ground surface to 10.6 feet below ground surface. Between October and December of 2024. Additional groundwater data is being collected and will be included in future versions of this report. Current data suggests that 9 feet of non-saturated soil are present at this location. Therefore, it appears that sufficient separation

exists to construct a detention pond at this location. We understand that a residential well is located in the vicinity of the proposed southern pond. HWA does not have a well log for the subject residential well. However, we can assume that the well is screened within the buried creek bed deposits encountered below 10 feet in this area. We do not expect that the construction of the proposed deletion pond will impact the water levels within the adjacent residential well. However, depending on the depth of the proposed pond, the detained water could come in contact with the water bearing layer in which the residential well could be screened. Depending on the level of stormwater treatment proposed, we recommend that the proposed southern detention pond be lined to avoid any possibility of contamination of the water bearing layer.

Boring BH-11 was drilled in the vicinity of the proposed northern detention pond. This boring encountered coarse grained buried creek bed soil near the ground surface. Data collected from the groundwater monitoring well installed at this location indicates that groundwater levels at this location are ties to the elevation of Nason Creek and vary from 2.9 to 3 feet below ground surface between October and December of 2024. It is possible that higher groundwater levels will be recorded at this location over the winter and spring of 2025. Given the shallow groundwater table at this proposed pond location, limited pond capacity is expected. We recommend that the design team consider shallow groundwater in the design of the northern detention pond and determine if a pond at this location is feasible. If the pond is designed at this location and lined, buoyancy forces are expected to develop and will need to be accounted for in the design of the facility. HWA can provide buoyancy recommendations as the design progresses.

4.9 ROADWAY CONSTRUCTION CONSIDERATIONS

The new roadway alignment will be constructed through forested areas with varying topography. Our explorations indicate that the proposed roadway alignment is underlaid by fine grained alluvial soils with soft to medium stiff relative consistencies. The soils and topography along the alignment will require special geotechnical considerations. HWA recommends the following be considered during planning of the proposed improvements.

4.7.1 Subgrade Preparation

Construction of the reroute will require clearing and grubbing of the proposed roadway alignment. Clearing and grubbing should be performed in accordance with the procedures outlined in the 2-01 of *WSDOT Construction Manual* (WSDOT, 2024). Any required tree removal should also be accomplished during subgrade preparation. Care should be taken to thoroughly remove all root systems from the proposed construction area. Materials disturbed during removal of stumps should be undercut and replaced with structural fill.

Prior to completing any settlement mitigation measures, we recommend that all unsuitable materials be removed from the site prior to placement of structural fill. We recommend that

qualified engineering personnel monitor the stripping operations to observe that all unsuitable materials have been removed. Care should be exercised to separate the move and stock unsuitable materials to avoid incorporation of the organic matter in structural fill sections. The subgrade excavation should be benched to avoid placing structural fill on sloped surfaces.

The existing subgrade soils are loose and or soft and are not expected to provide adequate support for the proposed roadway embankment. To stabilize the subgrade soils along the alignment we recommend that these soils be over excavated by a minimum of 2 feet below the proposed bottom of the embankment foundation elevation. The over excavated volume should be replaced with 4-8-inch quarry spalls as specified per Section 9-13.1(5) of the *WSDOT Standard Specifications* (WSDOT, 2025). A woven geotextile separator fabric, meeting the requirements of Table 3 of Section 9-33.2 of the *WSDOT Standard Specifications* (WSDOT, 2025) for soil stabilization, should be placed over the quarry spalls across the base of the excavation prior to the placement of the embankment structural fill. The placement of the quarry spalls and geotextile separator fabric will allow for placement of the embankment fill with limited loss to the subgrade soils. Failure to plan and implement these subgrade stabilization measures could result in cost overruns during construction, due to poor subgrade conditions.

4.7.2 Culvert Installation

As part of the subgrade preparation, we expect culverts will be required where the roadway crosses natural drainage features. The culvert should be founded at a grade that is capable of collecting all possible water from upslope of the roadway. If the drainage is not considered to be fish passable, the culvert pipes should be designed with a flexible piping material, such as fused HDPE, to avoid culvert separation as a result of embankment settlements. The culvert geometry and backfill should be designed to promote water flow into the culverts and avoid seepage into the quarry spalls placed to stabilize the base of the embankment excavation. This may require surface treatment at the inlet side of the culvert or possible grouting of some of the quarry spalls in the vicinity of the culvert inlet. Culvert slopes should be designed to maintain positive drainage after as much as 3 feet of consolidation settlement from the preload.

4.7.3 Structural Fill

The onsite soils are fine grained and are moisture sensitive. We do not recommend reusing the onsite soils as structural fill for this project. Structural fill should consist of clean, free-draining, granular soils free from organic matter or other deleterious materials. Such materials should be less than 4 inches in maximum particle dimension, with less than 7 percent fines (portion passing the U.S. Standard No. 200 sieve), as specified for “Gravel Borrow” in Section 9-03.14(1) of the *WSDOT Standard Specifications* (WSDOT, 2025). The fine-grained portion of structural fill soils should be non-plastic. Fill material having a fines content greater than 7 percent may be acceptable for structural fill in certain applications if the earthwork is performed during relatively dry weather and the contractor’s methods achieve proper compaction of the soil.

Material with a fines content greater than 7 percent should be approved by the project engineer prior to use.

4.7.4 Compaction

Structural fill soils should be moisture conditioned and compacted to a dense and unyielding condition and to the requirements specified in Section 2-03.3(14)C, Method C, of the *WSDOT Standard Specifications* (WSDOT, 2025); except the standard of compaction achieved should not be less than 95% of the maximum dry density (MDD) determined for the fill materials by test method ASTM D 1557 (Modified Proctor). Structural fill should be placed and compacted in loose, horizontal lifts of not more than 8 inches in thickness. Subgrade compaction in roadbed areas should conform to the requirements of Section 2-06.3(1) of the *WSDOT Standard Specifications* (WSDOT, 2025).

At the time of placement, the moisture content of structural fill should be at or near optimum. Achievement of proper density of a compacted fill depends on the size and type of compaction equipment, the number of passes, thickness of the layer being compacted, and soil moisture-density properties. In areas where limited space restricts the use of heavy equipment, smaller equipment can be used, but the soil must be placed in thin enough layers and at the proper moisture content to achieve the required relative compaction. Generally, loosely compacted soils result from poor construction technique and/or improper soil moisture content. Soils with high fines contents are particularly susceptible to becoming too wet and coarse-grained materials easily become too dry for proper compaction.

4.7.5 Temporary Excavations

Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. In accordance with Part N of Washington Administrative Code (WAC) 296-155, latest revisions, all temporary cuts in excess of 4 feet in height must be either sloped or shored prior to entry by personnel. Based on the guidelines, the onsite existing fill and alluvial soils classify as Type C soils. These materials should be sloped no steeper than 1.5H:1V. These recommended maximum slopes are applicable to temporary excavations above the water table only; flatter side slopes would be required for excavations where groundwater seepage is encountered.

The contractor should monitor the stability of temporary cut slopes and adjust the construction schedule and slope inclination accordingly. The contractor should be responsible for control of ground and surface water and should employ sloping, slope protection, ditching, sumps, dewatering, and other measures, as necessary, to prevent sloughing of soils.

4.7.6 Wet Weather Earth Work

The near surface soils along the project alignment are fine-grained and considered highly moisture sensitive. We recommend that subgrade preparation, along the alignment, be completed in the dry summer months. Attempting to complete subgrade preparations outside of the dry season is expected to result in costly subgrade improvements beyond the recommendations provided in this report. General recommendations relative to earthwork performed during wet weather or in wet conditions are presented below. These recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation of unsuitable and/or softened soil should be followed promptly by placement and compaction of clean structural fill. The size and type of construction equipment used may need to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic.

- Any backfill material including but not limited to Gravel Borrow as specified in Section 9-03.14(1) of the *WSDOT Standard Specifications* (WSDOT, 2023) and/or Crushed Surfacing Base Course (CSBC) as specified in Section 9-03.9(3) of the *WSDOT Standard Specifications* (WSDOT, 2023) used as excavation backfill in wet weather should consist of clean granular soil with less than 5 percent passing the U.S. No. 200 sieve, based on wet sieving the fraction passing the ¾-inch sieve. The fines should be non-plastic. It should be noted this is an additional restriction on the structural fill materials specified.

- The ground surface within the construction area should be graded to promote surface water run-off and to prevent ponding.

- Within the construction area, the ground surface should be sealed on completion of each shift by a smooth drum vibratory roller, or equivalent, and under no circumstances should soil be left uncompacted and exposed to moisture infiltration.

- Excavation and placement of backfill materials should be monitored by a geotechnical engineer experienced in wet weather earthwork to determine that the work is being accomplished in accordance with the project specifications and the recommendations contained herein.

- Bales of straw combined with other best management practices such as geotextile silt fences should be strategically located to control erosion and the movement of soil.

5.0 CONDITIONS AND LIMITATIONS

We have prepared this report exclusively for the Yakama Nation and Perteet for use in the evaluation of this project. The conclusions and interpretations presented in this report should not be construed as our warranty of subsurface conditions at the site. Experience has shown that soil and ground water conditions can vary significantly both spatially and with time. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study of this scope and nature. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, HWA should be notified for review of the recommendations of this report, and revision of such, if necessary. If there is a substantial lapse of time between submission of this report and the start of construction, or if conditions change due to construction operations, it is recommended that this report be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

Implementation of the engineering recommendations provided in this report are contingent on good construction practices. Poor construction techniques and methods may alter the subsurface conditions on which our recommendations are based and may result in unsatisfactory performance of the proposed structures. We recommend HWA be retained to review the plans and specifications to verify that our recommendations have been interpreted and implemented as intended. Sufficient geotechnical monitoring, testing, and consultation should be provided during construction to confirm the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications

Within the limitations of approved scope, schedule and budget, HWA attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology at the time the report was prepared. No warranty, express or implied, is made.

HWA does not practice or consult in the field of safety engineering. We do not direct the contractor's operations and cannot be responsible for the safety of personnel other than our own on the site. As such, the safety of others is the responsibility of the contractor. However, the contractor should notify the owner if any of the recommended actions presented herein are considered unsafe.

We appreciate this opportunity to be of service.

Sincerely,

Brett O'Brien, P.E.
Geotechnical Engineer

Donald J. Huling, P.E.
Principal Geotechnical Engineer

6.0 REFERENCES

American Association of State Highway and Transportation Officials, 2020. *AASHTO Guide Specifications for LRFD Seismic Bridge Design,* 9th Edition, American Association of State Highway and Transportation Officials. Washington, DC.

Department of Ecology, *Stormwater Management Manual for Western Washington*, 2019

Massmann, Joel W, *A Design Manual for Sizing Infiltration Ponds*, Washington State Transportation Commission, October 2003.

Petersen, Mark D.; Moschetti, Morgan P.; Powers, Peter M.; Mueller, Charles S., Haller, Kathleen M.; Frankel, Arthur D., Zeng, Yuehua; Rezaeian, Sanaz; Harmsen, Stephen C.; Boyd, Oliver S.; Field, Ned; Chen, Rui, Rukstales, Kenneth S.; Luco, Nico; Wheeler, Russell L.; Williams, Robert A. and Olsen, Anna H., *Documentation for the 2014 Update of the United States National Seismic Hazard Maps,* Open-File Report 2014-1091.

Tabor, R.W., Frizzell, V.A., Whetten, J.T., Waitt, R.B., Swanson, D.A., Byerly, G.R., Booth, D.B., Hetherington, M.J., and Zartman, R.E., 1987. *Geologic Map of the Chelan 30-Minute by 60-Minute Quadrangle, Washington,* United State Department of the Interior, United States Geological Survey Miscellaneous Investigations Series Map 1-1661, Scale 1:100,000.

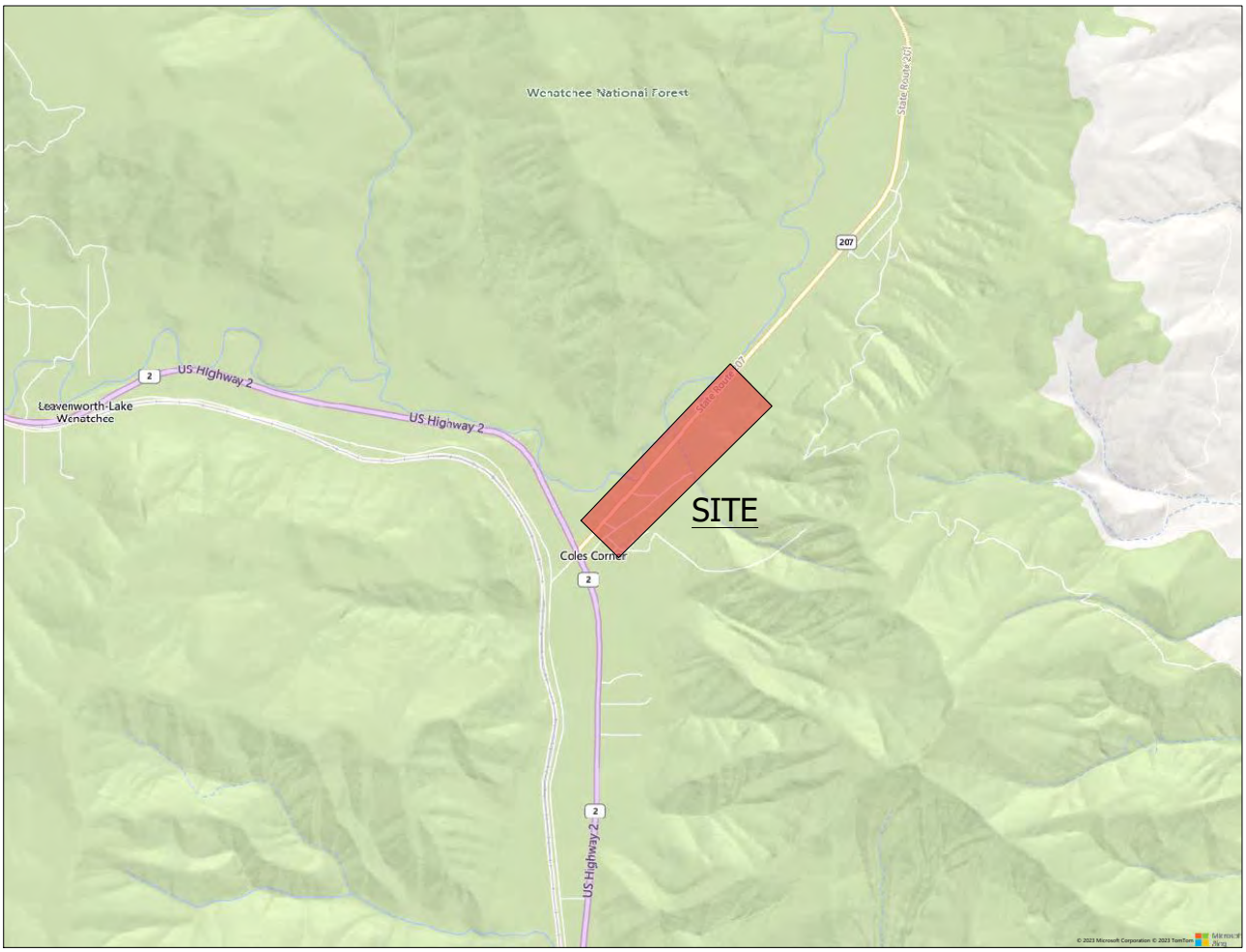
WSDOT, 2020*, Bridge Design Manual LRFD, 2020* Washington State Department of Transportation. M 23-50

WSDOT, 2025. *Standard Specifications for Road, Bridge, and Municipal Construction,* Washington State Department of Transportation.

SITE MAP

0 500' 1000' 1500' 2000'

SCALE: 1" = 1000'



VICINITY MAP

0 2000' 4000' 6000' 8000'

SCALE: 1" = 4000'

GeoSciences Inc.
DBE/MWBE

SITE AND VICINITY MAP

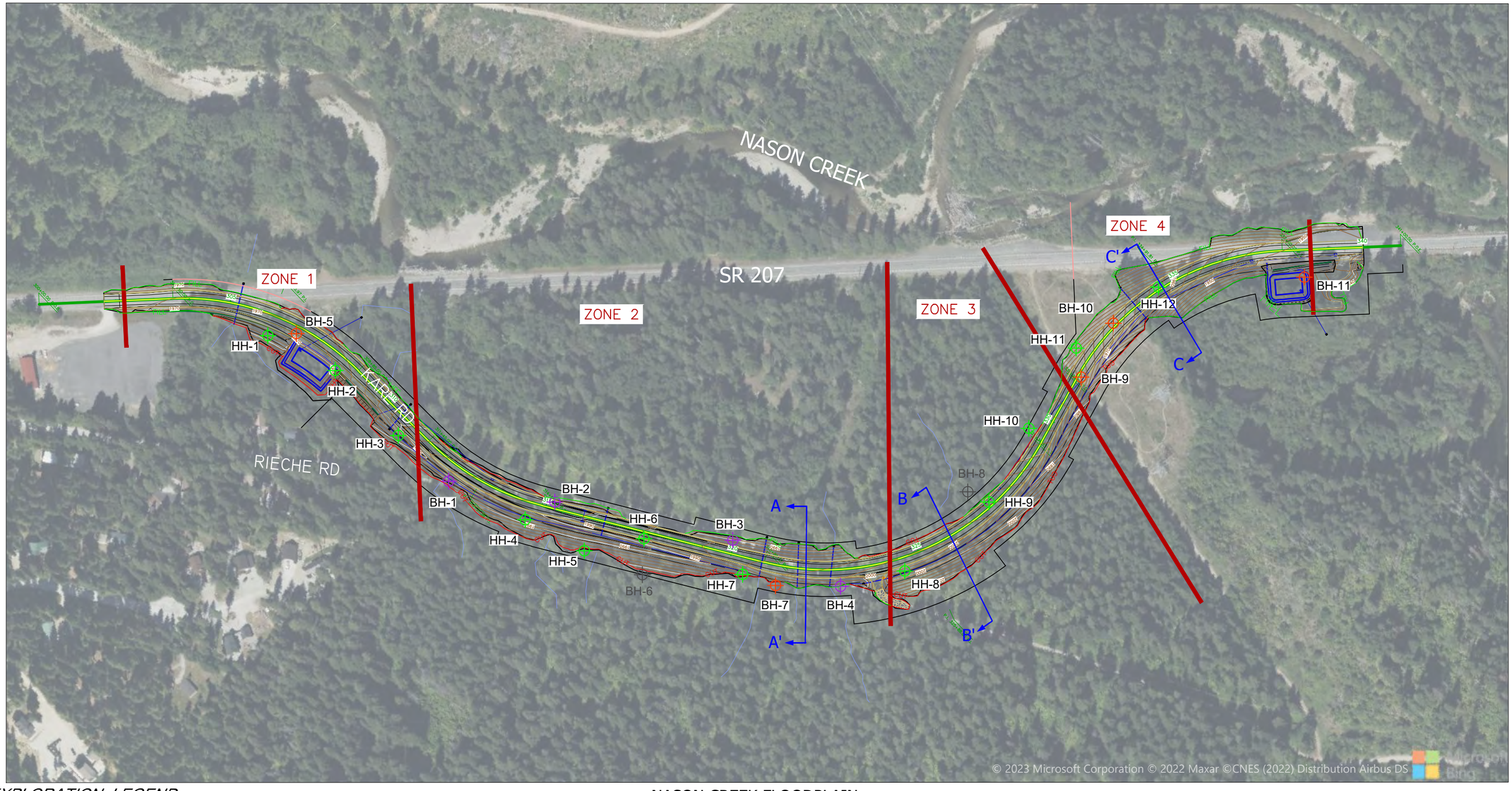
YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

FIGURE NO.: 1

DRAWN BY: CF
CHECK BY: MAB

PROJECT # 2022-144-21

C:\USERS\CFRY\DESKTOP\2022-144-21 SR 207 REALIGNMENT\2022-144-21 SR 207 REALIGNMENT.DWG <1> Plotted: 7/12/2023 7:41 AM



EXPLORATION LEGEND

- BH-4 — MACHINE DRILLED BORING DESIGNATION AND APPROXIMATE LOCATION (HWA, 2024)
- BH-6 — MACHINE DRILLED BORING DESIGNATION AND APPROXIMATE LOCATION (NOT DRILLED)
- HH-12 — HAND BORING DESIGNATION AND APPROXIMATE LOCATION (HWA, 2023)
- BH-4 — MACHINE DRILLED BORING DESIGNATION AND APPROXIMATE LOCATION (HWA, 2023)
- LIMITS OF RECONNAISSANCE ZONES
- A — A' GEOLOGIC CROSS SECTION

BASE MAP PROVIDED BY: BING AND PERTEET 4.23.2024

NASON CREEK FLOODPLAIN

Scale: 1" = 250'-0"

0 125 250 375 500

SCALE: 1" = 250'

AERIAL IMAGERY REFERENCE IS APPROXIMATE AND MAY APPEAR OFFSET FROM SURVEYED DATA AND BASEMAPS.

HWA GEOSCIENCES INC. DBE/MWBE

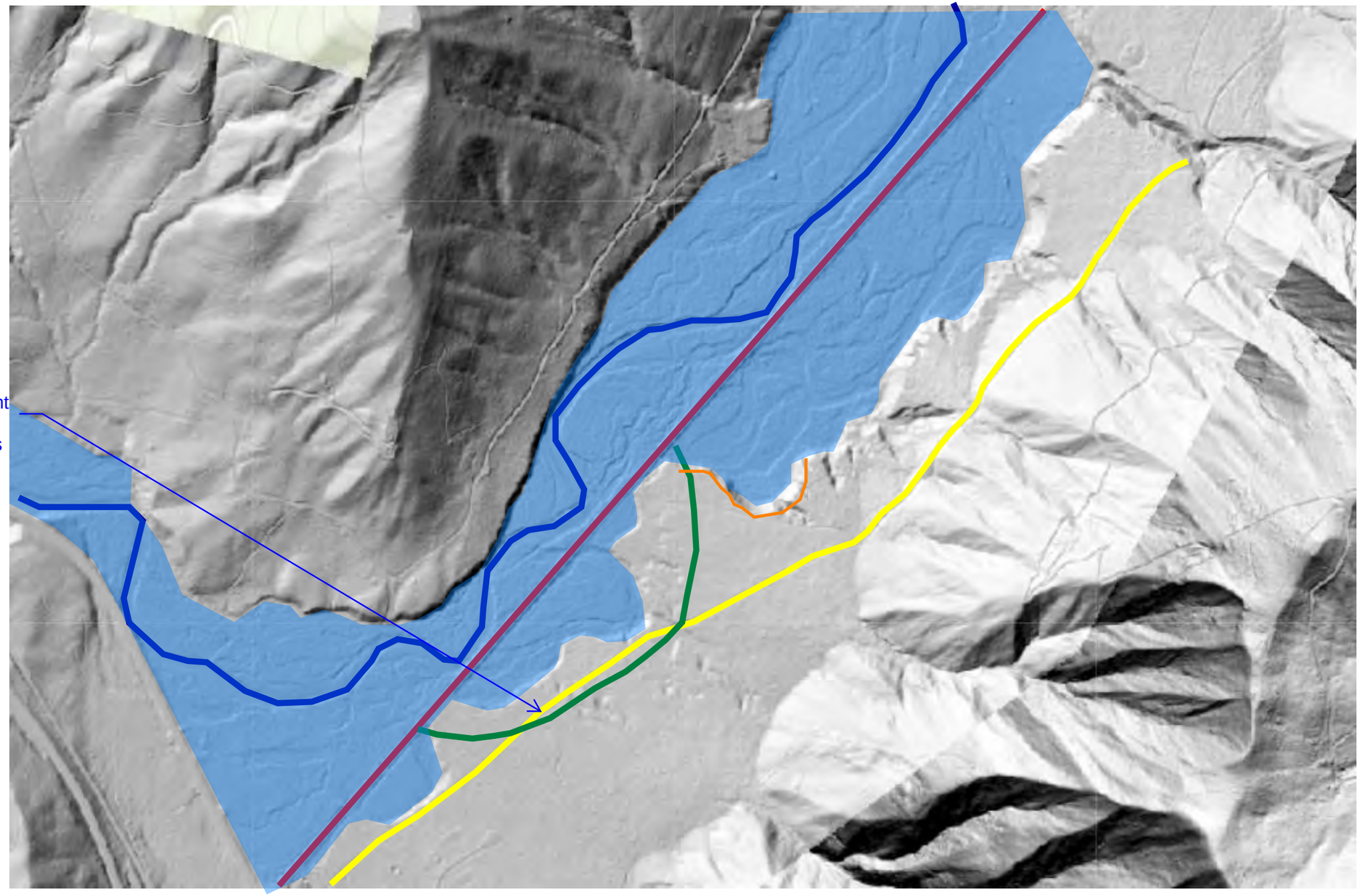
YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

SITE AND EXPLORATION PLAN

DRAWN BY:	FIGURE NO.:
CF	2
CHECK BY:	PROJECT NO.:
MAB/DJH	2022-144-21

C:\USERS\CFRY\DESKTOP\2022-144-21 SR 207 REALIGNMENT\2022-144-21 SR 207 REALIGNMENT.DWG <2> Plotted: 1/16/2025 2:37 PM

Can you draw this alignment in more accurately? We might be able to provide it as a KMZ file if that's helpful.



Legend

- Current SR 207 alignment
- Rieche Road/USFS Road 6603
- Approximate Proposed realignment
- Nason Creek main channel
- Nason Creek Floodplain
- Top of steep slope in Zone 4

N

Portions of the Chelan 2015 and Wenatchee Upper 2017 LiDAR sets, accessed from the Washington State DNR LiDAR Portal on 6/23/2023. Not to scale

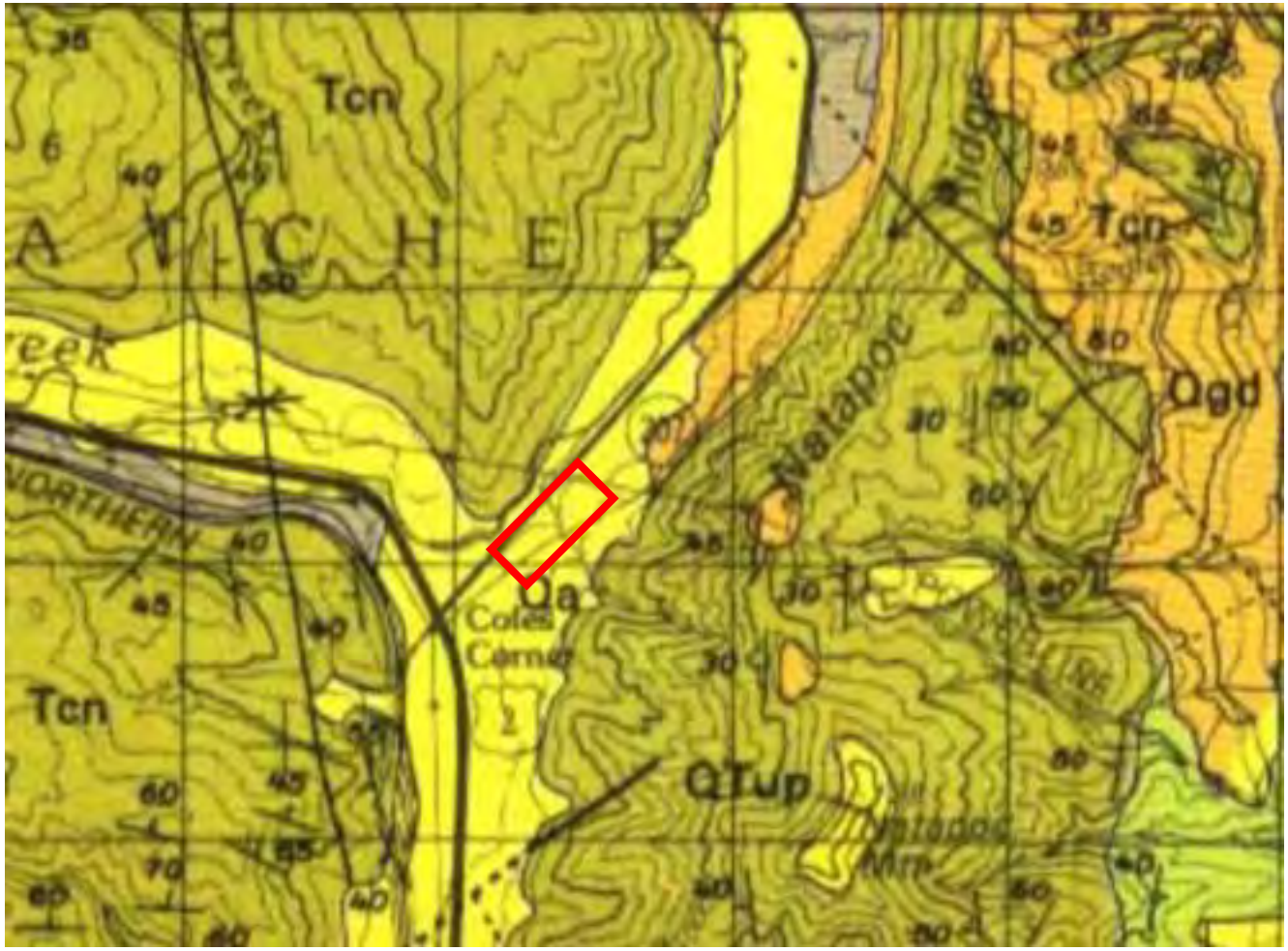
HWA GeoSciences Inc. DBE/MWBE

LIDAR

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

FIGURE NO. 3

PROJECT NO. 2022-144-21



N

Qa ALLUVIUM (HOLOCENE AND PLEISTOCENE)—Moderately sorted cobble gravel along rivers grading to poorly sorted gravelly sand on small-tributary fans; as mapped, includes some material in fans similar to unit Qt

Tcn Nahahum Canyon Member—Olive-brown carbonaceous, micaceous, finely laminated lacustrine shale interbedded with laminated sandstone turbidites and rocks similar to undivided part (Tc) of the Chumstick Formation

Approximate Project Area

Portion of the Geologic Map of the Chelan 30-Minute by 60-Minute Quadrangle, Washington (Tabor et al., 1987). Not to scale.

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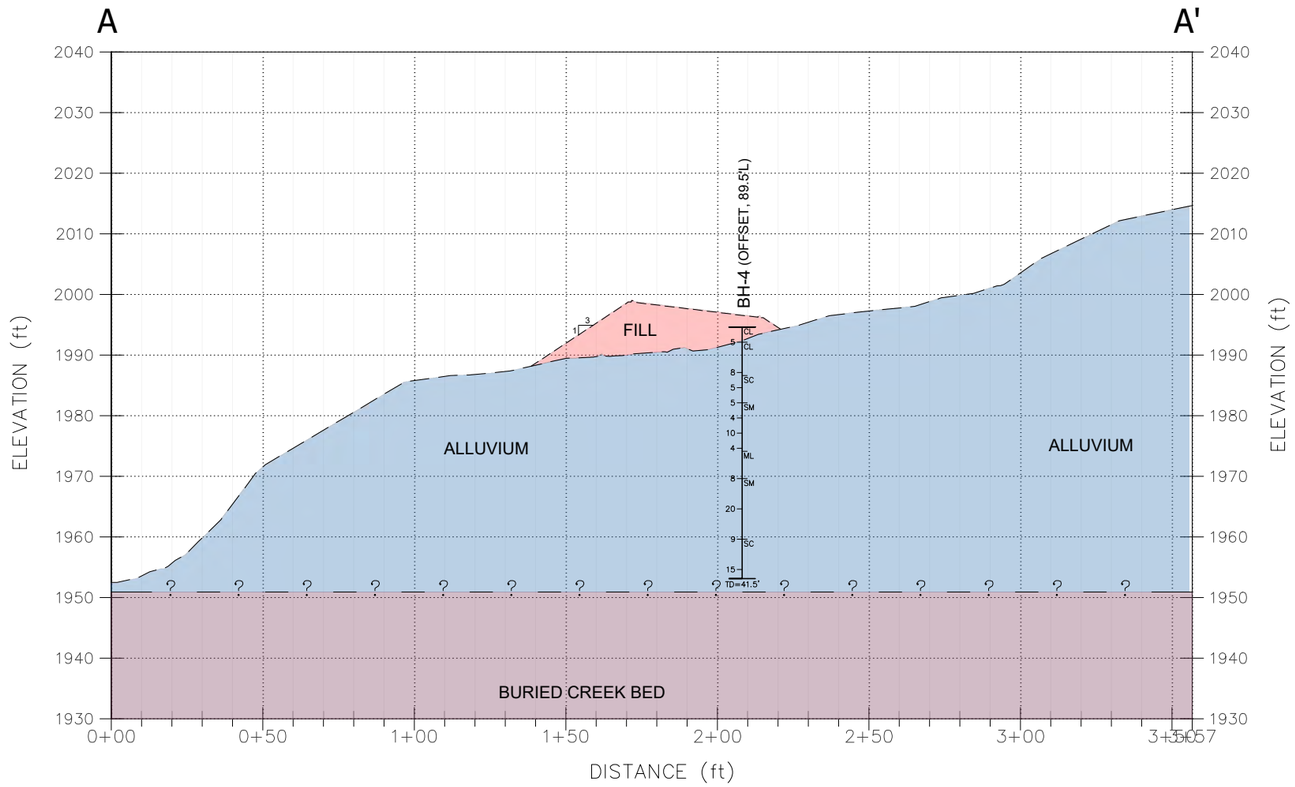
GEOLOGIC MAP

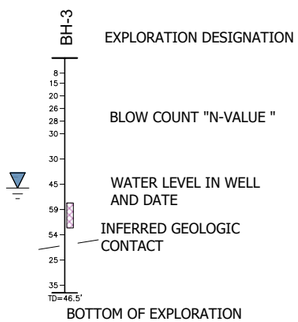
YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

FIGURE NO.
4

PROJECT NO.
2022-144



BORE LEGEND



SOILS LEGEND

- FILL
- ALLUVIUM
- BURIED CREEK BED

0 25 50 75 100

HORIZ. SCALE: 1" = 50'

0 12.5 25 37.5 50

VERT. SCALE: 1" = 25'

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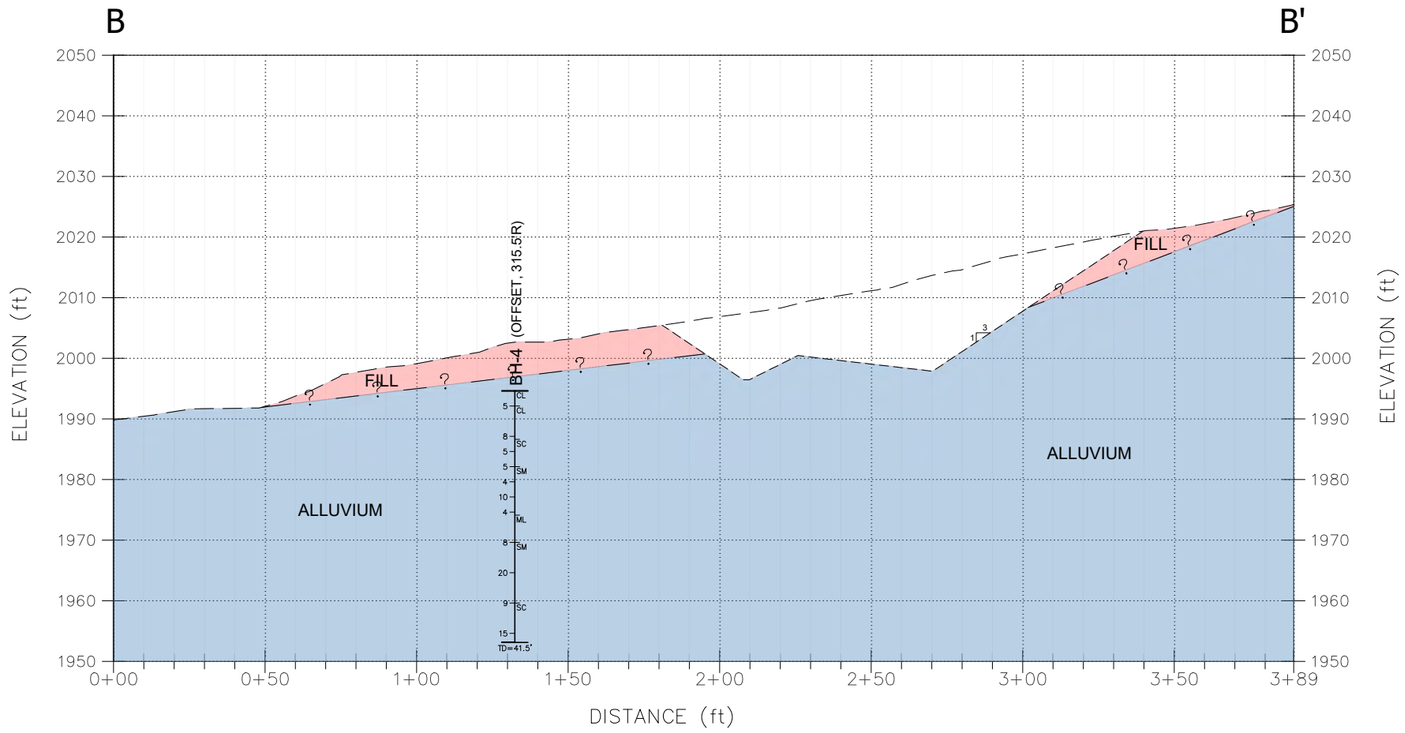
YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

CROSS SECTION A-A'
SECTION 322+00

DRAWN BY:	FIGURE NO.:
CF	5A
CHECK BY:	PROJECT NO.:
BOB	2022-144-21



BORE LEGEND

BH-3 — EXPLORATION DESIGNATION

8 15 20 26 28 30 — BLOW COUNT "N-VALUE "

30 45 59 — WATER LEVEL IN WELL AND DATE

54 — INFERRED GEOLOGIC CONTACT

25 35 TD=46.5' — BOTTOM OF EXPLORATION

SOILS LEGEND

- FILL
- ALLUVIUM

0 25 50 75 100

HORIZ. SCALE: 1" = 50'

0 12.5 25 37.5 50

VERT. SCALE: 1" = 25'

TWA GEOSCIENCES INC. DBE/MWBE

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

CROSS SECTION B-B'
SECTION 326+00

DRAWN BY:	FIGURE NO.:
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CHECK BY:	PROJECT NO.:
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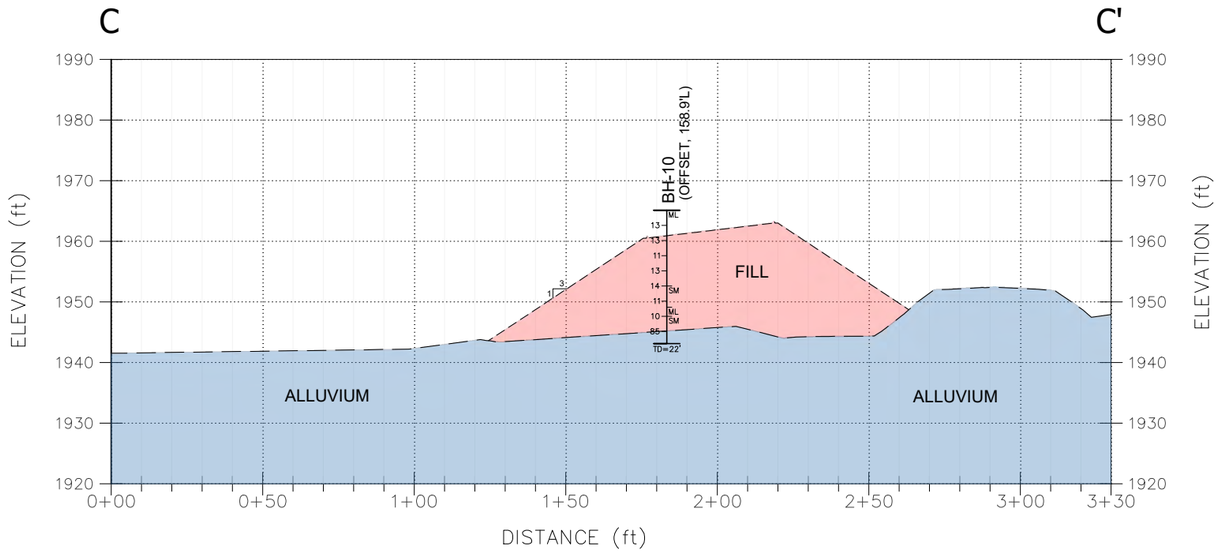

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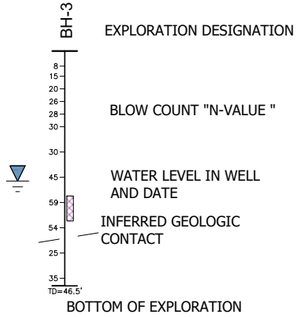

EXPLORATION DESIGNATION

BLOW COUNT "N-VALUE "

WATER LEVEL IN WELL AND DATE

INFERRED GEOLOGIC CONTACT

BOTTOM OF EXPLORATION

SOILS LEGEND

FILL

ALLUVIUM

0 25 50 75 100

HORIZ. SCALE: 1" = 50'

0 12.5 25 37.5 50

VERT. SCALE: 1" = 25'

TWA GEOSCIENCES INC. DBE/MWBE

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

CROSS SECTION C-C'
SECTION 334+70

DRAWN BY:	FIGURE NO.:
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CHECK BY:	PROJECT NO.:
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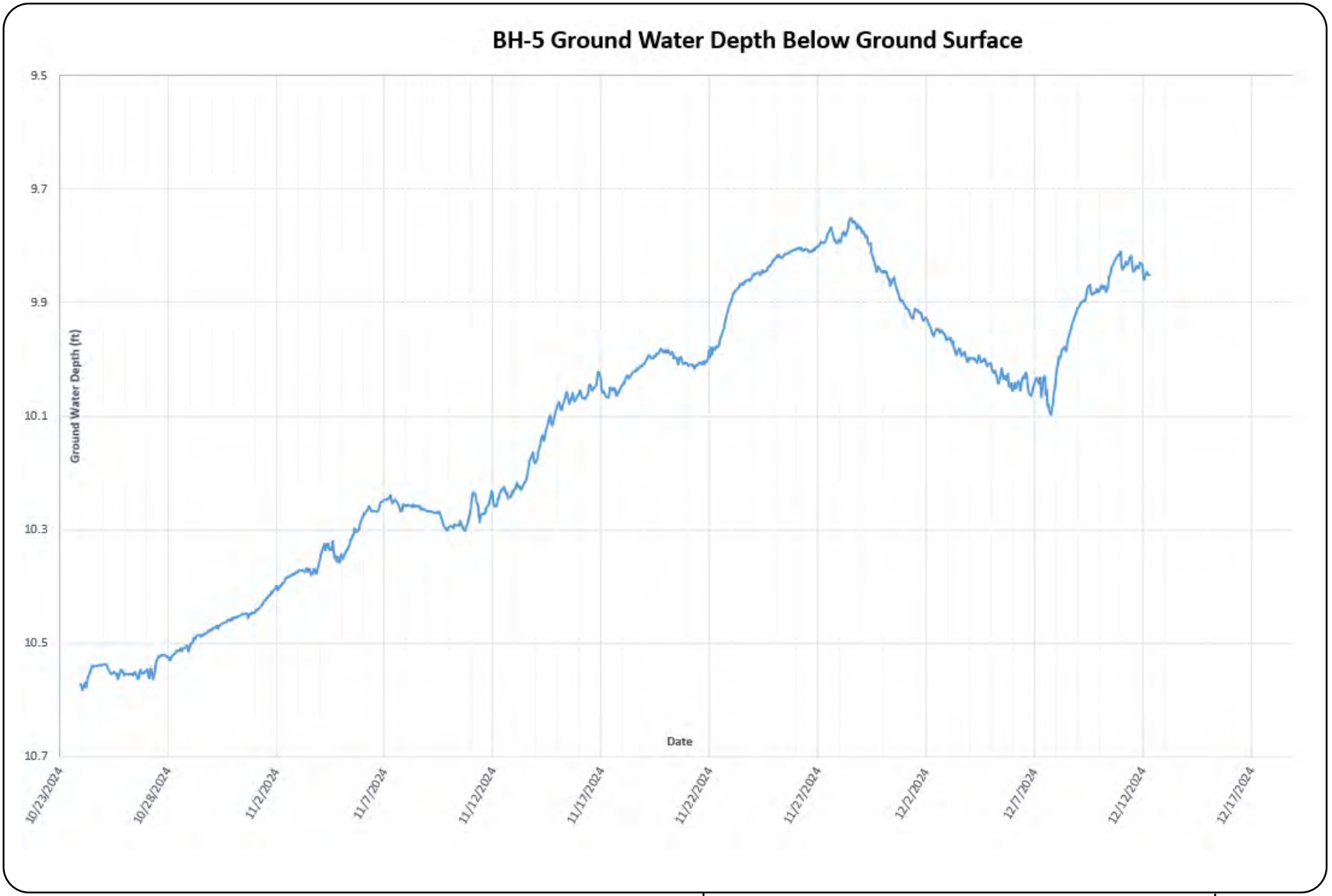


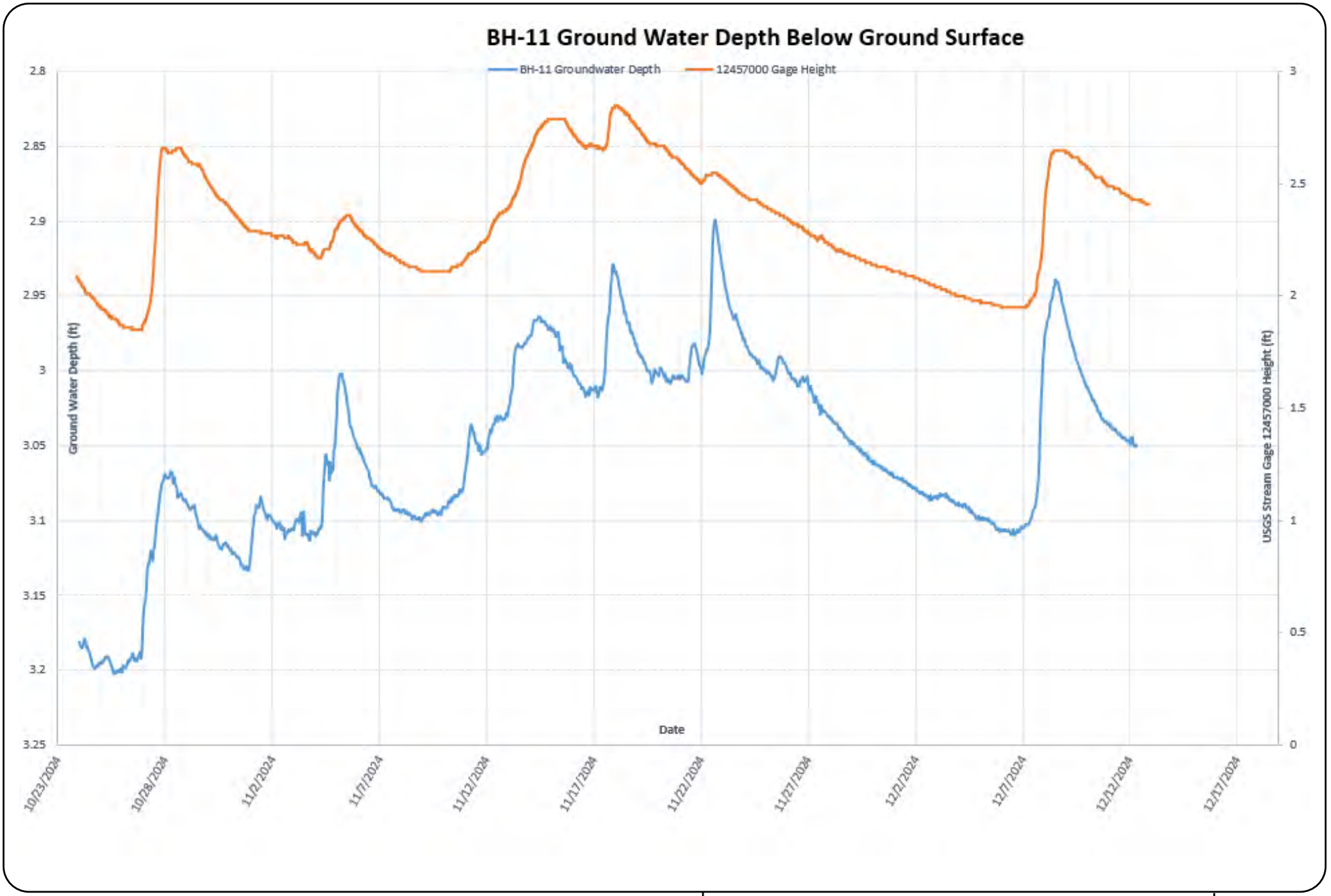
HWA GeoSciences Inc.
DBE/MWBE

BH-5 GROUNDWATER DATA PLOT

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

FIGURE NO.
6A

PROJECT NO.
2022-144



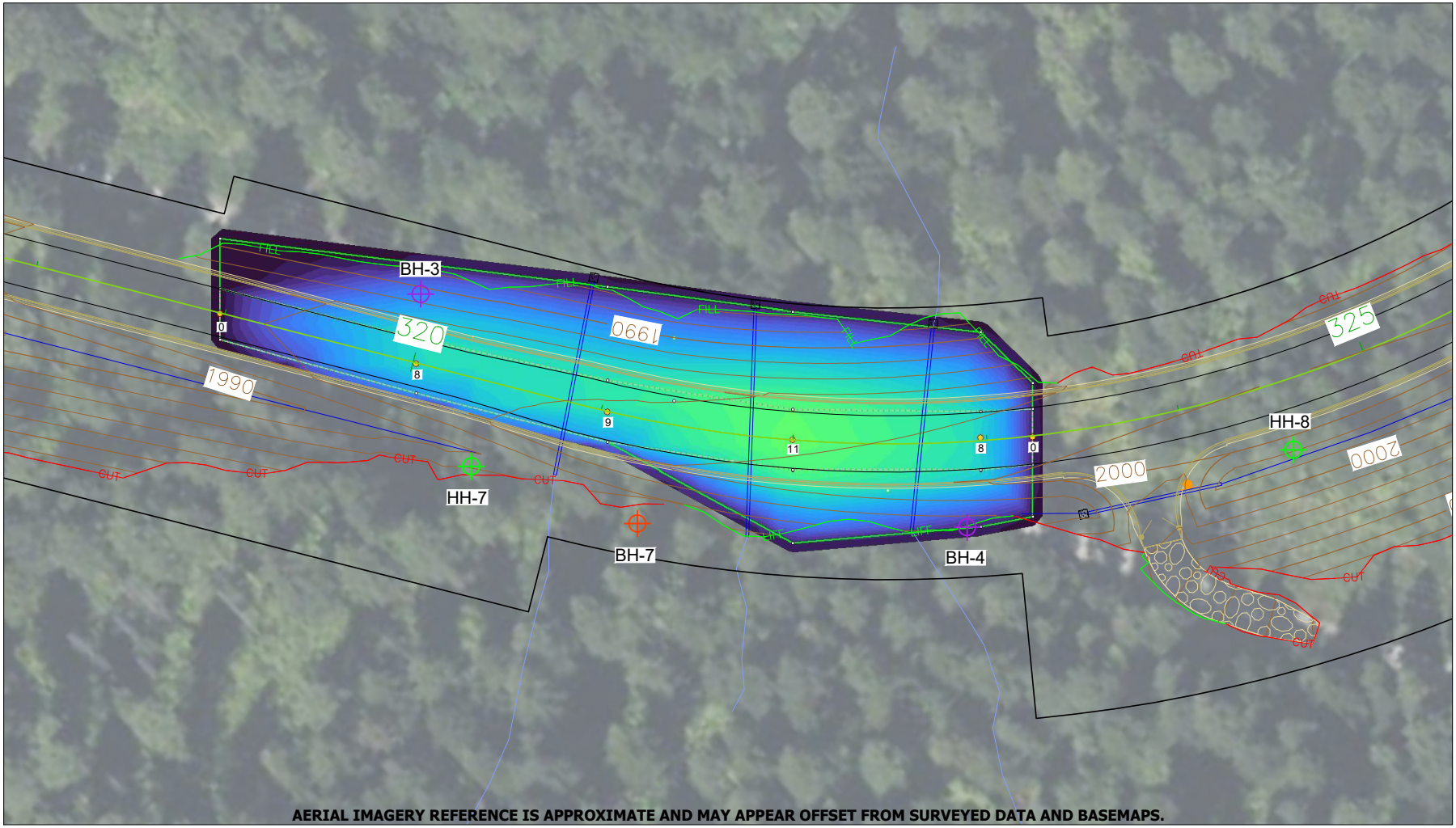
HWA GeoSciences Inc.
DBE/MWBE

BH-11 GROUNDWATER DATA PLOT

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

FIGURE NO.
6B

PROJECT NO.
2022-144



AERIAL IMAGERY REFERENCE IS APPROXIMATE AND MAY APPEAR OFFSET FROM SURVEYED DATA AND BASEMAPS.

NASON CREEK FLOODPLAIN

Scale: 1" = 80'-0"

LEGEND

- SETTLEMENT CALCULATION LOCATION
- 14 MAGNITUDE (INCHES)

N

0 40 80 120 160

SCALE: 1" = 80'

BASE MAP PROVIDED BY: BING AND PERTEET 4.23.2024

HWA GEOSCIENCES INC. DBE/MWBE

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

SETTLEMENT RESULTS
STA 319+00 - 323+20

DRAWN BY:	FIGURE NO.:
CF	7A
CHECK BY:	PROJECT NO.:
BOB/DJH	2022-144-21

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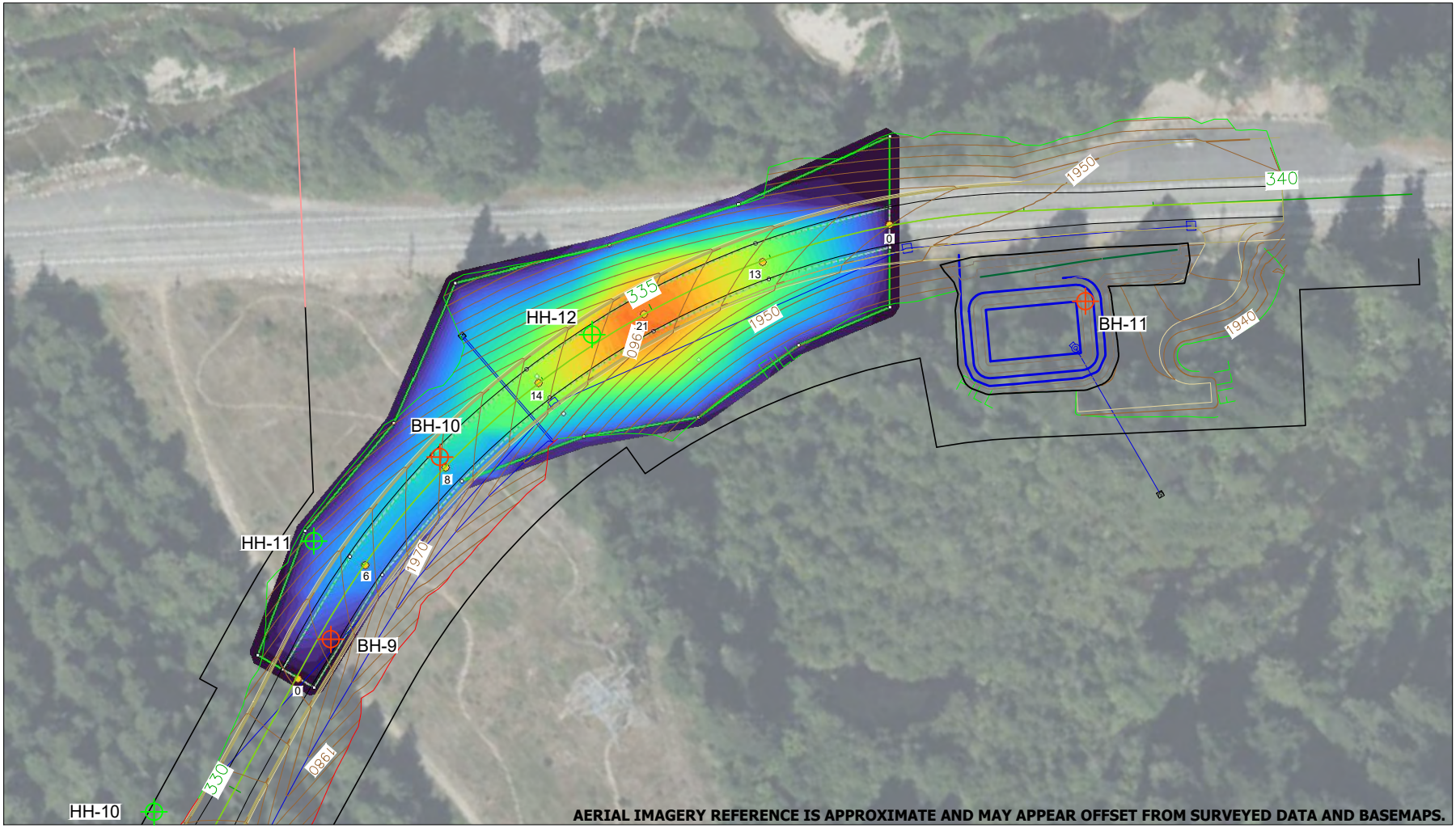

AERIAL IMAGERY REFERENCE IS APPROXIMATE AND MAY APPEAR OFFSET FROM SURVEYED DATA AND BASEMAPS.

NASON CREEK FLOODPLAIN

Scale: 1" = 120'-0"

LEGEND

- SETTLEMENT CALCULATION LOCATION
- 14 MAGNITUDE (INCHES)

0 60 120 180 240

SCALE: 1" = 120'

BASE MAP PROVIDED BY: BING AND PERTEET 4.23.2024

HWA GEOSCIENCES INC. DBE/MWBE

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

SETTLEMENT RESULTS
STA 331+00 - 337+00

DRAWN BY:	FIGURE NO.:
CF	7B
CHECK BY:	PROJECT NO.:
BOB/DJH	2022-144-21

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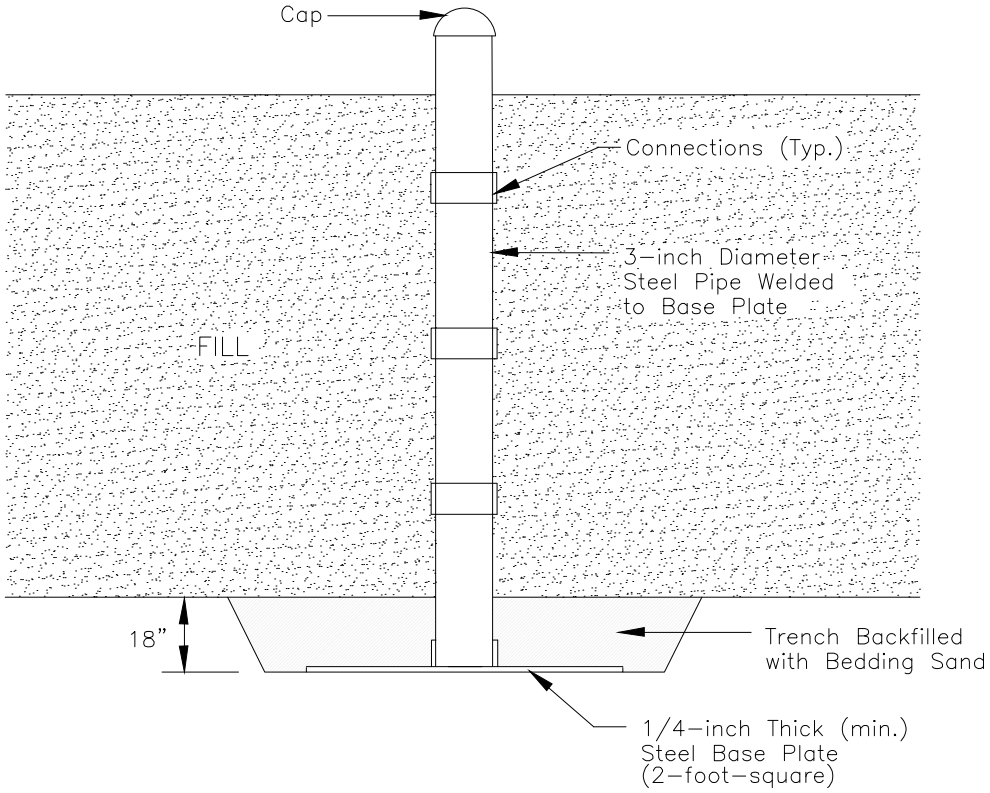


NOT TO SCALE

NOTES

1. LOCATIONS OF SETTLEMENT PLATES SHALL BE CLEARLY MARKED AND READILY VISIBLE (RED FLAGGED) TO EQUIPMENT OPERATORS.

2. IN THE EVENT OF DAMAGE TO SETTLEMENT PLATE OR EXTENSION. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE SOILS ENGINEER AND SHALL BE RESPONSIBLE FOR RESTORING THE SETTLEMENT PLATES TO WORKING ORDER,AS PER PROJECT SPECIFICATION 31 09 01.

3. INSTALL PLATES ON FIRM GROUND OR ON SAND PADS IF NEEDED FOR STABILITY. TAKE INITIAL READING ON TOP OF BASE PLATE. LEVEL PRIOR TO PLACEMENT OF FILL.

4. FOR EASE IN HANDLING, STEEL PIPE ARE USUALLY INSTALLED IN 5–FOOT OR 7–FOOT SECTIONS. AS FILL PROGRESSES, COUPLINGS ARE USED TO INSTALL ADDITIONAL LENGTHS.

5. RECORD THE BASE PLATE ELEVATION AT THE RECOMMENDED TIME INTERVALS. EACH TIME, NOTE THE ELEVATION OF THE ADJACENT FILL SURFACE. BASE PLATE ELEVATIONS SHALL BE RECORDED BY LOWERING A SURVEY ROD OF STEEL SURVEY TAPE DOWN THE CENTER OF THE PIPE RAISERS. THE CONTRACTOR SHALL ENSURE THAT THE SETTLEMENT PLATE CAP IS REPLACED AFTER MEASUREMENTS ARE TAKEN.

6. READ THE MEASUREMENT ROD OR STEEL TAPE TO THE NEAREST 0.01 FOOT. NOTE THE ADJACENT FILL ELEVATION TO THE NEAREST 0.1 FOOT.

7. THE ELEVATIONS SHOULD BE REFERENCED TO A TEMPORARY BENCHMARK LOCATED ON STABLE GROUND AT LEAST 200 FEET FROM THE EMBANKMENT.

APPENDIX A

FIELD EXPLORATIONS

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N-VALUE

COHESIONLESS SOILS			COHESIVE SOILS		
Density	N (blows/ft)	Approximate Relative Density(%)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	0 - 15	Very Soft	0 to 2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	35 - 65	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	over 30	>4000

ASTM SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP DESCRIPTIONS	
Coarse Grained Soils	Gravel and Gravelly Soils	Clean Gravel (little or no fines)	GW	Well-graded GRAVEL
			GP	Poorly-graded GRAVEL
	More than 50% of Coarse Fraction Retained on No. 4 Sieve	Gravel with Fines (appreciable amount of fines)	GM	Silty GRAVEL
			GC	Clayey GRAVEL
	Sand and Sandy Soils	Clean Sand (little or no fines)	SW	Well-graded SAND
			SP	Poorly-graded SAND
More than 50% Retained on No. 200 Sieve Size	50% or More of Coarse Fraction Passing No. 4 Sieve	Sand with Fines (appreciable amount of fines)	SM	Silty SAND
			SC	Clayey SAND
Fine Grained Soils	Silt and Clay	Liquid Limit Less than 50%	ML	SILT
			CL	Lean CLAY
			OL	Organic SILT/Organic CLAY
50% or More Passing No. 200 Sieve Size	Silt and Clay	Liquid Limit 50% or More	MH	Elastic SILT
			CH	Fat CLAY
			OH	Organic SILT/Organic CLAY
Highly Organic Soils			PT	PEAT

TEST SYMBOLS

%F	Percent Fines
AL	Atterberg Limits: PL = Plastic Limit, LL = Liquid Limit
CBR	California Bearing Ratio
CN	Consolidation
DD	Dry Density (pcf)
DS	Direct Shear
GS	Grain Size Distribution
K	Permeability
MD	Moisture/Density Relationship (Proctor)
MR	Resilient Modulus
OC	Organic Content
pH	pH of Soils
PID	Photoionization Device Reading
PP	Pocket Penetrometer (Approx. Comp. Strength, tsf)
Res.	Resistivity
SG	Specific Gravity
CD	Consolidated Drained Triaxial
CU	Consolidated Undrained Triaxial
UU	Unconsolidated Undrained Triaxial
TV	Torvane (Approx. Shear Strength, tsf)
UC	Unconfined Compression

SAMPLE TYPE SYMBOLS

- 2.0" OD Split Spoon (SPT) (140 lb. hammer with 30 in. drop)
- Shelby Tube
- Non-standard Penetration Test (3.0" OD Split Spoon with Brass Rings)
- Small Bag Sample
- Large Bag (Bulk) Sample
- Core Run
- 3-1/4" OD Split Spoon

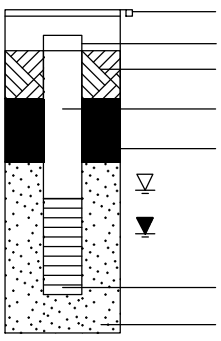
COMPONENT PROPORTIONS

DESCRIPTIVE TERMS	RANGE OF PROPORTION
Clean	< 5%
Slightly (Clayey, Silty, Sandy)	5 - 12%
Clayey, Silty, Sandy, Gravelly	12 - 30%
Very (Clayey, Silty, Sandy, Gravelly)	30 - 50%

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5 mm) to No. 200 (0.074 mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074mm)

GROUNDWATER WELL COMPLETIONS



NOTES: Soil classifications presented on exploration logs are based on visual and laboratory observation in general accordance with ASTM D 2487 and ASTM D 2488. Soil descriptions are presented in the following general order:

Density/consistency, color, modifier (if any) GROUP NAME, additions to group name (if any), moisture content. Proportion, gradation, and angularity of constituents, additional comments. (GEOLOGIC INTERPRETATION)

Please refer to the discussion in the report text as well as the exploration logs for a more complete description of subsurface conditions.

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
MOIST	Damp but no visible water.
WET	Visible free water, usually soil is below water table.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

LEGEND OF TERMS AND SYMBOLS USED ON EXPLORATION LOGS

PROJECT NO.: 2022-144-21 FIGURE: A-1

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT, Cal Mod w/Autohammer
LOCATION: See Figure 2; Lat: 47.759783, Long: -120.732454, Datum: NAD83

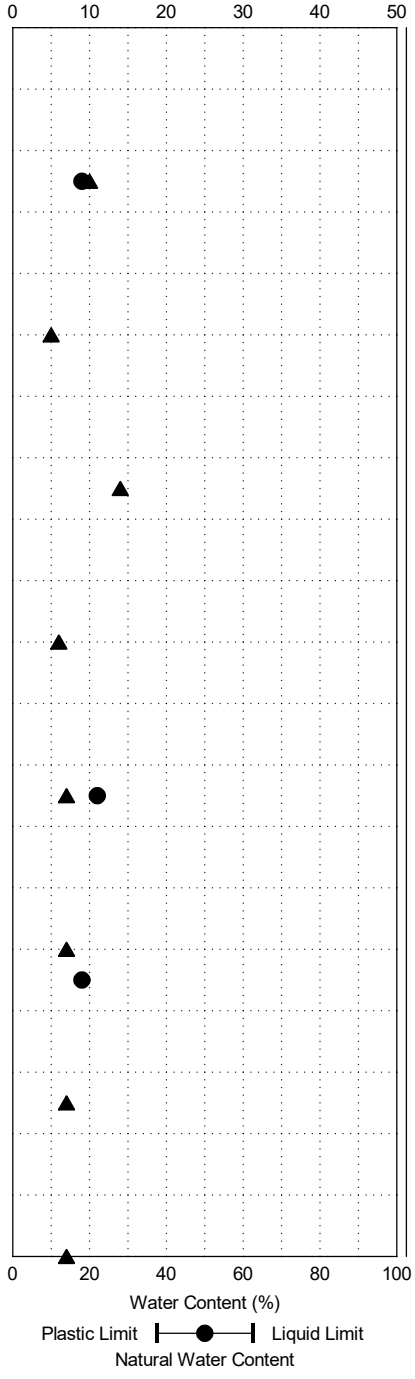
DATE STARTED: 5/19/2023
DATE COMPLETED: 5/19/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS
0		CL	Brown, sandy lean CLAY, moist, micaceous. **(FILL)**				
		CL	Stiff, brown, sandy lean CLAY. moist. Micaceous, 1-2" bedding. **(ALLUVIUM)**		S-1	4-4-6	
5			Medium stiff, brown, sandy lean CLAY, moist. Micaceous, trace gravel and charcoal, 1-2" bedding.		S-2	3-2-3	
			Becomes stiff.		S-3a S-3b S-3c	6-6-8	
10			Medium stiff, brown, sandy lean CLAY, moist. Few sand interbeds, scattered woody debris, charcoal. Wood looks fresh.		S-4	2-3-3	
			Similar to previous, no charcoal.		S-5	2-2-5	
15					S-6a S-6b	2-4-3	
		SM	Loose, brown, silty SAND, moist. Micaceous, 1/4-2" bedding.				
		CL	Medium stiff, brown, sandy lean CLAY, moist. Micaceous, scattered wood, charcoal.		S-7	2-3-4	
20							

GROUNDWATER

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot

ELEVATION (feet)



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-01

PROJECT NO.: 2022-144-21 FIGURE: A-2

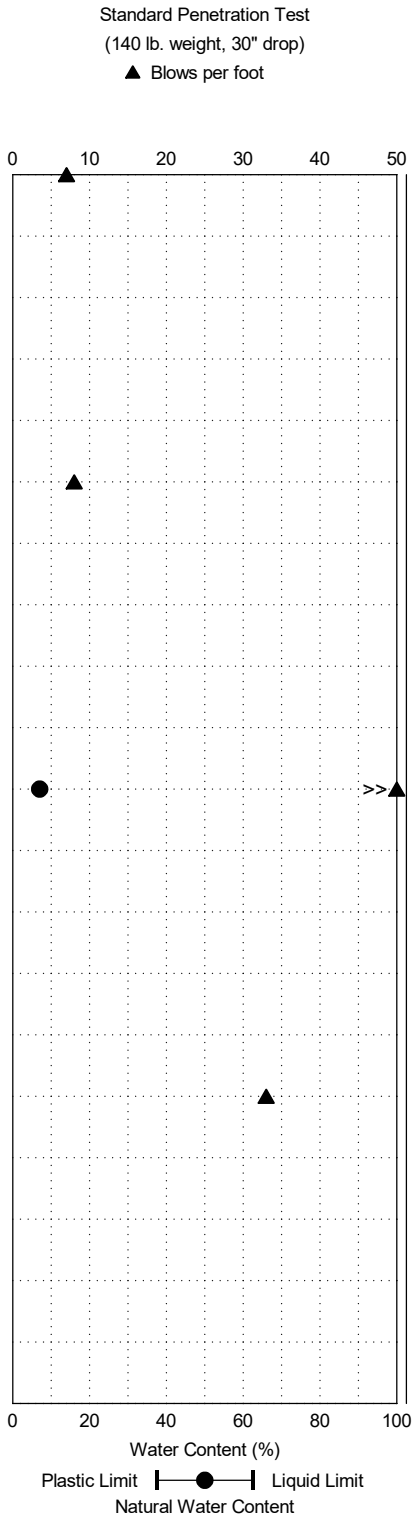
DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT, Cal Mod w/Autohammer
LOCATION: See Figure 2; Lat: 47.759783, Long: -120.732454, Datum: NAD83

DATE STARTED: 5/19/2023
DATE COMPLETED: 5/19/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS
20		SC	Loose, brown, clayey SAND, moist. Micaceous, few clay lenses.		S-8	2-3-4	
25			Clay fraction decreasing, grades to yellowish-brown.		S-9	3-4-4	
			Gravelly drill action.				
30		SP SM	Very dense, olive brown, slightly silty, very gravelly SAND, wet. Gravel broken by drill action, sampling. **(BURIED CREEK BED)**		S-10	24-37-25	GS
35		GM	Dense, dark olive brown, silty, sandy GRAVEL, wet. Gravel broken by drill action and sampling.		S-11	16-10-23	
40							

BH-1 terminated at about 36.5 feet below ground surface (bgs).
Groundwater encountered at about 30 feet bgs during the exploration.
Boring abandoned with 3/8" bentonite chips.

GROUNDWATER



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GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

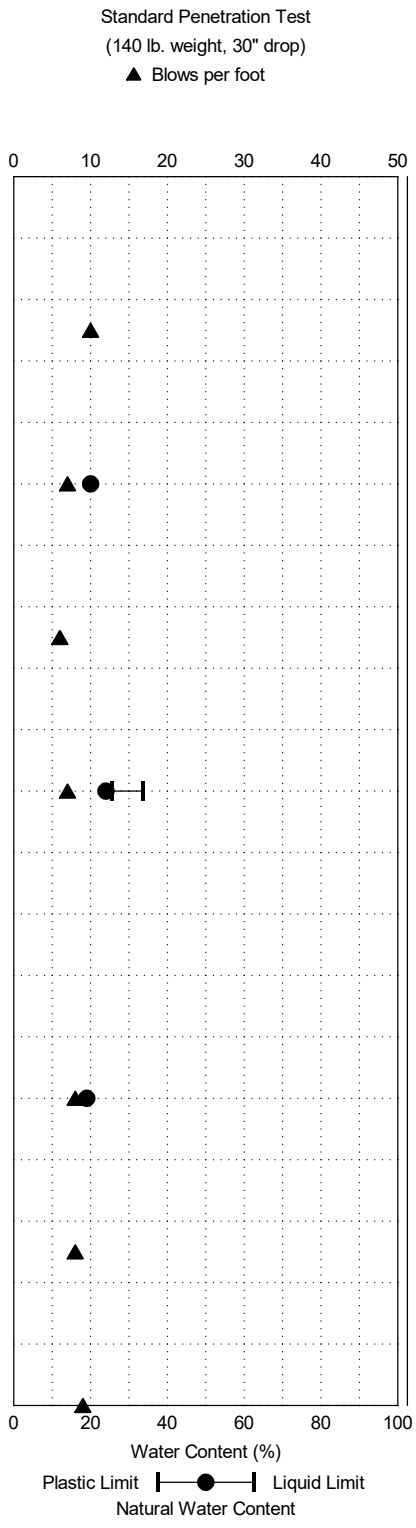
BORING:
BH-01

PROJECT NO.: 2022-144-21 FIGURE: A-2

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer, Shelby Tube
LOCATION: See Figure 2; Lat: 47.760223, Long: -120.731495, Datum: NAD83

DATE STARTED: 5/19/2023
DATE COMPLETED: 5/19/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS
0		CL	Brown, sandy lean CLAY, moist, micaceous. **(FILL)**				
		SC	Medium dense, brown, clayey SAND, moist. Micaceous, scattered charcoal. 1-2" bedding. **(ALLUVIUM)**		S-1	4-5-5	
5		CL	Loose, brown, sandy lean CLAY, moist. Clay fraction increasing with depth.		S-2	2-2-5	
			Same as previous, 2 inch sand lens at 7.5 feet.		S-3	2-2-4	
10		ML	Medium stiff, brown, sandy SILT, moist. Micaceous, few fine sand interbeds.		S-4	2-3-4	AL %F
		SC	Loose, olive brown, clayey SAND, moist.		S-5		DS
15		CL	Loose, brown, sandy lean CLAY, moist. Micaceous, 1-3" bedding.		S-6	2-3-5	
			Clay fraction decreases.		S-7	2-3-5	
20							



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

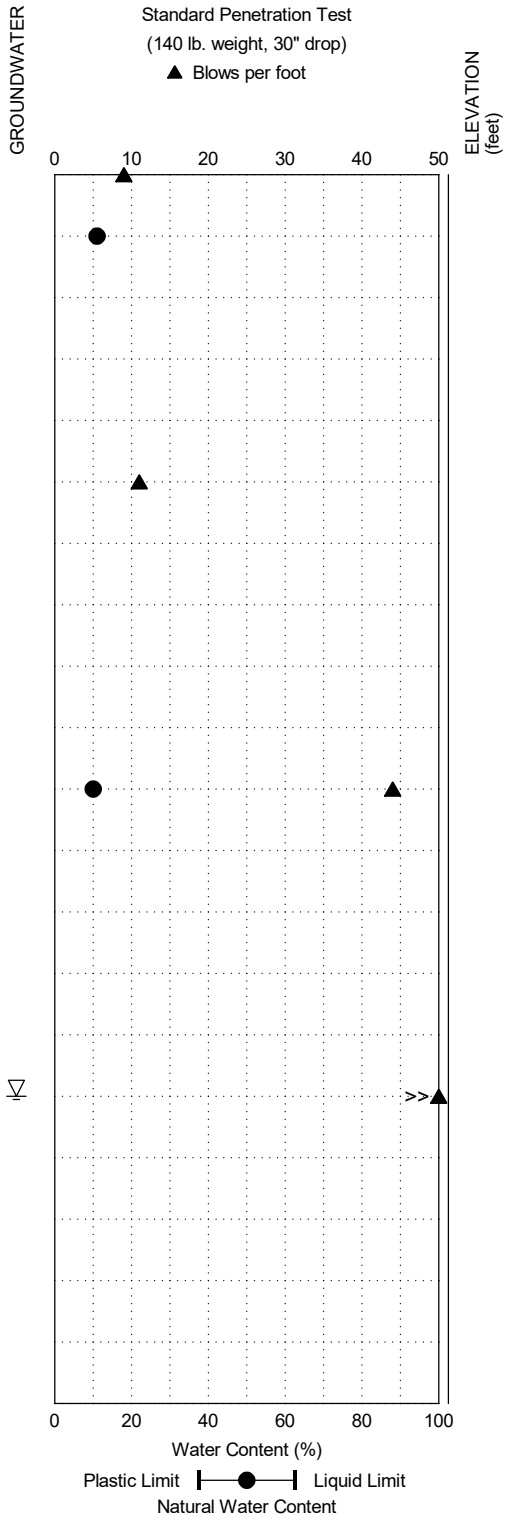
BORING:
BH-02

PROJECT NO.: 2022-144-21 FIGURE: A-3

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer, Shelby Tube
LOCATION: See Figure 2; Lat: 47.760223, Long: -120.731495, Datum: NAD83

DATE STARTED: 5/19/2023
DATE COMPLETED: 5/19/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS
20			Similar to previous.		S-8a	3-4-5	
		SM	Medium dense, yellowish-brown, silty SAND, moist. Scattered gravel, sample noticable less moist than previous samples.		S-8b		
25			Medium dense, yellowish-brown, gravelly, silty SAND, moist. Micaceous.		S-9	3-4-7	
30		SM	Dense, dark grayish-brown, silty SAND, moist. Micaceous, slightly gravelly. **(BURIED CREEK BED)**		S-10	5-11-33	
35		GM	Very dense, dark grayish-brown, silty, sandy GRAVEL, wet.		S-11	24-50/6"	
40			BH-2 terminated at about 36 feet below ground surface (bgs). Groundwater encountered at about 35 feet bgs during the exploration. Boring abandoned with 3/8" bentonite chips.				



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

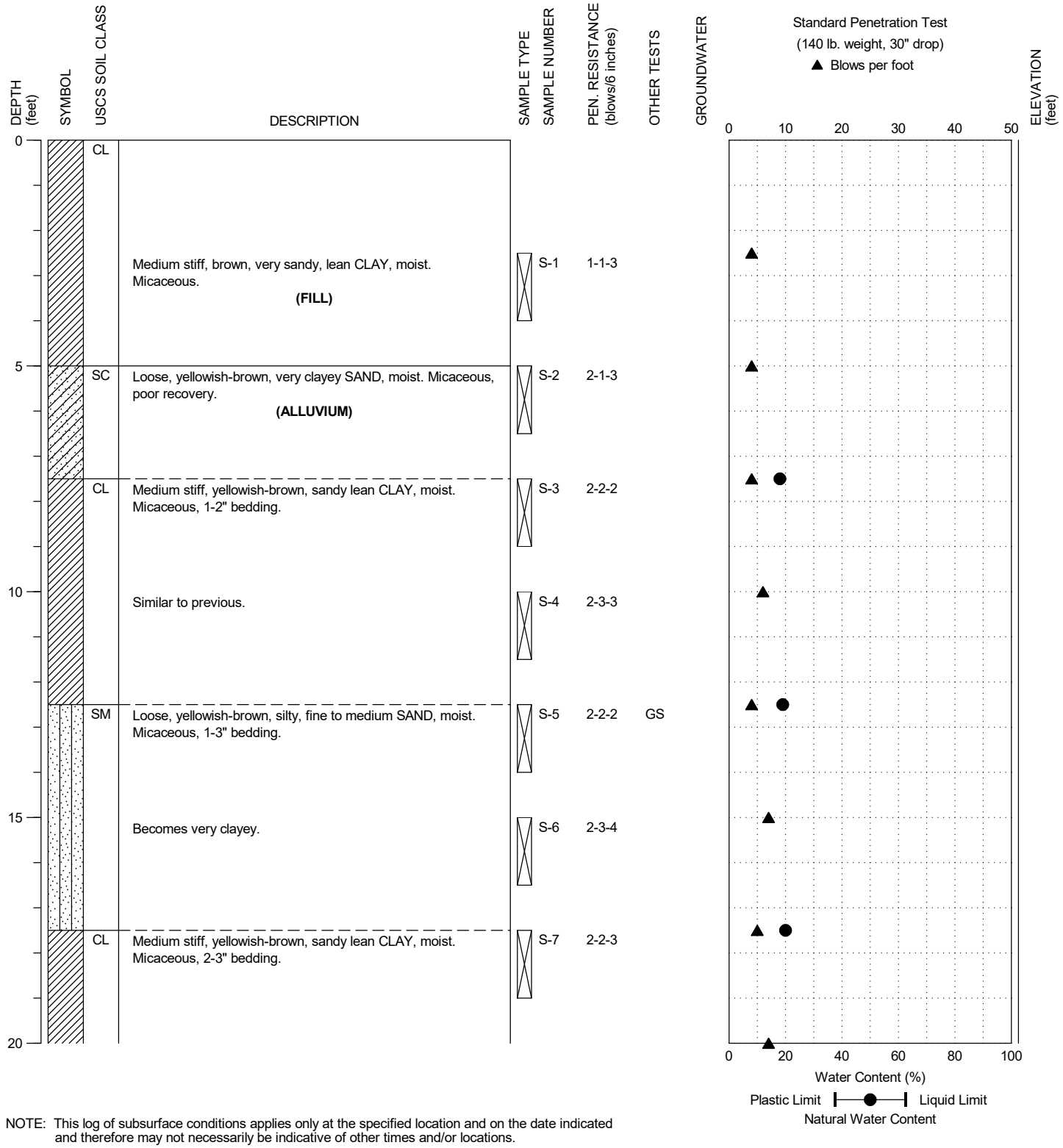
BORING:
BH-02

PROJECT NO.: 2022-144-21 FIGURE: A-3

BORING-DSM 2022-144.GPJ 12/13/24
Library: Q:\LIBRARY\LIBRARY - 2019 LAB.GLB

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer
LOCATION: See Figure 2; Lat: 47.760905, Long: -120.729809, Datum: NAD83

DATE STARTED: 6/26/2023
DATE COMPLETED: 6/26/2023
LOGGED BY: M.A. Benson



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GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

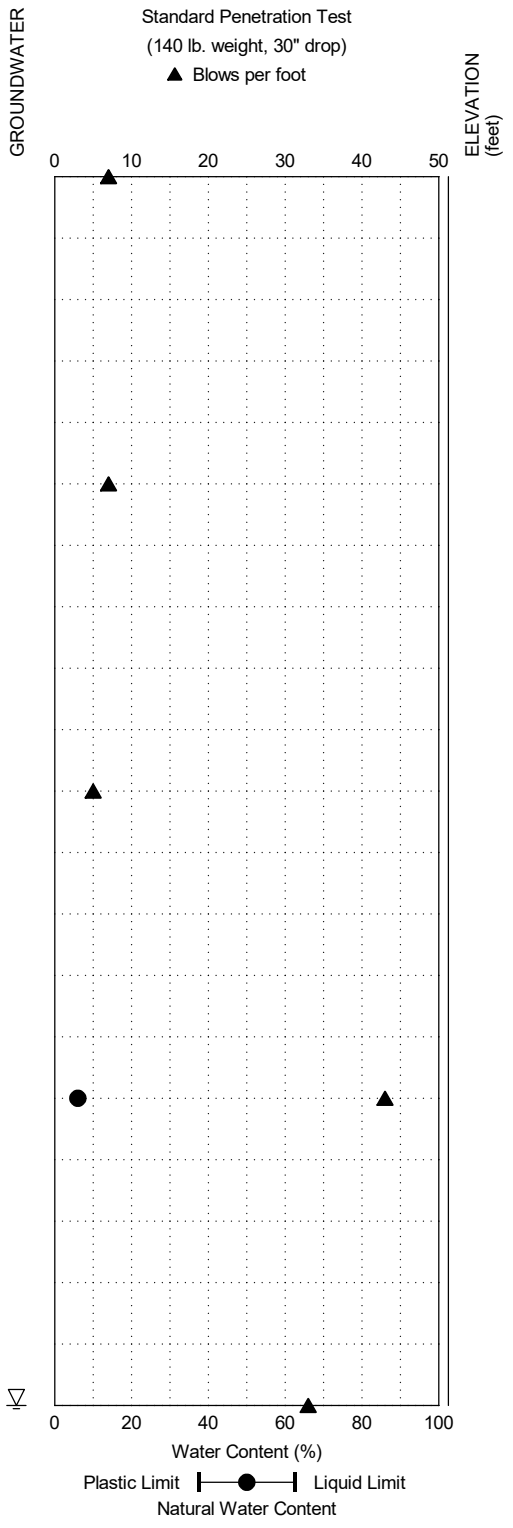
BORING:
BH-03

PROJECT NO.: 2022-144-21 FIGURE: A-4

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer
LOCATION: See Figure 2; Lat: 47.760905, Long: -120.729809, Datum: NAD83

DATE STARTED: 6/26/2023
DATE COMPLETED: 6/26/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS
20			Same as previous.		S-8	1-2-5	
25			Medium stiff, yellowish-brown, sandy lean CLAY, moist. Micaceous, 1/2-3" bedding.		S-9	2-3-4	
30			Similar to previous.		S-10	2-2-3	
35		SM	Dense, dark grayish-brown, silty, very gravelly, fine to course SAND, moist. Micaceous, sand angular to subrounded, gravel broken by drill action and sampling. **(BURIED CREEK BED)**		S-11	13-19-24	
40							



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-03

PROJECT NO.: 2022-144-21 FIGURE: A-4

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer
LOCATION: See Figure 2; Lat: 47.760905, Long: -120.729809, Datum: NAD83

DATE STARTED: 6/26/2023
DATE COMPLETED: 6/26/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
40			Dense, dark grayish-brown, silty, fine to coarse SAND, wet. Scattered gravel.		S-12	27-15-18		

BH-3 terminated at about 41.5 feet below ground surface (bgs).
Groundwater encountered at about 40 feet bgs during the exploration.
Boring abandoned with 3/8" bentonite chips.

45
50
55
60

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot

ELEVATION (feet)

0 10 20 30 40 50

0 20 40 60 80 100
Water Content (%)
Plastic Limit — Liquid Limit
Natural Water Content

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

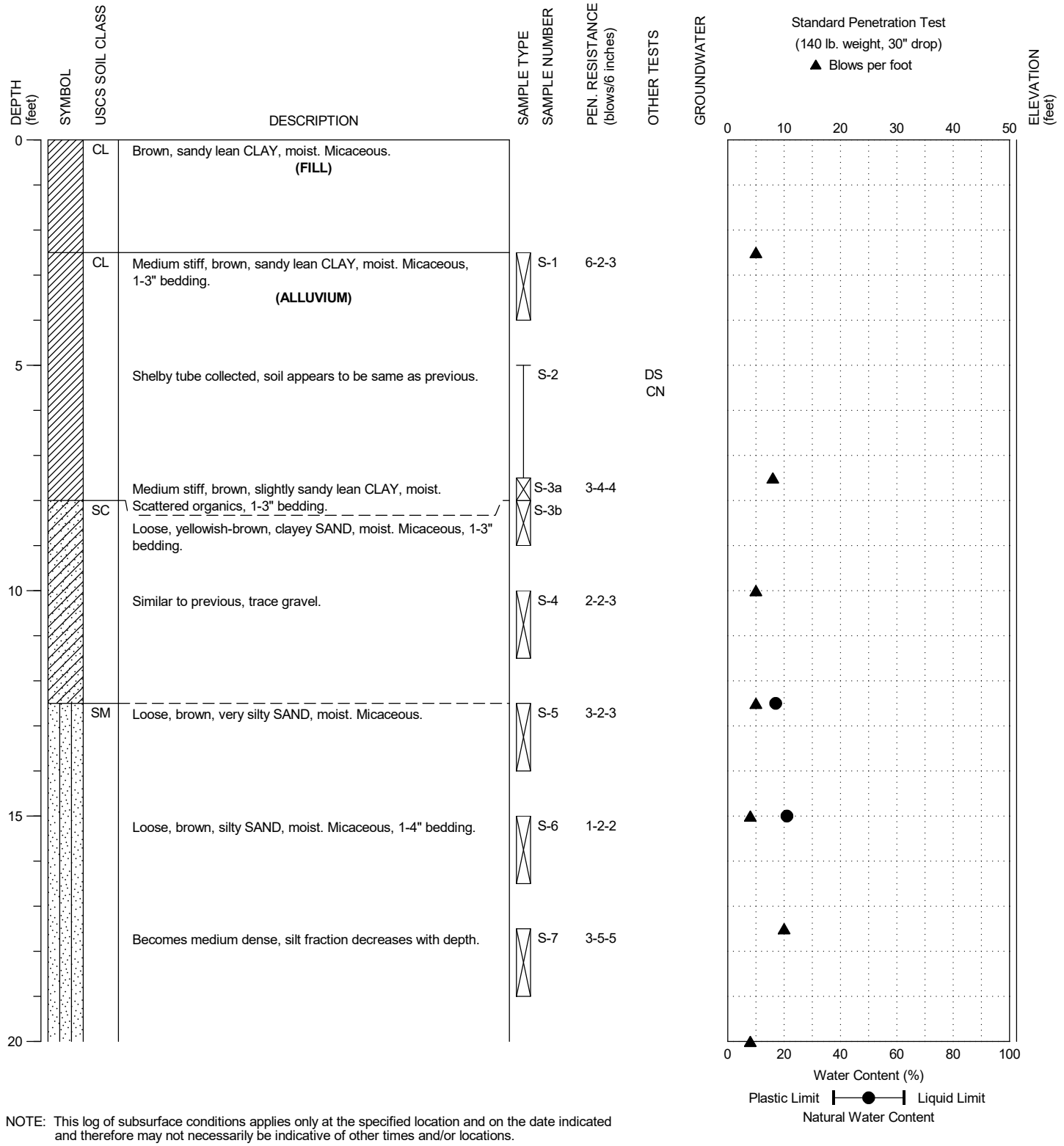
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-03

PROJECT NO.: 2022-144-21 FIGURE: A-4

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer, Shelby Tube
LOCATION: See Figure 2; Lat: 47.761291, Long: -120.728771, Datum: NAD83

DATE STARTED: 6/26/2023
DATE COMPLETED: 6/26/2023
LOGGED BY: M.A. Benson



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GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-04

PROJECT NO.: 2022-144-21 FIGURE: A-5

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer, Shelby Tube
LOCATION: See Figure 2; Lat: 47.761291, Long: -120.728771, Datum: NAD83

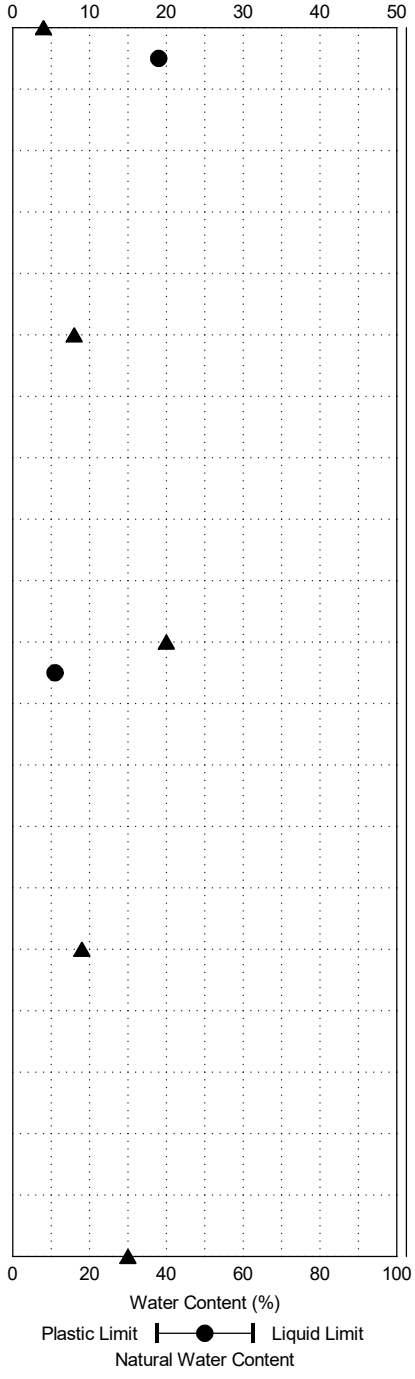
DATE STARTED: 6/26/2023
DATE COMPLETED: 6/26/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS
20			Becomes loose.		S-8a	1-2-2	
		ML	Medium stiff, brown, sandy SILT, moist to wet. Micaceous, scattered charcoal.		S-8b		
25		SM	Loose, brown, silty SAND, moist. Micaceous, 1/2-3" bedding.		S-9	4-3-5	
30			Becomes medium dense, slightly rust mottled. Gravel content increases, 1/4-2" bedding. Few very dark brown, very fine sand beds.		S-10a S-10b	6-9-11	
35		SC	Loose, brown, clayey SAND. moist. Micaceous, scattered charcoal.		S-11	3-4-5	
40							

GROUNDWATER

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot

ELEVATION (feet)



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GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-04

PROJECT NO.: 2022-144-21 FIGURE: A-5

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer, Shelby Tube
LOCATION: See Figure 2; Lat: 47.761291, Long: -120.728771, Datum: NAD83

DATE STARTED: 6/26/2023
DATE COMPLETED: 6/26/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
40			Medium dense, brown, clayey SAND, moist. Micaceous.		S-12	5-7-8		

BH-4 terminated at about 41.5 feet below ground surface.
No groundwater encountered during the exploration.
Boring abandoned with 3/8" bentonite chips.

45
50
55
60

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot

ELEVATION (feet)

0 10 20 30 40 50

0 20 40 60 80 100
Water Content (%)
Plastic Limit — Liquid Limit
Natural Water Content

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

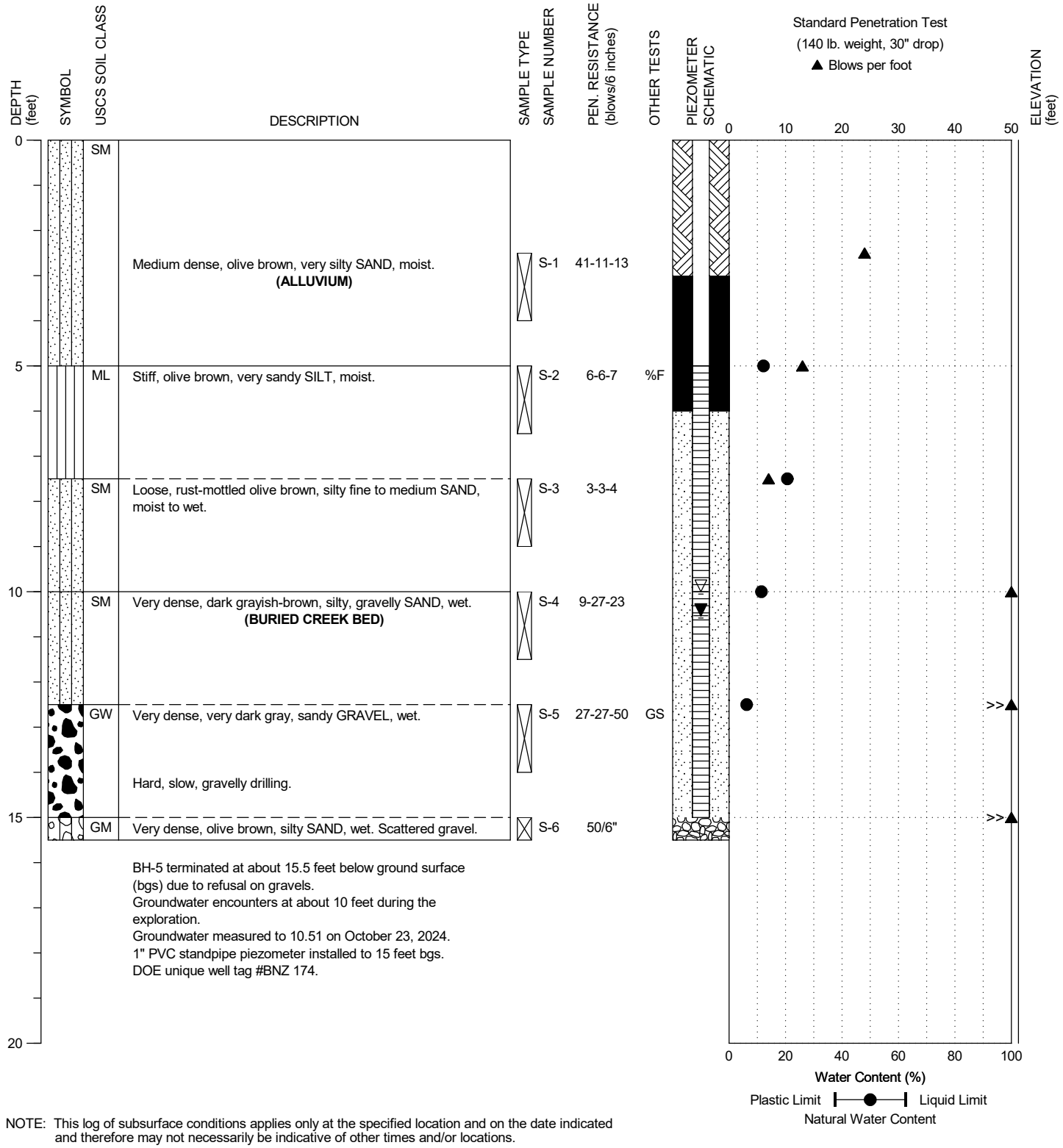
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-04

PROJECT NO.: 2022-144-21 FIGURE: A-5

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.759659, Long: -120.734389, Datum: NAD83

DATE STARTED: 10/22/2024
DATE COMPLETED: 10/22/2024
LOGGED BY: M.A. Benson



BH-5 terminated at about 15.5 feet below ground surface (bgs) due to refusal on gravels.
Groundwater encounters at about 10 feet during the exploration.
Groundwater measured to 10.51 on October 23, 2024.
1" PVC standpipe piezometer installed to 15 feet bgs.
DOE unique well tag #BNZ 174.

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

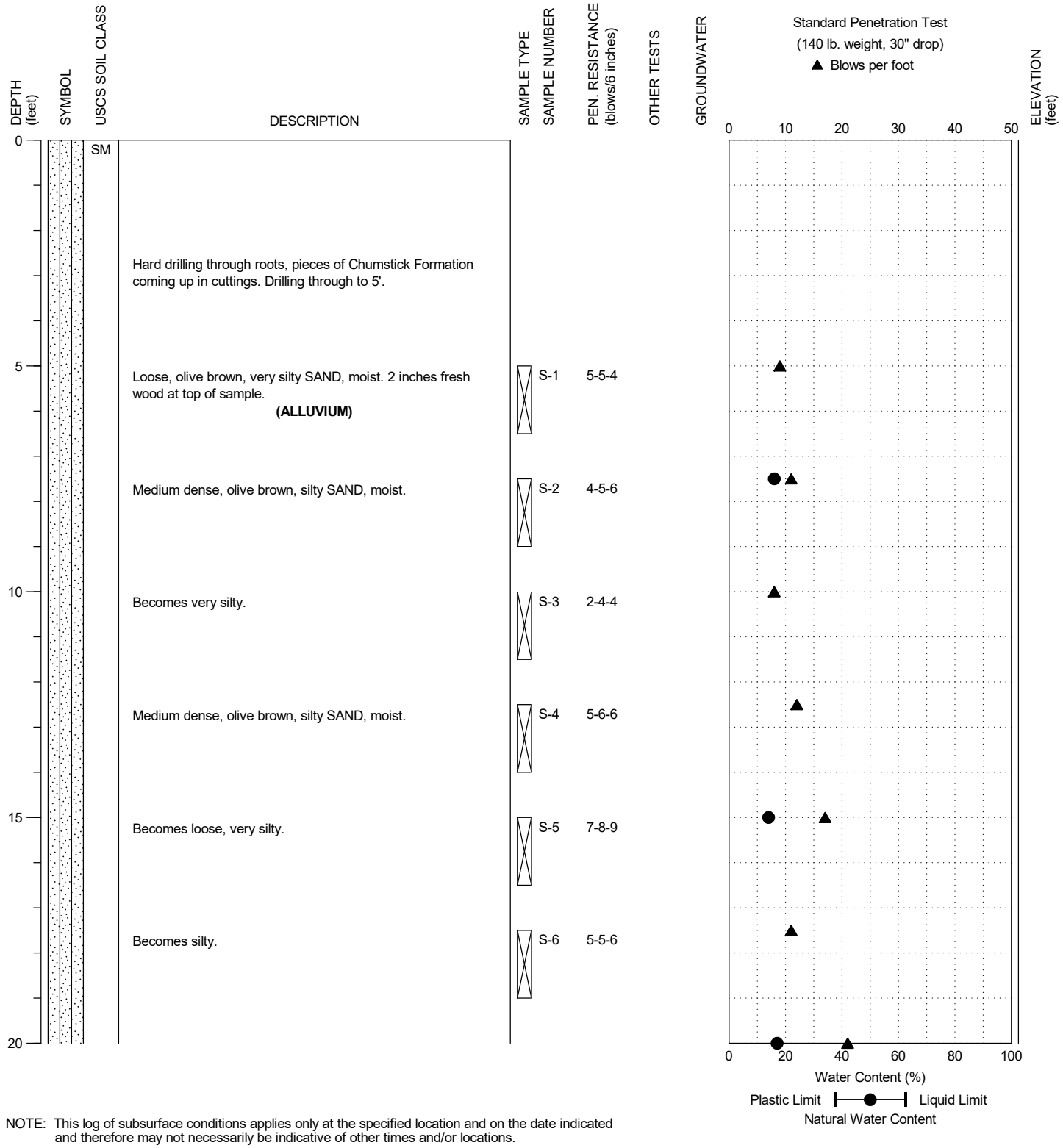
BORING:
BH-05

PROJECT NO.: 2022-144-21 FIGURE: A-6

PZO-DSM 2022-144.GPJ 12/13/24
Library: Q:\LIBRARY\LIBRARY - 2019 LAB.GLB

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.760713, Long: -120.729356, Datum: NAD83

DATE STARTED: 10/22/2024
DATE COMPLETED: 10/22/2024
LOGGED BY: M.A. Benson



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GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-07

PROJECT NO.: 2022-144-21 FIGURE: A-7

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.760713, Long: -120.729356, Datum: NAD83

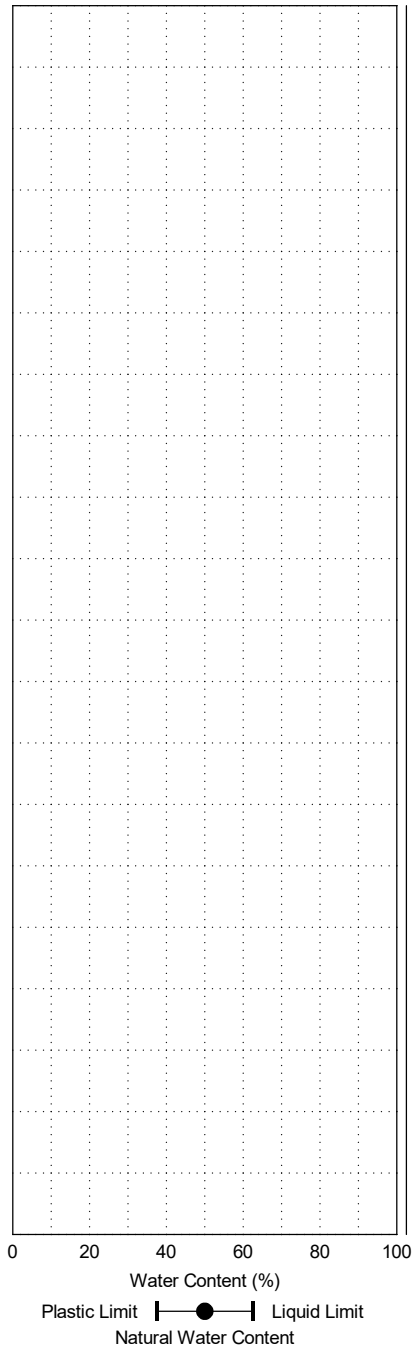
DATE STARTED: 10/22/2024
DATE COMPLETED: 10/22/2024
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
20			Medium dense, olive brown, silty SAND, moist. Scattered charcoal.		S-7	7-10-11		

BH-7 terminated at about 21.5 feet below ground surface (bgs).
No groundwater was encountered during the exploration.
Boring decommissioned with 3/8" bentonite chips.

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot

ELEVATION (feet)



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

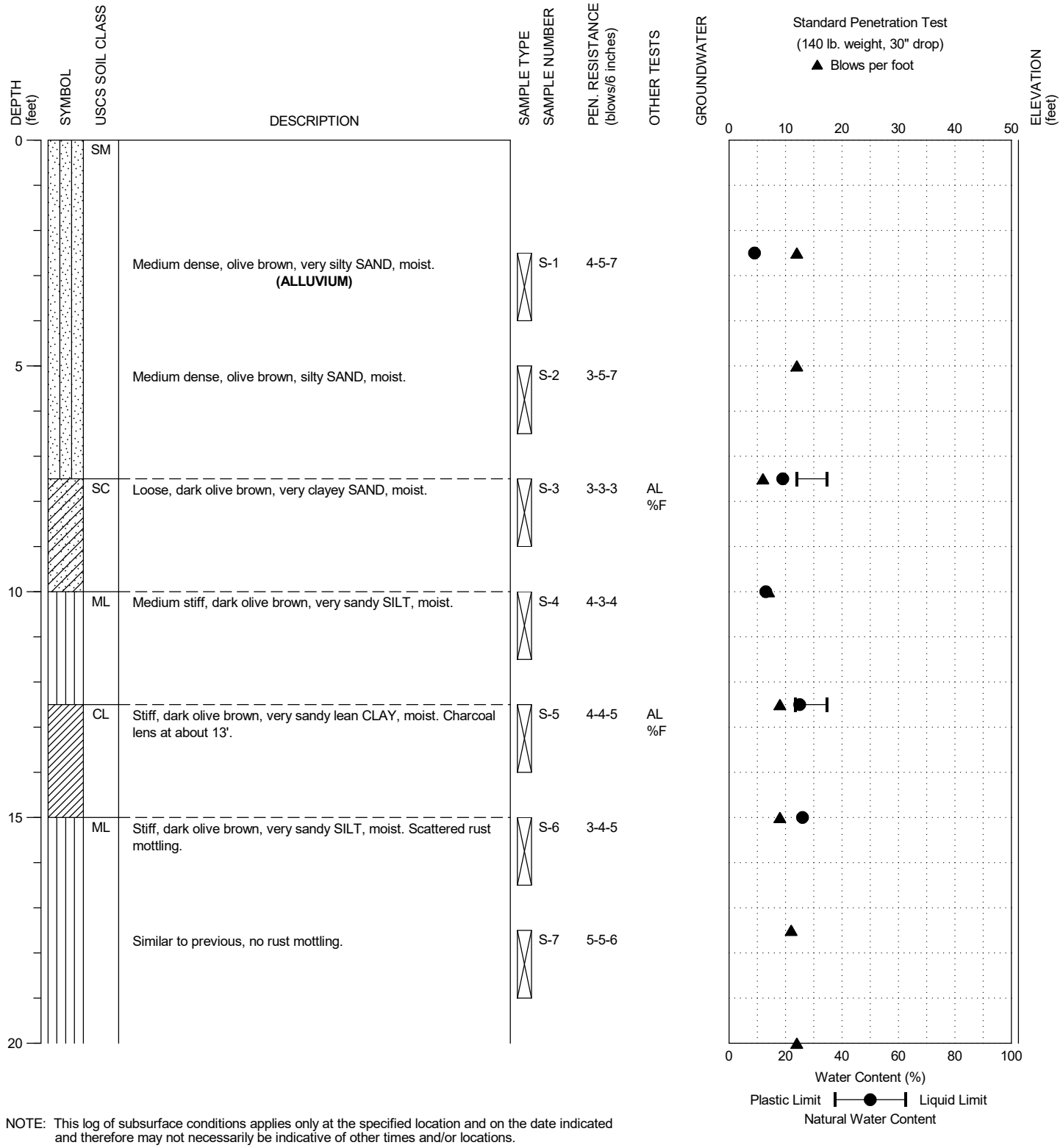
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-07

PROJECT NO.: 2022-144-21 FIGURE: A-7

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.763601, Long: -120.728712, Datum: NAD83

DATE STARTED: 10/22/2024
DATE COMPLETED: 10/22/2024
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-09

PROJECT NO.: 2022-144-21 FIGURE: A-8

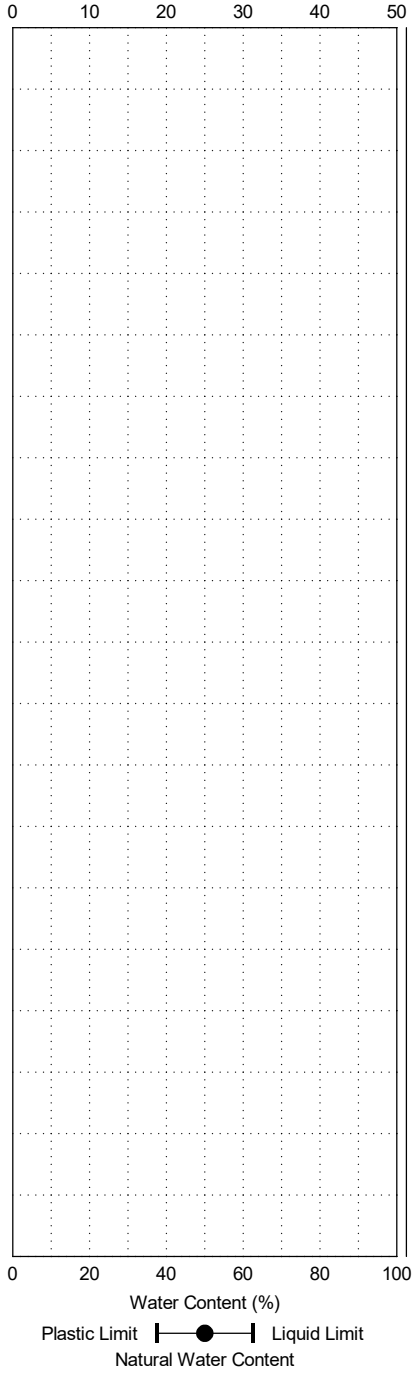
DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.763601, Long: -120.728712, Datum: NAD83

DATE STARTED: 10/22/2024
DATE COMPLETED: 10/22/2024
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
20			Stiff, dark olive brown SILT with sandy interbeds, moist. 3" to 4" bedding.		S-8	6-6-6		
			BH-9 terminated at about 21.5 feet below ground surface (bgs). No groundwater encountered during the exploration. Boring decommissioned with 3/8" bentonite chips.					
25								
30								
35								
40								

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot

ELEVATION (feet)



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

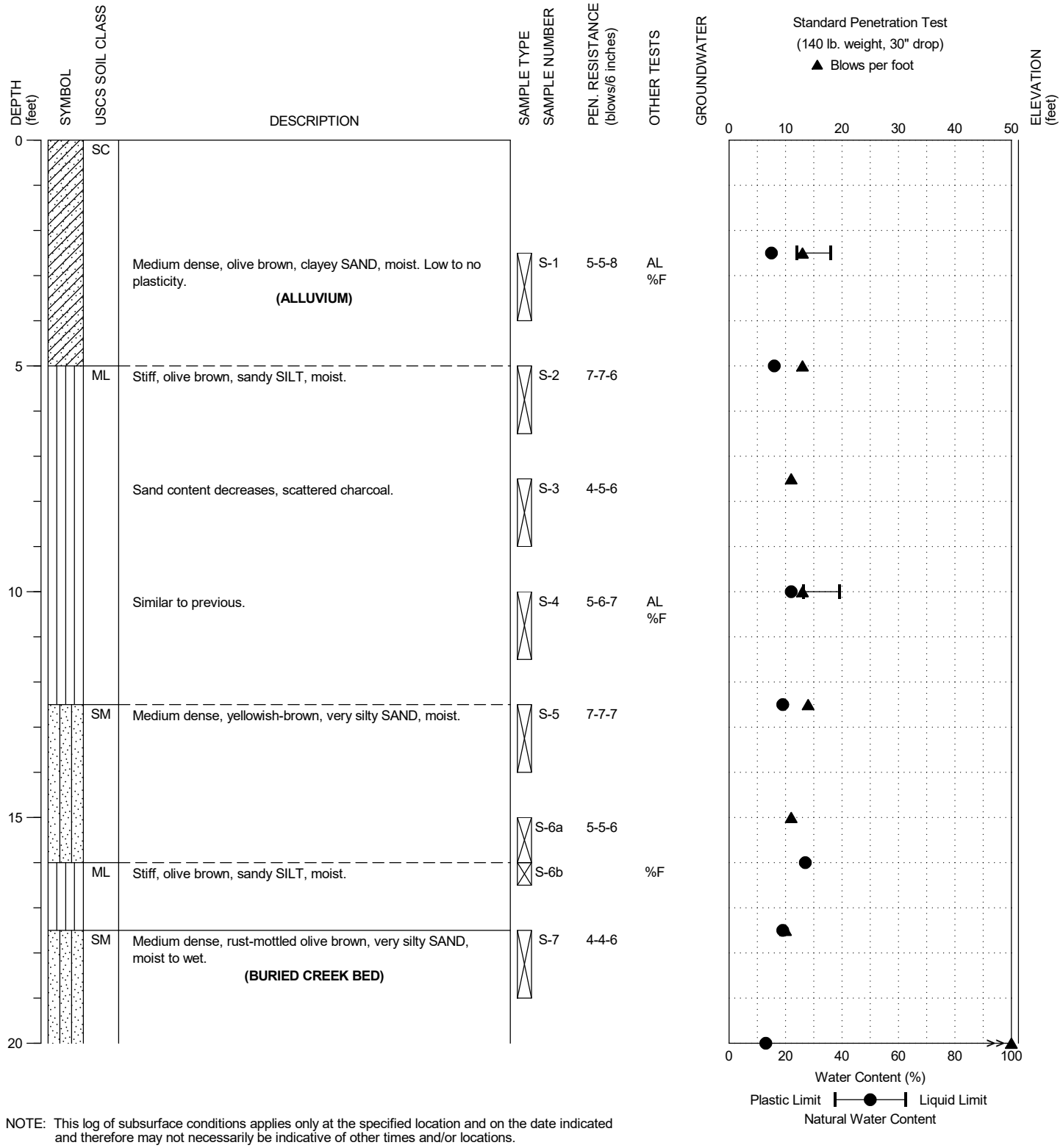
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-09

PROJECT NO.: 2022-144-21 FIGURE: A-8

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.76404, Long: -120.728764, Datum: NAD83

DATE STARTED: 10/23/2024
DATE COMPLETED: 10/23/2024
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-10

PROJECT NO.: 2022-144-21 FIGURE: A-9

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.76404, Long: -120.728764, Datum: NAD83

DATE STARTED: 10/23/2024
DATE COMPLETED: 10/23/2024
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
20			Very dense, rust-mottled olive gray, gravelly, silty SAND, moist to wet. 1" to 2" bedding.		S-8	5-48-37	GS	

BH-10 terminated at about 22 feet below ground surface (bgs) due to refusal on gravel.
No groundwater was encountered during the exploration.
Boring decommissioned with 3/8" bentonite chips.

25
30
35
40

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot

ELEVATION (feet)

0 10 20 30 40 50

0 20 40 60 80 100

Water Content (%)

Plastic Limit — Liquid Limit
Natural Water Content

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

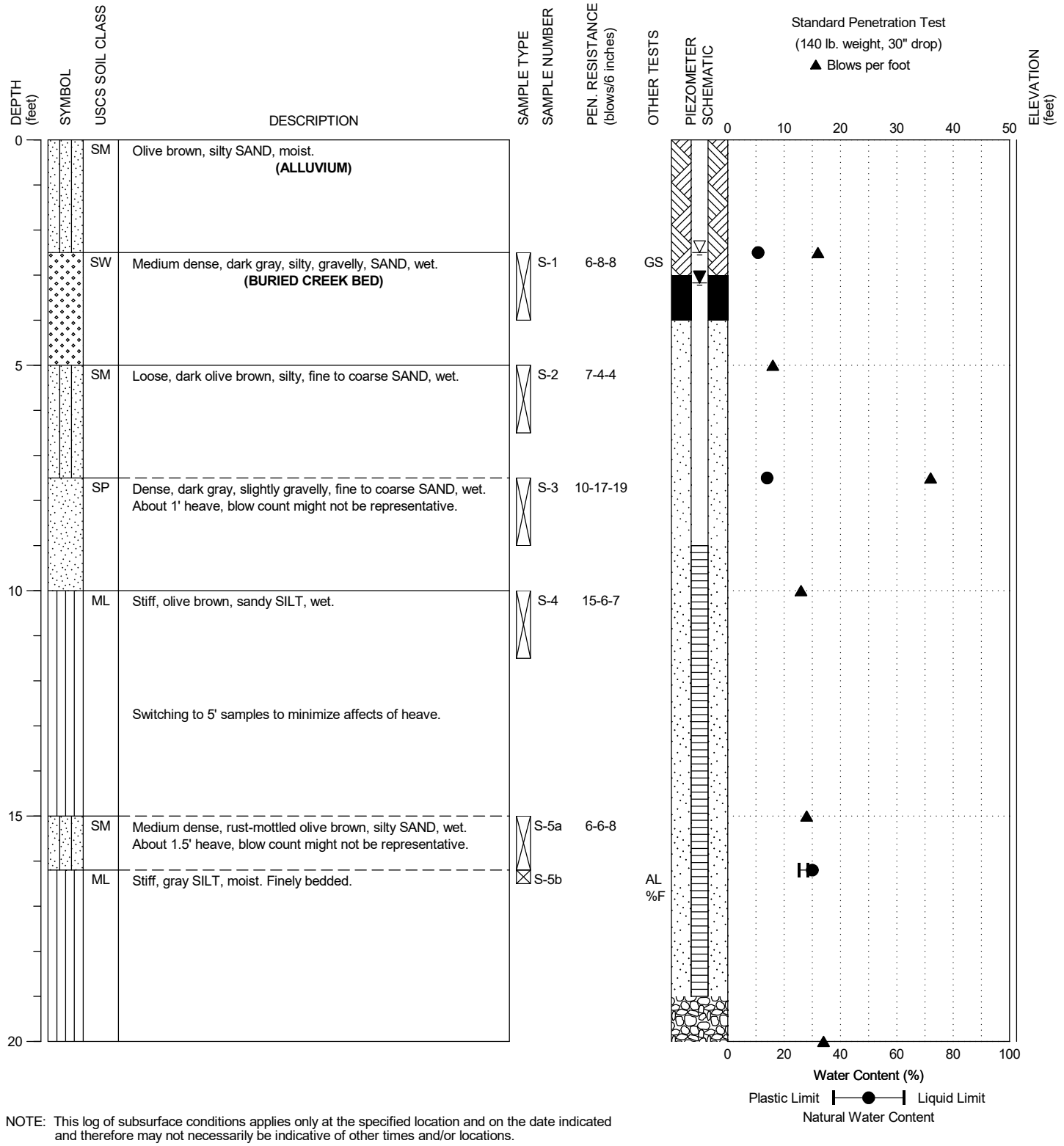
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-10

PROJECT NO.: 2022-144-21 FIGURE: A-9

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.765112, Long: -120.7278, Datum: NAD83

DATE STARTED: 10/23/2024
DATE COMPLETED: 10/23/2024
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-11

PROJECT NO.: 2022-144-21 FIGURE: A-10

PZO-DSM 2022-144.GPJ 12/13/24
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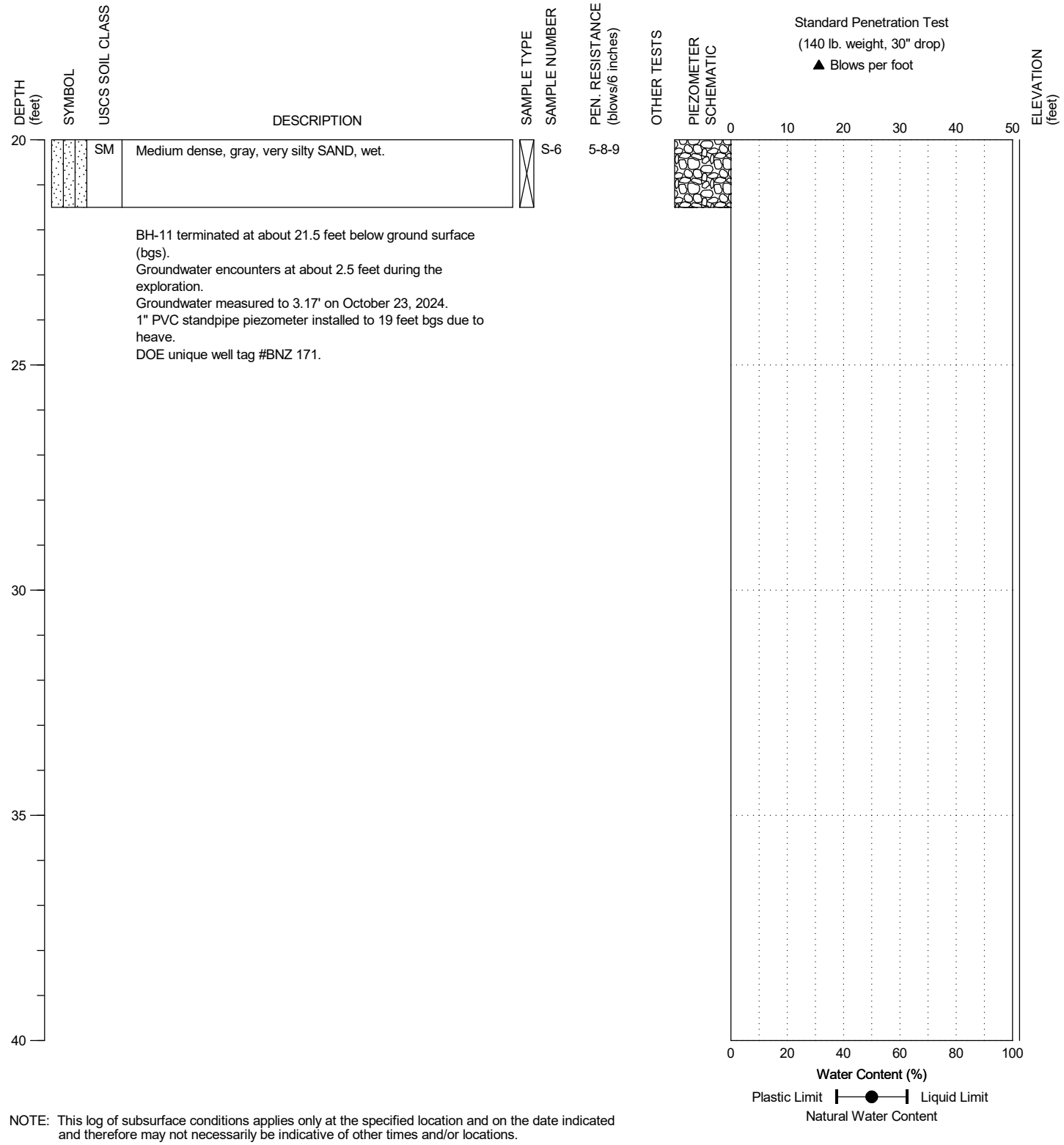
DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.765112, Long: -120.7278, Datum: NAD83

DATE STARTED: 10/23/2024
DATE COMPLETED: 10/23/2024
LOGGED BY: M.A. Benson



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GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

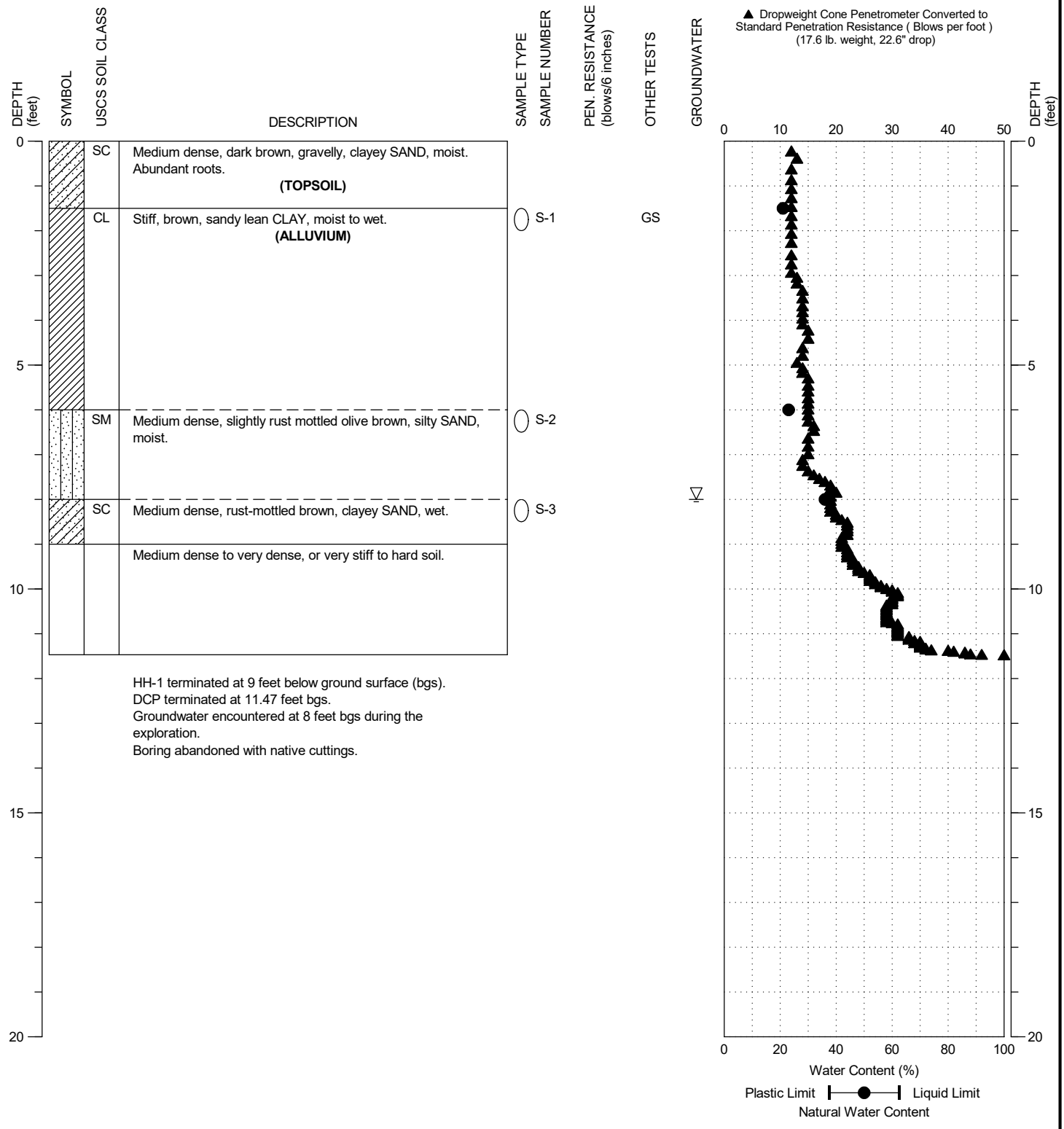
BORING:
BH-11

PROJECT NO.: 2022-144-21 FIGURE: A-10

DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.75954, Long: -120.735138, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/16/2023
DATE COMPLETED: 5/16/2023
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GEOSCIENCES INC.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 1

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-11

HAND HOLE WITH DCP TO SPT 2022-144.GPJ 12/13/24
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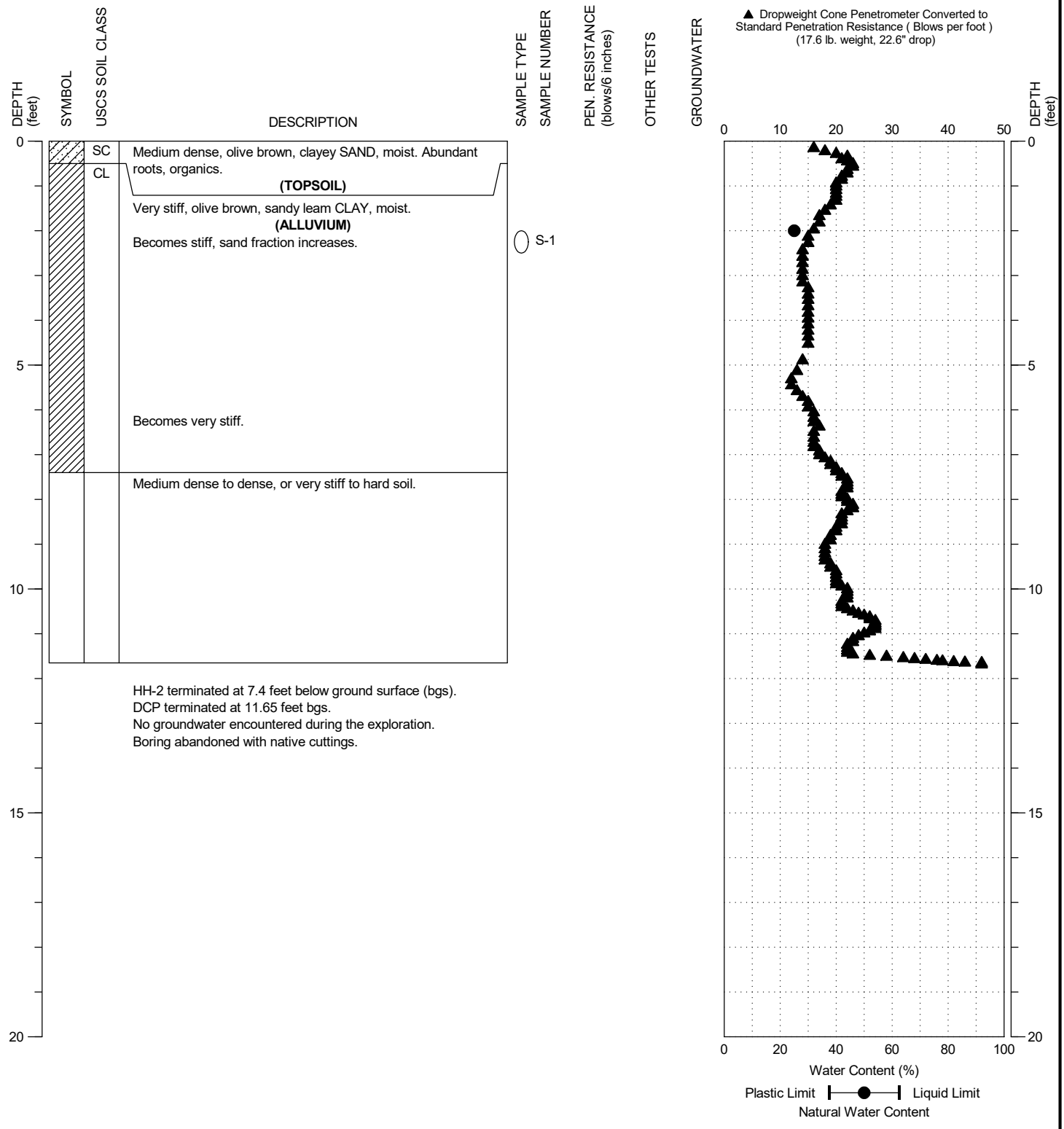
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.75977, Long: -120.734138, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/16/2023
DATE COMPLETED: 5/16/2023
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 2

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-12

HAND HOLE WITH DCP TO SPT 2022-144.GPJ 12/13/24
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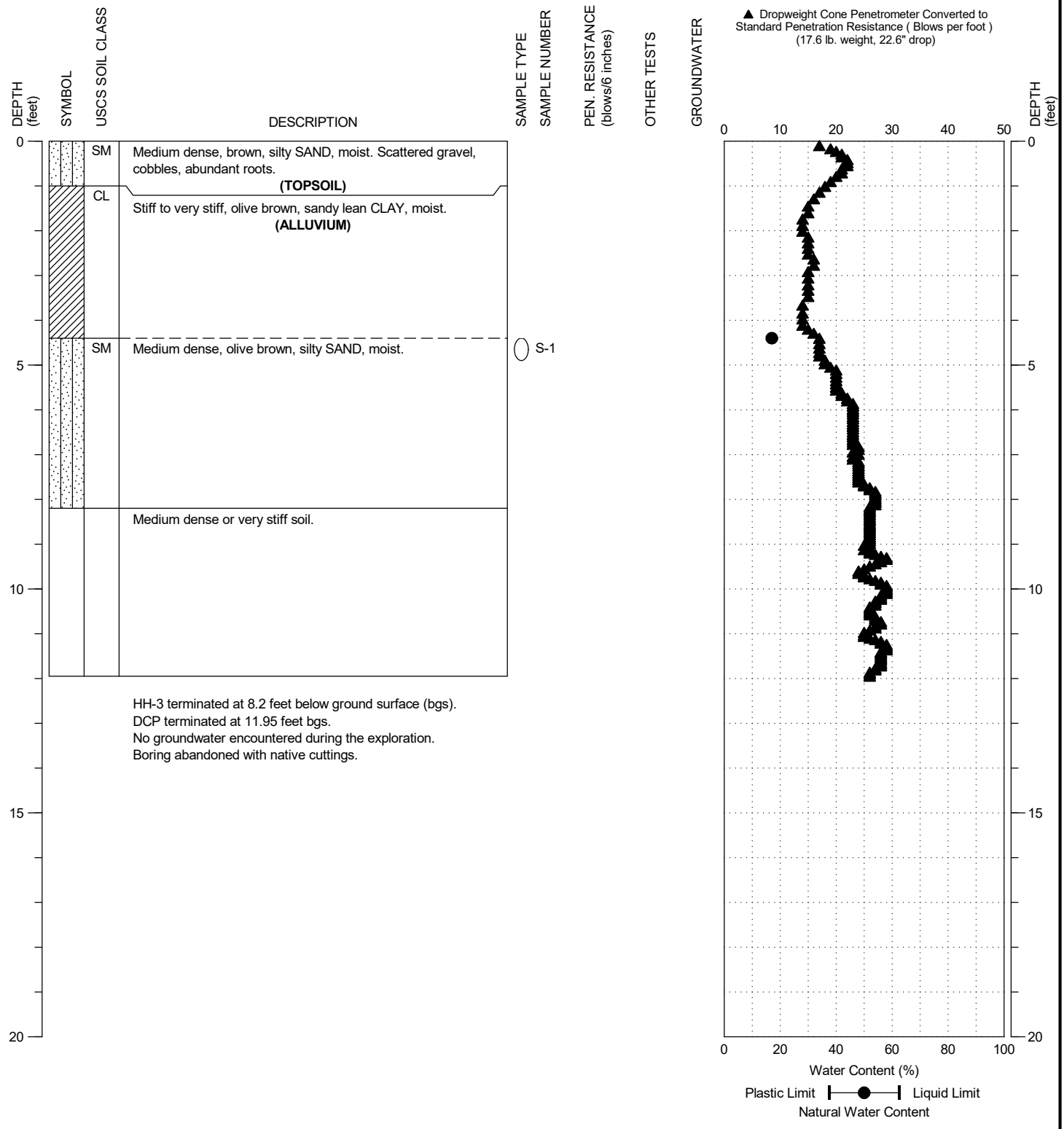
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.759745, Long: -120.733223, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/16/2023
DATE COMPLETED: 5/16/2023
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 3

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-13

HAND HOLE WITH DCP TO SPT 2022-144.GPJ 12/13/24
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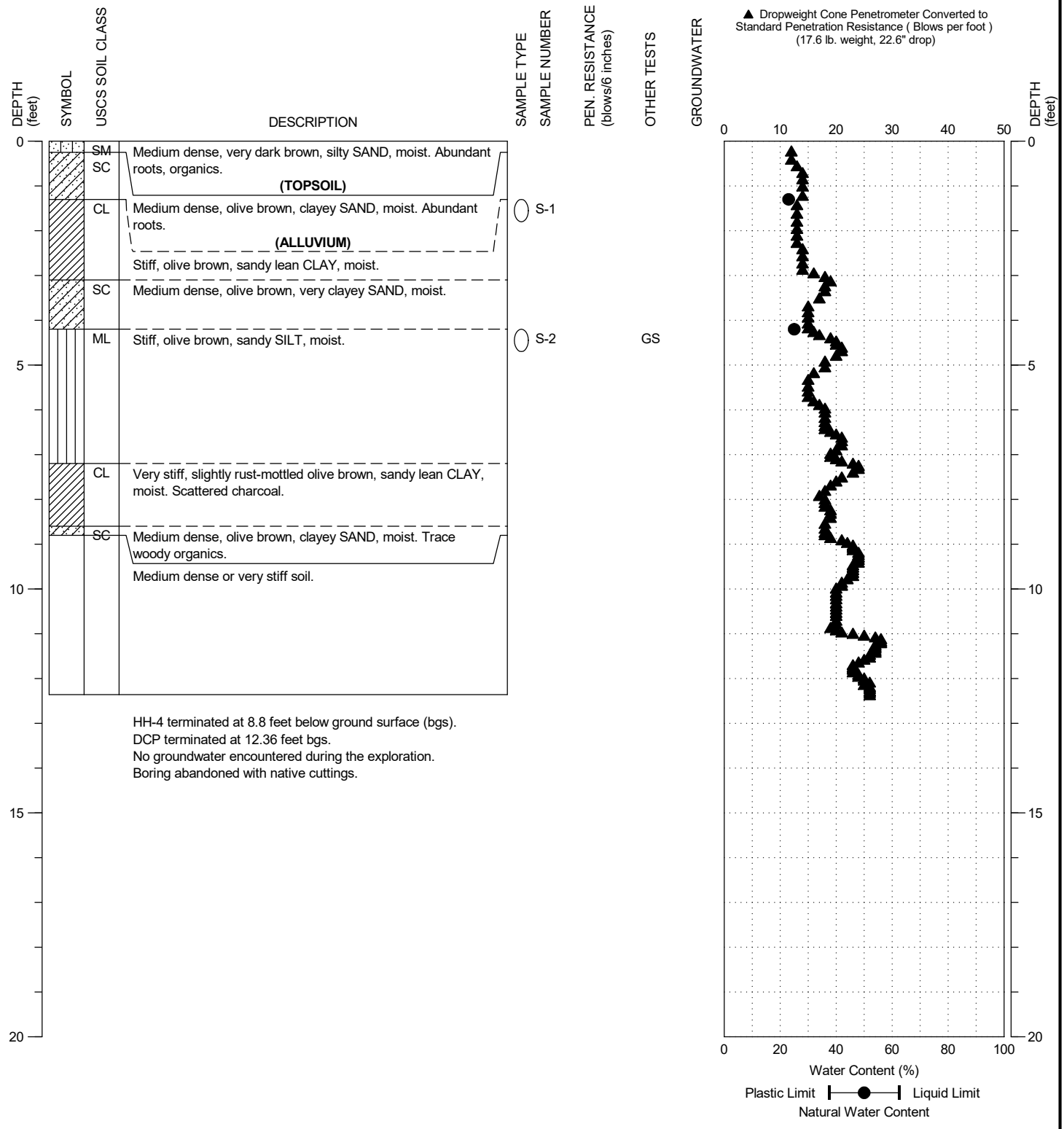
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.759898, Long: -120.731774, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/17/2023
DATE COMPLETED: 5/17/2023
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GEOSCIENCES INC.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 4

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-14

HAND HOLE WITH DCP TO SPT 2022-144.GPJ 12/13/24
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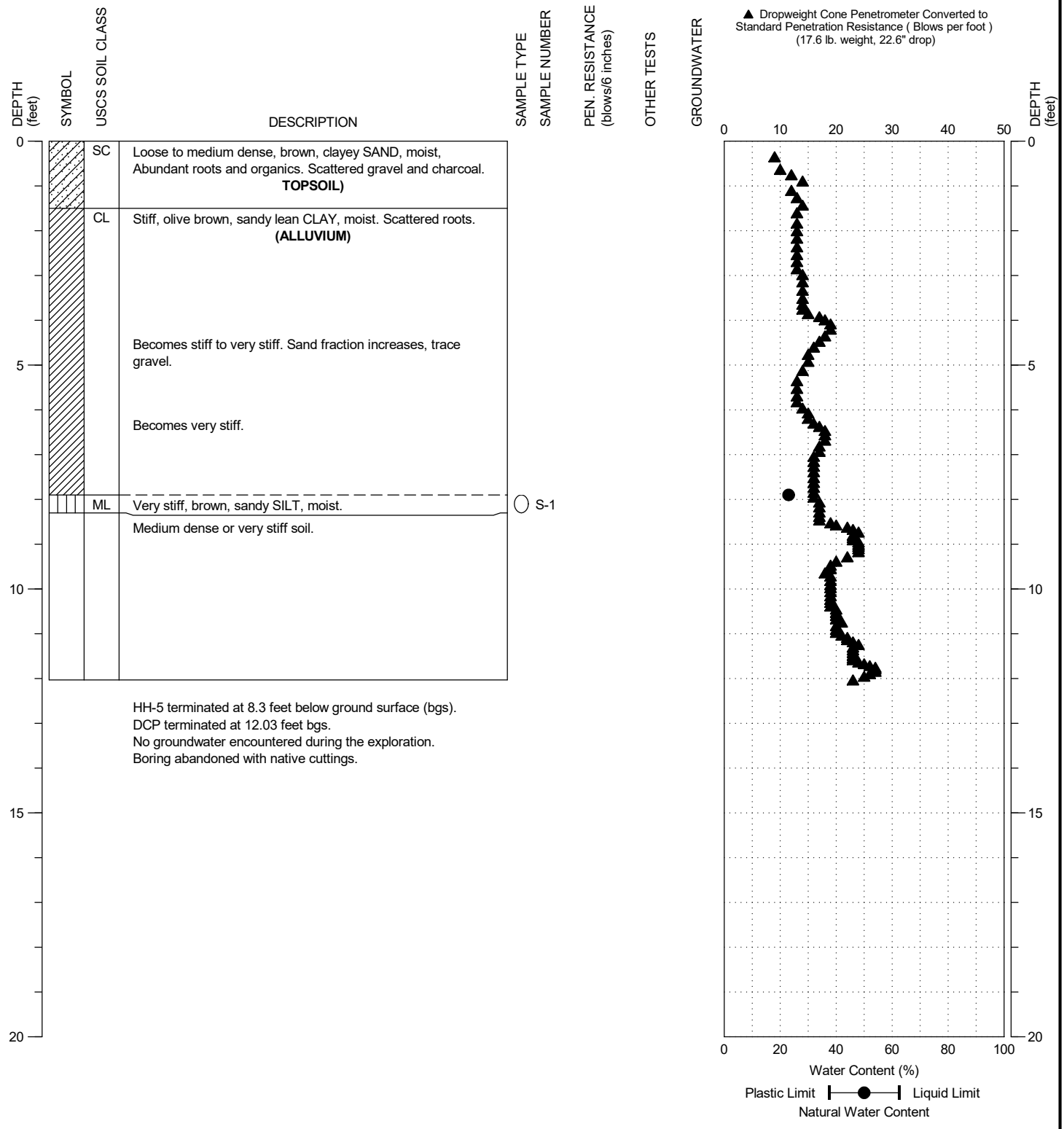
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.760076, Long: -120.731231, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/17/2023
DATE COMPLETED: 5/17/2023
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GEOSCIENCES INC.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 5

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-15

HAND HOLE WITH DCP TO SPT 2022-144.GPJ 12/13/24
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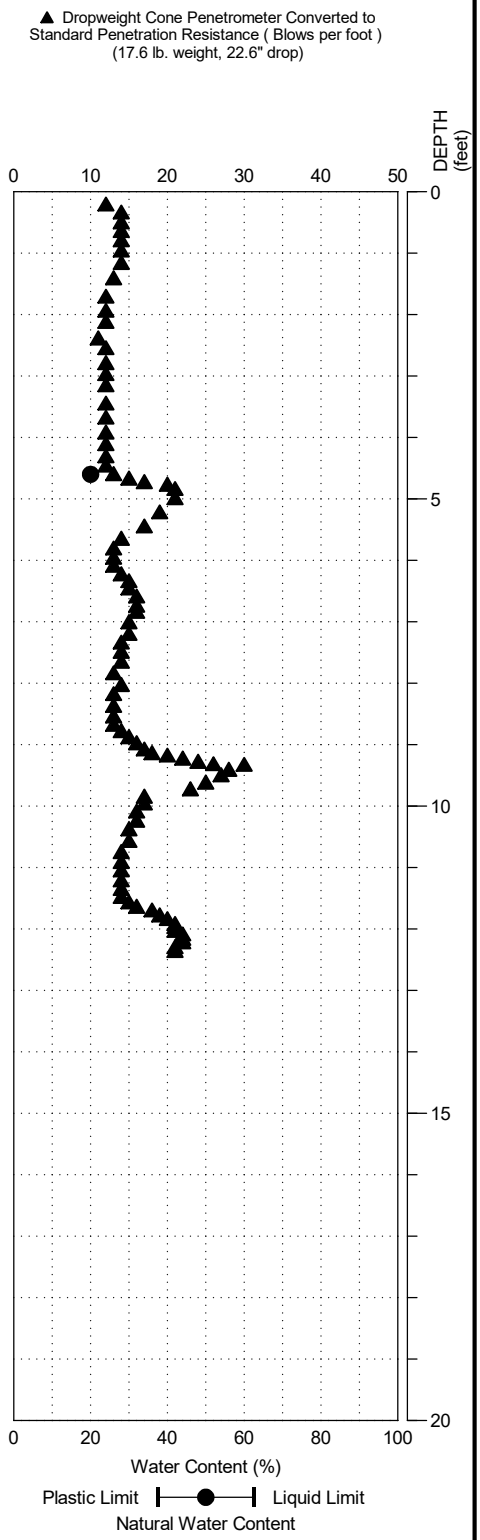
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.760375, Long: -120.730527, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/17/2023
DATE COMPLETED: 5/17/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
0		SC	Medium dense, dark brown, clayey SAND, moist. Abundant roots.					
			(TOPSOIL)					
		CL	Stiff, olive brown, sandy lean CLAY, moist.					
			(ALLUVIUM)					
5			Very stiff, olive brown, slightly gravelly, sandy lean CLAY, moist. Scattered roots.		S-1			
			Stiff, olive brown, sandy lean CLAY, moist. Scattered charcoal.					
			Contains scattered roots.					
			Sand fraction increases.					
10			Medium dense, or very stiff to hard soil.					
15								
20								

HH-6 terminated at 8 feet below ground surface (bgs).
DCP terminated at 12.35 feet bgs.
No groundwater encountered during the exploration.
Boring abandoned with native cuttings.



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 6

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-16

HAND HOLE WITH DCP TO SPT 2022-144.GPJ 12/13/24
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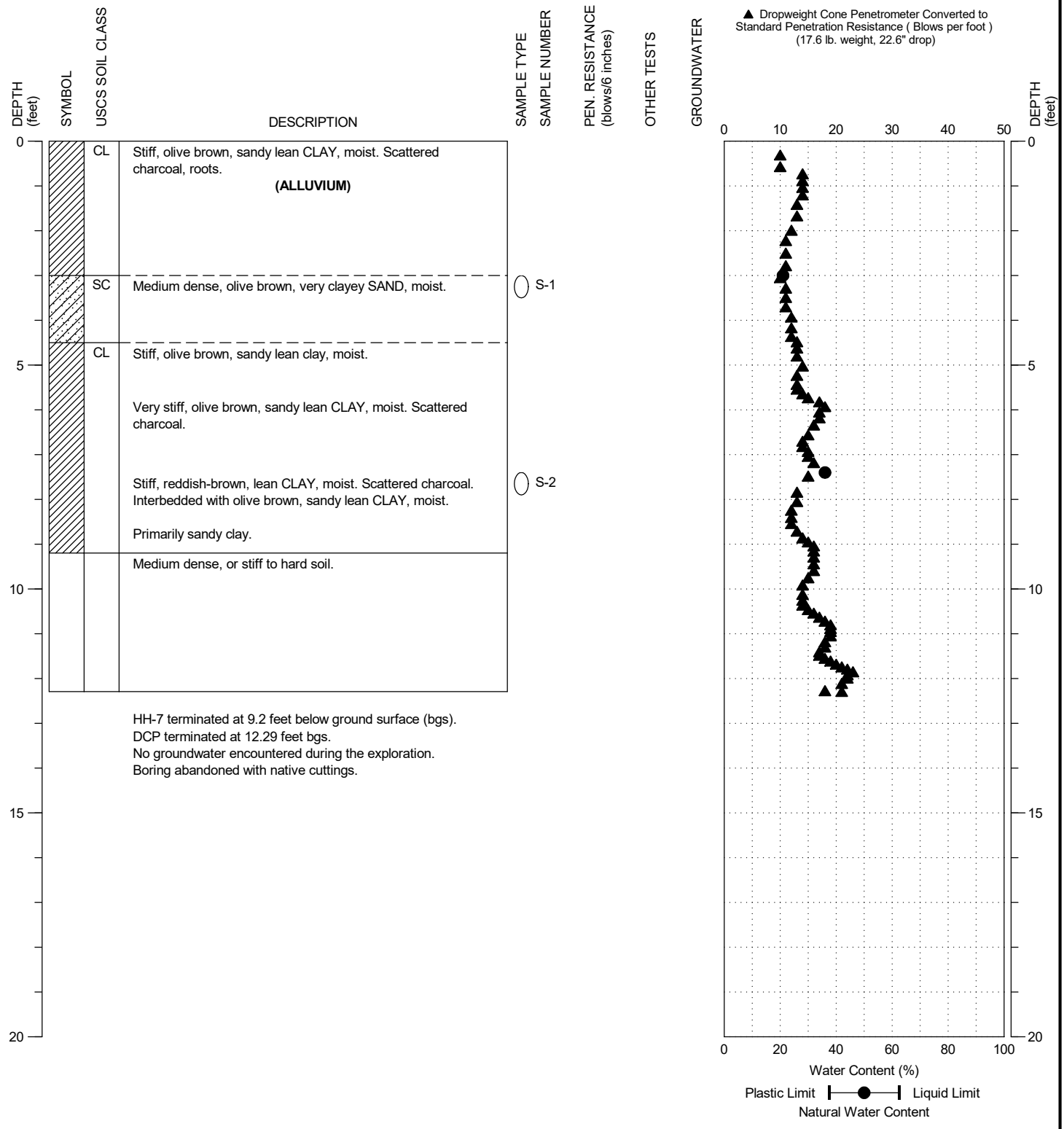
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.760714, Long: -120.7296, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/17/2023
DATE COMPLETED: 5/17/2023
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 7

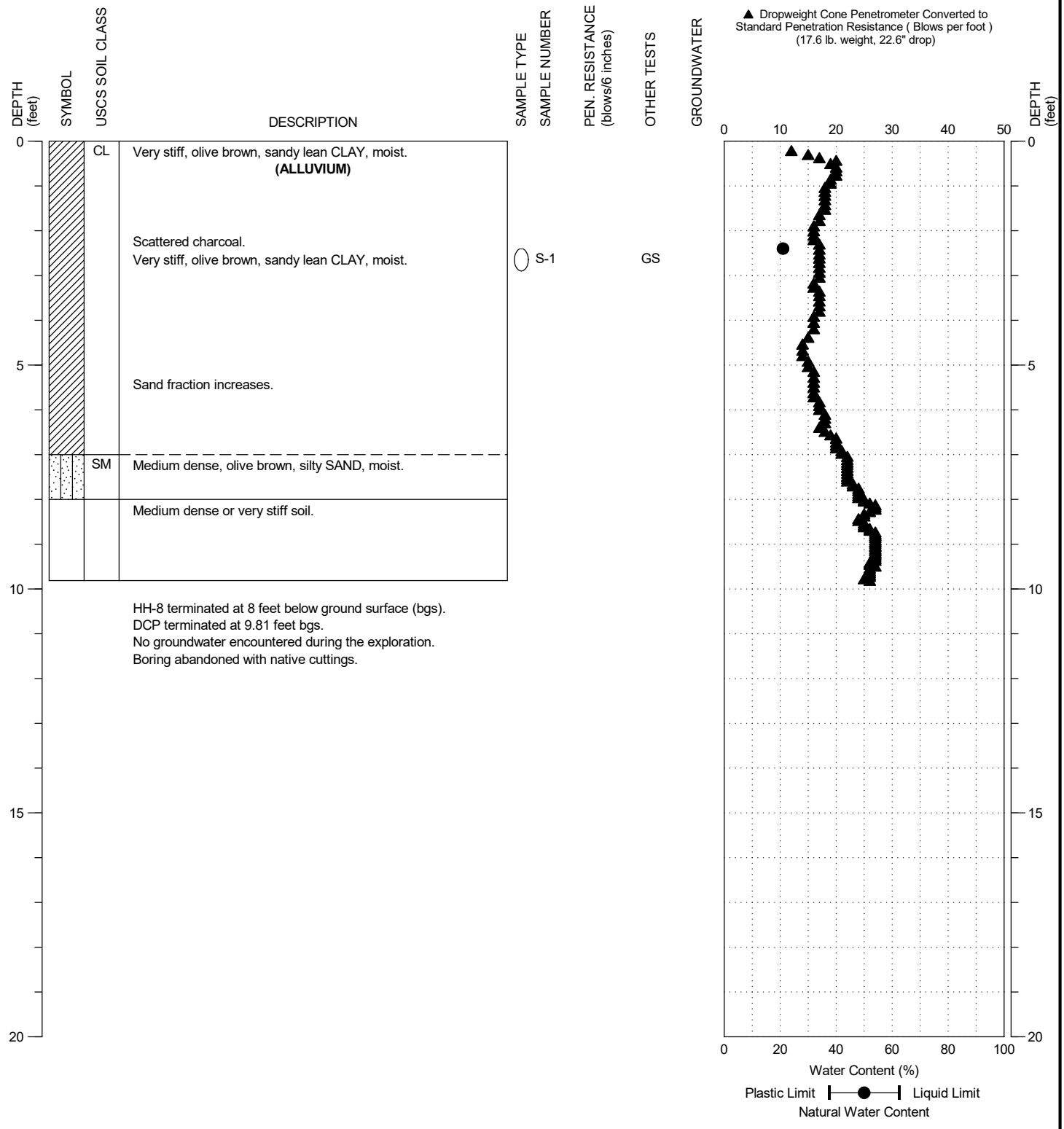
PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-17

DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.761802, Long: -120.728441, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/18/2023
DATE COMPLETED: 5/18/2023
LOGGED BY: M.A. Benson



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GEOSCIENCES INC.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

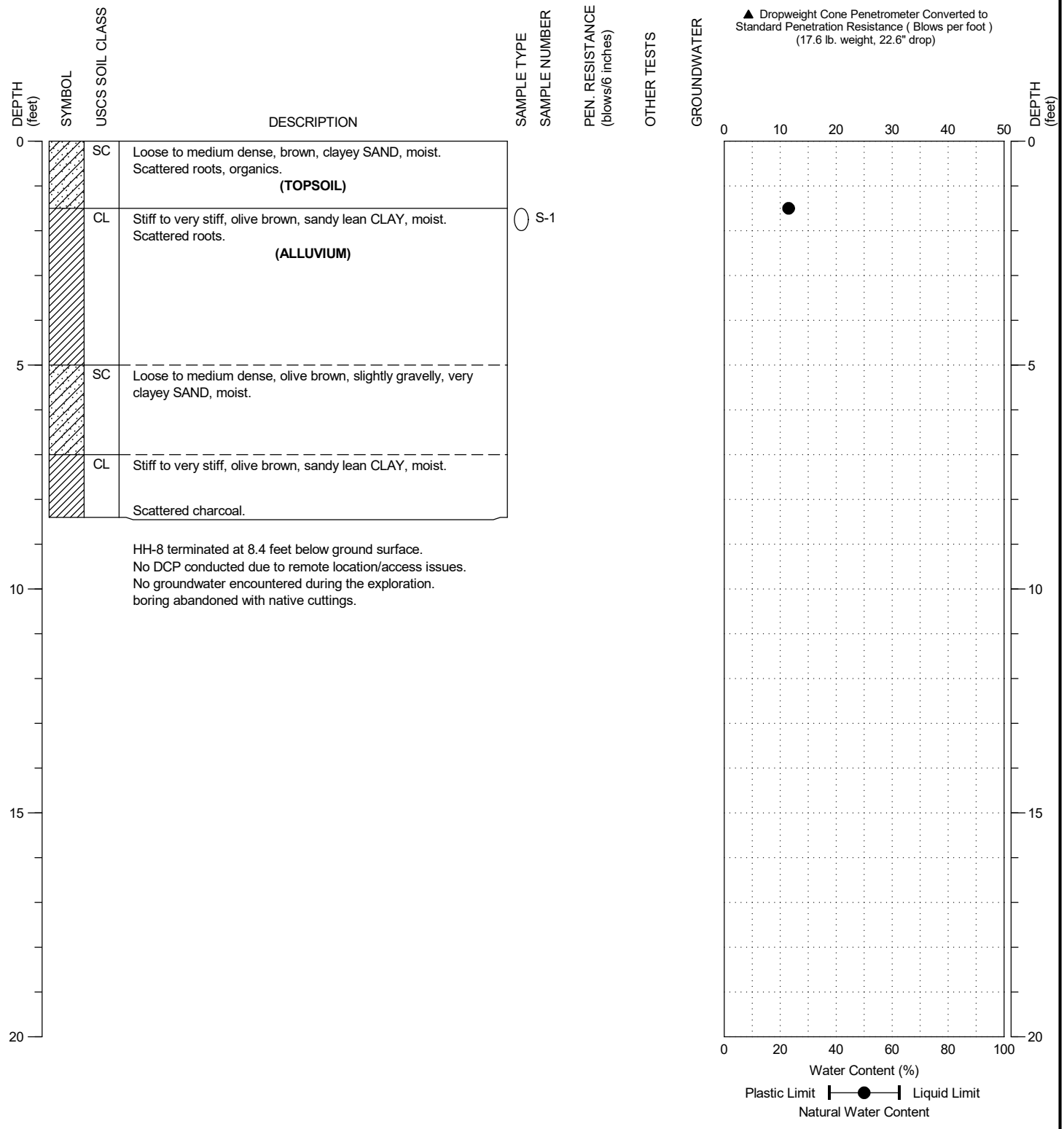
HAND HOLE:
HH- 8

PROJECT NO.: 2022-144-21 FIGURE: A-18

DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.762519, Long: -120.728384, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/18/2023
DATE COMPLETED: 5/18/2023
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GEOSCIENCES INC.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 9

PROJECT NO.: 2022-144-21 FIGURE: A-19

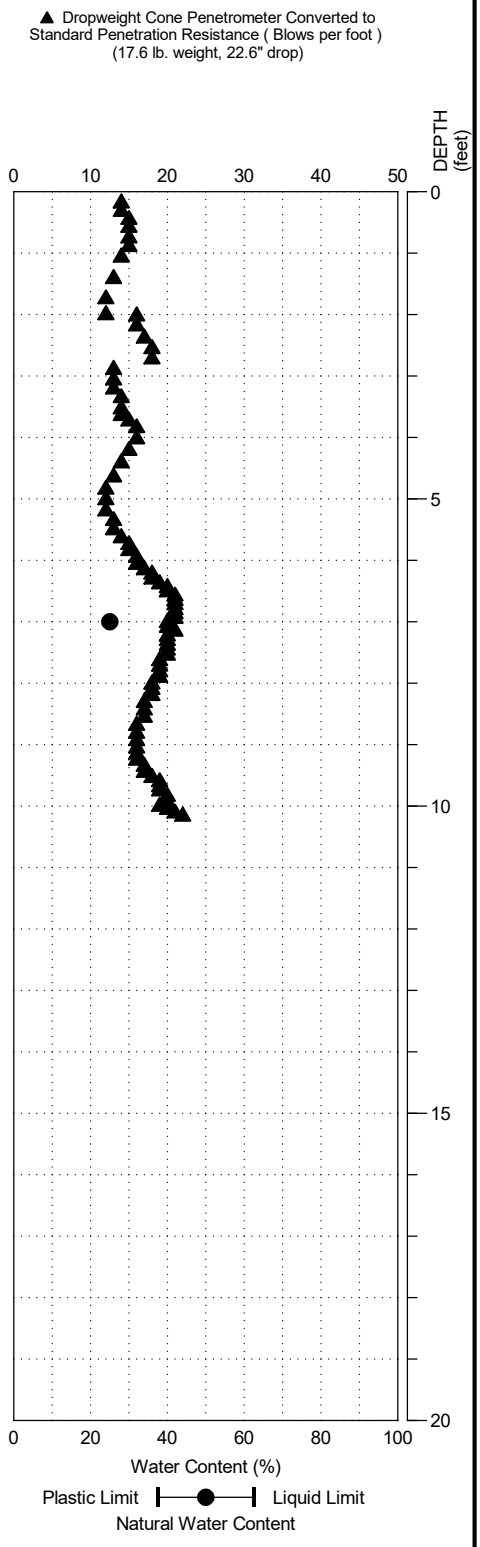
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.763085, Long: -120.728645, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/18/2023
DATE COMPLETED: 5/18/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE / SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
0		SC	Medium dense, brown, clayey SAND, moist. Scattered organics. **(TOPSOIL)**				
		CL	Stiff, olive brown, sandy lean CLAY, moist. Scattered organics. **(ALLUVIUM)**				
			Scattered gravel. Scattered charcoal.				
5			Becomes very stiff.				
			Very stiff, oilve brown, sandy lean CLAY, moist.	S-1			
			Medium dense or very stiff soil.				
10							
15							
20							

HH-10 terminated at 8.7 feet below ground surface (bgs).
DCP terminated at 10.13 feet bgs.
No groundwater encountered during the exploration.
Boring abandoned with native cuttings.



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GEOSCIENCES INC.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH-10

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-20

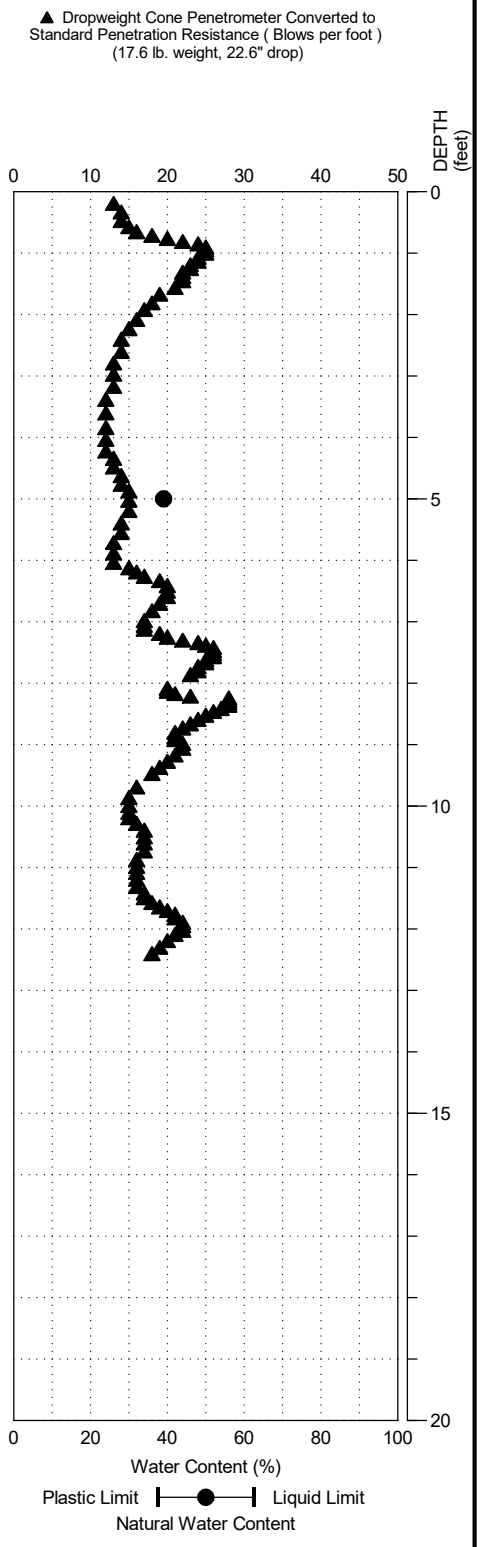
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.763708, Long: -120.728867, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/16/2023
DATE COMPLETED: 5/16/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE / SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
0		SC	Medium dense, dark olive brown, clayey SAND, moist. Scattered charcoal, roots. **(FILL)**				
		CL	Stiff, olive brown, sandy lean CLAY, moist. **(ALLUVIUM)**				
5			Becomes very stiff.	S-1			
		SC	Medium dense, olive brown, gravelly, clayey SAND, moist.				
10			Medium dense or very stiff soil.				
15							
20							

HH-11 terminated at 9 feet below ground surface (bgs).
DCP terminated at 12.4 feet bgs.
No groundwater encountered during the exploration.
Boring abandoned with native cuttings.



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH-11

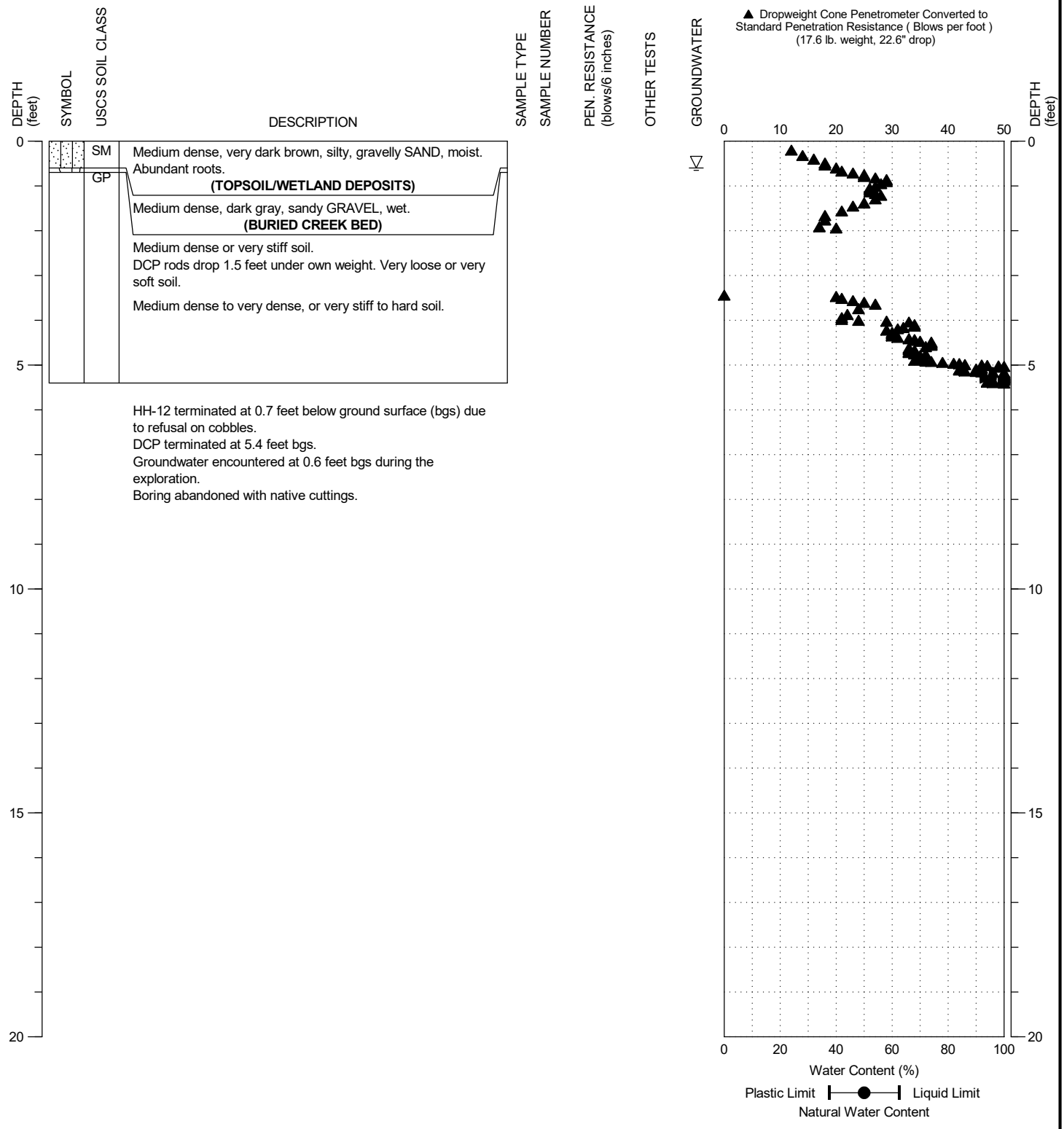
PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-21

DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.764288, Long: -120.728818, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/16/2023
DATE COMPLETED: 5/16/2023
LOGGED BY: M.A. Benson



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GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH-12

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-22

HAND HOLE WITH DCP TO SPT 2022-144.GPJ 12/13/24
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APPENDIX B

LABORATORY TESTING

APPENDIX B

LABORATORY TESTING

Representative soil samples obtained from the explorations were placed in plastic bags to prevent loss of moisture and transported to our Bothell, Washington, laboratory for further examination and testing. Laboratory tests were conducted on selected soil samples to characterize relevant engineering and index properties of the site soils.

MOISTURE CONTENT OF SOIL: The moisture content of selected soil samples (percent by dry mass) was determined in general accordance with ASTM D 2216. The results are shown at the sampled intervals on the appropriate summary logs in Appendix A and on the Summary of Material Properties provided on Figures B-1 and B-3 in Appendix B.

PARTICLE SIZE ANALYSIS OF SOILS: Selected samples were tested to determine the particle (grain) size distribution of material in general accordance with ASTM D 422. The results are summarized on the attached Summary of Material Properties, Figures B-1 and B-3, and Particle Size Analysis of Soils reports, Figures B-4 and B-9 (Appendix B) which also provide information regarding the classification of the sample.

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ATTERBERG LIMITS): Selected samples were tested using method ASTM D 4318, multi-point method. The results are reported on the attached Liquid Limit, Plastic Limit, and Plasticity Index report, Figure B-10 (Appendix B)

DIRECT SHEAR TESTING: Selected samples were tested to determine shear strength parameters of the material in general accordance with ASTM D 3080. The results are summarized in the direct shear test reports, Figures B-11 and B-12 (Appendix B).

CONSOLIDATION TESTING: A select sample was tested to determine consolidation parameters of the material in general accordance with ASTM D 2435. The results are summarized in the direct shear test reports, Figures B-13 through B-17 (Appendix B).

EXPLORATION DESIGNATION	TOP DEPTH (feet)	BOTTOM DEPTH (feet)	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	SPECIFIC GRAVITY	ATTERBERG LIMITS (%)			% GRAVEL	% SAND	% FINES	ASTM SOIL CLASSIFICATION	SAMPLE DESCRIPTION
						LL	PL	PI					
BH-01,S-1	2.5	4.0	18.1									CL	Brown, sandy lean CLAY
BH-01,S-5	12.5	14.0	21.9									CL	Brown, sandy lean CLAY
BH-01,S-6b	15.5	16.5	17.7									SM	Yellowish-brown, silty SAND
BH-01,S-10	30.0	31.5	6.9						42.9	47.6	9.5	SP-SM	Dark grayish-brown, poorly graded SAND with silt and gravel
BH-02,S-2	5.0	6.5	19.6									CL	Yellowish-brown, sandy lean CLAY
BH-02,S-4	10.0	11.5	23.9			34	26	8			54.4	ML	Yellowish-brown, sandy SILT
BH-02,S-6	15.0	16.5	18.9									CL	Yellowish-brown, sandy lean CLAY
BH-02,S-8b	21.0	21.5	10.7									SM	Yellowish-brown, silty SAND
BH-02,S-10	30.0	31.5	10.2									SM	Dark grayish-brown, silty SAND
BH-03,S-3	7.5	9.0	18.4									CL	Olive, lean CLAY with sand
BH-03,S-5	12.5	14.0	19.1						0.0	52.5	47.5	SM	Olive, silty SAND
BH-03,S-7	17.5	19.0	20.0									CL	Olive, sandy lean CLAY
BH-03,S-11	35.0	36.5	6.2									SM	Dark olive-gray, silty SAND with gravel
BH-04,S-5	12.5	14.0	17.1									SM	Olive, silty SAND
BH-04,S-6	15.0	16.5	21.0									SM	Olive, silty SAND
BH-04,S-8b	20.5	21.5	38.2									ML	Olive-brown, SILT with sand and organics
BH-04,S-10b	30.5	31.5	11.1									SM	Olive, silty SAND
BH-05,S-2	5.0	6.5	12.2								61.6	ML	Light olive-brown, sandy SILT
BH-05,S-3	7.5	9.0	20.6									SM	Light olive-brown, silty SAND
BH-05,S-4	10.0	11.5	11.4									SM	Olive-brown, silty SAND with gravel

Notes: 1. This table summarizes information presented elsewhere in the report and should be used in conjunction with the report test, other graphs and tables, and the exploration logs.
2. The soil classifications in this table are based on ASTM D2487 and D2488 as applicable.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

SUMMARY OF MATERIAL PROPERTIES

PROJECT NO.: 2022-144-21 FIGURE: B-1

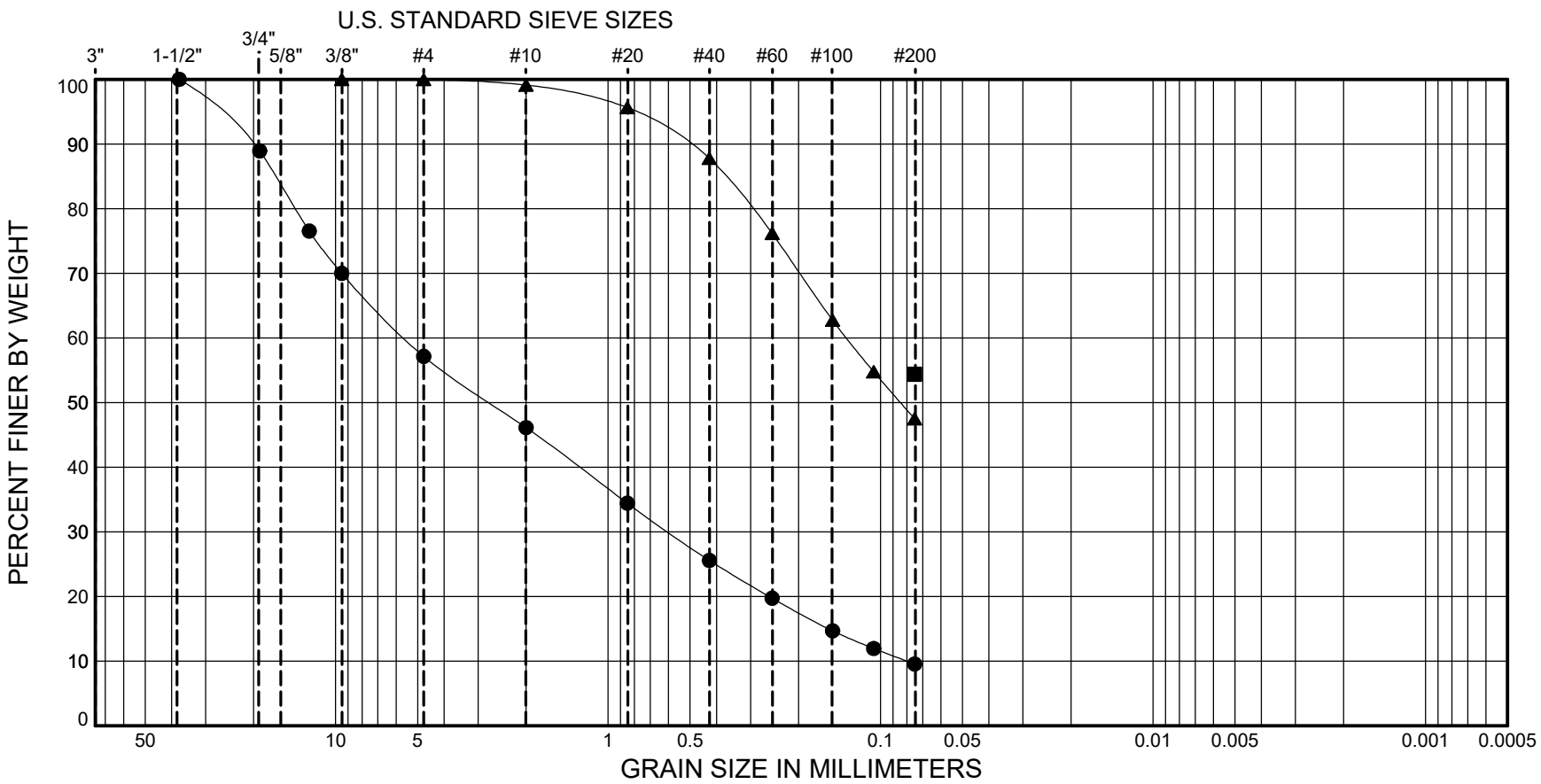
EXPLORATION DESIGNATION	TOP DEPTH (feet)	BOTTOM DEPTH (feet)	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	SPECIFIC GRAVITY	ATTERBERG LIMITS (%)			% GRAVEL	% SAND	% FINES	ASTM SOIL CLASSIFICATION	SAMPLE DESCRIPTION
						LL	PL	PI					
BH-05,S-5	12.5	14.0	6.2						49.0	46.4	4.6	GW	Dark grayish-brown, well-graded GRAVEL with sand
BH-07,S-2	7.5	9.0	15.8									SM	Light yellowish-brown, silty SAND
BH-07,S-5	15.0	16.5	14.1									SM	Light yellowish-brown, silty SAND
BH-07,S-7	20.0	21.5	16.6									SM	Light yellowish-brown, silty SAND
BH-09,S-1	2.5	4.0	9.4									SM	Light yellowish-brown, silty SAND
BH-09,S-3	7.5	9.0	19.0			35	24	11			45.4	SC	Light olive-brown, clayey SAND
BH-09,S-4	10.0	11.5	13.1									ML	Light olive-brown, sandy SILT
BH-09,S-5	12.5	14.0	24.5			35	23	12			55.6	CL	Light olive-brown, sandy lean CLAY
BH-09,S-6	15.0	16.5	25.6									ML	Light olive-brown, SILT with sand
BH-10,S-1	2.5	4.0	14.8			36	24	12			47.8	SC	Light yellowish-brown, clayey SAND
BH-10,S-2	5.0	6.5	15.5									ML	Light yellowish-brown, sandy SILT
BH-10,S-4	10.0	11.5	22.0			39	26	13			59.6	ML	Light olive-brown, sandy SILT
BH-10,S-5	12.5	14.0	18.6									SM	Yellowish-brown, silty SAND
BH-10,S-6b	16.0	16.5	26.5								62.6	ML	Olive, sandy SILT
BH-10,S-7	17.5	19.0	19.0									SM	Brown, silty SAND
BH-10,S-8	20.0	21.5	12.6						18.0	59.4	22.7	SM	Olive-brown, silty SAND with gravel
BH-11,S-1	2.5	4.0	10.8						35.6	61.2	3.1	SW	Olive-brown, well-graded SAND with gravel
BH-11,S-3	7.5	9.0	14.0									SP	Dark grayish-brown, poorly graded SAND with gravel
BH-11,S-5b	16.2	16.5	30.0			28	25	3			75.9	ML	Dark grayish-brown, SILT with sand
HH- 1,S-1	1.5	2.0	21.1							35.3	64.7	CL	Olive-brown, sandy lean CLAY

Notes: 1. This table summarizes information presented elsewhere in the report and should be used in conjunction with the report test, other graphs and tables, and the exploration logs.
2. The soil classifications in this table are based on ASTM D2487 and D2488 as applicable.

EXPLORATION DESIGNATION	TOP DEPTH (feet)	BOTTOM DEPTH (feet)	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	SPECIFIC GRAVITY	ATTERBERG LIMITS (%)			% GRAVEL	% SAND	% FINES	ASTM SOIL CLASSIFICATION	SAMPLE DESCRIPTION
						LL	PL	PI					
HH- 1,S-2	6.0	6.5	23.0									SM	Olive, silty SAND
HH- 1,S-3	8.0	8.5	36.0									SC	Brown, clayey SAND
HH- 2,S-1	2.0	2.5	24.8									CL	Olive-brown, sandy lean CLAY
HH- 3,S-1	4.4	4.9	16.8									SM	Light olive-brown, silty SAND
HH- 4,S-1	1.3	1.8	22.9									CL	Olive, sandy lean CLAY
HH- 4,S-2	4.2	4.7	25.1							39.1	60.9	ML	Olive, sandy SILT
HH- 5,S-1	7.9	8.3	22.7									ML	Light olive-brown, sandy SILT
HH- 6,S-1	4.6	5.1	19.9									CL	Olive, sandy lean CLAY
HH- 7,S-1	3.0	3.5	20.6									SC	Olive, clayey SAND
HH- 7,S-2	7.4	7.9	35.8									CL	Brown, lean CLAY with trace organics
HH- 8,S-1	2.4	2.9	20.7							35.2	64.8	CL	Olive, sandy lean CLAY
HH- 9,S-1	1.5	2.0	23.1									CL	Olive, sandy lean CLAY with trace organics
HH-10,S-1	7.0	7.5	25.3									CL	Olive, sandy lean CLAY
HH-11,S-1	5.0	5.5	39.0									CL	Olive, sandy lean CLAY

Notes: 1. This table summarizes information presented elsewhere in the report and should be used in conjunction with the report test, other graphs and tables, and the exploration logs.
2. The soil classifications in this table are based on ASTM D2487 and D2488 as applicable.

GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-01	S-10	30.0 - 31.5	(SP-SM) Dark grayish-brown, poorly graded SAND with silt and gravel	7				42.9	47.6			9.5
■	BH-02	S-4	10.0 - 11.5	(ML) Yellowish-brown, sandy SILT	24	34	26	8					54.4
▲	BH-03	S-5	12.5 - 14.0	(SM) Olive, silty SAND	19				0.0	52.5			47.5

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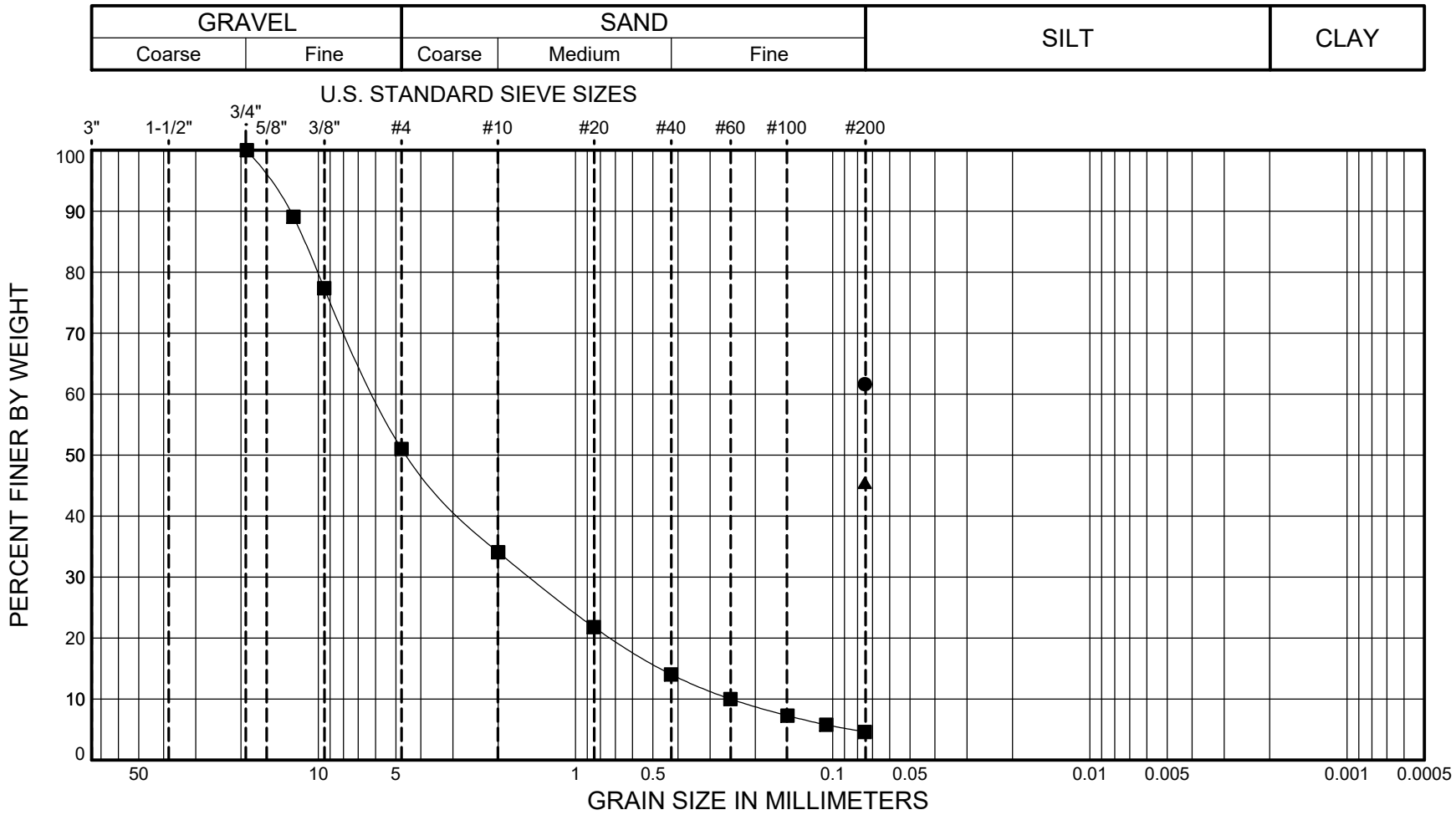
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

PARTICLE-SIZE ANALYSIS OF SOILS METHODS ASTM D6913/D7928/D1140

PROJECT NO.: 2022-144-21 FIGURE: B-4



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-05	S-2	5.0 - 6.5	(ML) Light olive-brown, sandy SILT	12								61.6
■	BH-05	S-5	12.5 - 14.0	(GW) Dark grayish-brown, well-graded GRAVEL with sand	6				49.0	46.4			4.6
▲	BH-09	S-3	7.5 - 9.0	(SC) Light olive-brown, clayey SAND	19	35	24	11					45.4

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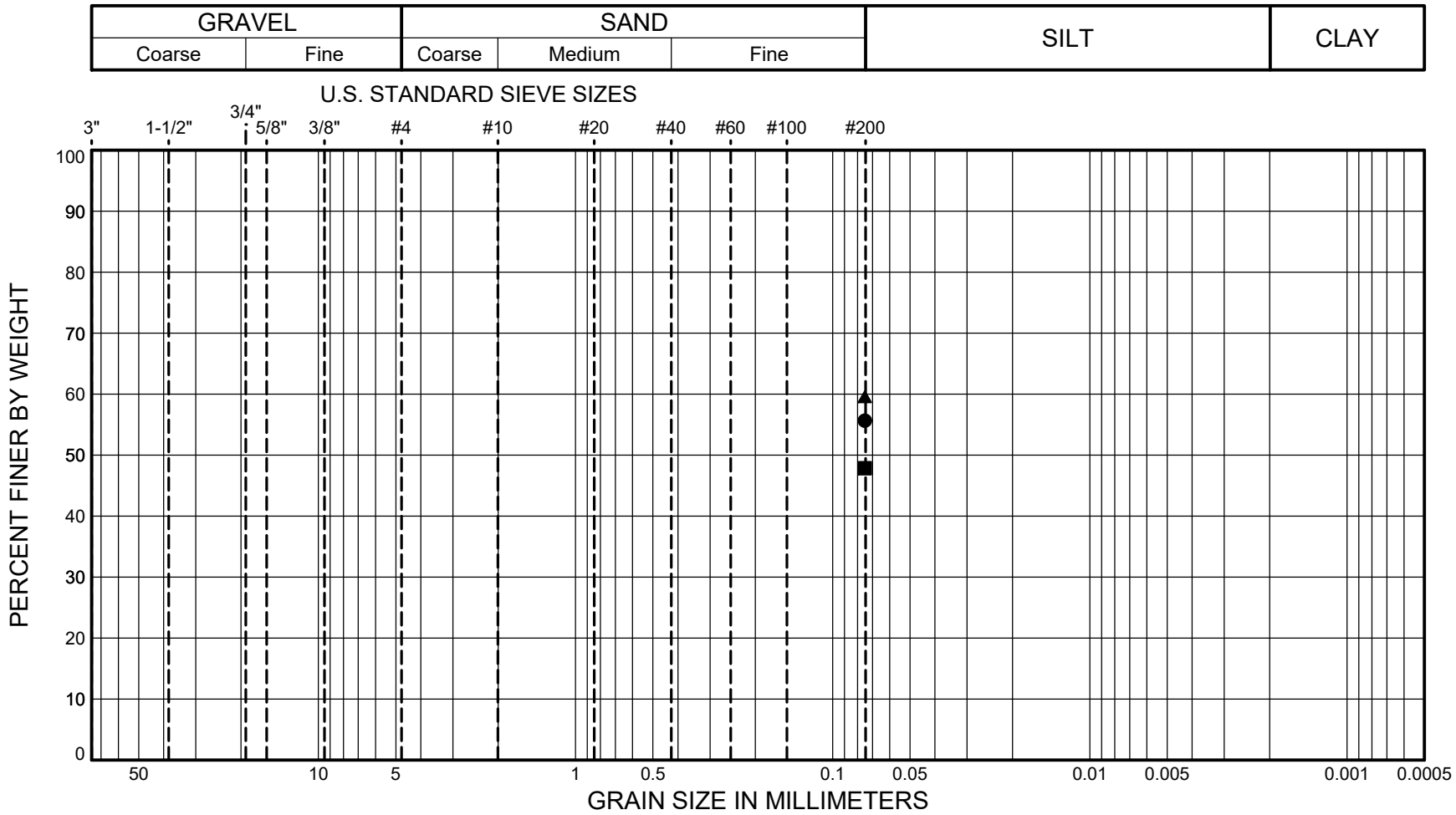
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

PARTICLE-SIZE ANALYSIS
OF SOILS
METHODS ASTM D6913/D7928/D1140

PROJECT NO.: 2022-144-21 FIGURE: B-5



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-09	S-5	12.5 - 14.0	(CL) Light olive-brown, sandy lean CLAY	25	35	23	12					55.6
■	BH-10	S-1	2.5 - 4.0	(SC) Light yellowish-brown, clayey SAND	15	36	24	12					47.8
▲	BH-10	S-4	10.0 - 11.5	(ML) Light olive-brown, sandy SILT	22	39	26	13					59.6

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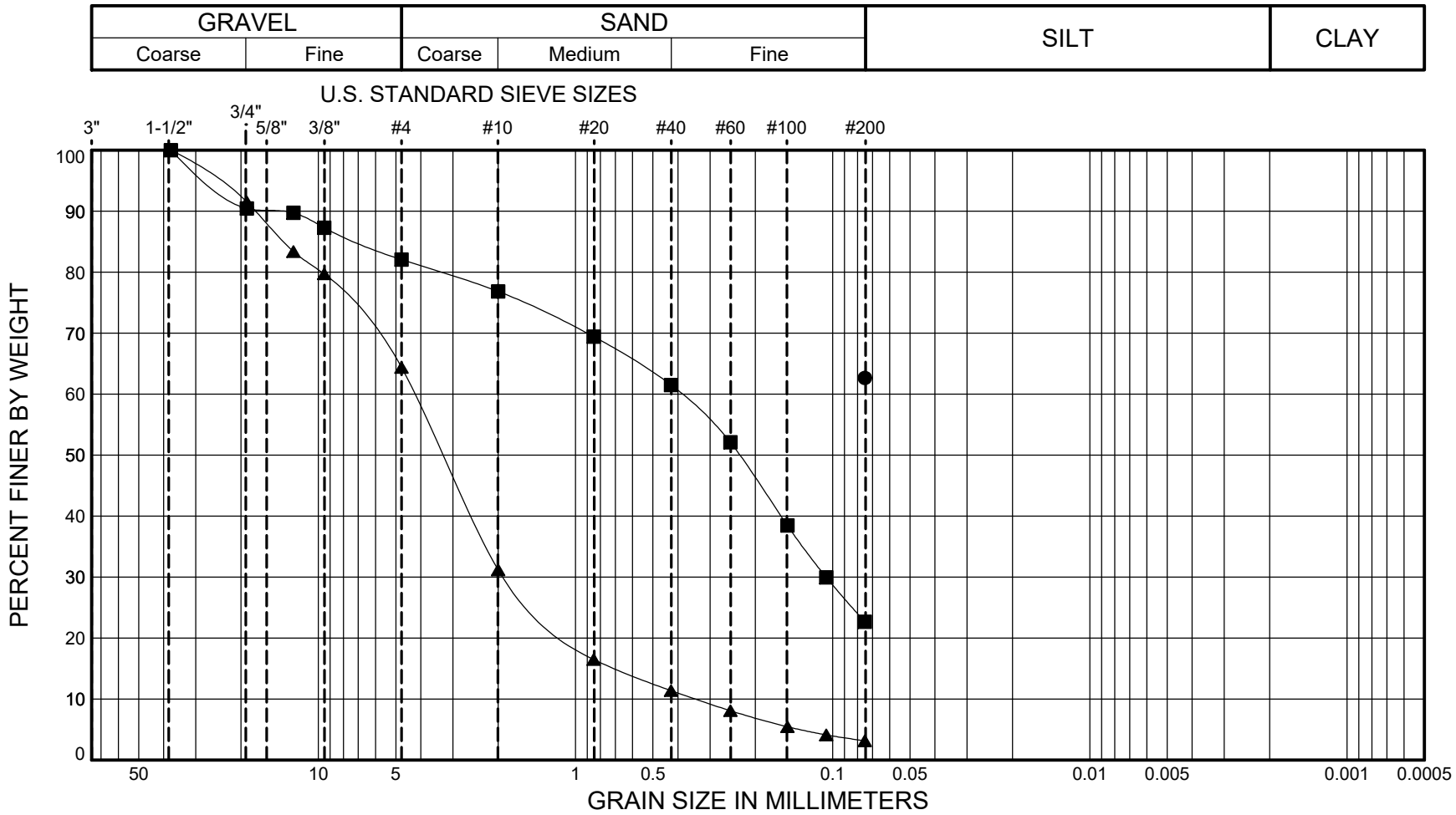
PARTICLE-SIZE ANALYSIS OF SOILS METHODS ASTM D6913/D7928/D1140

PROJECT NO.: 2022-144-21 FIGURE: B-6



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-10	S-6b	16.0 - 16.5	(ML) Olive, sandy SILT	27								62.6
■	BH-10	S-8	20.0 - 21.5	(SM) Olive-brown, silty SAND with gravel	13				18.0	59.4			22.7
▲	BH-11	S-1	2.5 - 4.0	(SW) Olive-brown, well-graded SAND with gravel	11				35.6	61.2			3.1

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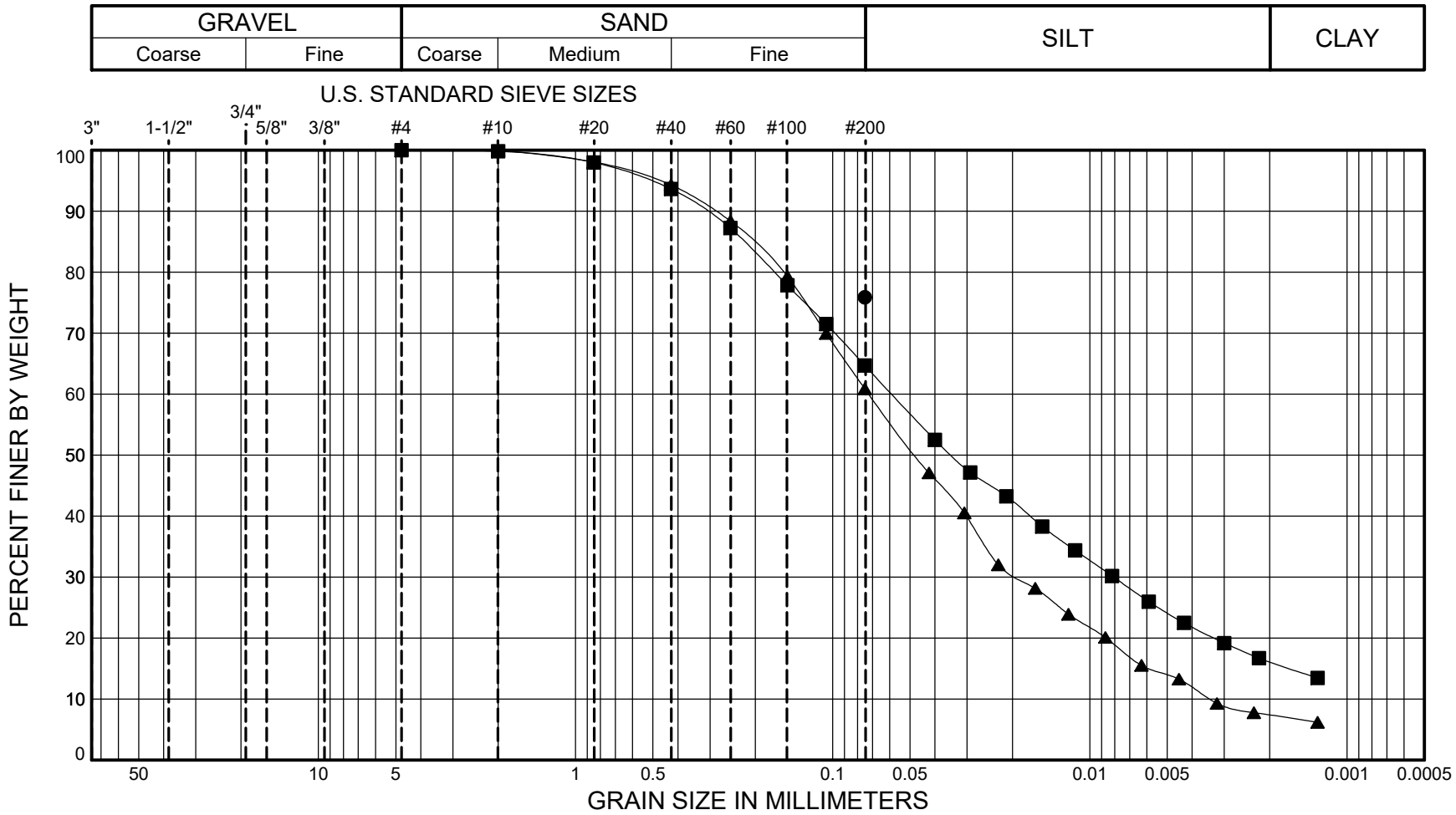
PARTICLE-SIZE ANALYSIS
OF SOILS
METHODS ASTM D6913/D7928/D1140

PROJECT NO.: 2022-144-21 FIGURE: B-7



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-11	S-5b	16.2 - 16.5	(ML) Dark grayish-brown, SILT with sand	30	28	25	3					75.9
■	HH- 1	S-1	1.5 - 2.0	(CL) Olive-brown, sandy lean CLAY	21					35.3	48.6	16.1	
▲	HH- 4	S-2	4.2 - 4.7	(ML) Olive, sandy SILT	25					39.1	53.5	7.4	

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Yakama Nation Nason Creek Floodplain
SR 207 Reroute
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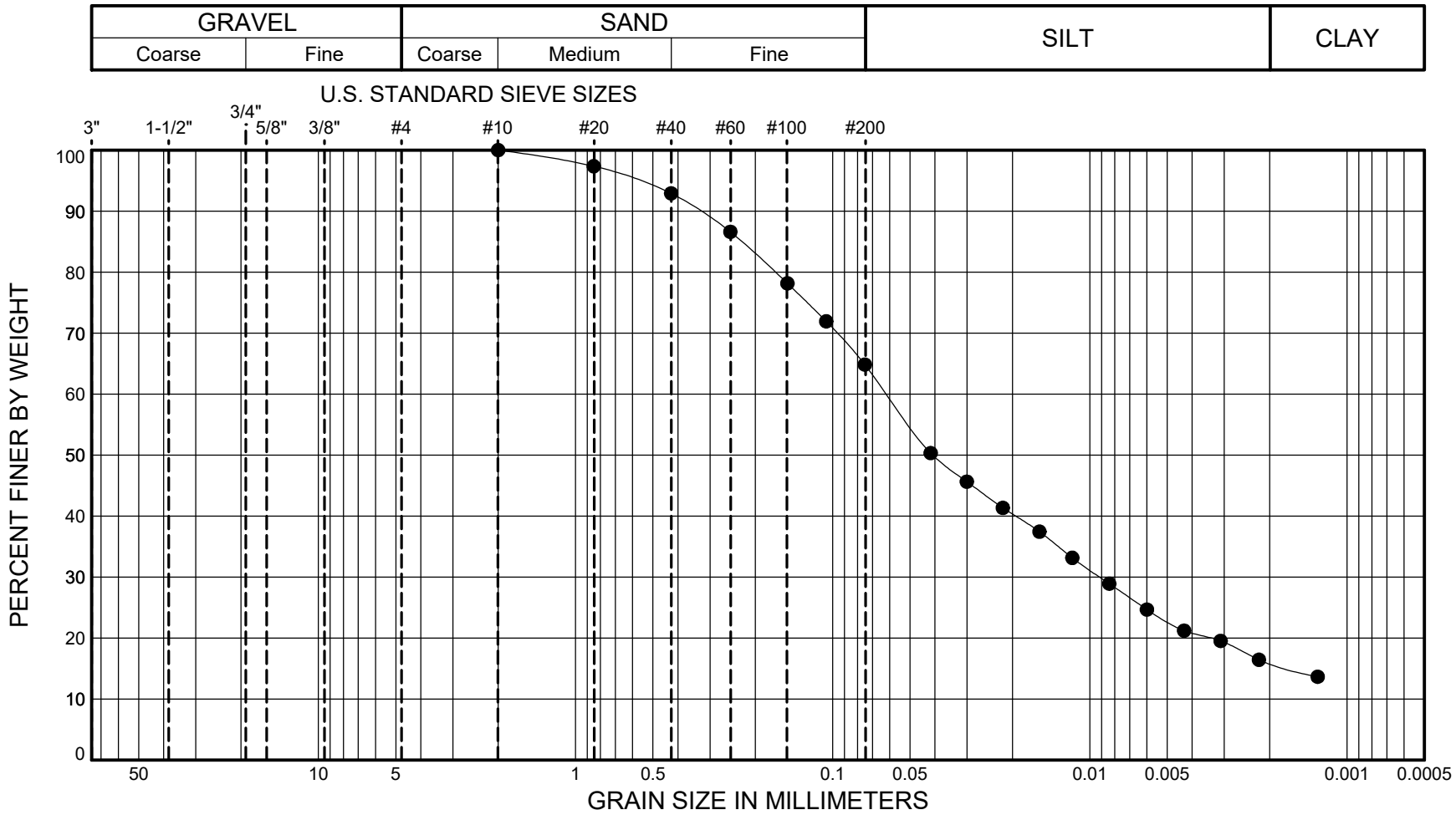
PARTICLE-SIZE ANALYSIS
OF SOILS
METHODS ASTM D6913/D7928/D1140

PROJECT NO.: 2022-144-21 FIGURE: B-8



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	HH- 8	S-1	2.4 - 2.9	(CL) Olive, sandy lean CLAY	21					35.2	48.9	15.9	

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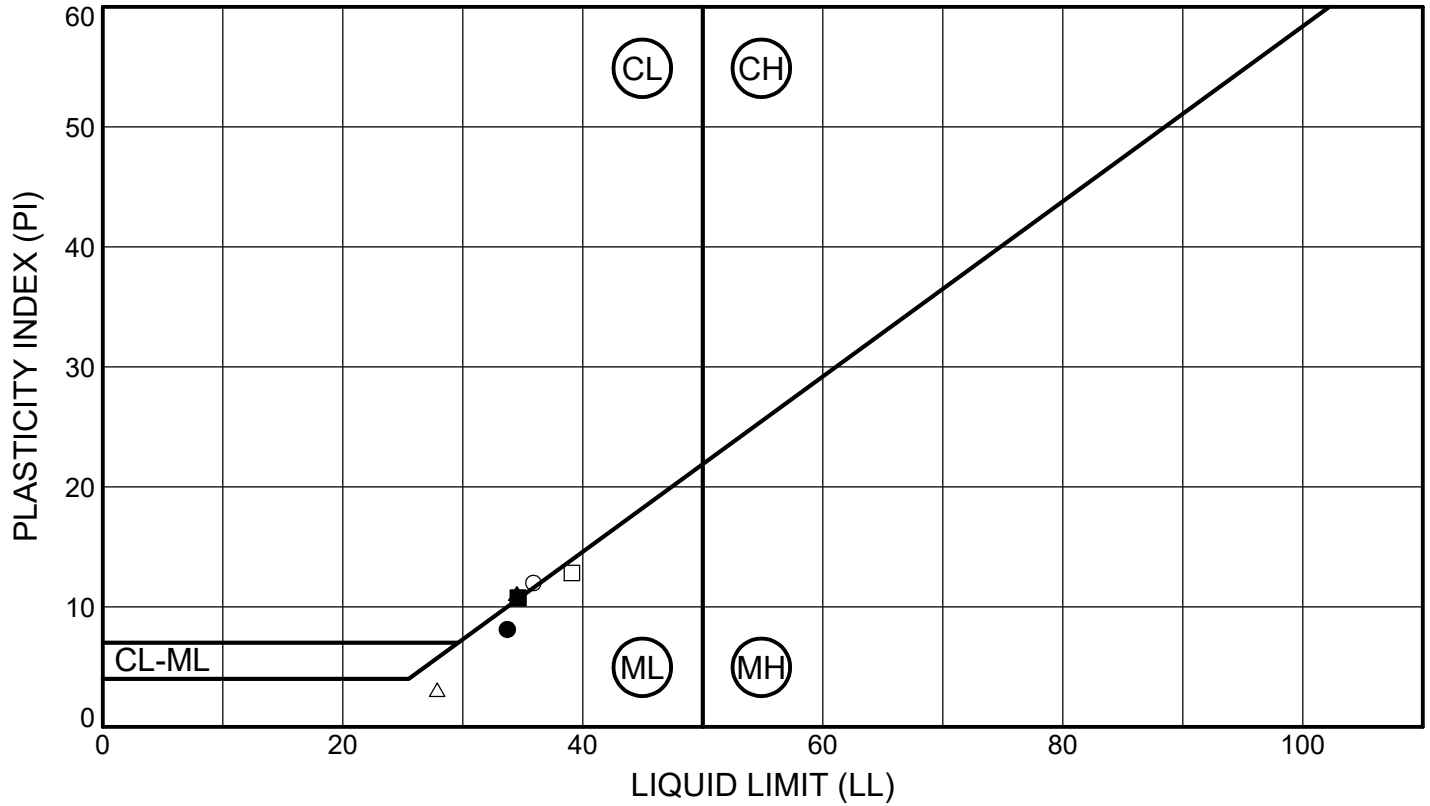
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

PARTICLE-SIZE ANALYSIS
OF SOILS
METHODS ASTM D6913/D7928/D1140

PROJECT NO.: 2022-144-21 FIGURE: B-9



SYMBOL	SAMPLE		DEPTH (ft)	CLASSIFICATION	% MC	LL	PL	PI	% Fines
●	BH-02	S-4	10.0 - 11.5	(ML) Yellowish-brown, sandy SILT	24	34	26	8	54.4
■	BH-09	S-3	7.5 - 9.0	(SC) Light olive-brown, clayey SAND	19	35	24	11	45.4
▲	BH-09	S-5	12.5 - 14.0	(CL) Light olive-brown, sandy lean CLAY	25	35	23	12	55.6
○	BH-10	S-1	2.5 - 4.0	(SC) Light yellowish-brown, clayey SAND	15	36	24	12	47.8
□	BH-10	S-4	10.0 - 11.5	(ML) Light olive-brown, sandy SILT	22	39	26	13	59.6
△	BH-11	S-5b	16.2 - 16.5	(ML) Dark grayish-brown, SILT with sand	30	28	25	3	75.9

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Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS
METHOD ASTM D4318

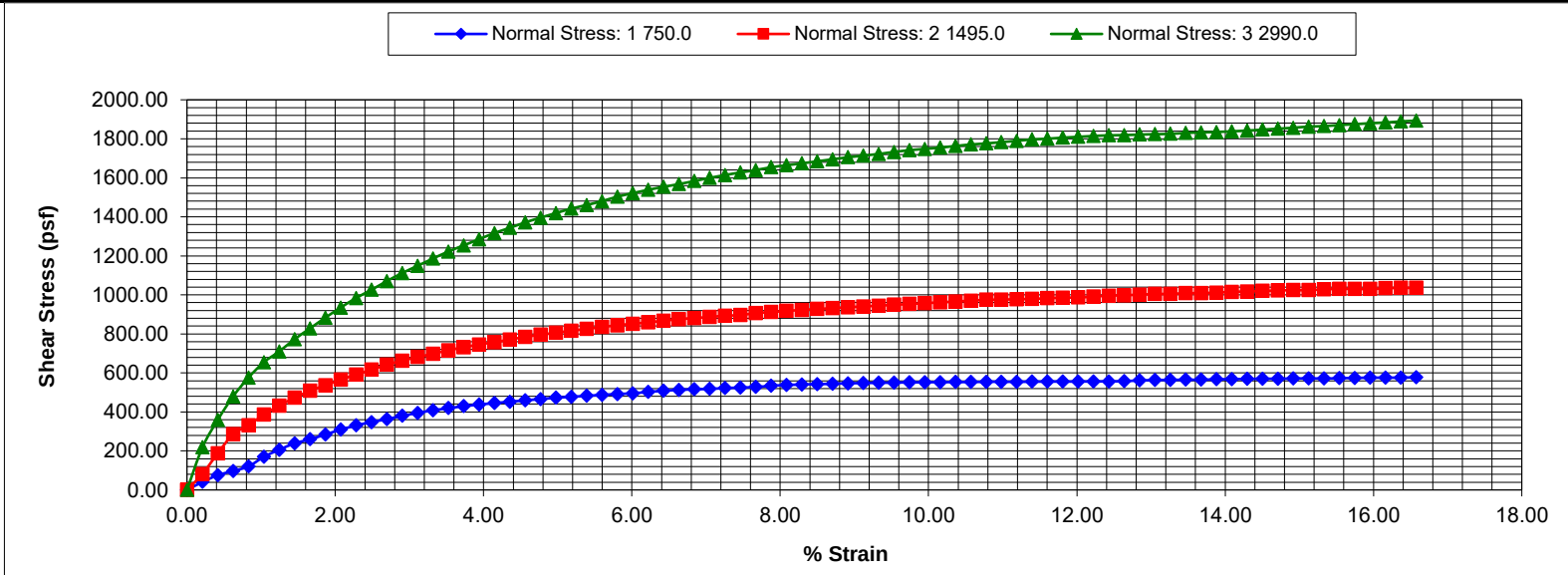
PROJECT NO.: 2022-144-21 FIGURE: B-10

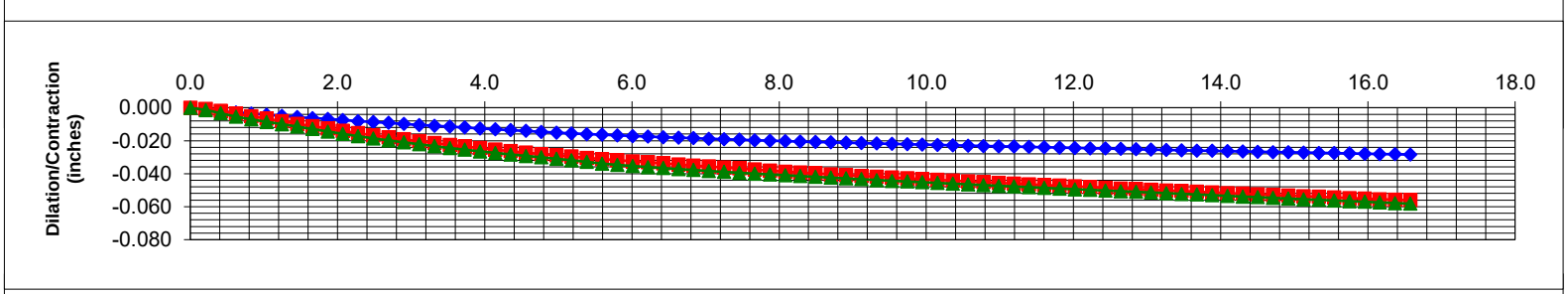
HWA GEOSCIENCES INC. Materials Testing Laboratory

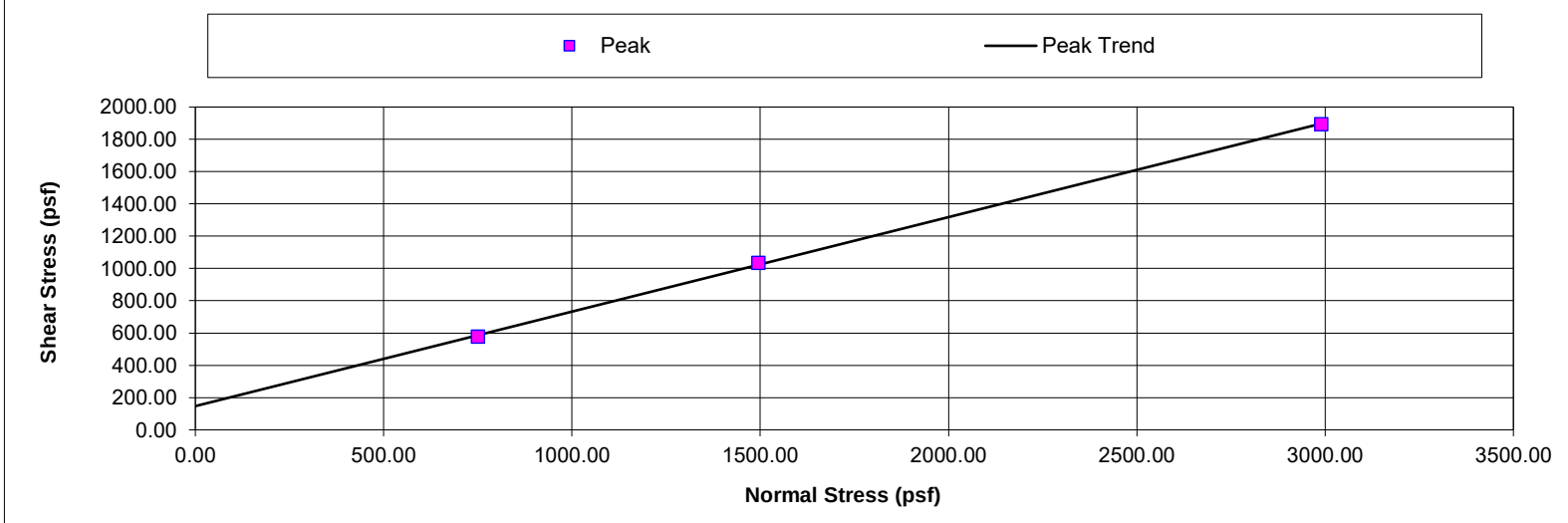
Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D 3080)

Project Name:	Nason Creek Floodplain	**Project Number:**	2022-144
Sample Point:	BH-2 **Sample No.:** S-5	**Sample Depth:**	12.5
Soil Description:	Olive-brown, clayey SAND		
Soil Color:	Olive-brown	Average Strain Rate:	0.5 % per min.
Soil Group Symbol:	SC	Soil Specific Gravity:	2.65 (assumed)

					Indicated Strength Parameters		
Normal Stress (psf)	750.00	1495.00	2990.00	**Average**			
Peak Stress (psf)	577.35	1035.57	1892.98			Cohesion psf	phi Angle (degrees)
Initial Moisture Content (%):	23.3	23.3	23.3	23.3			
Wet Unit Weight (pcf):	111.2	111.1	110.5	110.9			
Dry Unit Weight (pcf):	90.2	90.1	89.6	90.0	Peak	147.2	30.3
Calculated Void Ratio	0.833	0.835	0.845	0.838			
Calculated Porosity	0.454	0.455	0.458	0.456			
Calculated Saturation (%)	74.1	73.9	73.0	73.7			
Final Moisture Content (%)	28.5	27.9	24.5	27.0			







Checked By: SEG Figure B-11

HWA GEOSCIENCES INC. Materials Testing Laboratory

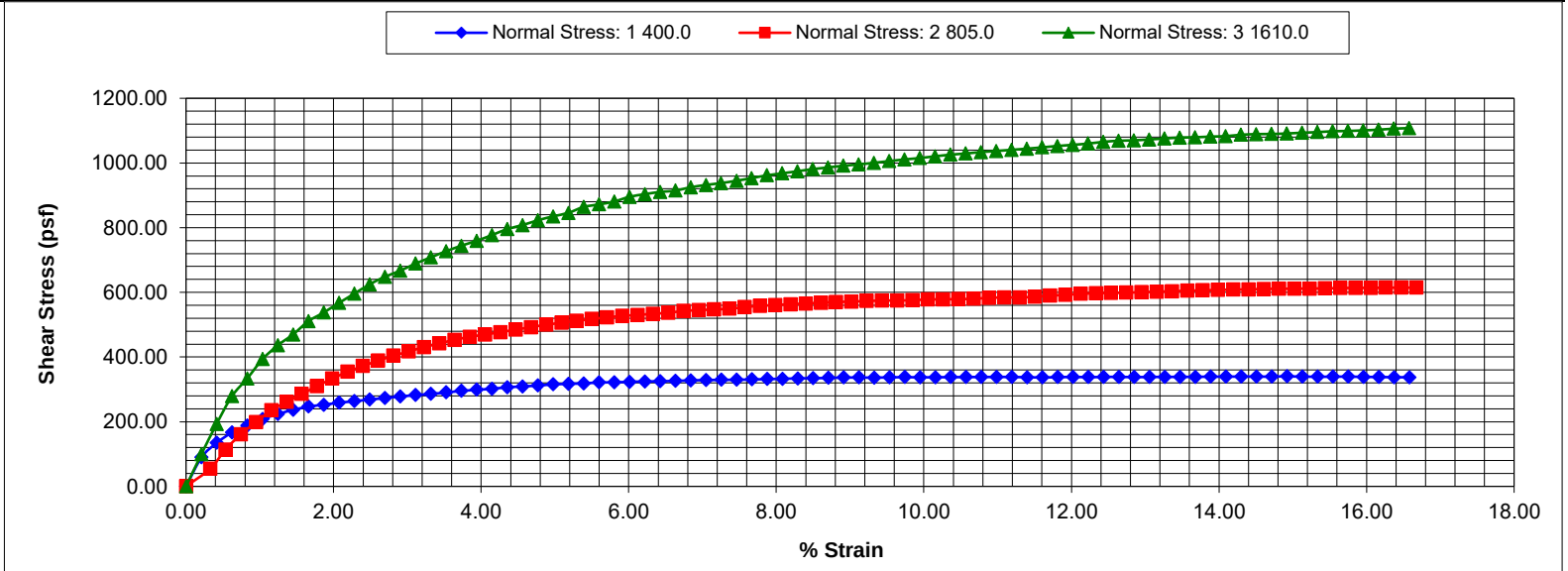
Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D 3080)

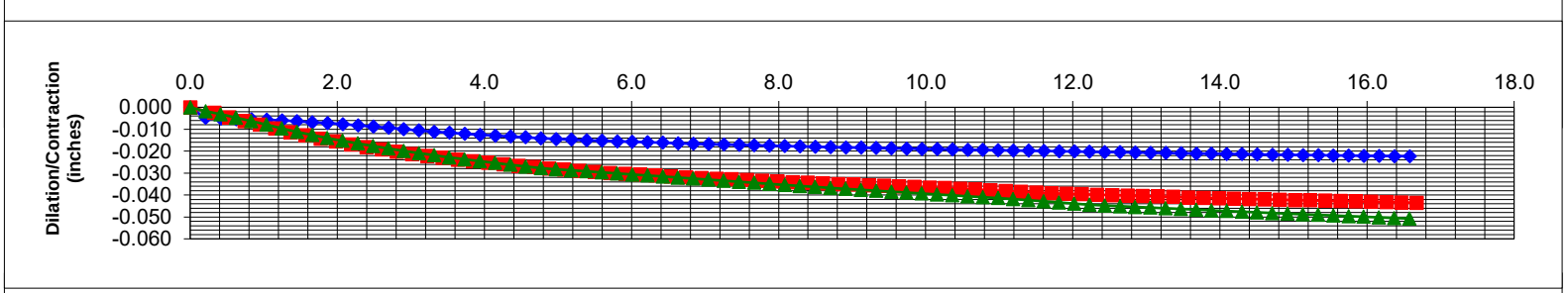
Project Name:	Nason Creek Floodplain	**Project Number:**	2022-144
Sample Point:	BH-4 **Sample No.:** S-2	**Sample Depth:**	5.0
Soil Description:	Olive-brown, lean CLAY with sand		
Soil Color:	Olive-brown	Average Strain Rate:	0.5 % per min.
Soil Group Symbol:	CL	Soil Specific Gravity:	2.65 (assumed)

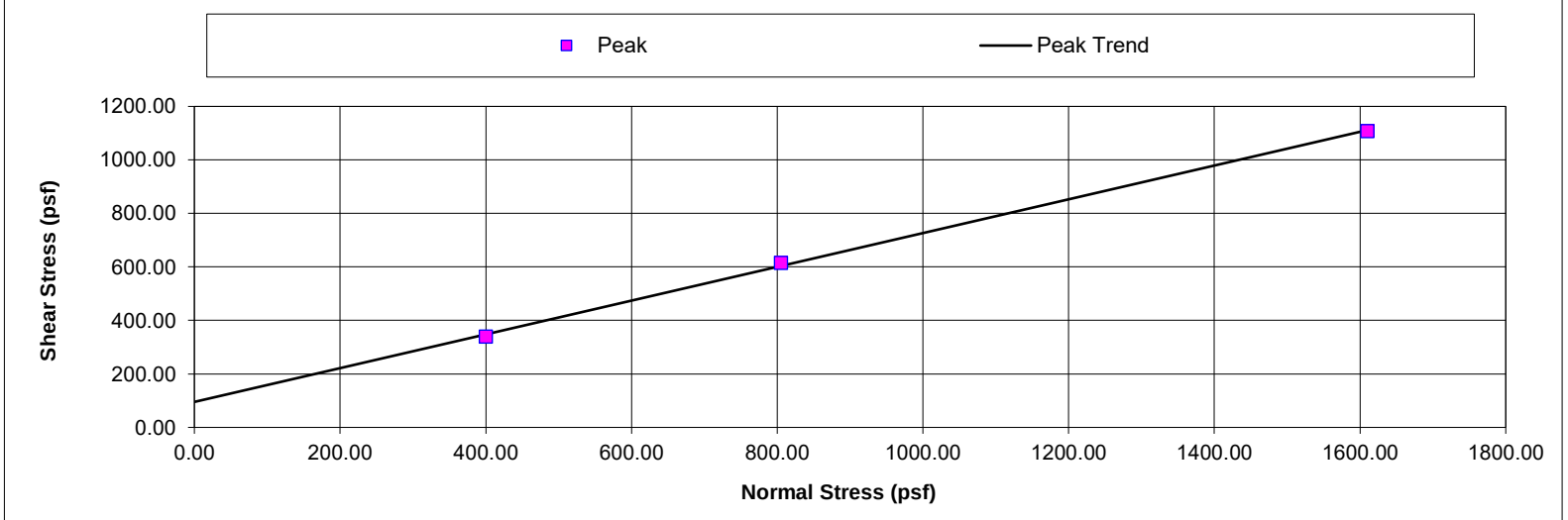
Normal Stress (psf)	400.00	805.00	1610.00	**Average**
Peak Stress (psf)	340.20	614.78	1107.60	
Initial Moisture Content (%):	26.4	26.4	26.4	26.4
Wet Unit Weight (pcf):	108.1	107.0	106.8	107.3
Dry Unit Weight (pcf):	85.5	84.6	84.5	84.9
Calculated Void Ratio	0.934	0.954	0.957	0.948
Calculated Porosity	0.483	0.488	0.489	0.487
Calculated Saturation (%)	75.0	73.4	73.2	73.9
Final Moisture Content (%)	29.8	29.2	27.1	28.7

Indicated Strength Parameters

	Cohesion psf	phi Angle (degrees)
Peak	95.3	32.3



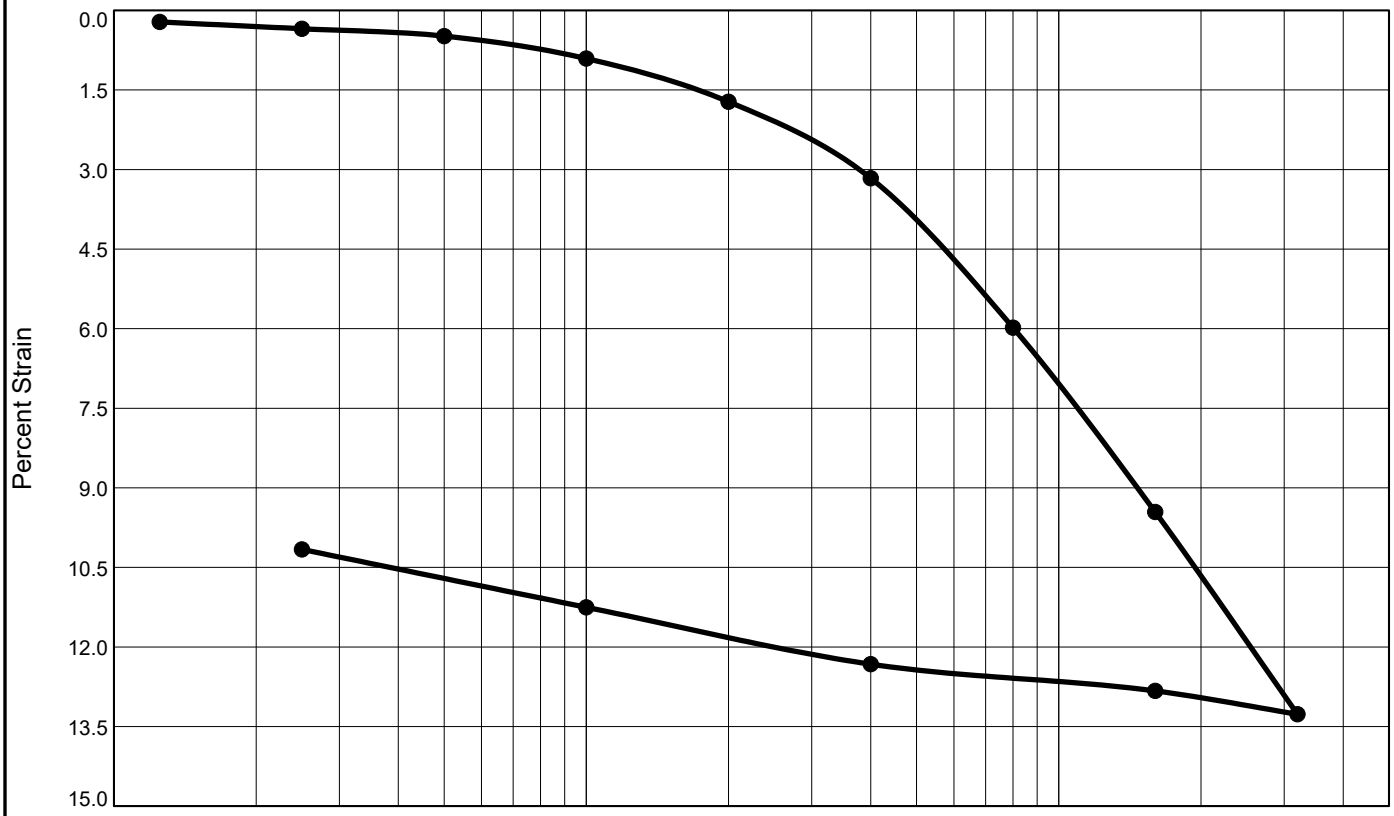


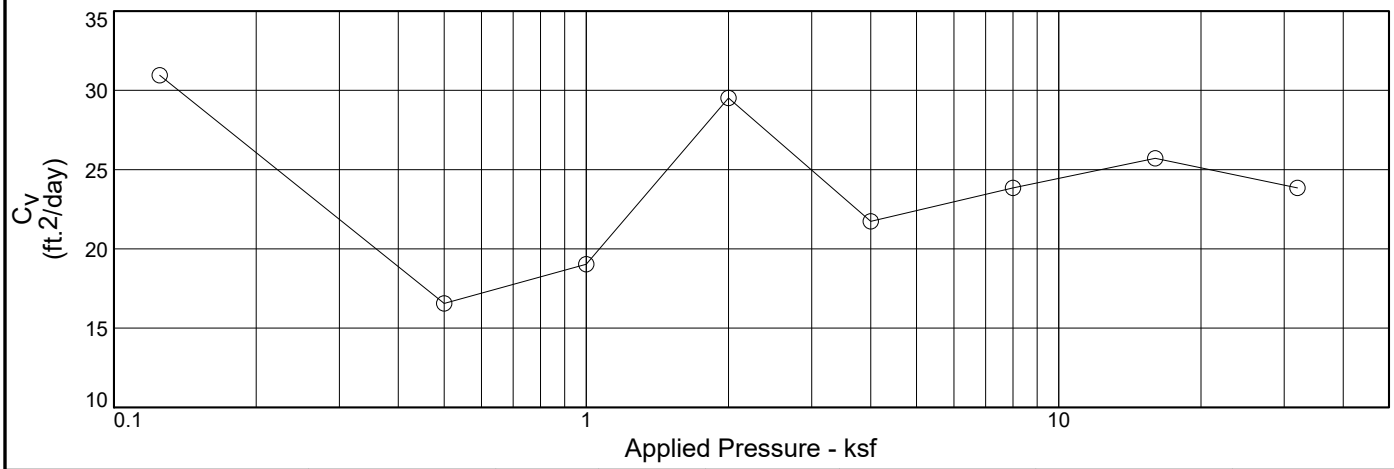


Checked By: SEG

Figure B-12

CONSOLIDATION TEST REPORT





Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
84.9 %	26.3 %	88.6			2.65	CL		0.822

MATERIAL DESCRIPTION

Olive-brown, lean CLAY with sand

Project No. 2022-144 **Client:**

Project: Yakama Nation Nason Creek Floodplain

Source of Sample: BH-4 **Depth:** 5.0 **Sample Number:** S-2

Remarks:
Assumed Specific Gravity

HWA | GEOSCIENCES INC. DBE/MWBE

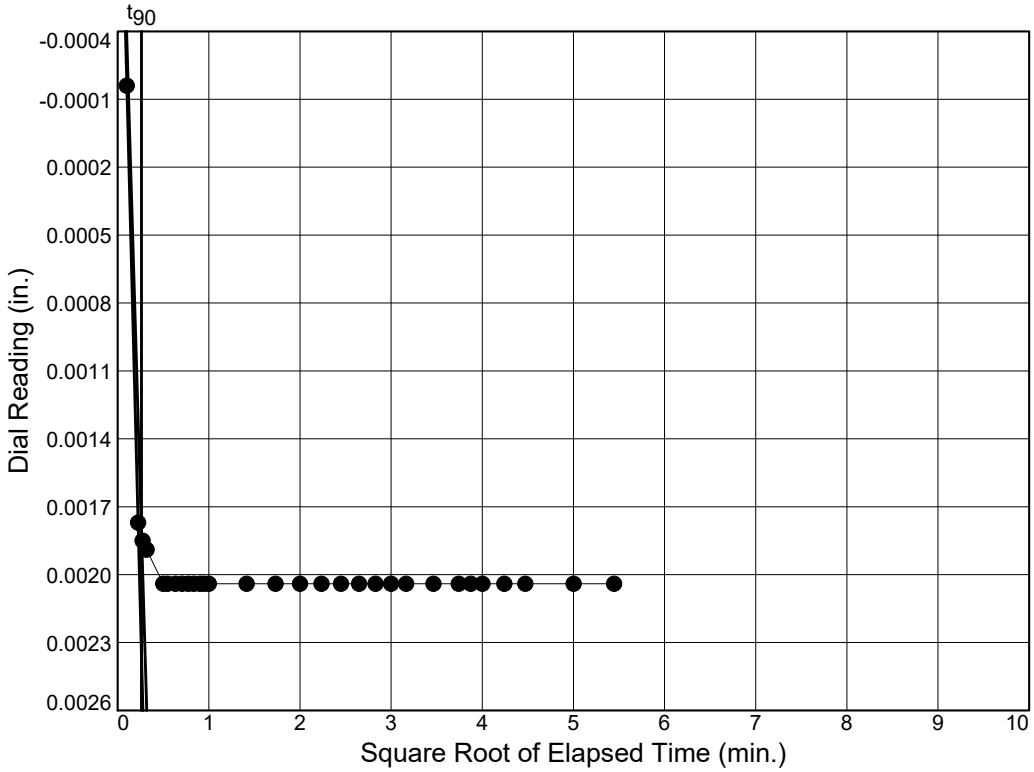
Figure B-13

Tested By: AH **Checked By:** SEG

Dial Reading vs. Time

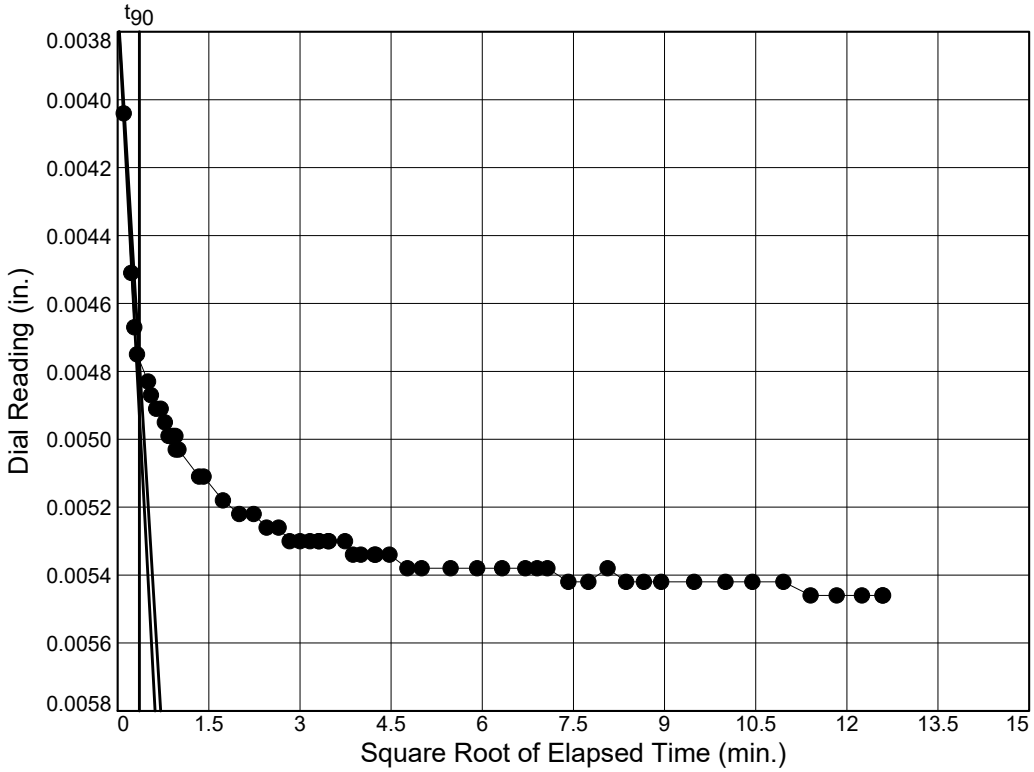
Project No.: 2022-144
Project: Yakama Nation Nason Creek Floodplain

Source of Sample: BH-4 Depth: 5.0 Sample Number: S-2



Load No.= 1
Load= 0.13 ksf
D_0 = -0.0017
D_{90} = 0.0018
D_{100} = 0.0022
T_{90} = 0.07 min.

C_v @ T_{90}
30.950 ft.^{2}/day



Load No.= 3
Load= 0.50 ksf
D_0 = 0.0037
D_{90} = 0.0048
D_{100} = 0.0049
T_{90} = 0.13 min.

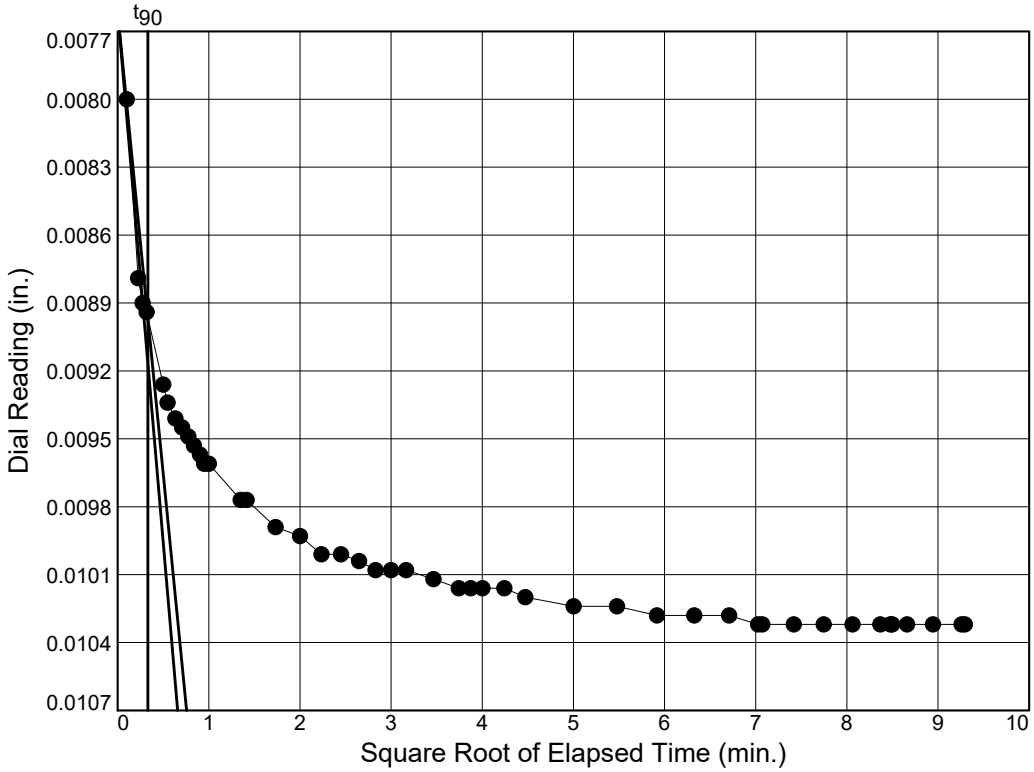
C_v @ T_{90}
16.564 ft.^{2}/day

Figure B-14

Dial Reading vs. Time

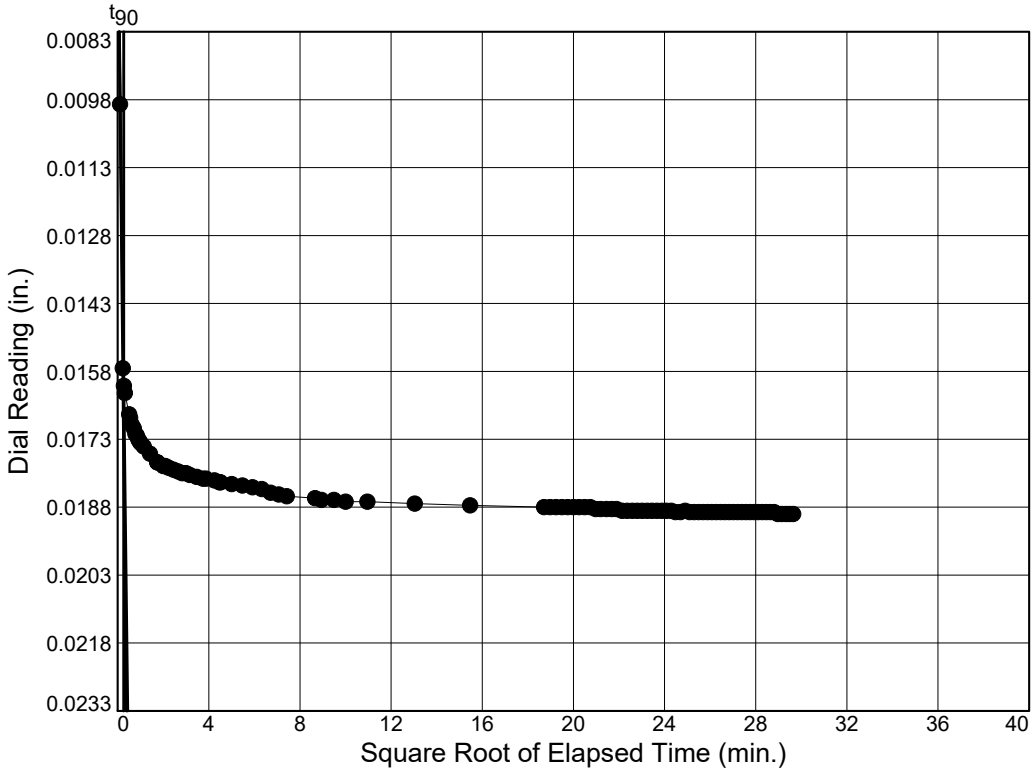
Project No.: 2022-144
Project: Yakama Nation Nason Creek Floodplain

Source of Sample: BH-4 Depth: 5.0 Sample Number: S-2



Load No.= 4
Load= 1.00 ksf
D_0 = 0.0076
D_{90} = 0.0090
D_{100} = 0.0091
T_{90} = 0.11 min.

C_v @ T_{90}
19.029 ft.^{2}/day



Load No.= 5
Load= 2.00 ksf
D_0 = 0.0052
D_{90} = 0.0161
D_{100} = 0.0173
T_{90} = 0.07 min.

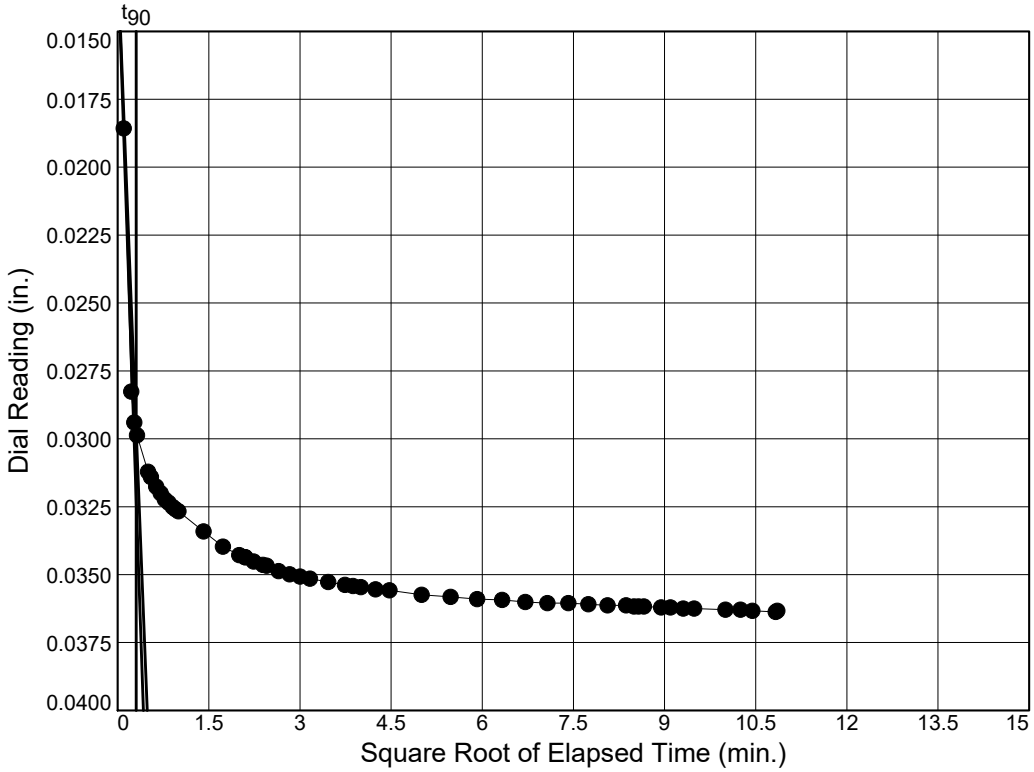
C_v @ T_{90}
29.521 ft.^{2}/day

Figure B-15

Dial Reading vs. Time

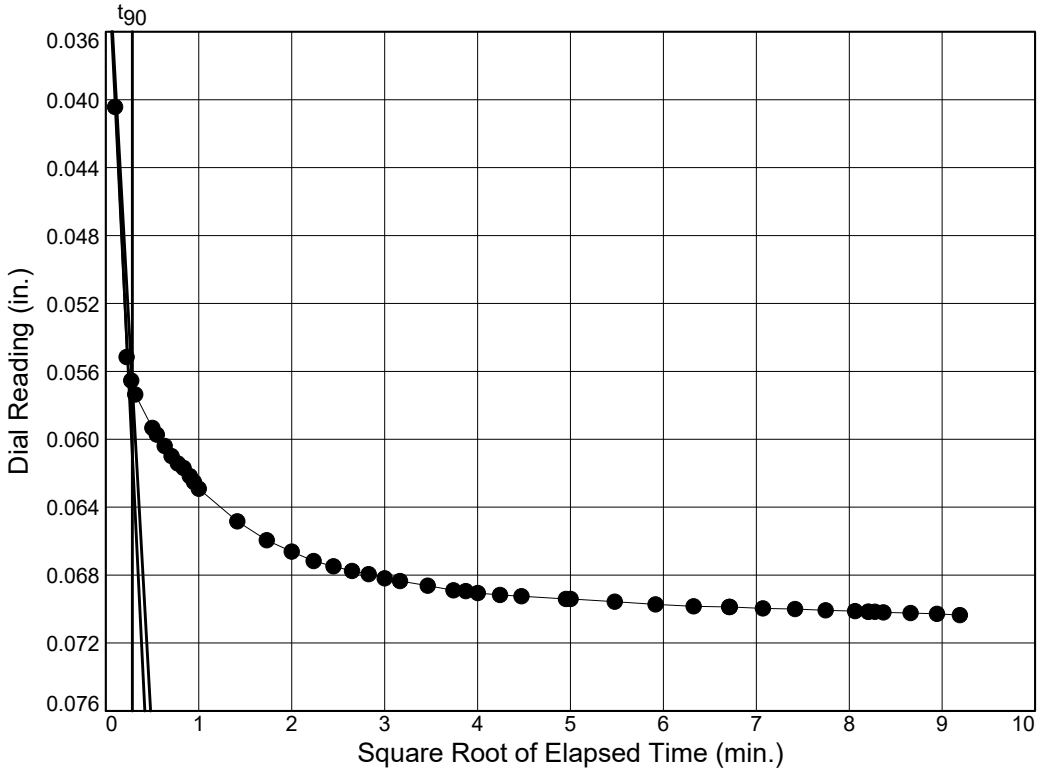
Project No.: 2022-144
Project: Yakama Nation Nason Creek Floodplain

Source of Sample: BH-4 Depth: 5.0 Sample Number: S-2



Load No.= 6
Load= 4.00 ksf
D_0 = 0.0124
D_{90} = 0.0298
D_{100} = 0.0317
T_{90} = 0.09 min.

C_v @ T_{90}
21.735 ft.^{2}/day



Load No.= 7
Load= 8.00 ksf
D_0 = 0.0289
D_{90} = 0.0568
D_{100} = 0.0598
T_{90} = 0.08 min.

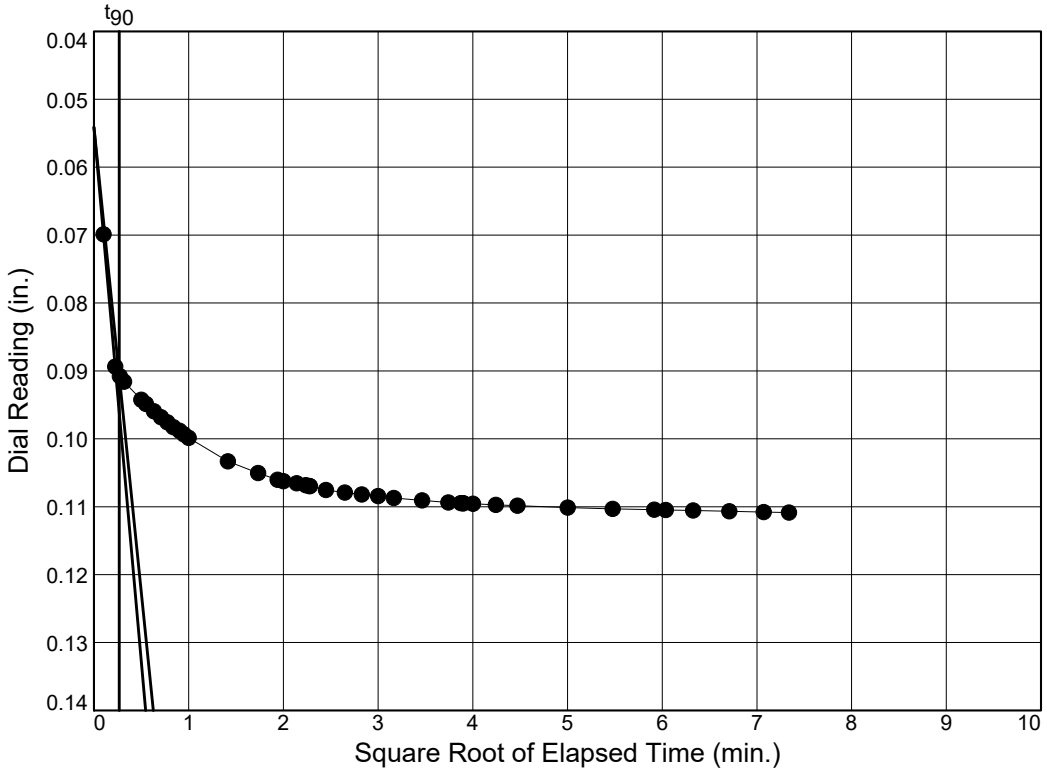
C_v @ T_{90}
23.850 ft.^{2}/day

Figure B-16

Dial Reading vs. Time

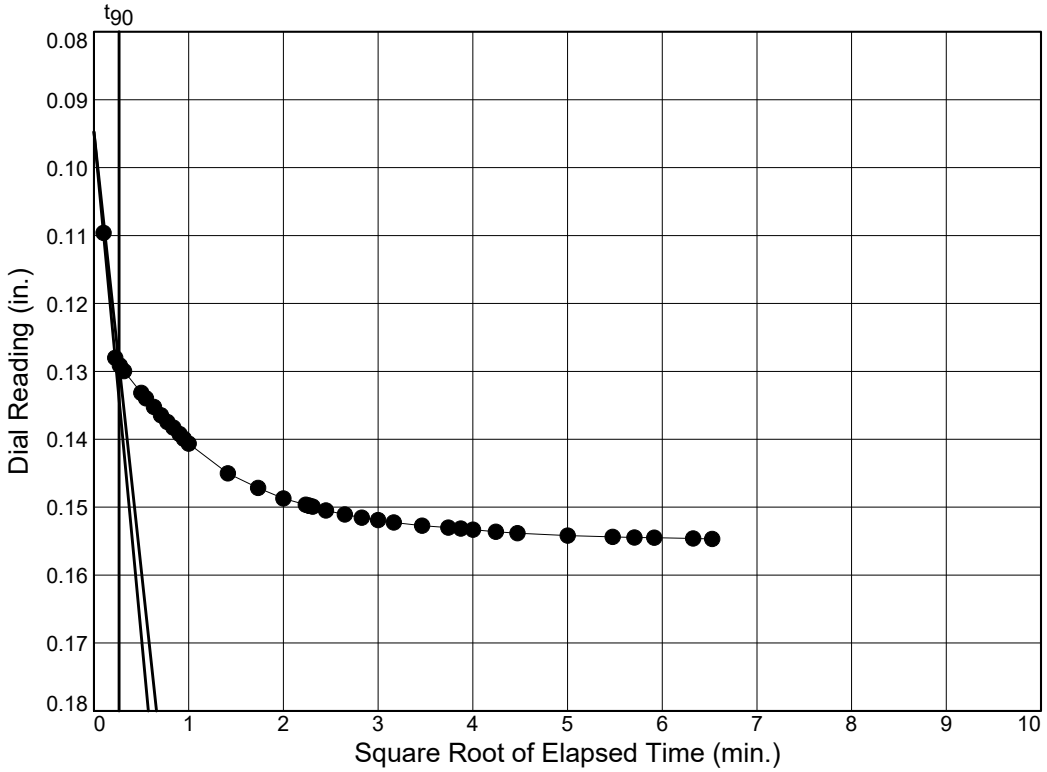
Project No.: 2022-144
Project: Yakama Nation Nason Creek Floodplain

Source of Sample: BH-4 Depth: 5.0 Sample Number: S-2



Load No.= 8
Load= 16.00 ksf
D_0 = 0.0541
D_{90} = 0.0906
D_{100} = 0.0946
T_{90} = 0.07 min.

C_v @ T_{90}
25.718 ft.^{2}/day



Load No.= 9
Load= 32.00 ksf
D_0 = 0.0947
D_{90} = 0.1289
D_{100} = 0.1327
T_{90} = 0.07 min.

C_v @ T_{90}
23.843 ft.^{2}/day

Figure B-17

APPENDIX D

Operations and Maintenance

Table 5-10 Maintenance standards for detention ponds.

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and debris	Accumulations exceed 5 cubic feet (about equal to the amount of trash needed to fill one standard-size garbage can) per 1,000 square feet. In general, there should be no visual evidence of dumping. If less than threshold, all trash and debris will be removed as part of the next scheduled maintenance.	Trash and debris are cleared from site.
	Poisonous vegetation and noxious weeds	Poisonous or nuisance vegetation may constitute a hazard to maintenance personnel or the public. Noxious weeds as defined by state or local regulations are evident. (Apply requirements of adopted integrated pest management [IPM] policies for the use of herbicides).	No danger is posed by poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with local health department.) Complete eradication of noxious weeds may not be possible. Compliance with state or local eradication policies is required.
	Contaminants and pollution	Oil, gasoline, contaminants, or other pollutants are evident. (Coordinate removal/cleanup with local water quality response agency.)	No contaminants or pollutants are present.
	Rodent holes	For facilities acting as a dam or berm: rodent holes are evident or there is evidence of water piping through dam or berm via rodent holes.	Rodents are destroyed and dam or berm repaired. (Coordinate with local health department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)
	Beaver dams	Dam results in change or function of the facility.	Facility is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies.)
	Insects	Insects such as wasps and hornets interfere with maintenance activities.	Insects are destroyed or removed from site. Insecticides are applied in compliance with adopted IPM policies.
	Tree growth and hazard trees	Tree growth does not allow maintenance access or interferes with maintenance activity (slope mowing, silt removal, vactoring, or equipment movements). If trees are not interfering with access or maintenance, do not remove. Dead, diseased, or dying trees are observed. (Use a certified arborist to determine health of tree or removal requirements.)	Trees do not hinder maintenance activities. Harvested trees can be processed or converted to mulch and either kept on site where it can be used as needed around the BMP, or taken off site. Hazard trees are removed.
Side slopes of pond	Erosion	Eroded damage is over 2 inches deep and cause of damage is still present, or there is potential for continued erosion. Erosion is observed on a compacted berm embankment.	Slopes are stabilized using appropriate erosion control measures (such as rock reinforcement, planting of grass, and compaction). If erosion is occurring on compacted berms, a licensed civil engineer should be consulted to resolve source of erosion.

Table 5-10 Maintenance standards for detention ponds (continued).

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Storage area	Sediment	Accumulated sediment exceeds 10% of the designed pond depth, unless otherwise specified, or affects inletting or outletting condition of the facility.	Sediment is cleaned out to designed pond shape and depth. Pond is reseeded if necessary to control erosion.
	Liner (if applicable)	Liner is visible and has more than three ¼-inch holes in it.	Liner is repaired or replaced. Liner is fully covered.
Pond berms (dikes)	Settlements	Any part of berm has settled 4 inches lower than the design elevation. (If settlement is apparent, measure berm to determine amount of settlement.) Settling can be an indication of more severe problems with the berm or outlet works. A licensed civil engineer should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.
	Piping	Water flow is discernible through pond berm. Ongoing erosion is observed, with potential for erosion to continue. (Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.)	Piping is eliminated. Erosion potential is resolved.
Emergency overflow/ spillway and berms over 4 feet high	Tree growth	Tree growth on emergency spillways reduces spillway conveyance capacity and may cause erosion elsewhere on the pond perimeter due to uncontrolled overtopping. Tree growth on berms over 4 feet high may lead to piping through the berm, which could lead to failure of the berm and related erosion or flood damage.	Trees should be removed. If root system is small (base less than 4 inches), the root system may be left in place; otherwise, the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
	Piping	Water flow is discernible through pond berm. Ongoing erosion is observed, with potential for erosion to continue. (Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.)	Piping is eliminated. Erosion potential is resolved.
Emergency overflow/ spillway	Spillway lining insufficient	Only one layer of rock exists above native soil in area 5 square feet or larger, or native soil is exposed at the top of outflow path of spillway. (Riprap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.

Table 5-11 Maintenance standards for bioinfiltration ponds/infiltration trenches/basins.

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and debris	See Table 5-23 (wet ponds).	See Table 5-23 (wet ponds).
	Poisonous/noxious vegetation	See Table 5-23 (wet ponds).	See Table 5-23 (wet ponds).
	Contaminants and pollution	See Table 5-23 (wet ponds).	See Table 5-23 (wet ponds).
	Rodent holes	See Table 5-23 (wet ponds).	See Table 5-23 (wet ponds).
Storage area	Sediment	Water ponds in infiltration pond after rainfall ceases and appropriate time has been allowed for infiltration. (A percolation test pit or test of facility indicates facility is working at only 90% of its designed capabilities. If 2 inches or more of sediment present, remove sediment).	Sediment is removed or facility is cleaned so that infiltration system works according to design.
Rock filters	Sediment and debris	By visual inspection, little or no water flows through filter during heavy rainstorms.	Gravel in rock filter is replaced.
Side slopes of pond	Erosion	See Table 5-23 (wet ponds).	See Table 5-23 (wet ponds).
Emergency overflow/spillway and berms over 4 feet high	Tree growth	See Table 5-23 (wet ponds).	See Table 5-23 (wet ponds).
	Piping	See Table 5-23 (wet ponds).	See Table 5-23 (wet ponds).
Emergency overflow/spillway	Rock missing	See Table 5-23 (wet ponds).	See Table 5-23 (wet ponds).
	Erosion	See Table 5-23 (wet ponds).	See Table 5-23 (wet ponds).
Presettling ponds and vaults	Facility or sump filled with sediment or debris	Sediment/debris exceeds 6 inches or designed sediment trap depth.	Sediment is removed.

Table 5-12 Maintenance standards for closed treatment systems (tanks/vaults).

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Storage area	Plugged air vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.	Vents are open and functioning.
	Debris and sediment	Accumulated sediment depth exceeds 10% of the diameter of the storage area for ½ length of storage vault or any point depth exceeds 15% of diameter. (Example: 72-inch storage tank requires cleaning when sediment reaches depth of 7 inches for more than ½ the length of the tank.)	All sediment and debris are removed from storage area.
	Joints between tank/pipe section	Openings or voids allow material to be transported into facility. (Will require engineering analysis to determine structural stability.)	All joints between tank/pipe sections are sealed.
	Tank/pipe bent out of shape	Any part of tank/pipe is bent out of shape for more than 10% of its design shape. (Review required by engineer to determine structural stability.)	Tank/pipe is repaired or replaced to design specifications.
	Vault structure: includes cracks in walls or bottom, damage to frame or top slab	Cracks are wider than ½ inch and there is evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault is replaced or repaired to design specifications and is structurally sound.
		Cracks are wider than ½ inch at the joint of any inlet/outlet pipe, or there is evidence of soil particles entering the vault through the walls.	No cracks are more than ¼-inch wide at the joint of the inlet/outlet pipe.
Manhole	Cover not in place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Locking mechanism not working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than ½ inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Cover difficult to remove	One maintenance person cannot remove lid after applying normal lifting pressure. *Intent: To prevent cover from sealing off access to maintenance.*	Cover can be removed and reinstalled by one maintenance person.
	Ladder unsafe	Ladder is unsafe due to missing rungs, misalignment, unsecure attachment to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch basins	See Table 5-15 (catch basins).	See Table 5-15 (catch basins).	See Table 5-15 (catch basins).

Table 5-13 Maintenance standards for control structure/flow restrictor.

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and debris (includes sediment)	Accumulation exceeds 25% of sump depth or is within 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris are removed.
	Structural damage	Structure is not securely attached to manhole wall.	Structure is securely attached to wall and outlet pipe.
		Structure is not in upright position; allow up to 10% from plumb.	Structure is in correct position.
		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are watertight; structure is repaired or replaced and works as designed.
		Holes other than designed holes are observed in the structure.	Structure has no holes other than designed holes.
Cleanout gate	Damaged or missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
		Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
		Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards.
Orifice plate	Damaged or missing	Control device is not working properly due to missing, out-of-place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Trash, debris, sediment, or vegetation blocks the plate.	Plate is free of all obstructions and works as designed.
Overflow pipe	Obstructions	Trash or debris blocks (or has the potential to block) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See Table 5-13 (closed treatment systems).	See Table 5-13 (closed treatment systems).	See Table 5-13 (closed treatment systems).
Catch basin	See Table 5-15 (catch basins).	See Table 5-15 (catch basins).	See Table 5-15 (catch basins).

Table 5-14 Maintenance standards for catch basins.

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and debris	Trash or debris is immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No trash or debris is immediately in front of catch basin or on grate opening.
		Trash or debris (in the basin) exceeds 60% of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case is clearance less than 6 inches from the debris surface to the invert of the lowest pipe.	No trash or debris is in the catch basin.
		Trash or debris in any inlet or outlet pipe blocks more than ⅓ of its height.	Inlet and outlet pipes are free of trash or debris.
		Dead animals or vegetation could generate odors that might cause complaints or dangerous gases (such as methane).	No vegetation or dead animals are present within the catch basin.
	Sediment	Sediment (in the basin) exceeds 60% of the sump depth as measured from the bottom of the basin to invert of the lowest pipe into or out of the basin, but in no case is clearance less than 6 inches from the sediment surface to the invert of the lowest pipe.	No sediment is in the catch basin.
	Structure damage to frame and/or top slab	Top slab has holes larger than 2 square inches or cracks wider than ¼ inch. *Intent: To make sure no material is running into basin.*	Top slab is free of holes and cracks.
		Frame is not sitting flush on top slab (separation of more than ¾ inch of the frame from the top slab). Frame is not securely attached.	Frame is sitting flush on the riser rings or top slab and is firmly attached.
	Fractures or cracks in basin walls/bottom	Maintenance person judges that structure is unsound.	Basin is replaced or repaired to design standards.
		Grout fillet has separated or cracked wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe, or there is evidence that soil particles have entered catch basin through cracks.	Pipe is regrouted and secure at the basin wall.
	Settlement/ misalignment	Failure of basin has created a safety, function, or design problem.	Basin is replaced or repaired to design standards.
	Vegetation	Vegetation is growing across and blocking more than 10% of the basin opening.	No vegetation blocks the opening to the basin.
		Vegetation growing in inlet/outlet pipe joints is more than 6 inches tall and less than 6 inches apart.	No vegetation or root growth is present.
	Contamination and pollution	Oil, gasoline, contaminants, or other pollutants are evident. (Coordinate removal/cleanup with local water quality response agency.)	No pollution is present.
Catch basin cover	Cover not in place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed.
	Locking mechanism not working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than ½ inch of thread.	Mechanism opens with proper tools.
Catch basin cover (continued)	Cover difficult to remove	One maintenance person cannot remove lid after applying normal lifting pressure. *Intent: To prevent cover from sealing off access to maintenance.*	Cover can be removed by one maintenance person.

Table 5-14 Maintenance standards for catch basins (continued).

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Ladder	Ladder unsafe	Ladder is unsafe due to missing rungs, insecure attachment to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance staff safe access.
Metal grates (if applicable)	Grate opening unsafe	Grate opening is wider than ⅞ inch.	Grate opening meets design standards.
	Trash and debris	Trash and debris block more than 20% of grate surface inletting capacity.	Grate is free of trash and debris.
	Damaged or missing	Grate is missing or components of the grate are broken.	Grate is in place and meets design standards.

Table 5-15 Maintenance standards for debris barriers (such as trash racks).

Maintenance Components	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and debris	Trash or debris plugs more than 20% of the openings in the barrier.	Barrier is cleared to design flow capacity.
Metal	Damaged/missing bars	Bars are bent out of shape more than 3 inches.	Bars are in place with no bends more than ¾ inch.
		Bars are missing or entire barrier is missing.	Bars are in place according to design.
		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Barrier is replaced or repaired to design standards.
	Inlet/outlet pipe	Debris barrier is missing or not attached to pipe.	Barrier is firmly attached to pipe.

Table 5-16 Maintenance standards for energy dissipaters.

Maintenance Components	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
External:			
Rock pad	Missing or moved rock	Only one layer of rock exists above native soil in area 5 square feet or larger, or native soil is exposed.	Rock pad is replaced to design standards.
	Erosion	Soil erosion is evident in or adjacent to rock pad.	Rock pad is replaced to design standards.
Dispersion trench	Pipe plugged with sediment	Accumulated sediment exceeds 20% of the design depth.	Pipe is cleaned/flushed so that it matches design.
	Not discharging water properly	There is visual evidence of water discharging at concentrated points along trench—normal condition is a "sheet flow" of water along trench. *Intent: To prevent erosion damage*.	Trench is redesigned or rebuilt to standards.
	Perforations plugged	Over ½ of perforations in pipe are plugged with debris and sediment.	Perforated pipe is cleaned or replaced.
	Water flows out top of "distributor" catch basin	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm, or water is causing (or appears likely to cause) damage.	Facility is rebuilt or redesigned to standards.
	Receiving area over-saturated	Water in receiving area is causing (or has potential of causing) landslide problems.	There is no danger of landslides.
Internal:			
Manhole/chamber	Worn or damaged post, baffles, side of chamber	Structure dissipating flow deteriorates to ½ of original size or any concentrated worn spot exceeds 1 square foot, which would make structure unsound.	Structure is replaced to design standards.
	Other defects	See entire contents of Table 5-15 (catch basins).	See entire contents of Table 5-15 (catch basins).

Table 5-17 Maintenance standards for biofiltration swale.

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Recommended Maintenance to Correct Problem
General	Sediment accumulation on grass	Sediment depth exceeds 2 inches.	Remove sediment deposits on grass treatment area of the swale. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.
	Standing water	Water stands in the swale between storms and does not drain freely.	Any of the following may apply: remove sediment or trash blockages; improve grade from head to foot of swale; remove clogged check dams; add underdrains; or convert to a wet biofiltration swale.
	Flow spreader	Flow spreader is uneven or clogged so that flows are not uniformly distributed through entire swale width.	Level the spreader and clean so that flows are spread evenly over entire swale width.
	Constant base flow	Small quantities of water continually flow through the swale, even when it has been dry for weeks, and an eroded, muddy channel has formed in the swale bottom.	Add a low-flow pea gravel drain the length of the swale, or bypass the base flow around the swale.
	Poor vegetation coverage	Grass is sparse or bare, or eroded patches occur in more than 10% of the swale bottom.	Consult with roadside vegetation specialists to determine why grass growth is poor and correct the offending condition. Reseed into loosened, fertile soil or replant with plugs of grass from the upper slope: plant in the swale bottom at 8-inch intervals.
	Vegetation	Grass becomes excessively tall (greater than 10 inches); nuisance weeds and other vegetation start to take over.	Mow vegetation or remove nuisance vegetation so that flow is not impeded. Grass should be mowed to a height of 6 inches. Mowing is not required for wet biofiltration swales. However, fall harvesting of very dense vegetation after plant die-back is recommended.
	Excessive shading	Grass growth is poor because sunlight does not reach swale.	If possible, trim back overhanging limbs and remove brushy vegetation on adjacent slopes.
	Inlet/outlet	Inlet/outlet areas are clogged with sediment/debris.	Remove material so there is no clogging or blockage in the inlet and outlet area.
	Trash and debris	Trash and debris have accumulated in the swale.	Remove trash and debris from bioswale.
	Erosion/scouring	Swale bottom has eroded or scoured due to flow channelization or high flows.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with 50/50 mixture of crushed gravel and compost. If bare areas are large (generally greater than 12 inches wide), the swale should be regraded and reseeded. For smaller bare areas, overseed when bare spots are evident, or take plugs of grass from the upper slope and plant in the swale bottom at 8-inch intervals.

Table 5-18 Maintenance standards for vegetated filter strip.

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Recommended Maintenance to Correct Problem
General	Sediment accumulation on grass	Sediment depth exceeds 2 inches.	Remove sediment deposits. Relevel so slope is even and flows pass evenly through strip.
	Vegetation	Grass becomes excessively tall (greater than 10 inches); nuisance weeds and other vegetation start to take over.	Mow grass and control nuisance vegetation so that flow is not impeded. Grass should be mowed to a height of 6 inches.
	Trash and debris	Trash and debris have accumulated on the vegetated filter strip.	Remove trash and debris from filter.
	Erosion/scouring	Areas have eroded or scoured due to flow channelization or high flows.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with a 50/50 mixture of crushed gravel and compost. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the vegetated filter strip should be regraded and reseeded. For smaller bare areas, overseed when bare spots are evident.
	Flow spreader	Flow spreader is uneven or clogged so that flows are not uniformly distributed over entire filter width.	Level the spreader and clean so that flows are spread evenly over entire filter width.

Table 5-19 Maintenance standards for media filter drain.

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Recommended Maintenance to Correct Problem
General	Sediment accumulation on grass filter strip	Sediment depth exceeds 2 inches or creates uneven grading that interferes with sheet flow.	Remove sediment deposits on grass treatment area of the embankment. When finished, embankment should be level from side to side and drain freely toward the toe of the embankment slope. There should be no areas of standing water once inflow has ceased.
	No-vegetation zone/flow spreader	Flow spreader is uneven or clogged so that flows are not uniformly distributed over entire embankment width.	Level the spreader and clean so that flows are spread evenly over entire embankment width.
	Poor vegetation coverage	Grass is sparse or bare, or eroded patches are observed in more than 10% of the grass strip surface area.	Consult with roadside vegetation specialists to determine why grass growth is poor and correct the offending condition. Reseed into loosened, fertile soil or compost or replant with plugs of grass from the upper slope.
	Vegetation	Grass becomes excessively tall (greater than 10 inches); nuisance weeds and other vegetation start to take over.	Mow vegetation or remove nuisance vegetation so that flow is not impeded. Grass should be mowed to a height of 6 inches.
	Media filter drain mix replacement	Water is seen on the surface of the media filter drain mix from storms that are less than a 6-month, 24-hour precipitation event. Maintenance also needed on a 10-year cycle and during a preservation project.	Excavate and replace all of the media filter drain mix contained within the media filter drain.
	Excessive shading	Grass growth is poor because sunlight does not reach embankment.	If possible, trim back overhanging limbs and remove brushy vegetation on adjacent slopes.
	Trash and debris	Trash and debris have accumulated on embankment.	Remove trash and debris from embankment.
	Flooding of media filter drain	When media filter drain is inundated by flood water	Evaluate media filter drain material for acceptable infiltration rate and replace if media filter drain does not meet long-term infiltration rate standards.

APPENDIX E

Wetland Reports

WETLAND ASSESSMENT REPORT

Wetland Delineation
Nason Creek River Mile 3.4 to 4.6
Fish Enhancement Project
Nason Creek, WA

Yakama Nation Upper Columbia

Habitat Restoration Project

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Chapter 1. Introduction

1.1 Scope and Purpose

This wetland assessment report has been prepared to meet requirements for wetland determinations according to U.S. Army Corps of Engineers guidelines (USACE 2008). The report contains descriptions of project area natural resources, including wetlands and rivers. The study area was assessed on August 4th and 5th, 2020. Eight wetlands were delineated within the study area.

Information gathered in this report assists project designers in avoiding and/or minimizing impacts to sensitive areas and species; provides information for regulatory reviewers; and provides information for mitigation reports if needed. The report is anticipated to support review by the Yakama Nation, U.S. Army Corps of Engineers (USACE), and/or the Washington State Department of Ecology (Ecology). The purpose of this document is to satisfy federal, state, and local regulations for wetland identification and delineation within the study area. The project proposes to implement instream restoration within Nason Creek to improve habitat for threatened fish species.

1.1 Project Location

This project is located in Chelan County, north and east of Coles Corner and south of Lake Wenatchee State Park. The proposed project site (APE) is composed of five locations, where project elements may affect site wetlands. The APE is within portions of Township 26 North, Range 17 East, Section 9. The site is located within WRIA 25, Wenatchee, and the Lower Nason Creek sub-watershed (HUC 170200110203).

Figure 1. Project Vicinity Map.

Chapter 2. Methods

2.1 Wetland Identification, Delineation, and Classification

Hamer wetland scientists, Adam Crispin (PWS) and Candice Trusty, delineated wetlands according to local, state, and federal guidelines throughout the APE and approximately 100 feet from its boundary (Appendix A). Wetland boundaries were surveyed using a Trimble GEOxt GPS unit. Wetland size for wetland outside the property or project area were estimated using aerial photos, LiDAR digital elevation models (DEM), and ArcGIS 10.6.

Wetland resources were delineated using guidelines and methods described in the *U.S. Army Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) as amended with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast (Version 2.0)* (USACE 2010).

Delineators used several tools to identify and classify plants and soils examined within the investigated area. Plant indicator status and scientific plant names were identified using the *National Wetland Plant List: 2014 Update of Wetland Ratings* (Lichvar et al. 2014) and any updates to the *National Wetland Plant List* (USACE 2016). Soil characteristics were recorded and classified using the *Field Book for Describing and Sampling Soils* (USDA, NRCS 2012). Hydric soil conditions were assessed using *Field Indicators of Hydric Soils in the United States, Version 8.1* (USDA, NRCS 2017).

Wetlands delineated were classified according to federal, state, and local systems. The *Classification of Wetlands and Deepwater Habitats of the United States* [Federal Geographic Data Committee (FGDC) 2013] is a descriptive classification, based on physical attributes (i.e., plant community, soils, and water regime). Wetlands perform a variety of biological, physical (hydrologic), and chemical (water quality) functions. For this project, each wetland was assigned a hydrogeomorphic (HGM) classification to more accurately assess impacts and determine appropriate wetland restoration or mitigation (Brinson 1993). Functions and values for wetlands within the project vicinity were classified under HGM and evaluated using the Washington State Wetland Rating System for Eastern Washington (Hruby 2014). Ecology divides wetlands into four hierarchical categories based on specific attributes such as rarity, sensitivity to disturbance, and functions (Hruby 2014). The Ecology classification hierarchy ranges from Category I wetlands, which exhibit outstanding features (rare wetland type, relatively undisturbed or a high sensitivity to disturbance, and high level of functions) to Category IV wetlands, which have the lowest levels of function and are often heavily disturbed.

2.2 Wetlands and Waters of the State Definitions and Regulatory Requirements

Waters of the United States: “All waters that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; All interstate waters including interstate wetlands; All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce...Wetlands adjacent to waters (other than waters that are themselves wetlands) identified above.” (Definition taken from 33 CFR, Part 328.3). “Adjacent” is defined as bordering, contiguous, or

neighboring.

Wetlands: “Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” (Definition taken from 33 CFR, Part 328.3).

Limits of jurisdiction in nontidal waters:

- in the absence of adjacent wetlands, the jurisdiction extends to the ordinary high-water mark;
- when adjacent wetlands are present, the jurisdiction extends beyond the ordinary high-water mark to the limit of the adjacent wetlands;
- when the Water of the United States consists only of wetlands, the jurisdiction extends to the limit of the wetland (taken from 33 CFR, Part 328.3).

Regulatory Requirements:

Wetlands/waters of the state are under the jurisdiction of the Army Corps of Engineers (Corps), state, and Yakama Tribal Code. The Corps has the authority to determine whether a wetland or stream is a water of the U.S. and thus federally regulated under Section 404 of the Clean Water Act (CWA).

Chapter 3. Existing Conditions

3.1 Landscape Setting

Within the project vicinity, land use is primarily commercial forest lands and rural residential zones (County of Chelan 2017). Low-density rural residences occur along State Highway 207 and within the project vicinity; however commercial timber harvest operations are the most common land use type upslope of the APE. In general, the river within the project vicinity is relatively “pristine”; however, Nason Creek likely receives significant stormwater inputs from State Highway 207.

3.1.1 Vicinity Wetlands

Several wetlands are mapped by the USFWS NWI within the study area; most are within the Nason Creek floodplain. Forested, scrub-shrub, and emergent riverine and palustrine wetlands are mapped by NWI (Figure 2). These wetlands are mapped as semi-permanently flooded and seasonally flooded (Ecology 2020). These mapped wetlands are based on a remote sensing-based wetland model. The Natural Heritage Information System has no records of rare plants, high quality wetlands or ecosystems within the study area (DNR 2020).

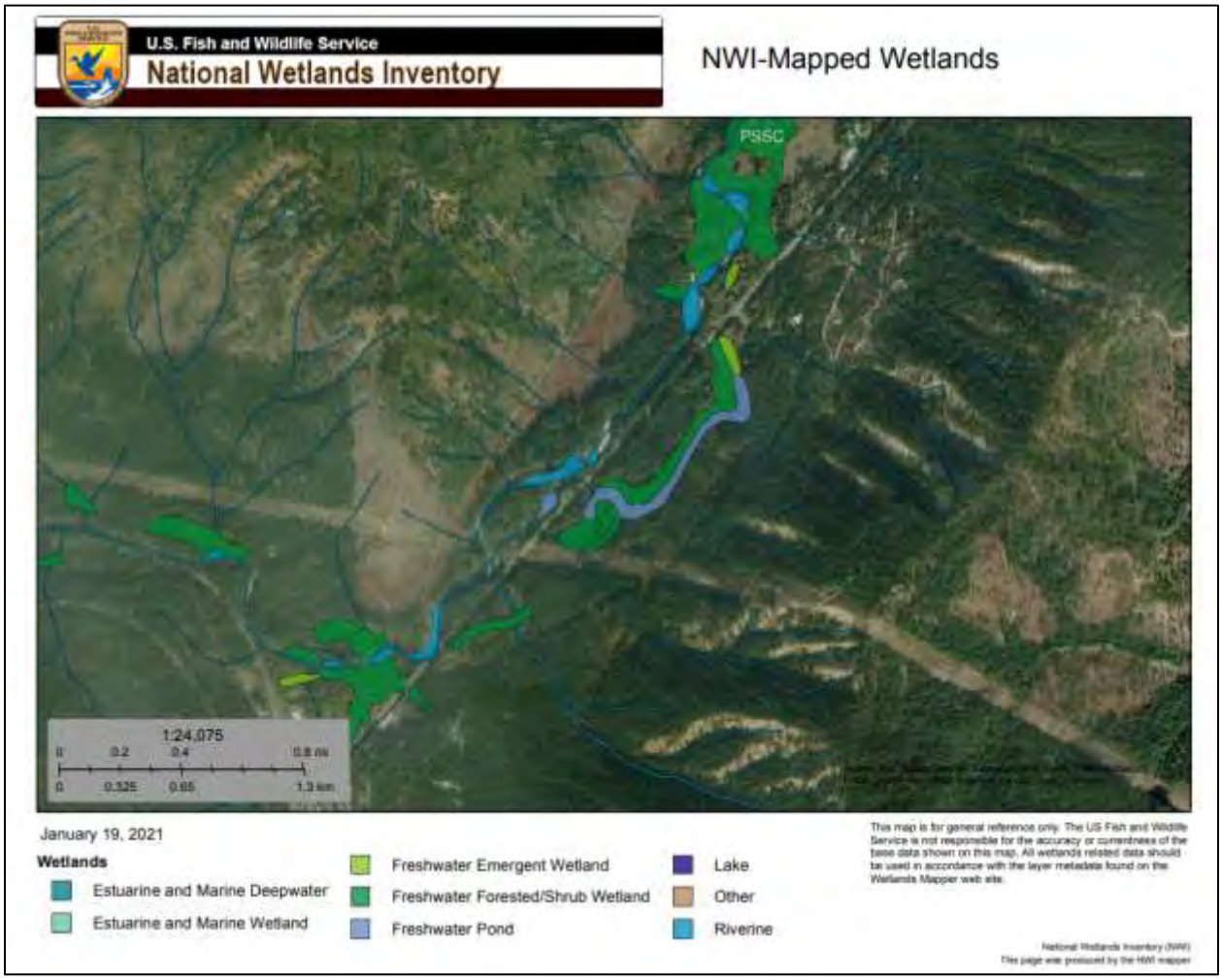


Figure 2. Surface waters and wetlands in study area vicinity (USFWS 2020).

3.2 Site Wetland Delineation Results

Wetland scientists completed USACE field data sheets (Appendix B). The study area contains forested, shrub, and emergent layers in both riverine and depressional wetlands (Figure 3). One wetland was delineated on-site (Wetland A). Wetland A contain forested and shrub plant communities, and generally provide moderate levels of biological, chemical, and physical characteristics. The National Wetlands Inventory (NWI) map indicates previously-delineated features in the vicinity as riverine and palustrine freshwater wetlands.

Table 1. Wetlands Near the Proposed Project Area.

Wetland	Wetland Classification			Wetland Size (acres)
	FGDC[1]	HGM	Ecology Category	
A	PFO/PSS	Depressional/ Riverine	III	0.26
B	PFO/PSS/PEM	Depressional/ Riverine	III	1.21
C	PFO/PSS/PEM	Depressional/ Riverine	II	1.62
D	R3EM	Riverine	II	0.52
E	PFO/PSS/PEM/ PAB	Depressional/ Riverine	II	3.40
F	PFO/PSS	Depressional	III	0.17
G	PFO/PSS/PEM	Depressional	II	1.82
H	PFO/PSS/PEM	Depressional	III	0.14

[1]FGDC (formerly Cowardin) or NWI Class based on vegetation: PFO=Palustrine Forested, PSS=Palustrine Scrub-shrub, PEM = Palustrine Emergent, R3EM = Riverine Upper Perennial Emergent.

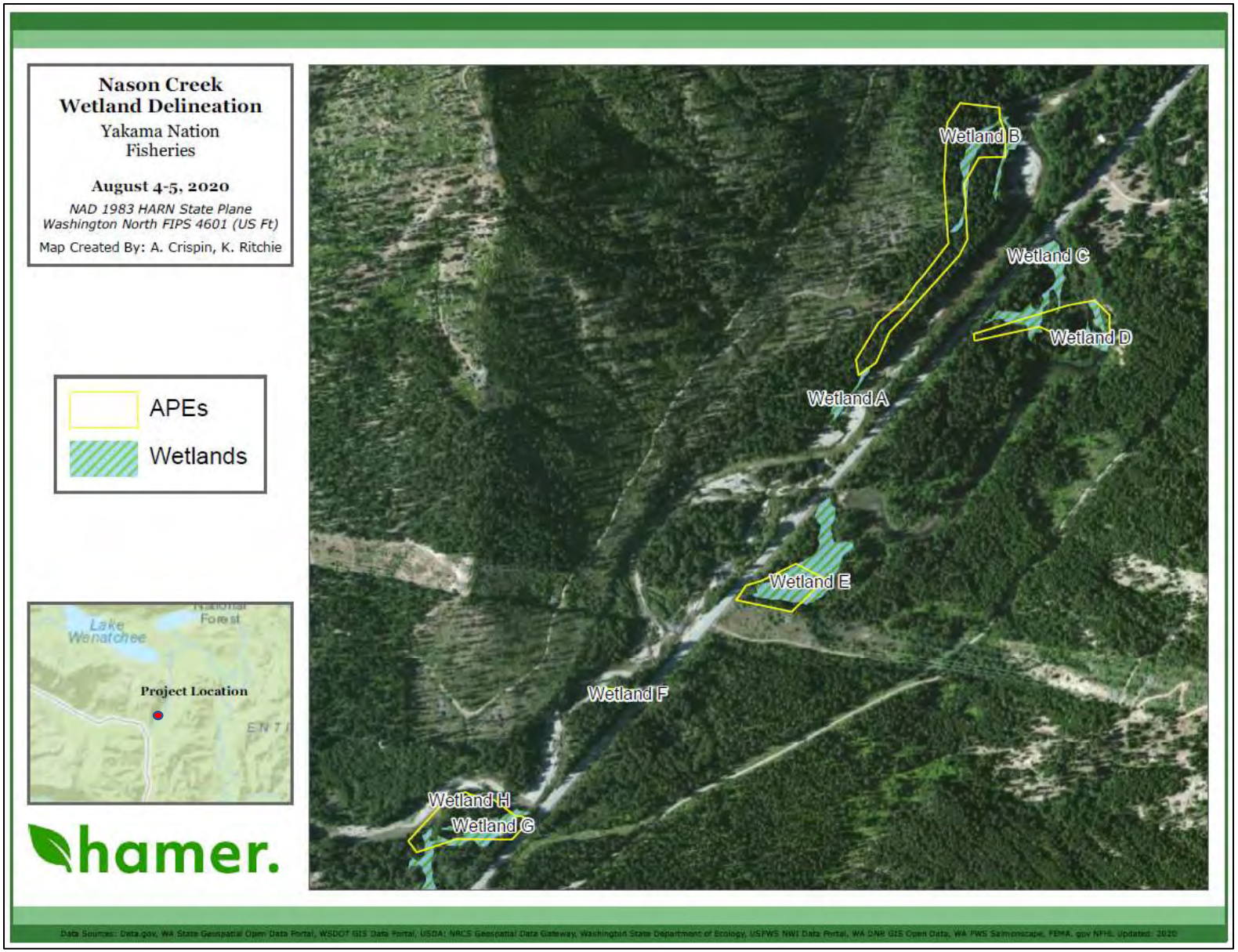


Figure 3. Nason Creek Study Area and Delineated Wetlands (APE in yellow). See also Appendix A.

3.2.1 Wetlands

Wetlands A and B

Wetland A is characterized as a forested and scrub-shrub palustrine wetland (PFO/PSS), and Wetland B as a forested, scrub-shrub, and emergent palustrine wetland (PFO/PSS/PEM). Both wetlands have both depressional and riverine wetland characteristics; however, each was rated using the depressional HGM form (FGDC 2013). The wetlands are located in distinct depressions which appear to be relict side channels that receive flows from Nason Creek. Conditions in the wetlands appear to be seasonally variable, and under winter flood conditions, there are likely periods in which the wetlands are ponded. In Wetland A, Hooker's willow (*Salix hookeriana*) and cattail (*Typha latifolia*) are dominant and in Wetland B the dominant tree layer was composed of black cottonwood (*Populus balsamifera*) and red alder (*Alnus rubra*) with an understory of red osier dogwood (*Cornus sericea*) with emergent layers composed of lady fern (*Athyrium americanum*) and Dewey sedge (*Carex deweyana*) (Figure 4, Figure 5, Appendix B).

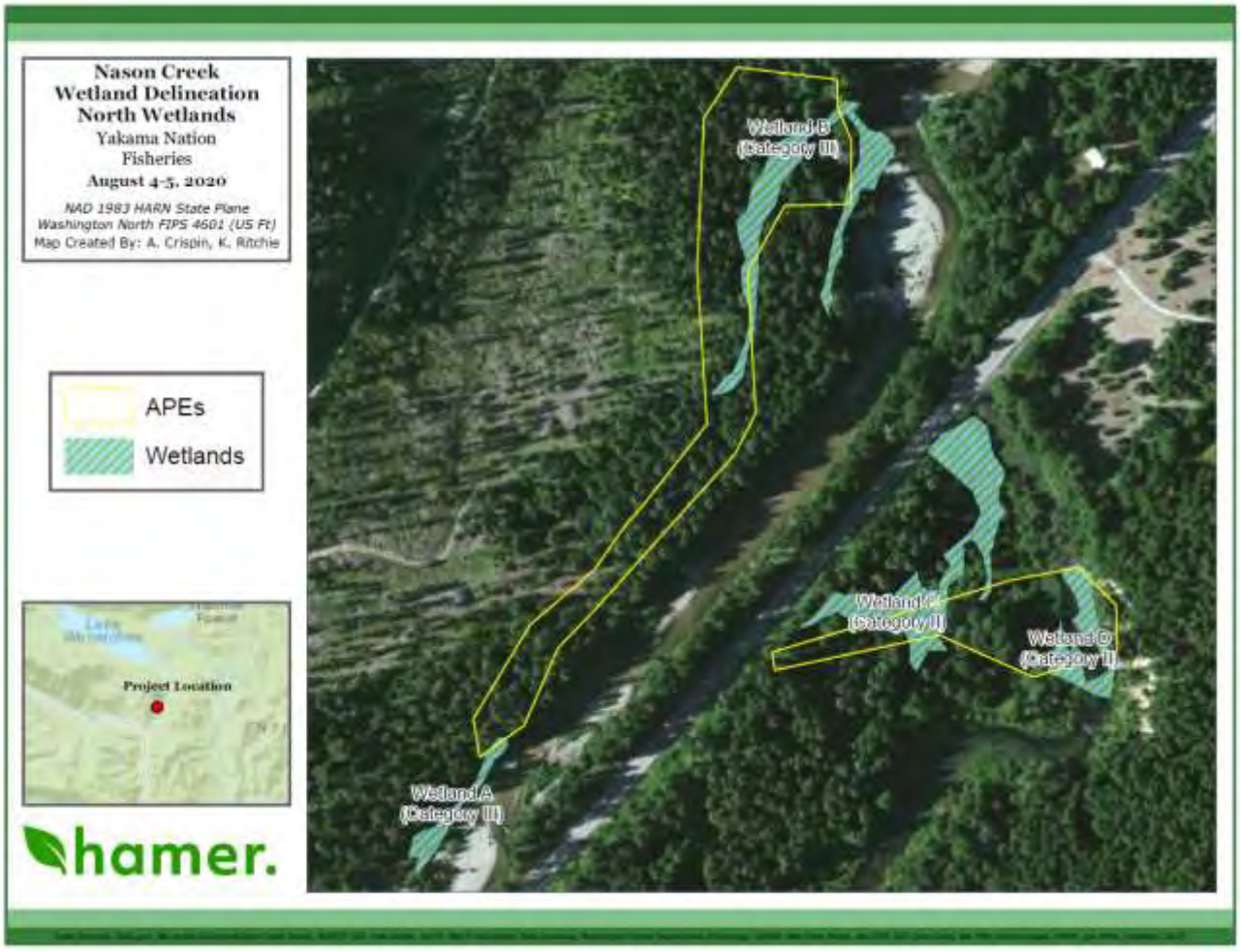


Figure 4. Nason Creek North Study Area and Delineated Wetlands A, B, C, and D (APE in yellow). See also Appendix A.

The hydric soil indicators of Depleted Below Dark Surface (A11) and Depleted Matrix (F3) were identified in soil test pits within the wetlands. The soil profile generally in Wetland A consists of dark gray (10YR 4/1) sandy silt loam with high organic content from 0 to 14 inches with 5%

redoximorphic concentrations (10YR 5/8) and a layer of very dark gray (10YR 3/1) sandy loam from 14 to 18 inches. Wetland B soils consist of black (10YR 2/1) sandy silt loam from 0 to 5 inches and a layer of dark gray (10YR 4/1) sandy silt loam from 5 to 16 inches with 10% redoximorphic concentrations (10YR 5/8) (Appendix B).

Overbank flooding and subsurface flows from Nason Creek likely serve as the main source of hydrology for Wetlands A and B; however, the wetland likely also receives hydrology from direct precipitation and upslope runoff. At the time of the field investigation, the wetlands showed evidence of the following wetland hydrology indicators: Surface Water (A1), High Water Table (A2), Saturation (A3), and Sparsely Vegetated Concave Surfaces (B8) (Appendix B). Both wetlands are in the floodplain of the Nason Creek and may become flooded in some years. Subsurface flows were the likely cause of saturation at the time of the field investigation.

Wetlands A and B are characterized as a depressional wetlands using the HGM system. They are each Category III wetlands according to the current Ecology (2014) rating system based on functions. The wetlands provide moderate levels of water quality, hydrologic, and habitat functions. Wetland Rating system points were assigned as follows:

Wetlands A and B:
Water Quality Score: 7 (Moderate level of function)
Hydrologic Score: 5 (Moderate level of function)
Habitat Score: 6 (Moderate level of function)
Total 18 (Category III)

Wetland functions and values for Wetlands A and B are detailed in Appendix C.

Figure 5. Overview of Wetland A near the center of the wetland.

Wetlands C and E

Wetland C is characterized as a forested, scrub-shrub, and emergent palustrine wetland (PFO/PSS/PEM), and Wetland E as a forested, scrub-shrub, emergent, and aquatic bed palustrine wetland (PFO/PSS/PEM/PAB). Both wetlands have both depressional and riverine wetland characteristics; however, each was rated using the depressional HGM form (FGDC 2013). The wetlands are located in distinct depressions which appear to be relict side channels or oxbows that receive flows from Nason Creek. Conditions in the wetlands appear to be seasonally variable, and under winter flood conditions, there are likely periods in which the wetlands are ponded. Beaver activity (chew marks) was observed in both wetlands, and daming may be contributing to wetland hydrologic conditions. In larger flood events, the wetlands and surrounding areas may also become flooded with overbank waters. In Wetland C, the dominant tree layer was composed of black cottonwood and red alder with an understory of Douglas' Spirea (*Spirea douglasii*) and Nootka rose (*Rosa nutkana*). In Wetland E, red alder is also the dominant tree, with twin berry (*Lonicera involucrata*) and vine maple (*Acer circinatum*) in the shrub layer, and emergent layers composed of lady fern, common horsetail (*Equisetum arvense*), skunk cabbage (*Lysichiton americanus*), and sparse associations of tall mannagrass (*Glyceria maxima*) (Figure 4, Figure 6, Figure 7, Appendix B).

Figure 6. Nason Creek Central Study Area and Delineated Wetlands E and F (APE in yellow). See also Appendix A.

The hydric soil indicators of Sandy Redox (S5) and Depleted Matrix (F3) were identified in soil

test pits within the wetlands. The soil profile generally in Wetland C consists of dark gray (10YR 4/1) silt loam with high organic content from 0 to 16 inches and 5% redoximorphic concentrations (7.5YR 5/8). Wetland E soils consist of very dark grey (10YR 3/1) silt loam from 0 to 4 inches and a layer of gray (10YR 5/1) sandy silt loam from 4 to 16 inches with 20% redoximorphic concentrations (7.5YR 4/6) (Appendix B).

Overbank flooding and subsurface flows from Nason Creek likely serve as the main source of hydrology for Wetlands C and E; however, the wetlands likely also receive hydrology from direct precipitation and upslope runoff. During the field investigation, the wetlands showed evidence of the following wetland hydrology indicators: Surface Water (A1), High Water Table (A2), Saturation (A3), and Sparsely Vegetated Concave Surfaces (B8) (Appendix B).

Wetlands C and E are characterized as a depressional wetlands using the HGM system. They are each Category II wetlands according to the current Ecology (2014) rating system based on functions. The wetlands provide moderate to high levels of water quality, hydrologic, and habitat functions. Wetland Rating system points were assigned as follows:

<u>Wetlands C and E:</u>
Water Quality Score: 7 (Moderate level of function)
Hydrologic Score: 6 (Moderate level of function)
Habitat Score: 8 (High level of function)
Total 21 (Category II)

Wetland functions and values for Wetlands C and E are detailed in Appendix C.

Figure 7. Overview of Wetland E near its southern boundary of the wetland.

Wetland D

Wetland D is characterized as a riverine upper perennial emergent wetland (R3EM) was rated using the riverine HGM form (FGDC 2013). The wetland is located near the ordinary high water mark (OHWM) of Nason Creek and contains some aquatic bed vegetation below the OHWM. Summer low flow conditions may have increased the proliferation of wetland vegetation and soil conditions. In Wetland D, red alder saplings, red osier dogwood, and Douglas' Spirea are dominant in the shrub layer; however, the emergent layers occupy a much larger area in the wetland. The emergent layer is composed of cattail, common horsetail, and lady fern (Figure 8, Appendix B).

Figure 8. Nason Creek South Study Area and Delineated Wetlands H and G (APE in yellow). See also Appendix A.

The hydric soil indicators of Depleted Matrix (F3) were identified in soil test pits within the wetland. The soil profile generally in Wetland C consists of black (10YR 2/1) silt loam with high organic content from 0 to 4 inches and a dark gray (10YR 4/1) silt loam from 4 to 16 inches with 5% redoximorphic concentrations (10YR 5/8) (Appendix B).

Surficial flow from Nason Creek likely serves as the primary source of hydrology for Wetland D (Figure 9); however, the wetland likely also receives hydrology from direct precipitation and upslope runoff (in its southern half). During the field investigation, the wetland showed evidence of the following wetland hydrology indicators: Surface Water (A1), High Water Table (A2),

Saturation (A3), Hydrogen Sulfide Odor (C1) and Sparsely Vegetated Concave Surfaces (B8) (Appendix B).

Wetland D is characterized as a riverine wetland using the HGM system. Wetland D is a Category II wetland according to the current Ecology (2014) rating system based on functions. The wetlands provide moderate to high levels of water quality, hydrologic, and habitat functions. Wetland Rating system points were assigned as follows:

Wetland D:
Water Quality Score: 6 (Moderate level of function)
Hydrologic Score: 5 (Moderate level of function)
Habitat Score: 8 (High level of function)
Total 19 (Category II)

Wetland functions and values for Wetland D are detailed in Appendix C.

Figure 9. Overview of Wetland D near the southern boundary of the wetland. Nason Creek at right.

Wetland F
Wetland F is characterized as a scrub-shrub and emergent palustrine wetland (PSS/PEM) with no apparent tree layer. The wetland is located in a distinct depression between a HWY 207 culvert and an active Nason Creek side channel. Conditions in the wetland appear to be seasonally variable, and under winter flood conditions, there may be periods in which the wetlands are saturated or temporarily ponded. In Wetland F, red osier dogwood, Douglas'

spirea, and Nootka rose are dominant in the shrub layer, an emergent layer composed of sparce affiliations of common horsetail (*Equisetum arvense*) (Figure 6, Appendix B). One skunk cabbage was observed in the herbaceous layer (Figure 10).

The hydric soil indicators of Depleted Matrix (F3) were identified in soil test pits within the wetlands. The soil profile generally in Wetland F consists of dark gray (10YR 4/1) silt loam with high organic content from 0 to 16 inches and 5% redoximorphic concentrations (7.5YR 5/8) (Appendix B).

Runoff from HWY 207 and the culvert is likely the main source of hydrology for Wetland F; however, the wetland likely also receives hydrology from overbank flooding and subsurface flows from Nason Creek, direct precipitation, and upslope runoff. During the field investigation, the wetland showed evidence of the following wetland hydrology indicators: Saturation (A3) and Sparsely Vegetated Concave Surfaces (B8) (Appendix B).

Wetland F is characterized as a depressional wetland using the HGM system. Wetland F is a Category III wetland according to the current Ecology (2014) rating system based on functions. The wetlands provide moderate levels of water quality, hydrologic, and habitat functions. Wetland Rating system points were assigned as follows:

Wetland F:
Water Quality Score: 7 (Moderate level of function)
Hydrologic Score: 5 (Moderate level of function)
Habitat Score: 6 (Moderate level of function)
Total 18 (Category III)

Wetland functions and values for Wetland F are detailed in Appendix C.

Figure 10. A lone skunk cabbage (*Lysichiton americanus*) plant near the center of wetland.

Wetlands G and H

Both Wetlands G and H are characterized as a forested, scrub-shrub, and emergent palustrine wetland (PFO/PSS/PEM). The wetlands have both depressional and riverine wetland characteristics; however, each was rated using the depressional HGM form (FGDC 2013). Wetland G is a large dynamic system that includes several habitat types including riparian areas, ponded areas with some aquatic bed vegetation (Figure 11), and emergent saturated areas where reed canarygrass (*Phalaris arundinacea*) is dominant. Wetland H is much less dynamic; and is sparsely vegetated within a saturated relict side channel. Nonetheless, conditions in the wetlands appear to be seasonally variable, and under winter flood conditions, there are likely periods in which sections of both wetlands are ponded. In Wetland G, the dominant tree layer was composed of black cottonwood and red alder with a mixed understory, and skunk cabbage; in open pasture areas, reed canarygrass is dominant with cattail, tall mannagrass, poison hemlock (*Conium maculatum*), and beaked sedge (*Carex utriculata*). In Wetland H, young red alder is the dominant tree, with red osier dogwood in the shrub layer (Appendix B).

The hydric soil indicators of Depleted Below Dark Surface (A11) and Depleted Matrix (F3) were identified in soil test pits within the wetlands. The soil profile generally in Wetland G consists of very dark gray (10YR 3/1) silt loam with high organic content from 0 to 8 inches and dark gray (10YR 4/1) silt loam from 8 to 16 inches with 5% redoximorphic concentrations (10YR 4/6). Wetland E soils consist of very dark grey (10YR 3/1) silt loam from 0 to 4 inches and a layer of gray (10YR 5/1) sandy silt loam from 4 to 16 inches with 20% redoximorphic concentrations (7.5YR 4/6) (Appendix B).

Overbank flooding and subsurface flows from Nason Creek likely serve as the main source of

hydrology for Wetlands G and H; however, the wetlands likely also receive hydrology from direct precipitation and upslope runoff. During the field investigation, the wetlands showed evidence of the following wetland hydrology indicators: Surface Water (A1), High Water Table (A2), Saturation (A3), and Sparsely Vegetated Concave Surfaces (B8) (Appendix B).

Wetlands G and H are characterized as a depressional wetlands using the HGM system. They are each Category II and Category III wetlands, respectively, according to the current Ecology (2014) rating system based on functions. The wetlands provide low to moderate levels of water quality, hydrologic, and habitat functions. Wetland Rating system points were assigned as follows:

Wetland G:
Water Quality Score: 7 (Moderate level of function)
Hydrologic Score: 5 (Moderate level of function)
Habitat Score: 7 (Moderate level of function)
Total 19 (Category II)

Wetland H:
Water Quality Score: 6 (Moderate level of function)
Hydrologic Score: 3 (Low level of function)
Habitat Score: 7 (Moderate level of function)
Total 16 (Category III)

Wetland functions and values for Wetlands G and H are detailed in Appendix C.

Figure 11. Overview of Wetland G near the southern boundary of the wetland.

3.2.2 Uplands

In addition to the wetland test pits, several upland pits were evaluated including upland areas adjacent to wetalnds (paired test pits) and non-adjacent areas. Uplands are dominated by Ponderosa pine (*Pinus ponderosa*), Western hemlock (*Tsuga heterophylla*), Douglas fir (*Pseudotsuga menziesii*), and Western red cedar (*Thuja Plicata*) with an understory of red osier dogwood, common snowberry (*Symphoricarpos albus*), vine maple, and Oregon grape (*Mahonia aquifolium*) (Figure 12). Although some upland test pits included hydrophytic vegetation, in these areas soils were well drained (sandy and gravelly) and did not contain hydric soil indicators. Moreover, these areas were absent of hydrology and indicators for hydrology.

Soils are generally dark brown to dark gray silty and gravelly loams and sands to a depth of 16-inches. Soils were generally dry (Appendix B).

Throughout the upland areas within the APE, a river bar within the historic floodplain of Nason Creek, there were many depressions and relict channels. However, a thorough evaluation of soils and hydrology ruled out these areas.

Figure 12. Example of site uplands west of Wetland B.

LIMITATIONS

This report is based upon information collected in the field and obtained from resources provided by Federal, State, and Local agencies. Conclusions are the professional opinion of the author are subject to approval by the appropriate agencies.

References

Brinson, M.M. 1993. *A Hydrogeomorphic Classification for Wetlands*. Technical Report WRPDE-4. US Amy Engineers Waterways Experiment Station, Vicksburg, MS.

County of Chelan. 2017. Chelan County Zoning Map Atlas. Accessed on online at: http://www.co.chelan.wa.us/files/community-development/documents/apps_form/Current_Planning/Related%20Documents/Official%20Zoning%20Maps.pdf

[DNR] Washington State Department of Natural Resources. 2020. WA Wetlands of High Conservation Value Map Viewer. Available from: http://wadnr.maps.arcgis.com/apps/webappviewer/index.html?id=5cf9e5b22f584ad7a4e2aebc63c47bda

[Ecology] Washington Department of Ecology. 2016. Washington State Department of Ecology. Water Quality Assessments/TMDLs. Accessed on line at: https://fortress.wa.gov/ecy/waterqualityatlas/map.aspx.

Ecology. 2018. *Wetlands in Washington State Volume 2 – Protecting and Managing Wetlands*. Appendix 8-D: Guidance on Widths of Buffers and Ratios for Compensatory Mitigation for Use with the Eastern Washington Wetland Rating System. Ecology Publication No. 05-06-008.

Environmental Laboratory. 1987. Corps of Engineers wetland delineation manual. Technical Report Y-87-1, Environmental Laboratory, Department of the Army, Waterways Experiment Station, Vicksburg, MI.

Federal Geographic Data Committee. 2013. Classification of wetlands and deepwater habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC.

Franklin, J.F. and C.T. Dyrness. 1988. Natural vegetation of Oregon and Washington. Oregon State University Press, Corvallis, OR.

Hruby, T. (2014). *Washington State Wetland Rating System for Eastern Washington: 2014 Update*. (Publication #14-06-030). Olympia, WA: Washington Department of Ecology.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List*: 2016 wetland ratings. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X.

StreamNet. 2019. StreamNet Mapper online. Available at: https://psmfc.maps.arcgis.com/apps/webappviewer/index.html?id=3be91b0a32a9488a901c3885bbfc2b0b

[USACE] U.S. Army Corps of Engineers. 2007. [Regulatory guidance letter No. 07-02.] Located at http://www.usace.army.mil/cecw/pages/rglsindx.aspx.

USACE. 2010. United States Army Corps of Engineers. Final Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountain, Valley, and Coast Region, ed. J.S. Wakely, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-03-13. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

USACE. 2016. United States Army Corps of Engineers. National Wetland Plant List, Version 3.3. Accessed online at: http://rsgisias.crrel.usace.army.mil/NWPL/.

USDA, NRCS. 2010. United States Department of Agriculture, Natural Resource Conservation Service, in cooperation with the National Technical Committee for Hydric Soils. Field indicators of hydric soils in the United States guide for identifying and delineating hydric soils, version 7.0. Washington, D.C.

USDA, NRCS. 2012. United States Department of Agriculture, Natural Resource Conservation Service. Field book for describing and sampling soils, version 3.0. September 2012. Accessed online at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052523.pdf.

USDA, NRCS. 2015. United States Department of Agriculture, Soil Conservation Service in cooperation with the National Technical Committee for Hydric Soils. Hydric soils of the United States. Available online at http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/.

USDA, NRCS. 2019. Soil survey of Project Area, Washington. U.S. Department of Agriculture, Natural Resource Conservation Service. Accessed online at: http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

USFWS. 1996. United States Fish and Wildlife Service, National Wetlands Inventory. NWI – National wetlands inventory in Washington State. Accessed online at: http://www.fws.gov/wetlands/Data/Mapper.html.

USFWS. 2019. Endangered Species Mapper for project site. Accessed online on at: https://ecos.fws.gov/ipac/.

WDFW. 2008. Washington Department of Fish and Wildlife. Priority Habitat and Species List. Olympia, Washington. 177 pp. Accessed online at: http://wdfw.wa.gov/conservation/phs/list/.

WDFW. 2019a. Washington Department of Fish and Wildlife Priority Habitat and Species Report for site. Accessed online at: http://apps.wdfw.wa.gov/phsontheweb/.

WDFW. 2019b. Washington State Department of Fish and Wildlife (WDFW) Salmonscape Maps. Accessed online at: http://apps.wdfw.wa.gov/salmonscape/map.html#.

WSCC. 2001.Washington State Conservation Commission. Habitat Limiting Factors Yakima River Watershed. Water Resource Inventory Areas 37-39 Final Report.

Appendix A — Supplementary Figures

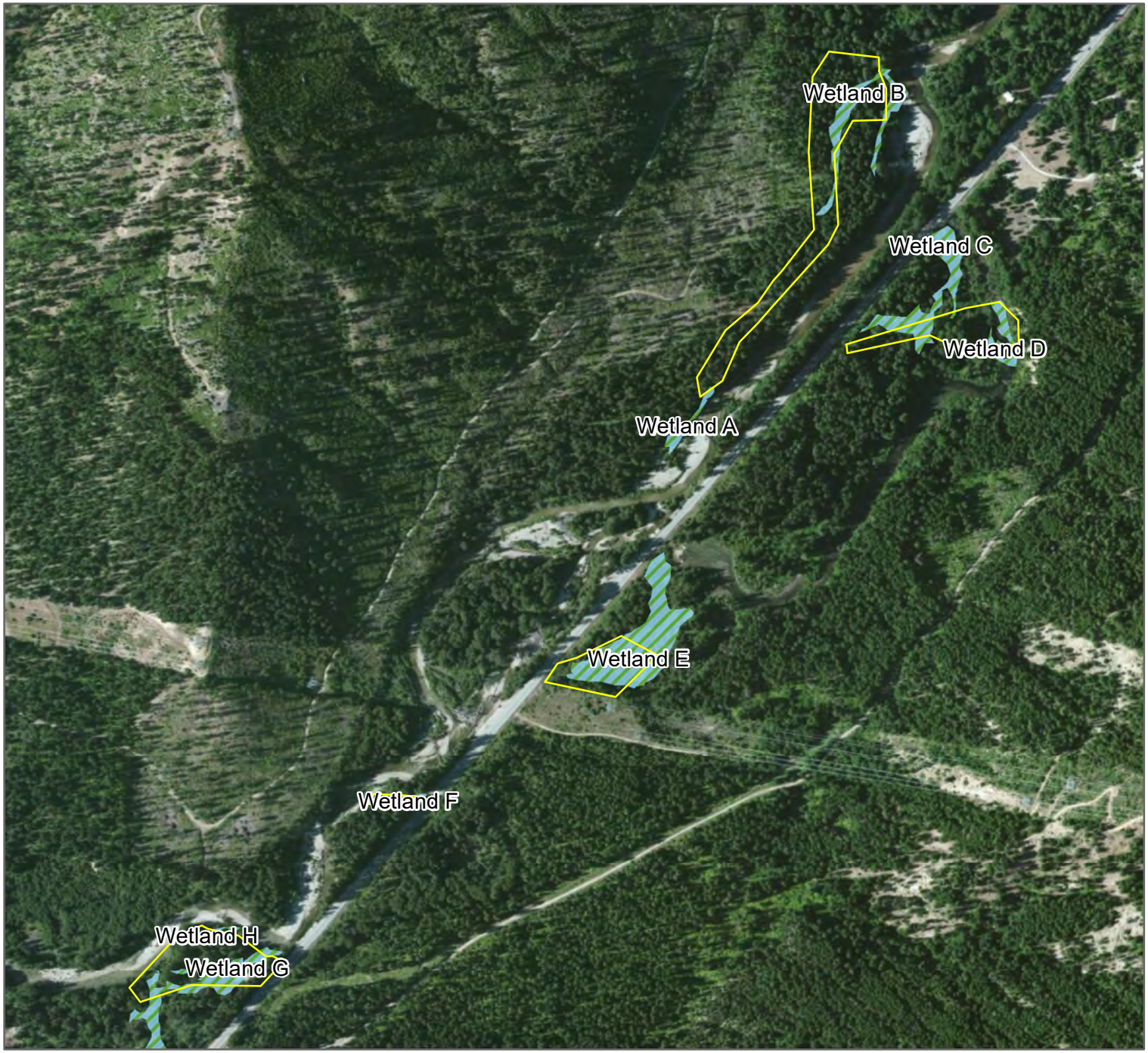
Nason Creek Wetland Delineation

Yakama Nation Fisheries

August 4-5, 2020

NAD 1983 HARN State Plane Washington North FIPS 4601 (US Ft)

Map Created By: A. Crispin, K. Ritchie



APEs

Wetlands

hamer.

Data Sources: Data.gov, WA State Geospatial Open Data Portal, WSDOT GIS Data Portal, USDA: NRCS Geospatial Data Gateway, Washington State Department of Ecology, USFWS NWI Data Portal, WA DNR GIS Open Data, WA FWS Salmonscape, FEMA. gov NFHL Updated: 2020

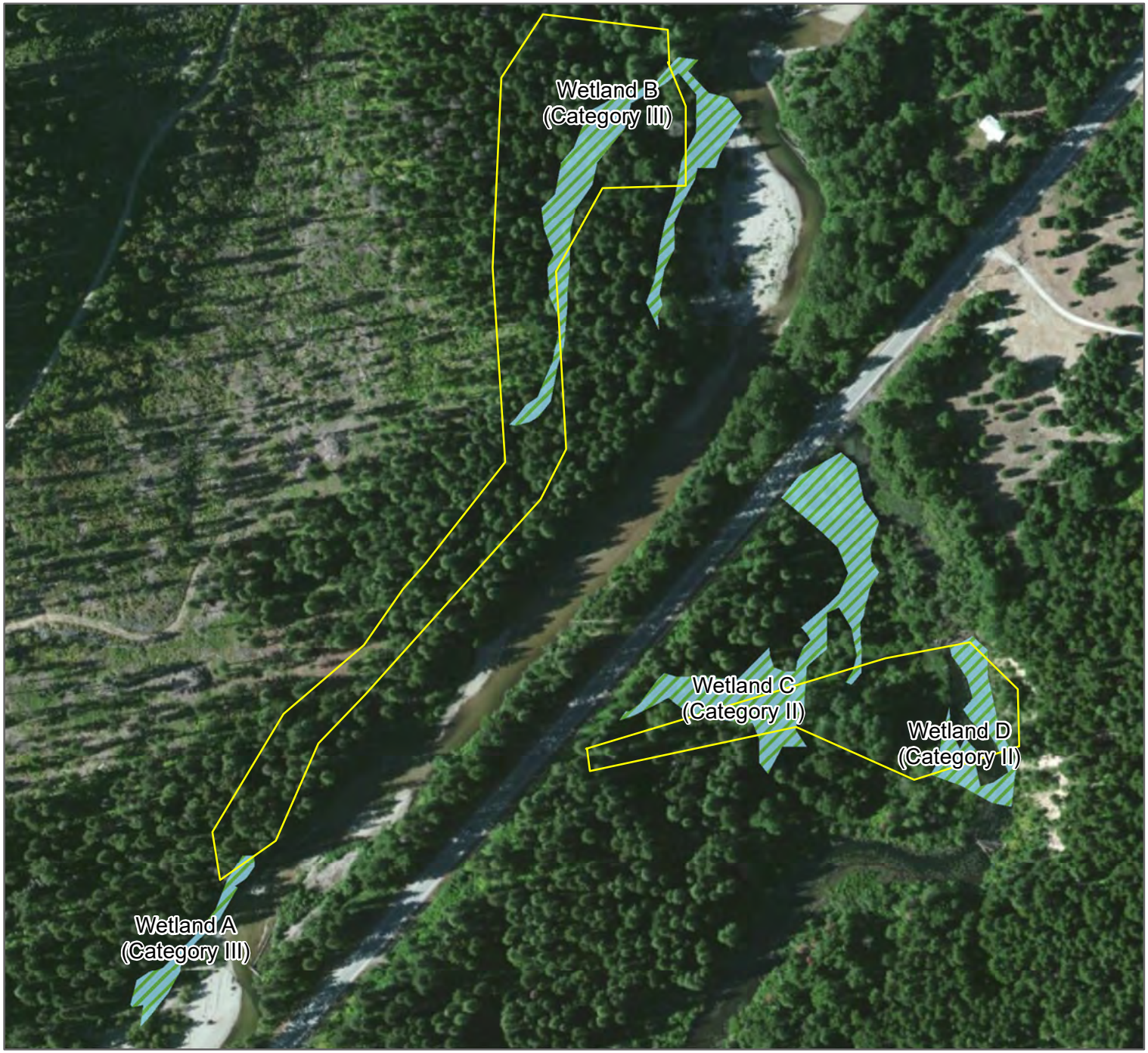
Nason Creek Wetland Delineation North Wetlands

Yakama Nation Fisheries

August 4-5, 2020

NAD 1983 HARN State Plane Washington North FIPS 4601 (US Ft)

Map Created By: A. Crispin, K. Ritchie



APEs

Wetlands

hamer.

Data Sources: Data.gov, WA State Geospatial Open Data Portal, WSDOT GIS Data Portal, USDA: NRCS Geospatial Data Gateway, Washington State Department of Ecology, USFWS NWI Data Portal, WA DNR GIS Open Data, WA FWS Salmonscape, FEMA. gov NFHL Updated: 2020

Nason Creek Wetland Delineation Central Wetlands

Yakama Nation Fisheries

August 4-5, 2020

NAD 1983 HARN State Plane Washington North FIPS 4601 (US Ft)

Map Created By: A. Crispin, K. Ritchie

APEs

Wetlands

hamer.

Data Sources: Data.gov, WA State Geospatial Open Data Portal, WSDOT GIS Data Portal, USDA: NRCS Geospatial Data Gateway, Washington State Department of Ecology, USFWS NWI Data Portal, WA DNR GIS Open Data, WA FWS Salmonscape, FEMA. gov NFHL Updated: 2020

Nason Creek Wetland Delineation South Wetlands

Yakama Nation Fisheries

August 4-5, 2020

NAD 1983 HARN State Plane Washington North FIPS 4601 (US Ft)

Map Created By: A. Crispin, K. Ritchie

APEs

Wetlands

hamer.

Data Sources: Data.gov, WA State Geospatial Open Data Portal, WSDOT GIS Data Portal, USDA: NRCS Geospatial Data Gateway, Washington State Department of Ecology, USFWS NWI Data Portal, WA DNR GIS Open Data, WA FWS Salmonscape, FEMA. gov NFHL Updated: 2020

Appendix B — Data Sheets

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/4/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-A1

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Goddard cobbly fine sandy loam, 0 to 8 percent slopes | NWI Classification: PSS

Are climatic / hydrologic conditions on the site typical for this time of year? (●) Yes ( ) No (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? (●) Yes ( ) No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	(●) Yes	( ) No
Hydric Soil Present?	(●) Yes	( ) No
Wetland Hydrology Present?	(●) Yes	( ) No
Is the Sampled Area within a Wetland?	(●) Yes	( ) No

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1.				
2.				
3.				
4.				
	= Total Cover			
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1. *Salix hookeriana*	20	Y	100.0	FACW
2.				
3.				
4.				
5.				
	20 = Total Cover			
Herb Stratum (Plot size: 15ft x 15ft)				
1. *Typha latifolia*	80	Y	94.1	OBL
2. *Phalaris arundinacea*	5	N	5.9	FACW
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
	85 = Total Cover			
Woody Vine Stratum (Plot size:)				
1.				
2.				
	= Total Cover			

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	80	x 1 =	80
FACW species	25	x 2 =	50
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	105 (A)		130 (B)

Prevalence Index = B/A = 1.238

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? (●) Yes ( ) No

Remarks:

SOIL

Sampling Point: SP-A1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)		%	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR	4/1	95	10YR	5/8	5	C	M	Sandy Silt Loam	concentration is prominent
14-18	10YR	3/1	100						Sandy Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? ◉ Yes ○ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	◉ Yes	○ No	Depth (inches):	3
Water Table Present?	◉ Yes	○ No	Depth (inches):	4
Saturation Present? (includes capillary fringe)	◉ Yes	○ No	Depth (inches):	0

Wetland Hydrology Present? ◉ Yes ○ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/4/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-A2

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%):

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Goddard cobbly fine sandy loam, 0 to 8 percent slopes | NWI Classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	○ Yes ◉ No
Hydric Soil Present?	○ Yes	◉ No		
Wetland Hydrology Present?	○ Yes	◉ No		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1. *Alnus rubra*	15	Y	33.3	FAC
2. *Populus balsamifera*	15	Y	33.3	FAC
3. *Salix hookeriana*	10	Y	22.2	FACW
4. *Pseudotsuga menziesii*	5	N	11.1	FACU
	45	= Total Cover		
Sapling/Shrub Stratum (Plot size:)				
1.				
2.				
3.				
4.				
5.				
	= Total Cover			
Herb Stratum (Plot size: 15ft x 15ft)				
1. *Tanacetum vulgare*	15	Y	60.0	FACU
2. *Cirsium vulgare*	10	Y	40.0	FACU
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
	25	= Total Cover		
Woody Vine Stratum (Plot size:)				
1.				
2.				
	= Total Cover			

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	30	x 3 =	90
FACU species	30	x 4 =	120
UPL species	0	x 5 =	0
Column Totals:	70 (A)		230 (B)

Prevalence Index = B/A = 3.286

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: SP-A2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR	5/4	100					Sand	
5-16	10YR	5/4	100					Sand	with gravel and small cobble

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? ○ Yes ◉ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches): _____

Water Table Present? ○ Yes ◉ No Depth (inches): _____

Saturation Present? (includes capillary fringe) ○ Yes ◉ No Depth (inches): _____

Wetland Hydrology Present? ○ Yes ◉ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/4/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-B1

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Goddard cobbly fine sandy loam, 0 to 8 percent slopes | NWI Classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	◉ Yes ○ No
Hydric Soil Present?	◉ Yes	○ No		
Wetland Hydrology Present?	◉ Yes	○ No		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1.				
2.				
3.				
4.				
	= Total Cover			
Sapling/Shrub Stratum (Plot size:)				
1.				
2.				
3.				
4.				
5.				
	= Total Cover			
Herb Stratum (Plot size: 15ft x 15ft)				
1. *Athyrium americanum*	80	Y	88.9	FAC
2. *Carex deweyana*	10	N	11.1	#N/A
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
	90 = Total Cover			
Woody Vine Stratum (Plot size:)				
1.				
2.				
	= Total Cover			

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	80	x 3 =	240
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	80 (A)		240 (B)

Prevalence Index = B/A = 3.000

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: SP-B1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)		%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR	2/1	100						Sandy Silt Loam	
5-16	10YR	4/1	90	7.5YR	5/8	10	C	M	Sandy Silt Loam	concentration is prominent

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☑ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? ◉ Yes ○ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches):

Water Table Present? ○ Yes ◉ No Depth (inches):

Saturation Present? (includes capillary fringe) ◉ Yes ○ No Depth (inches): 0

Wetland Hydrology Present? ◉ Yes ○ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Uprooted Pseudotsuga menziesii

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/4/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-B2

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Goddard cobbly fine sandy loam, 0 to 8 percent slopes | NWI Classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	○ Yes	◉ No	**Is the Sampled Area within a Wetland?**	○ Yes ◉ No
Hydric Soil Present?	○ Yes	◉ No		
Wetland Hydrology Present?	○ Yes	◉ No		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1. *Pseudotsuga menziesii*	80	Y	100.0	FACU
2.				
3.				
4.				
	80	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1. *Acer circinatum*	20	Y	40.0	FAC
2. *Rosa nutkana*	5	N	10.0	FAC
3. *Symphoricarpos albus*	10	Y	20.0	FACU
4. *Mahonia aquifolium*	15	Y	30.0	FACU
5.				
	50	= Total Cover		
Herb Stratum (Plot size: 15ft x 15ft)				
1. *Maianthemum dilatatum*	10	Y	100.0	FAC
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
	10	= Total Cover		
Woody Vine Stratum (Plot size:)				
1.				
2.				
		= Total Cover		

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 40.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	35	x 3 =	105
FACU species	105	x 4 =	420
UPL species	0	x 5 =	0
Column Totals:	140 (A)		525 (B)

Prevalence Index = B/A = 3.750

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ○ Yes ◉ No

Remarks:

SOIL

Sampling Point: SP-B2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR	5/3	100					Sandy Silt Loam	
4-16	10YR	6/3	100					Sandy Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? ○ Yes ◉ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches): _____

Water Table Present? ○ Yes ◉ No Depth (inches): _____

Saturation Present? (includes capillary fringe) ○ Yes ◉ No Depth (inches): _____

Wetland Hydrology Present? ○ Yes ◉ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/4/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-C1

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Goddard cobbly fine sandy loam, 0 to 8 percent slopes | NWI Classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	◉ Yes	○ No
Hydric Soil Present?	◉ Yes	○ No			
Wetland Hydrology Present?	◉ Yes	○ No			

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1. *Populus balsamifera*	40	Y	72.7	FAC
2. *Alnus rubra*	15	Y	27.3	FAC
3.				
4.				
	55	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1. *Crataegus douglasii*	15	N	16.7	FAC
2. *Spiraea douglasii*	60	Y	66.7	FACW
3. *Rosa nutkana*	15	N	16.7	FAC
4.				
5.				
	90	= Total Cover		
Herb Stratum (Plot size:)				
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
		= Total Cover		
Woody Vine Stratum (Plot size:)				
1.				
2.				
		= Total Cover		

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	85	x 3 =	255
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	145 (A)		375 (B)

Prevalence Index = B/A = 2.586

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: SP-C1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/1	95	7.5YR 5/8	5	C	M	Silt Loam	concentration is prominent

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? ◉ Yes ○ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☑ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ◉ Yes ○ No Depth (inches): 4

Water Table Present? ◉ Yes ○ No Depth (inches): 6

Saturation Present? (includes capillary fringe) ◉ Yes ○ No Depth (inches): 0

Wetland Hydrology Present? ◉ Yes ○ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/4/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-C2

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Goddard cobbly fine sandy loam, 0 to 8 percent slopes | NWI Classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	○ Yes ◉ No
Hydric Soil Present?	○ Yes	◉ No		
Wetland Hydrology Present?	○ Yes	◉ No		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1. *Alnus rubra*	30	Y	100.0	FAC
2.				
3.				
4.				
	30	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1. *Cornus alba*	40	Y	47.1	FACW
2. *Symphoricarpos albus*	40	Y	47.1	FACU
3. *Spiraea douglasii*	5	N	5.9	FACW
4.				
5.				
	85	= Total Cover		
Herb Stratum (Plot size:)				
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
		= Total Cover		
Woody Vine Stratum (Plot size:)				
1.				
2.				
		= Total Cover		

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	45	x 2 =	90
FAC species	30	x 3 =	90
FACU species	40	x 4 =	160
UPL species	0	x 5 =	0
Column Totals:	115 (A)		340 (B)

Prevalence Index = B/A = 2.957

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: SP-C2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR	3/2	100					Sandy Silt Loam	
8-16	10YR	3/3	100					Sandy Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? ○ Yes ◉ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches): _____

Water Table Present? ○ Yes ◉ No Depth (inches): _____

Saturation Present? (includes capillary fringe) ○ Yes ◉ No Depth (inches): _____

Wetland Hydrology Present? ○ Yes ◉ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/4/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-D1

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Peoh silt loam | NWI Classification: PSS

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	◉ Yes ○ No
Hydric Soil Present?	◉ Yes	○ No		
Wetland Hydrology Present?	◉ Yes	○ No		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1.				
2.				
3.				
4.				
	= Total Cover			
Sapling/Shrub Stratum (Plot size: 10x30)				
1. *Spiraea douglasii*	60	Y	57.1	FACW
2. *Alnus rubra*	30	Y	28.6	FAC
3. *Cornus alba*	15	N	14.3	FACW
4.				
5.				
	105 = Total Cover			
Herb Stratum (Plot size: 10x30)				
1. *Athyrium americanum*	30	Y	40.0	FAC
2. *Typha latifolia*	15	Y	20.0	OBL
3. *Equisetum arvense*	30	Y	40.0	FAC
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
	75 = Total Cover			
Woody Vine Stratum (Plot size:)				
1.				
2.				
	= Total Cover			

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1 =	15
FACW species	75	x 2 =	150
FAC species	90	x 3 =	270
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	180 (A)		435 (B)

Prevalence Index = B/A = 2.417

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: SP-D1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)		%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR	2/1	100						Silt Loam	
4-16	10YR	4/1	95	10YR	5/8	5	C	M	Silt Loam	concentration is prominent

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? ◉ Yes ○ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☑ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☑ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	◉ Yes	○ No	Depth (inches):	10
Water Table Present?	◉ Yes	○ No	Depth (inches):	2
Saturation Present? (includes capillary fringe)	◉ Yes	○ No	Depth (inches):	0

Wetland Hydrology Present? ◉ Yes ○ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/4/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-D2

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Peoh silt loam | NWI Classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	○ Yes ◉ No
Hydric Soil Present?	○ Yes	◉ No		
Wetland Hydrology Present?	○ Yes	◉ No		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1. *Alnus rubra*	30	Y	100.0	FAC
2.				
3.				
4.				
	30	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1. *Acer circinatum*	70	Y	77.8	FAC
2. *Cornus alba*	20	Y	22.2	FACW
3.				
4.				
5.				
	90	= Total Cover		
Herb Stratum (Plot size: 15ft x 15ft)				
1. *Equisetum arvense*	30	Y	66.7	FAC
2. *Urtica dioica*	15	Y	33.3	FAC
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
	45	= Total Cover		
Woody Vine Stratum (Plot size:)				
1.				
2.				
		= Total Cover		

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	145	x 3 =	435
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	165 (A)		475 (B)

Prevalence Index = B/A = 2.879

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: SP-D2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR	3/6	100					Silt Loam	
5-16	10YR	3/2	100					Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? ○ Yes ◉ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches): _____

Water Table Present? ○ Yes ◉ No Depth (inches): _____

Saturation Present? (includes capillary fringe) ○ Yes ◉ No Depth (inches): _____

Wetland Hydrology Present? ○ Yes ◉ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/5/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-E1

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Beverly gravelly fine sandy loam | NWI Classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	◉ Yes ○ No
Hydric Soil Present?	◉ Yes	○ No		
Wetland Hydrology Present?	◉ Yes	○ No		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1. *Alnus rubra*	40	Y	100.0	FAC
2.				
3.				
4.				
	40	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1. *Lonicera involucrata*	20	Y	66.7	FAC
2. *Acer circinatum*	10	Y	33.3	FAC
3.				
4.				
5.				
	30	= Total Cover		
Herb Stratum (Plot size: 15ft x 15ft)				
1. *Athyrium americanum*	40	Y	66.7	FAC
2. *Glyceria maxima*	5	N	8.3	OBL
3. *Equisetum arvense*	15	Y	25.0	FAC
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
	60	= Total Cover		
Woody Vine Stratum (Plot size:)				
1.				
2.				
		= Total Cover		

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	5	x 1 =	5
FACW species	0	x 2 =	0
FAC species	125	x 3 =	375
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	130 (A)		380 (B)

Prevalence Index = B/A = 2.923

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: SP-E1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)		%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR	3/1	100						Silt Loam	
4-16	10YR	5/1	100	7.5YR	4/6	20	C	M	Sand	with gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☑ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? ◉ Yes ○ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ◉ Yes ○ No Depth (inches): 2

Water Table Present? ◉ Yes ○ No Depth (inches): 4

Saturation Present? (includes capillary fringe) ◉ Yes ○ No Depth (inches): 0

Wetland Hydrology Present? ◉ Yes ○ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/5/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-E2

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Beverly gravelly fine sandy loam | NWI Classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	○ Yes ◉ No
Hydric Soil Present?	○ Yes	◉ No		
Wetland Hydrology Present?	○ Yes	◉ No		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1. *Alnus rubra*	70	Y	82.4	FAC
2. *Pseudotsuga menziesii*	15	N	17.6	FACU
3.				
4.				
	85	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1. *Cornus alba*	40	Y	100.0	FACW
2.				
3.				
4.				
5.				
	40	= Total Cover		
Herb Stratum (Plot size: 15ft x 15ft)				
1. *Geum macrophyllum*	30	Y	75.0	FAC
2. *Urtica dioica*	10	Y	25.0	FAC
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
	40	= Total Cover		
Woody Vine Stratum (Plot size:)				
1.				
2.				
		= Total Cover		

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	40	x 2 =	80
FAC species	110	x 3 =	330
FACU species	15	x 4 =	60
UPL species	0	x 5 =	0
Column Totals:	165 (A)		470 (B)

Prevalence Index = B/A = 2.848

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: SP-E2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR	2/2	100					Sandy Silt Loam	
4-10	10YR	2/2	100					Sandy Silt Loam	with small cobble

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: fill

Depth (inches): 10

Hydric Soil Present? ○ Yes ◉ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches): _____

Water Table Present? ○ Yes ◉ No Depth (inches): _____

Saturation Present? (includes capillary fringe) ○ Yes ◉ No Depth (inches): _____

Wetland Hydrology Present? ○ Yes ◉ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/5/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-F1

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Beverly gravelly fine sandy loam | NWI Classification: PSS

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	◉ Yes ○ No
Hydric Soil Present?	◉ Yes	○ No		
Wetland Hydrology Present?	◉ Yes	○ No		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1.				
2.				
3.				
4.				
	= Total Cover			
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1. *Cornus alba*	85	**Y**	85.0	FACW
2. *Spiraea douglasii*	10	N	10.0	FACW
3. *Rosa nutkana*	5	N	5.0	FAC
4.				
5.				
	100	= Total Cover		
Herb Stratum (Plot size: 15ft x 15ft)				
1. *Equisetum arvense*	5	**Y**	100.0	FAC
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
	5	= Total Cover		
Woody Vine Stratum (Plot size:)				
1.				
2.				
	= Total Cover			

% Bare Ground in Herb Stratum 85

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	95	x 2 =	190
FAC species	10	x 3 =	30
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	105 (A)		220 (B)

Prevalence Index = B/A = 2.095

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: SP-F1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)		%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR	2/1	100						Silt Loam	
2-16	10YR	4/1	95	10YR	5/8	5	C	M	Silt Loam	concentration is prominent

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? ◉ Yes ○ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☑ Sparsely Vegetated Concave Surface (B8)
- ☑ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches):

Water Table Present? ○ Yes ◉ No Depth (inches):

Saturation Present? (includes capillary fringe) ◉ Yes ○ No Depth (inches): 2

Wetland Hydrology Present? ◉ Yes ○ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/5/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-F2

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 5

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Beverly gravelly fine sandy loam | NWI Classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	○ Yes	◉ No	**Is the Sampled Area within a Wetland?**	○ Yes	◉ No
Hydric Soil Present?	○ Yes	◉ No			
Wetland Hydrology Present?	○ Yes	◉ No			

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1. *Pseudotsuga menziesii*	40	Y	53.3	FACU
2. *Pinus contorta*	35	Y	46.7	FAC
3.				
4.				
	75	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1. *Acer circinatum*	20	Y	80.0	FAC
2. *Mahonia aquifolium*	5	Y	20.0	FACU
3.				
4.				
5.				
	25	= Total Cover		
Herb Stratum (Plot size:)				
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
		= Total Cover		
Woody Vine Stratum (Plot size:)				
1.				
2.				
		= Total Cover		

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	55	x 3 =	165
FACU species	45	x 4 =	180
UPL species	0	x 5 =	0
Column Totals:	100 (A)		345 (B)

Prevalence Index = B/A = 3.450

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ○ Yes ◉ No

Remarks:

SOIL

Sampling Point: SP-F2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR	3/4	100					Sandy Silt Loam	
4-16	10YR	4/3	100					Sandy Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? ○ Yes ◉ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches): _____

Water Table Present? ○ Yes ◉ No Depth (inches): _____

Saturation Present? (includes capillary fringe) ○ Yes ◉ No Depth (inches): _____

Wetland Hydrology Present? ○ Yes ◉ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/5/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-G1

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Beverly gravelly fine sandy loam | NWI Classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	◉ Yes	○ No
Hydric Soil Present?	◉ Yes	○ No			
Wetland Hydrology Present?	◉ Yes	○ No			

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1.				
2.				
3.				
4.				
	= Total Cover			
Sapling/Shrub Stratum (Plot size:)				
1.				
2.				
3.				
4.				
5.				
	= Total Cover			
Herb Stratum (Plot size: 15ft x 15ft)				
1. *Phalaris arundinacea*	80	**Y**	80.0	FACW
2. *Typha latifolia*	5	N	5.0	OBL
3. *Glyceria maxima*	5	N	5.0	OBL
4. *Conium maculatum*	5	N	5.0	FAC
5. *Carex utriculata*	5	N	5.0	OBL
6.				
7.				
8.				
9.				
10.				
11.				
	100 = Total Cover			
Woody Vine Stratum (Plot size:)				
1.				
2.				
	= Total Cover			

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1 =	15
FACW species	80	x 2 =	160
FAC species	5	x 3 =	15
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		190 (B)

Prevalence Index = B/A = 1.900

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: SP-G1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)		%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR	3/1	100						Sandy Silt Loam	high organics
8-16	10YR	4/1	95	10YR	4/6	5	C	M	Sandy Silt Loam	concentration is prominent

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☑ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? ◉ Yes ○ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ◉ Yes ○ No Depth (inches): 1

Water Table Present? ○ Yes ◉ No Depth (inches):

Saturation Present? (includes capillary fringe) ◉ Yes ○ No Depth (inches): 0

Wetland Hydrology Present? ◉ Yes ○ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/5/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-G2

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 5

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Beverly gravelly fine sandy loam | NWI Classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	○ Yes ◉ No
Hydric Soil Present?	○ Yes	◉ No		
Wetland Hydrology Present?	○ Yes	◉ No		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1. *Crataegus douglasii*	30	Y	60.0	FAC
2. *Alnus rubra*	20	Y	40.0	FAC
3.				
4.				
	50	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1. *Cornus alba*	60	Y	80.0	FACW
2. *Symphoricarpos albus*	15	Y	20.0	FACU
3.				
4.				
5.				
	75	= Total Cover		
Herb Stratum (Plot size: 15ft x 15ft)				
1. *Tanacetum vulgare*	5	Y	100.0	FACU
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
	5	= Total Cover		
Woody Vine Stratum (Plot size:)				
1.				
2.				
		= Total Cover		

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	50	x 3 =	150
FACU species	20	x 4 =	80
UPL species	0	x 5 =	0
Column Totals:	130 (A)		350 (B)

Prevalence Index = B/A = 2.692

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: SP-G2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR	3/2	100					Silt Loam	
2-16	10YR	3/3	100					Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? ○ Yes ◉ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches): _____

Water Table Present? ○ Yes ◉ No Depth (inches): _____

Saturation Present? (includes capillary fringe) ○ Yes ◉ No Depth (inches): _____

Wetland Hydrology Present? ○ Yes ◉ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/5/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-H1

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Beverly gravelly fine sandy loam | NWI Classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	◉ Yes ○ No
Hydric Soil Present?	◉ Yes	○ No		
Wetland Hydrology Present?	◉ Yes	○ No		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1. *Alnus rubra*	60	Y	100.0	FAC
2.				
3.				
4.				
	60	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1. *Cornus alba*	20	Y	57.1	FACW
2. *Alnus rubra*	15	Y	42.9	FAC
3.				
4.				
5.				
	35	= Total Cover		
Herb Stratum (Plot size: 15ft x 15ft)				
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
		= Total Cover		
Woody Vine Stratum (Plot size:)				
1.				
2.				
		= Total Cover		

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	75	x 3 =	225
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	95 (A)		265 (B)

Prevalence Index = B/A = 2.789

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: SP-H1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)		%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR	2/1	100						Silt Loam	
2-10	10YR	3/1	95	10YR	5/8	5	C	M	Sandy Silt Loam	concentration is prominent

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☑ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: large cobble

Depth (inches): 10

Hydric Soil Present? ◉ Yes ○ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☑ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☑ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches): _____

Water Table Present? ○ Yes ◉ No Depth (inches): _____

Saturation Present? (includes capillary fringe) ○ Yes ◉ No Depth (inches): _____

Wetland Hydrology Present? ◉ Yes ○ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek Wetland Delineation | City/County: Chelan | Sampling Date: 8/5/2020

Applicant/Owner: Yakama Nation | State: WA | Sampling Point: SP-H2

Investigator(s): Adam Crispin, Candice Trusty | Section, Township, Range:

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): A | Lat: 47.774464 | Long: -120.719456 | Datum: NAD83HARN

Soil Map Unit Name: Beverly gravelly fine sandy loam | NWI Classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	○ Yes ◉ No
Hydric Soil Present?	○ Yes	◉ No		
Wetland Hydrology Present?	○ Yes	◉ No		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1. *Populus balsamifera*	30	Y	33.3	FAC
2. *Alnus rubra*	20	Y	22.2	FAC
3. *Pinus contorta*	40	Y	44.4	FAC
4.				
	90	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1. *Cornus alba*	60	Y	80.0	FACW
2. *Symphoricarpos albus*	15	Y	20.0	FACU
3.				
4.				
5.				
	75	= Total Cover		
Herb Stratum (Plot size: 15ft x 15ft)				
1. *Rumex crispus*	5	Y	25.0	FAC
2. *Tolmiea menziesii*	5	Y	25.0	FAC
3. *Geranium robertianum*	10	Y	50.0	FACU
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
	20	= Total Cover		
Woody Vine Stratum (Plot size:)				
1.				
2.				
		= Total Cover		

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	100	x 3 =	300
FACU species	25	x 4 =	100
UPL species	0	x 5 =	0
Column Totals:	185 (A)		520 (B)

Prevalence Index = B/A = 2.811

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: SP-H2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR	3/2	100					silty sand	
2-10	10YR	4/3	100					silty sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicble to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: cobble

Depth (inches): 10

Hydric Soil Present? ○ Yes ◉ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches): _____

Water Table Present? ○ Yes ◉ No Depth (inches): _____

Saturation Present? (includes capillary fringe) ○ Yes ◉ No Depth (inches): _____

Wetland Hydrology Present? ○ Yes ◉ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix C — Rating Forms

Wetland name or number A and B

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): Wetlands A, B, and C Date of site visit: 8/4/2020

Rated by Adam Crispin Trained by Ecology? ☑ Yes ☐ No Date of training 11/13/2019

HGM Class used for rating Depressional Wetland has multiple HGM classes? ☑ Yes ☐ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ☑ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

_____ **Category I** - Total score = 22 - 27
_____ **Category II** - Total score = 19 - 21
X **Category III** - Total score = 16 - 18
_____ **Category IV** - Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
		List appropriate rating (H, M, L)		
Site Potential	M	M	M	
Landscape Potential	L	L	H	
Value	H	L	M	**Total**
Score Based on Ratings	6	5	7	**18**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	Category
Vernal Pools	
Alkali	
Wetland of High Conservation Value	
Bog and Calcareous Fens	
Old Growth or Mature Forest - slow growing	
Aspen Forest	
Old Growth or Mature Forest - fast growing	

Wetland name or number A and B

Maps and Figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	x
Map of the contributing basin	D 5.3	x
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	x
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	x

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream (*can be added to another figure*)	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	

HGM Classification of Wetland in Eastern Washington

For questions 1 - 4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?

- ☐ The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
- ☐ At least 30% of the open water area is deeper than 10 ft (3 m)

☑ NO - go to 2 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit meet all of the following criteria?

- ☑ The wetland is on a slope (*slope can be very gradual*),
- ☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
- ☐ The water leaves the wetland **without being impounded**.

☑ NO - go to 3 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?

- ☑ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
- ☑ The overbank flooding occurs at least once every 10 years.

☐ NO - go to 4 ☑ **YES** - The wetland class is **Riverine**

NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 5 ☑ **YES** - The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1 - 4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:
Wetland has multiple classes but is overall Depressional.

Wetland name or number A and B

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality		Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?		
D 1.1. Characteristics of surface water outflows from the wetland:		
Wetland has no surface water outlet	points = 5	
☑ Wetland has an intermittently flowing outlet	points = 3	3
☐ Wetland has a highly constricted permanently flowing outlet	points = 3	
Wetland has a permanently flowing, unconstricted, surface outlet	points = 1	
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions of soils*)	Yes = 3 No = 0	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes)		
Wetland has persistent, ungrazed, vegetation for > $^2/_3$ of area	points = 5	
Wetland has persistent, ungrazed, vegetation from $^1/_3$ to $^2/_3$ of area	points = 3	5
Wetland has persistent, ungrazed vegetation from $^1/_{10}$ to < $^1/_3$ of area	points = 1	
Wetland has persistent, ungrazed vegetation < $^1/_{10}$ of area	points = 0	
D 1.4. Characteristics of seasonal ponding or inundation:		
This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.		
Area seasonally ponded is > ½ total area of wetland	points = 3	1
Area seasonally ponded is ¼ - ½ total area of wetland	points = 1	
Area seasonally ponded is < ¼ total area of wetland	points = 0	
Total for D 1	Add the points in the boxes above	**9**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?		
D 2.1. Does the wetland receive stormwater discharges?	Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants?	Yes = 1 No = 0	0
D 2.3. Are there septic systems within 250 ft of the wetland?	Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3?		0
Source	Yes = 1 No = 0	
Total for D 2	Add the points in the boxes above	**0**

Rating of Landscape Potential If score is: ☐ **3 or 4 = H** ☐ **1 or 2 = M** ☑ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?		
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list?	Yes = 1 No = 0	0
D 3.2.Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]?	Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)?	Yes = 2 No = 0	2
Total for D 3	Add the points in the boxes above	**3**

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number A and B

DEPRESSIONAL WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and erosion

Points (only 1 score per box)

D 4.0. Does the site have the potential to reduce flooding and erosion?

D 4.1. Characteristics of surface water outflows from the wetland:

	Wetland has no surface water outlet	points = 8	4
☐	Wetland has an intermittently flowing outlet	points = 4	
☐	Wetland has a highly constricted permanently flowing outlet	points = 4	
	Wetland has a permanently flowing unconstricted surface outlet	points = 0	
	(*If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing"*)		

D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).*

	Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding	points = 8	2
	Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding	points = 6	
☐	The wetland is a headwater wetland	points = 4	
☐	Seasonal ponding: 1 ft - < 2 ft	points = 4	
	Seasonal ponding: 6 in - < 1 ft	points = 2	
	Seasonal ponding: < 6 in or wetland has only saturated soils	points = 0	

Total for D 4	Add the points in the boxes above	**6**

Rating of Site Potential If score is: ☐**12 - 16 = H** ☑**6 - 11 = M** ☐**0 - 5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?

D 5.1. Does the wetland receive stormwater discharges?	Yes = 1 No = 0	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in land uses that generates runoff?	Yes = 1 No = 0	0
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses ?	Yes = 1 No = 0	0
Total for D 5	Add the points in the boxes above	**0**

Rating of Landscape Potential If score is: ☐ **3 = H** ☐**1 or 2 = M** ☑**0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?

D 6.1. The wetland is in a landscape that has flooding problems.

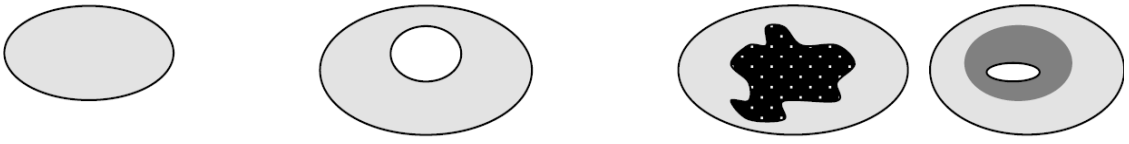
Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.*

	The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND		0
	Flooding occurs in sub-basin that is immediately down-gradient of wetland	points = 2	
	Surface flooding problems are in a sub-basin farther down-gradient	points = 1	
☐	The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood.	points = 0	
	Explain why		
☑	There are no problems with flooding downstream of the wetland	points = 0	

D 6.2. Has the site been identified as important for flood storage or flood conveyance 0

in a regional flood control plan?	Yes = 2 No = 0	0
Total for D 6	Add the points in the boxes above	**0**

Rating of Value If score is: ☐ **2 - 4 = H** ☐ **1 = M** ☑ **0 = L** *Record the rating on the first page*

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is > = ¼ ac or > = 10% of the wetland if wetland is < 2.5 ac.* ☐ Aquatic bed ☐ Emergent plants 0 - 12 in (0-30 cm) high are the highest layer and have > 30% cover ☐ Emergent plants > 12 - 40 in (> 30-100 cm) high are the highest layer with >30% cover ☐ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ☑ Scrub-shrub (areas where shrubs have > 30% cover) ☑ Forested (areas where trees have > 30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points - 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* ☐ Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* ☑ Yes = 3 No = 0	3
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species. Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species 12 Scoring: > 9 species: points = 2 4 - 9 species: points = 1 < 4 species: points = 0	2
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **HIGH** = 3 points	2

H 1.6. Special habitat features: *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ☐ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ☑ Cattails or bulrushes are present within the wetland. ☐ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ☑ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ☐ Invasive species cover less than 20% in each stratum of vegetation (*canopy, sub-canopy, shrubs, herbaceous, moss/ground cover*)	2
Total for H 1 Add the points in the boxes above	**10**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☑ **7 - 14 = M** ☐ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1 Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* 41 % undisturbed habitat + (15 % moderate & low intensity land uses / 2) = 48.5% > 1/3 (33.3%) of 1 km Polygon points = 3 20 - 33% of 1 km Polygon points = 2 10 - 19% of 1 km Polygon points = 1 < 10 % of 1 km Polygon points = 0	3
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* 89 % undisturbed habitat + (10 % moderate & low intensity land uses / 2) = 94% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1 - 3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	3
H 2.3 Land use intensity in 1 km Polygon: > 50% of 1 km Polygon is high intensity land use points = (-2) Does not meet criterion above points = 0	0
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* Yes = 3 No = 0	0
Total for H 2 Add the points in the boxes above	**6**

Rating of Landscape Potential If Score is: ☑ **4 - 9 = H** ☐ **1 - 3 = M** ☐ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated* . Site meets ANY of the following criteria: points = 2 ☐ It has 3 or more priority habitats within 100 m (see Appendix B) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) ☐ It is mapped as a location for an individual WDFW species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan	1

Site has 1 or 2 priority habitats within 100 m (see Appendix B)	points = 1	
Site does not meet any of the criteria above	points = 0	

Rating of Value If Score is: ☐ **2 = H** ☑ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number A and B

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate category. NOTE: A wetland may meet the criteria for more than one set of special characteristics. Record all those that apply. NOTE: All wetlands should also be characterized based on their functions.

Wetland Type	Category
Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.	
SC 1.0. Vernal Pools Is the wetland **less than 4000 ft^2**, and does it meet at least **two** of the following criteria? ☐ Its only source of water is rainfall or snowmelt from a small contributing basin and has no groundwater input. ☐ Wetland plants are typically present only in the spring; the summer vegetation is typically upland annuals. *If you find perennial, obligate, wetland plants, the wetland is probably NOT a vernal pool.* ☐ The soil in the wetland is shallow [< 1 ft (30 cm) deep] and is underlain by an impermeable layer such as basalt or clay. ☐ Surface water is present for less than 120 days during the wet season. ☐ Yes - Go to **SC 1.1** ☑ No = **Not vernal pool** SC 1.1. Is the vernal pool relatively undisturbed in February and March? ☐ Yes – Go to **SC 1.2** ☐ No = **Not a vernal pool with special characteristics**	
SC 1.2. Is the vernal pool in an area where there are at least 3 separate aquatic resources within 0.5 mi (other wetlands, rivers, lakes etc.)? ☐ Yes = **Category II** ☐ No = **Category III**	
SC 2.0. Alkali wetlands Does the wetland meet **one** of the following criteria? ☐ The wetland has a conductivity > 3.0 mS/cm. ☐ The wetland has a conductivity between 2.0 and 3.0 mS, and more than 50% of the plant cover in the wetland can be classified as "alkali" species (see Table 4 for list of plants found in alkali systems). ☐ If the wetland is dry at the time of your field visit, the central part of the area is covered with a layer of salt. **OR** does the wetland unit meet two of the following three sub-criteria? ☐ Salt encrustations around more than 75% of the edge of the wetland ☐ More than ¾ of the plant cover consists of species listed on Table 4 ☐ A pH above 9.0. All alkali wetlands have a high pH, but please note that some freshwater wetlands may also have a high pH. Thus, pH alone is not a good indicator of alkali wetlands. ☐ Yes = **Category I** ☑ No = **Not an alkali wetland**	
SC 3.0. Wetlands of High Conservation Value (WHCV) SC 3.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☑ Yes - Go to **SC 3.2** ☐ No - Go to **SC 3.3** SC 3.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☑ No = **Not WHCV** SC 3.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 3.4** ☑ No = **Not WHCV** SC 3.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☑ No = **Not WHCV**	

SC 4.0. Bogs and Calcareous Fens

Does the wetland (or any part of the wetland unit) meet both the criteria for soils and vegetation in bogs or calcareous fens? Use the key below to identify if the wetland is a bog or calcareous fen. ***If you answer yes you will still need to rate the wetland based on its functions.***

SC 4.1. Does an area within the wetland have organic soil horizons (i.e., layers of organic soil), either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? *See Appendix C for a field key to identify organic soils.*

☐ Yes - Go to **SC 4.3** ☑ No - Go to **SC 4.2**

SC 4.2. Does an area within the wetland have organic soils, either peats or mucks, that are less than 16 in deep over bedrock or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond?

☐ Yes - Go to **SC 4.3** ☑ No = **Is not a bog for rating**

SC 4.3. Does an area within the wetland have more than 70% cover of mosses at ground level AND at least 30% of the total plant cover consists of species in Table 5?

☐ Yes = **Category I bog** ☐ No - Go to **SC 4.4**

NOTE: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 5 are present, the wetland is a bog.

SC 4.4. Is an area with peats or mucks forested (> 30% cover) with subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 5 provide more than 30% of the cover under the canopy?

☐ Yes = **Category I bog** ☐ No - Go to **SC 4.5**

SC 4.5. Do the species listed in Table 6 comprise at least 20% of the total plant cover within an area of peats and mucks?

☐ Yes = **Is a Calcareous Fen for purpose of rating** ☐ No - Go to **SC 4.6**

SC 4.6. Do the species listed in Table 6 comprise at least 10% of the total plant cover in an area of peats and mucks, AND one of the two following conditions is met:

☐ Marl deposits [calcium carbonate ($CaCO_3$) precipitate] occur on the soil surface or plant stems

☐ The pH of free water is ≥ 6.8 AND electrical conductivity is ≥ 200 uS/cm at multiple locations within the wetland

☐ Yes = **Is a Category I calcareous fen** ☐ No = **Is not a calcareous fen**

SC 5.0. Forested Wetlands

Does the wetland have an area of forest rooted within its boundary that meets **at least one** of the following three criteria? (*Continue only if you have identified that a forested class is present in question H*

☑ The wetland is within the 100 year floodplain of a river or stream

☐ Aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species

☐ There is at least ¼ ac of trees (even in wetlands smaller than 2.5 ac) that are "mature" or "old-growth" according to the definitions for these priority habitats developed by WDFW (*see definitions in question H3.1*)

☑ Yes - Go to **SC 5.1** ☐ No = **Not a forested wetland with special characteristics**

SC 5.1. Does the wetland have a forest canopy where more than 50% of the tree species (by cover) are slow growing native trees (*see Table 7*)?

☐ Yes = **Category I** ☑ No - Go to **SC 5.2**

SC 5.2. Does the wetland have areas where aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species?

☐ Yes = **Category I** ☑ No - Go to **SC 5.3**

SC 5.3. Does the wetland have at least ¼ acre with a forest canopy where more than 50% of the tree species (by cover) are fast growing species (*see Table 7*)?

☐ Yes = **Category II** ☑ No - Go to **SC 5.4**

SC 5.4. Is the forested component of the wetland within the 100 year floodplain of a river or stream?

☐ Yes = **Category II** ☑ No = **Not a forested wetland with special characteristics**

Cat. II

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.
http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here:
http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE** : This question is independent of the land use between the wetland unit and the priority habitat.*

- ☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).
- ☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).
- ☐ **Old-growth/Mature forests**: Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.
- ☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).
- ☑ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- ☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.
- ☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.
- ☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- ☑ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.
- ☐ **Shrub-steppe**: A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).
- ☐ **Eastside Steppe**: Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).
- ☐ **Juniper Savannah**: All juniper woodlands.

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): Wetland E Date of site visit: 8/5/2020

Rated by Adam Crispin Trained by Ecology? ☑ Yes ☐ No Date of training 11/13/2019

HGM Class used for rating Depressional Wetland has multiple HGM classes? ☑ Yes ☐ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY II (based on functions ☑ or special characteristics ☑)

1. Category of wetland based on FUNCTIONS

_____ **Category I** - Total score = 22 - 27
X **Category II** - Total score = 19 - 21
_____ **Category III** - Total score = 16 - 18
_____ **Category IV** - Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
		List appropriate rating (H, M, L)		
Site Potential	M	H	M	
Landscape Potential	M	M	H	
Value	H	L	H	**Total**
Score Based on Ratings	7	6	8	**21**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	Category
Vernal Pools	
Alkali	
Wetland of High Conservation Value	
Bog and Calcareous Fens	
Old Growth or Mature Forest - slow growing	
Aspen Forest	
Old Growth or Mature Forest - fast growing	

Wetland name or number E

Maps and Figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	x
Map of the contributing basin	D 5.3	x
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	x
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	x

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream (*can be added to another figure*)	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	

HGM Classification of Wetland in Eastern Washington

For questions 1 - 4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?

- ☐ The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
- ☐ At least 30% of the open water area is deeper than 10 ft (3 m)

☑ NO - go to 2 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit meet all of the following criteria?

- ☑ The wetland is on a slope (*slope can be very gradual*),
- ☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
- ☐ The water leaves the wetland **without being impounded**.

☑ NO - go to 3 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?

- ☑ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
- ☑ The overbank flooding occurs at least once every 10 years.

☐ NO - go to 4 ☑ **YES** - The wetland class is **Riverine**

NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 5 ☑ **YES** - The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1 - 4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:
Wetland has multiple classes but is overall Depressional.

Wetland name or number E

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality		Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?		
D 1.1. Characteristics of surface water outflows from the wetland:		
Wetland has no surface water outlet	points = 5	
☐ Wetland has an intermittently flowing outlet	points = 3	3
☑ Wetland has a highly constricted permanently flowing outlet	points = 3	
Wetland has a permanently flowing, unconstricted, surface outlet	points = 1	
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions of soils*)	Yes = 3 No = 0	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes)		
Wetland has persistent, ungrazed, vegetation for > $^2/_3$ of area	points = 5	
Wetland has persistent, ungrazed, vegetation from $^1/_3$ to $^2/_3$ of area	points = 3	5
Wetland has persistent, ungrazed vegetation from $^1/_{10}$ to < $^1/_3$ of area	points = 1	
Wetland has persistent, ungrazed vegetation < $^1/_{10}$ of area	points = 0	
D 1.4. Characteristics of seasonal ponding or inundation:		
This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.		
Area seasonally ponded is > ½ total area of wetland	points = 3	3
Area seasonally ponded is ¼ - ½ total area of wetland	points = 1	
Area seasonally ponded is < ¼ total area of wetland	points = 0	
Total for D 1	Add the points in the boxes above	**11**

Rating of Site Potential If score is: ☐**12 - 16 = H** ☑**6 - 11 = M** ☐**0 - 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?		
D 2.1. Does the wetland receive stormwater discharges?	Yes = 1 No = 0	1
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants?	Yes = 1 No = 0	0
D 2.3. Are there septic systems within 250 ft of the wetland?	Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3?		0
Source	Yes = 1 No = 0	
Total for D 2	Add the points in the boxes above	**1**

Rating of Landscape Potential If score is: ☐**3 or 4 = H** ☑**1 or 2 = M** ☐**0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?		
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list?	Yes = 1 No = 0	0
D 3.2.Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]?	Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)?	Yes = 2 No = 0	2
Total for D 3	Add the points in the boxes above	**3**

Rating of Value If score is: ☑ **2 - 4 = H** ☐**1 = M** ☐**0 = L** *Record the rating on the first page*

Wetland name or number E

DEPRESSIONAL WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and erosion		Points (only 1 score per box)
D 4.0. Does the site have the potential to reduce flooding and erosion?		
D 4.1. Characteristics of surface water outflows from the wetland:		4
Wetland has no surface water outlet	points = 8	
☐ Wetland has an intermittently flowing outlet	points = 4	
☑ Wetland has a highly constricted permanently flowing outlet	points = 4	
Wetland has a permanently flowing unconstricted surface outlet	points = 0	
(*If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing"*)		
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).*		8
Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding	points = 8	
Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding	points = 6	
☐ The wetland is a headwater wetland	points = 4	
☐ Seasonal ponding: 1 ft - < 2 ft	points = 4	
Seasonal ponding: 6 in - < 1 ft	points = 2	
Seasonal ponding: < 6 in or wetland has only saturated soils	points = 0	
Total for D 4	Add the points in the boxes above	**12**

Rating of Site Potential If score is: ☑**12 - 16 = H** ☐**6 - 11 = M** ☐**0 - 5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?			
D 5.1. Does the wetland receive stormwater discharges?	Yes = 1	No = 0	1
D 5.2. Is > 10% of the area within 150 ft of the wetland in land uses that generates runoff?	Yes = 1	No = 0	0
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses ?	Yes = 1	No = 0	0
Total for D 5	Add the points in the boxes above		**1**

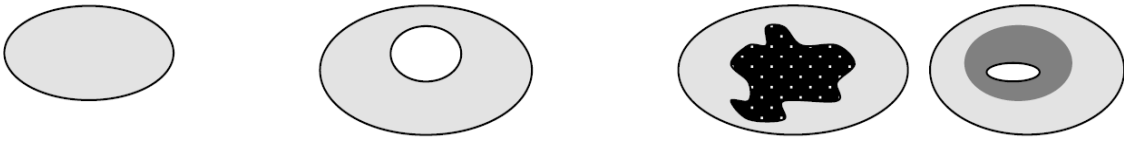
Rating of Landscape Potential If score is: ☐ **3 = H** ☑**1 or 2 = M** ☐**0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?		
D 6.1. The wetland is in a landscape that has flooding problems. Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.*		0
The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND		
Flooding occurs in sub-basin that is immediately down-gradient of wetland	points = 2	
Surface flooding problems are in a sub-basin farther down-gradient	points = 1	
☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood.	points = 0	
Explain why		
☑ There are no problems with flooding downstream of the wetland	points = 0	
D 6.2. Has the site been identified as important for flood storage or flood conveyance		0

in a regional flood control plan?	Yes = 2 No = 0	0
Total for D 6	Add the points in the boxes above	**0**

Rating of Value If score is: ☐ **2 - 4 = H** ☐ **1 = M** ☑ **0 = L** *Record the rating on the first page*

Wetland name or number E

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is > = ¼ ac or > = 10% of the wetland if wetland is < 2.5 ac.* ☐ Aquatic bed ☐ Emergent plants 0 - 12 in (0-30 cm) high are the highest layer and have > 30% cover ☐ Emergent plants > 12 - 40 in (> 30-100 cm) high are the highest layer with >30% cover ☐ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ☑ Scrub-shrub (areas where shrubs have > 30% cover) ☑ Forested (areas where trees have > 30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points - 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* ☑ Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* ☐ Yes = 3 No = 0	3
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species. Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species 15 Scoring: > 9 species: points = 2 4 - 9 species: points = 1 < 4 species: points = 0	2
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **HIGH** = 3 points	3

H 1.6. Special habitat features: *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ☐ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ☑ Cattails or bulrushes are present within the wetland. ☐ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ☑ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ☑ Invasive species cover less than 20% in each stratum of vegetation (*canopy, sub-canopy, shrubs, herbaceous, moss/ground cover*)	3
Total for H 1 Add the points in the boxes above	**12**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☑ **7 - 14 = M** ☐ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1 Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* 15 % undisturbed habitat + (12 % moderate & low intensity land uses / 2) = 21% > 1/3 (33.3%) of 1 km Polygon points = 3 20 - 33% of 1 km Polygon points = 2 10 - 19% of 1 km Polygon points = 1 < 10 % of 1 km Polygon points = 0	2
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* 89 % undisturbed habitat + (10 % moderate & low intensity land uses / 2) = 94% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1 - 3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	3
H 2.3 Land use intensity in 1 km Polygon: > 50% of 1 km Polygon is high intensity land use points = (-2) Does not meet criterion above points = 0	0
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* Yes = 3 No = 0	0
Total for H 2 Add the points in the boxes above	**5**

Rating of Landscape Potential If Score is: ☑ **4 - 9 = H** ☐ **1 - 3 = M** ☐ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated* . Site meets ANY of the following criteria: points = 2 ☐ It has 3 or more priority habitats within 100 m (see Appendix B) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) ☐ It is mapped as a location for an individual WDFW species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan	1

Site has 1 or 2 priority habitats within 100 m (see Appendix B)	points = 1	
Site does not meet any of the criteria above	points = 0	

Rating of Value If Score is: ☐ **2 = H** ☑ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number E

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate category. NOTE: A wetland may meet the criteria for more than one set of special characteristics. Record all those that apply. NOTE: All wetlands should also be characterized based on their functions.

Wetland Type	Category
Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.	
SC 1.0. Vernal Pools Is the wetland **less than 4000 ft^2**, and does it meet at least **two** of the following criteria? ☐ Its only source of water is rainfall or snowmelt from a small contributing basin and has no groundwater input. ☐ Wetland plants are typically present only in the spring; the summer vegetation is typically upland annuals. *If you find perennial, obligate, wetland plants, the wetland is probably NOT a vernal pool.* ☐ The soil in the wetland is shallow [< 1 ft (30 cm) deep] and is underlain by an impermeable layer such as basalt or clay. ☐ Surface water is present for less than 120 days during the wet season. ☐ Yes - Go to **SC 1.1** ☑ No = **Not vernal pool** SC 1.1. Is the vernal pool relatively undisturbed in February and March? ☐ Yes – Go to **SC 1.2** ☐ No = **Not a vernal pool with special characteristics**	
SC 1.2. Is the vernal pool in an area where there are at least 3 separate aquatic resources within 0.5 mi (other wetlands, rivers, lakes etc.)? ☐ Yes = **Category II** ☐ No = **Category III**	
SC 2.0. Alkali wetlands Does the wetland meet **one** of the following criteria? ☐ The wetland has a conductivity > 3.0 mS/cm. ☐ The wetland has a conductivity between 2.0 and 3.0 mS, and more than 50% of the plant cover in the wetland can be classified as "alkali" species (see Table 4 for list of plants found in alkali systems). ☐ If the wetland is dry at the time of your field visit, the central part of the area is covered with a layer of salt. **OR** does the wetland unit meet two of the following three sub-criteria? ☐ Salt encrustations around more than 75% of the edge of the wetland ☐ More than ¾ of the plant cover consists of species listed on Table 4 ☐ A pH above 9.0. All alkali wetlands have a high pH, but please note that some freshwater wetlands may also have a high pH. Thus, pH alone is not a good indicator of alkali wetlands. ☐ Yes = **Category I** ☑ No = **Not an alkali wetland**	
SC 3.0. Wetlands of High Conservation Value (WHCV) SC 3.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☑ Yes - Go to **SC 3.2** ☐ No - Go to **SC 3.3** SC 3.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☑ No = **Not WHCV** SC 3.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 3.4** ☑ No = **Not WHCV** SC 3.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☑ No = **Not WHCV**	

SC 4.0. Bogs and Calcareous Fens

Does the wetland (or any part of the wetland unit) meet both the criteria for soils and vegetation in bogs or calcareous fens? Use the key below to identify if the wetland is a bog or calcareous fen. ***If you answer yes you will still need to rate the wetland based on its functions.***

SC 4.1. Does an area within the wetland have organic soil horizons (i.e., layers of organic soil), either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? *See Appendix C for a field key to identify organic soils.*

☐ Yes - Go to **SC 4.3** ☑ No - Go to **SC 4.2**

SC 4.2. Does an area within the wetland have organic soils, either peats or mucks, that are less than 16 in deep over bedrock or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond?

☐ Yes - Go to **SC 4.3** ☑ No = **Is not a bog for rating**

SC 4.3. Does an area within the wetland have more than 70% cover of mosses at ground level AND at least 30% of the total plant cover consists of species in Table 5?

☐ Yes = **Category I bog** ☐ No - Go to **SC 4.4**

NOTE: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 5 are present, the wetland is a bog.

SC 4.4. Is an area with peats or mucks forested (> 30% cover) with subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 5 provide more than 30% of the cover under the canopy?

☐ Yes = **Category I bog** ☐ No - Go to **SC 4.5**

SC 4.5. Do the species listed in Table 6 comprise at least 20% of the total plant cover within an area of peats and mucks?

☐ Yes = **Is a Calcareous Fen for purpose of rating** ☐ No - Go to **SC 4.6**

SC 4.6. Do the species listed in Table 6 comprise at least 10% of the total plant cover in an area of peats and mucks, AND one of the two following conditions is met:

☐ Marl deposits [calcium carbonate ($CaCO_3$) precipitate] occur on the soil surface or plant stems

☐ The pH of free water is ≥ 6.8 AND electrical conductivity is ≥ 200 uS/cm at multiple locations within the wetland

☐ Yes = **Is a Category I calcareous fen** ☐ No = **Is not a calcareous fen**

SC 5.0. Forested Wetlands

Does the wetland have an area of forest rooted within its boundary that meets **at least one** of the following three criteria? (*Continue only if you have identified that a forested class is present in question H*

☑ The wetland is within the 100 year floodplain of a river or stream

☐ Aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species

☐ There is at least ¼ ac of trees (even in wetlands smaller than 2.5 ac) that are "mature" or "old-growth" according to the definitions for these priority habitats developed by WDFW (*see definitions in question H3.1*)

☑ Yes - Go to **SC 5.1** ☐ No = **Not a forested wetland with special characteristics**

SC 5.1. Does the wetland have a forest canopy where more than 50% of the tree species (by cover) are slow growing native trees (*see Table 7*)?

☐ Yes = **Category I** ☑ No - Go to **SC 5.2**

SC 5.2. Does the wetland have areas where aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species?

☐ Yes = **Category I** ☑ No - Go to **SC 5.3** **Cat. II**

SC 5.3. Does the wetland have at least ¼ acre with a forest canopy where more than 50% of the tree species (by cover) are fast growing species (*see Table 7*)?

☐ Yes = **Category II** ☑ No - Go to **SC 5.4**

SC 5.4. Is the forested component of the wetland within the 100 year floodplain of a river or stream?

☐ Yes = **Category II** ☑ No = **Not a forested wetland with special characteristics**

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.
http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here:
http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE** : This question is independent of the land use between the wetland unit and the priority habitat.*

- ☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).
- ☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).
- ☐ **Old-growth/Mature forests**: Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.
- ☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).
- ☑ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- ☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.
- ☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.
- ☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- ☑ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.
- ☐ **Shrub-steppe**: A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).
- ☐ **Eastside Steppe**: Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).
- ☐ **Juniper Savannah**: All juniper woodlands.

Wetland name or number D

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): Wetland D Date of site visit: 8/5/2020

Rated by Adam Crispin Trained by Ecology? ☑ Yes ☐ No Date of training Nov-19

HGM Class used for rating Riverine Wetland has multiple HGM classes? ☐ Yes ☑ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map ArcGIS online

OVERALL WETLAND CATEGORY II (based on functions ☑ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

_____ **Category I** - Total score = 22 - 27
X **Category II** - Total score = 19 - 21
_____ **Category III** - Total score = 16 - 18
_____ **Category IV** - Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	List appropriate rating (H, M, L)			
Site Potential	M	M	M	
Landscape Potential	M	M	H	
Value	H	L	H	**Total**
Score Based on Ratings	6	5	8	**19**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	Category
Vernal Pools	
Alkali	
Wetland of High Conservation Value	
Bog and Calcareous Fens	
Old Growth or Mature Forest - slow growing	
Aspen Forest	
Old Growth or Mature Forest - fast growing	

Maps and Figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	
Map of the contributing basin	D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream (*can be added to another figure*)	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	

HGM Classification of Wetland in Eastern Washington

For questions 1 - 4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?

- ☐ The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
- ☐ At least 30% of the open water area is deeper than 10 ft (3 m)

☑ NO - go to 2 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit meet all of the following criteria?

- ☐ The wetland is on a slope (*slope can be very gradual*),
- ☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
- ☐ The water leaves the wetland **without being impounded**.

☑ NO - go to 3 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?

- ☑ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
- ☑ The overbank flooding occurs at least once every 10 years.

☐ NO - go to 4 ☑ **YES** - The wetland class is **Riverine**

NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 5 ☐ **YES** - The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1 - 4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:

Wetland name or number D

RIVERINE WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality		Points (only 1 score per box)
R 1.0. Does the site have the potential to improve water quality?		
R 1.1. Area of surface depressions within the Riverine wetland that can trap sediments during a flooding event:		6
Depressions cover > 1/3 area of wetland	points = 6	
Depressions cover > 1/10 area of wetland	points = 3	
Depressions present but cover < 1/10 area of wetland	points = 1	
No depressions present	points = 0	
R 1.2. Structure of plants in the wetland (areas with > 90% cover at person height; **not** Cowardin classes):		5
Forest or shrub > 2/3 the area of the wetland	points = 10	
☐ Forest or shrub 1/3 – 2/3 area of the wetland	points = 5	
☑ Ungrazed, herbaceous plants > 2/3 area of wetland	points = 5	
Ungrazed herbaceous plants 1/3 – 2/3 area of wetland	points = 2	
Forest, shrub, and ungrazed herbaceous < 1/3 area of wetland	points = 0	
Total for R 1	Add the points in the boxes above	**11**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

R 2.0. Does the landscape have the potential to support the water quality function of the site?		
R 2.1. Is the wetland within an incorporated city or within its UGA?	Yes = 2 No = 0	0
R 2.2. Does the contributing basin to the wetland include a UGA or incorporated area?	Yes = 1 No = 0	0
R 2.3. Does at least 10% of the contributing basin contain tilled fields, pastures, or forests that have been clearcut within the last 5 years?	Yes = 1 No = 0	1
R 2.4. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants?	Yes = 1 No = 0	0
R 2.5. Are there other sources of pollutants coming into the wetland that are not listed in questions R 2.1 - R 2.4? Sources	Yes = 1 No = 0	0
Total for R 2	Add the points in the boxes above	**1**

Rating of Landscape Potential If score is: ☐ **3 - 6 = H** ☑ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

R 3.0. Is the water quality improvement provided by the site valuable to society?		
R 3.1. Is the wetland along a stream or river that is on the 303(d) list or on a tributary that drains to one within 1 mi?	Yes = 1 No = 0	0
R 3.2. Does the river or stream have TMDL limits for nutrients, toxics, or pathogens?	Yes = 1 No = 0	1
R 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? (*Answer YES if there is a TMDL for the drainage in which the unit is found*).	Yes = 2 No = 0	2
Total for R 3	Add the points in the boxes above	**3**

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number D

RIVERINE WETLANDS **Hydrologic Functions** - Indicators that site functions to reduce flooding and stream erosion		Points (only 1 score per box)
R 4.0. Does the site have the potential to reduce flooding and erosion?		
R 4.1. Characteristics of the overbank storage the wetland provides: *Estimate the average width of the wetland perpendicular to the direction of the flow and the width of the stream or river channel (distance between banks). Calculate the ratio: (average width of wetland)/(average width of stream between banks).*		
If the ratio is more than 2	points = 10	4
If the ratio is 1 - 2	points = 8	
If the ratio is ½ - < 1	points = 4	
If the ratio is ¼ - < ½	points = 2	
If the ratio is < ¼	points = 1	
R 4.2. Characteristics of plants that slow down water velocities during floods: *Treat large woody debris as forest or shrub. Choose the points appropriate for the best description (polygons need to have > 90% cover at person height. These are NOT Cowardin classes).*		
Forest or shrub for more than $^2/_3$ the area of the wetland	points = 6	4
Forest or shrub for > $^1/_3$ area OR emergent plants > $^2/_3$ area	points = 4	
Forest or shrub for > $^1/_{10}$ area OR emergent plants > $^1/_3$ area	points = 2	
Plants do not meet above criteria	points = 0	
Total for R 4	Add the points in the boxes above	**8**

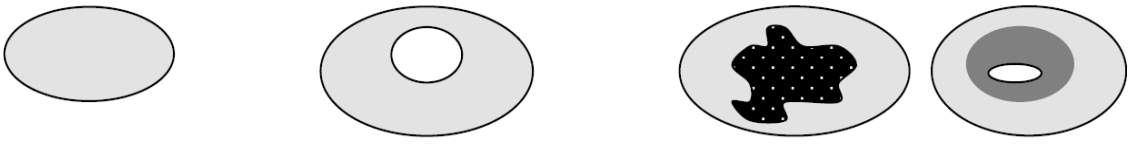
Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

R 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
R 5.1. Is the stream or river adjacent to the wetland downcut?	Yes = 0 No = 1	1
R 5.2. Does the up-gradient watershed include a UGA or incorporated area?	Yes = 1 No = 0	0
R 5.3. Is the up-gradient stream or river controlled by dams?	Yes = 0 No = 1	1
Total for R 5	Add the points in the boxes above	**2**

Rating of Landscape Potential If score is: ☐ **3 = H** ☑ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

R 6.0. Are the hydrologic functions provided by the site valuable to society?		
R 6.1. Distance to the nearest areas downstream that have flooding problems? *Choose the description that best fits the site.*		
The sub-basin immediately down-gradient of the site has flooding problems that result in damage to human or natural resources	points = 2	0
Surface flooding problems are in a sub-basin farther down-gradient	points = 1	
No flooding problems anywhere downstream	points = 0	
R 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan?	Yes = 2 No = 0	0
Total for R 6	Add the points in the boxes above	**0**

Rating of Value If score is: ☐ **2 - 4 = H** ☐ **1 = M** ☑ **0 = L** *Record the rating on the first page*

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is > = ¼ ac or > = 10% of the wetland if wetland is < 2.5 ac.* ☑ Aquatic bed ☑ Emergent plants 0 - 12 in (0-30 cm) high are the highest layer and have > 30% cover ☑ Emergent plants > 12 - 40 in (> 30-100 cm) high are the highest layer with >30% cover ☐ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ☑ Scrub-shrub (areas where shrubs have > 30% cover) ☑ Forested (areas where trees have > 30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points - 1 1 check: points = 0	3
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	1
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* ☐ Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* ☑ Yes = 3 No = 0	3
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species. Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species 9 Scoring: > 9 species: points = 2 4 - 9 species: points = 1 < 4 species: points = 0	1
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **HIGH** = 3 points 	2

H 1.6. Special habitat features: *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ☐ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ☑ Cattails or bulrushes are present within the wetland. ☐ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ☑ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ☑ Invasive species cover less than 20% in each stratum of vegetation (*canopy, sub-canopy, shrubs, herbaceous, moss/ground cover*)	3
Total for H 1 Add the points in the boxes above	**13**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☑ **7 - 14 = M** ☐ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1 Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* 15 % undisturbed habitat + (12 % moderate & low intensity land uses / 2) = 21% > 1/3 (33.3%) of 1 km Polygon points = 3 20 - 33% of 1 km Polygon points = 2 10 - 19% of 1 km Polygon points = 1 < 10 % of 1 km Polygon points = 0	2
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* 89 % undisturbed habitat + (10 % moderate & low intensity land uses / 2) = 94% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1 - 3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	3
H 2.3 Land use intensity in 1 km Polygon: > 50% of 1 km Polygon is high intensity land use points = (-2) Does not meet criterion above points = 0	0
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* Yes = 3 No = 0	0
Total for H 2 Add the points in the boxes above	**5**

Rating of Landscape Potential If Score is: ☑ **4 - 9 = H** ☐ **1 - 3 = M** ☐ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated* . Site meets ANY of the following criteria: points = 2 ☑ It has 3 or more priority habitats within 100 m (see Appendix B) ☑ It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) ☐ It is mapped as a location for an individual WDFW species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100 m (see Appendix B) points = 1	2

Site does not meet any of the criteria above	points = 0

Rating of Value If Score is: ☑ **2 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate category. NOTE: A wetland may meet the criteria for more than one set of special characteristics. Record all those that apply. NOTE: All wetlands should also be characterized based on their functions.

Wetland Type	Category
Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.	
SC 1.0. Vernal Pools Is the wetland **less than 4000 ft²**, and does it meet at least **two** of the following criteria? ☐ Its only source of water is rainfall or snowmelt from a small contributing basin and has no groundwater input. ☐ Wetland plants are typically present only in the spring; the summer vegetation is typically upland annuals. *If you find perennial, obligate, wetland plants, the wetland is probably NOT a vernal pool.* ☐ The soil in the wetland is shallow [< 1 ft (30 cm) deep] and is underlain by an impermeable layer such as basalt or clay. ☐ Surface water is present for less than 120 days during the wet season. ☐ Yes - Go to **SC 1.1** ☐ No = **Not vernal pool** SC 1.1. Is the vernal pool relatively undisturbed in February and March? ☐ Yes – Go to **SC 1.2** ☐ No = **Not a vernal pool with special characteristics**	
SC 1.2. Is the vernal pool in an area where there are at least 3 separate aquatic resources within 0.5 mi (other wetlands, rivers, lakes etc.)? ☐ Yes = **Category II** ☐ No = **Category III**	
SC 2.0. Alkali wetlands Does the wetland meet **one** of the following criteria? ☐ The wetland has a conductivity > 3.0 mS/cm. ☐ The wetland has a conductivity between 2.0 and 3.0 mS, and more than 50% of the plant cover in the wetland can be classified as "alkali" species (see Table 4 for list of plants found in alkali systems). ☐ If the wetland is dry at the time of your field visit, the central part of the area is covered with a layer of salt. **OR** does the wetland unit meet two of the following three sub-criteria? ☐ Salt encrustations around more than 75% of the edge of the wetland ☐ More than ¾ of the plant cover consists of species listed on Table 4 ☐ A pH above 9.0. All alkali wetlands have a high pH, but please note that some freshwater wetlands may also have a high pH. Thus, pH alone is not a good indicator of alkali wetlands. ☐ Yes = **Category I** ☐ No = **Not an alkali wetland**	
SC 3.0. Wetlands of High Conservation Value (WHCV) SC 3.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☐ Yes - Go to **SC 3.2** ☐ No - Go to **SC 3.3** SC 3.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☐ No = **Not WHCV** SC 3.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 3.4** ☐ No = **Not WHCV** SC 3.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☐ No = **Not WHCV**	

SC 4.0. Bogs and Calcareous Fens

Does the wetland (or any part of the wetland unit) meet both the criteria for soils and vegetation in bogs or calcareous fens? Use the key below to identify if the wetland is a bog or calcareous fen. ***If you answer yes you will still need to rate the wetland based on its functions.***

SC 4.1. Does an area within the wetland have organic soil horizons (i.e., layers of organic soil), either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? *See Appendix C for a field key to identify organic soils.*

☐ Yes - Go to **SC 4.3** ☐ No - Go to **SC 4.2**

SC 4.2. Does an area within the wetland have organic soils, either peats or mucks, that are less than 16 in deep over bedrock or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond?

☐ Yes - Go to **SC 4.3** ☐ No = **Is not a bog for rating**

SC 4.3. Does an area within the wetland have more than 70% cover of mosses at ground level AND at least 30% of the total plant cover consists of species in Table 5?

☐ Yes = **Category I bog** ☐ No - Go to **SC 4.4**

NOTE: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 5 are present, the wetland is a bog.

SC 4.4. Is an area with peats or mucks forested (> 30% cover) with subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 5 provide more than 30% of the cover under the canopy?

☐ Yes = **Category I bog** ☐ No - Go to **SC 4.5**

SC 4.5. Do the species listed in Table 6 comprise at least 20% of the total plant cover within an area of peats and mucks?

☐ Yes = **Is a Calcareous Fen for purpose of rating** ☐ No - Go to **SC 4.6**

SC 4.6. Do the species listed in Table 6 comprise at least 10% of the total plant cover in an area of peats and mucks, AND one of the two following conditions is met:

☐ Marl deposits [calcium carbonate ($CaCO_3$) precipitate] occur on the soil surface or plant stems

☐ The pH of free water is ≥ 6.8 AND electrical conductivity is ≥ 200 uS/cm at multiple locations within the wetland

☐ Yes = **Is a Category I calcareous fen** ☐ No = **Is not a calcareous fen**

SC 5.0. Forested Wetlands

Does the wetland have an area of forest rooted within its boundary that meets **at least one** of the following three criteria? (*Continue only if you have identified that a forested class is present in question H*

☐ The wetland is within the 100 year floodplain of a river or stream

☐ Aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species

☐ There is at least ¼ ac of trees (even in wetlands smaller than 2.5 ac) that are "mature" or "old-growth" according to the definitions for these priority habitats developed by WDFW (*see definitions in question H3.1*)

☐ Yes - Go to **SC 5.1** ☐ No = **Not a forested wetland with special characteristics**

SC 5.1. Does the wetland have a forest canopy where more than 50% of the tree species (by cover) are slow growing native trees (*see Table 7*)?

☐ Yes = **Category I** ☐ No - Go to **SC 5.2**

SC 5.2. Does the wetland have areas where aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species?

☐ Yes = **Category I** ☐ No - Go to **SC 5.3**

SC 5.3. Does the wetland have at least ¼ acre with a forest canopy where more than 50% of the tree species (by cover) are fast growing species (*see Table 7*)?

☐ Yes = **Category II** ☐ No - Go to **SC 5.4**

SC 5.4. Is the forested component of the wetland within the 100 year floodplain of a river or stream?

☐ Yes = **Category II** ☐ No = **Not a forested wetland with special characteristics**

Category of wetland based on Special Characteristics

Choose the highest rating if wetland falls into several categories If you answered No for all types, enter “Not Applicable” on Summary Form	

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.
http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here:
http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE** : This question is independent of the land use between the wetland unit and the priority habitat.*

- ☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).
- ☑ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).
- ☐ **Old-growth/Mature forests**: Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.
- ☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).
- ☑ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- ☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.
- ☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.
- ☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- ☑ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.
- ☐ **Shrub-steppe**: A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).
- ☐ **Eastside Steppe**: Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

Wetland name or number F

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): Wetland F Date of site visit: 8/5/2020

Rated by Adam Crispin Trained by Ecology? ☑ Yes ☐ No Date of training 11/13/2019

HGM Class used for rating Depressional Wetland has multiple HGM classes? ☑ Yes ☐ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ☑ or special characteristics ☑)

1. Category of wetland based on FUNCTIONS

_____ **Category I** - Total score = 22 - 27
_____ **Category II** - Total score = 19 - 21
X **Category III** - Total score = 16 - 18
_____ **Category IV** - Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
		List appropriate rating (H, M, L)		
Site Potential	M	L	L	
Landscape Potential	M	M	H	
Value	H	L	M	**Total**
Score Based on Ratings	7	5	6	**18**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	Category
Vernal Pools	
Alkali	
Wetland of High Conservation Value	
Bog and Calcareous Fens	
Old Growth or Mature Forest - slow growing	
Aspen Forest	
Old Growth or Mature Forest - fast growing	

Wetland name or number F

Maps and Figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	x
Map of the contributing basin	D 5.3	x
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	x
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	x

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream (*can be added to another figure*)	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	

HGM Classification of Wetland in Eastern Washington

For questions 1 - 4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?

- ☐ The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
- ☐ At least 30% of the open water area is deeper than 10 ft (3 m)

☑ NO - go to 2 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit meet all of the following criteria?

- ☐ The wetland is on a slope (*slope can be very gradual*),
- ☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
- ☐ The water leaves the wetland **without being impounded**.

☐ NO - go to 3 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?

- ☑ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
- ☑ The overbank flooding occurs at least once every 10 years.

☐ NO - go to 4 ☐ **YES** - The wetland class is **Riverine**

NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 5 ☑ **YES** - The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1 - 4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:
Wetland has multiple classes but is overall Depressional.

Wetland name or number F

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality		Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?		
D 1.1. Characteristics of surface water outflows from the wetland:		
Wetland has no surface water outlet	points = 5	
☑ Wetland has an intermittently flowing outlet	points = 3	3
☐ Wetland has a highly constricted permanently flowing outlet	points = 3	
Wetland has a permanently flowing, unconstricted, surface outlet	points = 1	
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions of soils*)	Yes = 3 No = 0	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes)		
Wetland has persistent, ungrazed, vegetation for > $^2/_3$ of area	points = 5	
Wetland has persistent, ungrazed, vegetation from $^1/_3$ to $^2/_3$ of area	points = 3	5
Wetland has persistent, ungrazed vegetation from $^1/_{10}$ to < $^1/_3$ of area	points = 1	
Wetland has persistent, ungrazed vegetation < $^1/_{10}$ of area	points = 0	
D 1.4. Characteristics of seasonal ponding or inundation:		
This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.		
Area seasonally ponded is > ½ total area of wetland	points = 3	1
Area seasonally ponded is ¼ - ½ total area of wetland	points = 1	
Area seasonally ponded is < ¼ total area of wetland	points = 0	
Total for D 1	Add the points in the boxes above	**9**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?		
D 2.1. Does the wetland receive stormwater discharges?	Yes = 1 No = 0	1
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants?	Yes = 1 No = 0	0
D 2.3. Are there septic systems within 250 ft of the wetland?	Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3?		0
Source	Yes = 1 No = 0	
Total for D 2	Add the points in the boxes above	**1**

Rating of Landscape Potential If score is: ☐ **3 or 4 = H** ☑ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?		
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list?	Yes = 1 No = 0	0
D 3.2.Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]?	Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)?	Yes = 2 No = 0	2
Total for D 3	Add the points in the boxes above	**3**

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number F

DEPRESSIONAL WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and erosion	Points (only 1 score per box)
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland has no surface water outlet — points = 8 ☐ Wetland has an intermittently flowing outlet — points = 4 ☐ Wetland has a highly constricted permanently flowing outlet — points = 4 Wetland has a permanently flowing unconstricted surface outlet — points = 0 (*If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing"*)	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).* Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 8 Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 6 ☐ The wetland is a headwater wetland — points = 4 ☐ Seasonal ponding: 1 ft - < 2 ft — points = 4 Seasonal ponding: 6 in - < 1 ft — points = 2 Seasonal ponding: < 6 in or wetland has only saturated soils — points = 0	0
Total for D 4 — Add the points in the boxes above	**4**

Rating of Site Potential If score is: ☐**12 - 16 = H** ☐**6 - 11 = M** ☑**0 - 5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
D 5.1. Does the wetland receive stormwater discharges?	Yes = 1 No = 0	1
D 5.2. Is > 10% of the area within 150 ft of the wetland in land uses that generates runoff?	Yes = 1 No = 0	0
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses ?	Yes = 1 No = 0	0
Total for D 5	Add the points in the boxes above	**1**

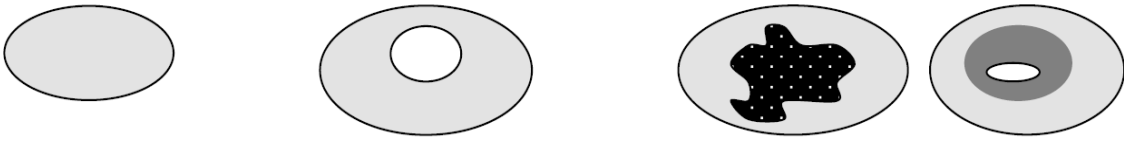
Rating of Landscape Potential If score is: ☐ **3 = H** ☑**1 or 2 = M** ☐**0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The wetland is in a landscape that has flooding problems. Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND Flooding occurs in sub-basin that is immediately down-gradient of wetland — points = 2 Surface flooding problems are in a sub-basin farther down-gradient — points = 1 ☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. — points = 0 *Explain why* ☑ There are no problems with flooding downstream of the wetland — points = 0	0
D 6.2. Has the site been identified as important for flood storage or flood conveyance	0

in a regional flood control plan?	Yes = 2 No = 0	0
Total for D 6	Add the points in the boxes above	**0**

Rating of Value If score is: ☐ **2 - 4 = H** ☐ **1 = M** ☑ **0 = L** *Record the rating on the first page*

Wetland name or number F

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is > = ¼ ac or > = 10% of the wetland if wetland is < 2.5 ac.* ☐ Aquatic bed ☐ Emergent plants 0 - 12 in (0-30 cm) high are the highest layer and have > 30% cover ☐ Emergent plants > 12 - 40 in (> 30-100 cm) high are the highest layer with >30% cover ☐ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ☑ Scrub-shrub (areas where shrubs have > 30% cover) ☑ Forested (areas where trees have > 30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points - 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* ☐ Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* ☐ Yes = 3 No = 0	0
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species. Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species 5 Scoring: > 9 species: points = 2 4 - 9 species: points = 1 < 4 species: points = 0	1
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **HIGH** = 3 points	0

H 1.6. Special habitat features: *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ☐ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ☐ Cattails or bulrushes are present within the wetland. ☐ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ☐ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ☑ Invasive species cover less than 20% in each stratum of vegetation (*canopy, sub-canopy, shrubs, herbaceous, moss/ground cover*)	1
Total for H 1 Add the points in the boxes above	**3**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☐ **7 - 14 = M** ☑ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1 Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* 41 % undisturbed habitat + (15 % moderate & low intensity land uses / 2) = 48.5% > 1/3 (33.3%) of 1 km Polygon points = 3 20 - 33% of 1 km Polygon points = 2 10 - 19% of 1 km Polygon points = 1 < 10 % of 1 km Polygon points = 0	3
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* 89 % undisturbed habitat + (10 % moderate & low intensity land uses / 2) = 94% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1 - 3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	3
H 2.3 Land use intensity in 1 km Polygon: > 50% of 1 km Polygon is high intensity land use points = (-2) Does not meet criterion above points = 0	0
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* Yes = 3 No = 0	0
Total for H 2 Add the points in the boxes above	**6**

Rating of Landscape Potential If Score is: ☑ **4 - 9 = H** ☐ **1 - 3 = M** ☐ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated* . Site meets ANY of the following criteria: points = 2 ☐ It has 3 or more priority habitats within 100 m (see Appendix B) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) ☐ It is mapped as a location for an individual WDFW species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan	1

Site has 1 or 2 priority habitats within 100 m (see Appendix B)	points = 1	
Site does not meet any of the criteria above	points = 0	

Rating of Value If Score is: ☐ **2 = H** ☑ **1 = M** ☐ **0 = L** *Record the rating on the first page*

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate category. NOTE: A wetland may meet the criteria for more than one set of special characteristics. Record all those that apply. NOTE: All wetlands should also be characterized based on their functions.

Wetland Type	Category
Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.	
SC 1.0. Vernal Pools Is the wetland **less than 4000 ft²**, and does it meet at least **two** of the following criteria? ☐ Its only source of water is rainfall or snowmelt from a small contributing basin and has no groundwater input. ☐ Wetland plants are typically present only in the spring; the summer vegetation is typically upland annuals. *If you find perennial, obligate, wetland plants, the wetland is probably NOT a vernal pool.* ☐ The soil in the wetland is shallow [< 1 ft (30 cm) deep] and is underlain by an impermeable layer such as basalt or clay. ☐ Surface water is present for less than 120 days during the wet season. ☐ Yes - Go to **SC 1.1** ☑ No = **Not vernal pool** SC 1.1. Is the vernal pool relatively undisturbed in February and March? ☐ Yes – Go to **SC 1.2** ☐ No = **Not a vernal pool with special characteristics**	
SC 1.2. Is the vernal pool in an area where there are at least 3 separate aquatic resources within 0.5 mi (other wetlands, rivers, lakes etc.)? ☐ Yes = **Category II** ☐ No = **Category III**	
SC 2.0. Alkali wetlands Does the wetland meet **one** of the following criteria? ☐ The wetland has a conductivity > 3.0 mS/cm. ☐ The wetland has a conductivity between 2.0 and 3.0 mS, and more than 50% of the plant cover in the wetland can be classified as "alkali" species (see Table 4 for list of plants found in alkali systems). ☐ If the wetland is dry at the time of your field visit, the central part of the area is covered with a layer of salt. **OR** does the wetland unit meet two of the following three sub-criteria? ☐ Salt encrustations around more than 75% of the edge of the wetland ☐ More than ¾ of the plant cover consists of species listed on Table 4 ☐ A pH above 9.0. All alkali wetlands have a high pH, but please note that some freshwater wetlands may also have a high pH. Thus, pH alone is not a good indicator of alkali wetlands. ☐ Yes = **Category I** ☑ No = **Not an alkali wetland**	
SC 3.0. Wetlands of High Conservation Value (WHCV) SC 3.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☑ Yes - Go to **SC 3.2** ☐ No - Go to **SC 3.3** SC 3.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☑ No = **Not WHCV** SC 3.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 3.4** ☑ No = **Not WHCV** SC 3.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☑ No = **Not WHCV**	

SC 4.0. Bogs and Calcareous Fens

Does the wetland (or any part of the wetland unit) meet both the criteria for soils and vegetation in bogs or calcareous fens? Use the key below to identify if the wetland is a bog or calcareous fen. ***If you answer yes you will still need to rate the wetland based on its functions.***

SC 4.1. Does an area within the wetland have organic soil horizons (i.e., layers of organic soil), either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? *See Appendix C for a field key to identify organic soils.*

☐ Yes - Go to **SC 4.3** ☑ No - Go to **SC 4.2**

SC 4.2. Does an area within the wetland have organic soils, either peats or mucks, that are less than 16 in deep over bedrock or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond?

☐ Yes - Go to **SC 4.3** ☑ No = **Is not a bog for rating**

SC 4.3. Does an area within the wetland have more than 70% cover of mosses at ground level AND at least 30% of the total plant cover consists of species in Table 5?

☐ Yes = **Category I bog** ☐ No - Go to **SC 4.4**

NOTE: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 5 are present, the wetland is a bog.

SC 4.4. Is an area with peats or mucks forested (> 30% cover) with subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 5 provide more than 30% of the cover under the canopy?

☐ Yes = **Category I bog** ☐ No - Go to **SC 4.5**

SC 4.5. Do the species listed in Table 6 comprise at least 20% of the total plant cover within an area of peats and mucks?

☐ Yes = **Is a Calcareous Fen for purpose of rating** ☐ No - Go to **SC 4.6**

SC 4.6. Do the species listed in Table 6 comprise at least 10% of the total plant cover in an area of peats and mucks, AND one of the two following conditions is met:

☐ Marl deposits [calcium carbonate ($CaCO_3$) precipitate] occur on the soil surface or plant stems

☐ The pH of free water is ≥ 6.8 AND electrical conductivity is ≥ 200 uS/cm at multiple locations within the wetland

☐ Yes = **Is a Category I calcareous fen** ☐ No = **Is not a calcareous fen**

SC 5.0. Forested Wetlands

Does the wetland have an area of forest rooted within its boundary that meets **at least one** of the following three criteria? (*Continue only if you have identified that a forested class is present in question H*

☑ The wetland is within the 100 year floodplain of a river or stream

☐ Aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species

☐ There is at least ¼ ac of trees (even in wetlands smaller than 2.5 ac) that are "mature" or "old-growth" according to the definitions for these priority habitats developed by WDFW (*see definitions in question H3.1*)

☑ Yes - Go to **SC 5.1** ☐ No = **Not a forested wetland with special characteristics**

SC 5.1. Does the wetland have a forest canopy where more than 50% of the tree species (by cover) are slow growing native trees (*see Table 7*)?

☐ Yes = **Category I** ☑ No - Go to **SC 5.2**

SC 5.2. Does the wetland have areas where aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species?

☐ Yes = **Category I** ☑ No - Go to **SC 5.3** **Cat. II**

SC 5.3. Does the wetland have at least ¼ acre with a forest canopy where more than 50% of the tree species (by cover) are fast growing species (*see Table 7*)?

☐ Yes = **Category II** ☑ No - Go to **SC 5.4**

SC 5.4. Is the forested component of the wetland within the 100 year floodplain of a river or stream?

☐ Yes = **Category II** ☑ No = **Not a forested wetland with special characteristics**

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.
http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here:
http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE** : This question is independent of the land use between the wetland unit and the priority habitat.*

- ☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).
- ☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).
- ☐ **Old-growth/Mature forests**: Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.
- ☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).
- ☑ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- ☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.
- ☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.
- ☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- ☑ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.
- ☐ **Shrub-steppe**: A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).
- ☐ **Eastside Steppe**: Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).
- ☐ **Juniper Savannah**: All juniper woodlands.

Wetland name or number G

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): Wetland G Date of site visit: 8/5/2020

Rated by Adam Crispin Trained by Ecology? ☑ Yes ☐ No Date of training 11/13/2019

HGM Class used for rating Depressional Wetland has multiple HGM classes? ☑ Yes ☐ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY II (based on functions ☑ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

_____ **Category I** - Total score = 22 - 27
X **Category II** - Total score = 19 - 21
_____ **Category III** - Total score = 16 - 18
_____ **Category IV** - Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
		List appropriate rating (H, M, L)		
Site Potential	M	M	M	
Landscape Potential	M	M	H	
Value	H	L	M	**Total**
Score Based on Ratings	7	5	7	**19**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	Category
Vernal Pools	
Alkali	
Wetland of High Conservation Value	
Bog and Calcareous Fens	
Old Growth or Mature Forest - slow growing	
Aspen Forest	
Old Growth or Mature Forest - fast growing	

Wetland name or number G

Maps and Figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	x
Map of the contributing basin	D 5.3	x
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	x
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	x

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream (*can be added to another figure*)	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	

Wetland name or number G

HGM Classification of Wetland in Eastern Washington

For questions 1 - 4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?

- ☐ The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
- ☐ At least 30% of the open water area is deeper than 10 ft (3 m)

☑ NO - go to 2 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit meet all of the following criteria?

- ☐ The wetland is on a slope (*slope can be very gradual*),
- ☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
- ☐ The water leaves the wetland **without being impounded**.

☑ NO - go to 3 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?

- ☐ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
- ☐ The overbank flooding occurs at least once every 10 years.

☑ NO - go to 4 ☐ **YES** - The wetland class is **Riverine**

NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 5 ☑ **YES** - The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1 - 4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:
Wetland has multiple classes but is overall Depressional.

Wetland name or number G

DEPRESSIONAL WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

		Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?		
D 1.1. Characteristics of surface water outflows from the wetland:		
Wetland has no surface water outlet	points = 5	
☑ Wetland has an intermittently flowing outlet	points = 3	3
☐ Wetland has a highly constricted permanently flowing outlet	points = 3	
Wetland has a permanently flowing, unconstricted, surface outlet	points = 1	
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions of soils*)	Yes = 3 No = 0	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes)		
Wetland has persistent, ungrazed, vegetation for > $^2/_3$ of area	points = 5	
Wetland has persistent, ungrazed, vegetation from $^1/_3$ to $^2/_3$ of area	points = 3	5
Wetland has persistent, ungrazed vegetation from $^1/_{10}$ to < $^1/_3$ of area	points = 1	
Wetland has persistent, ungrazed vegetation < $^1/_{10}$ of area	points = 0	
D 1.4. Characteristics of seasonal ponding or inundation:		
This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.		
Area seasonally ponded is > ½ total area of wetland	points = 3	1
Area seasonally ponded is ¼ - ½ total area of wetland	points = 1	
Area seasonally ponded is < ¼ total area of wetland	points = 0	
Total for D 1	Add the points in the boxes above	**9**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?		
D 2.1. Does the wetland receive stormwater discharges?	Yes = 1 No = 0	1
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants?	Yes = 1 No = 0	0
D 2.3. Are there septic systems within 250 ft of the wetland?	Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3?		0
Source	Yes = 1 No = 0	
Total for D 2	Add the points in the boxes above	**1**

Rating of Landscape Potential If score is: ☐ **3 or 4 = H** ☑ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?		
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list?	Yes = 1 No = 0	0
D 3.2.Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]?	Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)?	Yes = 2 No = 0	2
Total for D 3	Add the points in the boxes above	**3**

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number G

DEPRESSIONAL WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and erosion	Points (only 1 score per box)
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland has no surface water outlet — points = 8 ☑ Wetland has an intermittently flowing outlet — points = 4 ☐ Wetland has a highly constricted permanently flowing outlet — points = 4 Wetland has a permanently flowing unconstricted surface outlet — points = 0 (*If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing"*)	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).* Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 8 Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 6 ☐ The wetland is a headwater wetland — points = 4 ☐ Seasonal ponding: 1 ft - < 2 ft — points = 4 Seasonal ponding: 6 in - < 1 ft — points = 2 Seasonal ponding: < 6 in or wetland has only saturated soils — points = 0	6
Total for D 4 — Add the points in the boxes above	**10**

Rating of Site Potential If score is: ☐**12 - 16 = H** ☑**6 - 11 = M** ☐**0 - 5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
D 5.1. Does the wetland receive stormwater discharges?	Yes = 1 No = 0	1
D 5.2. Is > 10% of the area within 150 ft of the wetland in land uses that generates runoff?	Yes = 1 No = 0	0
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses ?	Yes = 1 No = 0	0
Total for D 5	Add the points in the boxes above	**1**

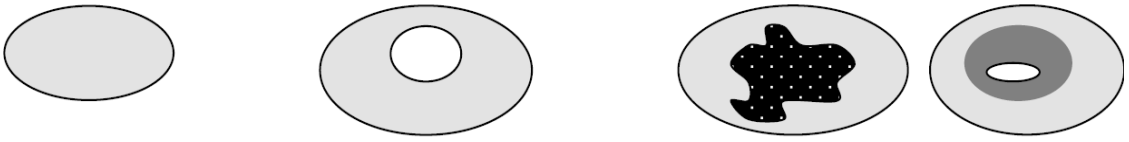
Rating of Landscape Potential If score is: ☐ **3 = H** ☑**1 or 2 = M** ☐**0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The wetland is in a landscape that has flooding problems. Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND Flooding occurs in sub-basin that is immediately down-gradient of wetland — points = 2 Surface flooding problems are in a sub-basin farther down-gradient — points = 1 ☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. — points = 0 *Explain why* ☑ There are no problems with flooding downstream of the wetland — points = 0	0
D 6.2. Has the site been identified as important for flood storage or flood conveyance	0

in a regional flood control plan?	Yes = 2 No = 0	0
Total for D 6	Add the points in the boxes above	**0**

Rating of Value If score is: ☐ **2 - 4 = H** ☐ **1 = M** ☑ **0 = L** *Record the rating on the first page*

Wetland name or number G

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is > = ¼ ac or > = 10% of the wetland if wetland is < 2.5 ac.* ☐ Aquatic bed ☑ Emergent plants 0 - 12 in (0-30 cm) high are the highest layer and have > 30% cover ☐ Emergent plants > 12 - 40 in (> 30-100 cm) high are the highest layer with >30% cover ☑ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ☑ Scrub-shrub (areas where shrubs have > 30% cover) ☑ Forested (areas where trees have > 30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points - 1 1 check: points = 0	3
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* ☐ Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* ☐ Yes = 3 No = 0	0
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species. Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species 12 Scoring: > 9 species: points = 2 4 - 9 species: points = 1 < 4 species: points = 0	2
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **HIGH** = 3 points	3

H 1.6. Special habitat features: *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ☐ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ☐ Cattails or bulrushes are present within the wetland. ☑ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ☑ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ☐ Invasive species cover less than 20% in each stratum of vegetation (*canopy, sub-canopy, shrubs, herbaceous, moss/ground cover*)	2
Total for H 1 Add the points in the boxes above	**10**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☑ **7 - 14 = M** ☐ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1 Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* 12 % undisturbed habitat + (20 % moderate & low intensity land uses / 2) = 22% > 1/3 (33.3%) of 1 km Polygon points = 3 20 - 33% of 1 km Polygon points = 2 10 - 19% of 1 km Polygon points = 1 < 10 % of 1 km Polygon points = 0	2
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* 89 % undisturbed habitat + (10 % moderate & low intensity land uses / 2) = 94% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1 - 3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	3
H 2.3 Land use intensity in 1 km Polygon: > 50% of 1 km Polygon is high intensity land use points = (-2) Does not meet criterion above points = 0	0
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* Yes = 3 No = 0	0
Total for H 2 Add the points in the boxes above	**5**

Rating of Landscape Potential If Score is: ☑ **4 - 9 = H** ☐ **1 - 3 = M** ☐ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated* . Site meets ANY of the following criteria: points = 2 ☐ It has 3 or more priority habitats within 100 m (see Appendix B) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) ☐ It is mapped as a location for an individual WDFW species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan	1

Site has 1 or 2 priority habitats within 100 m (see Appendix B)	points = 1	
Site does not meet any of the criteria above	points = 0	

Rating of Value If Score is: ☐ **2 = H** ☑ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number G

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate category. NOTE: A wetland may meet the criteria for more than one set of special characteristics. Record all those that apply. NOTE: All wetlands should also be characterized based on their functions.

Wetland Type	Category
Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.	
SC 1.0. Vernal Pools Is the wetland **less than 4000 ft²**, and does it meet at least **two** of the following criteria? ☐ Its only source of water is rainfall or snowmelt from a small contributing basin and has no groundwater input. ☐ Wetland plants are typically present only in the spring; the summer vegetation is typically upland annuals. *If you find perennial, obligate, wetland plants, the wetland is probably NOT a vernal pool.* ☐ The soil in the wetland is shallow [< 1 ft (30 cm) deep] and is underlain by an impermeable layer such as basalt or clay. ☐ Surface water is present for less than 120 days during the wet season. ☐ Yes - Go to **SC 1.1** ☑ No = **Not vernal pool** SC 1.1. Is the vernal pool relatively undisturbed in February and March? ☐ Yes – Go to **SC 1.2** ☐ No = **Not a vernal pool with special characteristics**	
SC 1.2. Is the vernal pool in an area where there are at least 3 separate aquatic resources within 0.5 mi (other wetlands, rivers, lakes etc.)? ☐ Yes = **Category II** ☐ No = **Category III**	
SC 2.0. Alkali wetlands Does the wetland meet **one** of the following criteria? ☐ The wetland has a conductivity > 3.0 mS/cm. ☐ The wetland has a conductivity between 2.0 and 3.0 mS, and more than 50% of the plant cover in the wetland can be classified as "alkali" species (see Table 4 for list of plants found in alkali systems). ☐ If the wetland is dry at the time of your field visit, the central part of the area is covered with a layer of salt. **OR** does the wetland unit meet two of the following three sub-criteria? ☐ Salt encrustations around more than 75% of the edge of the wetland ☐ More than ¾ of the plant cover consists of species listed on Table 4 ☐ A pH above 9.0. All alkali wetlands have a high pH, but please note that some freshwater wetlands may also have a high pH. Thus, pH alone is not a good indicator of alkali wetlands. ☐ Yes = **Category I** ☑ No = **Not an alkali wetland**	
SC 3.0. Wetlands of High Conservation Value (WHCV) SC 3.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☑ Yes - Go to **SC 3.2** ☐ No - Go to **SC 3.3** SC 3.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☑ No = **Not WHCV** SC 3.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 3.4** ☑ No = **Not WHCV** SC 3.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☑ No = **Not WHCV**	

SC 4.0. Bogs and Calcareous Fens

Does the wetland (or any part of the wetland unit) meet both the criteria for soils and vegetation in bogs or calcareous fens? Use the key below to identify if the wetland is a bog or calcareous fen. ***If you answer yes you will still need to rate the wetland based on its functions.***

SC 4.1. Does an area within the wetland have organic soil horizons (i.e., layers of organic soil), either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? *See Appendix C for a field key to identify organic soils.*

☐ Yes - Go to **SC 4.3** ☑ No - Go to **SC 4.2**

SC 4.2. Does an area within the wetland have organic soils, either peats or mucks, that are less than 16 in deep over bedrock or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond?

☐ Yes - Go to **SC 4.3** ☑ No = **Is not a bog for rating**

SC 4.3. Does an area within the wetland have more than 70% cover of mosses at ground level AND at least 30% of the total plant cover consists of species in Table 5?

☐ Yes = **Category I bog** ☐ No - Go to **SC 4.4**

NOTE: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 5 are present, the wetland is a bog.

SC 4.4. Is an area with peats or mucks forested (> 30% cover) with subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 5 provide more than 30% of the cover under the canopy?

☐ Yes = **Category I bog** ☐ No - Go to **SC 4.5**

SC 4.5. Do the species listed in Table 6 comprise at least 20% of the total plant cover within an area of peats and mucks?

☐ Yes = **Is a Calcareous Fen for purpose of rating** ☐ No - Go to **SC 4.6**

SC 4.6. Do the species listed in Table 6 comprise at least 10% of the total plant cover in an area of peats and mucks, AND one of the two following conditions is met:

☐ Marl deposits [calcium carbonate ($CaCO_3$) precipitate] occur on the soil surface or plant stems

☐ The pH of free water is ≥ 6.8 AND electrical conductivity is ≥ 200 uS/cm at multiple locations within the wetland

☐ Yes = **Is a Category I calcareous fen** ☐ No = **Is not a calcareous fen**

SC 5.0. Forested Wetlands

Does the wetland have an area of forest rooted within its boundary that meets **at least one** of the following three criteria? (*Continue only if you have identified that a forested class is present in question H*

☑ The wetland is within the 100 year floodplain of a river or stream

☐ Aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species

☐ There is at least ¼ ac of trees (even in wetlands smaller than 2.5 ac) that are "mature" or "old-growth" according to the definitions for these priority habitats developed by WDFW (*see definitions in question H3.1*)

☑ Yes - Go to **SC 5.1** ☐ No = **Not a forested wetland with special characteristics**

SC 5.1. Does the wetland have a forest canopy where more than 50% of the tree species (by cover) are slow growing native trees (*see Table 7*)?

☐ Yes = **Category I** ☑ No - Go to **SC 5.2**

SC 5.2. Does the wetland have areas where aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species?

☐ Yes = **Category I** ☑ No - Go to **SC 5.3** **Cat. II**

SC 5.3. Does the wetland have at least ¼ acre with a forest canopy where more than 50% of the tree species (by cover) are fast growing species (*see Table 7*)?

☐ Yes = **Category II** ☑ No - Go to **SC 5.4**

SC 5.4. Is the forested component of the wetland within the 100 year floodplain of a river or stream?

☐ Yes = **Category II** ☑ No = **Not a forested wetland with special characteristics**

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.
http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here:
http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE** : This question is independent of the land use between the wetland unit and the priority habitat.*

- ☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).
- ☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).
- ☐ **Old-growth/Mature forests**: Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.
- ☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).
- ☑ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- ☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.
- ☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.
- ☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- ☑ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.
- ☐ **Shrub-steppe**: A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).
- ☐ **Eastside Steppe**: Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).
- ☐ **Juniper Savannah**: All juniper woodlands.

Wetland name or number H

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): Wetland H Date of site visit: 8/5/2020

Rated by Adam Crispin Trained by Ecology? ☑ Yes ☐ No Date of training 11/13/2019

HGM Class used for rating Depressional Wetland has multiple HGM classes? ☑ Yes ☐ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ☑ or special characteristics ☑)

1. Category of wetland based on FUNCTIONS

_____ **Category I** - Total score = 22 - 27
_____ **Category II** - Total score = 19 - 21
X **Category III** - Total score = 16 - 18
_____ **Category IV** - Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	List appropriate rating (H, M, L)			
Site Potential	M	L	M	
Landscape Potential	L	L	H	
Value	H	L	M	**Total**
Score Based on Ratings	6	3	7	**16**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	Category
Vernal Pools	
Alkali	
Wetland of High Conservation Value	
Bog and Calcareous Fens	
Old Growth or Mature Forest - slow growing	
Aspen Forest	
Old Growth or Mature Forest - fast growing	

Wetland name or number H

Maps and Figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	x
Map of the contributing basin	D 5.3	x
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	x
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	x

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream (*can be added to another figure*)	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	

HGM Classification of Wetland in Eastern Washington

For questions 1 - 4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?

- ☐ The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
- ☐ At least 30% of the open water area is deeper than 10 ft (3 m)

☑ NO - go to 2 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit meet all of the following criteria?

- ☑ The wetland is on a slope (*slope can be very gradual*),
- ☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
- ☐ The water leaves the wetland **without being impounded**.

☑ NO - go to 3 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?

- ☑ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
- ☑ The overbank flooding occurs at least once every 10 years.

☐ NO - go to 4 ☑ **YES** - The wetland class is **Riverine**

NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 5 ☑ **YES** - The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1 - 4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:
Wetland has multiple classes but is overall Depressional.

Wetland name or number H

DEPRESSIONAL WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

		Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?		
D 1.1. Characteristics of surface water outflows from the wetland:		
Wetland has no surface water outlet	points = 5	
☐ Wetland has an intermittently flowing outlet	points = 3	3
☑ Wetland has a highly constricted permanently flowing outlet	points = 3	
Wetland has a permanently flowing, unconstricted, surface outlet	points = 1	
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions of soils*)	Yes = 3 No = 0	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes)		
Wetland has persistent, ungrazed, vegetation for > $^2/_3$ of area	points = 5	
Wetland has persistent, ungrazed, vegetation from $^1/_3$ to $^2/_3$ of area	points = 3	3
Wetland has persistent, ungrazed vegetation from $^1/_{10}$ to < $^1/_3$ of area	points = 1	
Wetland has persistent, ungrazed vegetation < $^1/_{10}$ of area	points = 0	
D 1.4. Characteristics of seasonal ponding or inundation:		
This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.		
Area seasonally ponded is > ½ total area of wetland	points = 3	0
Area seasonally ponded is ¼ - ½ total area of wetland	points = 1	
Area seasonally ponded is < ¼ total area of wetland	points = 0	
Total for D 1	Add the points in the boxes above	**6**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?		
D 2.1. Does the wetland receive stormwater discharges?	Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants?	Yes = 1 No = 0	0
D 2.3. Are there septic systems within 250 ft of the wetland?	Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3?		0
Source	Yes = 1 No = 0	
Total for D 2	Add the points in the boxes above	**0**

Rating of Landscape Potential If score is: ☐ **3 or 4 = H** ☐ **1 or 2 = M** ☑ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?		
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list?	Yes = 1 No = 0	0
D 3.2.Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]?	Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)?	Yes = 2 No = 0	2
Total for D 3	Add the points in the boxes above	**3**

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number H

DEPRESSIONAL WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and erosion

Points (only 1 score per box)

D 4.0. Does the site have the potential to reduce flooding and erosion?

D 4.1. Characteristics of surface water outflows from the wetland:

	Wetland has no surface water outlet	points = 8	4
☑	Wetland has an intermittently flowing outlet	points = 4	
☐	Wetland has a highly constricted permanently flowing outlet	points = 4	
	Wetland has a permanently flowing unconstricted surface outlet	points = 0	

(*If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing"*)

D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).*

	Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding	points = 8	0
	Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding	points = 6	
☐	The wetland is a headwater wetland	points = 4	
☐	Seasonal ponding: 1 ft - < 2 ft	points = 4	
	Seasonal ponding: 6 in - < 1 ft	points = 2	
	Seasonal ponding: < 6 in or wetland has only saturated soils	points = 0	

Total for D 4	Add the points in the boxes above	**4**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☐ **6 - 11 = M** ☑ **0 - 5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?

D 5.1. Does the wetland receive stormwater discharges?	Yes = 1 No = 0	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in land uses that generates runoff?	Yes = 1 No = 0	0
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses ?	Yes = 1 No = 0	0
Total for D 5	Add the points in the boxes above	**0**

Rating of Landscape Potential If score is: ☐ **3 = H** ☐ **1 or 2 = M** ☑ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?

D 6.1. The wetland is in a landscape that has flooding problems.

Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.*

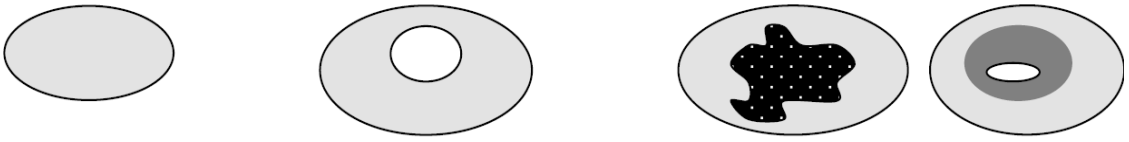
	The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND		0
	Flooding occurs in sub-basin that is immediately down-gradient of wetland	points = 2	
	Surface flooding problems are in a sub-basin farther down-gradient	points = 1	
☐	The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood.	points = 0	
	Explain why		
☑	There are no problems with flooding downstream of the wetland	points = 0	

D 6.2. Has the site been identified as important for flood storage or flood conveyance 0

in a regional flood control plan?	Yes = 2 No = 0	0
Total for D 6	Add the points in the boxes above	**0**

Rating of Value If score is: ☐ **2 - 4 = H** ☐ **1 = M** ☑ **0 = L** *Record the rating on the first page*

Wetland name or number H

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is > = ¼ ac or > = 10% of the wetland if wetland is < 2.5 ac.* ☐ Aquatic bed ☑ Emergent plants 0 - 12 in (0-30 cm) high are the highest layer and have > 30% cover ☐ Emergent plants > 12 - 40 in (> 30-100 cm) high are the highest layer with >30% cover ☐ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ☑ Scrub-shrub (areas where shrubs have > 30% cover) ☑ Forested (areas where trees have > 30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points - 1 1 check: points = 0	2
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* ☐ Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* ☑ Yes = 3 No = 0	0
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species. Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species 5 Scoring: > 9 species: points = 2 4 - 9 species: points = 1 < 4 species: points = 0	1
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **HIGH** = 3 points	2

H 1.6. Special habitat features: *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ☐ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ☑ Cattails or bulrushes are present within the wetland. ☐ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ☑ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ☐ Invasive species cover less than 20% in each stratum of vegetation (*canopy, sub-canopy, shrubs, herbaceous, moss/ground cover*)	2
Total for H 1 Add the points in the boxes above	**7**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☑ **7 - 14 = M** ☐ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1 Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* 12 % undisturbed habitat + (20 % moderate & low intensity land uses / 2) = 22% > 1/3 (33.3%) of 1 km Polygon points = 3 20 - 33% of 1 km Polygon points = 2 10 - 19% of 1 km Polygon points = 1 < 10 % of 1 km Polygon points = 0	2
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* 89 % undisturbed habitat + (10 % moderate & low intensity land uses / 2) = 94% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1 - 3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	3
H 2.3 Land use intensity in 1 km Polygon: > 50% of 1 km Polygon is high intensity land use points = (-2) Does not meet criterion above points = 0	0
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* Yes = 3 No = 0	0
Total for H 2 Add the points in the boxes above	**5**

Rating of Landscape Potential If Score is: ☑ **4 - 9 = H** ☐ **1 - 3 = M** ☐ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated* . Site meets ANY of the following criteria: points = 2 ☐ It has 3 or more priority habitats within 100 m (see Appendix B) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) ☐ It is mapped as a location for an individual WDFW species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan	1

Site has 1 or 2 priority habitats within 100 m (see Appendix B)	points = 1	
Site does not meet any of the criteria above	points = 0	

Rating of Value If Score is: ☐ **2 = H** ☑ **1 = M** ☐ **0 = L** *Record the rating on the first page*

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate category. NOTE: A wetland may meet the criteria for more than one set of special characteristics. Record all those that apply. NOTE: All wetlands should also be characterized based on their functions.

Wetland Type	Category
Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.	
SC 1.0. Vernal Pools Is the wetland **less than 4000 ft^2**, and does it meet at least **two** of the following criteria? ☐ Its only source of water is rainfall or snowmelt from a small contributing basin and has no groundwater input. ☐ Wetland plants are typically present only in the spring; the summer vegetation is typically upland annuals. *If you find perennial, obligate, wetland plants, the wetland is probably NOT a vernal pool.* ☐ The soil in the wetland is shallow [< 1 ft (30 cm) deep] and is underlain by an impermeable layer such as basalt or clay. ☐ Surface water is present for less than 120 days during the wet season. ☐ Yes - Go to **SC 1.1** ☑ No = **Not vernal pool** SC 1.1. Is the vernal pool relatively undisturbed in February and March? ☐ Yes – Go to **SC 1.2** ☐ No = **Not a vernal pool with special characteristics**	
SC 1.2. Is the vernal pool in an area where there are at least 3 separate aquatic resources within 0.5 mi (other wetlands, rivers, lakes etc.)? ☐ Yes = **Category II** ☐ No = **Category III**	
SC 2.0. Alkali wetlands Does the wetland meet **one** of the following criteria? ☐ The wetland has a conductivity > 3.0 mS/cm. ☐ The wetland has a conductivity between 2.0 and 3.0 mS, and more than 50% of the plant cover in the wetland can be classified as “alkali” species (see Table 4 for list of plants found in alkali systems). ☐ If the wetland is dry at the time of your field visit, the central part of the area is covered with a layer of salt. **OR** does the wetland unit meet two of the following three sub-criteria? ☐ Salt encrustations around more than 75% of the edge of the wetland ☐ More than ¾ of the plant cover consists of species listed on Table 4 ☐ A pH above 9.0. All alkali wetlands have a high pH, but please note that some freshwater wetlands may also have a high pH. Thus, pH alone is not a good indicator of alkali wetlands. ☐ Yes = **Category I** ☑ No = **Not an alkali wetland**	
SC 3.0. Wetlands of High Conservation Value (WHCV) SC 3.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☑ Yes - Go to **SC 3.2** ☐ No - Go to **SC 3.3** SC 3.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☑ No = **Not WHCV** SC 3.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 3.4** ☑ No = **Not WHCV** SC 3.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☑ No = **Not WHCV**	

SC 4.0. Bogs and Calcareous Fens

Does the wetland (or any part of the wetland unit) meet both the criteria for soils and vegetation in bogs or calcareous fens? Use the key below to identify if the wetland is a bog or calcareous fen. ***If you answer yes you will still need to rate the wetland based on its functions.***

SC 4.1. Does an area within the wetland have organic soil horizons (i.e., layers of organic soil), either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? *See Appendix C for a field key to identify organic soils.*

☐ Yes - Go to **SC 4.3** ☑ No - Go to **SC 4.2**

SC 4.2. Does an area within the wetland have organic soils, either peats or mucks, that are less than 16 in deep over bedrock or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond?

☐ Yes - Go to **SC 4.3** ☑ No = **Is not a bog for rating**

SC 4.3. Does an area within the wetland have more than 70% cover of mosses at ground level AND at least 30% of the total plant cover consists of species in Table 5?

☐ Yes = **Category I bog** ☐ No - Go to **SC 4.4**

NOTE: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 5 are present, the wetland is a bog.

SC 4.4. Is an area with peats or mucks forested (> 30% cover) with subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 5 provide more than 30% of the cover under the canopy?

☐ Yes = **Category I bog** ☐ No - Go to **SC 4.5**

SC 4.5. Do the species listed in Table 6 comprise at least 20% of the total plant cover within an area of peats and mucks?

☐ Yes = **Is a Calcareous Fen for purpose of rating** ☐ No - Go to **SC 4.6**

SC 4.6. Do the species listed in Table 6 comprise at least 10% of the total plant cover in an area of peats and mucks, AND one of the two following conditions is met:

☐ Marl deposits [calcium carbonate ($CaCO_3$) precipitate] occur on the soil surface or plant stems

☐ The pH of free water is ≥ 6.8 AND electrical conductivity is ≥ 200 uS/cm at multiple locations within the wetland

☐ Yes = **Is a Category I calcareous fen** ☐ No = **Is not a calcareous fen**

SC 5.0. Forested Wetlands

Does the wetland have an area of forest rooted within its boundary that meets **at least one** of the following three criteria? (*Continue only if you have identified that a forested class is present in question H*

☑ The wetland is within the 100 year floodplain of a river or stream

☐ Aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species

☐ There is at least ¼ ac of trees (even in wetlands smaller than 2.5 ac) that are "mature" or "old-growth" according to the definitions for these priority habitats developed by WDFW (*see definitions in question H3.1*)

☑ Yes - Go to **SC 5.1** ☐ No = **Not a forested wetland with special characteristics**

SC 5.1. Does the wetland have a forest canopy where more than 50% of the tree species (by cover) are slow growing native trees (*see Table 7*)?

☐ Yes = **Category I** ☑ No - Go to **SC 5.2**

SC 5.2. Does the wetland have areas where aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species?

☐ Yes = **Category I** ☑ No - Go to **SC 5.3**

SC 5.3. Does the wetland have at least ¼ acre with a forest canopy where more than 50% of the tree species (by cover) are fast growing species (*see Table 7*)?

☐ Yes = **Category II** ☑ No - Go to **SC 5.4**

SC 5.4. Is the forested component of the wetland within the 100 year floodplain of a river or stream?

☐ Yes = **Category II** ☑ No = **Not a forested wetland with special characteristics**

Cat. II

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.
http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here:
http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE** : This question is independent of the land use between the wetland unit and the priority habitat.*

- ☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).
- ☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).
- ☐ **Old-growth/Mature forests**: Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.
- ☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).
- ☑ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- ☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.
- ☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.
- ☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- ☑ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.
- ☐ **Shrub-steppe**: A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).
- ☐ **Eastside Steppe**: Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).
- ☐ **Juniper Savannah**: All juniper woodlands.

DRAFT MEMORANDUM

2302 W Dolarway Road, Suite 1, Ellensburg, WA 98926 | P 800.615.9900

To: Jennifer Saugen

From: Christina Wollman, AICP CFM

Date: August 24, 2021

Re: Environmental Review Memo – DRAFT SR 207 Realignment Feasibility Study

PURPOSE

This memo was prepared as part of a larger report to inform the feasibility of relocating a portion of State Route 207, near Leavenworth, Washington in Chelan County. The existing highway is adjacent to Nason Creek. The project proposes to move the highway away from the creek to provide additional floodplain and riparian habitat. The existing road grade will be removed.

REGULATORY CONTEXT

Federal Determinations/Permits

- US Forest Service NEPA Program – The proposed road relocation will occur on federal land owned by the US Forest Service (USFS). Evaluation under the National Environmental Policy Act (NEPA) is assumed due to federal land nexus. Assumed NEPA evaluation level is EA or EIS. This memo does not identify the specific policies and regulations that are required by the USFS NEPA program. Project level evaluation for NEPA documentation scoping would occur with the USFS under NEPA early coordination. Early coordination with the USFS is advised to identify specific NEPA documentation requirements.
- Section 7 ESA Consultation – Assumed due to federal project nexus, Endangered Species Act review would occur under NEPA evaluation and could be applied to other federal permits as needed (e.g. Corps 404).
- Section 106 NHPA Consultation – Assumed due to federal project nexus, 106 National Historic Preservation Act (NHPA) review would occur under NEPA evaluation and could be applied to other federal permits as needed (e.g. Corps 404).
- 404 Permit - If any project activities occur within the Waters of the US, project applicant agency may be required to obtain a Clean Water Act Section 404 permit from the US Army Corps of Engineers (Corps) along with impact and mitigation identification for any work in Waters of the US (wetlands or streams). Requires Joint Aquatic Resources Permit Application (JARPA) to be submitted to Corps.

State Permits

- Hydrologic Project Approval - Work within, above, or below the waterbody or near the ordinary high water mark of a State Water must be permitted by the Washington Department of Fish and Wildlife

(WDFW) through the Hydraulic Project Approval (HPA) process. WDFW HPA occurs after local SEPA determination.

- NPDES – Construction Stormwater General Permit Notice of Intent is assumed to be required for construction activities.
- 401 Certification – If triggered under Section 404 Permit, Corps can require Ecology to certify under 404. Requires separate JARPA submittal to ecology similar to 404 permit and coordinated with both the Corps and Ecology under 404 permit evaluation.

Local Determinations/Permits

- SEPA – Project action is assumed to require evaluation under the WA State Environmental Policy Act (SEPA) under Chelan County jurisdiction.
- Shoreline Management Program - A portion of the site falls within the jurisdiction of the Chelan County Shoreline Management Program (SMP). The shoreline jurisdiction extends approximately 200-feet inland from the ordinary high water mark of Nason Creek including associated wetlands and floodplains. Pursuant to the SMP, Section 1.3, "This SMP shall apply to all nonfederal developments and uses undertaken on federal lands and on lands subject to nonfederal ownership, lease, or easement, even though such lands may fall within the external boundaries of a federal ownership." All uses within this jurisdiction must comply with the County's SMP and receive the applicable shoreline permit from the County. This memo does not evaluate the policies and regulations that are required by the SMP for specific uses. The applicable shoreline designation is Conservancy.
- Critical Areas - Critical areas regulations differ in Chelan County depending on whether the critical area is located within the shoreline jurisdiction. Within the shoreline, the critical areas are regulated by Appendix B of the Chelan County SMP. Outside of the shoreline jurisdiction the critical areas are regulated by the overlay district regulations within Title 11 of the Chelan County Code.
- Floodplain - All development activities within the 100-year floodplain must receive a floodplain development permit from Chelan County pursuant to Chelan County Code Chapter 3.20 Flood Hazard Development.

MAPS

Perteet prepared maps with the following environmental information to support this review memo:

- Wetlands, Floodplains, and Riparian Areas
- Wellhead Protection Area

ENVIRONMENTAL REVIEW

Wetlands

The Yakama Nation provided a wetland report for the project area prepared by the Chelan County Natural Resource Department in 2016 for a proposed culvert project in the project area. The wetland was classified as a Type III with a habitat score of 6 using the 2014 rating method. Chelan County Code requires a buffer of 110-150 feet. The Yakama Nation also provided a GIS layer with wetland boundaries adjacent to the project area. This data does not appear to encompass the entire project area, and the National Wetland Inventory (NWI) indicates a forested wetland on the east side of the current roadway that may be within the new road alignment. The actual

presence or absence of this or any other wetlands must be determined by a field investigation performed by a qualified professional. This information would be included in permit documentation for HPA and Corps Permit as well as mitigation design for any direct wetland impacts as may be necessary and unavoidable, should the wetlands be confirmed and be impacted by this project.

Habitat

The study area contains several species that are considered endangered or priority. Due to the presence of these species, federal and local permitting as discussed above will be required.

Riparian Habitat

The DNR Forest Practices Application Mapping Tool identifies a potential non-fish bearing stream though the project area. The 2016 wetlands report noted that this stream was not present as a surface feature. However, this stream did not affect the previously proposed project and it does not appear there was any consultation with other agencies to confirm the determination. The actual presence or absence of this stream must be confirmed.

According to the WDFW SalmonScape map, Nason Creek is home to the following ESA listed fish species:

- Upper Columbia River Spring-run Chinook Salmon
- Upper Columbia River Summer and Winter Steelhead

The WDFW PHS on the Web map identifies the Nason Creek as supporting the following PHS fish species:

- Rainbow Trout
- Steelhead (Federal ESA)
- Westslope Cutthroat
- Spring and Summer Chinook
- Dolly Varden/Bull Trout (Federal EFH)

Upland Habitat

The PHS map also identifies the area as masked for Spotted Owl which is an ESA listed species. The area is also shown as mule deer fawning and elk calving grounds.

Aquifer Recharge Area

The Department of Health Source Water Assessment Program (SWAP) mapping application identifies one wellhead protection area at the southern end of the site. Because a road with stormwater control would likely be considered a low intensity land use and because the site has low soil permeability according to the US Department of Agriculture Web Soil Survey, the potential designation of aquifer recharge area should not be a limiting factor.

Because the proposed roadway may be located near the wellhead, precautions should be taken to avoid well impacts.

Floodplain

FEMA Flood Insurance Rate Maps designate Nason Creek as the 100-year floodplain. The floodplain is located to the west of the current highway location and on the east side of the highway to the north of the power lines. The floodplain designation will not create any limiting factors. However, as the current roadway acts as a floodplain barrier, an updated flood study may be required to map the changed conditions.

Geohazards

The DNR Geologic Information Portal indicates that no faults are on or near the study site and the liquefaction is identified as moderate to high liquefaction risk. The Web Soil Survey map indicates the erosion hazard is slight. There are no landslides identified and no steep slopes.

SUMMARY

Overall there are few environmental constraints for this project, and the mitigation opportunities from removing and restoring the current road bed area are likely more than sufficient to mitigate any impacts from constructing the new road. The most important actions are to investigate the presence of additional wetlands and a stream, and determine actual locations and buffers.

DATA SOURCES

Chelan County Assessor Data. Accessed through the Chelan County GIS Parcel Search Map https://maps.co.chelan.wa.us/GIS/.

FEMA Flood Insurance Rate Maps. Panel 5300150775B. Downloaded from FEMA Map Service Center and provided by Department of Ecology as Q3 Data through ArcGIS Online.

US Department of Agriculture Web Soil Survey. Accessed through https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

US Fish and Wildlife Service National Wetlands Inventory. Accessed through ArcGIS Online USA Wetlands data hosted by ESRI and https://www.fws.gov/wetlands/data/mapper.html.

Washington Department of Fish and Wildlife SalmonScape Map. Accessed through https://apps.wdfw.wa.gov/salmonscape/.

Washington Department of Fish and Wildlife Priority Habitat Species on the Web Map. Accessed through https://geodataservices.wdfw.wa.gov/hp/phs/.

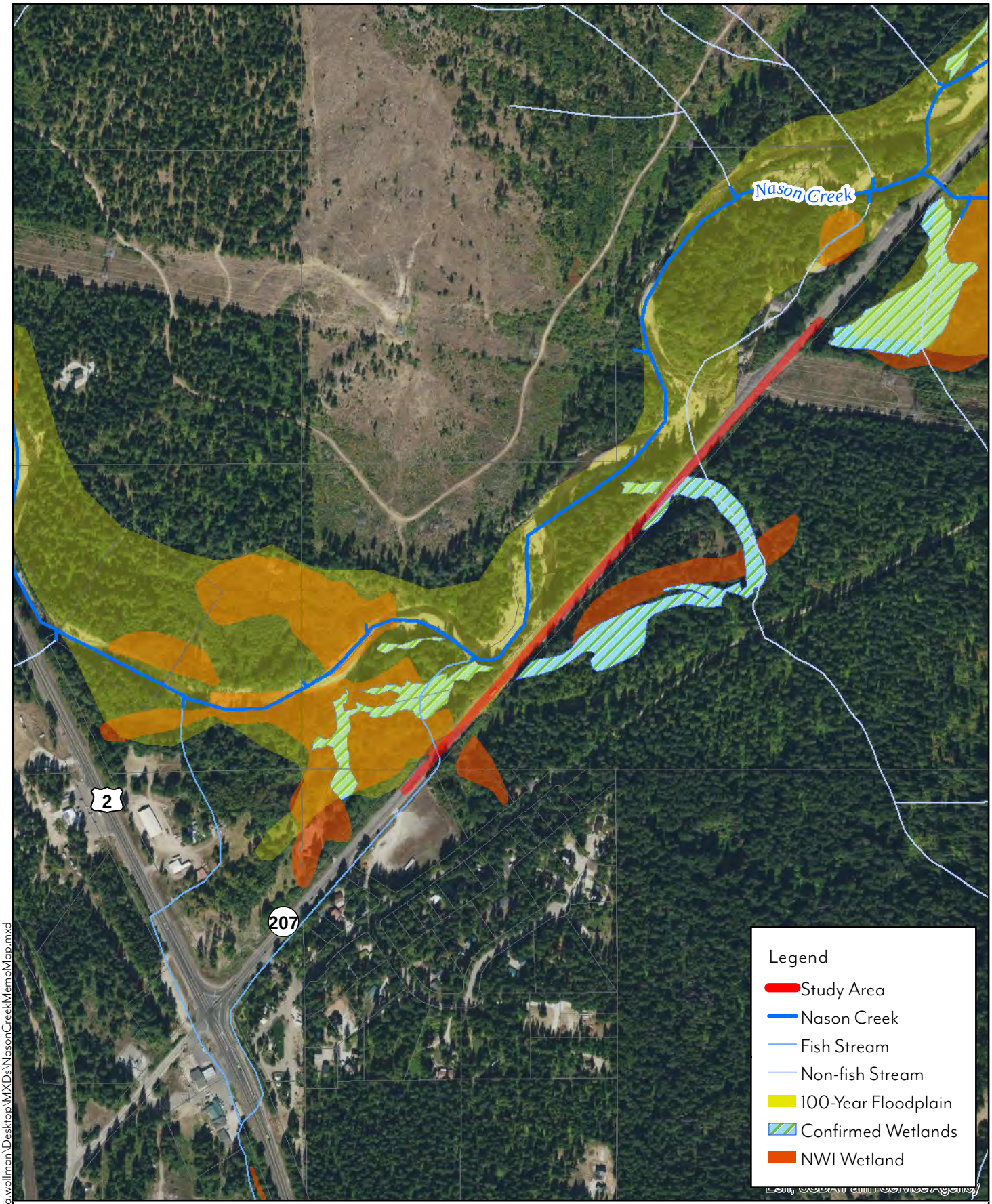
Washington Department of Health SWAP Map. Accessed through ArcGIS Online and https://fortress.wa.gov/doh/swap/index.html.

Washington Department of Natural Resources Geologic Information Portal. Accessed through https://geologyportal.dnr.wa.gov/. Data downloaded from https://www.dnr.wa.gov/programs-and-services/geology/publications-and-data/gis-data-and-databases.

Washington Department of Natural Resources Forest Practices Application Mapping Tool. Accessed through https://fpamt.dnr.wa.gov/default.aspx.

ACRONYMS

Corps	US Army Corps of Engineers
DNR	Washington Department of Natural Resources
EFH	Essential Fish Habitat
ESA	Endangered Species Act
HPA	Hydraulic Project Approval process
JARPA	Joint Aquatic Resources Permit Application
NWI	National Wetland Inventory
PHS	Priority Habitat Species
SWAP	Source Water Assessment Program
SMP	Chelan County Shoreline Management Program
USFW	US Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife



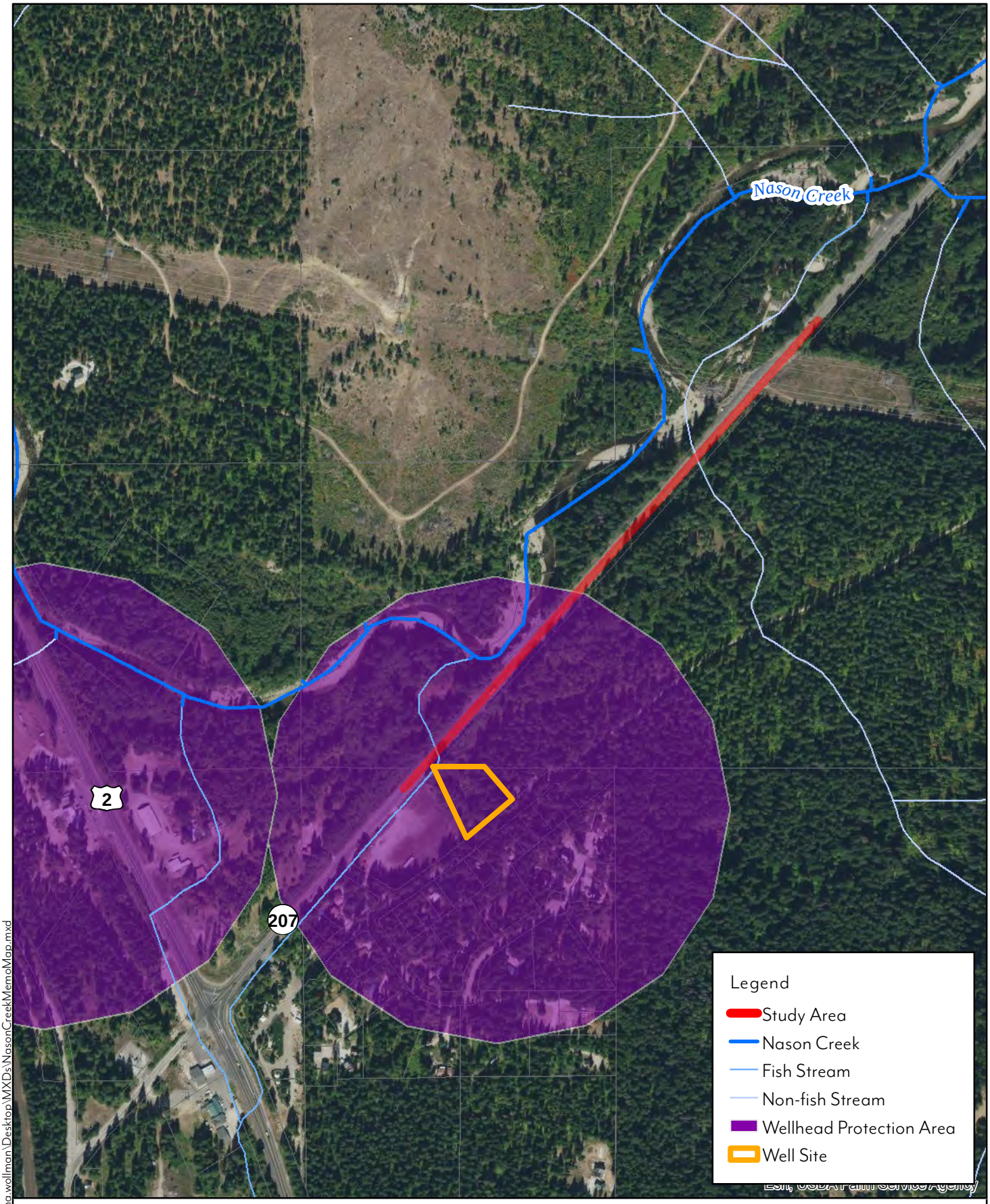
PERTEET

0 250 500
Feet

Nason Creek Floodplain
Wetlands, Floodplain, and Riparian Areas

Path: C:\Users\christina.wollman\Desktop\MXDs\NasonCreekMemoMap.mxd

Source: USFWS; ECY; Chelan County; Yakama Nation; ESRI



PERTEET

0 250 500
Feet

Nason Creek Floodplain
Wellhead Protection Area

Path: C:\Users\christina.wollman\Desktop\MXDs\NasonCreekMemoMap.mxd

Source: USFWS; ECY; Chelan County; Yakama Nation; ESRI

WETLAND ASSESSMENT REPORT

Wetland Delineation
Nason Creek Floodplain Repeat
Winton, Chelan County, WA

Yakama Nation Upper Columbia

Habitat Restoration Project

Prepared by

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Appendices

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Limitations

This report is based upon information collected in the field and obtained from resources provided by the Federal, State and Local Agencies. Conclusions are the professional opinion of the authors and are subject to approval by the appropriate agencies.

Executive Summary

On November 3rd, 2021, Hamer Environmental (Hamer) scientists conducted a site assessment of the study area, which consisted of 3.86 acres with the Nason Creek floodplain in Chelan County, Washington. This wetland assessment was prepared for Yakama Nation Fisheries in conjunction with the Yakama Nation Upper Columbia Habitat Restoration Project (URCHPP) under the Yakama Fisheries Resource Management Program. One wetland was delineated within the study area during the site assessment, and wetland edges were flagged. The wetland was rated according to the current Washington State Department of Ecology Wetland Rating System (Hruby 2014) and was determined to be Category III. According to County Critical Area Ordinances, a Category III wetland with low land-use intensity and moderate habitat function requires a 75-foot buffer. After reviewing historical aerial images, LiDAR, and USACE field methodologies, Hamer scientists evaluate wetland habitat function and values. This report contains descriptions of the existing conditions of the study area.

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Chapter 1. Introduction

1.1 Scope and Purpose

This Wetland Assessment Report has been prepared to meet the requirements for wetland determinations according to U.S. Army Corps of Engineers guidelines (USACE 2008). A wetland assessment was conducted for the Yakama Nation Fisheries in conjunction with the Yakama Nation Upper Columbia Habitat Restoration Project (URCHPP). This report contains project area natural resources descriptions, including wetlands and rivers. Hamer delineated one wetland onsite during the site investigation, and wetland boundaries were flagged.

Information gathered in this report assists project designers in avoiding and/or minimizing impacts to sensitive areas and species, provides information for regulatory reviewers, and provides information for mitigation reports if needed. The report is anticipated to support review by the Yakama Nation, U.S. Army Corps of Engineers (USACE), and/or the Washington State Department of Ecology (Ecology). The purpose of this document is to satisfy federal, state, and local regulations for wetland identification and delineation within the proposed project area. The project proposes implementing instream restoration on Nason Creek to improve habitat for threatened fish species.

1.2 Project Location

The project site (APE) is approximately 3.86 acres located along State Route 207 near Coles Corner in Chelan Country, Washington. The site is situated in the WRIA 45 and sub-watershed Lower Nason Creek (HUC 170200110203). The legal geographic location is Section 09, Township 26 North, Range 17 East (Figure 1).

Figure 1. Project location in red (Google Maps 2021)

Chapter 2. Methods

2.1 Wetland Identification, Delineation, and Classification

Hamer scientists delineate wetlands according to local, state, and federal guidelines. Wetland resources are delineated using guidelines and methods described in the *U.S. Army Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) as amended with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast (Version 2.0)* (USACE 2010). Wetland boundaries are surveyed using a Trimble GEOxt GPS unit.

Delineators used several tools to identify and classify plants and soils examined within the investigated area. Plant indicator status and scientific plant names were identified using the *National Wetland Plant List: 2020 Update of Wetland Ratings* (Lichvar et al. 2014) and any updates to the *National Wetland Plant List* (USACE, 2016). Soil characteristics were recorded and classified using the *Field Book for Describing and Sampling Soils* (USDA, NRCS 2012). Hydric soil conditions were assessed using *Field Indicators of Hydric Soils in the United States, Version 8.2* (USDA, NRCS 2018).

Wetlands delineated were classified according to federal, state, and local systems. The *Classification of Wetlands and Deepwater Habitats of the United States* [Federal Geographic Data Committee (FGDC) 2013] is a descriptive classification, based on physical attributes (i.e., plant community, soils, and water regime). Wetlands perform a variety of biological, physical (hydrologic), and chemical (water quality) functions.

Chelan County defines wetland protection standards in Chapter 11.80 Wetland Overlay District (WOD), which includes guidelines for determining wetland buffers' width. The standard buffer widths are based on the category of wetland and the habitat score as determined by a qualified consultant. For this project, each wetland was assigned a hydrogeomorphic (HGM) classification to assess impacts and determine appropriate wetland restoration or mitigation (Brinson 1993). Functions and values for wetlands within the project vicinity were classified under HGM and evaluated using the Washington State Wetland Rating System for Eastern Washington (Hruby 2014). Ecology divides wetlands into four hierarchical categories based on specific attributes such as rarity, sensitivity to disturbance, and functions (Hruby 2014). The Ecology classification hierarchy ranges from Category I wetlands, which exhibit outstanding features (rare wetland type, relatively undisturbed or a high sensitivity to disturbance, and high level of functions) to Category IV wetlands, which have the lowest levels of function and are often heavily disturbed.

2.2 Wetlands and Waters of the State Definitions and Regulatory Requirements

Waters of the United States: “All waters that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; All interstate waters including interstate wetlands; All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the

use, degradation, or destruction of which could affect interstate or foreign commerce...Wetlands adjacent to waters (other than waters that are themselves wetlands) identified above." (Definition taken from 33 CFR, Part 328.3). "Adjacent" is defined as bordering, contiguous, or neighboring.

Wetlands: "Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." (Definition taken from 33 CFR, Part 328.3).

Limits of jurisdiction in nontidal waters:

- in the absence of adjacent wetlands, the jurisdiction extends to the ordinary high-water mark;
- when adjacent wetlands are present, the jurisdiction extends beyond the ordinary high-water mark to the limit of the adjacent wetlands;
- when the Water of the United States consists only of wetlands, the jurisdiction extends to the limit of the wetland (taken from 33 CFR, Part 328.3).

Ordinary high-water mark: "that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas." (U.S. Congress 1986).

Regulatory Requirements:

Wetlands/waters of the state are under the jurisdiction of the Army Corps of Engineers (Corps), state, and Yakama Tribal Code. The Corps has the authority to determine whether a wetland or stream is a water of the U.S. and thus federally regulated under Section 404 of the Clean Water Act (CWA).

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Chapter 3. Existing Conditions

3.1 Landscape Setting

The study area lies in the Nason Creek Drainage. Nason Creek is constrained by steep and rough mountains that range up to 6,000 feet in elevation. The surrounding Wenatchee National Forest has historically been logged for mid-elevation tree species such as Pacific silver fir (*Abies amabilis*), western hemlock (*Tsuga heterophylla*), and western red cedar (*Thuja plicata*) (Consulting, 2019). Snow falls between October to May and provides habitat to large mammals such as elk, bighorn sheep, and grey wolf. The study area lies south of the Lake Wenatchee State Park, where rural residencies transition into National Forest land for recreational use. In general, Nason Creek is relatively “pristine”; however, there are likely some downstream impacts due to stormwater (from impervious surfaces, old logging activities, campgrounds, and road runoff) and general residential inhabitance within the Lower Nason Creek Watershed.

3.2 Previously Mapped Wetlands and Streams

The National Wetlands Inventory (NWI) Map indicates a forested and scrub-shrub and riverine habitat within and in the Nason Creek APE's vicinity (Figure 2). Nason Creek flows from the southwest to the north relative to the project area. Nason Creek is the principal hydraulic feature to the surrounding wetlands and exhibits braided streams, divergent side channels, and the development of gravel bars (WSCC, 2000). The WDNR Natural Heritage Information System has no records of rare plants, high-quality wetlands, or ecosystems within the study area (WDNR 2020b).

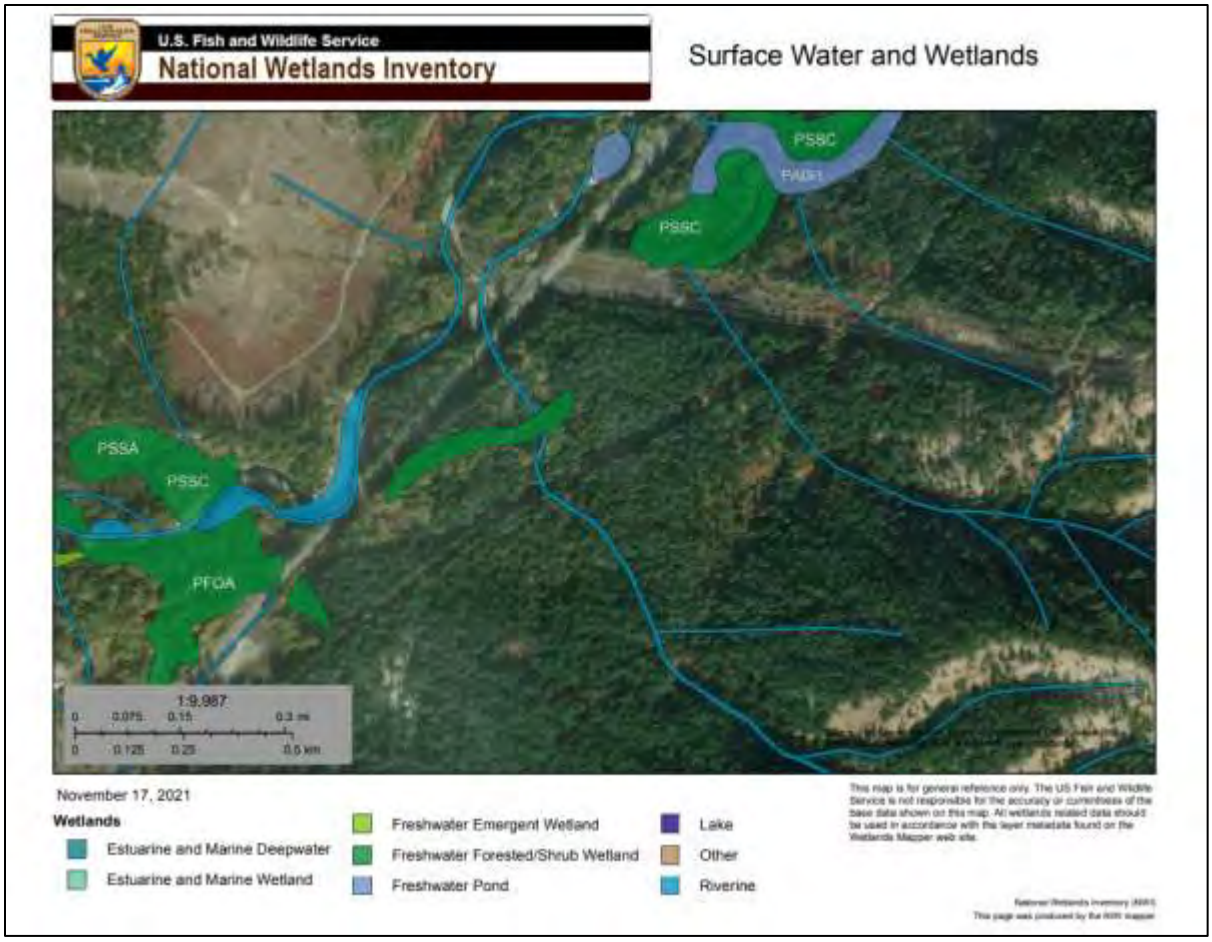


Figure 2. NWI-mapped wetlands

3.3 Wetlands

During the site assessment, Hamer scientists traversed the study area and observed one wetland onsite. Onsite wetland boundaries were delineated where indicators for hydrophytic vegetation, hydric soils, and wetland hydrology were present. Wetland determination data forms are complete with field observations from several sample plots within the study area (Figure 3). Table 1 summarizes the characteristics of the wetland.

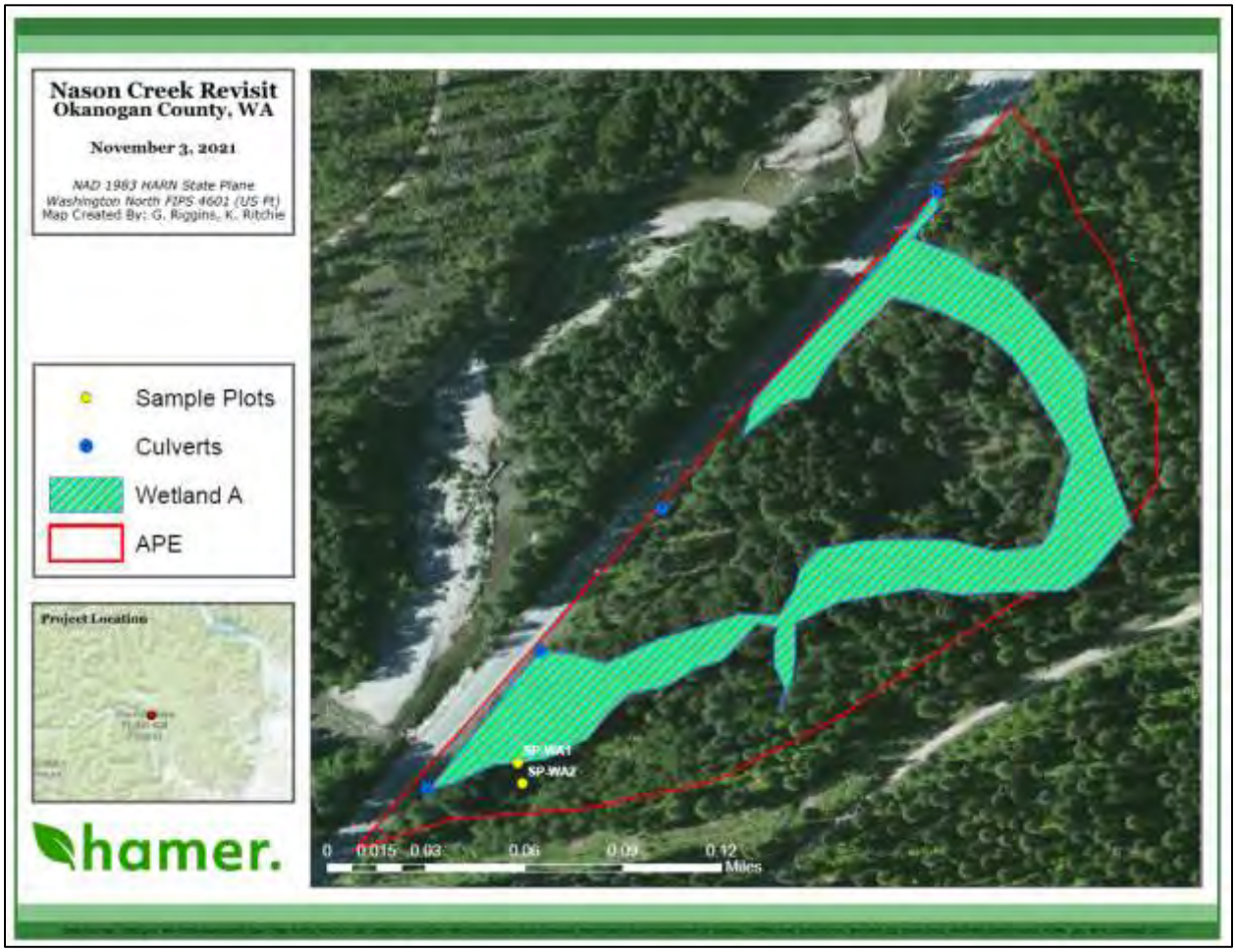


Figure 3. Wetland A within the boundaries of the Study area.

Table 1. Wetlands within the Project Area.

Wetland/ stream	Wetland Classification				Wetland Size (acres)	Wetland Buffer (ft)
	FGDC[1]	HGM	Ecology Category	Habitat Score		
Wetland A	PFO/PSS	Depressional	III	6	3.86	75

[1]FGDC (formerly Cowardin) or NWI Class based on vegetation: PFO=Palustrine Forested, PSS=Palustrine Scrub-shrub, PEM=Palustrine Emergent, R2EM = Riverine, Lower Perennial, Emergent.

3.3.1 Wetland A

Wetland A is characterized as a palustrine forested and scrub/shrub (PFO/PSS) wetland in topographical depression with diverging stream beds (FGDC 2013). The wetland is confined by State Route 207; however, several culverts allow water to flow from Nason Creek into the wetland. Conditions within the wetland appear to be seasonally variable and under winter flood conditions (Figure 3, Figure 4).

Wetland conditions vary throughout the wetland. The southern half of the wetland vegetation is dominated by red-osier dogwood (*Cornus sercicea)* and field horsetail *(Equisetum arvense L.).* As you transition into the northern half of the wetland, hummock islands provide habitat for Pacific silver fir (*Abies amabilis*) and douglas fir (*Pseudotsuga menziesii*) saplings. In addition, diverging streams channels interlace the wetland but appear to be abandoned side channels of Nason Creek. Along State Route 207 and in the northern half of the wetland, the dominant plant community is scrub-shrub. Douglas spiraea (*Spiraea douglasii*) and red-osier dogwood densely populate the roadside ditch and continue into the northern half of the wetland (Figure 5).

The hydric soil indicator Depleted Below Dark Surface (A11) was identified in the soil test plot in the wetland. In general, the subsurface soil layer is dark with a depleted matrix of 60% or more chroma of 2 or less, starting within 12inches and having a minimum thickness of 6 inches. The soil sample plot observed had a soil subsurface layer with a matrix color (7.5YR 2.5/1) and a second soil layer with matrix color (10YR 2/1) with an observed thickness of 13 inches. No prominent redox concentrations were observed (Appendix B).

Hyporheic flows from Nason Creek serve as the primary source of hydrology for Wetland A; however, the wetland likely also receives hydrology from road runoff and direct precipitation. At the time of the field investigation, the site showed evidence of the following wetland hydrology indicators: Sparsely Vegetated Concave Surface (B8), Geomorphic Position (D2), and FAC-Neutral Test (D5) (Appendix B). Wetland A has areas of seasonal surface water ponding outside of the sampled plots. The water depth in ponded areas ranges from one to three feet deep during times of high precipitation and spring runoff. Stream channels vary in vegetation cover, and hydrology ranges from ephemeral flowing streams to channels that may only be partially saturated year-round (Figure 3). Conditions within the wetland appear to be seasonally variable and under winter flood conditions. Some areas may be flooded from the subsurface flows from the Nason Creek. Apart from the sample plots, surface water was observed in the northwest half of the wetland that was dominated by the scrub-shrub plant community. Wetland A is partially within the floodplain of Nason Creek and may become inundated with surface water during seasonal or occasional flooding.

Wetland A is characterized as a Depressional wetland using the HGM system. It is a Category III wetland according to the current Ecology (2014) rating system based on its functions. Wetland A provides low levels of water quality and hydrologic function with a high level of habitat function. Wetland Rating system points were assigned as follows:

Water Quality Score: 6 (Low level of function)
Hydrologic Score: 6 (Low level of function)
Habitat Score: 6 (High level of function)
Total 18

Wetland functions and values for Wetland A are detailed in Appendix C.

Figure 4. Stream Channel found within the boundaries of Wetland A.

Figure 5. Ponded Areas within Wetland A.

3.3.2 Uplands

In addition to the wetland test pit, one upland sample pit (paired test pit) adjacent to the wetland was evaluated (Figure 6). Uplands are dominated by pacific silver fir, bitter cherry (*Prunus emarginata*), and black cottonwood *(Populus balsamifera spp.).* The forest understory was largely bare ground with sparse Oregon-grape (*Mahonia aquafolium*). Upland soils are generally very dark brown (10YR 3/2) to brown (10YR 4/3) silt loam (Appendix B).

Figure 6. Overview of upland areas.

References

Brinson, M.M. 1993. *A Hydrogeomorphic Classification for Wetlands*. Technical Report WRPDE-4. US Amy Engineers Waterways Experiment Station, Vicksburg, MS.

Consulting, C. C. (2019). *Nason Ridge Community Forest Management Plan.* Retrieved from https://www.co.chelan.wa.us/files/natural-resources/documents/Nason%20Ridge%20Community%20Forest%20Management%20Plan_2019%201125.pdf

[Ecology] Washington Department of Ecology. 2021. Washington State Department of Ecology. Water Quality Assessments/TMDLs. Accessed online at: https://fortress.wa.gov/ecy/waterqualityatlas/map.aspx.

Ecology. 2018. *Wetlands in Washington State Volume 2 – Protecting and Managing Wetlands*. Appendix 8-D: Guidance on Widths of Buffers and Ratios for Compensatory Mitigation for Use with the Eastern Washington Wetland Rating System. Ecology Publication No. 05-06-008.

Environmental Laboratory. 1987. Corps of Engineers wetland delineation manual. Technical Report Y-87-1, Environmental Laboratory, Department of the Army, Waterways Experiment Station, Vicksburg, MI.

Federal Geographic Data Committee. 2013. Classification of wetlands and deepwater habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC.

Fisheries, Y. N. (2021). *Upper Columbia Habitat Restoration Project (UCHRP).* Retrieved from Yakama Nation Fisheries: https://www.yakamafish-nsn.gov/restore/projects/uchrp

Franklin, J.F. and C.T. Dyrness. 1988. Natural vegetation of Oregon and Washington. Oregon State University Press, Corvallis, OR.

Hruby, T. (2014). *Washington State Wetland Rating System for Eastern Washington: 2014 Update*. (Publication #14-06-030). Olympia, WA: Washington Department of Ecology.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List*: 2016 wetland ratings. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X.

StreamNet. 2021. StreamNet Mapper online. Available at: https://psmfc.maps.arcgis.com/apps/webappviewer/index.html?id=3be91b0a32a9488a901c3885bbfc2b0b

[USACE] U.S. Army Corps of Engineers. 2007. [Regulatory guidance letter No. 07-02.] Located at http://www.usace.army.mil/cecw/pages/rglsindx.aspx.

USACE. 2010. United States Army Corps of Engineers. Final Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountain, Valley, and Coast Region, ed. J.S. Wakely, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-03-13. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

USACE. 2020. United States Army Corps of Engineers. National Wetland Plant List, Version 3.3. Accessed online at: https://www.codot.gov/programs/environmental/wetlands/assets/nwpl_co2020.pdf

USDA, NRCS. 2010. United States Department of Agriculture, Natural Resource Conservation Service, in cooperation with the National Technical Committee for Hydric Soils. Field indicators of hydric soils in the United States guide for identifying and delineating hydric soils, version 7.0. Washington, D.C.

USDA, NRCS. 2012. United States Department of Agriculture, Natural Resource Conservation Service. Field book for describing and sampling soils, version 3.0. September 2012. Accessed online at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052523.pdf.

USDA, NRCS. 2018. United States Department of Agriculture, Soil Conservation Service in cooperation with the National Technical Committee for Hydric Soils. Hydric soils of the United States. Available online at http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/.

USDA, NRCS. 2021. Soil survey of Project Area, Washington. U.S. Department of Agriculture, Natural Resource Conservation Service. Accessed online at: http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

USFWS. 2021. United States Fish and Wildlife Service, National Wetlands Inventory. NWI – National wetlands inventory in Washington State. Accessed online at: http://www.fws.gov/wetlands/Data/Mapper.html.

USFWS. 2021. Endangered Species Mapper for project site. Accessed online on at: https://ecos.fws.gov/ipac/.

WDFW. 2008. Washington Department of Fish and Wildlife. Priority Habitat and Species List. Olympia, Washington. 177 pp. Accessed online at: http://wdfw.wa.gov/conservation/phs/list/.

WDFW. 2021a. Washington Department of Fish and Wildlife Priority Habitat and Species Report for site. Accessed online at: http://apps.wdfw.wa.gov/phsontheweb/.

WDFW. 2021b. Washington State Department of Fish and Wildlife (WDFW) Salmonscape Maps. Accessed online at: http://apps.wdfw.wa.gov/salmonscape/map.html#.

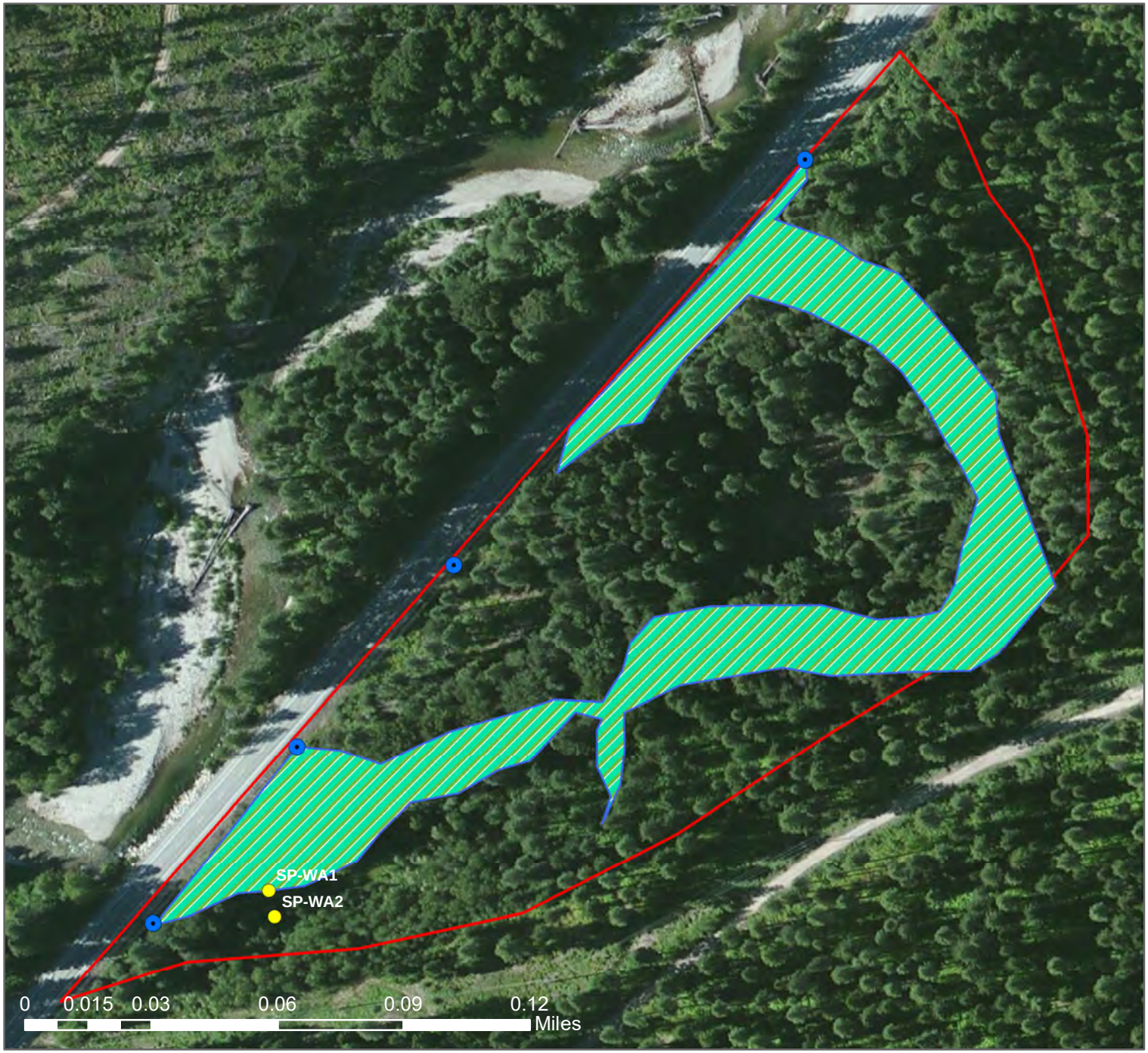
WSCC. 2000. Washington State Conservation Commission. Salmon, Steelhead and Bull Trout Habitat Limiting Factors. Water Resource Inventory Area 48 Final Report.

Appendix A — Existing Conditions Map

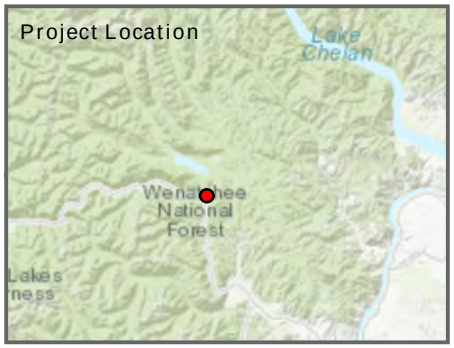
Nason Creek Revisit
Okanogan County, WA

November 3, 2021

NAD 1983 HARN State Plane Washington North FIPS 4601 (US Ft)
Map Created By: G. Riggins, K. Ritchie



- Sample Plots
- Culverts
- Wetland A
- APE



hamer.

Data Sources: Data.gov, WA State Geospatial Open Data Portal, WSDOT GIS Data Portal, USDA: NRCS Geospatial Data Gateway, Washington State Department of Ecology, USFWS NWI Data Portal, WA DNR GIS Open Data, WA FWS Salmonscape, FEMA. gov NFHL Updated: 2020

Appendix B — Data Sheets

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek revisit City/County: Chelan Sampling Date: 2021-11-03

Applicant/Owner: Yakama fisheries State: Washington Sampling Point: SP-UP1

Investigator(s): Adam Crispin, Meg Harrison Section, Township, Range: 09, T26N, R17E

Landform (hillslope, terrace, etc.): Upland Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR): A 6 Lat: 47.7605266 Long: -120.7335133 Datum: WGS 84

Soil Map Unit Name: Wintoner silt loam, 3 to 8 percent slopes NWI classification: PSS/PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✔	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Abies amabilis	20	✔	FACU
2. Prunus emarginata	15	✔	FACU
3. Populus balsamifera	10	✔	FAC
4.			
	45%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Acer circinatum	60	✔	FAC
2. Mahonia aquifolium	10		FACU
3.			
4.			
5.			
	70%	= Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Equisetum arvense	3	✔	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	3%	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	73	x 3 =	219
FACU species	45	x 4 =	180
UPL species	0	x 5 =	0
Column Totals:	118 (A)		399 (B)

Prevalence Index = B/A = 3.38

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✔

Remarks:

SOIL

Sampling Point: SP-UP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0 - 6	10YR 3/2	100					Silt Loam	
6 - 16	10YR 4/2	100					Silt Loam	
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✔

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Vis ble on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek revisit City/County: Chelan Sampling Date: 2021-11-03

Applicant/Owner: Yakama fisheries State: Washington Sampling Point: SP-WA1

Investigator(s): Adam Crispin, Meg Harrison Section, Township, Range: 09, T26N, R17E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR): A 6 Lat: 47.7605100 Long: -120.7335366 Datum: WGS 84

Soil Map Unit Name: Wintoner silt loam, 3 to 8 percent slopes NWI classification: PSS/PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No _____	**Is the Sampled Area within a Wetland?** Yes ✔ No _____
Hydric Soil Present?	Yes ✔ No _____	
Wetland Hydrology Present?	Yes ✔ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	15	✔	FAC
2.			
3.			
4.			
	15%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Cornus alba	60	✔	FACW
2. Acer circinatum	10		FAC
3.			
4.			
5.			
	70%	= Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Equisetum arvense	40	✔	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	40%	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	65	x 3 =	195
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	125 (A)		315 (B)

Prevalence Index = B/A = 2.52

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

✔ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No _____

Remarks:

SOIL

Sampling Point: SP-WA1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 5	7.5YR 2.5/1	100						
5 - 18	10YR 2/1	100					Silt Loam	
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ✔ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Vis ble on Aerial Imagery (B7)
- ✔ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✔ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✔ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✔ Depth (inches): _____

Water Table Present? Yes ___ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes ✔ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water was present in the Northwestern area of the wetland; depth varied between .5 and 1 foot.

Appendix C — Rating Forms

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): Wetland A Date of site visit: 11/2/2021

Rated by Adam Crispin Trained by Ecology? ☑ Yes ☐ No Date of training 11/13/2019

HGM Class used for rating Depressional Wetland has multiple HGM classes? ☑ Yes ☐ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ☑ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

_____ **Category I** - Total score = 22 - 27
_____ **Category II** - Total score = 19 - 21
X **Category III** - Total score = 16 - 18
_____ **Category IV** - Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
		List appropriate rating (H, M, L)		
Site Potential	M	M	L	
Landscape Potential	M	M	H	
Value	M	M	M	**Total**
Score Based on Ratings	6	6	6	**18**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	Category
Vernal Pools	
Alkali	
Wetland of High Conservation Value	
Bog and Calcareous Fens	
Old Growth or Mature Forest - slow growing	
Aspen Forest	
Old Growth or Mature Forest - fast growing	

Floodplain forest	
None of the above	

Maps and Figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	
Map of the contributing basin	D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream (*can be added to another figure*)	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	

Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

HGM Classification of Wetland in Eastern Washington

For questions 1 - 4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?

- ☐ The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
- ☐ At least 30% of the open water area is deeper than 10 ft (3 m)

☑ NO - go to 2 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit meet all of the following criteria?

- ☐ The wetland is on a slope (*slope can be very gradual*),
- ☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
- ☑ The water leaves the wetland **without being impounded**.

☑ NO - go to 3 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?

- ☑ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
- ☐ The overbank flooding occurs at least once every 10 years.

☑ NO - go to 4 ☐ **YES** - The wetland class is **Riverine**

NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 5 ☑ **YES** - The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1 - 4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:
Wetland has multiple classes but is overall Depressional.

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality		Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?		
D 1.1. Characteristics of surface water outflows from the wetland:		
Wetland has no surface water outlet	points = 5	
☑ Wetland has an intermittently flowing outlet	points = 3	3
☐ Wetland has a highly constricted permanently flowing outlet	points = 3	
Wetland has a permanently flowing, unconstricted, surface outlet	points = 1	
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions of soils*)	Yes = 3 No = 0	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes)		
Wetland has persistent, ungrazed, vegetation for > $^{2}/_{3}$ of area	points = 5	
Wetland has persistent, ungrazed, vegetation from $^{1}/_{3}$ to $^{2}/_{3}$ of area	points = 3	5
Wetland has persistent, ungrazed vegetation from $^{1}/_{10}$ to < $^{1}/_{3}$ of area	points = 1	
Wetland has persistent, ungrazed vegetation < $^{1}/_{10}$ of area	points = 0	
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.*		
Area seasonally ponded is > ½ total area of wetland	points = 3	0
Area seasonally ponded is ¼ - ½ total area of wetland	points = 1	
Area seasonally ponded is < ¼ total area of wetland	points = 0	
Total for D 1	Add the points in the boxes above	**8**

Rating of Site Potential If score is: ☐**12 - 16 = H** ☑**5 - 11 = M** ☐**0 - 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?		
D 2.1. Does the wetland receive stormwater discharges?	Yes = 1 No = 0	1
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants?	Yes = 1 No = 0	0
D 2.3. Are there septic systems within 250 ft of the wetland?	Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3?		0
Source	Yes = 1 No = 0	
Total for D 2	Add the points in the boxes above	**1**

Rating of Landscape Potential If score is: ☐**3 or 4 = H** ☑**1 or 2 = M** ☐**0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?		
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list?	Yes = 1 No = 0	0
D 3.2.Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]?	Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)?	Yes = 2 No = 0	0
Total for D 3	Add the points in the boxes above	**1**

Rating of Value If score is: ☐ **2 - 4 = H** ☑**1 = M** ☐**0 = L** *Record the rating on the first page*

DEPRESSIONAL WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and erosion

Points (only 1 score per box)

D 4.0. Does the site have the potential to reduce flooding and erosion?

D 4.1. Characteristics of surface water outflows from the wetland:

- Wetland has no surface water outlet — points = 8
- ☑ Wetland has an intermittently flowing outlet — points = 4
- ☐ Wetland has a highly constricted permanently flowing outlet — points = 4
- Wetland has a permanently flowing unconstricted surface outlet — points = 0

(*If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing"*)

4

D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).*

- Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 8
- Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 6
- ☐ The wetland is a headwater wetland — points = 4
- ☐ Seasonal ponding: 1 ft - < 2 ft — points = 4
- Seasonal ponding: 6 in - < 1 ft — points = 2
- Seasonal ponding: < 6 in or wetland has only saturated soils — points = 0

2

Total for D 4 — Add the points in the boxes above: **6**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?

D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0 — **1**

D 5.2. Is > 10% of the area within 150 ft of the wetland in land uses that generates runoff? Yes = 1 No = 0 — **0**

D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses ? Yes = 1 No = 0 — **0**

Total for D 5 — Add the points in the boxes above: **1**

Rating of Landscape Potential If score is: ☐ **3 = H** ☑ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?

D 6.1. The wetland is in a landscape that has flooding problems.

Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.*

The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND

- Flooding occurs in sub-basin that is immediately down-gradient of wetland — points = 2
- Surface flooding problems are in a sub-basin farther down-gradient — points = 1

☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. — points = 0

Explain why

☐ There are no problems with flooding downstream of the wetland — points = 0

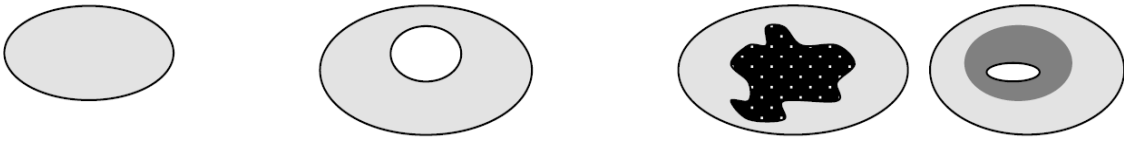
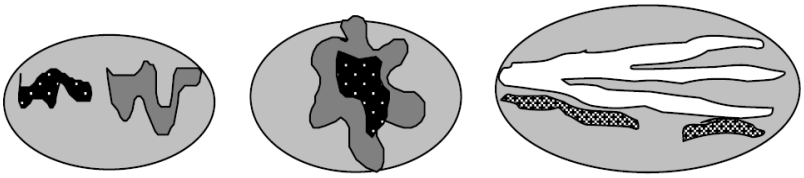
1

D 6.2. Has the site been identified as important for flood storage or flood conveyance

0

in a regional flood control plan?	Yes = 2 No = 0	0
Total for D 6	Add the points in the boxes above	**1**

Rating of Value If score is: ☐ **2 - 4 = H** ☑ **1 = M** ☐**0 = L** *Record the rating on the first page*

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is > = ¼ ac or > = 10% of the wetland if wetland is < 2.5 ac.* ☐ Aquatic bed ☐ Emergent plants 0 - 12 in (0-30 cm) high are the highest layer and have > 30% cover ☐ Emergent plants > 12 - 40 in (> 30-100 cm) high are the highest layer with >30% cover ☐ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ☑ Scrub-shrub (areas where shrubs have > 30% cover) ☑ Forested (areas where trees have > 30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points - 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* ☐ Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* ☐ Yes = 3 No = 0	0
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species. Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species 5 Scoring: > 9 species: points = 2 4 - 9 species: points = 1 < 4 species: points = 0	1
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points  All three diagrams in this row are **HIGH** = 3 points	2

Riparian braided channels with 2 classes	

H 1.6. Special habitat features: *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ☐ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ☐ Cattails or bulrushes are present within the wetland. ☐ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ☑ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ☑ Invasive species cover less than 20% in each stratum of vegetation (*canopy, sub-canopy, shrubs, herbaceous, moss/ground cover*)	2
Total for H 1 — Add the points in the boxes above	**6**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☐ **7 - 14 = M** ☑ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1 Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* 28 % undisturbed habitat + (9 % moderate & low intensity land uses / 2) = 32.5% > 1/3 (33.3%) of 1 km Polygon — points = 3 20 - 33% of 1 km Polygon — points = 2 10 - 19% of 1 km Polygon — points = 1 < 10 % of 1 km Polygon — points = 0	2
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* 82 % undisturbed habitat + (9 % moderate & low intensity land uses / 2) = 86.5% Undisturbed habitat > 50% of Polygon — points = 3 Undisturbed habitat 10 - 50% and in 1 - 3 patches — points = 2 Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of 1 km Polygon — points = 0	3
H 2.3 Land use intensity in 1 km Polygon: > 50% of 1 km Polygon is high intensity land use — points = (-2) Does not meet criterion above — points = 0	0
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* Yes = 3 No = 0	0
Total for H 2 — Add the points in the boxes above	**5**

Rating of Landscape Potential If Score is: ☑ **4 - 9 = H** ☐ **1 - 3 = M** ☐ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated*. Site meets ANY of the following criteria: — points = 2 ☐ It has 3 or more priority habitats within 100 m (see Appendix B) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) ☐ It is mapped as a location for an individual WDFW species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan	1

Site has 1 or 2 priority habitats within 100 m (see Appendix B)	points = 1	
Site does not meet any of the criteria above	points = 0	

Rating of Value If Score is: ☐ **2 = H** ☑ **1 = M** ☐ **0 = L** *Record the rating on the first page*

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate category. NOTE: A wetland may meet the criteria for more than one set of special characteristics. Record all those that apply. NOTE: All wetlands should also be characterized based on their functions.

Wetland Type	Category
Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.	
SC 1.0. Vernal Pools Is the wetland **less than 4000 ft²**, and does it meet at least **two** of the following criteria? ☐ Its only source of water is rainfall or snowmelt from a small contributing basin and has no groundwater input. ☐ Wetland plants are typically present only in the spring; the summer vegetation is typically upland annuals. *If you find perennial, obligate, wetland plants, the wetland is probably NOT a vernal pool.* ☐ The soil in the wetland is shallow [< 1 ft (30 cm) deep] and is underlain by an impermeable layer such as basalt or clay. ☐ Surface water is present for less than 120 days during the wet season. ☐ Yes - Go to **SC 1.1** ☑ No = **Not vernal pool** SC 1.1. Is the vernal pool relatively undisturbed in February and March? ☐ Yes – Go to **SC 1.2** ☑ No = **Not a vernal pool with special characteristics**	
SC 1.2. Is the vernal pool in an area where there are at least 3 separate aquatic resources within 0.5 mi (other wetlands, rivers, lakes etc.)? ☐ Yes = **Category II** ☑ No = **Category III**	
SC 2.0. Alkali wetlands Does the wetland meet **one** of the following criteria? ☐ The wetland has a conductivity > 3.0 mS/cm. ☐ The wetland has a conductivity between 2.0 and 3.0 mS, and more than 50% of the plant cover in the wetland can be classified as "alkali" species (see Table 4 for list of plants found in alkali systems). ☐ If the wetland is dry at the time of your field visit, the central part of the area is covered with a layer of salt. **OR** does the wetland unit meet two of the following three sub-criteria? ☐ Salt encrustations around more than 75% of the edge of the wetland ☐ More than ¾ of the plant cover consists of species listed on Table 4 ☐ A pH above 9.0. All alkali wetlands have a high pH, but please note that some freshwater wetlands may also have a high pH. Thus, pH alone is not a good indicator of alkali wetlands. ☐ Yes = **Category I** ☑ No = **Not an alkali wetland**	
SC 3.0. Wetlands of High Conservation Value (WHCV) SC 3.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☐ Yes - Go to **SC 3.2** ☑ No - Go to **SC 3.3** SC 3.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☑ No = **Not WHCV** SC 3.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 3.4** ☑ No = **Not WHCV** SC 3.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☑ No = **Not WHCV**	

SC 4.0. Bogs and Calcareous Fens

Does the wetland (or any part of the wetland unit) meet both the criteria for soils and vegetation in bogs or calcareous fens? Use the key below to identify if the wetland is a bog or calcareous fen. ***If you answer yes you will still need to rate the wetland based on its functions.***

SC 4.1. Does an area within the wetland have organic soil horizons (i.e., layers of organic soil), either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? *See Appendix C for a field key to identify organic soils.*

☐ Yes - Go to **SC 4.3** ☑ No - Go to **SC 4.2**

SC 4.2. Does an area within the wetland have organic soils, either peats or mucks, that are less than 16 in deep over bedrock or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond?

☐ Yes - Go to **SC 4.3** ☑ No = **Is not a bog for rating**

SC 4.3. Does an area within the wetland have more than 70% cover of mosses at ground level AND at least 30% of the total plant cover consists of species in Table 5?

☐ Yes = **Category I bog** ☑ No - Go to **SC 4.4**

NOTE: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 5 are present, the wetland is a bog.

SC 4.4. Is an area with peats or mucks forested (> 30% cover) with subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 5 provide more than 30% of the cover under the canopy?

☐ Yes = **Category I bog** ☑ No - Go to **SC 4.5**

SC 4.5. Do the species listed in Table 6 comprise at least 20% of the total plant cover within an area of peats and mucks?

☐ Yes = **Is a Calcareous Fen for purpose of rating** ☑ No - Go to **SC 4.6**

SC 4.6. Do the species listed in Table 6 comprise at least 10% of the total plant cover in an area of peats and mucks, AND one of the two following conditions is met:

☐ Marl deposits [calcium carbonate ($CaCO_3$) precipitate] occur on the soil surface or plant stems

☐ The pH of free water is ≥ 6.8 AND electrical conductivity is ≥ 200 uS/cm at multiple locations within the wetland

☐ Yes = **Is a Category I calcareous fen** ☑ No = **Is not a calcareous fen**

SC 5.0. Forested Wetlands

Does the wetland have an area of forest rooted within its boundary that meets **at least one** of the following three criteria? (*Continue only if you have identified that a forested class is present in question H*

☑ The wetland is within the 100 year floodplain of a river or stream

☐ Aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species

☐ There is at least ¼ ac of trees (even in wetlands smaller than 2.5 ac) that are “mature” or “old-growth” according to the definitions for these priority habitats developed by WDFW (*see definitions in question H3.1*)

☐ Yes - Go to **SC 5.1** ☑ No = **Not a forested wetland with special characteristics**

SC 5.1. Does the wetland have a forest canopy where more than 50% of the tree species (by cover) are slow growing native trees (*see Table 7*)?

☐ Yes = **Category I** ☑ No - Go to **SC 5.2**

SC 5.2. Does the wetland have areas where aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species?

☐ Yes = **Category I** ☑ No - Go to **SC 5.3**

SC 5.3. Does the wetland have at least ¼ acre with a forest canopy where more than 50% of the tree species (by cover) are fast growing species (*see Table 7*)?

☐ Yes = **Category II** ☑ No - Go to **SC 5.4**

SC 5.4. Is the forested component of the wetland within the 100 year floodplain of a river or stream?

☑ Yes = **Category II** ☐ No = **Not a forested wetland with special characteristics**

Category of wetland based on Special Characteristics *Choose the highest rating if wetland falls into several categories* If you answered No for all types, enter “Not Applicable” on Summary Form	**Cat. II**

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.
http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here:
http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE** : This question is independent of the land use between the wetland unit and the priority habitat.*

- ☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).
- ☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).
- ☐ **Old-growth/Mature forests**: Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.
- ☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).
- ☐ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- ☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.
- ☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.
- ☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- ☑ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.
- ☐ **Shrub-steppe**: A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).
- ☐ **Eastside Steppe**: Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).
- ☐ **Juniper Savannah**: All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

MEMORANDUM

2707 Colby Avenue, Suite 900, Everett, WA 98201 | P 425.252.7700

To: Chris Butler, UCHRP Senior Habitat Specialist, Yakama Nation Fisheries

From: Adam Crispin, PWS, Senior Environmental Scientist, Perteet Inc.
Jennifer Saugen, PE, Project Manager, Perteet Inc.

Date: October 7, 2025

Re: SR 207 Nason Creek Floodplain Realignment - Wetland Stormwater Impacts

Introduction

Yakama Nation Fisheries (YNF) is working with the Washington State Department of Transportation (WSDOT), and the National Marine Fisheries Service (NMFS) to complete the design and environmental permitting for the SR 207 Nason Creek Floodplain Realignment Project. In 2022, a wetland delineation report was completed by Adam Crispin, PWS, while he was employed at Hamer Environmental (Appendix A). The report describes the delineation and assessment of Wetland A (Figure 1), a Category III wetland with a habitat score of 6 as determined by the Washington State Wetland Rating System for Eastern Washington (Hruby 2014). This memorandum describes our review of the current project footprint, Chelan County and WSDOT regulatory guidance, and provides an assessment of Wetland A in the context of WSDOT's Highway Runoff Manual (HRM), Minimum Requirement 7 regarding wetlands protection and stormwater treatment. Environmental review, design, and permitting are currently underway for the project.

Regulatory Compliance

Chelan County lists wetland buffer widths based on wetland category, habitat score, and level of land use impact as shown in *Table 1. Standard Wetland Buffer Requirements* in Chapter 11.80.050 of the Chelan County Code (CCC). Based on the land use types listed in the CCC, the proposed level of impact for the project is assumed to be "High" because the proposed realignment of SR 207 is assumed to be more or less consistent with "commercial" land use. Wetland A was rated as a Category III wetland with a 150-foot buffer width. According to the HRM, Minimum Requirement 7, Category III wetlands that have been previously disturbed by human activity may be used to meet enhanced treatment requirements for stormwater runoff, and stormwater may be discharged into these wetlands (WSDOT 2019).

Wetland Impacts

The construction and realignment of SR 207, which occurred in the 1940s significantly impacted the Nason Creek floodplain and floodplain wetlands and disconnected the creek from side channels and large oxbows, including the oxbow where Wetland A is located. The highway's bisecting of the floodplain likely contributed to the hydrologic conditions in Wetlands A and other wetlands adjacent to SR 207. After the highway's construction, Wetland A has been greatly impacted by human activity, primarily due to stormwater impacts from roadside ditches and culverts (Figure 1). The wetland receives stormwater runoff from SR 207 and adjacent logging roads and restricted flow from culverts under SR 207. The wetland and its buffer are also likely impacted by routine maintenance activities (such as brush clearing) along the highway corridor. Given the project footprint and proposed buffer to Wetland A, the proposed realignment of SR 207 may result in buffer impacts.

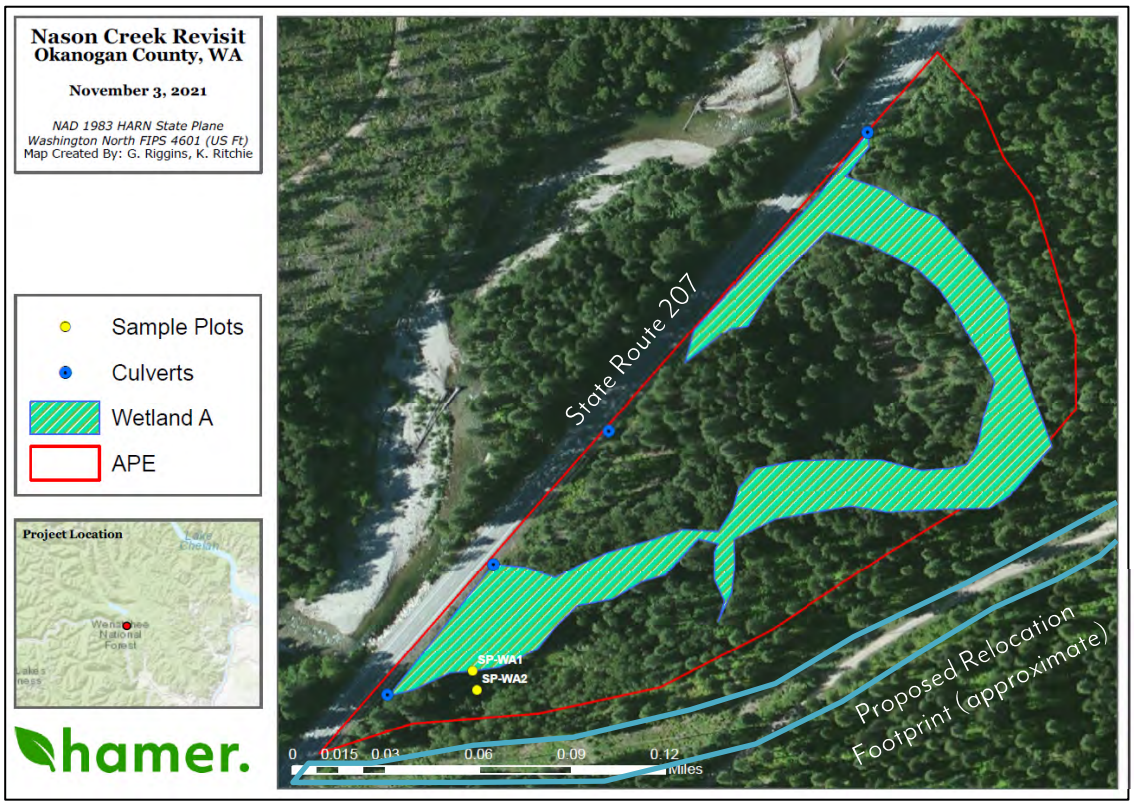


Figure 1. Wetland A, SR 207 relocation footprint, and location of culverts (Hamer 2022).

Conclusions and Recommendations

Due to construction and realignment of SR 207, the historic Nason Creek floodplain has been bisected resulting in loss of hydrologic connectivity to the mainstem and allowing for wetland hydrologic conditions in historic oxbows and side channels. According to the HRM, in Eastern Washington, Category III wetlands and their buffers may receive stormwater discharges (WSDOT 2019). Wetland A meets the criteria described in the HRM. Moreover, pursuant to Chelan County critical areas code, CCC 11.80.050, and based on the approximate realignment of SR 207 and the proposed project may impact the 150-foot buffer of Wetland A.

References

Hruby, T. (2014). Washington State Wetland Rating System for Eastern Washington: 2014 Update. (Publication #14-06-030). Olympia, WA: Washington Department of Ecology.

Washington State Department of Ecology (Ecology). 2019. Stormwater Management Manual for Western Washington (SWMMWW). Publication Number 19-10-021. Water Quality Program.

WSDOT. 2019. Highway Runoff Manual, M 31-16.05. WSDOT HQ Design Office, Highway Runoff Unit. Updated April 30, 2019. Retrieved from https://wsdot.wa.gov/engineering-standards/all- manuals-and-standards/manuals/highway-runoff-manual

WETLAND ASSESSMENT REPORT

Wetland Delineation
Nason Creek Floodplain Repeat
Winton, Chelan County, WA

Yakama Nation Upper Columbia

Habitat Restoration Project

Prepared by

hamerenvironmental
INNOVATIVE SOLUTIONS TO NATURAL RESOURCES

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Appendices

Appendix A — Existing Conditions Map
Appendix B — Data Sheets
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Limitations

This report is based upon information collected in the field and obtained from resources provided by the Federal, State and Local Agencies. Conclusions are the professional opinion of the authors and are subject to approval by the appropriate agencies.

Executive Summary

On November 3rd, 2021, Hamer Environmental (Hamer) scientists conducted a site assessment of the study area, which consisted of 3.86 acres with the Nason Creek floodplain in Chelan County, Washington. This wetland assessment was prepared for Yakama Nation Fisheries in conjunction with the Yakama Nation Upper Columbia Habitat Restoration Project (URCHPP) under the Yakama Fisheries Resource Management Program. One wetland was delineated within the study area during the site assessment, and wetland edges were flagged. The wetland was rated according to the current Washington State Department of Ecology Wetland Rating System (Hruby 2014) and was determined to be Category III. According to County Critical Area Ordinances, a Category III wetland with low land-use intensity and moderate habitat function requires a 75-foot buffer. After reviewing historical aerial images, LiDAR, and USACE field methodologies, Hamer scientists evaluate wetland habitat function and values. This report contains descriptions of the existing conditions of the study area.

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Chapter 1. Introduction

1.1 Scope and Purpose

This Wetland Assessment Report has been prepared to meet the requirements for wetland determinations according to U.S. Army Corps of Engineers guidelines (USACE 2008). A wetland assessment was conducted for the Yakama Nation Fisheries in conjunction with the Yakama Nation Upper Columbia Habitat Restoration Project (URCHPP). This report contains project area natural resources descriptions, including wetlands and rivers. Hamer delineated one wetland onsite during the site investigation, and wetland boundaries were flagged.

Information gathered in this report assists project designers in avoiding and/or minimizing impacts to sensitive areas and species, provides information for regulatory reviewers, and provides information for mitigation reports if needed. The report is anticipated to support review by the Yakama Nation, U.S. Army Corps of Engineers (USACE), and/or the Washington State Department of Ecology (Ecology). The purpose of this document is to satisfy federal, state, and local regulations for wetland identification and delineation within the proposed project area. The project proposes implementing instream restoration on Nason Creek to improve habitat for threatened fish species.

1.2 Project Location

The project site (APE) is approximately 3.86 acres located along State Route 207 near Coles Corner in Chelan Country, Washington. The site is situated in the WRIA 45 and sub-watershed Lower Nason Creek (HUC 170200110203). The legal geographic location is Section 09, Township 26 North, Range 17 East (Figure 1).

Figure 1. Project location in red (Google Maps 2021)

Chapter 2. Methods

2.1 Wetland Identification, Delineation, and Classification

Hamer scientists delineate wetlands according to local, state, and federal guidelines. Wetland resources are delineated using guidelines and methods described in the *U.S. Army Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) as amended with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast (Version 2.0)* (USACE 2010). Wetland boundaries are surveyed using a Trimble GEOxt GPS unit.

Delineators used several tools to identify and classify plants and soils examined within the investigated area. Plant indicator status and scientific plant names were identified using the *National Wetland Plant List: 2020 Update of Wetland Ratings* (Lichvar et al. 2014) and any updates to the *National Wetland Plant List* (USACE, 2016). Soil characteristics were recorded and classified using the *Field Book for Describing and Sampling Soils* (USDA, NRCS 2012). Hydric soil conditions were assessed using *Field Indicators of Hydric Soils in the United States, Version 8.2* (USDA, NRCS 2018).

Wetlands delineated were classified according to federal, state, and local systems. The *Classification of Wetlands and Deepwater Habitats of the United States* [Federal Geographic Data Committee (FGDC) 2013] is a descriptive classification, based on physical attributes (i.e., plant community, soils, and water regime). Wetlands perform a variety of biological, physical (hydrologic), and chemical (water quality) functions.

Chelan County defines wetland protection standards in Chapter 11.80 Wetland Overlay District (WOD), which includes guidelines for determining wetland buffers' width. The standard buffer widths are based on the category of wetland and the habitat score as determined by a qualified consultant. For this project, each wetland was assigned a hydrogeomorphic (HGM) classification to assess impacts and determine appropriate wetland restoration or mitigation (Brinson 1993). Functions and values for wetlands within the project vicinity were classified under HGM and evaluated using the Washington State Wetland Rating System for Eastern Washington (Hruby 2014). Ecology divides wetlands into four hierarchical categories based on specific attributes such as rarity, sensitivity to disturbance, and functions (Hruby 2014). The Ecology classification hierarchy ranges from Category I wetlands, which exhibit outstanding features (rare wetland type, relatively undisturbed or a high sensitivity to disturbance, and high level of functions) to Category IV wetlands, which have the lowest levels of function and are often heavily disturbed.

2.2 Wetlands and Waters of the State Definitions and Regulatory Requirements

Waters of the United States: “All waters that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; All interstate waters including interstate wetlands; All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the

use, degradation, or destruction of which could affect interstate or foreign commerce...Wetlands adjacent to waters (other than waters that are themselves wetlands) identified above." (Definition taken from 33 CFR, Part 328.3). "Adjacent" is defined as bordering, contiguous, or neighboring.

Wetlands: "Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." (Definition taken from 33 CFR, Part 328.3).

Limits of jurisdiction in nontidal waters:

- in the absence of adjacent wetlands, the jurisdiction extends to the ordinary high-water mark;
- when adjacent wetlands are present, the jurisdiction extends beyond the ordinary high-water mark to the limit of the adjacent wetlands;
- when the Water of the United States consists only of wetlands, the jurisdiction extends to the limit of the wetland (taken from 33 CFR, Part 328.3).

Ordinary high-water mark: "that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas." (U.S. Congress 1986).

Regulatory Requirements:

Wetlands/waters of the state are under the jurisdiction of the Army Corps of Engineers (Corps), state, and Yakama Tribal Code. The Corps has the authority to determine whether a wetland or stream is a water of the U.S. and thus federally regulated under Section 404 of the Clean Water Act (CWA).

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Chapter 3. Existing Conditions

3.1 Landscape Setting

The study area lies in the Nason Creek Drainage. Nason Creek is constrained by steep and rough mountains that range up to 6,000 feet in elevation. The surrounding Wenatchee National Forest has historically been logged for mid-elevation tree species such as Pacific silver fir (*Abies amabilis*), western hemlock (*Tsuga heterophylla*), and western red cedar (*Thuja plicata*) (Consulting, 2019). Snow falls between October to May and provides habitat to large mammals such as elk, bighorn sheep, and grey wolf. The study area lies south of the Lake Wenatchee State Park, where rural residencies transition into National Forest land for recreational use. In general, Nason Creek is relatively “pristine”; however, there are likely some downstream impacts due to stormwater (from impervious surfaces, old logging activities, campgrounds, and road runoff) and general residential inhabitance within the Lower Nason Creek Watershed.

3.2 Previously Mapped Wetlands and Streams

The National Wetlands Inventory (NWI) Map indicates a forested and scrub-shrub and riverine habitat within and in the Nason Creek APE's vicinity (Figure 2). Nason Creek flows from the southwest to the north relative to the project area. Nason Creek is the principal hydraulic feature to the surrounding wetlands and exhibits braided streams, divergent side channels, and the development of gravel bars (WSCC, 2000). The WDNR Natural Heritage Information System has no records of rare plants, high-quality wetlands, or ecosystems within the study area (WDNR 2020b).

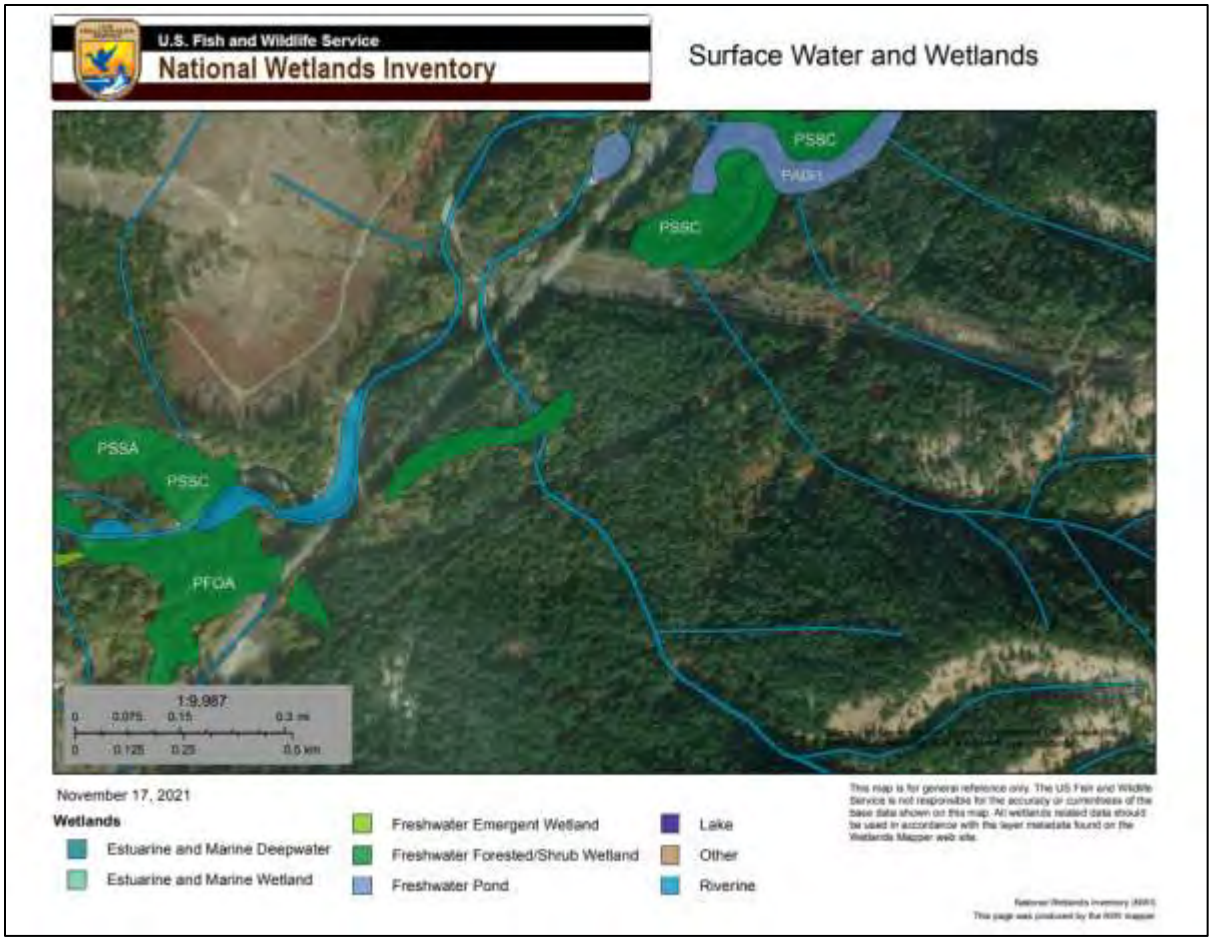


Figure 2. NWI-mapped wetlands

3.3 Wetlands

During the site assessment, Hamer scientists traversed the study area and observed one wetland onsite. Onsite wetland boundaries were delineated where indicators for hydrophytic vegetation, hydric soils, and wetland hydrology were present. Wetland determination data forms are complete with field observations from several sample plots within the study area (Figure 3). Table 1 summarizes the characteristics of the wetland.

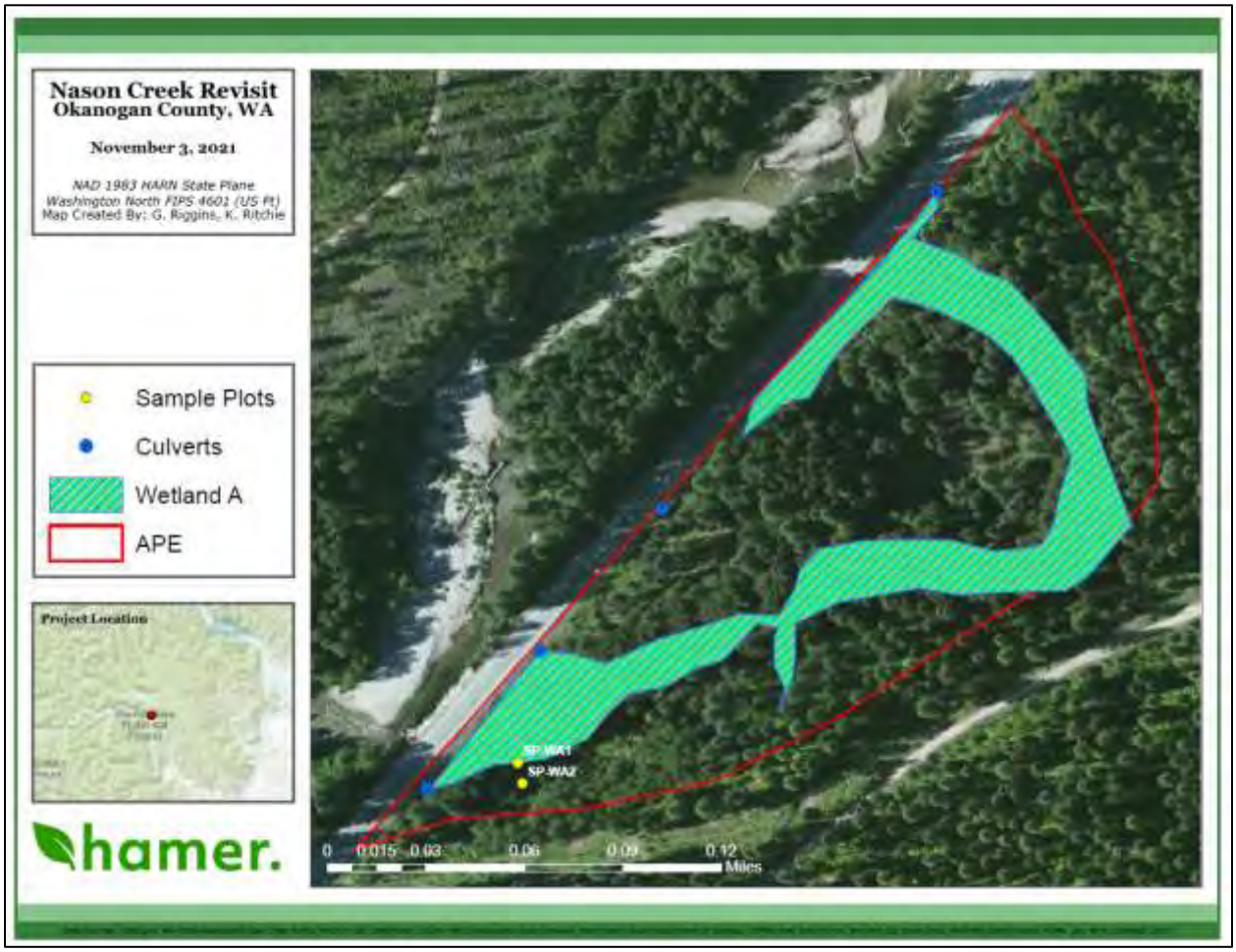


Figure 3. Wetland A within the boundaries of the Study area.

Table 1. Wetlands within the Project Area.

Wetland/ stream	Wetland Classification				Wetland Size (acres)	Wetland Buffer (ft)
	FGDC[1]	HGM	Ecology Category	Habitat Score		
Wetland A	PFO/PSS	Depressional	III	6	3.86	75

[1]FGDC (formerly Cowardin) or NWI Class based on vegetation: PFO=Palustrine Forested, PSS=Palustrine Scrub-shrub, PEM=Palustrine Emergent, R2EM = Riverine, Lower Perennial, Emergent.

3.3.1 Wetland A

Wetland A is characterized as a palustrine forested and scrub/shrub (PFO/PSS) wetland in topographical depression with diverging stream beds (FGDC 2013). The wetland is confined by State Route 207; however, several culverts allow water to flow from Nason Creek into the wetland. Conditions within the wetland appear to be seasonally variable and under winter flood conditions (Figure 3, Figure 4).

Wetland conditions vary throughout the wetland. The southern half of the wetland vegetation is dominated by red-osier dogwood (*Cornus sercicea)* and field horsetail *(Equisetum arvense L.).* As you transition into the northern half of the wetland, hummock islands provide habitat for Pacific silver fir (*Abies amabilis*) and douglas fir (*Pseudotsuga menziesii*) saplings. In addition, diverging streams channels interlace the wetland but appear to be abandoned side channels of Nason Creek. Along State Route 207 and in the northern half of the wetland, the dominant plant community is scrub-shrub. Douglas spiraea (*Spiraea douglasii*) and red-osier dogwood densely populate the roadside ditch and continue into the northern half of the wetland (Figure 5).

The hydric soil indicator Depleted Below Dark Surface (A11) was identified in the soil test plot in the wetland. In general, the subsurface soil layer is dark with a depleted matrix of 60% or more chroma of 2 or less, starting within 12inches and having a minimum thickness of 6 inches. The soil sample plot observed had a soil subsurface layer with a matrix color (7.5YR 2.5/1) and a second soil layer with matrix color (10YR 2/1) with an observed thickness of 13 inches. No prominent redox concentrations were observed (Appendix B).

Hyporheic flows from Nason Creek serve as the primary source of hydrology for Wetland A; however, the wetland likely also receives hydrology from road runoff and direct precipitation. At the time of the field investigation, the site showed evidence of the following wetland hydrology indicators: Sparsely Vegetated Concave Surface (B8), Geomorphic Position (D2), and FAC-Neutral Test (D5) (Appendix B). Wetland A has areas of seasonal surface water ponding outside of the sampled plots. The water depth in ponded areas ranges from one to three feet deep during times of high precipitation and spring runoff. Stream channels vary in vegetation cover, and hydrology ranges from ephemeral flowing streams to channels that may only be partially saturated year-round (Figure 3). Conditions within the wetland appear to be seasonally variable and under winter flood conditions. Some areas may be flooded from the subsurface flows from the Nason Creek. Apart from the sample plots, surface water was observed in the northwest half of the wetland that was dominated by the scrub-shrub plant community. Wetland A is partially within the floodplain of Nason Creek and may become inundated with surface water during seasonal or occasional flooding.

Wetland A is characterized as a Depressional wetland using the HGM system. It is a Category III wetland according to the current Ecology (2014) rating system based on its functions. Wetland A provides low levels of water quality and hydrologic function with a high level of habitat function. Wetland Rating system points were assigned as follows:

Water Quality Score: 6 (Low level of function)
Hydrologic Score: 6 (Low level of function)
Habitat Score: 6 (High level of function)
Total 18

Wetland functions and values for Wetland A are detailed in Appendix C.

Figure 4. Stream Channel found within the boundaries of Wetland A.

Figure 5. Ponded Areas within Wetland A.

3.3.2 Uplands

In addition to the wetland test pit, one upland sample pit (paired test pit) adjacent to the wetland was evaluated (Figure 6). Uplands are dominated by pacific silver fir, bitter cherry (*Prunus emarginata*), and black cottonwood *(Populus balsamifera spp.).* The forest understory was largely bare ground with sparse Oregon-grape (*Mahonia aquafolium*). Upland soils are generally very dark brown (10YR 3/2) to brown (10YR 4/3) silt loam (Appendix B).

Figure 6. Overview of upland areas.

References

Brinson, M.M. 1993. *A Hydrogeomorphic Classification for Wetlands*. Technical Report WRPDE-4. US Amy Engineers Waterways Experiment Station, Vicksburg, MS.

Consulting, C. C. (2019). *Nason Ridge Community Forest Management Plan.* Retrieved from https://www.co.chelan.wa.us/files/natural-resources/documents/Nason%20Ridge%20Community%20Forest%20Management%20Plan_2019%201125.pdf

[Ecology] Washington Department of Ecology. 2021. Washington State Department of Ecology. Water Quality Assessments/TMDLs. Accessed online at: https://fortress.wa.gov/ecy/waterqualityatlas/map.aspx.

Ecology. 2018. *Wetlands in Washington State Volume 2 – Protecting and Managing Wetlands*. Appendix 8-D: Guidance on Widths of Buffers and Ratios for Compensatory Mitigation for Use with the Eastern Washington Wetland Rating System. Ecology Publication No. 05-06-008.

Environmental Laboratory. 1987. Corps of Engineers wetland delineation manual. Technical Report Y-87-1, Environmental Laboratory, Department of the Army, Waterways Experiment Station, Vicksburg, MI.

Federal Geographic Data Committee. 2013. Classification of wetlands and deepwater habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC.

Fisheries, Y. N. (2021). *Upper Columbia Habitat Restoration Project (UCHRP).* Retrieved from Yakama Nation Fisheries: https://www.yakamafish-nsn.gov/restore/projects/uchrp

Franklin, J.F. and C.T. Dyrness. 1988. Natural vegetation of Oregon and Washington. Oregon State University Press, Corvallis, OR.

Hruby, T. (2014). *Washington State Wetland Rating System for Eastern Washington: 2014 Update*. (Publication #14-06-030). Olympia, WA: Washington Department of Ecology.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List*: 2016 wetland ratings. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X.

StreamNet. 2021. StreamNet Mapper online. Available at: https://psmfc.maps.arcgis.com/apps/webappviewer/index.html?id=3be91b0a32a9488a901c3885bbfc2b0b

[USACE] U.S. Army Corps of Engineers. 2007. [Regulatory guidance letter No. 07-02.] Located at http://www.usace.army.mil/cecw/pages/rglsindx.aspx.

USACE. 2010. United States Army Corps of Engineers. Final Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountain, Valley, and Coast Region, ed. J.S. Wakely, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-03-13. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

USACE. 2020. United States Army Corps of Engineers. National Wetland Plant List, Version 3.3. Accessed online at: https://www.codot.gov/programs/environmental/wetlands/assets/nwpl_co2020.pdf

USDA, NRCS. 2010. United States Department of Agriculture, Natural Resource Conservation Service, in cooperation with the National Technical Committee for Hydric Soils. Field indicators of hydric soils in the United States guide for identifying and delineating hydric soils, version 7.0. Washington, D.C.

USDA, NRCS. 2012. United States Department of Agriculture, Natural Resource Conservation Service. Field book for describing and sampling soils, version 3.0. September 2012. Accessed online at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052523.pdf.

USDA, NRCS. 2018. United States Department of Agriculture, Soil Conservation Service in cooperation with the National Technical Committee for Hydric Soils. Hydric soils of the United States. Available online at http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/.

USDA, NRCS. 2021. Soil survey of Project Area, Washington. U.S. Department of Agriculture, Natural Resource Conservation Service. Accessed online at: http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

USFWS. 2021. United States Fish and Wildlife Service, National Wetlands Inventory. NWI – National wetlands inventory in Washington State. Accessed online at: http://www.fws.gov/wetlands/Data/Mapper.html.

USFWS. 2021. Endangered Species Mapper for project site. Accessed online on at: https://ecos.fws.gov/ipac/.

WDFW. 2008. Washington Department of Fish and Wildlife. Priority Habitat and Species List. Olympia, Washington. 177 pp. Accessed online at: http://wdfw.wa.gov/conservation/phs/list/.

WDFW. 2021a. Washington Department of Fish and Wildlife Priority Habitat and Species Report for site. Accessed online at: http://apps.wdfw.wa.gov/phsontheweb/.

WDFW. 2021b. Washington State Department of Fish and Wildlife (WDFW) Salmonscape Maps. Accessed online at: http://apps.wdfw.wa.gov/salmonscape/map.html#.

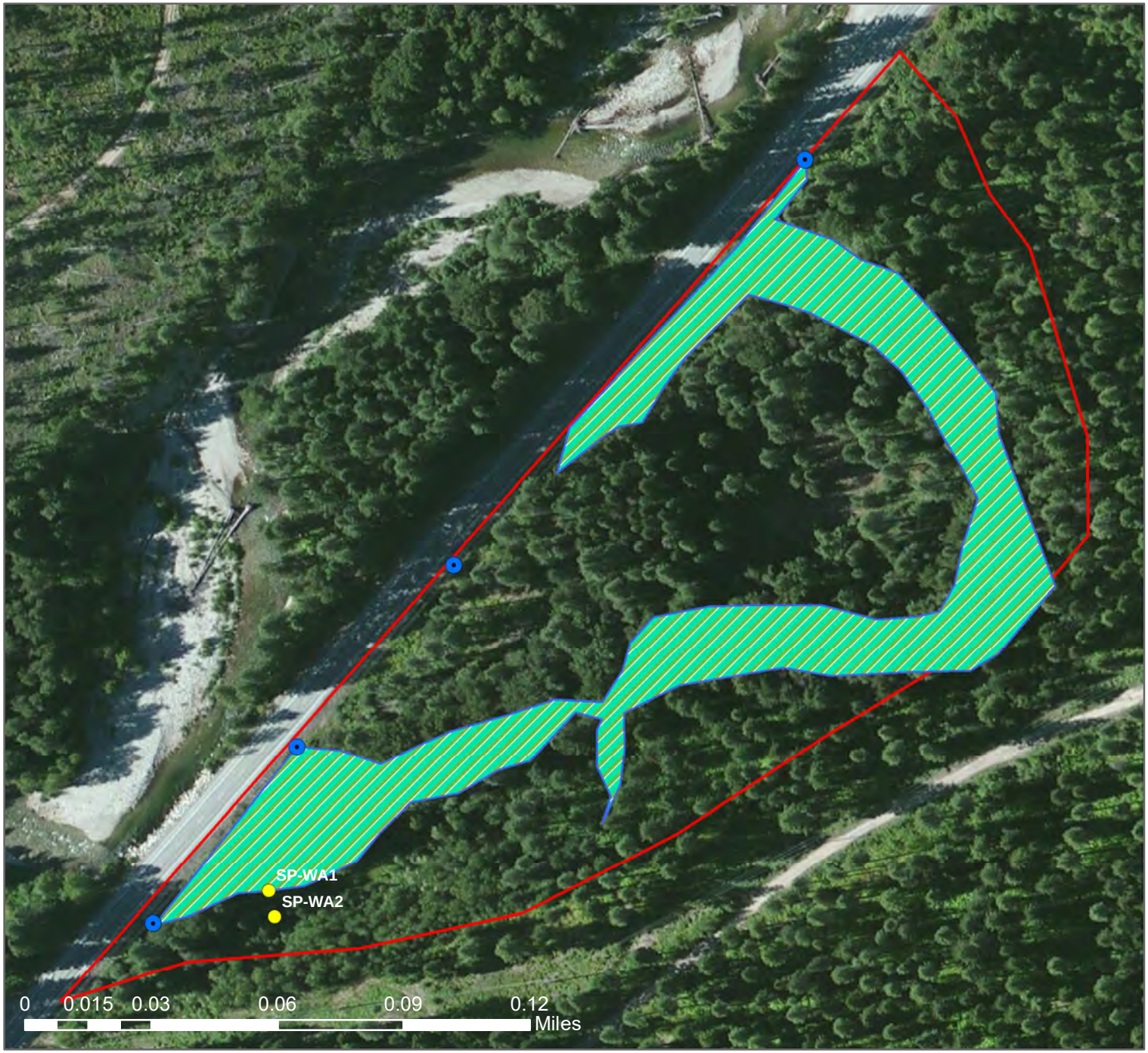
WSCC. 2000. Washington State Conservation Commission. Salmon, Steelhead and Bull Trout Habitat Limiting Factors. Water Resource Inventory Area 48 Final Report.

Appendix A — Existing Conditions Map

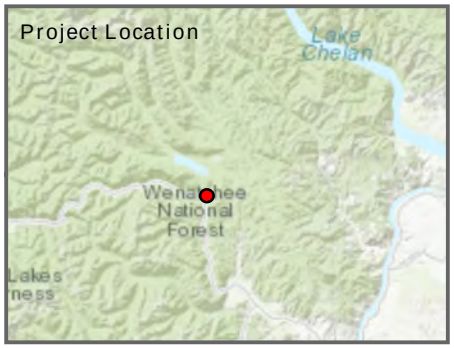
Nason Creek Revisit
Okanogan County, WA

November 3, 2021

NAD 1983 HARN State Plane Washington North FIPS 4601 (US Ft)
Map Created By: G. Riggins, K. Ritchie



- Sample Plots
- Culverts
- Wetland A
- APE



hamer.

Data Sources: Data.gov, WA State Geospatial Open Data Portal, WSDOT GIS Data Portal, USDA: NRCS Geospatial Data Gateway, Washington State Department of Ecology, USFWS NWI Data Portal, WA DNR GIS Open Data, WA FWS Salmonscape, FEMA. gov NFHL Updated: 2020

Appendix B — Data Sheets

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek revisit City/County: Chelan Sampling Date: 2021-11-03

Applicant/Owner: Yakama fisheries State: Washington Sampling Point: SP-UP1

Investigator(s): Adam Crispin, Meg Harrison Section, Township, Range: 09, T26N, R17E

Landform (hillslope, terrace, etc.): Upland Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR): A 6 Lat: 47.7605266 Long: -120.7335133 Datum: WGS 84

Soil Map Unit Name: Wintoner silt loam, 3 to 8 percent slopes NWI classification: PSS/PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✔	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Abies amabilis	20	✔	FACU
2. Prunus emarginata	15	✔	FACU
3. Populus balsamifera	10	✔	FAC
4.			
	45%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Acer circinatum	60	✔	FAC
2. Mahonia aquifolium	10		FACU
3.			
4.			
5.			
	70%	= Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Equisetum arvense	3	✔	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	3%	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	73	x 3 =	219
FACU species	45	x 4 =	180
UPL species	0	x 5 =	0
Column Totals:	118 (A)		399 (B)

Prevalence Index = B/A = 3.38

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✔

Remarks:

SOIL

Sampling Point: SP-UP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0 - 6	10YR 3/2	100					Silt Loam	
6 - 16	10YR 4/2	100					Silt Loam	
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✔

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Vis ble on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Nason Creek revisit City/County: Chelan Sampling Date: 2021-11-03

Applicant/Owner: Yakama fisheries State: Washington Sampling Point: SP-WA1

Investigator(s): Adam Crispin, Meg Harrison Section, Township, Range: 09, T26N, R17E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR): A 6 Lat: 47.7605100 Long: -120.7335366 Datum: WGS 84

Soil Map Unit Name: Wintoner silt loam, 3 to 8 percent slopes NWI classification: PSS/PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No _____	**Is the Sampled Area within a Wetland?** Yes ✔ No _____
Hydric Soil Present?	Yes ✔ No _____	
Wetland Hydrology Present?	Yes ✔ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	15	✔	FAC
2.			
3.			
4.			
	15%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Cornus alba	60	✔	FACW
2. Acer circinatum	10		FAC
3.			
4.			
5.			
	70%	= Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Equisetum arvense	40	✔	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	40%	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	65	x 3 =	195
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	125 (A)		315 (B)

Prevalence Index = B/A = 2.52

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

✔ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No _____

Remarks:

SOIL

Sampling Point: SP-WA1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 5	7.5YR 2.5/1	100						
5 - 18	10YR 2/1	100					Silt Loam	
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ✔ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Vis ble on Aerial Imagery (B7)
- ✔ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✔ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✔ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✔ Depth (inches): _____

Water Table Present? Yes ___ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes ✔ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water was present in the Northwestern area of the wetland; depth varied between .5 and 1 foot.

Appendix C — Rating Forms

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): Wetland A Date of site visit: 11/2/2021

Rated by Adam Crispin Trained by Ecology? ☑ Yes ☐ No Date of training 11/13/2019

HGM Class used for rating Depressional Wetland has multiple HGM classes? ☑ Yes ☐ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ☑ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

_____ **Category I** - Total score = 22 - 27
_____ **Category II** - Total score = 19 - 21
X **Category III** - Total score = 16 - 18
_____ **Category IV** - Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
		List appropriate rating (H, M, L)		
Site Potential	M	M	L	
Landscape Potential	M	M	H	
Value	M	M	M	**Total**
Score Based on Ratings	6	6	6	**18**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	Category
Vernal Pools	
Alkali	
Wetland of High Conservation Value	
Bog and Calcareous Fens	
Old Growth or Mature Forest - slow growing	
Aspen Forest	
Old Growth or Mature Forest - fast growing	

Floodplain forest	
None of the above	

Maps and Figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	
Map of the contributing basin	D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream (*can be added to another figure*)	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	

Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

HGM Classification of Wetland in Eastern Washington

For questions 1 - 4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?

- ☐ The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
- ☐ At least 30% of the open water area is deeper than 10 ft (3 m)

☑ NO - go to 2 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit meet all of the following criteria?

- ☐ The wetland is on a slope (*slope can be very gradual*),
- ☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
- ☑ The water leaves the wetland **without being impounded**.

☑ NO - go to 3 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?

- ☑ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
- ☐ The overbank flooding occurs at least once every 10 years.

☑ NO - go to 4 ☐ **YES** - The wetland class is **Riverine**

NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 5 ☑ **YES** - The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1 - 4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:
Wetland has multiple classes but is overall Depressional.

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality		Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?		
D 1.1. Characteristics of surface water outflows from the wetland:		
Wetland has no surface water outlet	points = 5	
☑ Wetland has an intermittently flowing outlet	points = 3	3
☐ Wetland has a highly constricted permanently flowing outlet	points = 3	
Wetland has a permanently flowing, unconstricted, surface outlet	points = 1	
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions of soils*)	Yes = 3 No = 0	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes)		
Wetland has persistent, ungrazed, vegetation for > $^{2}/_{3}$ of area	points = 5	
Wetland has persistent, ungrazed, vegetation from $^{1}/_{3}$ to $^{2}/_{3}$ of area	points = 3	5
Wetland has persistent, ungrazed vegetation from $^{1}/_{10}$ to < $^{1}/_{3}$ of area	points = 1	
Wetland has persistent, ungrazed vegetation < $^{1}/_{10}$ of area	points = 0	
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.*		
Area seasonally ponded is > ½ total area of wetland	points = 3	0
Area seasonally ponded is ¼ - ½ total area of wetland	points = 1	
Area seasonally ponded is < ¼ total area of wetland	points = 0	
Total for D 1	Add the points in the boxes above	**8**

Rating of Site Potential If score is: ☐**12 - 16 = H** ☑**5 - 11 = M** ☐**0 - 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?		
D 2.1. Does the wetland receive stormwater discharges?	Yes = 1 No = 0	1
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants?	Yes = 1 No = 0	0
D 2.3. Are there septic systems within 250 ft of the wetland?	Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3?		0
Source	Yes = 1 No = 0	
Total for D 2	Add the points in the boxes above	**1**

Rating of Landscape Potential If score is: ☐**3 or 4 = H** ☑**1 or 2 = M** ☐**0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?		
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list?	Yes = 1 No = 0	0
D 3.2.Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]?	Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)?	Yes = 2 No = 0	0
Total for D 3	Add the points in the boxes above	**1**

Rating of Value If score is: ☐ **2 - 4 = H** ☑**1 = M** ☐**0 = L** *Record the rating on the first page*

DEPRESSIONAL WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and erosion

Points (only 1 score per box)

D 4.0. Does the site have the potential to reduce flooding and erosion?

D 4.1. Characteristics of surface water outflows from the wetland:

- Wetland has no surface water outlet — points = 8
- ☑ Wetland has an intermittently flowing outlet — points = 4
- ☐ Wetland has a highly constricted permanently flowing outlet — points = 4
- Wetland has a permanently flowing unconstricted surface outlet — points = 0

(*If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing"*)

4

D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).*

- Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 8
- Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 6
- ☐ The wetland is a headwater wetland — points = 4
- ☐ Seasonal ponding: 1 ft - < 2 ft — points = 4
- Seasonal ponding: 6 in - < 1 ft — points = 2
- Seasonal ponding: < 6 in or wetland has only saturated soils — points = 0

2

Total for D 4 — Add the points in the boxes above: **6**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?

D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0 — **1**

D 5.2. Is > 10% of the area within 150 ft of the wetland in land uses that generates runoff? Yes = 1 No = 0 — **0**

D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses ? Yes = 1 No = 0 — **0**

Total for D 5 — Add the points in the boxes above: **1**

Rating of Landscape Potential If score is: ☐ **3 = H** ☑ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?

D 6.1. The wetland is in a landscape that has flooding problems.

Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.*

The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND

- Flooding occurs in sub-basin that is immediately down-gradient of wetland — points = 2
- Surface flooding problems are in a sub-basin farther down-gradient — points = 1

☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. — points = 0

Explain why

☐ There are no problems with flooding downstream of the wetland — points = 0

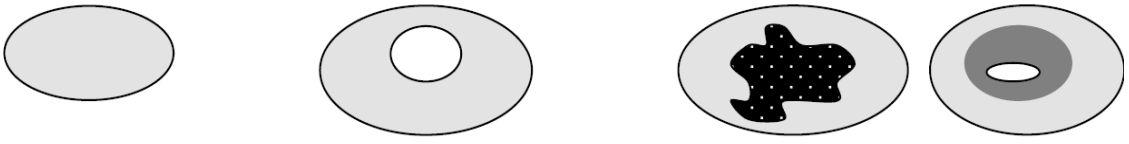
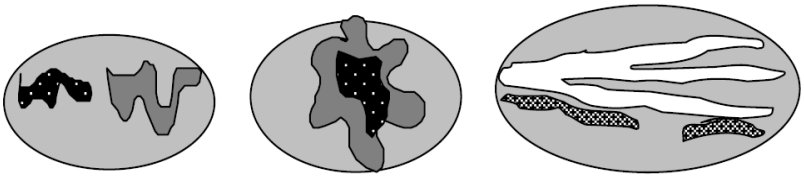
1

D 6.2. Has the site been identified as important for flood storage or flood conveyance

0

in a regional flood control plan?	Yes = 2 No = 0	0
Total for D 6	Add the points in the boxes above	**1**

Rating of Value If score is: ☐ **2 - 4 = H** ☑ **1 = M** ☐**0 = L** *Record the rating on the first page*

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is > = ¼ ac or > = 10% of the wetland if wetland is < 2.5 ac.* ☐ Aquatic bed ☐ Emergent plants 0 - 12 in (0-30 cm) high are the highest layer and have > 30% cover ☐ Emergent plants > 12 - 40 in (> 30-100 cm) high are the highest layer with >30% cover ☐ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ☑ Scrub-shrub (areas where shrubs have > 30% cover) ☑ Forested (areas where trees have > 30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points - 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* ☐ Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* ☐ Yes = 3 No = 0	0
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species. Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species 5 Scoring: > 9 species: points = 2 4 - 9 species: points = 1 < 4 species: points = 0	1
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points  All three diagrams in this row are **HIGH** = 3 points	2

Riparian braided channels with 2 classes	

H 1.6. Special habitat features: *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ☐ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ☐ Cattails or bulrushes are present within the wetland. ☐ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ☑ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ☑ Invasive species cover less than 20% in each stratum of vegetation (*canopy, sub-canopy, shrubs, herbaceous, moss/ground cover*)	2
Total for H 1 — Add the points in the boxes above	**6**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☐ **7 - 14 = M** ☑ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1 Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* 28 % undisturbed habitat + (9 % moderate & low intensity land uses / 2) = 32.5% > 1/3 (33.3%) of 1 km Polygon — points = 3 20 - 33% of 1 km Polygon — points = 2 10 - 19% of 1 km Polygon — points = 1 < 10 % of 1 km Polygon — points = 0	2
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* 82 % undisturbed habitat + (9 % moderate & low intensity land uses / 2) = 86.5% Undisturbed habitat > 50% of Polygon — points = 3 Undisturbed habitat 10 - 50% and in 1 - 3 patches — points = 2 Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of 1 km Polygon — points = 0	3
H 2.3 Land use intensity in 1 km Polygon: > 50% of 1 km Polygon is high intensity land use — points = (-2) Does not meet criterion above — points = 0	0
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* Yes = 3 No = 0	0
Total for H 2 — Add the points in the boxes above	**5**

Rating of Landscape Potential If Score is: ☑ **4 - 9 = H** ☐ **1 - 3 = M** ☐ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated*. Site meets ANY of the following criteria: — points = 2 ☐ It has 3 or more priority habitats within 100 m (see Appendix B) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) ☐ It is mapped as a location for an individual WDFW species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan	1

Site has 1 or 2 priority habitats within 100 m (see Appendix B)	points = 1	
Site does not meet any of the criteria above	points = 0	

Rating of Value If Score is: ☐ **2 = H** ☑ **1 = M** ☐ **0 = L** *Record the rating on the first page*

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate category. NOTE: A wetland may meet the criteria for more than one set of special characteristics. Record all those that apply. NOTE: All wetlands should also be characterized based on their functions.

Wetland Type	Category
Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.	
SC 1.0. Vernal Pools Is the wetland **less than 4000 ft²**, and does it meet at least **two** of the following criteria? ☐ Its only source of water is rainfall or snowmelt from a small contributing basin and has no groundwater input. ☐ Wetland plants are typically present only in the spring; the summer vegetation is typically upland annuals. *If you find perennial, obligate, wetland plants, the wetland is probably NOT a vernal pool.* ☐ The soil in the wetland is shallow [< 1 ft (30 cm) deep] and is underlain by an impermeable layer such as basalt or clay. ☐ Surface water is present for less than 120 days during the wet season. ☐ Yes - Go to **SC 1.1** ☑ No = **Not vernal pool** SC 1.1. Is the vernal pool relatively undisturbed in February and March? ☐ Yes – Go to **SC 1.2** ☑ No = **Not a vernal pool with special characteristics**	
SC 1.2. Is the vernal pool in an area where there are at least 3 separate aquatic resources within 0.5 mi (other wetlands, rivers, lakes etc.)? ☐ Yes = **Category II** ☑ No = **Category III**	
SC 2.0. Alkali wetlands Does the wetland meet **one** of the following criteria? ☐ The wetland has a conductivity > 3.0 mS/cm. ☐ The wetland has a conductivity between 2.0 and 3.0 mS, and more than 50% of the plant cover in the wetland can be classified as "alkali" species (see Table 4 for list of plants found in alkali systems). ☐ If the wetland is dry at the time of your field visit, the central part of the area is covered with a layer of salt. **OR** does the wetland unit meet two of the following three sub-criteria? ☐ Salt encrustations around more than 75% of the edge of the wetland ☐ More than ¾ of the plant cover consists of species listed on Table 4 ☐ A pH above 9.0. All alkali wetlands have a high pH, but please note that some freshwater wetlands may also have a high pH. Thus, pH alone is not a good indicator of alkali wetlands. ☐ Yes = **Category I** ☑ No = **Not an alkali wetland**	
SC 3.0. Wetlands of High Conservation Value (WHCV) SC 3.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☐ Yes - Go to **SC 3.2** ☑ No - Go to **SC 3.3** SC 3.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☑ No = **Not WHCV** SC 3.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 3.4** ☑ No = **Not WHCV** SC 3.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☑ No = **Not WHCV**	

SC 4.0. Bogs and Calcareous Fens

Does the wetland (or any part of the wetland unit) meet both the criteria for soils and vegetation in bogs or calcareous fens? Use the key below to identify if the wetland is a bog or calcareous fen. ***If you answer yes you will still need to rate the wetland based on its functions.***

SC 4.1. Does an area within the wetland have organic soil horizons (i.e., layers of organic soil), either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? *See Appendix C for a field key to identify organic soils.*

☐ Yes - Go to **SC 4.3** ☑ No - Go to **SC 4.2**

SC 4.2. Does an area within the wetland have organic soils, either peats or mucks, that are less than 16 in deep over bedrock or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond?

☐ Yes - Go to **SC 4.3** ☑ No = **Is not a bog for rating**

SC 4.3. Does an area within the wetland have more than 70% cover of mosses at ground level AND at least 30% of the total plant cover consists of species in Table 5?

☐ Yes = **Category I bog** ☑ No - Go to **SC 4.4**

NOTE: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 5 are present, the wetland is a bog.

SC 4.4. Is an area with peats or mucks forested (> 30% cover) with subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 5 provide more than 30% of the cover under the canopy?

☐ Yes = **Category I bog** ☑ No - Go to **SC 4.5**

SC 4.5. Do the species listed in Table 6 comprise at least 20% of the total plant cover within an area of peats and mucks?

☐ Yes = **Is a Calcareous Fen for purpose of rating** ☑ No - Go to **SC 4.6**

SC 4.6. Do the species listed in Table 6 comprise at least 10% of the total plant cover in an area of peats and mucks, AND one of the two following conditions is met:

☐ Marl deposits [calcium carbonate ($CaCO_3$) precipitate] occur on the soil surface or plant stems

☐ The pH of free water is ≥ 6.8 AND electrical conductivity is ≥ 200 uS/cm at multiple locations within the wetland

☐ Yes = **Is a Category I calcareous fen** ☑ No = **Is not a calcareous fen**

SC 5.0. Forested Wetlands

Does the wetland have an area of forest rooted within its boundary that meets **at least one** of the following three criteria? (*Continue only if you have identified that a forested class is present in question H*

☑ The wetland is within the 100 year floodplain of a river or stream

☐ Aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species

☐ There is at least ¼ ac of trees (even in wetlands smaller than 2.5 ac) that are “mature” or “old-growth” according to the definitions for these priority habitats developed by WDFW (*see definitions in question H3.1*)

☐ Yes - Go to **SC 5.1** ☑ No = **Not a forested wetland with special characteristics**

SC 5.1. Does the wetland have a forest canopy where more than 50% of the tree species (by cover) are slow growing native trees (*see Table 7*)?

☐ Yes = **Category I** ☑ No - Go to **SC 5.2**

SC 5.2. Does the wetland have areas where aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species?

☐ Yes = **Category I** ☑ No - Go to **SC 5.3**

SC 5.3. Does the wetland have at least ¼ acre with a forest canopy where more than 50% of the tree species (by cover) are fast growing species (*see Table 7*)?

☐ Yes = **Category II** ☑ No - Go to **SC 5.4**

SC 5.4. Is the forested component of the wetland within the 100 year floodplain of a river or stream?

☑ Yes = **Category II** ☐ No = **Not a forested wetland with special characteristics**

Category of wetland based on Special Characteristics *Choose the highest rating if wetland falls into several categories* If you answered No for all types, enter “Not Applicable” on Summary Form	**Cat. II**

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.
http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here:
http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE** : This question is independent of the land use between the wetland unit and the priority habitat.*

- ☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).
- ☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).
- ☐ **Old-growth/Mature forests**: Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.
- ☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).
- ☐ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- ☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.
- ☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.
- ☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- ☑ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.
- ☐ **Shrub-steppe**: A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).
- ☐ **Eastside Steppe**: Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).
- ☐ **Juniper Savannah**: All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

DRAFT GEOTECHNICAL REPORT
YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

HWA Project No. 2022-144-21

January 15, 2026

Prepared for:

Yakama Nation

&

Perteet

HWA GEOSCIENCES INC.

DRAFT

HWA GeoSciences Inc.
DBE/MWBE

January 15, 2026
HWA Project No. 2022-144-21

Perteet
2707 Colby Avenue, Suite 900
Everett, WA 98201

Attention: Jennifer Saugen P.E.

Subject: **DRAFT GEOTECHNICAL REPORT**
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

Dear Ms. Saugen:

As requested, HWA GeoSciences Inc. (HWA) has completed a geotechnical engineering study for the proposed State Route (SR) 207 Reroute adjacent to the Nason Creek Floodplain in Chelan County, Washington. This report presents the results of our field explorations, laboratory testing, and geotechnical engineering analysis and recommendations.

We appreciate the opportunity to provide geotechnical services on this project. If you have any questions regarding this report or require additional information or services, please contact the undersigned at your convenience.

Sincerely,

HWA GEOSCIENCES INC.

Donald Huling, P.E.
Geotechnical Engineer, Principal

Brett O'Brien, P.E.
Geotechnical Engineer

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DRAFT GEOTECHNICAL REPORT
YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

1.0 INTRODUCTION

1.1 GENERAL

This report summarizes the results of a geotechnical engineering study performed by HWA GeoSciences Inc. (HWA) for the Yakama Nation Nason Creek Floodplain SR 207 Reroute project (Project) in Chelan County, Washington. The approximate location of the project site is shown on the Site and Vicinity Map, Figure 1, and on the Site and Exploration Plan, Figure 2. Our field work consisted of three phases of exploration. Phase 1 included advancing twelve (12) handhole explorations, Phase 2 included drilling four (4) machine-drilled borings, and Phase 3 included drilling five (5) machine-drilled borings. Phases 1 and 2 were completed in 2023 in support of the preliminary investigation. Phase 3 was completed in 2024 in support of the final design. Laboratory testing was conducted on selected soil samples to determine relevant engineering properties for the subsurface soils. The purpose of this study was to evaluate the soil and groundwater conditions along the proposed roadway alignment to provide geotechnical engineering recommendations for the proposed improvements.

1.2 PROJECT UNDERSTANDING

We understand the project will include rerouting SR 207 in the vicinity of milepost (MP) 0.15 to MP 1.00 (Nason Creek river mile 3.2 to 4.6) around the historic Nason Creek floodplain, south from the current alignment. The purpose of this project is to improve aquatic habitat conditions and protect roadway infrastructure. The Yakama Nation Upper Columbia Habitat Restoration Project and Washington State Department of Transportation have partnered for this project.

Grading for the new alignment will require significant cuts and fills to achieve the design grades. Based on the latest concept drawings, three primary areas along the alignment will receive significant fill. The roadway segment between STA 303+50 and 312+65 will have up to 6 feet of fill placed, with local maximum fills near STA 305+80. The segment between STA 319+00 and 323+15 will have up to 7½ feet of fill placed, with local maximum fills near STA 321+50. The segment between STA 33+60 and 337+60 will have up to 14 feet of fill placed, with local maximum fills near STA 334+70.

The grading plan proposes cuts of up to about 4 feet between STA 312+65 and 319+00, and cuts of up to about 10 feet between STA 323+15 to 33+62. We understand that sloped excavations are going to be utilized to achieve the design finished grades for cut portions of the alignment.

1.3 SITE DESCRIPTION

The Project area is located in, and adjacent to, the historic Nason Creek floodplain in Chelan County, Washington. It initiates approximately 0.15 miles northeast of the intersection of US 2 and SR 207, and extends 0.85 miles along SR 207 to MP 1.00. SR 207 trends roughly northeast/southwest within the Project area and bisecting the historic floodplain in a straight line. The existing roadway is constructed with hot mix asphalt on a fill berm ranging in height from about 4 to 10 feet, and consists of two 12.5-foot-wide lanes, one each northbound and southbound, with 6-foot-wide shoulders. The roadway has minimal slope.

The main channel of Nason Creek is located west of SR 207 and flows generally north to Lake Wenatchee. The creek channel is constrained by Nason Ridge to the west, a bedrock ridge generally consisting of Chumstick Formation sedimentary rock. The historic floodplain extends beyond SR 207 to the east and contains multiple historic overflow and/or abandoned Nason Creek channels, visible in Figure 3. There are wetlands located at the north and south ends of the Project area associated with these overflow channels.

East of SR 207 and the historic floodplain the topography slopes up gently, with a grade ranging from 8% to 12%, to Rieche Road/USFS Road 6603, and beyond to the base of Natapoc Ridge, another bedrock ridge consisting of Chumstick Formation sedimentary bedrock. USFS Road 6603 is a closed, one-lane forest service road that generally parallels SR 207 within the Project area and is primarily unpaved. Discrete areas of hot mix asphalt pavement are visible on USFS Road 6603, indicating it was likely paved when originally constructed. The roadway slopes up gently from south to north until Project Station 319+00, where the slope becomes steep. The slope from SR 207 to the base of Natapoc Ridge is heavily vegetated with evergreen trees, vine maple and shrubs.

Within the Project area a Chelan County PUD 115 kV aboveground pole line extends from SR 207 to Rieche Road, then parallels USFS Road 6603 to the north. Near the north end of the Project area is a Bonneville Power Administration (BPA) transmission line corridor containing three extra high voltage transmission lines. These lines trend generally east/west, crossing Nason Creek and SR 207 on two sets of lattice towers. This corridor has been cleared of vegetation, apart from grass and scattered small shrubs.

2.0 FIELD INVESTIGATION

2.1 SUBSURFACE EXPLORATION

Our geotechnical exploration program included surface reconnaissance of the alignment, drilling a total of nine (9) machine-drilled borings and completion of twelve (12) shallow hand borings over the course of three phases of work, as described below. The approximate locations of these

borings are shown on the Site and Exploration plan, Figure 2. Logs for the borings are presented in Appendix A of this report.

Phase 1: Phase 1 of our field exploration program consisted of advancing twelve shallow hand borings, designated HH-1 through HH-12. Borings were advanced approximately equidistance apart within the proposed reroute alignment to depths ranging from about 0.7 to 9.2 feet below ground surface (bgs). Dynamic cone penetrometer (DCP) data was collected at eleven (11) boring locations to depths ranging from about 5.4 to 12.4 feet bgs. No DCP data was collected at HH-9 due to remote location and heavy vegetation access issues that made transportation of DCP equipment prohibitively difficult. These explorations were conducted in support of investigation of subsurface soil and groundwater conditions on the proposed Project alignment. In addition, reconnaissance of the adjacent slopes and floodplain were conducted to better understand site geology, soil, and rock types present in the vicinity of the Project alignment. Phase 1 was completed on May 16 through 18, 2023, by HWA geologists using hand operated drilling and sampling equipment.

For the handholes conducted in Phase 1, Dynamic Cone Penetrometer (DCP) testing was performed at most boring locations to assess subsurface soil and groundwater conditions. The DCP equipment consists of a steel extension shaft assembly, with a 60-degree hardened steel cone tip attached to one end, which is driven into the soil by means of a sliding drop hammer. The base diameter of the cone is 20 mm (0.79 inches). The diameter of the shaft is 8 mm (~0.315 inches) less than the cone, to reduce rod friction at shallow penetration depths. The DCP is driven by repeatedly dropping an 8-kg (~17.6-pound) sliding hammer from a fixed height of 575 mm (~22.6 inches). The depth of cone penetration is measured after each hammer drop and the in-situ shear strength of the soil is reported in terms of the DCP index. The index is based on the average penetration depth resulting from 1 blow of the 8-kg (17.6-pound) hammer and is reported as millimeters per blow (mm/blow). The data obtained from the DCP tests was then correlated to Standard Penetration Test (SPT) N-value (blows/foot), to evaluate the strength of the subgrade soils. The DCP data, converted to SPT N-value (blows/foot), is plotted on Figures A-11 through A-22 for the hand auger borings.

Phase 2: Phase 2 of our field exploration program consisted of drilling four machine-drilled borings, designated BH-1 through BH-4. Borings were drilled within the United States Forest Service (USFS) Road 6603 road prism to depths ranging from about 36 to 41½ feet bgs. Borings were conducted on USFS Road 6603 due to accessibility issues for the drill rig on the proposed Project alignment. Samples were collected at approximate 2½-foot intervals to 20 feet, then approximate 5-foot intervals to the termination depths of the borings. These explorations were conducted in support of investigation of subsurface soil and groundwater conditions in the vicinity of the

proposed Project alignment. Phase 2 was performed on June 19 and June 26, 2023 by Holocene Drilling of Puyallup, Washington, under subcontract to HWA using a track-mounted Diedrich D-50 tracked drill rig. The machine-drilled boring logs completed for Phase 2 are presented in Figures A-2 through A-5.

Standard Penetration Testing (SPT) was performed in each boring for Phase 2 using a 2-inch outside diameter, split-spoon sampler driven by a 140-pound automatic hammer. During the test, a sample was obtained by driving the sampler 18 inches into the soil with the hammer free-falling 30 inches. The number of blows required for each 6 inches of sampler penetration was recorded. The N-value (or resistance in terms of blows per foot) is defined as the number of blows recorded to drive the sampler the final 12 inches. If a total of 50 blows was recorded within a single 6-inch interval, the test was terminated, and the blow count was recorded as 50 blows for the number of inches of penetration achieved. This resistance, or N-value, provides an indication of the relative density of granular soils and the relative consistency of cohesive soils.

Additionally, a larger 3-inch outside diameter, Modified California sampler was utilized at specific depths during Phase 2 exploration program in order to collect ring samples to conduct direct shear tests. The sample collected with this sampler (HWA-1, S-3) has blow counts that do not reflect standardized values as they utilized the larger Modified California sampler with the standard 140-lb hammer. These values have been adjusted in our analyses to reflect standard SPT N-value blow counts for the purpose of our design.

Two relatively undisturbed samples were obtained in Shelby tubes from two of the borings (BH-2, S-5 and BH-4, S-2) in order to collect samples for direct shear and consolidation testing. Sampling with a Shelby tube consists of pushing a 3-inch O.D., thin-walled steel tube (bolted to the bottom of the sampling rods) 30 inches into undisturbed soil below the bottom of the borehole using drill rig hydraulics. The sample tube is allowed to equilibrate for a few minutes before retrieval to promote adequate recovery. Due to the method of sample collection, no SPT-N values or correlating SPT-N values are available for these samples.

Phase 3: Phase 3 of our field exploration program consisted of drilling five machine-drilled borings, designated BH-5, BH-7 and BH-9 through BH-11. Borings were drilled approximately equidistance apart within the proposed reroute alignment to depths ranging from about 15.5 to 22 feet below ground surface (bgs). Two additional borings, designated BH-6 and BH-8, were planned for this phase, but the boring locations were not accessible using available drill equipment. Therefore, these two locations were not completed. Samples were collected at approximately 2½-foot intervals to the termination depths of the borings, unless drilling conditions dictated otherwise. Monitoring wells were installed to depths of 15 feet and 20 feet in BH-5 and BH-11 respectively. These explorations were conducted in support of investigation of subsurface soil and

groundwater conditions in the vicinity of the proposed Project alignment. Phase 3 was performed on October 22 and 23, 2024 by Geologic Drill Partners Inc, of Fall City, Washington, under subcontract to HWA using a track-mounted Mini-Bobcat drill rig. The Phase 3 machine-drilled boring logs are presented in Figures A-6 through A-10.

Standard Penetration Testing (SPT) was performed in each boring for Phase 3 using a 2-inch outside diameter, split-spoon sampler driven by a 140-pound rope and cathead hammer. During the test, a sample was obtained by driving the sampler 18 inches into the soil with the hammer free-falling 30 inches. The number of blows required for each 6 inches of sampler penetration was recorded. The N-value (or resistance in terms of blows per foot) is defined as the number of blows recorded to drive the sampler the final 12 inches. If a total of 50 blows was recorded within a single 6-inch interval, the test was terminated, and the blow count was recorded as 50 blows for the number of inches of penetration achieved. This resistance, or N-value, provides an indication of the relative density of granular soils and the relative consistency of cohesive soils.

A geologist from HWA logged the explorations and recorded pertinent information, including sample depths, stratigraphy, soil engineering characteristics, and groundwater occurrence. Soil samples obtained from the explorations were classified in the field and representative portions were placed in plastic bags. These soil samples were then taken to our Bothell, Washington, laboratory for further examination and testing.

The stratigraphic contacts shown on the exploration logs represent the approximate boundaries between soil types; actual transitions may be more gradual. The soil and groundwater conditions depicted are only for the specific date and location reported and, therefore, are not necessarily representative of other locations and times.

2.2 LABORATORY TESTING

Laboratory tests were conducted on selected samples retrieved from our explorations to characterize relevant engineering and index parameters of the soils encountered at the site. The tests included visual classifications, determination of natural moisture contents, Atterberg Limits, hydrometer, grain size distributions, direct shear, and consolidation. All tests were conducted in the HWA laboratory in general accordance with appropriate American Society for Testing and Materials (ASTM) standards. A brief description of laboratory test methodology is presented in Appendix B. The test results are presented in Appendix B and displayed on the boring logs in Appendix A, as appropriate.

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3.0 GEOLOGIC AND SUBSURFACE CONDITIONS

3.1 GENERAL GEOLOGY

According to the *Geologic Map of Chelan 30-Minute by 60-Minute Quadrangle, Washington* (Tabor et al., 1987), the project area is underlain by Quaternary alluvium (Qa). This unit is defined as poorly sorted cobbles, gravel and sand. The ridges that define the width of the Nason Creek floodplain consist of the Nahahum Canyon Member of the Eocene Chumstick Formation (Tcn). This unit is defined as micaceous laminated shales and sandstones. Qa was deposited by running water and/or overbank flow from Nason Creek. Tcn rocks are composed of clay, silt and sand grains that were deposited in as still water body, such as a lake, then subsequently lithified. In general, the Tcn unit is easily erodible. A portion of the geologic map is presented in Figure 4.

The Project area is located within the Wenatchee River watershed basin. Nason Creek originates approximately 18 miles west of the Project area at Lake Valhalla, near Stevens Pass. Nason Creek continues to flow north from the Project area, converging with the Wenatchee River near the south end of Lake Wenatchee. The Wenatchee River roughly parallels Nason Creek in the vicinity of the Project area, but flows on the east side of Natapoc Ridge, with said ridge creating a natural barrier between the two waterways.

3.2 SUBSURFACE CONDITIONS

Our explorations encountered topsoil, fill, alluvium, and buried creek bed. In general, the alluvium was more fine-grained than the geologic map unit description indicates, and is likely a mix of colluvium eroded from the Tcn rock above, and overbank deposits from Nason Creek. The borings terminated in alluvium more similar to the map unit description, and are differentiated from the atypical alluvium deposits as being buried creek bed. the Units interpreted from the boring logs are described below. Geologic Cross-Sections A-A' through C-C' showing our interpretation of the soil profile at selected critical sections are presented in Figures 5A through 5C, respectively.

- **Topsoil:** Topsoil was encountered in HH-1 through HH-6, HH-9, HH-10, HH-12, BH-5, and BH-7 from ground surface to depths ranging from about ¼ to 1½ feet bgs. In general, the topsoil consisted of loose to medium dense, clayey or silty sand with varying percentages of gravel and abundant organics and roots.

- **Fill:** Fill was encountered at the ground surface or below the topsoil in HH-11, BH-1 through BH-4, BH-9 and BH-10 extending to depths ranging from 2 to 5 feet bgs. In general, the fill consisted of medium dense or medium stiff, clayey sand or sandy clay. Fill soils were similar to native soils, and we expect they are reworked soils placed during

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construction of USFS Road 6603 (BH-1 through BH-4) or the BPA transmission line corridor (HH-11, BH-9 and BH-10).

- **Alluvium:** Alluvium was encountered underlying the fill or topsoil in HH-1 through HH-11, and BH-1 through BH-5, BH-7, BH-9, and BH-10. The alluvium extends to depths of up to 35 bgs and to the termination depths of most of the borings. Alluvium was encountered at ground surface in BH-11, and extended to 2.5 feet bgs. In general, the alluvium consisted of loose to medium dense, or medium stiff, silty sand, clayey sand, or sandy clay. Alluvium soils are emplaced by running water. The high fine-grained soil content implies that this unit is likely representative of overbank flood deposits of Nason Creek. The soils consist of sediment similar to what we observed in Chumstick Formation sedimentary rock upslope on Natapoc Ridge, and colluvium from this source is likely also present in this unit. Observed bedding implies that the main depositional environment is alluvial.

- **Buried Creek bed:** Buried creek bed was encountered underlying the topsoil or alluvium in HH-12, BH-1 through BH-3, BH-5, BH-10 and BH-11, extending to the termination depths of the borings, when encountered. In general, the buried creek bed consisted of dense to very dense sand and gravel. Much of the sand observed in BH-1 through BH-3 was angular, and appeared to be disaggregated weathered gravel that had been broken apart during drilling and/or sampling. The sand and gravel in this unit would have also been emplaced by running water and is considered alluvium; however, HWA feels the emplacement conditions are different enough to warrant a separate unit. This soil would have been placed in an active-flowing channel, implying that the main Nason Creek channel has migrated from east to west over time, and the abandoned channel has since been buried in the overbank flood deposit alluvium described above. The gravel and sand minerology observed in this unit is primarily associated with metamorphic crystalline bedrock, present upstream and in surrounding areas, and is not similar to the observed Chumstick Formation sedimentary rocks upslope.

3.3 GROUNDWATER CONDITIONS

Groundwater was encountered in BH-1 through BH-3, BH-5 and BH-11 at depths ranging from about 3.17 to 40 feet below ground surface. For BH-1 through BH-3 and groundwater was observed at the time of drilling at depths ranging from 30-40 feet below ground surface. Within borings BH-5 and BH-11 groundwater was measured at 10.51 feet bgs and 3.17 feet bgs, respectively on October 23, 2024. When encountered, the groundwater was located within the buried creek bed soil. The depth of observed groundwater increased with added elevation, and was generally encountered at about the same elevation as the main Nason Creek channel. Groundwater was also encountered in HH-12 at 0.6 feet bgs in the buried creek bed soils. HH-12 was advanced in the mapped wetlands at the north extent of the Project area, at approximately the same elevation as the main Nason Creek channel.

HWA installed groundwater transducers in piezometers BH-5 and BH-11 on October 23, 2024, and collected groundwater transducer data on December 12, 2024. The data was corrected using barometric pressure data when calculating groundwater depth. Groundwater depths at BH-5 fluctuated between 9.8 and 10.6 feet below ground surface (bgs) between October and December 2024, with the depth generally decreasing over time, as shown on Figure 6A.

Groundwater depth at BH-11 fluctuated between 2.9 and 3.2 feet bgs between October and December 2024. While groundwater depth also generally decreased over time, the transducer data recorded within BH-11 produced more groundwater peaks than BH-5. These groundwater peaks manifest as individual data spikes where groundwater levels rise and fall rapidly. We compared United States Geological Survey (USGS) stream gage data for the same timeframe from Wenatchee River stream gage 12457000, located in Plain, Washington, to the BH-11 groundwater data. Stream gage data was accessed from the USGS website (https://waterdata.usgs.gov) on December 15, 2024. Stream gage 12457000 is located approximately 3 miles east of the project area and represents the geographically closest stream height data within the Wenatchee River watershed basin. Both BH-11 groundwater data and stream gage 12457000 data are shown for comparison in Figure 6B. While not a direct correlation, the peaks in BH-11 groundwater depth roughly align with the peaks in the Wenatchee River gage height, implying that the groundwater at BH-11 is affected by the general water height trends within the Wenatchee River watershed basin, which includes the Nason River water height in the main channel west of SR 207.

The data from both piezometer locations are consistent with the expected trend during the wet season, which typically extends from approximately October to March. Due to the origin and location of Nason Creek, we anticipate that high ground water conditions would continue through the snow melt season into early summer. Groundwater conditions can vary over time and distance, and what we encountered during our explorations might not be representative across the Project area. Contractors should be prepared to encounter varying groundwater conditions during construction and excavation.

3.4 SITE RECONNAISSANCE

Site conditions were observed on May 16 through 18, June 20, and June 26 by an HWA geologist or geotechnical engineer. Ground surface and slope observations were made within the Project area from SR 207 to the base of Natapoc Ridge to document geomorphology, vegetation patterns and conditions, soil exposures, and surface water. Site observations are broken up by zones based on similar conditions. Four zones were identified and designated Zone 1 through Zone 4. Zone extents are shown on the Site and Exploration Plan, Figure 2.

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3.4.1 Zone 1 (STA. 302+20 to 311+00)

Zone 1 extends from project stationing STA. 302+20 to 311+00 and contains explorations HH-1 through HH-3, and BH-5. The proposed new SR 207 alignment begins at STA. 305+00 and crosses a small wetland area that is part of the historic Nason Creek floodplain. The wetland area is at the base of a steep slope that is about 10 feet tall. No signs of slope instability were noted during our site reconnaissance, but the wetland was heavily vegetated with trees and shrubs that limited visibility. Zone 1 slopes up gently to the east with an average aspect ratio of approximately 30 Horizontal to 1Vertical (30H:1V), but localized areas with steeper or more shallow aspect ratios are possible. We noted no signs of slope instability in Zone 1.

Zone 1 contains a cleared Chelan County PUD utility corridor containing the 115kV line mentioned above. The corridor extends from the edge of the wetland and parallels SR 207 to STA. 310, then defines the north Zone 1 boundary to USFS Road 6603. Outside this corridor, the remaining area within Zone 1 is heavily forested with evergreens and vine maple.

3.4.2 Zone 2 (STA. 311+00 to 324+25)

Zone 2 extends from STA. 311+00 to 324+25 and contains HH-4 though HH-7, BH-1 through BH-4, and BH-7. This zone contains a large portion of the historic floodplain located east of SR 207, and a portion of the USFS Road 6603 alignment.

The historic floodplain is located at approximately the same elevation as the main Nason Creek Channel, and historic and/or abandoned channels can be seen in Figure 3. There is a steepened slope separating the historic floodplain from the higher-elevation area where the proposed realignment would be located. This steepened slope is the creek bank from when the channels contained flowing water, and was difficult to observe due to heavy tree, vine maple, and brush undergrowth, but we did not note any visible signs of slope instability at the time of our site visits. A portion of the historic floodplain is not vegetated and can be seen in Figure 2, which we identified as a sand and gravel creek bed. This creek bed was dry during our reconnaissance, but the ditch on the east edge of SR 207 contained a significant amount of water and was difficult to cross. According to the Washington State Department of Ecology records for the Nason Creek stream gage station 45J070, located downstream near the Nason Creek mouth, the Nason Creek stage was approximately 4.6 feet during our May site visit, and water levels in the creek during May were the highest recorded for the 2022 water year to date. In comparison, the stage during our June visits was approximately 1.5 feet. No flood stage has been established for Nason Creek, but based on the lack of vegetation we anticipate that during times of high flow the dry creek bed could contain water.

As described above, USFS Road 6603 was primarily an unpaved dirt road, with discrete areas where asphalt pavement was still in place. The road is in relatively decent condition considering the fact that is closed and likely gets minimal maintenance. There were no signs of settlement,

and minimal rutting. Multiple large potholes have formed, the largest of which was approximately 10 feet by 10 feet, and 1-foot deep. Water that collected in these potholes was slow to drain, and we observed that potholes would remain nearly full up to a day after rain, implying that the infiltration rate in the subgrade soil is low in the Project area.

The slope east of USFS Road 6603 slopes gently up to Natapoc Ridge, with an average aspect ratio of approximately 8H:1V, and is heavily vegetated with evergreen trees, vine maple, and brush undergrowth. Observations of the ground surface were difficult to make under these conditions, but in general surface conditions were uneven and the ground surface undulated. It is possible the uneven surface is due in part to prehistoric mass wasting deposits and colluvium sourced from the Chumstick Formation sedimentary rock off Natapoc Ridge, but we noted no signs of current slope instability or failure.

3.4.3 Zone 3 (STA. 324+25 to 331+00)

Zone 3 extends from STA. 324+25 to 331+00 and contains HH-8 though HH-10. This zone contains little historic floodplain, and primarily consists of a gentle, heavily vegetated slope with an average aspect ratio of approximately 10H:1V. No concerns were noted in this zone.

3.4.4 Zone 4 (STA. 331+00 to 338+60)

Zone 4 extends from STA. 331+00 to 338+50 and contains HH-11, HH-12, and BH-9 through BH-11. This zone contains the BPA transmission line corridor and a portion of a mapped wetland. Adjacent to the north is a large section of historic floodplain, located at approximately the same elevation as the main Nason Creek channel. Surface water was observed near HH-12 during our investigation. Our Google Earth imagery search indicates that there is often surface water in the channels of the historic flood plain to the north, with water transferring from the main Nason Creek Channel through a culvert, located under SR 207 at approximately and into the historic floodplain channels east of SR 207.

The BPA transmission line corridor extends from SR 207 to the top of Natapoc Ridge. It is an approximately 200-foot-wide linear cleared path vegetated with grass and small shrubs. The average aspect ratio is approximately 10H:1V. On the north edge of the transmission line corridor there is a narrow band of trees, then a steep drop down to the historic floodplain and wetland, which can be seen in Figure 3. Where the proposed new alignment is planned to rejoin the current SR 207 ROW there is an approximately 14-foot-tall, exposed soil slope with an average aspect ratio of 4H:1V. This soil appeared to be similar to the alluvium encountered in our explorations and was easily excavated. Approximately 600 feet east of SR 207 there is a large arcuate feature with an average aspect ratio of 0.6H:1V that spans across most of the cleared corridor. We interpret these steep slopes to the north to be creek banks related to previously active Nason Creek channels observed in the historic floodplain in Figure 3. We did

not observe signs of slope instability during our site reconnaissance; however, our observations imply that these soils are readily erodible, and could present issues during and after construction if left unmitigated.

4.0 CONCLUSIONS & RECOMMENDATIONS

4.1 GENERAL

Our subsurface exploration and site reconnaissance indicate that construction of the proposed realignment of SR 207 is feasible from a geotechnical perspective. However, the presence of compressible, soft/loose alluvial soils along the proposed alignment will need to be considered during design and construction of the proposed improvements. The alluvial soils overlying the buried creek bed deposits are generally compressible and will settle under the proposed service loads. We expect that significant consolidation settlement will occur in the fine-grained alluvial layers when embankment fills are placed to construct the new roadway. Settlements are expected to be differential in nature, with estimated maximum total settlement on the order of 18 inches where proposed fills are thickest. HWA recommends that a preloading program be implemented prior to roadway construction to reduce anticipated future settlements.

Assuming the proposed cut and fill slopes are constructed at a maximum slope of 3H :1V, our stability analysis indicates that the proposed roadway embankment will be stable under static and seismic loading conditions.

Due to the depth of the groundwater table and the consistency of the subsurface soils, we expect the potential for liquefaction of the subsurface soils to be low.

The near surface soils along the alignment consist of fine-grained alluvium that possess low infiltration capacity. Given the sloping nature of the site and the low expected infiltration rate, we expect that the use of onsite infiltration could result in increased erosion. If possible, we recommend that other means of stormwater management be considered.

4.2 SEISMIC DESIGN CONSIDERATIONS

4.2.1 Seismic Design Parameters

Earthquake loading for the project was developed in accordance with the General Procedure provided in Section 3.10 of the *AASHTO Guide Specifications for LRFD Seismic Bridge Design*, 9th Edition, 2020. For seismic analysis, the Site Class is required to be established and is determined based on the average soil properties in the upper 100 feet below the ground surface. Based on our subsurface explorations and understanding of site geology, it is our opinion that the site is underlain by soils that are consistent with Site Class D. The mapped seismic design

coefficients for the design level event, which has a probability of exceedance of 7 percent in 75 years (equal to an approximate return period of approximately 1033 years), were obtained using the USGS Unified Hazard Tool to incorporate the probabilistic seismic hazard parameters from the 2014 updates to the National Hazard Maps (Peterson, et al., 2014). The recommended seismic coefficients for the design event are provided in Table 1. Site Coefficients were obtained from Tables 3.10.3.2-1 through 3.10.3.2-3 (AASHTO, 2020).

Table 1. AASHTO Guide Specifications calculated by USGS Seismic Hazard Map

Site Class	Peak Horizontal Bedrock Acceleration PBA, (g)	Spectral Bedrock Acceleration at 0.2 sec S_S, (g)	Spectral Bedrock Acceleration at 1.0 sec S_1, (g)	Site Coefficients			Peak Horizontal Acceleration PGA (A_S), (g)
				F_{pga}	F_a	F_v	
D	0.1782	0.3996	0.1179	1.44	1.3	2.33	0.257

Based on the above parameters the Peak Ground Acceleration, PGA (As) for Site Class D at the site is 0.257 g. Based on the parameters calculated and shown in Table 1 the AASHTO Seismic Performance Zone for the site is 2.

4.2.2 Liquefaction

Liquefaction is a temporary loss of soil shear strength due to earthquake shaking. Loose, saturated cohesionless soils are susceptible to earthquake-induced liquefaction; however, recent experience and research has shown that certain silts and low-plasticity clays are also susceptible. Primary factors controlling the development of liquefaction include the intensity and duration of strong ground motions, the characteristics of subsurface soils, in-situ stress conditions and the depth to groundwater.

Our explorations suggest that the water table across the site is suppressed within the very dense buried stream bed deposits underlying the project alignment. Due to the very dense nature of these soils, we expect the potential for liquefaction to occur along the project alignment to be low.

4.3 Slope Stability Analysis

HWA performed global slope stability analysis along geologic profiles A-A', B-B', and C-C' based on the proposed roadway geometry. Geologic profile A-A' (presented in Figure 5A) was selected as a critical section for analysis due to the proposed fills and presence of an existing 3H:1V slope near the east edge of the new embankment. Geologic profile B-B'(presented in Figure 5B) was selected as a critical section with respect to the proposed cut geometry. Geologic

profile C-C' (presented in Figure 5C) was selected as a critical section based on the proposed embankment heights, with fills approaching 19 feet above existing grade. The location and orientation of these profiles can be seen on the Site and Exploration Plan, Figure 2. Global slope stability was analyzed under static loading and pseudo-static earthquake loading. Soil strength parameters and ground water conditions for this analysis were developed based on field exploration observations and laboratory test results.

Limit equilibrium analyses were performed using the computer program SLIDE 5.0. Global factors of safety with respect to potential deep-seated failure surfaces were determined under the two load cases. The factor of safety computed is the ratio of the summation of the driving forces to the summation of the resisting forces. Where the factor of safety is less than 1.0, instability is predicted. For global slope stability design, minimum acceptable factors of safety under static loading conditions are commonly taken as 1.3 for slopes not supporting structures or walls. The minimum acceptable factors of safety for the pseudo-static loading is 1.1.

4.3.1 Static Loading Condition

The proposed roadway embankment geometries, assuming maximum cut and fill slopes of 3H:1V, at the locations of Geologic Profiles A-A', B-B', and C-C' were found to be stable under the static loading condition with factors of safety significantly greater than 1.5. Therefore, static slope instability is not expected under the proposed grading geometries along the alignment. Static stability for the temporary embankment preload condition was also checked which also produced a factor of safety greater than 1.5.

4.3.2 Seismic Stability

Seismic stability along the proposed alignment was evaluated using a pseudo-static horizontal acceleration of 0.129g, which is equal to half of the peak ground acceleration (PGA) associated with the 1,033-year design earthquake for the project location. From our analyses, we conclude that, under the design earthquake scenario, a factor of safety for global stability greater than 1.1 exists at the locations of Geologic Profiles A-A', B-B' and C-C'. Therefore, in the event of a design-level earthquake, slope failure is not expected to occur along the proposed grading geometries provided cut and fill slopes are 3H:1V or flatter.

4.4 Embankment Settlement Analysis

The project alignment is underlain by fine-grained alluvial deposits. This soil is considered compressible and will undergo consolidation settlement in response to the proposed embankment construction. Consolidation settlement results from the application of static loading on compressible soil deposits that have not previously experienced similar loading conditions.

Consolidation settlement occurs as both primary consolidation and secondary consolidation. Both mechanisms are described below.

Primary consolidation initiates immediately upon the application of load and is a result of pore water being expelled from the void space within the soil unit. As load is applied, the pore water pressure increases within the soil unit and slowly decreases as the pore water is expelled from the soil. Through this process the void space is reduced and the volume of the soil deposit decreases. This decrease in volume results in a reduction in the thickness of the soil unit which manifests as settlement at the ground surface. The magnitude of primary consolidation settlement is dependent on the properties and thickness of the compressible soil unit, and the magnitude and geometry of the applied load.

Secondary compression is a settlement phenomenon that occurs in soil deposits after completion of the primary consolidation stage and can continue for many years. The magnitude of secondary compression settlement is difficult to predict but is typically a small fraction (5 to 10%) of the settlement that occurs as primary consolidation for most mineral soils.

Based on a review of preliminary plans provided by Perteet, we understand that embankment fills are generally proposed between roadway Stations 303+50 to 312+65, 319+00 to 323+15, and 333+62 to 337+60. The placement of new structural fill for the roadway embankments will cause a net increase in load being applied to the underlying compressible soils, and consolidation settlement is expected to occur as a result. HWA has conducted settlement evaluations along these portions of the proposed roadway. Our evaluations were completed using the computer software Settle3D (Rocscience, Inc., 2022). Embankment geometry was assumed based on the preliminary layout and roadway profile provided by Perteet and consolidation parameters for the alluvial soils were identified from laboratory testing conducted on relatively undisturbed samples collected during our Phase 2 exploration program. Our analyses indicate that construction of the proposed roadway embankment, assuming conventional construction methods, could result in up to 3 inches of primary consolidation settlement between Stations 303+50 to 319+65 with the maximum settlement occurring near Station 310+00. The results indicate that the embankment fills proposed from Station 319+00 to 323+15 could result in up to 10 inches of primary consolidation settlement, with the maximum settlement occurring near Station 321+00. Where the proposed fill heights are the greatest between Stations 333+60 to 337+60, the results indicate that up to 17 inches of primary settlement could occur, with the maximum settlement expected near Station 335+00.

In addition to the expected primary consolidation settlements, we expect that long-term secondary consolidation could result in an additional 1-2 inches of settlement over the design life of the roadway. Total settlement along the fill embankments is expected to be variable and differential in nature due to the variation of fill heights and soil conditions along the alignment. The estimated magnitude of total settlement with respect to roadway Station within the proposed

fill areas are shown in Figures 7A (303+50 to 312+65) and 7B (319+00 to 323+15), and 7C (333+60 to 337+60).

As shown in Figures 7A through 7C, substantial and differential primary consolidation settlements are expected to result from construction of the proposed roadway. The anticipated settlement should be considered as the design of the proposed realignment progresses. Implementation of settlement mitigation measures should be considered to achieve the desired long-term performance of the roadway.

4.5 SETTLEMENT MITIGATION ALTERNATIVES

There are several settlement mitigation measures that are commonly used to reduce or eliminate potential settlements along new roadways. These mitigation options include do nothing, over-excavation and replacement, preloading, and placement of lightweight fill. A description of each of these possible options is provided below.

- **Do Nothing:** Yakama Nation could choose to reconstruct the roadway without addressing the subsurface conditions. With this option, the proposed roadway from Stations 303+50 to 312+65, 319+00 to 323+15, and 333+60 to 337+60, would be expected to undergo significant differential settlements. We expect these differential settlements would result in localized sags in the roadway vertical alignment and variable pavement distress. In addition to pavement distress, we expect that the settlement geometry associated with doing nothing could result in stormwater ponding associated with changes in the anticipated flow path of stormwater over time. We do not recommend proceeding with no settlement mitigation measures implemented.

- **Over-Excavation and Replacement:** Over excavation of compressible soils and replacement with compacted structural fill is a mitigation measure often implemented to eliminate the potential of future settlements along new roadways. This may be a viable option in areas of localized wetland crossings, where the depth of required excavation is minimal. However, subsurface investigations indicate that the base of the compressible alluvium, in the vicinity of the largest fill embankments, is approximately 30 feet below ground surface. Therefore, over-excavation and replacement would require very deep excavations that would require significant shoring. Due to the anticipated cost of over-excavation and replacement, we do not believe that it is a viable settlement mitigation option for the project.

- **Preloading:** Preloading is often a viable way to reduce future settlements. Preloading involves placing a specified amount of soil or weight over a given area and allowing the weight to consolidate the underlying compressible or weak soils prior to construction of the proposed improvements. Preloading has been used successfully on similar projects in the past. However, the viability of preloading requires time. Preloading would be a

viable option to reduce anticipated settlements if the project construction schedule has sufficient time available to allow for the preload to be in place.

- **Lightweight Fill:** Lightweight material could be used to reduce the load on the underlying compressible soils, reducing anticipated future settlements. This would be achieved by excavating existing soils and replacing them with lightweight materials. The depth of excavation would depend on the type of lightweight materials. The use of lightweight materials would need to extend across the entire roadway.

  Several lightweight fill materials are available and have been used on past projects with success. These materials include Geofoam, bottom ash, volcanic rock, glass cutlet and lightweight cellular concrete. Geofoam consists of proprietary lightweight Styrofoam blocks that are readily available to contractors and have been used successfully on numerous road projects. Some drawbacks in transportation related applications are that Geofoam blocks require encapsulation with a gasoline resistant geomembrane and they have densities significantly lighter than water and thus hydrostatic uplift pressures would need to be considered if groundwater levels are able to rise above the base of the geofoam blocks. Bottom Ash is a byproduct of coal fired power plants and weighs between 45 and 75 pounds per cubic foot. Bottom ash has been used on several road projects but is becoming hard to obtain. Volcanic rock has been used as lightweight fill in the past. Volcanic rock generally weighs approximately 45 to 60 pounds per cubic foot. However, there are no readily available sources of volcanic rock in Washington State. Therefore, the cost associated with importing the material would be prohibitive for this project. Lastly, lightweight cellular concrete could be used for this project.

  Lightweight cellular concrete is a proprietary product that can be manufactured onsite to a wide range of unit weights (36 to 120 pcf) and compressive strengths to match project requirements. Cellular concrete is widely available in Washington State and has been used successfully on road projects. Cellular concrete can be excavated for future utility crossings if needed.

  Lightweight fill could be designed to reduce anticipated future settlements; however, the cost associated with using lightweight fill as a settlement mitigation measure is expected to be significant. Therefore, we do not expect that the use of lightweight material is a viable settlement mitigation option for this project.

Given the soil geometry and location of the project site, most of the above-described mitigation options present significant challenges that make them less favorable for this project. If settlement mitigation methods are to be implemented, we recommend the use of preloading.

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4.6 EMBANKMENT PRELOAD

Based on our communications with the project team, we understand that preloading the roadway embankment is the preferred settlement mitigation option for the project. This can be accomplished by first constructing the roadway embankment per plan, then placing an additional preload surcharge above the embankment to increase the applied load and thereby decrease the time required to reach the end of primary (EOP) consolidation that will occur under the service loads.

The onset of consolidation settlement will occur as soon as embankment construction begins, thus it is necessary to construct the surcharge to a design thickness rather than an absolute elevation. For the fill embankment between Stations 303+50 to 312+65, the expected settlements are on the order of 3 inches. We recommend the design team and owner determine if 3 inches of consolidation settlement is acceptable along this section of roadway. If 3-inches of settlement is determined to be acceptable, then preloading may not be necessary between Station 303+50 to 312+65. If 3-inches of settlement is not desirable, then we recommend placing a surcharge of compacted soil that extends 4 feet above the roadway fished grade and from Station 307+70 to 312+65. For the fill embankment between Stations 319+00 and 323+15, we recommend placing a surcharge of compacted soil that extends 7 feet above the roadway finished grade over the full length of the embankment. For the fill embankment between Stations 333+60 to 337+60, we recommend placing a surcharge of compacted soil that extends 9 feet above finished grade over the full length of the embankment. The full height surcharge should extend from shoulder to shoulder of the proposed roadway and should taper at a 2H:1V slope both laterally to the sides of the embankment and longitudinally at the terminal ends of the embankment. The top surface of the surcharge should be crowned or inclined slightly to promote surface drainage.

We anticipate that the recommended preload surcharges will induce approximately 3 to 6 inches of additional consolidation settlement across the roadway alignment, resulting in an estimated maximum total settlement (at EOP) of 6 inches near Station 310+00, 15 inches near Station 322+00, and 22 inches near Station 335+00. This settlement will result in an overall lowering of the preload and surcharge causing the top of the embankment to drop below finished grade. To account for this, the base of the surcharge should be placed as compacted structural fill per the specifications of the permanent roadway embankment. From Station 308+00 to 312+65, the planned embankment and bottom 2 feet of the surcharge should be placed as permanent structural fill, the remaining 2 feet of surcharge material may consist of native borrow. From Station 319+00 and 323+15, the planned embankment and the bottom 2 feet of the surcharge should be placed as permanent structural fill, the remaining 5 feet of surcharge material (surcharge expected to be removed at the end of preloading) may consist of native borrow. From Station 333+60 to 337+60 the proposed embankment and bottom 3 feet of the surcharge should be placed as permanent structural fill, the remaining 6 feet may consist of native borrow.

Based on the proposed roadway realignment, the limits of the fill embankment between approximate Stations 335+00 and 337+00 will extend into the existing SR 207 right-of-way. To decrease the footprint of the embankment and minimize disruption of traffic flow, we recommend placing a temporary ecology block wall, or a similar system, along the inside (north) shoulder of the new roadway to retain fills for the embankment and surcharge throughout the duration of the preload program. The required height of ecology block walls will depend on wall location and final height of the proposed preload. Design of the temporary ecology block wall should be provided by the wall manufacturer or a qualified structural engineer. It should be noted that placing a preload directly adjacent to the SR 207 roadway shoulder is expected to result in some pavement distress in the vicinity of the preload. We recommend that the design assume that repair of this portion of the roadway will be required as part of the project.

It is expected that the excavated soils generated from cut portions of the alignment (from Stations 312+65 to 319+00 and 323+15 to 331+20) will generally be suitable as native borrow for temporary embankment surcharge applications. Native borrow soils should be placed such that a minimum bulk density of 120 pounds per cubic foot (pcf) is achieved. We anticipate that this will require compacting the soils to at least 90% of the maximum dry density (MDD) as determined for the material by test method ASTM D 1557 (Modified Proctor).

Note that surficial failures, i.e. sloughing of the preload may occur throughout the duration of the preload period, which may require periodic repair over localized areas. Plastic sheeting may be used to cover the preload to prevent instability and erosion.

4.7 SETTLEMENT MONITORING

After the recommended preload configuration for the embankment has been constructed, consolidation settlement will occur gradually over time. We anticipate that the construction will be performed in phases, with clearing and grubbing beginning in early spring followed by grading and construction of embankment fills and the preload surcharge throughout the summer months. With the expectation that the preload construction would be completed by late summer or early fall, we anticipate that removal of the preload and final construction could proceed sometime during the following spring or early summer. Based on the results of our consolidation analysis, we anticipate that 90 percent of the primary consolidation will be realized after a preload period of approximately 6 months. It is our opinion that this degree of consolidation will be sufficient to limit long-term, post-construction settlement to within acceptable project tolerances.

To monitor settlement during the preload program, we recommend installing settlement plates at locations where maximum fills are placed. A typical detail for the recommended settlement plate geometry is shown in Figure 8. At a minimum, settlement plates should be installed along the roadway centerline at 100-foot spacings, with one settlement plate installed near Station 310+00,

one near 321+00, and another near Station 335+00. Settlement plates should be installed on firm ground or on sand pads if needed for stability. Plates should be installed at or slightly below the current ground surface immediately following clearing of surface vegetation, and prior to placing any fill. The preload surcharge should not be removed until analysis of settlement data indicates that sufficient settlement has occurred.

Initial elevation readings should be taken on all settlement plates prior to placing any fill. Settlement plates should be monitored daily during fill placement, weekly for the first month after fill placement, biweekly for the next 3 months, and monthly thereafter. All readings should be taken through the center of the steel rods, at the level of the plate. The elevation of the adjacent fill surface should also be noted at each reading. Settlement plate readings should be to the nearest 0.01 foot; fill elevations should be measured to the nearest 0.1 foot. All elevations should be referenced to a benchmark located on stable ground at least 200 feet from the preload embankment.

4.8 STORMWATER MANAGEMENT

We understand that the design team would like to consider the use of onsite infiltration as a means of stormwater management for the project. The following sections discuss stormwater-related design recommendations.

4.8.1 Stormwater Infiltration Feasibility

Our subsurface explorations encountered fine-grained alluvial soils underlying the entirety of the project. These soils are not expected to possess an appreciable degree of infiltration potential. The lack of infiltration potential of the onsite alluvial soils is supported by the observations of significant ponding along the forest service road during our site reconnaissance, days after the last rainfall.

Initial saturated hydraulic conductivity (K_{sat}) rates were estimated using the results of laboratory testing and the grain-size methodology procedure outlined in Section 5.4 of the Department of Ecology Stormwater Management Manual for Western Washington (DOE, 2019). The initial K_{sat} values used to evaluate preliminary design infiltration rates for the alluvial soils are summarized in Table 2.

Table 2.
Infiltration Screening Based on Grain Size Analysis

Boring		HH-1	HH-4	HH-8
Depth	ft	1.5	4.2	2.4
USCS Classification		CL	ML	CL
D10	mm	0.001	0.0035	0.001
D60	mm	0.06	0.074	0.062
D90	mm	0.3	0.28	0.31

f_{fines}	%	64.7	60.9	64.8
K_{sat}	in/hr	**0.18**	**0.21**	**0.21**

Based on an average K_{sat} value of approximately 0.2 inches per hour for the samples collected within the fine-grained alluvial deposits, we estimate that the controlling design infiltration rate for the project would be less than 0.05 inches per hour after applying the appropriate correction factors. Given the sloping site and very limited infiltration potential, we recommend other means of stormwater management be considered for this project. HWA does not recommend any further infiltration testing at this site.

4.8.2 Detention Pond Recommendations

Due to the use of onsite infiltration not being feasible along the project alignment, it is our understanding that the design team proposes to construct two detention ponds along the project alignment for flow control. The location of these ponds are shown in Figure 2 at the north and south ends of the project.

Boring BH-5 was drilled in the vicinity of the proposed detention pond to be constructed at the south end of the project alignment. This boring encountered approximately 10 feet of high fines alluvium underlain by courser grained and saturated buried creek bed deposits. The groundwater at this location was recorded as varying from 9.8 feet below ground surface to 10.6 feet below ground surface. Between October and December of 2024. Additional groundwater data is being collected and will be included in future versions of this report. Current data suggests that 9 feet of non-saturated soil are present at this location. Therefore, it appears that sufficient separation exists to construct a detention pond at this location. We understand that a residential well is located in the vicinity of the proposed southern pond. HWA does not have a well log for the subject residential well. However, we can assume that the well is screened within the buried creek bed deposits encountered below 10 feet in this area. We do not expect that the construction of the proposed deletion pond will impact the water levels within the adjacent residential well. However, depending on the depth of the proposed pond, the detained water could come in contact with the water bearing layer in which the residential well could be screened. Depending on the level of stormwater treatment proposed, we recommend that the proposed southern detention pond be lined to avoid any possibility of contamination of the water bearing layer.

Boring BH-11 was drilled in the vicinity of the proposed northern detention pond. This boring encountered coarse grained buried creek bed soil near the ground surface. Data collected from the groundwater monitoring well installed at this location indicates that groundwater levels at this location are ties to the elevation of Nason Creek and vary from 2.9 to 3 feet below ground surface between October and December of 2024. It is possible that higher groundwater levels will be recorded at this location over the winter and spring of 2025. Given the shallow groundwater table at this proposed pond location, limited pond capacity is expected. We recommend that the design team consider shallow groundwater in the design of the northern

detention pond and determine if a pond at this location is feasible. If the pond is designed at this location and lined, buoyancy forces are expected to develop and will need to be accounted for in the design of the facility. HWA can provide buoyancy recommendations as the design progresses.

4.9 ROADWAY CONSTRUCTION CONSIDERATIONS

The new roadway alignment will be constructed through forested areas with varying topography. Our explorations indicate that the proposed roadway alignment is underlaid by fine grained alluvial soils with soft to medium stiff relative consistencies. The soils and topography along the alignment will require special geotechnical considerations. HWA recommends the following be considered during planning of the proposed improvements.

4.7.1 Subgrade Preparation

Construction of the reroute will require clearing and grubbing of the proposed roadway alignment. Clearing and grubbing should be performed in accordance with the procedures outlined in the 2-01 of *WSDOT Construction Manual* (WSDOT, 2024). Any required tree removal should also be accomplished during subgrade preparation. Care should be taken to thoroughly remove all root systems from the proposed construction area. Materials disturbed during removal of stumps should be undercut and replaced with structural fill.

Prior to completing any settlement mitigation measures, we recommend that all unsuitable materials be removed from the site prior to placement of structural fill. We recommend that qualified engineering personnel monitor the stripping operations to observe that all unsuitable materials have been removed. Care should be exercised to separate the move and stock unsuitable materials to avoid incorporation of the organic matter in structural fill sections. The subgrade excavation should be benched to avoid placing structural fill on sloped surfaces.

The existing subgrade soils are loose and or soft and are not expected to provide adequate support for the proposed roadway embankment. To stabilize the subgrade soils along the alignment we recommend that these soils be over excavated by a minimum of 2 feet below the proposed bottom of the embankment foundation elevation. The over excavated volume should be replaced with 4-8-inch quarry spalls as specified per Section 9-13.1(5) of the *WSDOT Standard Specifications* (WSDOT, 2025). A woven geotextile separator fabric, meeting the requirements of Table 3 of Section 9-33.2 of the *WSDOT Standard Specifications* (WSDOT, 2025) for soil stabilization, should be placed over the quarry spalls across the base of the excavation prior to the placement of the embankment structural fill. The placement of the quarry spalls and geotextile separator fabric will allow for placement of the embankment fill with limited loss to the subgrade soils. Failure to plan and implement these subgrade stabilization measures could result in cost overruns during construction, due to poor subgrade conditions.

4.7.2 Culvert Installation

As part of the subgrade preparation, we expect culverts will be required where the roadway crosses natural drainage features. The culvert should be founded at a grade that is capable of collecting all possible water from upslope of the roadway. If the drainage is not considered to be fish passable, the culvert pipes should be designed with a flexible piping material, such as fused HDPE, to avoid culvert separation as a result of embankment settlements. The culvert geometry and backfill should be designed to promote water flow into the culverts and avoid seepage into the quarry spalls placed to stabilize the base of the embankment excavation. This may require surface treatment at the inlet side of the culvert or possible grouting of some of the quarry spalls in the vicinity of the culvert inlet. Culvert slopes should be designed to maintain positive drainage after as much as 3 feet of consolidation settlement from the preload.

4.7.3 Structural Fill

The onsite soils are fine grained and are moisture sensitive. We do not recommend reusing the onsite soils as structural fill for this project. Structural fill should consist of clean, free-draining, granular soils free from organic matter or other deleterious materials. Such materials should be less than 4 inches in maximum particle dimension, with less than 7 percent fines (portion passing the U.S. Standard No. 200 sieve), as specified for "Gravel Borrow" in Section 9-03.14(1) of the *WSDOT Standard Specifications* (WSDOT, 2025). The fine-grained portion of structural fill soils should be non-plastic. Fill material having a fines content greater than 7 percent may be acceptable for structural fill in certain applications if the earthwork is performed during relatively dry weather and the contractor's methods achieve proper compaction of the soil. Material with a fines content greater than 7 percent should be approved by the project engineer prior to use.

4.7.4 Compaction

Structural fill soils should be moisture conditioned and compacted to a dense and unyielding condition and to the requirements specified in Section 2-03.3(14)C, Method C, of the *WSDOT Standard Specifications* (WSDOT, 2025); except the standard of compaction achieved should not be less than 95% of the maximum dry density (MDD) determined for the fill materials by test method ASTM D 1557 (Modified Proctor). Structural fill should be placed and compacted in loose, horizontal lifts of not more than 8 inches in thickness. Subgrade compaction in roadbed areas should conform to the requirements of Section 2-06.3(1) of the *WSDOT Standard Specifications* (WSDOT, 2025).

At the time of placement, the moisture content of structural fill should be at or near optimum. Achievement of proper density of a compacted fill depends on the size and type of compaction equipment, the number of passes, thickness of the layer being compacted, and soil moisture-density properties. In areas where limited space restricts the use of heavy equipment, smaller

equipment can be used, but the soil must be placed in thin enough layers and at the proper moisture content to achieve the required relative compaction. Generally, loosely compacted soils result from poor construction technique and/or improper soil moisture content. Soils with high fines contents are particularly susceptible to becoming too wet and coarse-grained materials easily become too dry for proper compaction.

4.7.5 Temporary Excavations

Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. In accordance with Part N of Washington Administrative Code (WAC) 296-155, latest revisions, all temporary cuts in excess of 4 feet in height must be either sloped or shored prior to entry by personnel. Based on the guidelines, the onsite existing fill and alluvial soils classify as Type C soils. These materials should be sloped no steeper than 1.5H:1V. These recommended maximum slopes are applicable to temporary excavations above the water table only; flatter side slopes would be required for excavations where groundwater seepage is encountered.

The contractor should monitor the stability of temporary cut slopes and adjust the construction schedule and slope inclination accordingly. The contractor should be responsible for control of ground and surface water and should employ sloping, slope protection, ditching, sumps, dewatering, and other measures, as necessary, to prevent sloughing of soils.

4.7.6 Wet Weather Earth Work

The near surface soils along the project alignment are fine-grained and considered highly moisture sensitive. We recommend that subgrade preparation, along the alignment, be completed in the dry summer months. Attempting to complete subgrade preparations outside of the dry season is expected to result in costly subgrade improvements beyond the recommendations provided in this report. General recommendations relative to earthwork performed during wet weather or in wet conditions are presented below. These recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation of unsuitable and/or softened soil should be followed promptly by placement and compaction of clean structural fill. The size and type of construction equipment used may need to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic.

- Any backfill material including but not limited to Gravel Borrow as specified in Section 9-03.14(1) of the *WSDOT Standard Specifications* (WSDOT, 2023) and/or

Crushed Surfacing Base Course (CSBC) as specified in Section 9-03.9(3) of the *WSDOT Standard Specifications* (WSDOT, 2023) used as excavation backfill in wet weather should consist of clean granular soil with less than 5 percent passing the U.S. No. 200 sieve, based on wet sieving the fraction passing the ¾-inch sieve. The fines should be non-plastic. It should be noted this is an additional restriction on the structural fill materials specified.

- The ground surface within the construction area should be graded to promote surface water run-off and to prevent ponding.

- Within the construction area, the ground surface should be sealed on completion of each shift by a smooth drum vibratory roller, or equivalent, and under no circumstances should soil be left uncompacted and exposed to moisture infiltration.

- Excavation and placement of backfill materials should be monitored by a geotechnical engineer experienced in wet weather earthwork to determine that the work is being accomplished in accordance with the project specifications and the recommendations contained herein.

- Bales of straw combined with other best management practices such as geotextile silt fences should be strategically located to control erosion and the movement of soil.

5.0 CONDITIONS AND LIMITATIONS

We have prepared this report exclusively for the Yakama Nation and Perteet for use in the evaluation of this project. The conclusions and interpretations presented in this report should not be construed as our warranty of subsurface conditions at the site. Experience has shown that soil and ground water conditions can vary significantly both spatially and with time. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study of this scope and nature. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, HWA should be notified for review of the recommendations of this report, and revision of such, if necessary. If there is a substantial lapse of time between submission of this report and the start of construction, or if conditions change due to construction operations, it is recommended that this report be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

Implementation of the engineering recommendations provided in this report are contingent on good construction practices. Poor construction techniques and methods may alter the subsurface conditions on which our recommendations are based and may result in unsatisfactory performance of the proposed structures. We recommend HWA be retained to review the plans and specifications to verify that our recommendations have been interpreted and implemented as

intended. Sufficient geotechnical monitoring, testing, and consultation should be provided during construction to confirm the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications

Within the limitations of approved scope, schedule and budget, HWA attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology at the time the report was prepared. No warranty, express or implied, is made.

HWA does not practice or consult in the field of safety engineering. We do not direct the contractor's operations and cannot be responsible for the safety of personnel other than our own on the site. As such, the safety of others is the responsibility of the contractor. However, the contractor should notify the owner if any of the recommended actions presented herein are considered unsafe.

We appreciate this opportunity to be of service.

Sincerely,

Brett O'Brien, P.E.
Geotechnical Engineer

Donald J. Huling, P.E.
Principal Geotechnical Engineer

DRAFT

6.0 REFERENCES

American Association of State Highway and Transportation Officials, 2020. *AASHTO Guide Specifications for LRFD Seismic Bridge Design*, 9th Edition, American Association of State Highway and Transportation Officials. Washington, DC.

Department of Ecology, *Stormwater Management Manual for Western Washington*, 2019

Massmann, Joel W, *A Design Manual for Sizing Infiltration Ponds*, Washington State Transportation Commission, October 2003.

Petersen, Mark D.; Moschetti, Morgan P.; Powers, Peter M.; Mueller, Charles S., Haller, Kathleen M.; Frankel, Arthur D., Zeng, Yuehua; Rezaeian, Sanaz; Harmsen, Stephen C.; Boyd, Oliver S.; Field, Ned; Chen, Rui, Rukstales, Kenneth S.; Luco, Nico; Wheeler, Russell L.; Williams, Robert A. and Olsen, Anna H., *Documentation for the 2014 Update of the United States National Seismic Hazard Maps*, Open-File Report 2014-1091.

Tabor, R.W., Frizzell, V.A., Whetten, J.T., Waitt, R.B., Swanson, D.A., Byerly, G.R., Booth, D.B., Hetherington, M.J., and Zartman, R.E., 1987. *Geologic Map of the Chelan 30-Minute by 60-Minute Quadrangle, Washington*, United State Department of the Interior, United States Geological Survey Miscellaneous Investigations Series Map 1-1661, Scale 1:100,000.

WSDOT, 2020, *Bridge Design Manual LRFD, 2020* Washington State Department of Transportation. M 23-50

WSDOT, 2025. *Standard Specifications for Road, Bridge, and Municipal Construction*, Washington State Department of Transportation.

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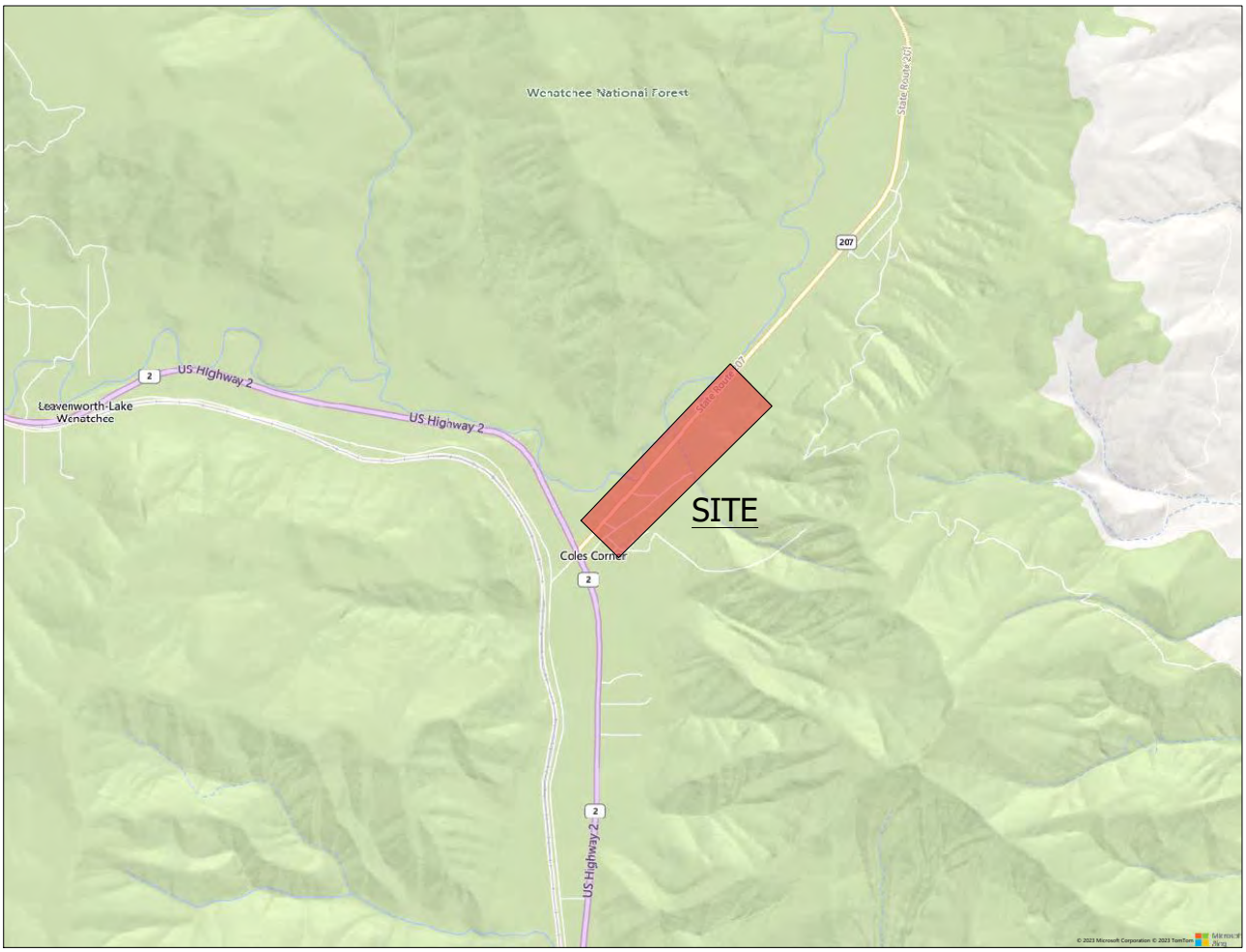
SITE MAP

0 500' 1000' 1500' 2000'

SCALE: 1" = 1000'



VICINITY MAP

0 2000' 4000' 6000' 8000'

SCALE: 1" = 4000'

GeoSciences Inc.
DBE/MWBE

SITE AND VICINITY MAP

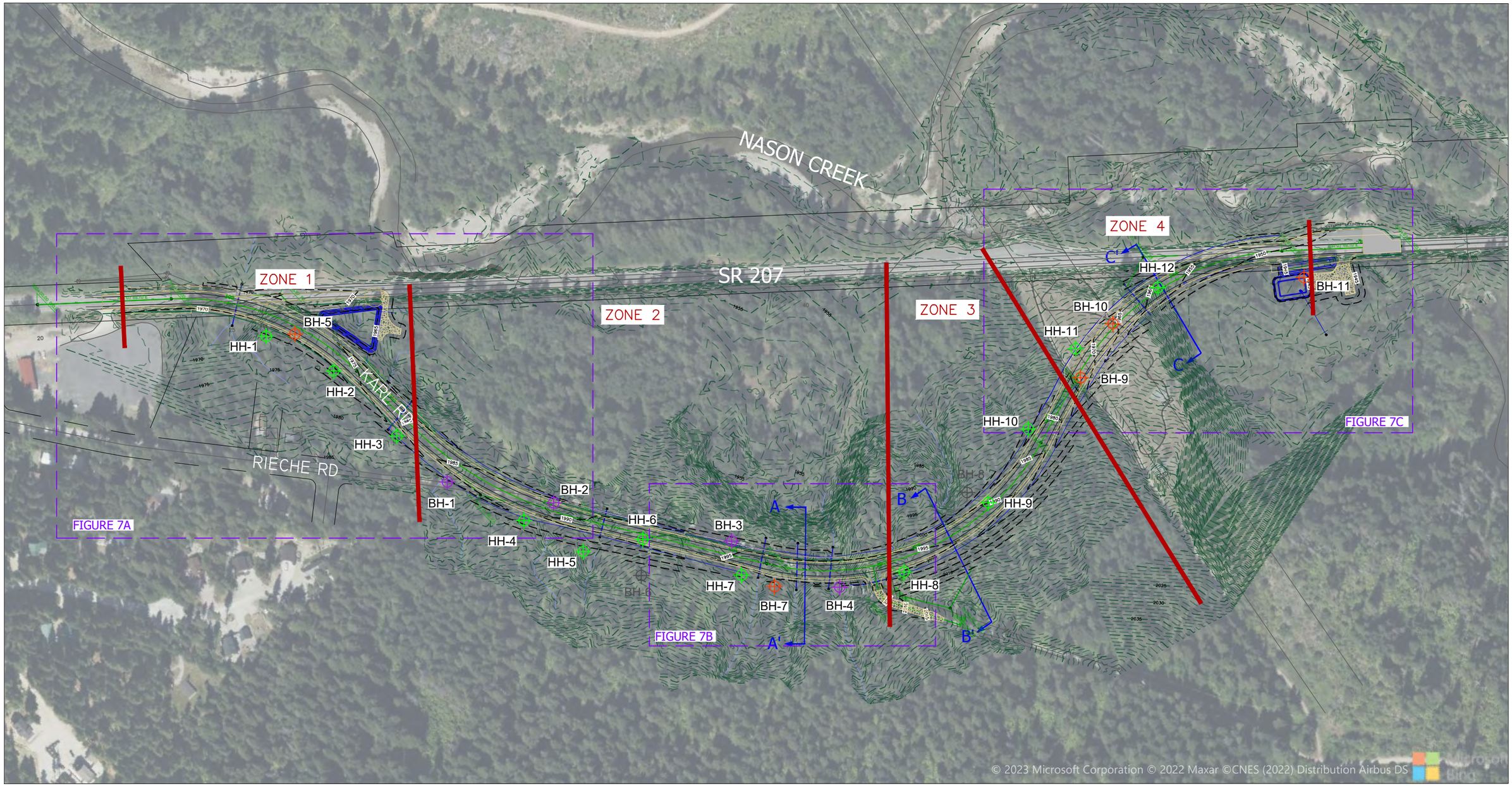
YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

FIGURE NO.: 1

DRAWN BY: CF
CHECK BY: MAB

PROJECT # 2022-144-21

C:\USERS\CFRY\DESKTOP\2022-144-21 SR 207 REALIGNMENT\2022-144-21 SR 207 REALIGNMENT.DWG <1> Plotted: 7/12/2023 7:41 AM



EXPLORATION LEGEND

- BH-4 — MACHINE DRILLED BORING DESIGNATION AND APPROXIMATE LOCATION (HWA, 2024)
- BH-6 — MACHINE DRILLED BORING DESIGNATION AND APPROXIMATE LOCATION (NOT DRILLED)
- HH-12 — HAND BORING DESIGNATION AND APPROXIMATE LOCATION (HWA, 2023)
- BH-4 — MACHINE DRILLED BORING DESIGNATION AND APPROXIMATE LOCATION (HWA, 2023)
- LIMITS OF RECONNAISSANCE ZONES
- A — A' GEOLOGIC CROSS SECTION

BASE MAP PROVIDED BY: BING AND PERTEET 12.22.2025

NASON CREEK FLOODPLAIN
Scale: 1" = 250'-0"

0 125 250 375 500
SCALE: 1" = 250'

AERIAL IMAGERY REFERENCE IS APPROXIMATE AND MAY APPEAR OFFSET FROM SURVEYED DATA AND BASEMAPS.

HWA GEOSCIENCES INC. DBE/MWBE

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

SITE AND EXPLORATION PLAN

DRAWN BY:	FIGURE NO.:
CF	2
CHECK BY:	PROJECT NO.:
MAB/DJH	2022-144-21

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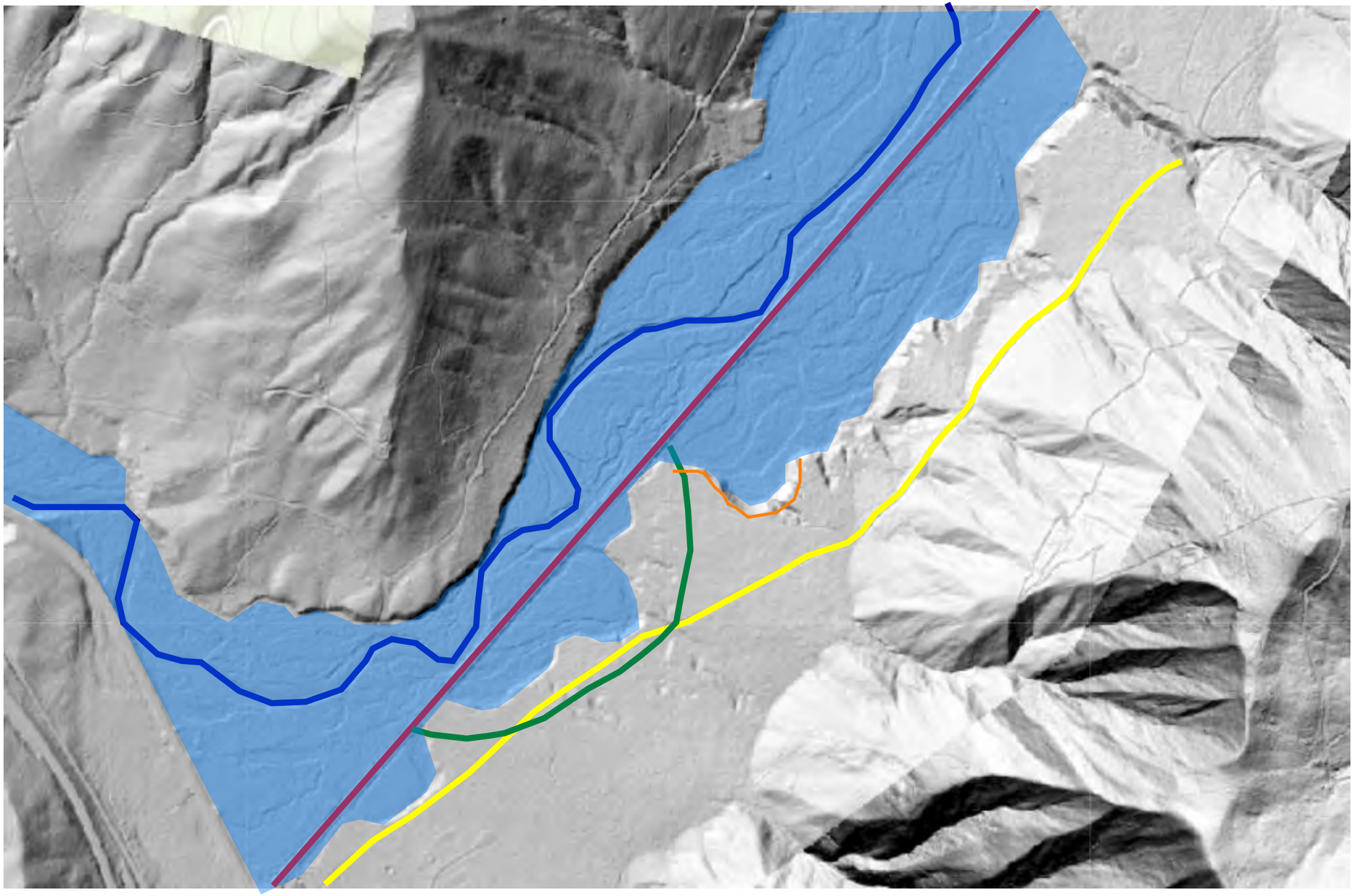


Legend

- Current SR 207 alignment
- Rieche Road/USFS Road 6603
- Approximate Proposed realignment
- Nason Creek main channel
- Nason Creek Floodplain
- Top of steep slope in Zone 4

Portions of the Chelan 2015 and Wenatchee Upper 2017 LiDAR sets, accessed from the Washington State DNR LiDAR Portal on 6/23/2023. Not to scale

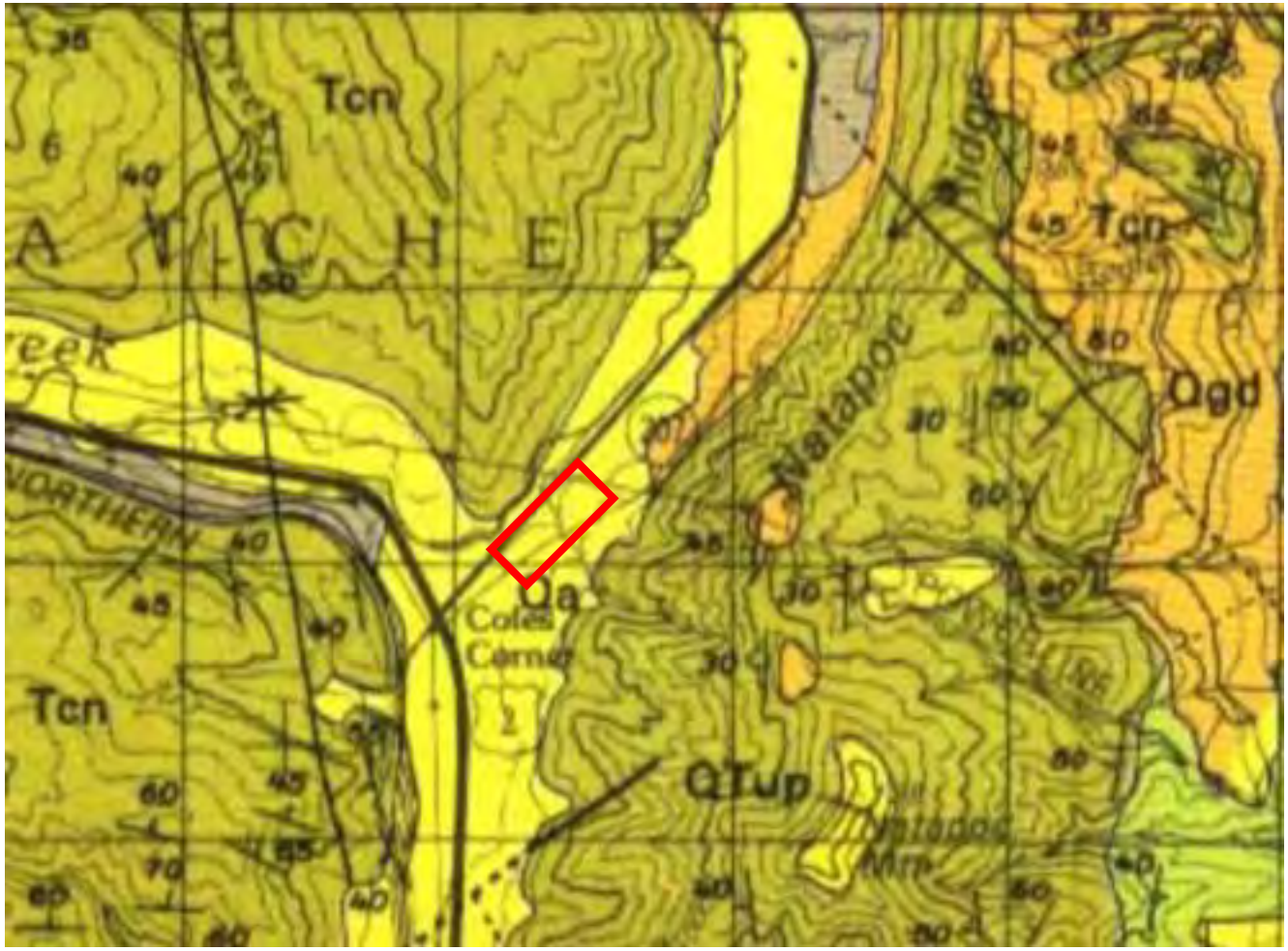
HWA GeoSciences Inc. DBE/MWBE

LIDAR

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

FIGURE NO. 3

PROJECT NO. 2022-144-21



Qa — ALLUVIUM (HOLOCENE AND PLEISTOCENE)—Moderately sorted cobble gravel along rivers grading to poorly sorted gravelly sand on small-tributary fans; as mapped, includes some material in fans similar to unit Qt

Tcn — Nahahum Canyon Member—Olive-brown carbonaceous, micaceous, finely laminated lacustrine shale interbedded with laminated sandstone turbidites and rocks similar to undivided part (Tc) of the Chumstick Formation

Approximate Project Area

Portion of the Geologic Map of the Chelan 30-Minute by 60-Minute Quadrangle, Washington (Tabor et al., 1987). Not to scale.

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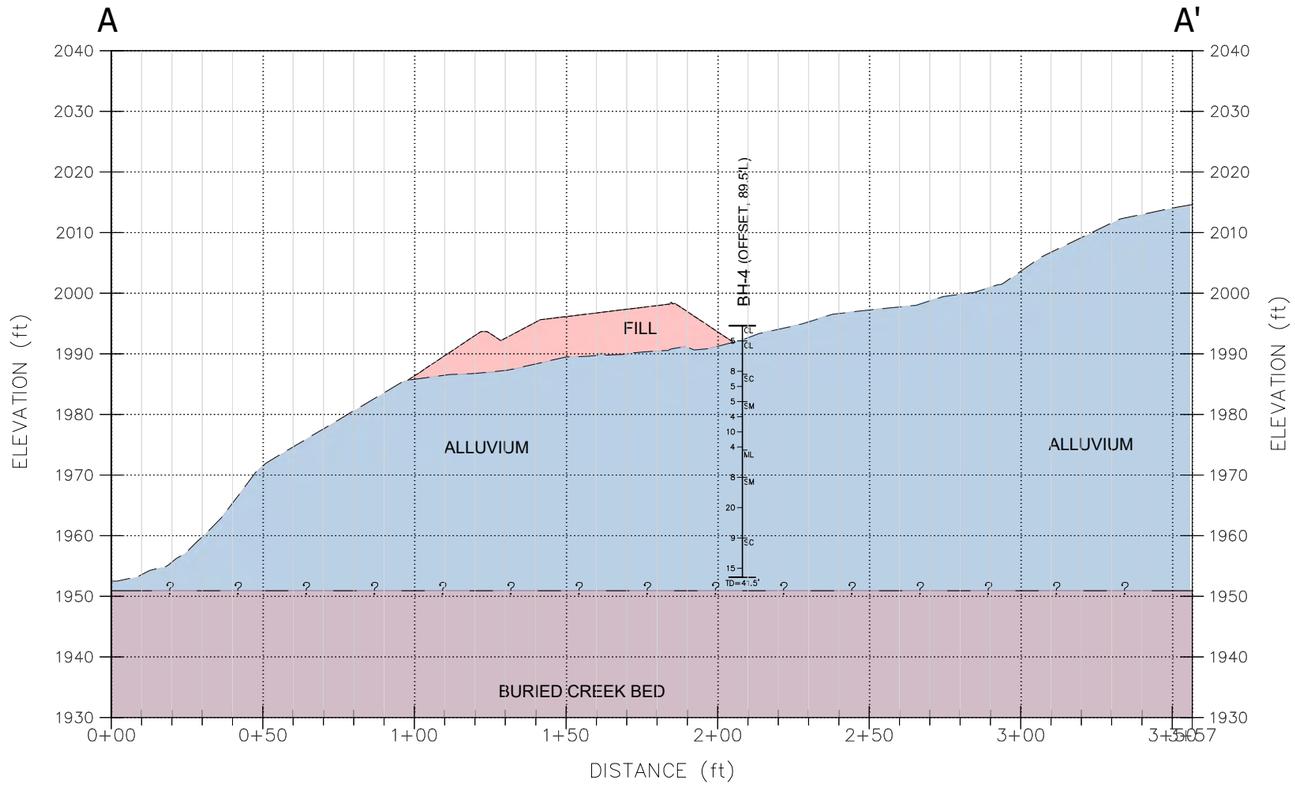
GEOLOGIC MAP

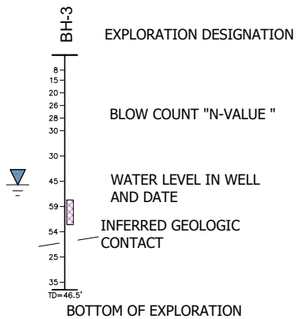
YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

FIGURE NO.
4

PROJECT NO.
2022-144



BORE LEGEND



SOILS LEGEND

- FILL
- ALLUVIUM
- BURIED CREEK BED

0 25 50 75 100

HORIZ. SCALE: 1" = 50'

0 12.5 25 37.5 50

VERT. SCALE: 1" = 25'

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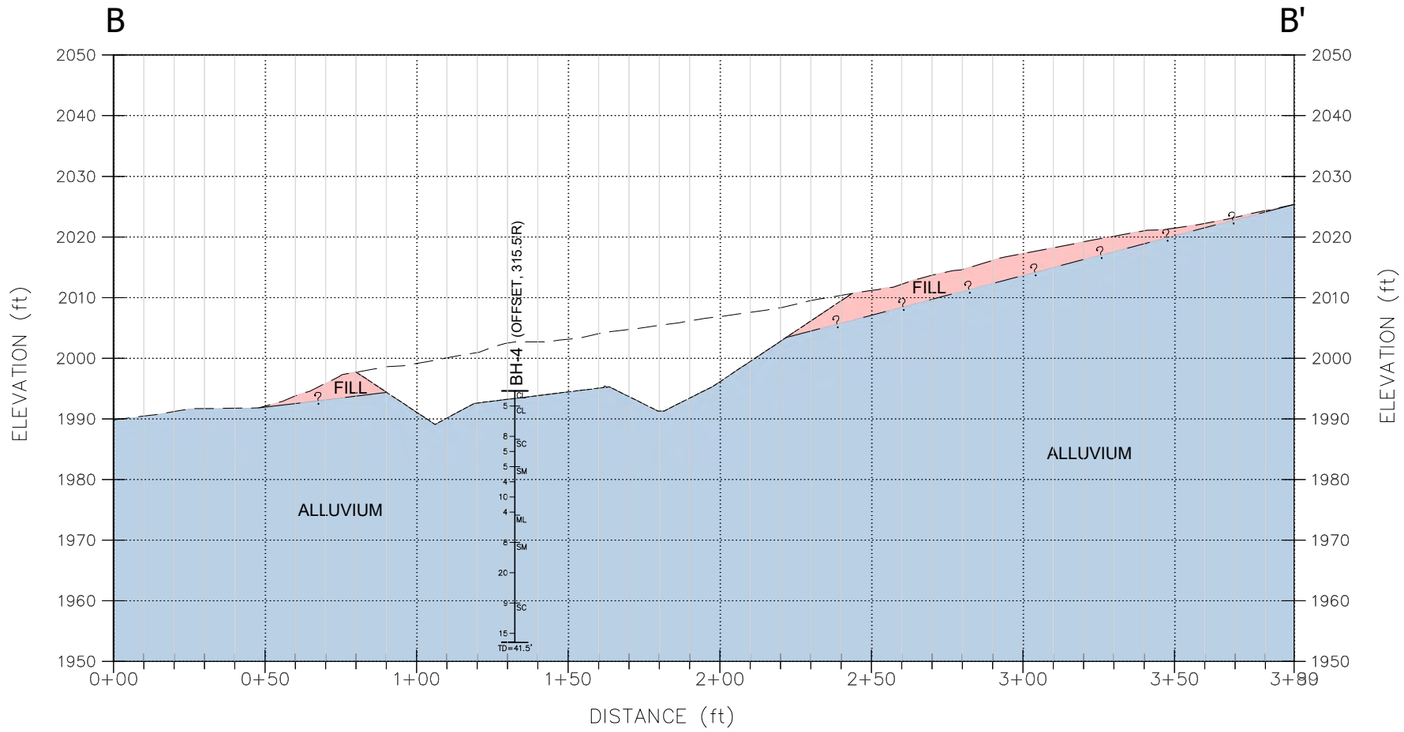
YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

CROSS SECTION A-A'
SECTION 322+00

DRAWN BY:	FIGURE NO.:
CF	5A
CHECK BY:	PROJECT NO.:
BOB	2022-144-21



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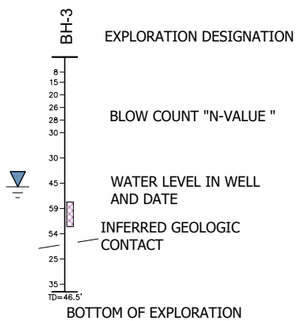

EXPLORATION DESIGNATION

BLOW COUNT "N-VALUE "

WATER LEVEL IN WELL AND DATE

INFERRED GEOLOGIC CONTACT

BOTTOM OF EXPLORATION

SOILS LEGEND

- FILL
- ALLUVIUM
- BURIED CREEK BED

0 25 50 75 100

HORIZ. SCALE: 1" = 50'

0 12.5 25 37.5 50

VERT. SCALE: 1" = 25'

GeoSciences Inc. DBE/MWBE

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

CROSS SECTION B-B'
SECTION 326+00

DRAWN BY:	FIGURE NO.:
CF	5B
CHECK BY:	PROJECT NO.:
BOB	2022-144-21

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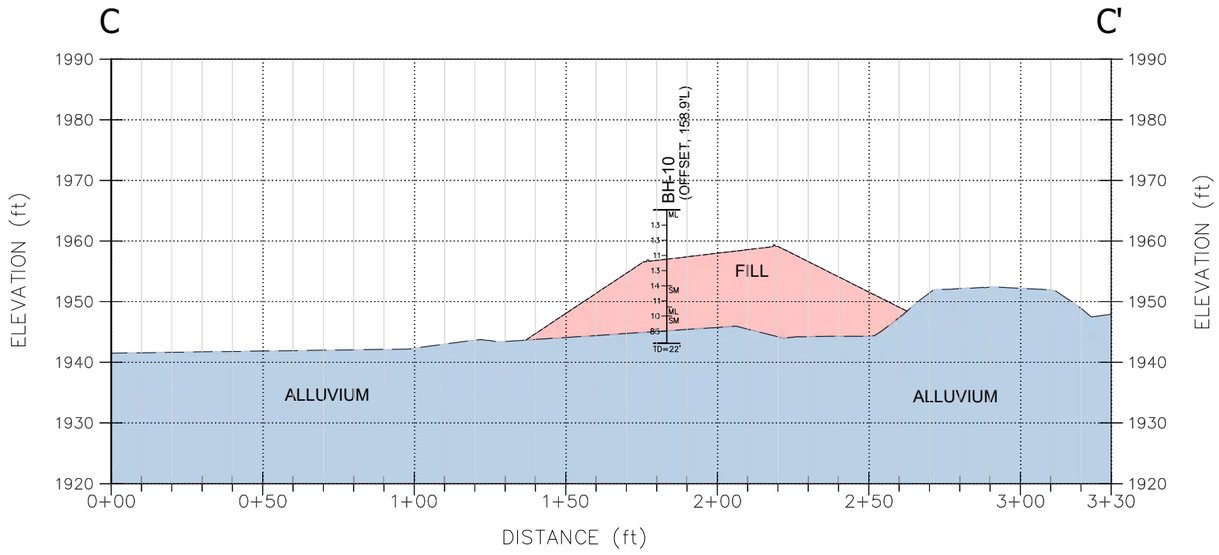

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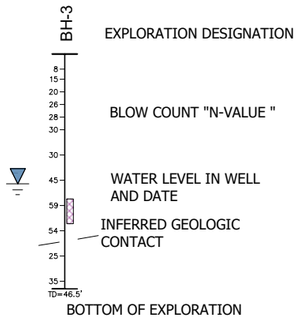

SOILS LEGEND

- FILL
- ALLUVIUM
- BURIED CREEK BED

0 25 50 75 100

HORIZ. SCALE: 1" = 50'

0 12.5 25 37.5 50

VERT. SCALE: 1" = 25'

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YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

CROSS SECTION C-C'
SECTION 334+70

DRAWN BY:	FIGURE NO.:
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CHECK BY:	PROJECT NO.:
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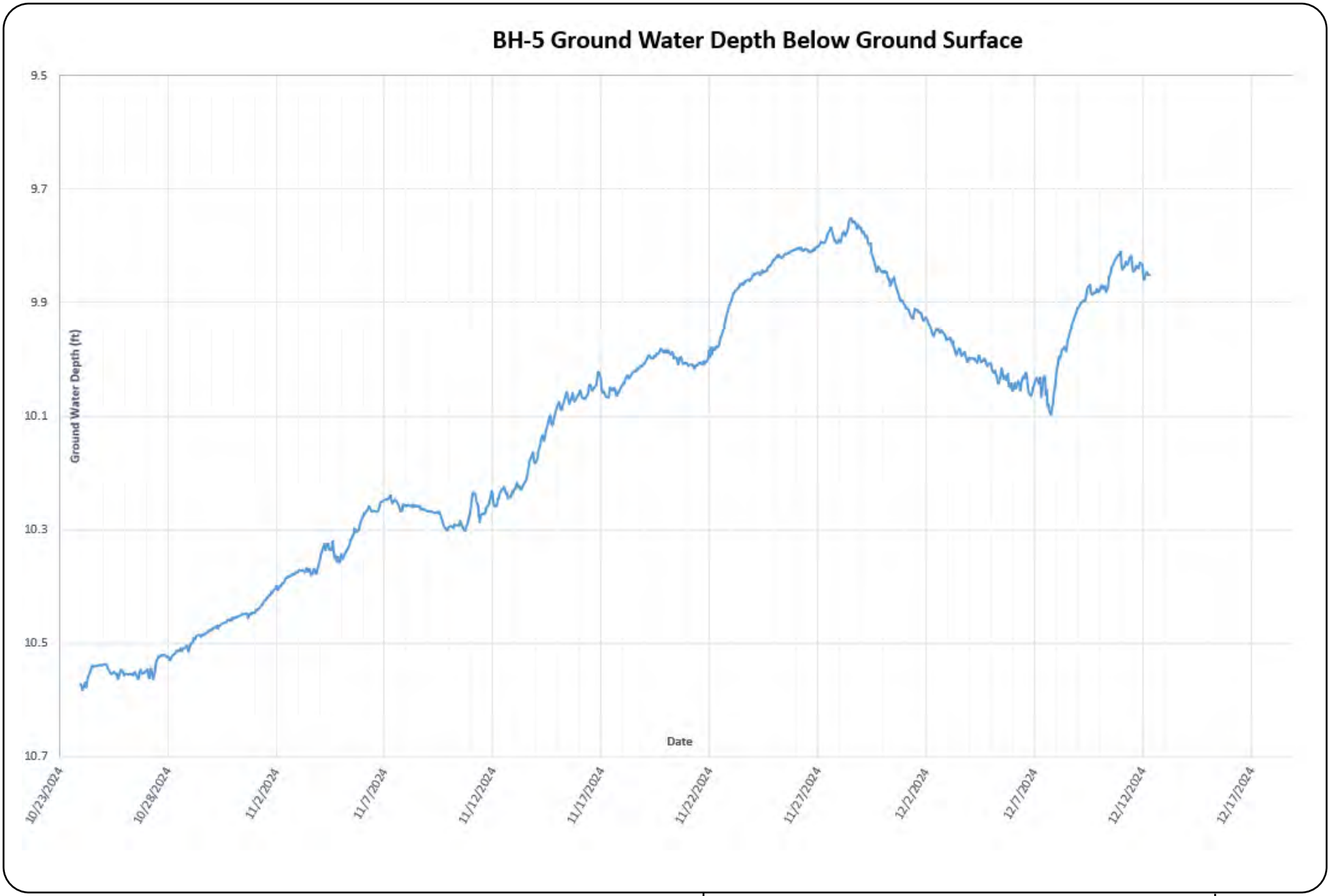


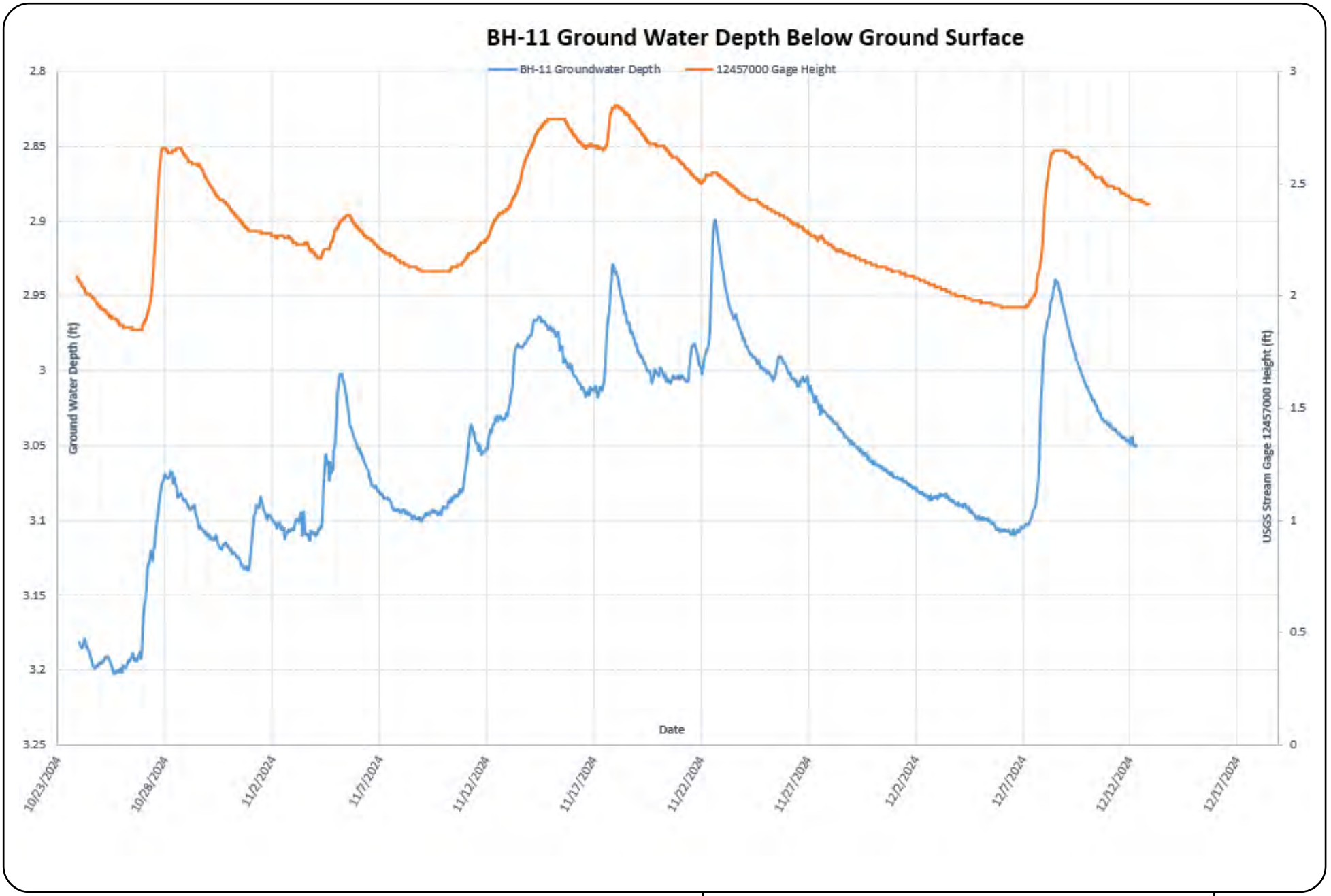
HWA GeoSciences Inc.
DBE/MWBE

BH-5 GROUNDWATER DATA PLOT

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

FIGURE NO.
6A

PROJECT NO.
2022-144



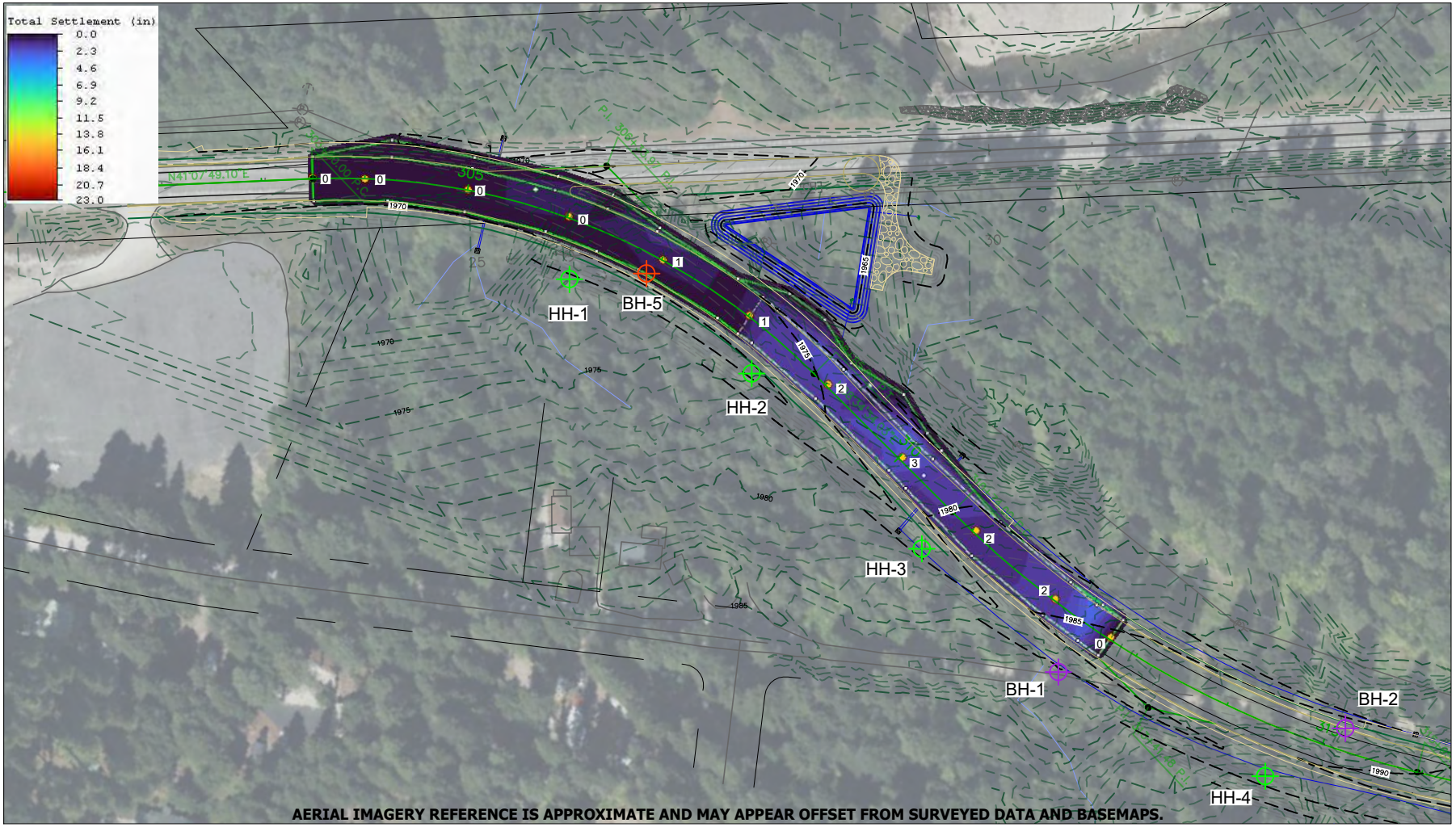
HWA GeoSciences Inc.
DBE/MWBE

BH-11 GROUNDWATER DATA PLOT

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

FIGURE NO.
6B

PROJECT NO.
2022-144



NASON CREEK FLOODPLAIN

Scale: 1" = 150'-0"

LEGEND

- SETTLEMENT CALCULATION LOCATION
- 14 MAGNITUDE (INCHES)

0 75 150 225 300

SCALE: 1" = 150'

BASE MAP PROVIDED BY: BING AND PERTEET 12.22.2025

GEOSCIENCES INC. DBE/MWBE

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

SETTLEMENT RESULTS
STA 303+50 - 312+65

DRAWN BY:	FIGURE NO.:
CF	7A
CHECK BY:	PROJECT NO.:
BOB/DJH	2022-144-21

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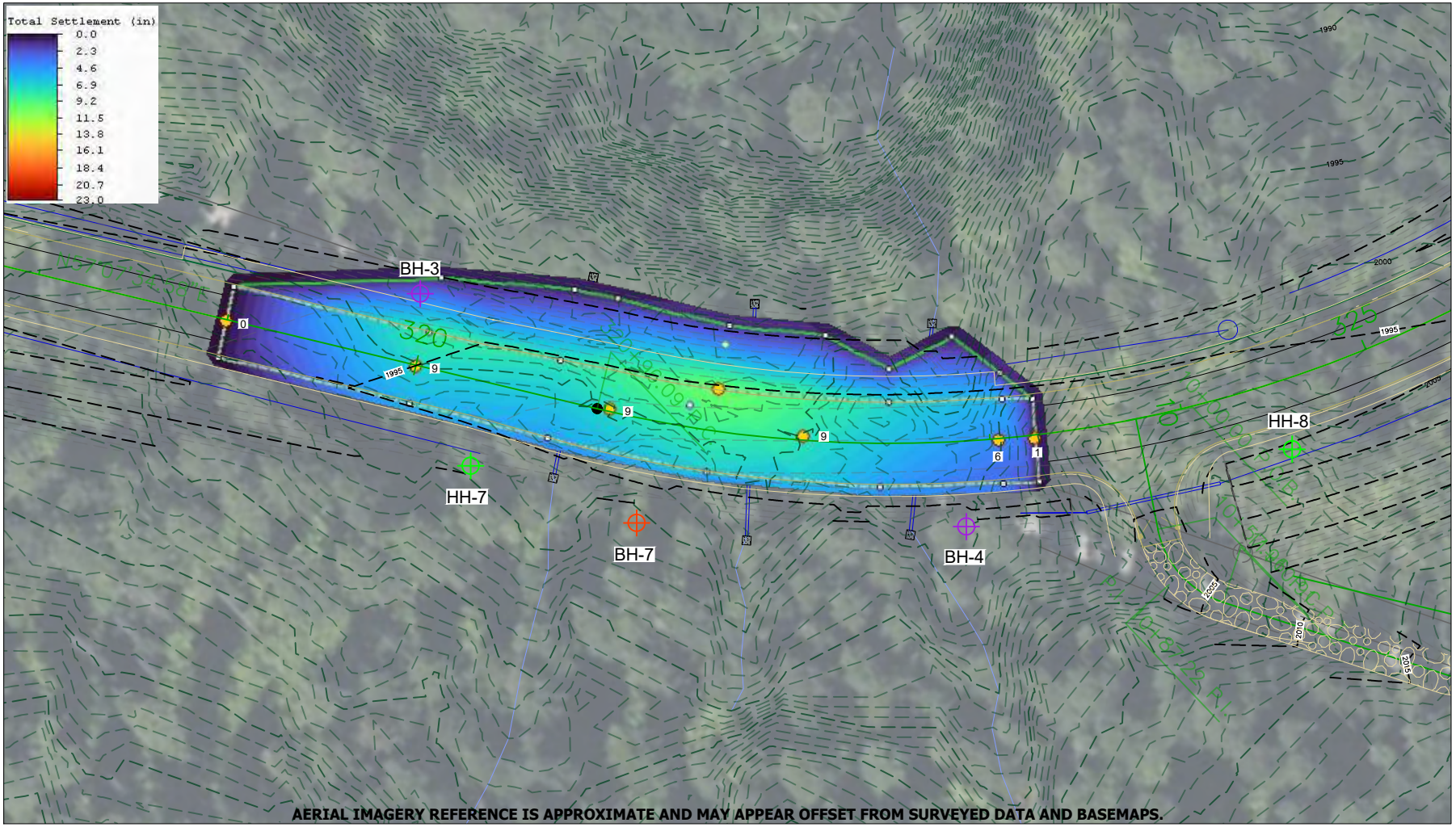

NASON CREEK FLOODPLAIN

Scale: 1" = 80'-0"

LEGEND

- SETTLEMENT CALCULATION LOCATION
- 14 MAGNITUDE (INCHES)

0 40 80 120 160

SCALE: 1" = 80'

BASE MAP PROVIDED BY: BING AND PERTEET 12.22.2025

HWA GEOSCIENCES INC. DBE/MWBE

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

SETTLEMENT RESULTS
STA 319+00 - 323+15

DRAWN BY:	FIGURE NO.:
CF	7B
CHECK BY:	PROJECT NO.:
BOB/DJH	2022-144-21

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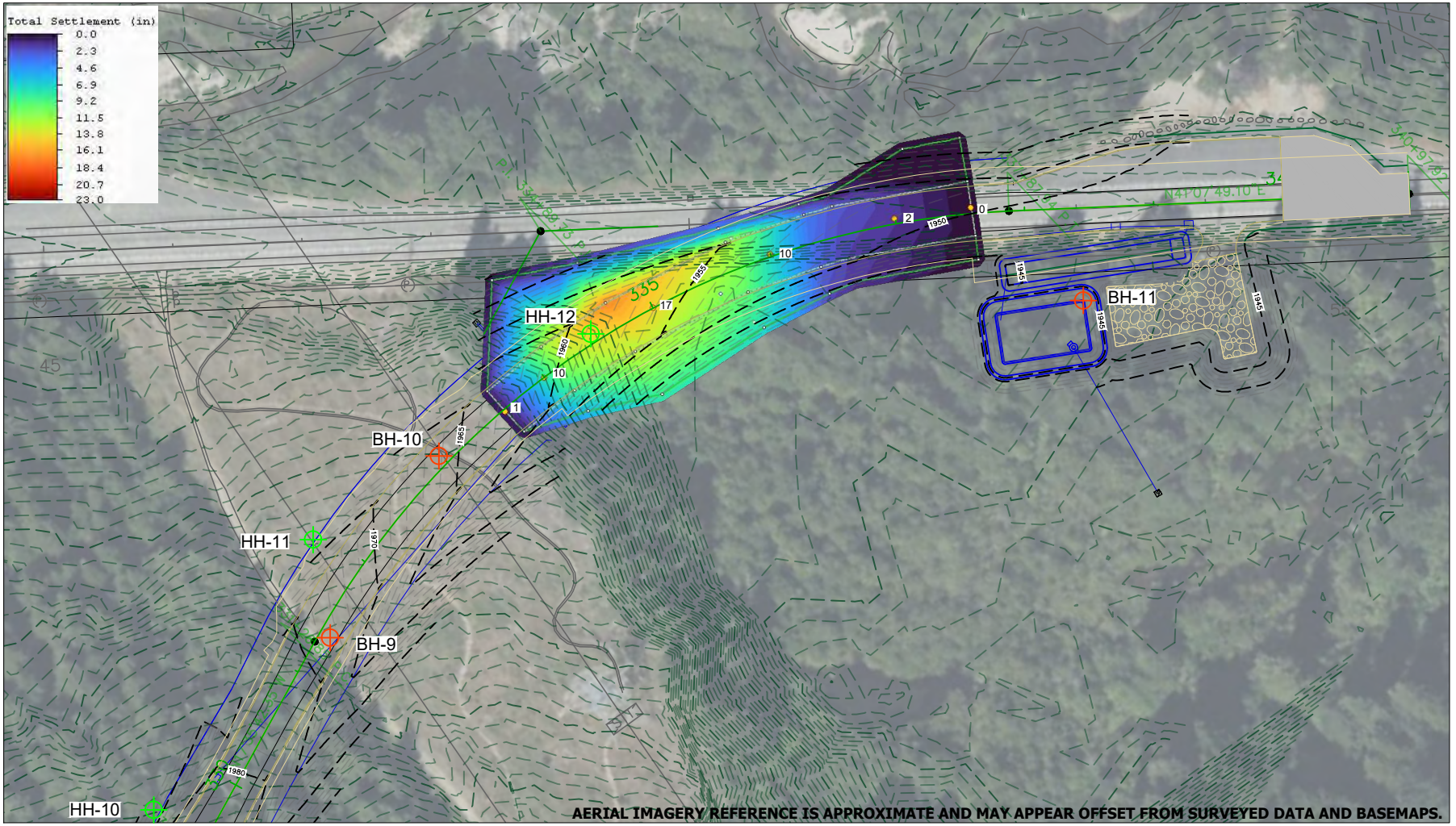

NASON CREEK FLOODPLAIN

Scale: 1" = 120'-0"

LEGEND

- SETTLEMENT CALCULATION LOCATION
- 14 MAGNITUDE (INCHES)

0 60 120 180 240

SCALE: 1" = 120'

BASE MAP PROVIDED BY: BING AND PERTEET 12.22.2025

GEOSCIENCES INC. DBE/MWBE

YAKAMA NATION NASON CREEK FLOODPLAIN
SR 207 REROUTE
CHELAN COUNTY, WASHINGTON

SETTLEMENT RESULTS
STA 333+60 - 337+60

DRAWN BY:	FIGURE NO.:
CF	7C
CHECK BY:	PROJECT NO.:
BOB/DJH	2022-144-21

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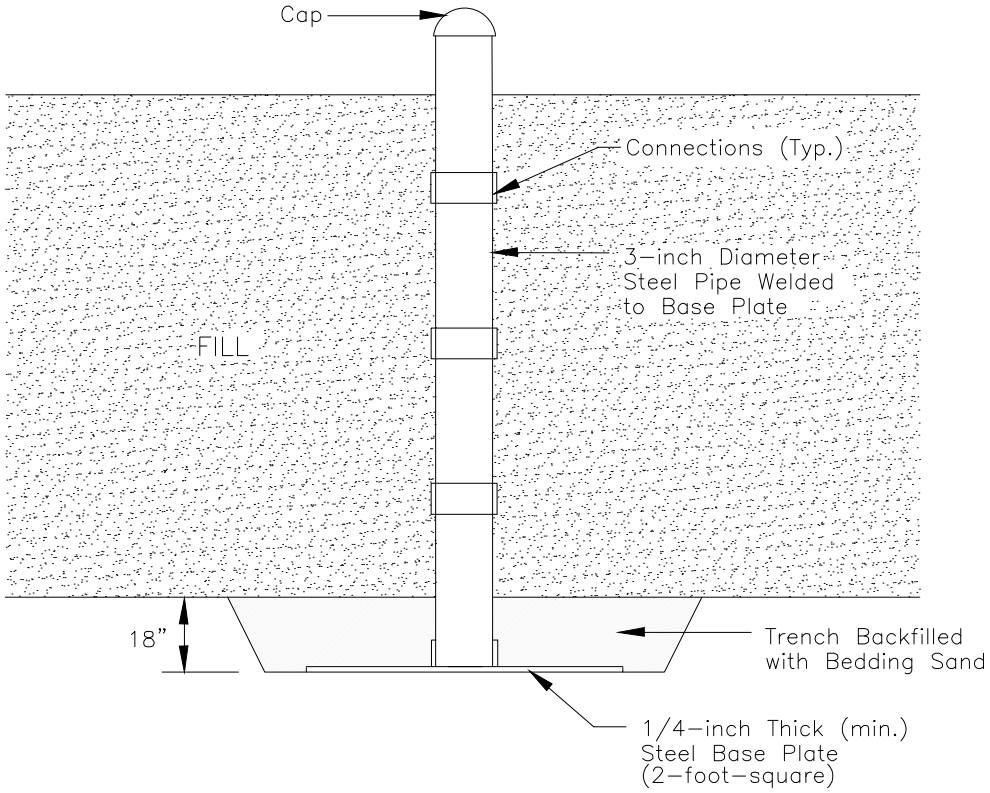


NOT TO SCALE

NOTES

1. LOCATIONS OF SETTLEMENT PLATES SHALL BE CLEARLY MARKED AND READILY VISIBLE (RED FLAGGED) TO EQUIPMENT OPERATORS.

2. IN THE EVENT OF DAMAGE TO SETTLEMENT PLATE OR EXTENSION. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE SOILS ENGINEER AND SHALL BE RESPONSIBLE FOR RESTORING THE SETTLEMENT PLATES TO WORKING ORDER,AS PER PROJECT SPECIFICATION 31 09 01.

3. INSTALL PLATES ON FIRM GROUND OR ON SAND PADS IF NEEDED FOR STABILITY. TAKE INITIAL READING ON TOP OF BASE PLATE. LEVEL PRIOR TO PLACEMENT OF FILL.

4. FOR EASE IN HANDLING, STEEL PIPE ARE USUALLY INSTALLED IN 5–FOOT OR 7–FOOT SECTIONS. AS FILL PROGRESSES, COUPLINGS ARE USED TO INSTALL ADDITIONAL LENGTHS.

5. RECORD THE BASE PLATE ELEVATION AT THE RECOMMENDED TIME INTERVALS. EACH TIME, NOTE THE ELEVATION OF THE ADJACENT FILL SURFACE. BASE PLATE ELEVATIONS SHALL BE RECORDED BY LOWERING A SURVEY ROD OF STEEL SURVEY TAPE DOWN THE CENTER OF THE PIPE RAISERS. THE CONTRACTOR SHALL ENSURE THAT THE SETTLEMENT PLATE CAP IS REPLACED AFTER MEASUREMENTS ARE TAKEN.

6. READ THE MEASUREMENT ROD OR STEEL TAPE TO THE NEAREST 0.01 FOOT. NOTE THE ADJACENT FILL ELEVATION TO THE NEAREST 0.1 FOOT.

7. THE ELEVATIONS SHOULD BE REFERENCED TO A TEMPORARY BENCHMARK LOCATED ON STABLE GROUND AT LEAST 200 FEET FROM THE EMBANKMENT.

APPENDIX A

FIELD EXPLORATIONS

DRAFT

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N-VALUE

COHESIONLESS SOILS			COHESIVE SOILS		
Density	N (blows/ft)	Approximate Relative Density(%)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	0 - 15	Very Soft	0 to 2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	35 - 65	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	over 30	>4000

ASTM SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP DESCRIPTIONS	
Coarse Grained Soils	Gravel and Gravelly Soils	Clean Gravel (little or no fines)	GW	Well-graded GRAVEL
			GP	Poorly-graded GRAVEL
	More than 50% of Coarse Fraction Retained on No. 4 Sieve	Gravel with Fines (appreciable amount of fines)	GM	Silty GRAVEL
			GC	Clayey GRAVEL
	Sand and Sandy Soils	Clean Sand (little or no fines)	SW	Well-graded SAND
			SP	Poorly-graded SAND
More than 50% Retained on No. 200 Sieve Size	50% or More of Coarse Fraction Passing No. 4 Sieve	Sand with Fines (appreciable amount of fines)	SM	Silty SAND
			SC	Clayey SAND
Fine Grained Soils	Silt and Clay	Liquid Limit Less than 50%	ML	SILT
			CL	Lean CLAY
			OL	Organic SILT/Organic CLAY
50% or More Passing No. 200 Sieve Size	Silt and Clay	Liquid Limit 50% or More	MH	Elastic SILT
			CH	Fat CLAY
			OH	Organic SILT/Organic CLAY
Highly Organic Soils			PT	PEAT

TEST SYMBOLS

%F	Percent Fines
AL	Atterberg Limits: PL = Plastic Limit, LL = Liquid Limit
CBR	California Bearing Ratio
CN	Consolidation
DD	Dry Density (pcf)
DS	Direct Shear
GS	Grain Size Distribution
K	Permeability
MD	Moisture/Density Relationship (Proctor)
MR	Resilient Modulus
OC	Organic Content
pH	pH of Soils
PID	Photoionization Device Reading
PP	Pocket Penetrometer (Approx. Comp. Strength, tsf)
Res.	Resistivity
SG	Specific Gravity
CD	Consolidated Drained Triaxial
CU	Consolidated Undrained Triaxial
UU	Unconsolidated Undrained Triaxial
TV	Torvane (Approx. Shear Strength, tsf)
UC	Unconfined Compression

SAMPLE TYPE SYMBOLS

- 2.0" OD Split Spoon (SPT) (140 lb. hammer with 30 in. drop)
- Shelby Tube
- Non-standard Penetration Test (3.0" OD Split Spoon with Brass Rings)
- Small Bag Sample
- Large Bag (Bulk) Sample
- Core Run
- 3-1/4" OD Split Spoon

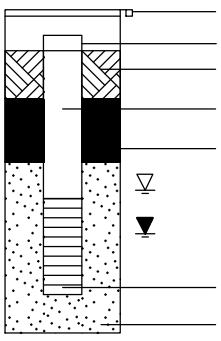
COMPONENT PROPORTIONS

DESCRIPTIVE TERMS	RANGE OF PROPORTION
Clean	< 5%
Slightly (Clayey, Silty, Sandy)	5 - 12%
Clayey, Silty, Sandy, Gravelly	12 - 30%
Very (Clayey, Silty, Sandy, Gravelly)	30 - 50%

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5 mm) to No. 200 (0.074 mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074mm)

GROUNDWATER WELL COMPLETIONS



NOTES: Soil classifications presented on exploration logs are based on visual and laboratory observation in general accordance with ASTM D 2487 and ASTM D 2488. Soil descriptions are presented in the following general order:

Density/consistency, color, modifier (if any) GROUP NAME, additions to group name (if any), moisture content. Proportion, gradation, and angularity of constituents, additional comments. (GEOLOGIC INTERPRETATION)

Please refer to the discussion in the report text as well as the exploration logs for a more complete description of subsurface conditions.

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
MOIST	Damp but no visible water.
WET	Visible free water, usually soil is below water table.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

LEGEND OF TERMS AND SYMBOLS USED ON EXPLORATION LOGS

PROJECT NO.: 2022-144-21 FIGURE: A-1

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT, Cal Mod w/Autohammer
LOCATION: See Figure 2; Lat: 47.759783, Long: -120.732454, Datum: NAD83

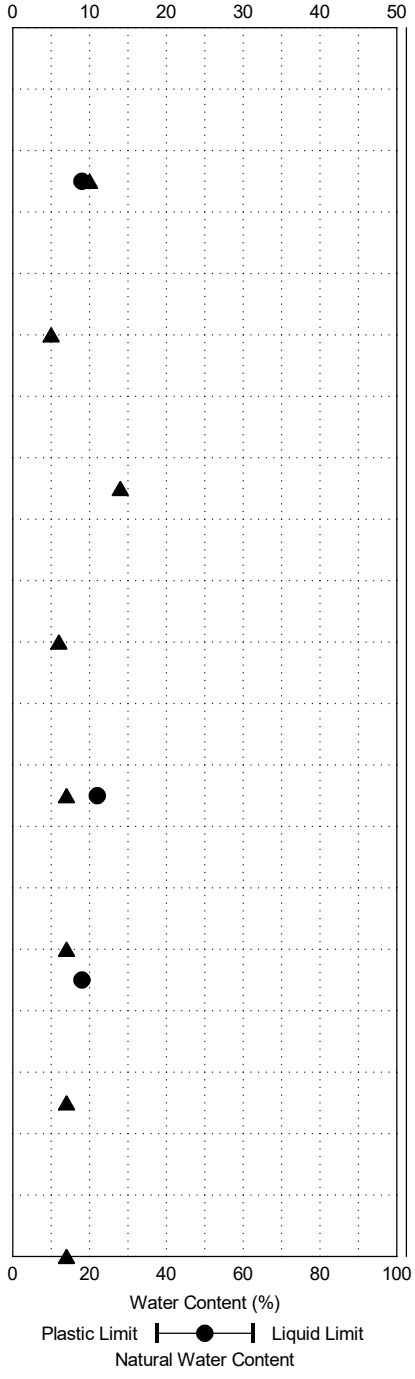
DATE STARTED: 5/19/2023
DATE COMPLETED: 5/19/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS
0		CL	Brown, sandy lean CLAY, moist, micaceous. **(FILL)**				
		CL	Stiff, brown, sandy lean CLAY. moist. Micaceous, 1-2" bedding. **(ALLUVIUM)**		S-1	4-4-6	
5			Medium stiff, brown, sandy lean CLAY, moist. Micaceous, trace gravel and charcoal, 1-2" bedding.		S-2	3-2-3	
			Becomes stiff.		S-3a S-3b S-3c	6-6-8	
10			Medium stiff, brown, sandy lean CLAY, moist. Few sand interbeds, scattered woody debris, charcoal. Wood looks fresh.		S-4	2-3-3	
			Similar to previous, no charcoal.		S-5	2-2-5	
15					S-6a S-6b	2-4-3	
		SM	Loose, brown, silty SAND, moist. Micaceous, 1/4-2" bedding.				
		CL	Medium stiff, brown, sandy lean CLAY, moist. Micaceous, scattered wood, charcoal.		S-7	2-3-4	
20							

GROUNDWATER

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot

ELEVATION (feet)



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-01

PROJECT NO.: 2022-144-21 FIGURE: A-2

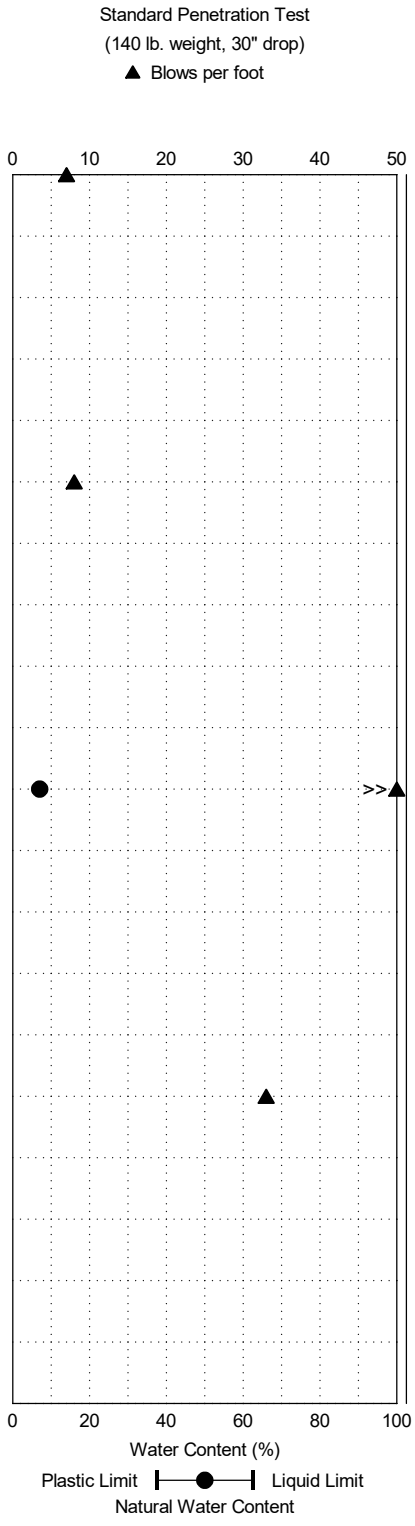
DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT, Cal Mod w/Autohammer
LOCATION: See Figure 2; Lat: 47.759783, Long: -120.732454, Datum: NAD83

DATE STARTED: 5/19/2023
DATE COMPLETED: 5/19/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS
20		SC	Loose, brown, clayey SAND, moist. Micaceous, few clay lenses.		S-8	2-3-4	
25			Clay fraction decreasing, grades to yellowish-brown.		S-9	3-4-4	
			Gravelly drill action.				
30		SP SM	Very dense, olive brown, slightly silty, very gravelly SAND, wet. Gravel broken by drill action, sampling. **(BURIED CREEK BED)**		S-10	24-37-25	GS
35		GM	Dense, dark olive brown, silty, sandy GRAVEL, wet. Gravel broken by drill action and sampling.		S-11	16-10-23	
40							

BH-1 terminated at about 36.5 feet below ground surface (bgs).
Groundwater encountered at about 30 feet bgs during the exploration.
Boring abandoned with 3/8" bentonite chips.

GROUNDWATER



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GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

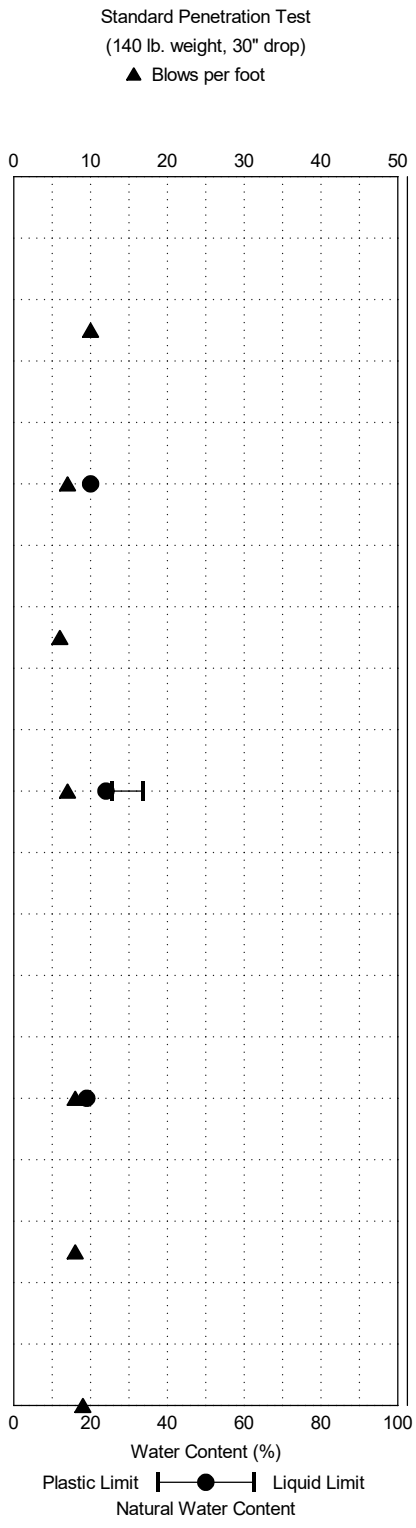
BORING:
BH-01

PROJECT NO.: 2022-144-21 FIGURE: A-2

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer, Shelby Tube
LOCATION: See Figure 2; Lat: 47.760223, Long: -120.731495, Datum: NAD83

DATE STARTED: 5/19/2023
DATE COMPLETED: 5/19/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS
0		CL	Brown, sandy lean CLAY, moist, micaceous. **(FILL)**				
		SC	Medium dense, brown, clayey SAND, moist. Micaceous, scattered charcoal. 1-2" bedding. **(ALLUVIUM)**		S-1	4-5-5	
5		CL	Loose, brown, sandy lean CLAY, moist. Clay fraction increasing with depth.		S-2	2-2-5	
			Same as previous, 2 inch sand lens at 7.5 feet.		S-3	2-2-4	
10		ML	Medium stiff, brown, sandy SILT, moist. Micaceous, few fine sand interbeds.		S-4	2-3-4	AL %F
		SC	Loose, olive brown, clayey SAND, moist.		S-5		DS
15		CL	Loose, brown, sandy lean CLAY, moist. Micaceous, 1-3" bedding.		S-6	2-3-5	
			Clay fraction decreases.		S-7	2-3-5	
20							



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

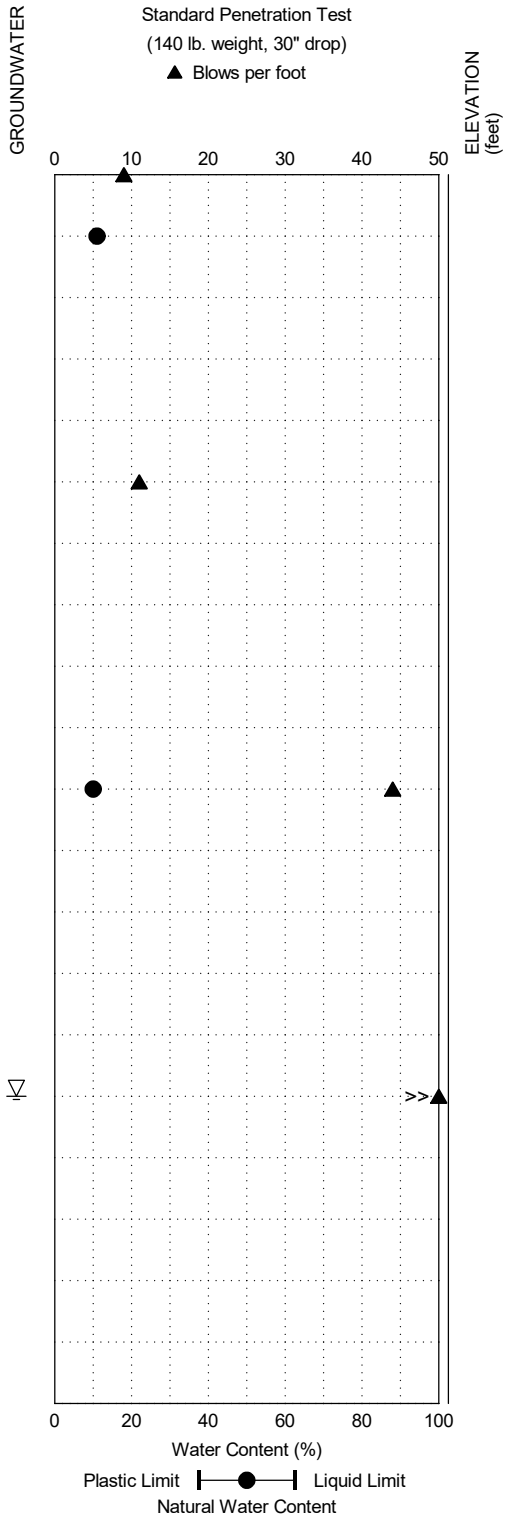
BORING:
BH-02

PROJECT NO.: 2022-144-21 FIGURE: A-3

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer, Shelby Tube
LOCATION: See Figure 2; Lat: 47.760223, Long: -120.731495, Datum: NAD83

DATE STARTED: 5/19/2023
DATE COMPLETED: 5/19/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS
20			Similar to previous.		S-8a	3-4-5	
		SM	Medium dense, yellowish-brown, silty SAND, moist. Scattered gravel, sample noticable less moist than previous samples.		S-8b		
25			Medium dense, yellowish-brown, gravelly, silty SAND, moist. Micaceous.		S-9	3-4-7	
30		SM	Dense, dark grayish-brown, silty SAND, moist. Micaceous, slightly gravelly. **(BURIED CREEK BED)**		S-10	5-11-33	
35		GM	Very dense, dark grayish-brown, silty, sandy GRAVEL, wet.		S-11	24-50/6"	
40			BH-2 terminated at about 36 feet below ground surface (bgs). Groundwater encountered at about 35 feet bgs during the exploration. Boring abandoned with 3/8" bentonite chips.				



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

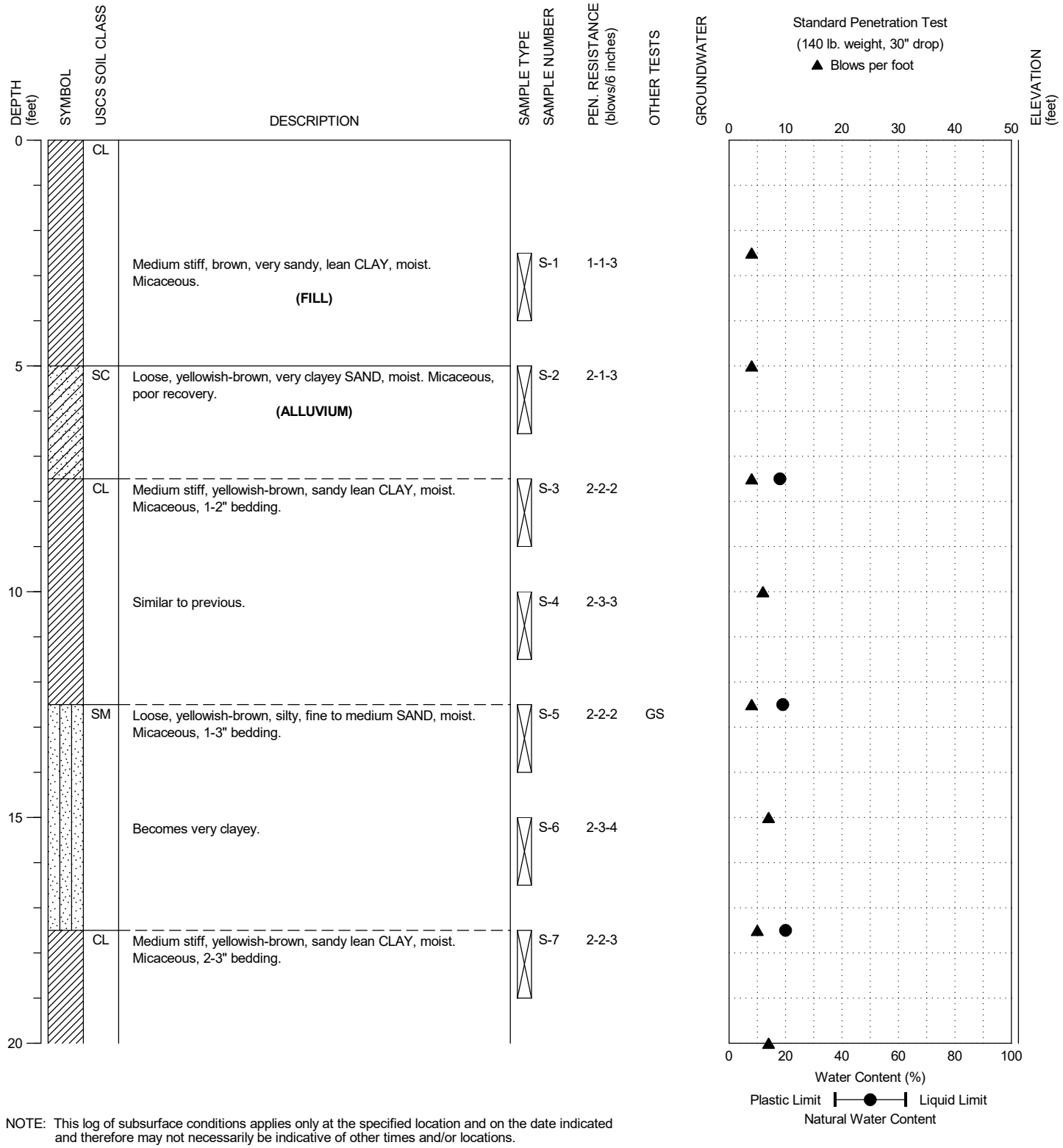
BORING:
BH-02

PROJECT NO.: 2022-144-21 FIGURE: A-3

BORING-DSM 2022-144.GPJ 12/13/24
Library: Q:\LIBRARY\LIBRARY - 2019 LAB.GLB

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer
LOCATION: See Figure 2; Lat: 47.760905, Long: -120.729809, Datum: NAD83

DATE STARTED: 6/26/2023
DATE COMPLETED: 6/26/2023
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

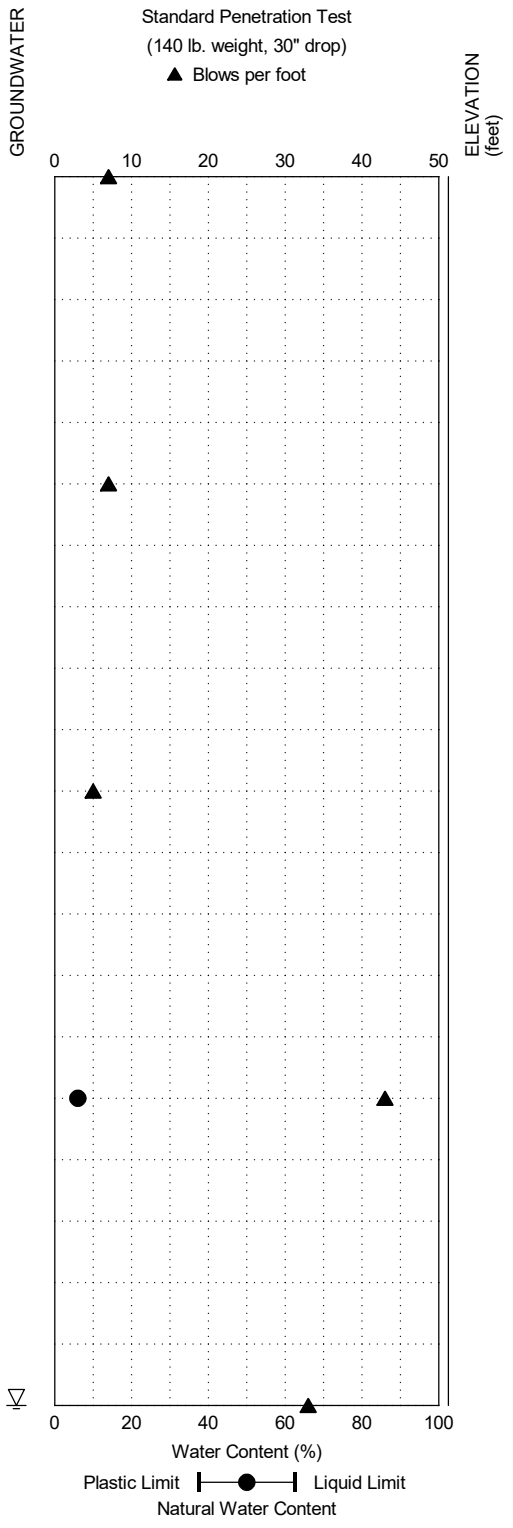
BORING:
BH-03

PROJECT NO.: 2022-144-21 FIGURE: A-4

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer
LOCATION: See Figure 2; Lat: 47.760905, Long: -120.729809, Datum: NAD83

DATE STARTED: 6/26/2023
DATE COMPLETED: 6/26/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS
20			Same as previous.		S-8	1-2-5	
25			Medium stiff, yellowish-brown, sandy lean CLAY, moist. Micaceous, 1/2-3" bedding.		S-9	2-3-4	
30			Similar to previous.		S-10	2-2-3	
35		SM	Dense, dark grayish-brown, silty, very gravelly, fine to course SAND, moist. Micaceous, sand angular to subrounded, gravel broken by drill action and sampling. **(BURIED CREEK BED)**		S-11	13-19-24	
40							



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-03

PROJECT NO.: 2022-144-21 FIGURE: A-4

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer
LOCATION: See Figure 2; Lat: 47.760905, Long: -120.729809, Datum: NAD83

DATE STARTED: 6/26/2023
DATE COMPLETED: 6/26/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
40			Dense, dark grayish-brown, silty, fine to coarse SAND, wet. Scattered gravel.		S-12	27-15-18		

BH-3 terminated at about 41.5 feet below ground surface (bgs).
Groundwater encountered at about 40 feet bgs during the exploration.
Boring abandoned with 3/8" bentonite chips.

45
50
55
60

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot

ELEVATION (feet)

0 10 20 30 40 50

0 20 40 60 80 100
Water Content (%)
Plastic Limit — Liquid Limit
Natural Water Content

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

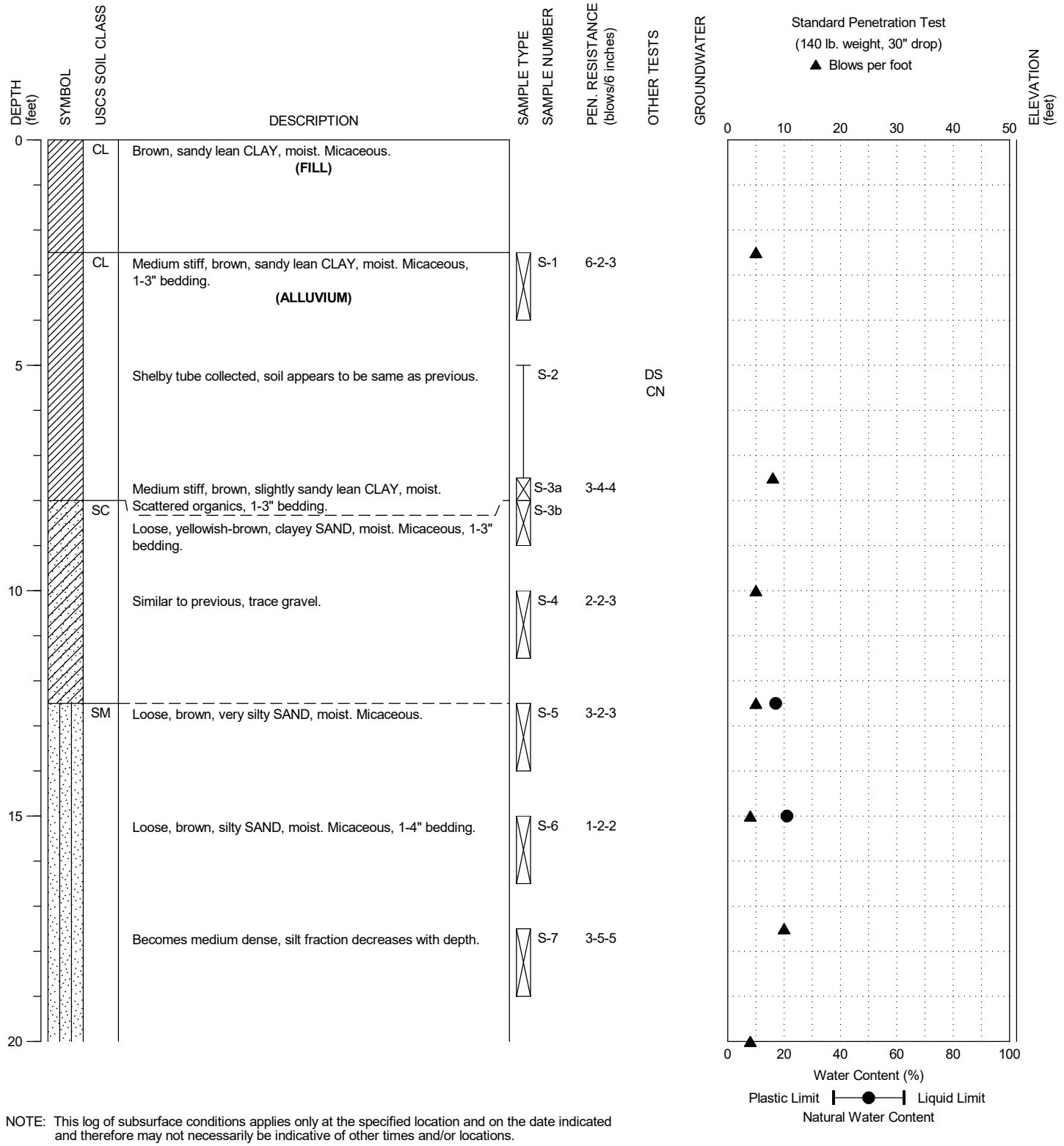
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-03

PROJECT NO.: 2022-144-21 FIGURE: A-4

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer, Shelby Tube
LOCATION: See Figure 2; Lat: 47.761291, Long: -120.728771, Datum: NAD83

DATE STARTED: 6/26/2023
DATE COMPLETED: 6/26/2023
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-04

PROJECT NO.: 2022-144-21 FIGURE: A-5

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer, Shelby Tube
LOCATION: See Figure 2; Lat: 47.761291, Long: -120.728771, Datum: NAD83

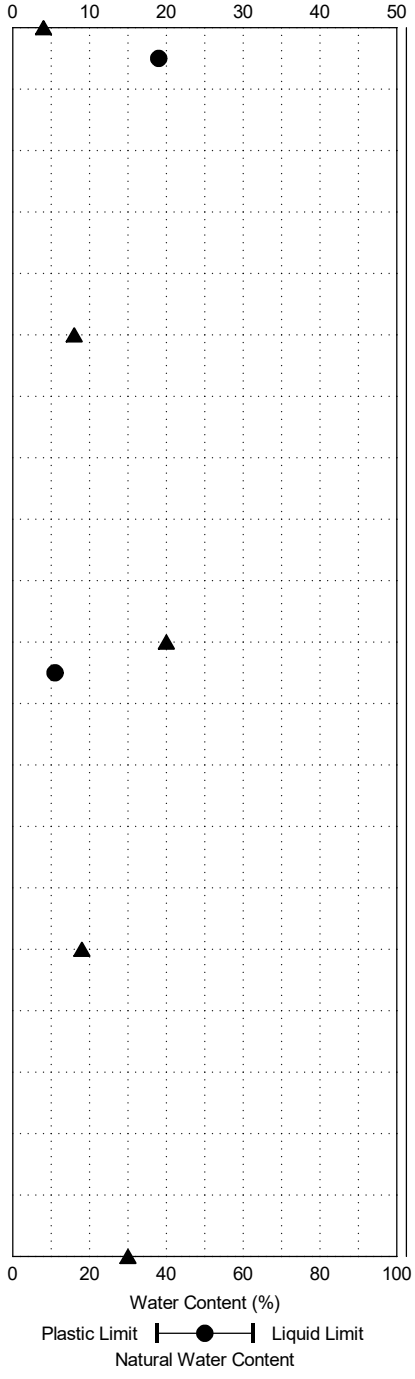
DATE STARTED: 6/26/2023
DATE COMPLETED: 6/26/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS
20			Becomes loose.		S-8a	1-2-2	
		ML	Medium stiff, brown, sandy SILT, moist to wet. Micaceous, scattered charcoal.		S-8b		
25		SM	Loose, brown, silty SAND, moist. Micaceous, 1/2-3" bedding.		S-9	4-3-5	
30			Becomes medium dense, slightly rust mottled. Gravel content increases, 1/4-2" bedding. Few very dark brown, very fine sand beds.		S-10a S-10b	6-9-11	
35		SC	Loose, brown, clayey SAND. moist. Micaceous, scattered charcoal.		S-11	3-4-5	
40							

GROUNDWATER

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot

ELEVATION (feet)



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-04

PROJECT NO.: 2022-144-21 FIGURE: A-5

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Diedrich D-50 Tracked rig, HSA w/4,25" ID
SAMPLING METHOD: SPT w/Autohammer, Shelby Tube
LOCATION: See Figure 2; Lat: 47.761291, Long: -120.728771, Datum: NAD83

DATE STARTED: 6/26/2023
DATE COMPLETED: 6/26/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
40			Medium dense, brown, clayey SAND, moist. Micaceous.		S-12	5-7-8		

BH-4 terminated at about 41.5 feet below ground surface.
No groundwater encountered during the exploration.
Boring abandoned with 3/8" bentonite chips.

45
50
55
60

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot

ELEVATION (feet)

0 10 20 30 40 50

0 20 40 60 80 100
Water Content (%)
Plastic Limit — Liquid Limit
Natural Water Content

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

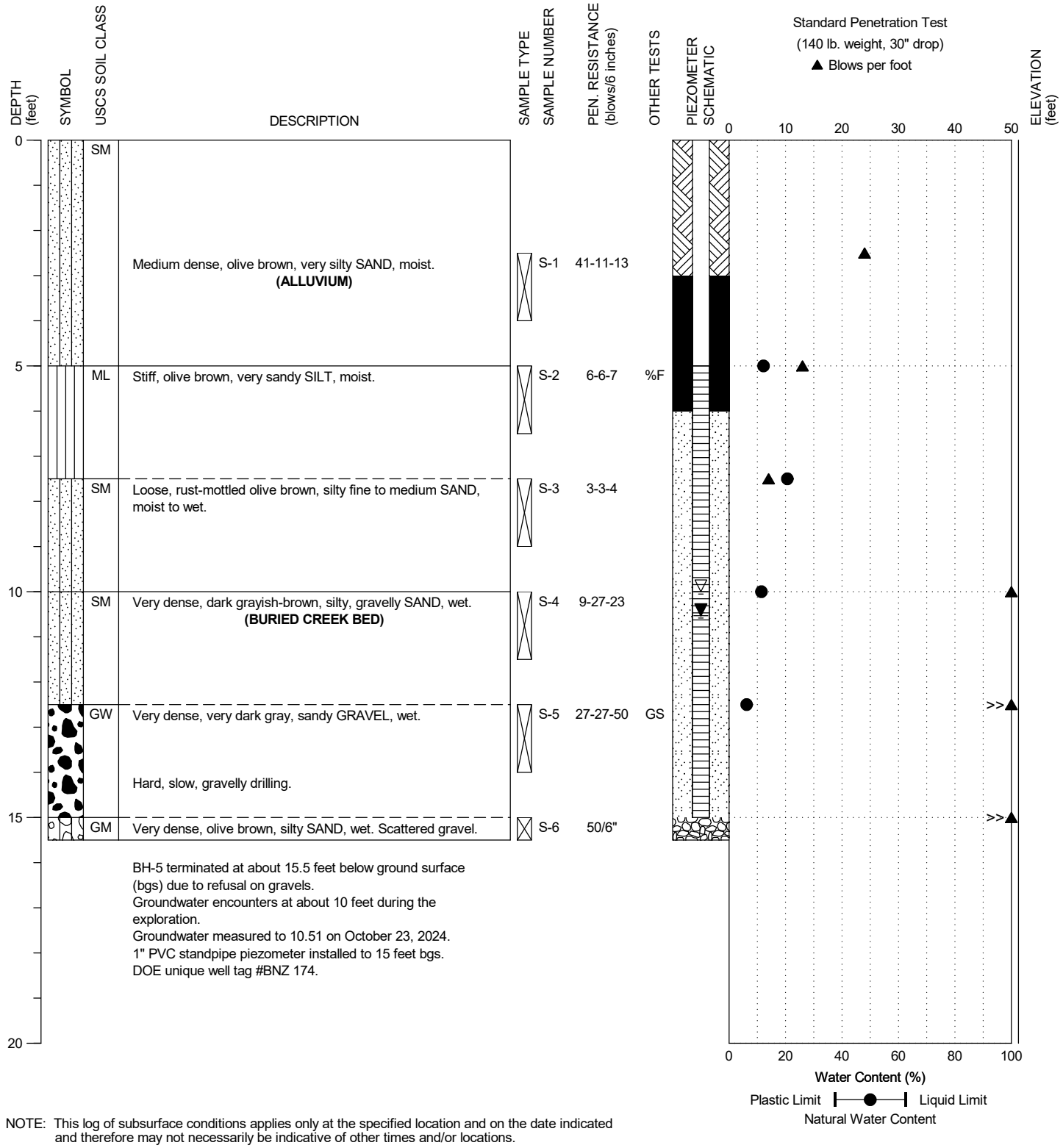
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-04

PROJECT NO.: 2022-144-21 FIGURE: A-5

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.759659, Long: -120.734389, Datum: NAD83

DATE STARTED: 10/22/2024
DATE COMPLETED: 10/22/2024
LOGGED BY: M.A. Benson



BH-5 terminated at about 15.5 feet below ground surface (bgs) due to refusal on gravels.
Groundwater encounters at about 10 feet during the exploration.
Groundwater measured to 10.51 on October 23, 2024.
1" PVC standpipe piezometer installed to 15 feet bgs.
DOE unique well tag #BNZ 174.

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

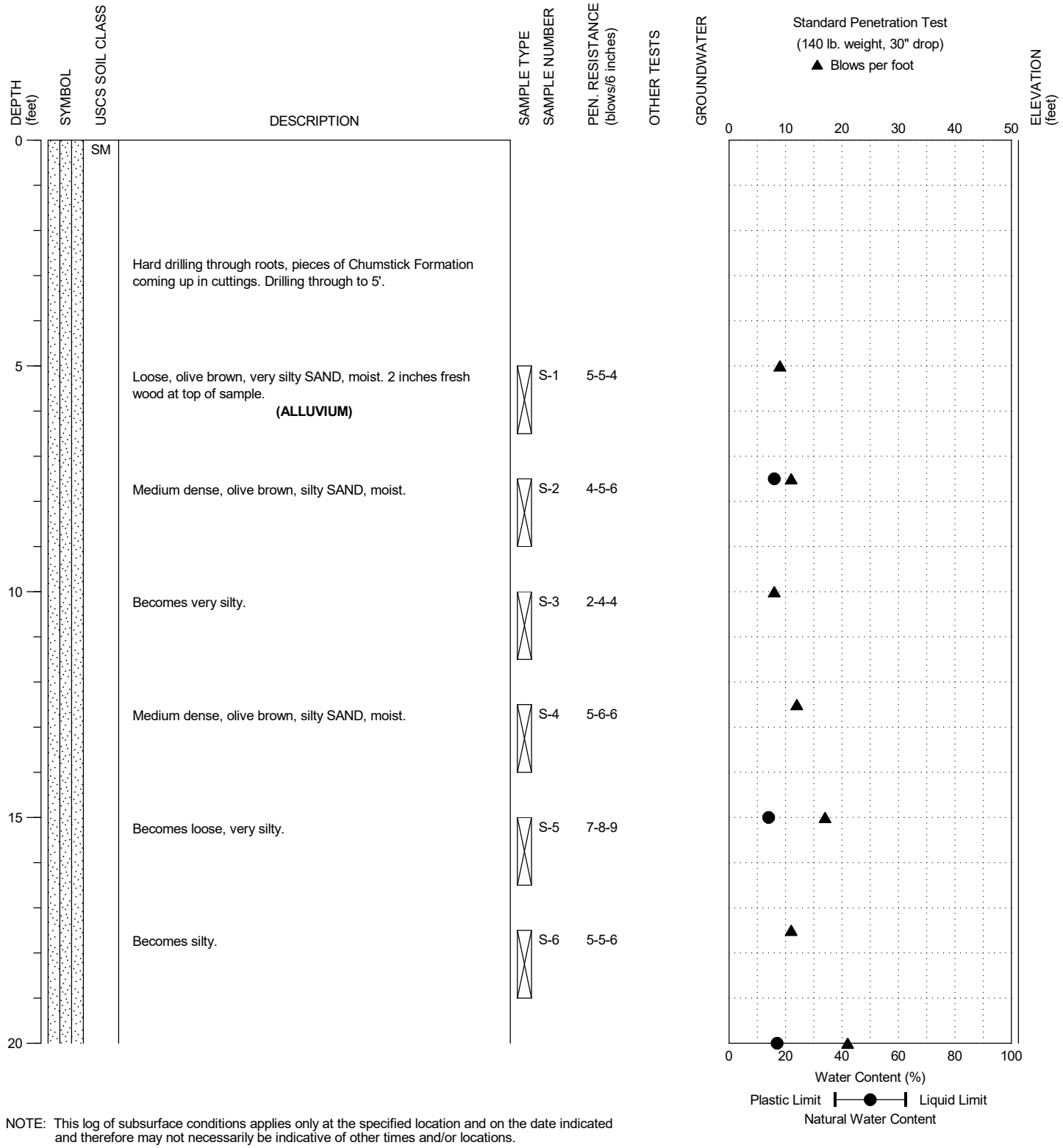
BORING:
BH-05

PROJECT NO.: 2022-144-21 FIGURE: A-6

PZO-DSM 2022-144.GPJ 12/13/24
Library: Q:\LIBRARY\LIBRARY - 2019 LAB.GLB

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.760713, Long: -120.729356, Datum: NAD83

DATE STARTED: 10/22/2024
DATE COMPLETED: 10/22/2024
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-07

PROJECT NO.: 2022-144-21 FIGURE: A-7

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.760713, Long: -120.729356, Datum: NAD83

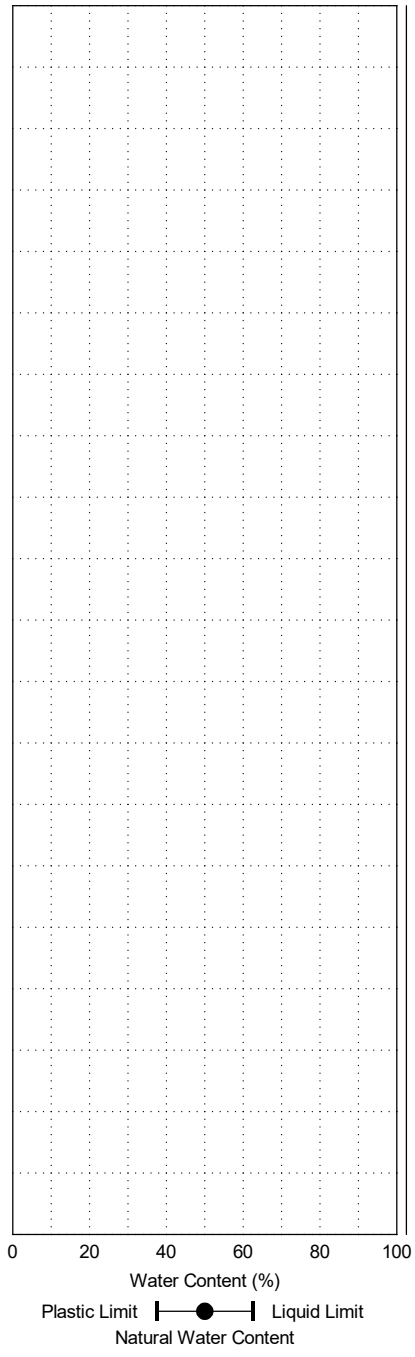
DATE STARTED: 10/22/2024
DATE COMPLETED: 10/22/2024
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
20			Medium dense, olive brown, silty SAND, moist. Scattered charcoal.		S-7	7-10-11		

BH-7 terminated at about 21.5 feet below ground surface (bgs).
No groundwater was encountered during the exploration.
Boring decommissioned with 3/8" bentonite chips.

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot

ELEVATION (feet)



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

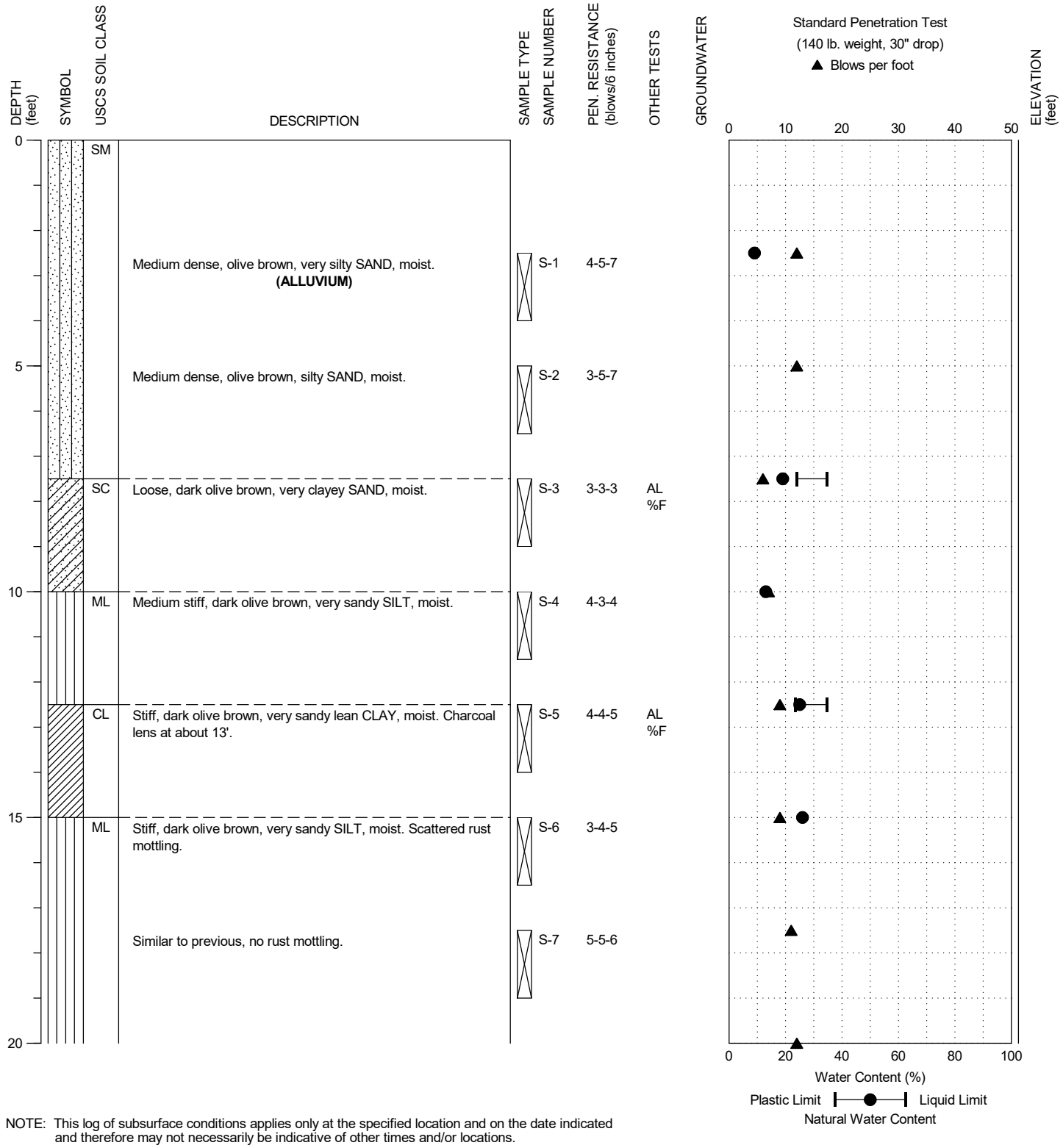
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-07

PROJECT NO.: 2022-144-21 FIGURE: A-7

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.763601, Long: -120.728712, Datum: NAD83

DATE STARTED: 10/22/2024
DATE COMPLETED: 10/22/2024
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-09

PROJECT NO.: 2022-144-21 FIGURE: A-8

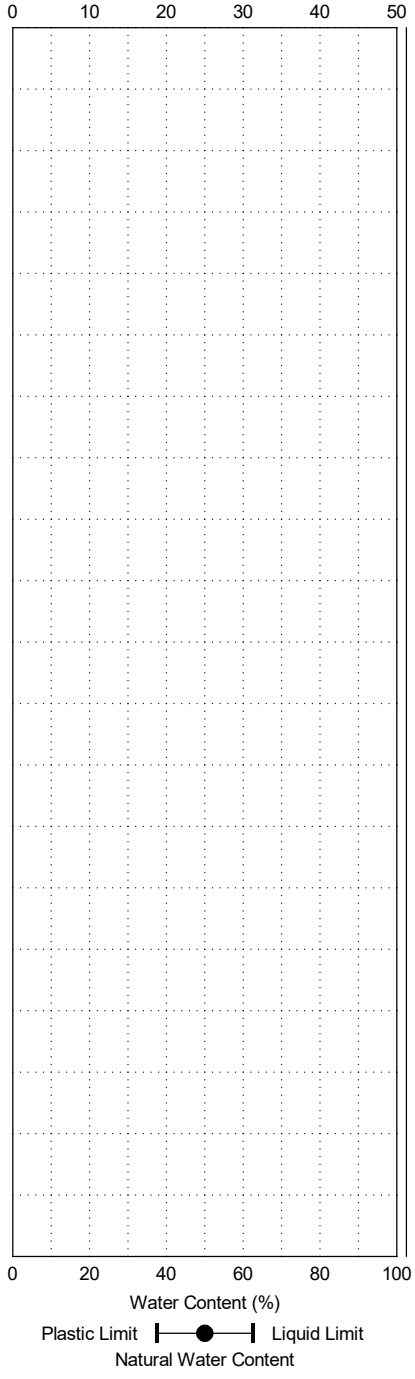
DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.763601, Long: -120.728712, Datum: NAD83

DATE STARTED: 10/22/2024
DATE COMPLETED: 10/22/2024
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
20			Stiff, dark olive brown SILT with sandy interbeds, moist. 3" to 4" bedding.		S-8	6-6-6		
			BH-9 terminated at about 21.5 feet below ground surface (bgs). No groundwater encountered during the exploration. Boring decommissioned with 3/8" bentonite chips.					
25								
30								
35								
40								

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot

ELEVATION (feet)



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

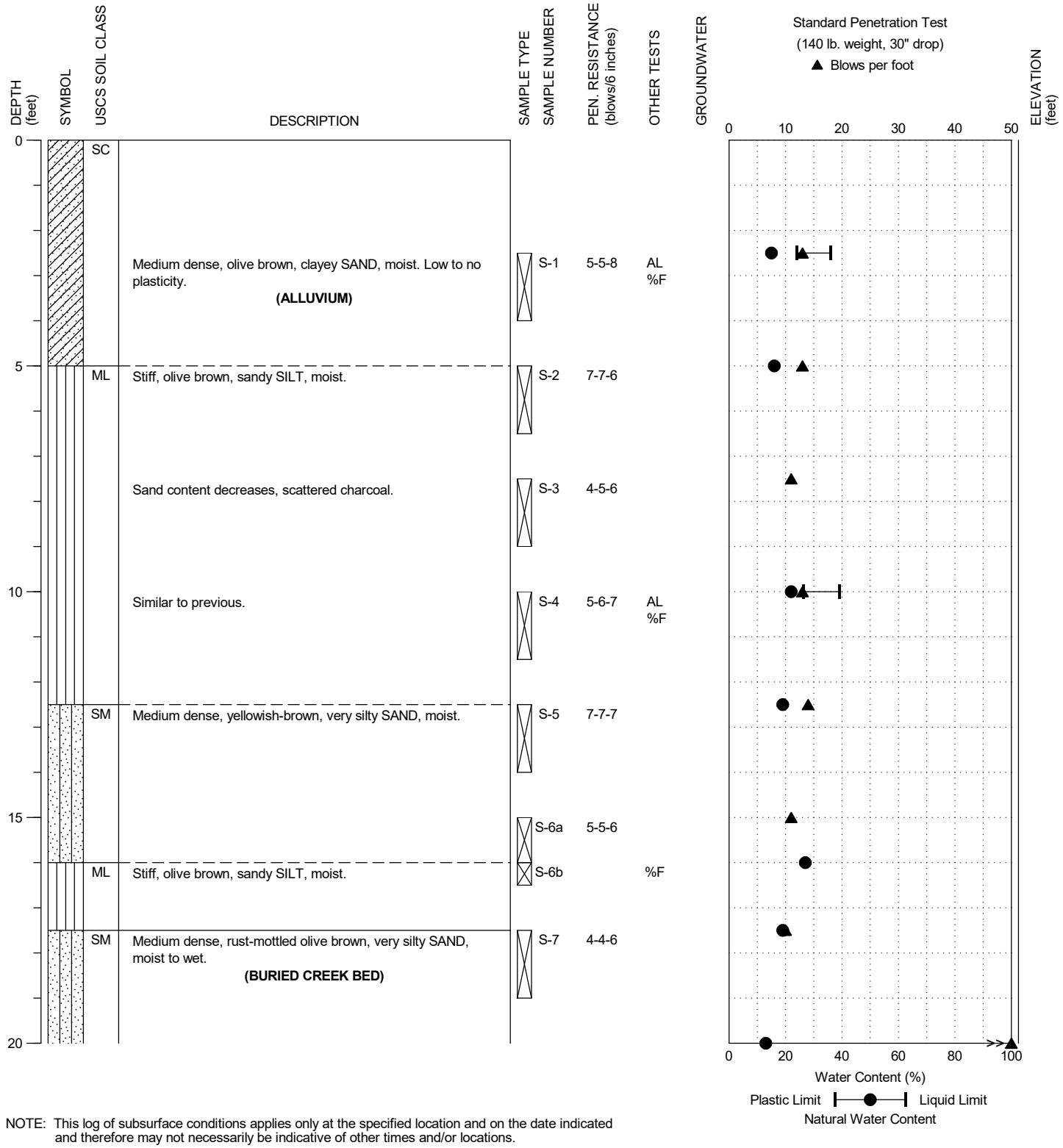
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-09

PROJECT NO.: 2022-144-21 FIGURE: A-8

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.76404, Long: -120.728764, Datum: NAD83

DATE STARTED: 10/23/2024
DATE COMPLETED: 10/23/2024
LOGGED BY: M.A. Benson



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GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-10

PROJECT NO.: 2022-144-21 FIGURE: A-9

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.76404, Long: -120.728764, Datum: NAD83

DATE STARTED: 10/23/2024
DATE COMPLETED: 10/23/2024
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
20			Very dense, rust-mottled olive gray, gravelly, silty SAND, moist to wet. 1" to 2" bedding.		S-8	5-48-37	GS	

BH-10 terminated at about 22 feet below ground surface (bgs) due to refusal on gravel.
No groundwater was encountered during the exploration.
Boring decommissioned with 3/8" bentonite chips.

25
30
35
40

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot

ELEVATION (feet)

0 10 20 30 40 50

0 20 40 60 80 100

Water Content (%)

Plastic Limit — Liquid Limit
Natural Water Content

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

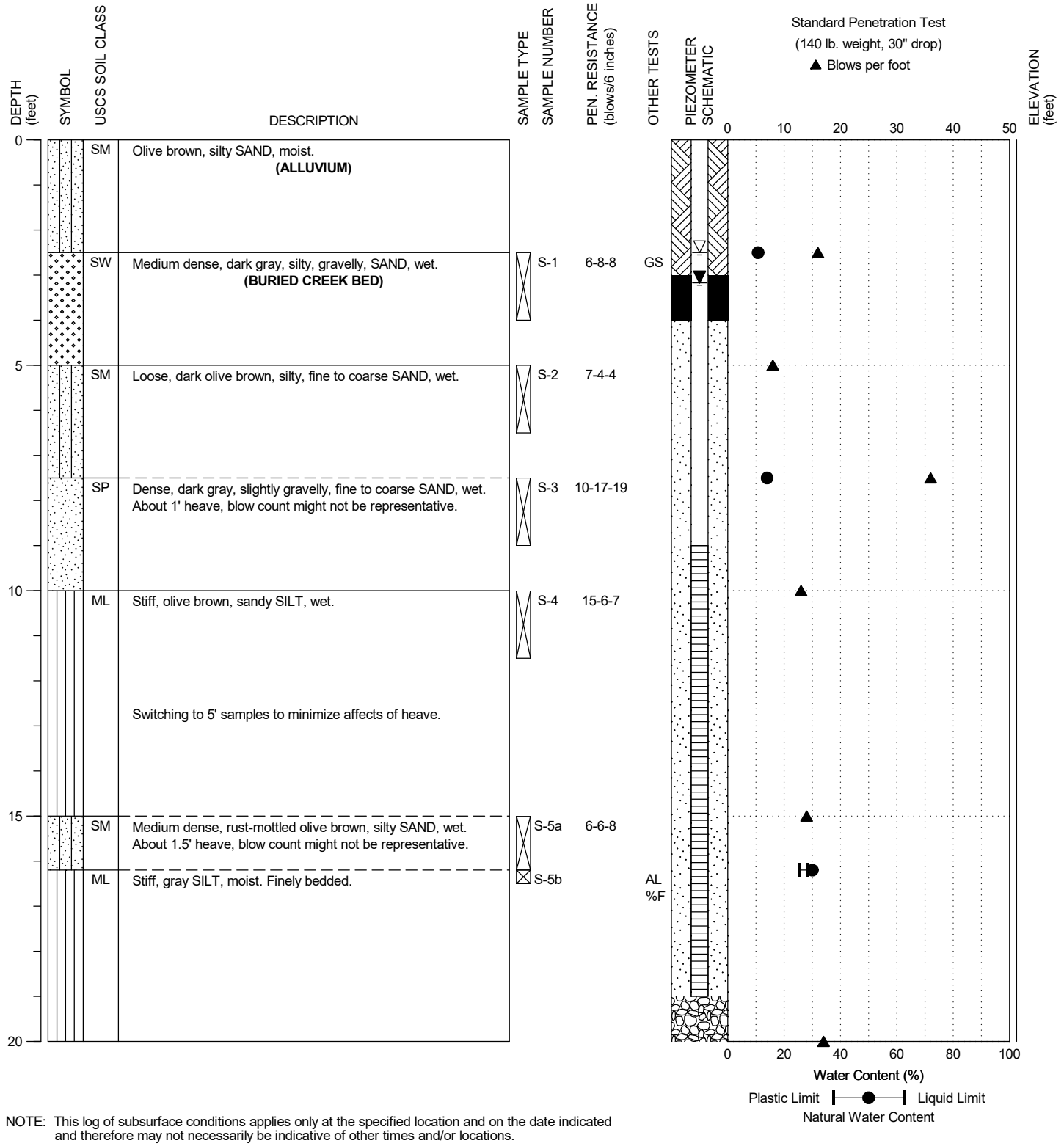
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

BORING:
BH-10

PROJECT NO.: 2022-144-21 FIGURE: A-9

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.765112, Long: -120.7278, Datum: NAD83

DATE STARTED: 10/23/2024
DATE COMPLETED: 10/23/2024
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

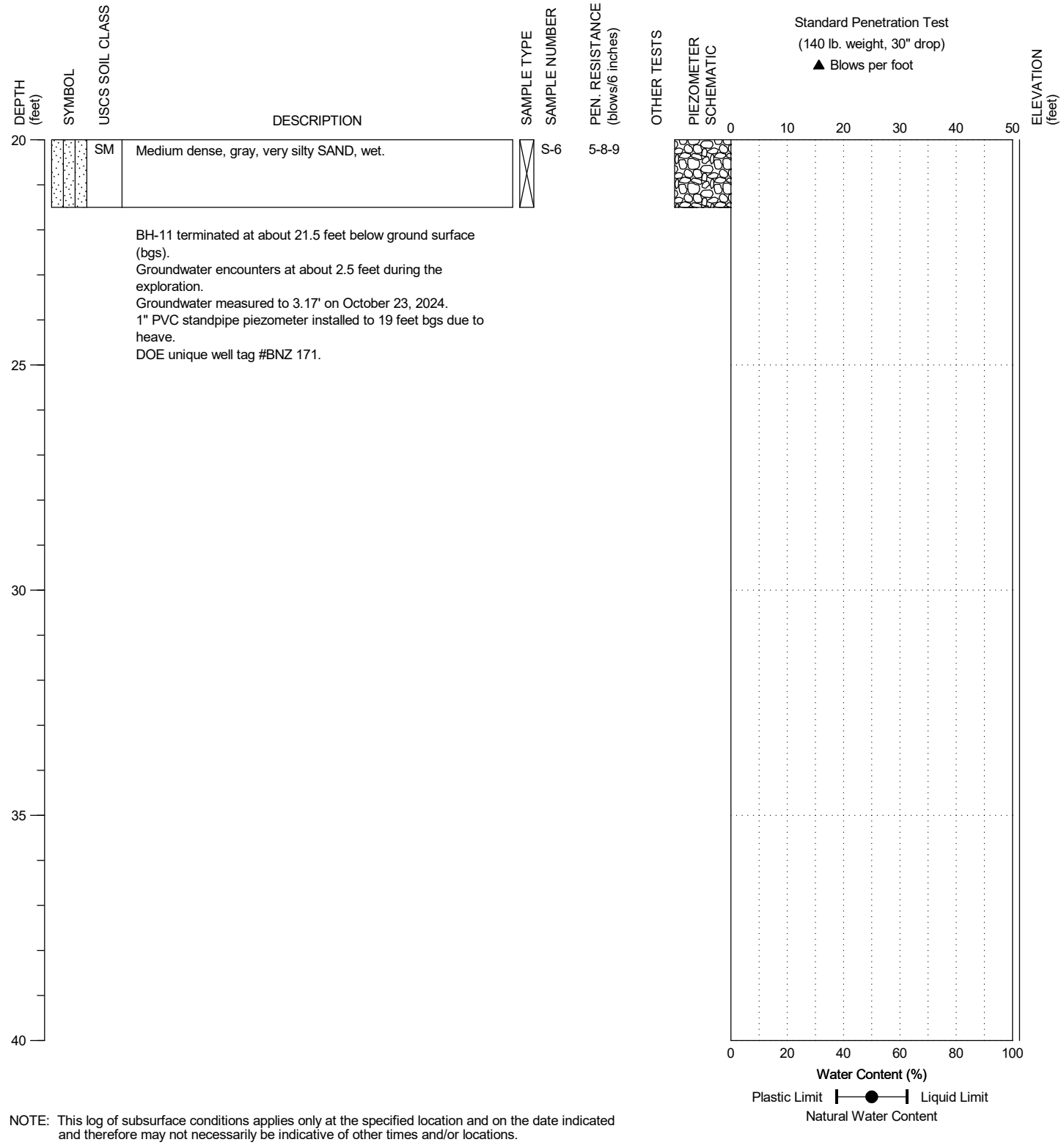
BORING:
BH-11

PROJECT NO.: 2022-144-21 FIGURE: A-10

PZO-DSM 2022-144.GPJ 12/13/24
Library: Q:\LIBRARY\LIBRARY - 2019 LAB.GLB

DRILLING COMPANY: Geologic Drill Partners
DRILLING METHOD: Mini-Bobcat Tracked Rig, HSA w/2.25" ID
SAMPLING METHOD: SPT w/Rope and Cathead
LOCATION: See Figure 2; Lat: 47.765112, Long: -120.7278, Datum: NAD83

DATE STARTED: 10/23/2024
DATE COMPLETED: 10/23/2024
LOGGED BY: M.A. Benson



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GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

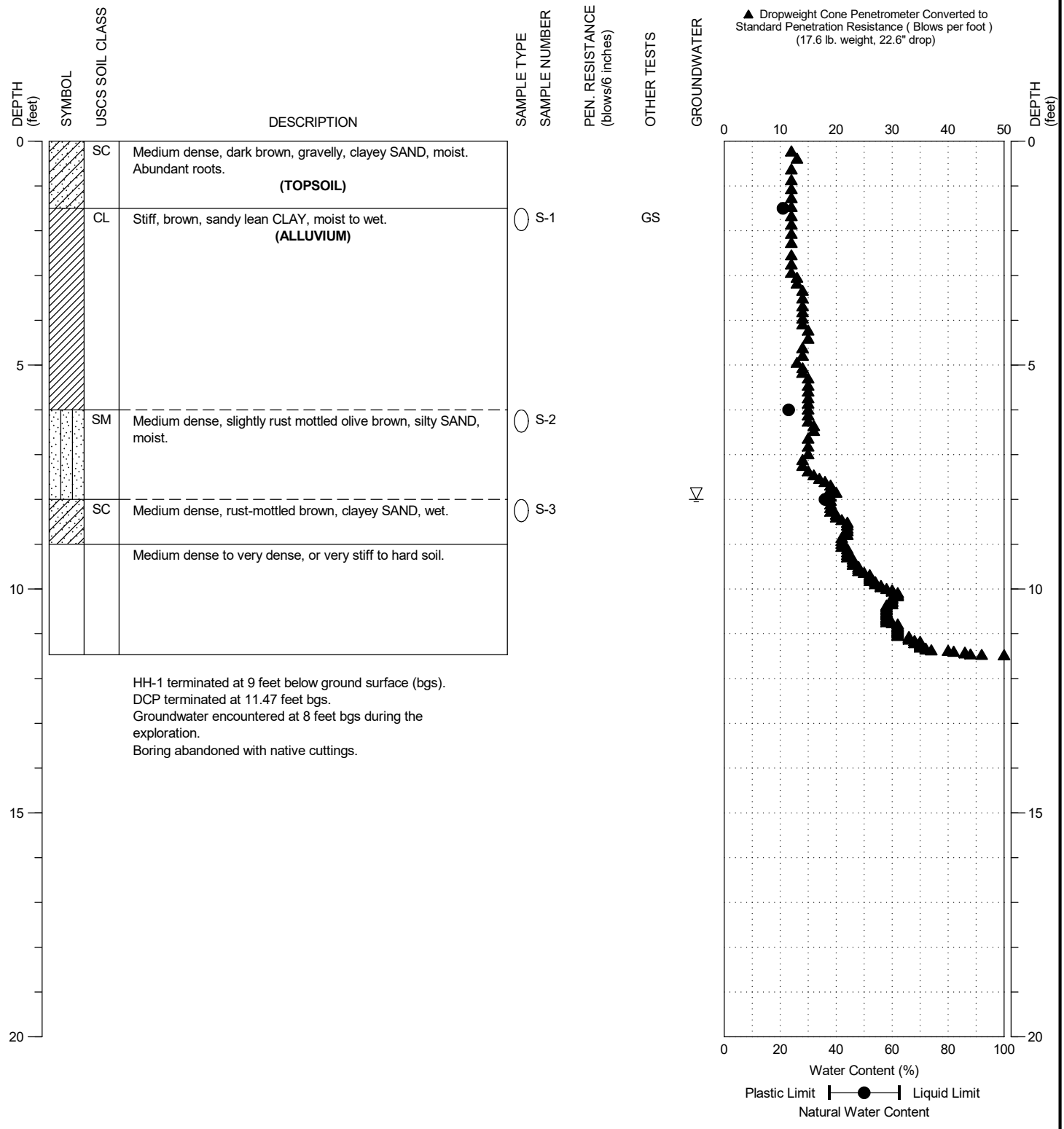
BORING:
BH-11

PROJECT NO.: 2022-144-21 FIGURE: A-10

DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.75954, Long: -120.735138, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/16/2023
DATE COMPLETED: 5/16/2023
LOGGED BY: M.A. Benson



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GEOSCIENCES INC.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 1

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-11

HAND HOLE WITH DCP TO SPT 2022-144.GPJ 12/13/24
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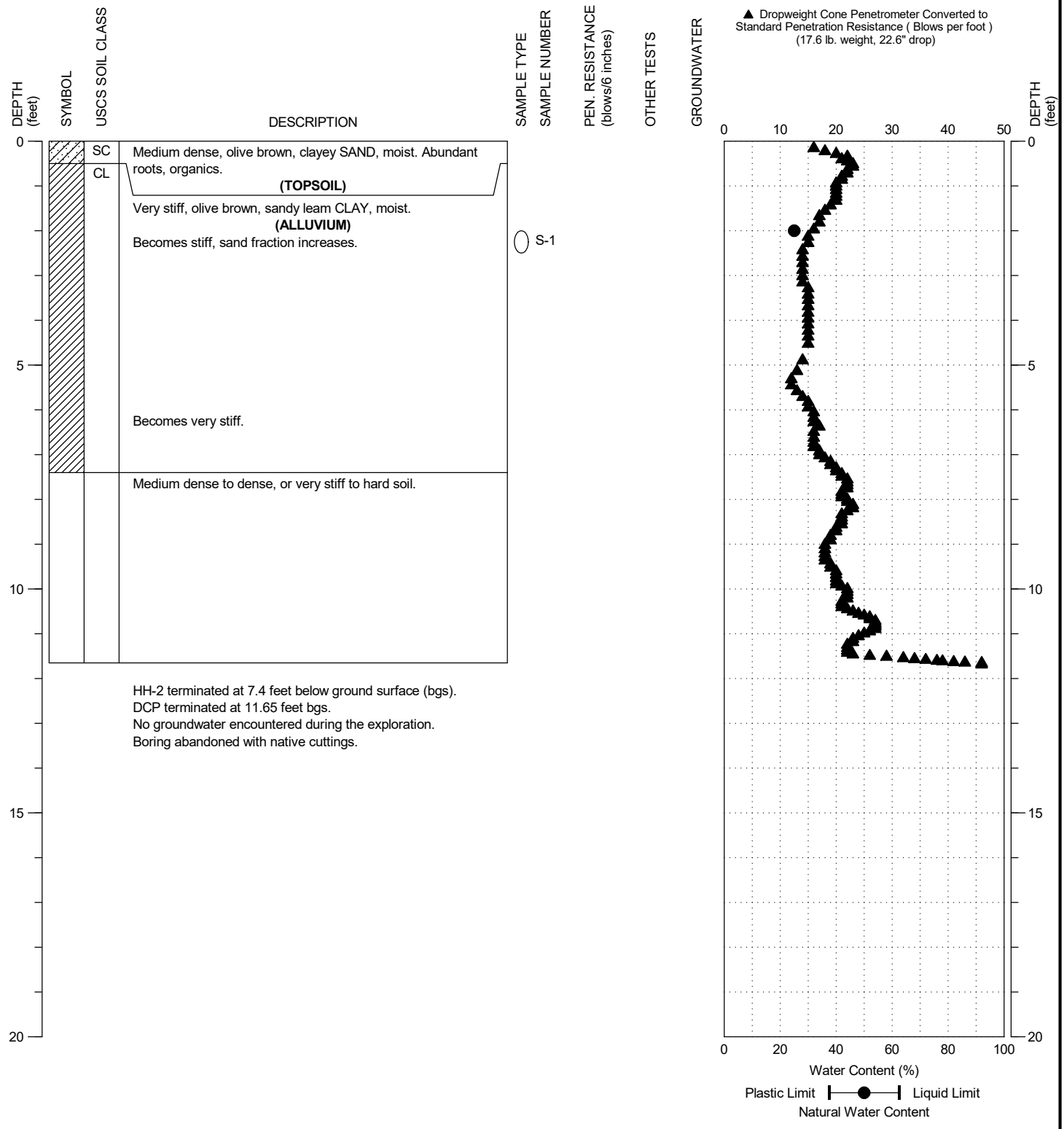
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.75977, Long: -120.734138, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/16/2023
DATE COMPLETED: 5/16/2023
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 2

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-12

HAND HOLE WITH DCP TO SPT 2022-144.GPJ 12/13/24
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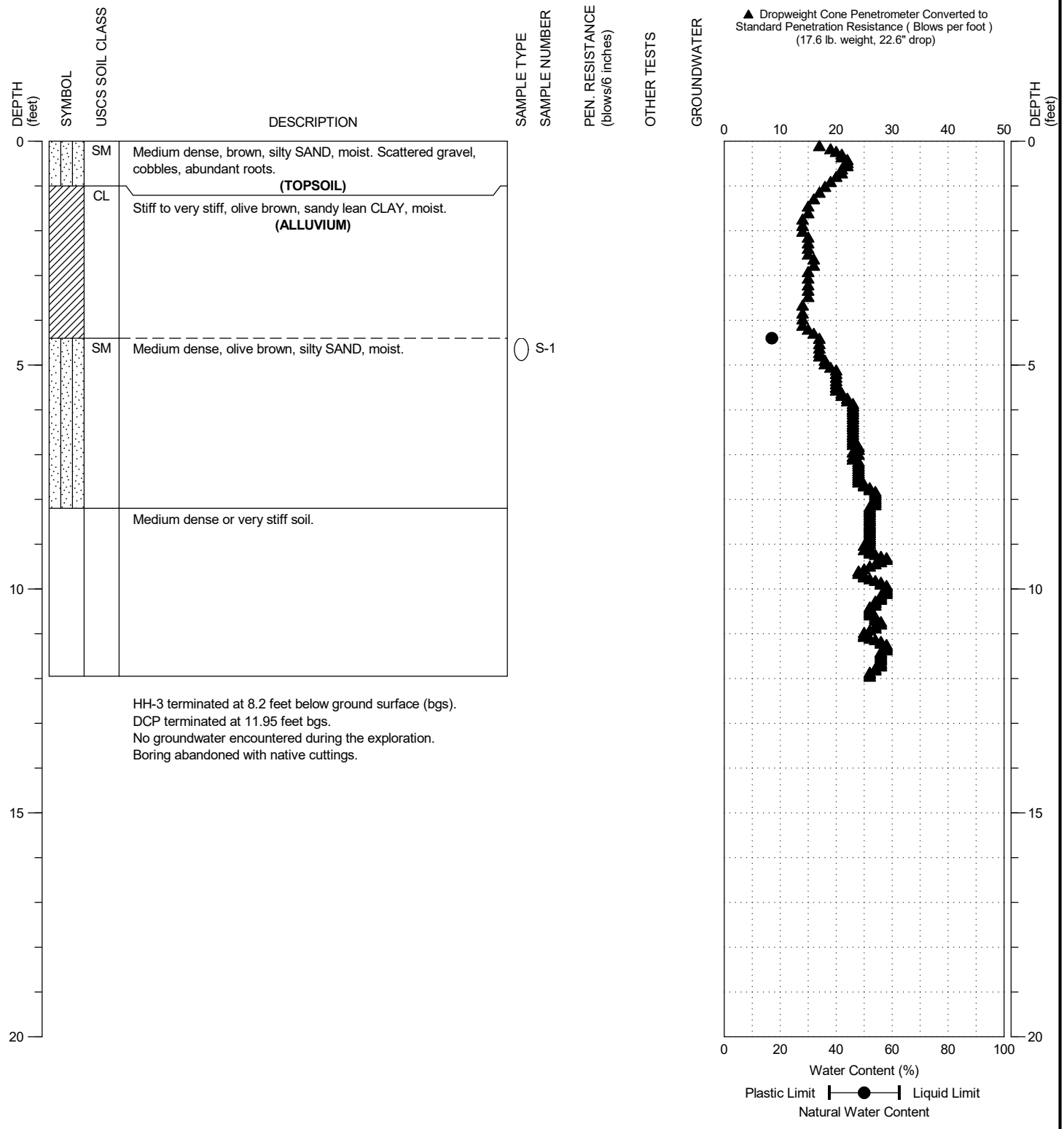
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.759745, Long: -120.733223, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/16/2023
DATE COMPLETED: 5/16/2023
LOGGED BY: M.A. Benson



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 3

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-13

HAND HOLE WITH DCP TO SPT 2022-144.GPJ 12/13/24
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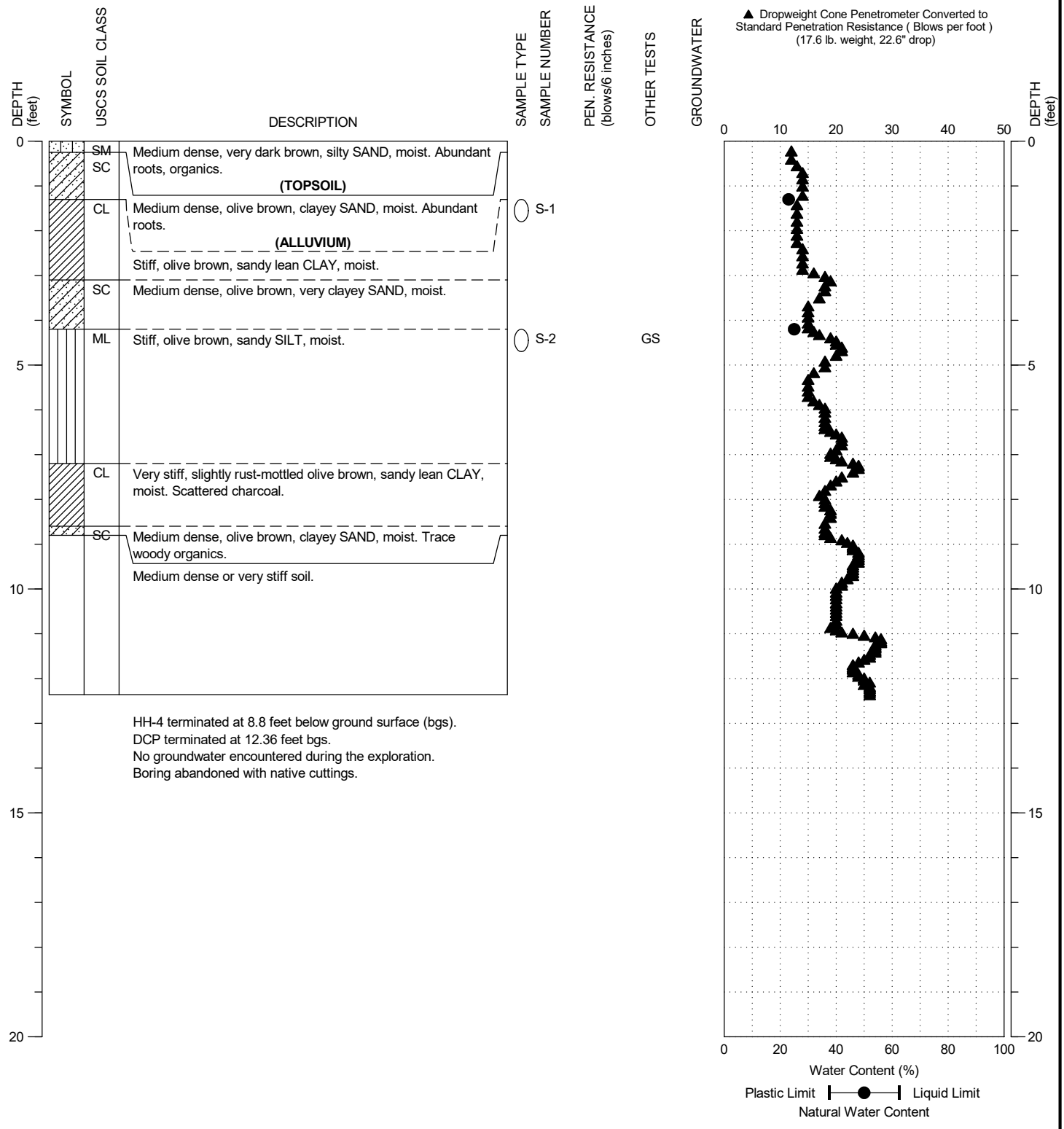
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.759898, Long: -120.731774, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/17/2023
DATE COMPLETED: 5/17/2023
LOGGED BY: M.A. Benson



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GEOSCIENCES INC.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 4

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-14

HAND HOLE WITH DCP TO SPT 2022-144.GPJ 12/13/24
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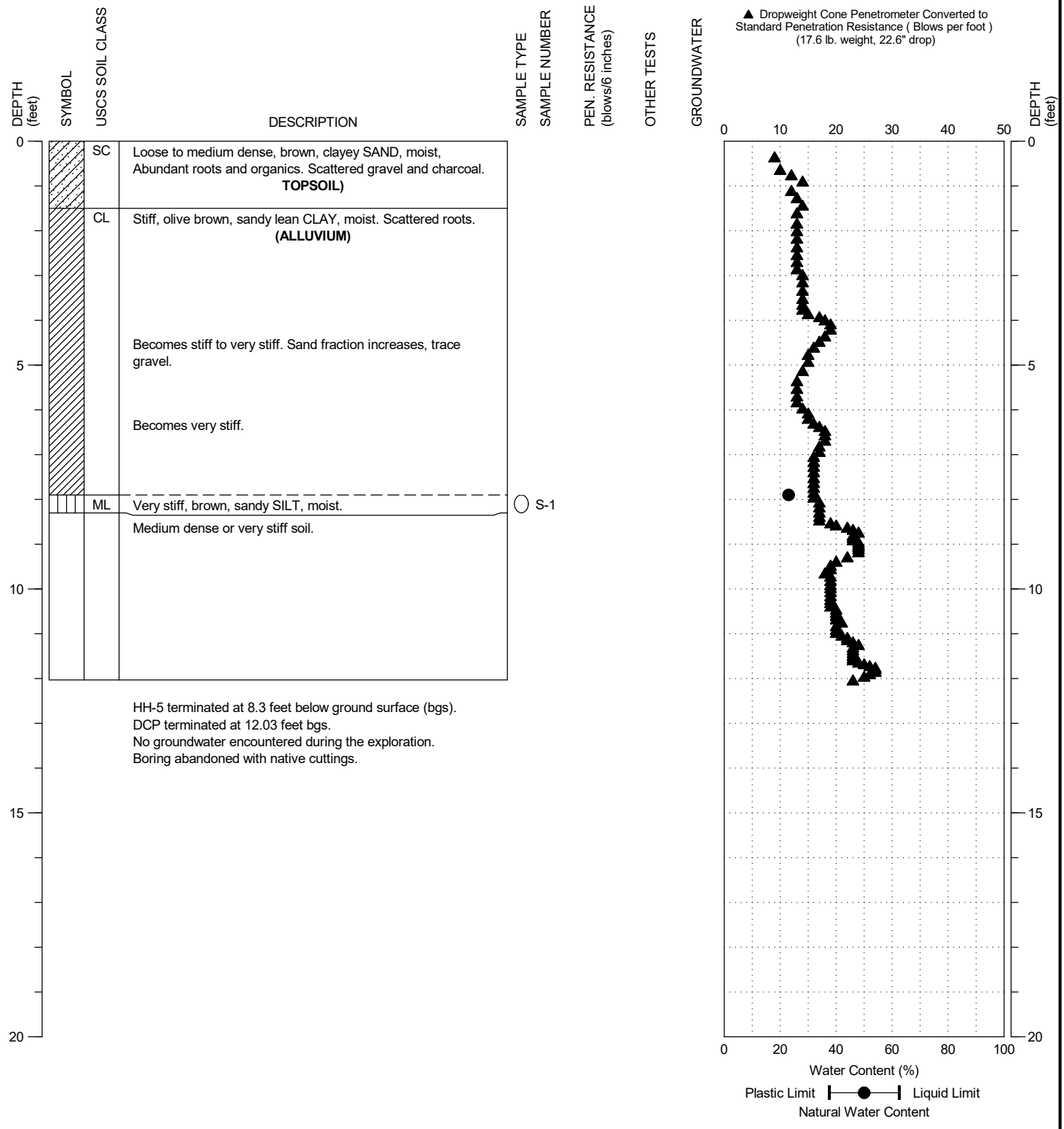
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.760076, Long: -120.731231, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/17/2023
DATE COMPLETED: 5/17/2023
LOGGED BY: M.A. Benson



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GEOSCIENCES INC.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 5

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-15

HAND HOLE WITH DCP TO SPT 2022-144.GPJ 12/13/24
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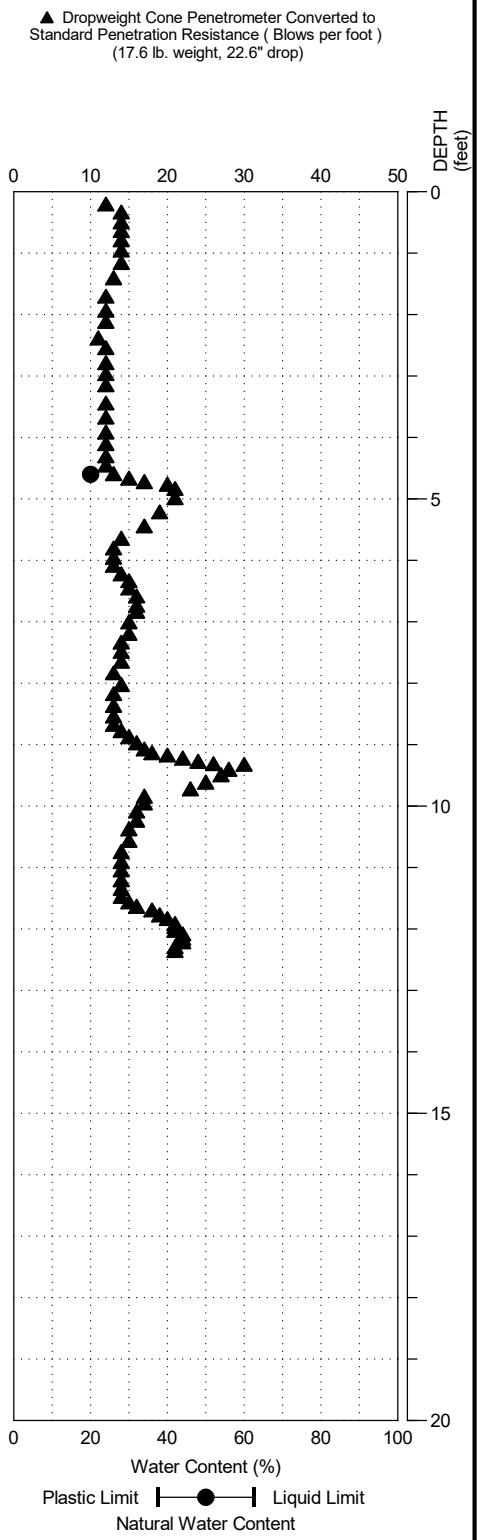
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.760375, Long: -120.730527, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/17/2023
DATE COMPLETED: 5/17/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
0		SC	Medium dense, dark brown, clayey SAND, moist. Abundant roots.					
			(TOPSOIL)					
		CL	Stiff, olive brown, sandy lean CLAY, moist.					
			(ALLUVIUM)					
5			Very stiff, olive brown, slightly gravelly, sandy lean CLAY, moist. Scattered roots.		S-1			
			Stiff, olive brown, sandy lean CLAY, moist. Scattered charcoal.					
			Contains scattered roots.					
			Sand fraction increases.					
10			Medium dense, or very stiff to hard soil.					
15								
20								

HH-6 terminated at 8 feet below ground surface (bgs).
DCP terminated at 12.35 feet bgs.
No groundwater encountered during the exploration.
Boring abandoned with native cuttings.



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GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 6

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-16

HAND HOLE WITH DCP TO SPT 2022-144.GPJ 12/13/24
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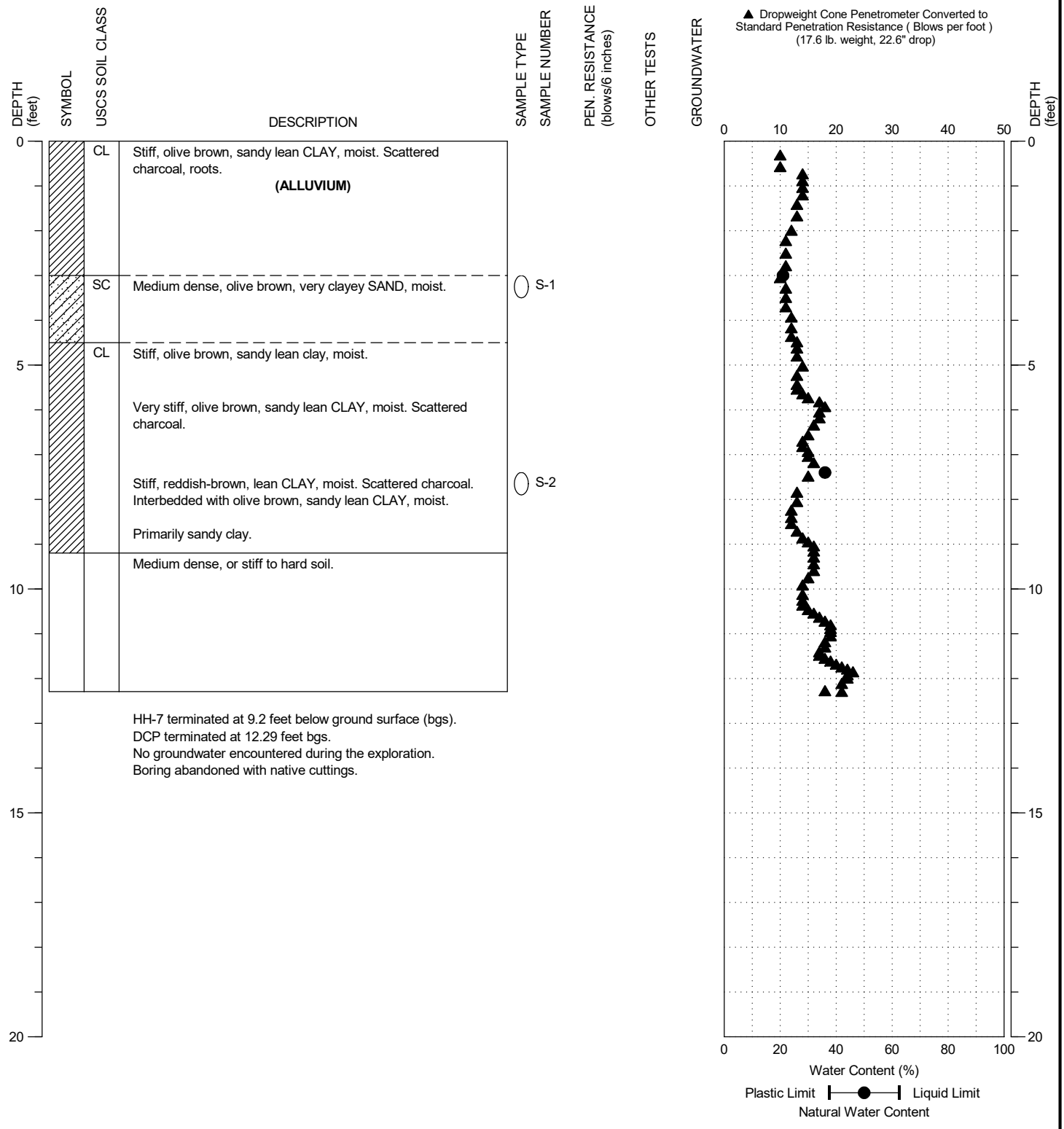
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.760714, Long: -120.7296, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/17/2023
DATE COMPLETED: 5/17/2023
LOGGED BY: M.A. Benson



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GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 7

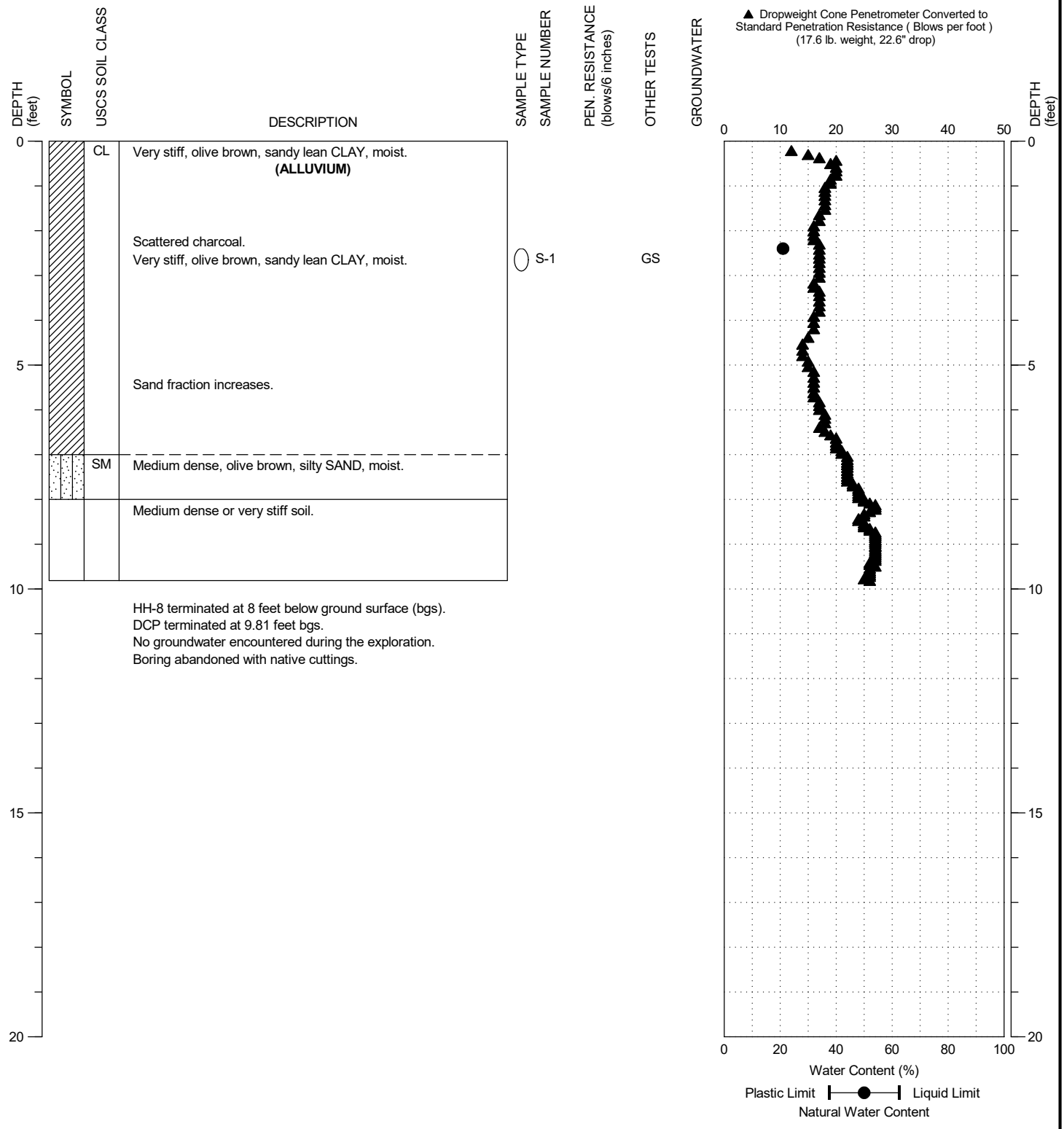
PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-17

DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.761802, Long: -120.728441, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/18/2023
DATE COMPLETED: 5/18/2023
LOGGED BY: M.A. Benson



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GEOSCIENCES INC.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

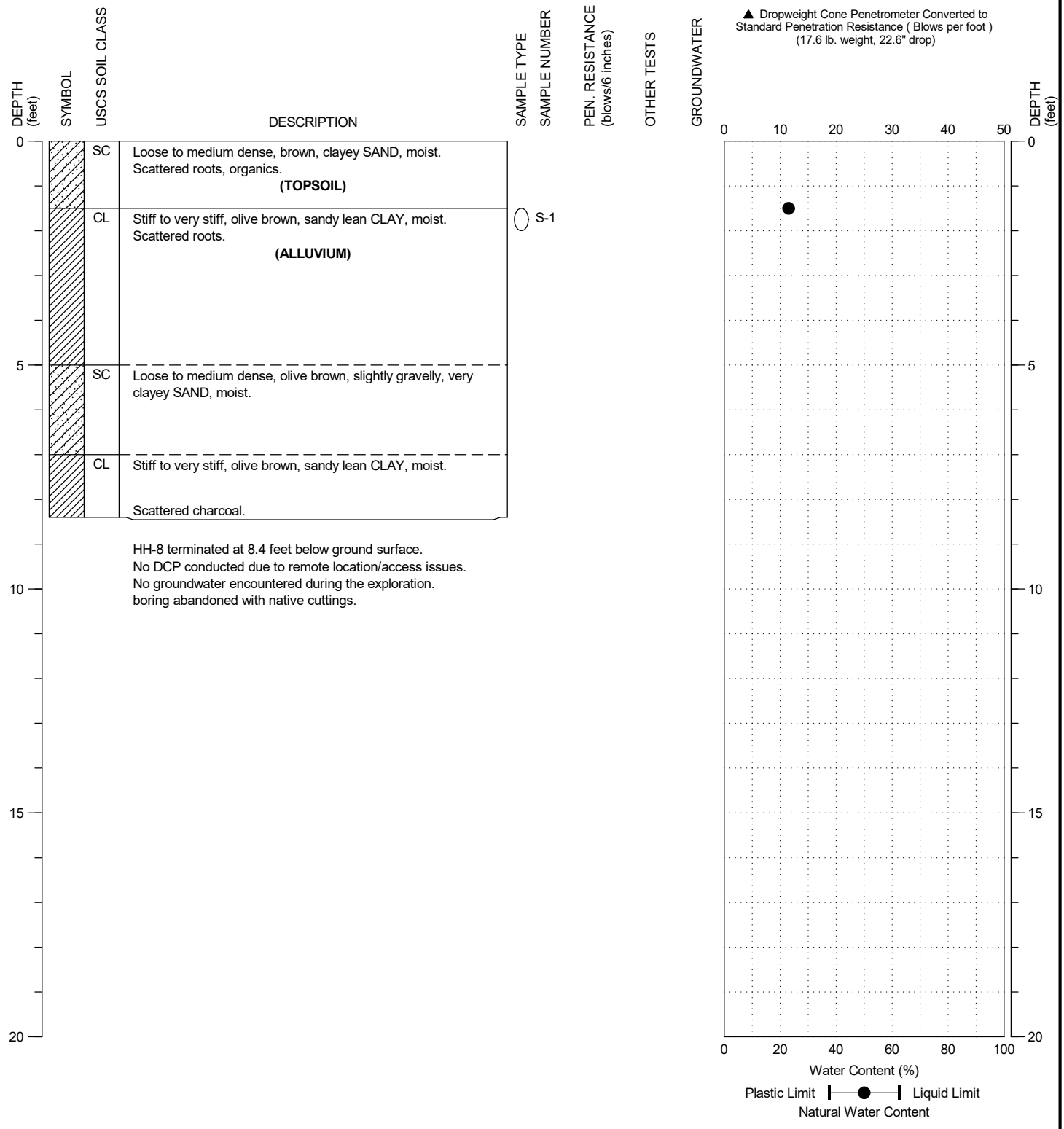
HAND HOLE:
HH- 8

PROJECT NO.: 2022-144-21 FIGURE: A-18

DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.762519, Long: -120.728384, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/18/2023
DATE COMPLETED: 5/18/2023
LOGGED BY: M.A. Benson



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GEOSCIENCES INC.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH- 9

PROJECT NO.: 2022-144-21 FIGURE: A-19

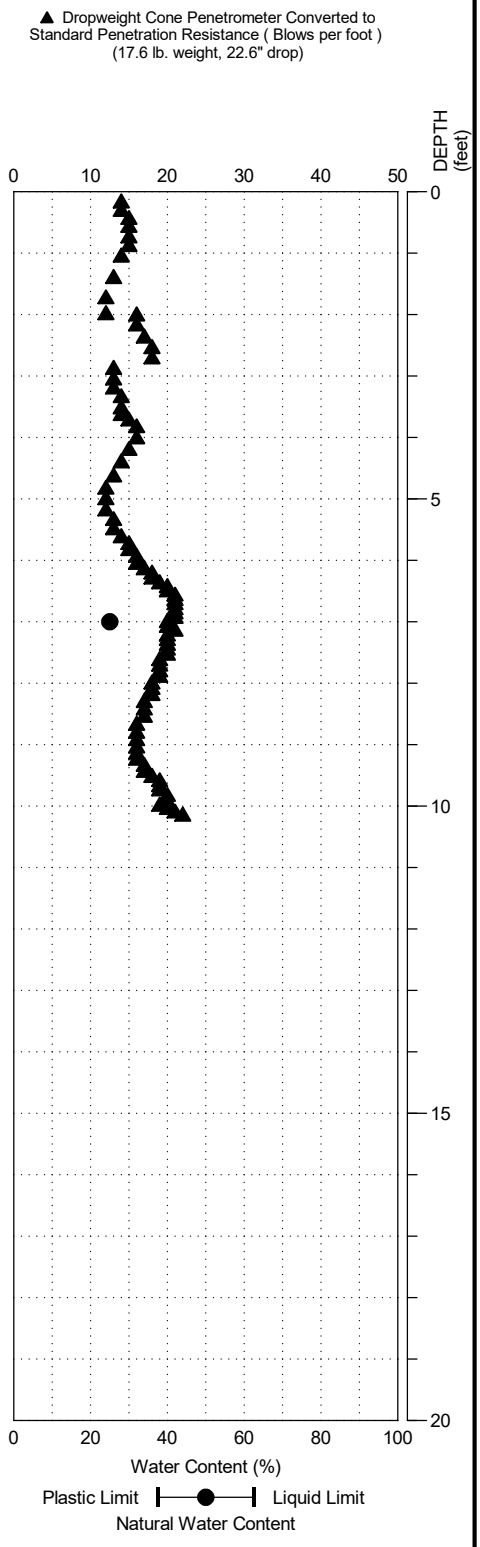
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.763085, Long: -120.728645, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/18/2023
DATE COMPLETED: 5/18/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE / SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
0		SC	Medium dense, brown, clayey SAND, moist. Scattered organics. **(TOPSOIL)**				
		CL	Stiff, olive brown, sandy lean CLAY, moist. Scattered organics. **(ALLUVIUM)**				
			Scattered gravel. Scattered charcoal.				
5			Becomes very stiff.				
			Very stiff, oilve brown, sandy lean CLAY, moist.	S-1			
			Medium dense or very stiff soil.				
10							
15							
20							

HH-10 terminated at 8.7 feet below ground surface (bgs).
DCP terminated at 10.13 feet bgs.
No groundwater encountered during the exploration.
Boring abandoned with native cuttings.



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GEOSCIENCES INC.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH-10

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-20

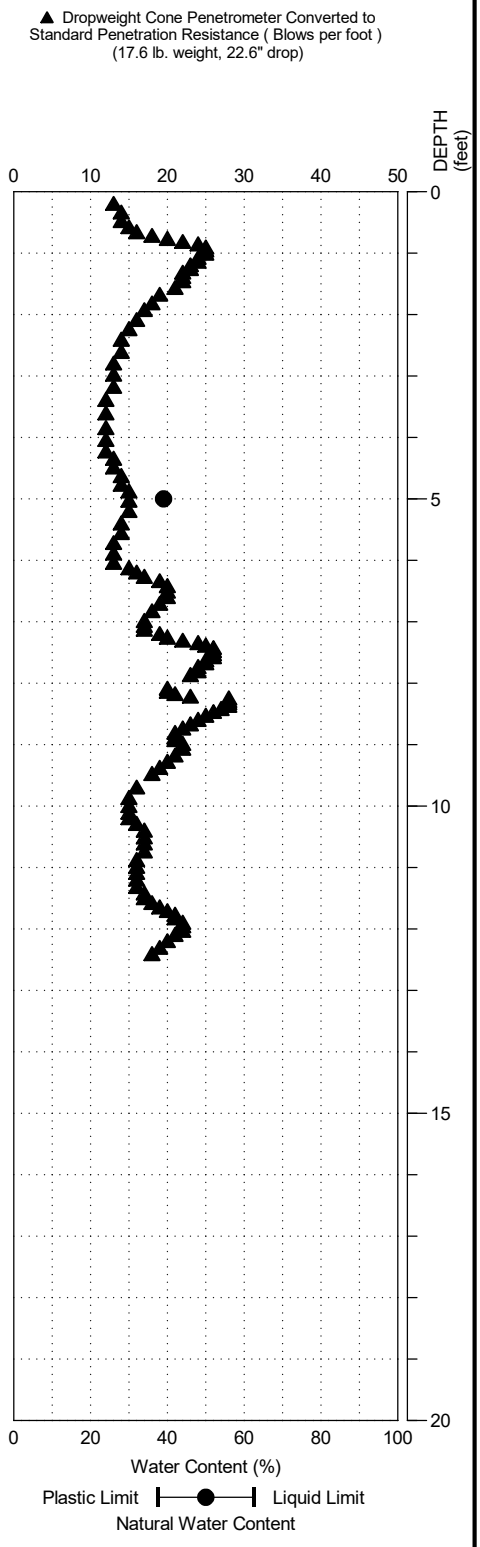
DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.763708, Long: -120.728867, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/16/2023
DATE COMPLETED: 5/16/2023
LOGGED BY: M.A. Benson

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE / SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
0		SC	Medium dense, dark olive brown, clayey SAND, moist. Scattered charcoal, roots. **(FILL)**				
		CL	Stiff, olive brown, sandy lean CLAY, moist. **(ALLUVIUM)**				
5			Becomes very stiff.	S-1			
		SC	Medium dense, olive brown, gravelly, clayey SAND, moist.				
10			Medium dense or very stiff soil.				
15							
20							

HH-11 terminated at 9 feet below ground surface (bgs).
DCP terminated at 12.4 feet bgs.
No groundwater encountered during the exploration.
Boring abandoned with native cuttings.



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GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH-11

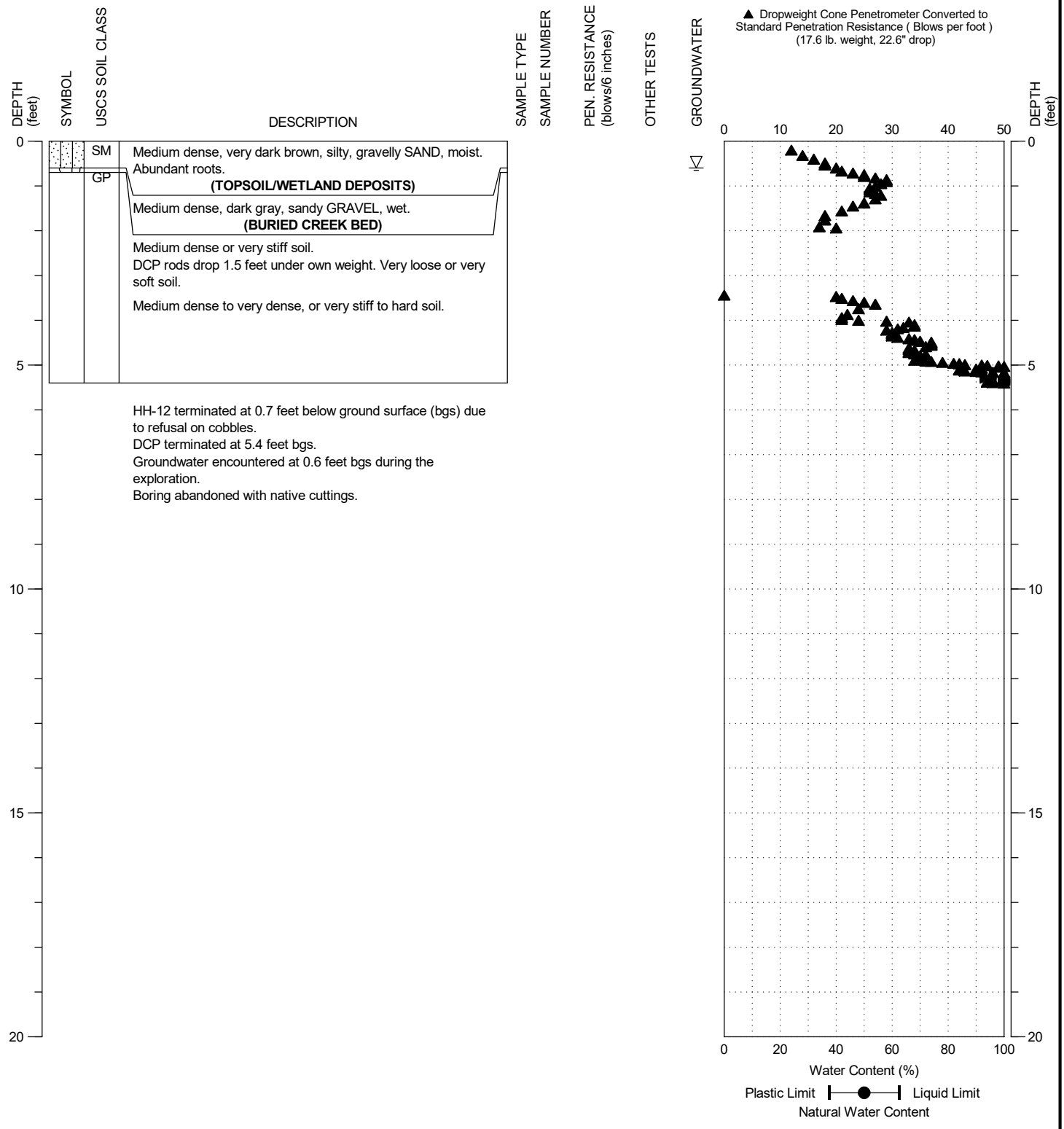
PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-21

DRILLING COMPANY: HWA GeoSciences Inc.
DRILLING METHOD: Hand Bucket Auger, 3" ID
SAMPLING METHOD: Grab
LOCATION: See Figure 2; Lat: 47.764288, Long: -120.728818, Datum: NAD83

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 5/16/2023
DATE COMPLETED: 5/16/2023
LOGGED BY: M.A. Benson



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GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

HAND HOLE:
HH-12

PAGE: 1 of 1

PROJECT NO.: 2022-144-21 FIGURE: A-22

HAND HOLE WITH DCP TO SPT 2022-144.GPJ 12/13/24
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APPENDIX B

LABORATORY TESTING

DRAFT

APPENDIX B

LABORATORY TESTING

Representative soil samples obtained from the explorations were placed in plastic bags to prevent loss of moisture and transported to our Bothell, Washington, laboratory for further examination and testing. Laboratory tests were conducted on selected soil samples to characterize relevant engineering and index properties of the site soils.

MOISTURE CONTENT OF SOIL: The moisture content of selected soil samples (percent by dry mass) was determined in general accordance with ASTM D 2216. The results are shown at the sampled intervals on the appropriate summary logs in Appendix A and on the Summary of Material Properties provided on Figures B-1 and B-3 in Appendix B.

PARTICLE SIZE ANALYSIS OF SOILS: Selected samples were tested to determine the particle (grain) size distribution of material in general accordance with ASTM D 422. The results are summarized on the attached Summary of Material Properties, Figures B-1 and B-3, and Particle Size Analysis of Soils reports, Figures B-4 and B-9 (Appendix B) which also provide information regarding the classification of the sample.

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ATTERBERG LIMITS): Selected samples were tested using method ASTM D 4318, multi-point method. The results are reported on the attached Liquid Limit, Plastic Limit, and Plasticity Index report, Figure B-10 (Appendix B)

DIRECT SHEAR TESTING: Selected samples were tested to determine shear strength parameters of the material in general accordance with ASTM D 3080. The results are summarized in the direct shear test reports, Figures B-11 and B-12 (Appendix B).

CONSOLIDATION TESTING: A select sample was tested to determine consolidation parameters of the material in general accordance with ASTM D 2435. The results are summarized in the direct shear test reports, Figures B-13 through B-17 (Appendix B).

DRAFT

EXPLORATION DESIGNATION	TOP DEPTH (feet)	BOTTOM DEPTH (feet)	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	SPECIFIC GRAVITY	ATTERBERG LIMITS (%)			% GRAVEL	% SAND	% FINES	ASTM SOIL CLASSIFICATION	SAMPLE DESCRIPTION
						LL	PL	PI					
BH-01,S-1	2.5	4.0	18.1									CL	Brown, sandy lean CLAY
BH-01,S-5	12.5	14.0	21.9									CL	Brown, sandy lean CLAY
BH-01,S-6b	15.5	16.5	17.7									SM	Yellowish-brown, silty SAND
BH-01,S-10	30.0	31.5	6.9						42.9	47.6	9.5	SP-SM	Dark grayish-brown, poorly graded SAND with silt and gravel
BH-02,S-2	5.0	6.5	19.6									CL	Yellowish-brown, sandy lean CLAY
BH-02,S-4	10.0	11.5	23.9			34	26	8			54.4	ML	Yellowish-brown, sandy SILT
BH-02,S-6	15.0	16.5	18.9									CL	Yellowish-brown, sandy lean CLAY
BH-02,S-8b	21.0	21.5	10.7									SM	Yellowish-brown, silty SAND
BH-02,S-10	30.0	31.5	10.2									SM	Dark grayish-brown, silty SAND
BH-03,S-3	7.5	9.0	18.4									CL	Olive, lean CLAY with sand
BH-03,S-5	12.5	14.0	19.1						0.0	52.5	47.5	SM	Olive, silty SAND
BH-03,S-7	17.5	19.0	20.0									CL	Olive, sandy lean CLAY
BH-03,S-11	35.0	36.5	6.2									SM	Dark olive-gray, silty SAND with gravel
BH-04,S-5	12.5	14.0	17.1									SM	Olive, silty SAND
BH-04,S-6	15.0	16.5	21.0									SM	Olive, silty SAND
BH-04,S-8b	20.5	21.5	38.2									ML	Olive-brown, SILT with sand and organics
BH-04,S-10b	30.5	31.5	11.1									SM	Olive, silty SAND
BH-05,S-2	5.0	6.5	12.2								61.6	ML	Light olive-brown, sandy SILT
BH-05,S-3	7.5	9.0	20.6									SM	Light olive-brown, silty SAND
BH-05,S-4	10.0	11.5	11.4									SM	Olive-brown, silty SAND with gravel

Notes: 1. This table summarizes information presented elsewhere in the report and should be used in conjunction with the report test, other graphs and tables, and the exploration logs.
2. The soil classifications in this table are based on ASTM D2487 and D2488 as applicable.

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Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

SUMMARY OF MATERIAL PROPERTIES

PROJECT NO.: 2022-144-21 FIGURE: B-1

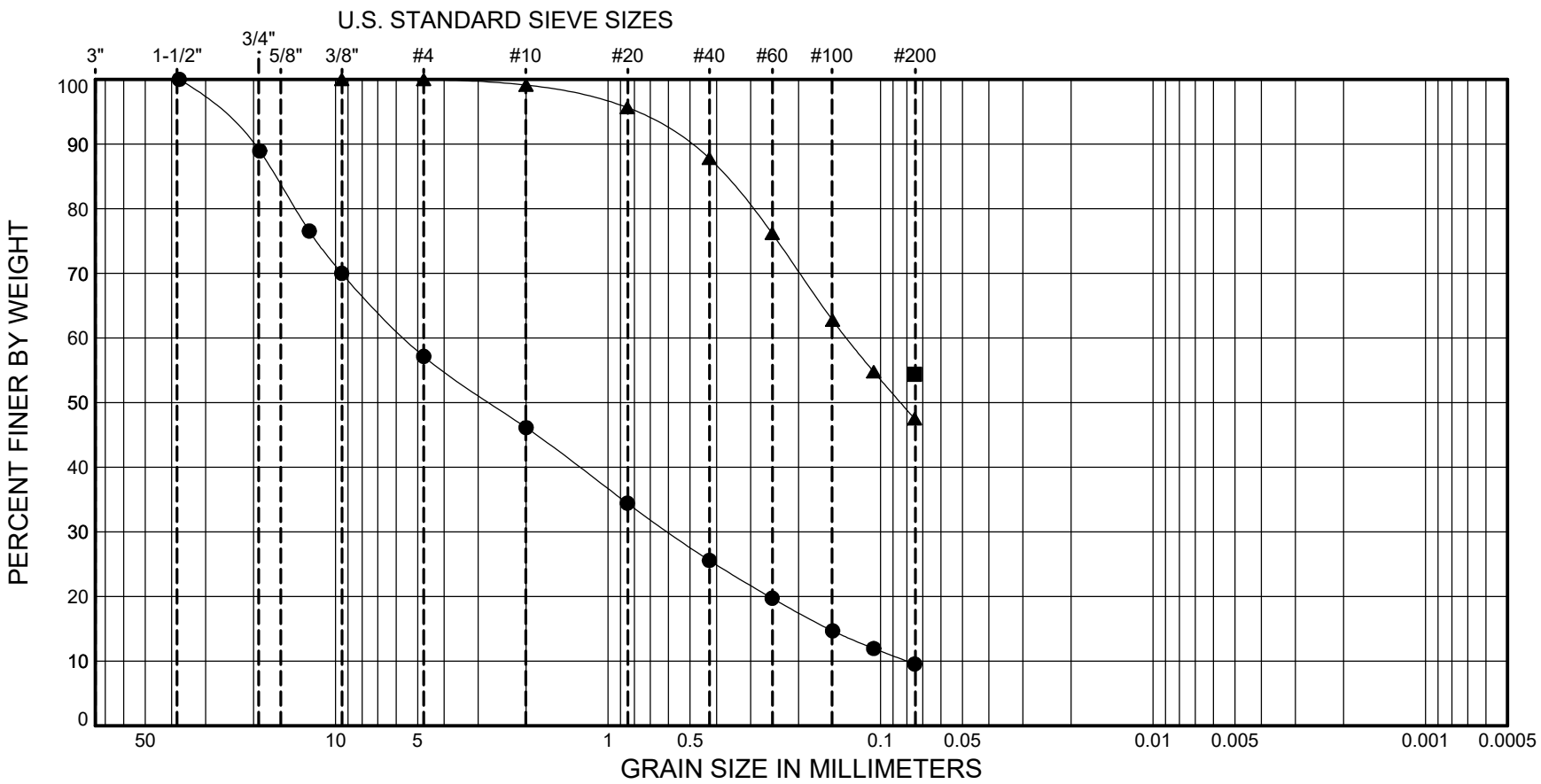
EXPLORATION DESIGNATION	TOP DEPTH (feet)	BOTTOM DEPTH (feet)	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	SPECIFIC GRAVITY	ATTERBERG LIMITS (%)			% GRAVEL	% SAND	% FINES	ASTM SOIL CLASSIFICATION	SAMPLE DESCRIPTION
						LL	PL	PI					
BH-05,S-5	12.5	14.0	6.2						49.0	46.4	4.6	GW	Dark grayish-brown, well-graded GRAVEL with sand
BH-07,S-2	7.5	9.0	15.8									SM	Light yellowish-brown, silty SAND
BH-07,S-5	15.0	16.5	14.1									SM	Light yellowish-brown, silty SAND
BH-07,S-7	20.0	21.5	16.6									SM	Light yellowish-brown, silty SAND
BH-09,S-1	2.5	4.0	9.4									SM	Light yellowish-brown, silty SAND
BH-09,S-3	7.5	9.0	19.0			35	24	11			45.4	SC	Light olive-brown, clayey SAND
BH-09,S-4	10.0	11.5	13.1									ML	Light olive-brown, sandy SILT
BH-09,S-5	12.5	14.0	24.5			35	23	12			55.6	CL	Light olive-brown, sandy lean CLAY
BH-09,S-6	15.0	16.5	25.6									ML	Light olive-brown, SILT with sand
BH-10,S-1	2.5	4.0	14.8			36	24	12			47.8	SC	Light yellowish-brown, clayey SAND
BH-10,S-2	5.0	6.5	15.5									ML	Light yellowish-brown, sandy SILT
BH-10,S-4	10.0	11.5	22.0			39	26	13			59.6	ML	Light olive-brown, sandy SILT
BH-10,S-5	12.5	14.0	18.6									SM	Yellowish-brown, silty SAND
BH-10,S-6b	16.0	16.5	26.5								62.6	ML	Olive, sandy SILT
BH-10,S-7	17.5	19.0	19.0									SM	Brown, silty SAND
BH-10,S-8	20.0	21.5	12.6						18.0	59.4	22.7	SM	Olive-brown, silty SAND with gravel
BH-11,S-1	2.5	4.0	10.8						35.6	61.2	3.1	SW	Olive-brown, well-graded SAND with gravel
BH-11,S-3	7.5	9.0	14.0									SP	Dark grayish-brown, poorly graded SAND with gravel
BH-11,S-5b	16.2	16.5	30.0			28	25	3			75.9	ML	Dark grayish-brown, SILT with sand
HH- 1,S-1	1.5	2.0	21.1							35.3	64.7	CL	Olive-brown, sandy lean CLAY

Notes: 1. This table summarizes information presented elsewhere in the report and should be used in conjunction with the report test, other graphs and tables, and the exploration logs.
2. The soil classifications in this table are based on ASTM D2487 and D2488 as applicable.

EXPLORATION DESIGNATION	TOP DEPTH (feet)	BOTTOM DEPTH (feet)	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	SPECIFIC GRAVITY	ATTERBERG LIMITS (%)			% GRAVEL	% SAND	% FINES	ASTM SOIL CLASSIFICATION	SAMPLE DESCRIPTION
						LL	PL	PI					
HH- 1,S-2	6.0	6.5	23.0									SM	Olive, silty SAND
HH- 1,S-3	8.0	8.5	36.0									SC	Brown, clayey SAND
HH- 2,S-1	2.0	2.5	24.8									CL	Olive-brown, sandy lean CLAY
HH- 3,S-1	4.4	4.9	16.8									SM	Light olive-brown, silty SAND
HH- 4,S-1	1.3	1.8	22.9									CL	Olive, sandy lean CLAY
HH- 4,S-2	4.2	4.7	25.1							39.1	60.9	ML	Olive, sandy SILT
HH- 5,S-1	7.9	8.3	22.7									ML	Light olive-brown, sandy SILT
HH- 6,S-1	4.6	5.1	19.9									CL	Olive, sandy lean CLAY
HH- 7,S-1	3.0	3.5	20.6									SC	Olive, clayey SAND
HH- 7,S-2	7.4	7.9	35.8									CL	Brown, lean CLAY with trace organics
HH- 8,S-1	2.4	2.9	20.7							35.2	64.8	CL	Olive, sandy lean CLAY
HH- 9,S-1	1.5	2.0	23.1									CL	Olive, sandy lean CLAY with trace organics
HH-10,S-1	7.0	7.5	25.3									CL	Olive, sandy lean CLAY
HH-11,S-1	5.0	5.5	39.0									CL	Olive, sandy lean CLAY

Notes: 1. This table summarizes information presented elsewhere in the report and should be used in conjunction with the report test, other graphs and tables, and the exploration logs.
2. The soil classifications in this table are based on ASTM D2487 and D2488 as applicable.

GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-01	S-10	30.0 - 31.5	(SP-SM) Dark grayish-brown, poorly graded SAND with silt and gravel	7				42.9	47.6			9.5
■	BH-02	S-4	10.0 - 11.5	(ML) Yellowish-brown, sandy SILT	24	34	26	8					54.4
▲	BH-03	S-5	12.5 - 14.0	(SM) Olive, silty SAND	19				0.0	52.5			47.5

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Yakama Nation Nason Creek Floodplain
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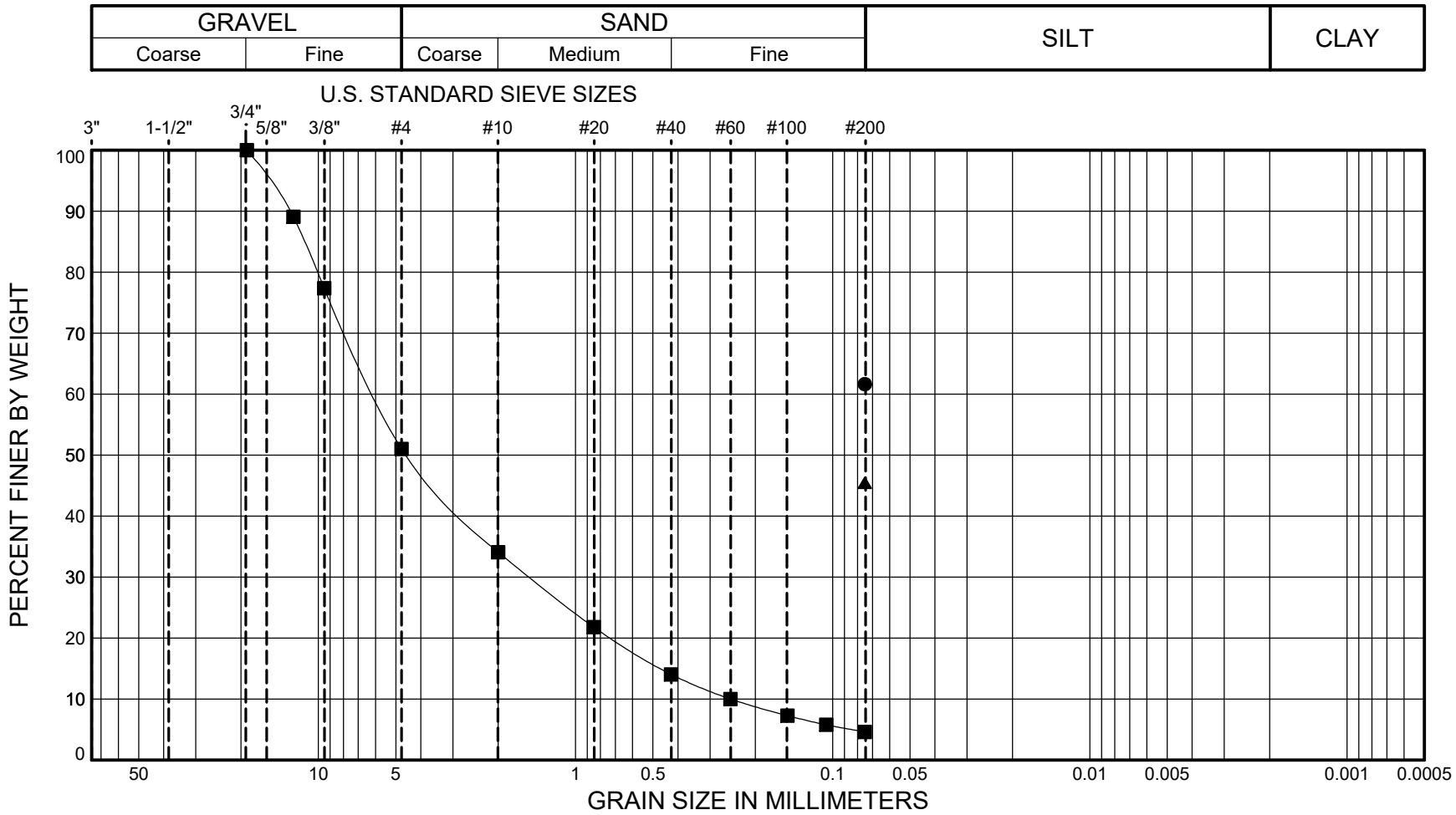
PARTICLE-SIZE ANALYSIS OF SOILS METHODS ASTM D6913/D7928/D1140

PROJECT NO.: 2022-144-21 FIGURE: B-4



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-05	S-2	5.0 - 6.5	(ML) Light olive-brown, sandy SILT	12								61.6
■	BH-05	S-5	12.5 - 14.0	(GW) Dark grayish-brown, well-graded GRAVEL with sand	6				49.0	46.4			4.6
▲	BH-09	S-3	7.5 - 9.0	(SC) Light olive-brown, clayey SAND	19	35	24	11					45.4

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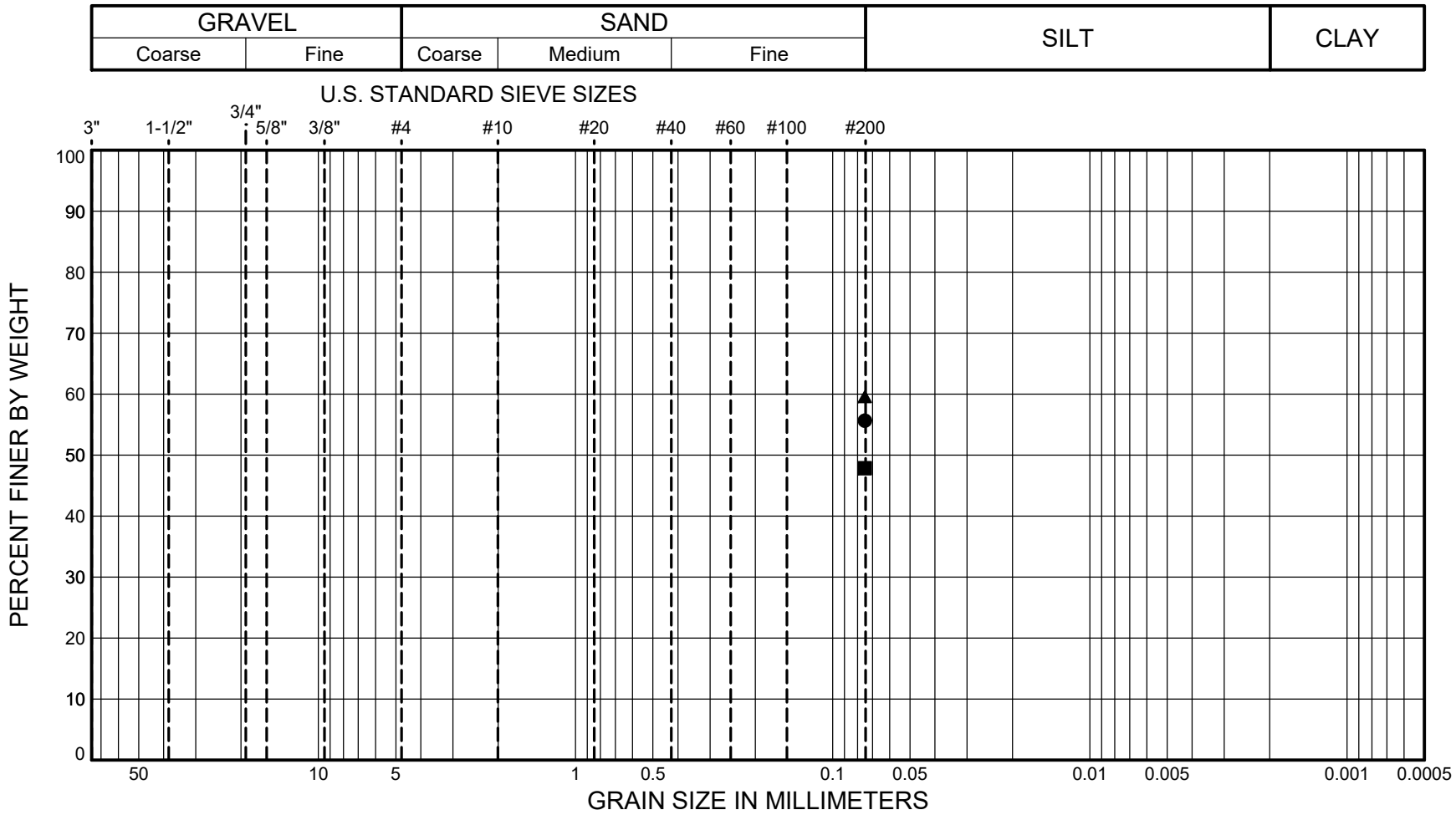
Chelan County, Washington

PARTICLE-SIZE ANALYSIS
OF SOILS
METHODS ASTM D6913/D7928/D1140

PROJECT NO.: 2022-144-21 FIGURE: B-5



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-09	S-5	12.5 - 14.0	(CL) Light olive-brown, sandy lean CLAY	25	35	23	12					55.6
■	BH-10	S-1	2.5 - 4.0	(SC) Light yellowish-brown, clayey SAND	15	36	24	12					47.8
▲	BH-10	S-4	10.0 - 11.5	(ML) Light olive-brown, sandy SILT	22	39	26	13					59.6

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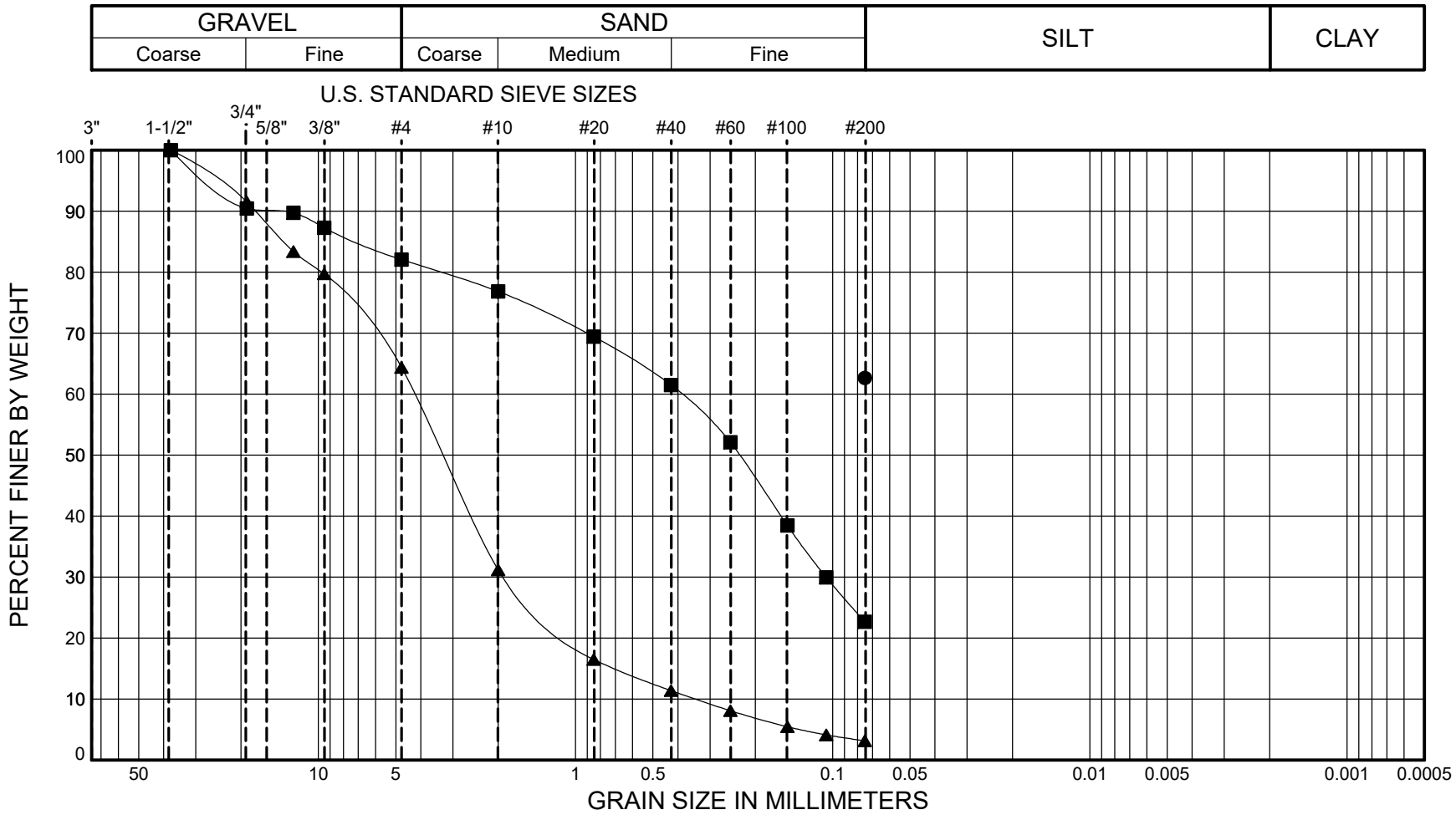
PARTICLE-SIZE ANALYSIS OF SOILS METHODS ASTM D6913/D7928/D1140

PROJECT NO.: 2022-144-21 FIGURE: B-6



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-10	S-6b	16.0 - 16.5	(ML) Olive, sandy SILT	27								62.6
■	BH-10	S-8	20.0 - 21.5	(SM) Olive-brown, silty SAND with gravel	13				18.0	59.4			22.7
▲	BH-11	S-1	2.5 - 4.0	(SW) Olive-brown, well-graded SAND with gravel	11				35.6	61.2			3.1

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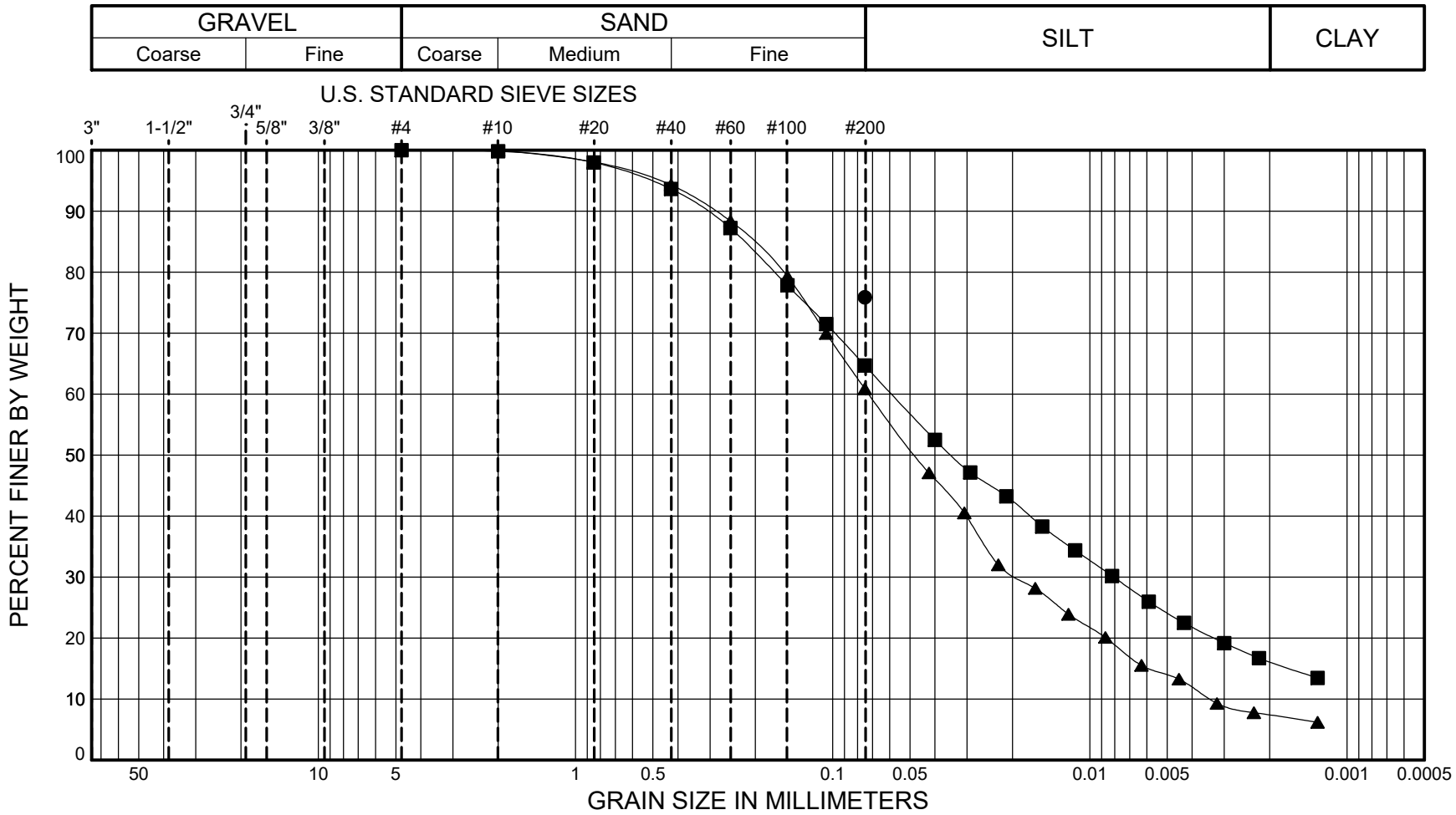
PARTICLE-SIZE ANALYSIS
OF SOILS
METHODS ASTM D6913/D7928/D1140

PROJECT NO.: 2022-144-21 FIGURE: B-7



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-11	S-5b	16.2 - 16.5	(ML) Dark grayish-brown, SILT with sand	30	28	25	3					75.9
■	HH- 1	S-1	1.5 - 2.0	(CL) Olive-brown, sandy lean CLAY	21					35.3	48.6	16.1	
▲	HH- 4	S-2	4.2 - 4.7	(ML) Olive, sandy SILT	25					39.1	53.5	7.4	

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Yakama Nation Nason Creek Floodplain
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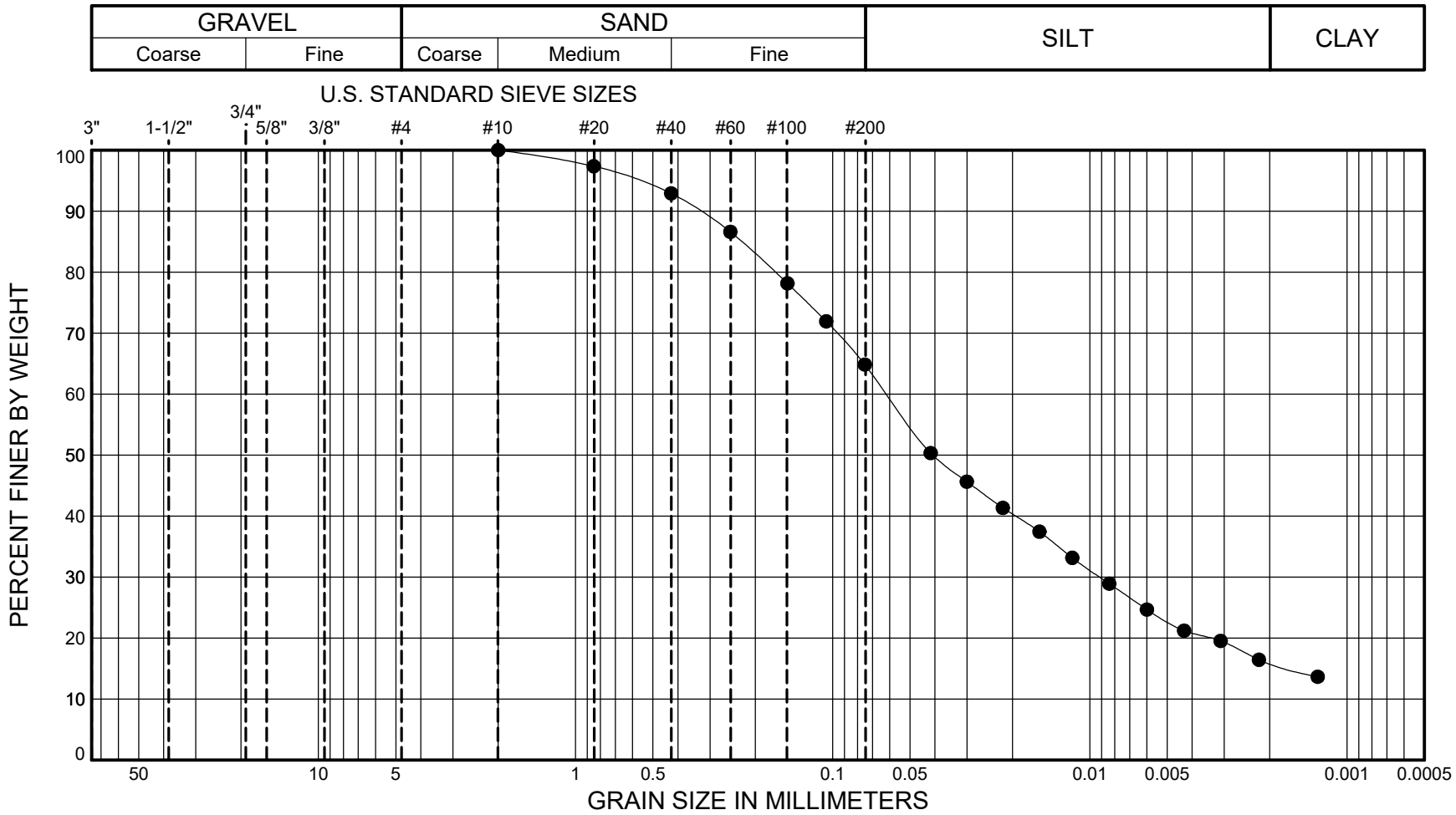
Chelan County, Washington

PARTICLE-SIZE ANALYSIS
OF SOILS
METHODS ASTM D6913/D7928/D1140

PROJECT NO.: 2022-144-21 FIGURE: B-8



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	HH- 8	S-1	2.4 - 2.9	(CL) Olive, sandy lean CLAY	21					35.2	48.9	15.9	

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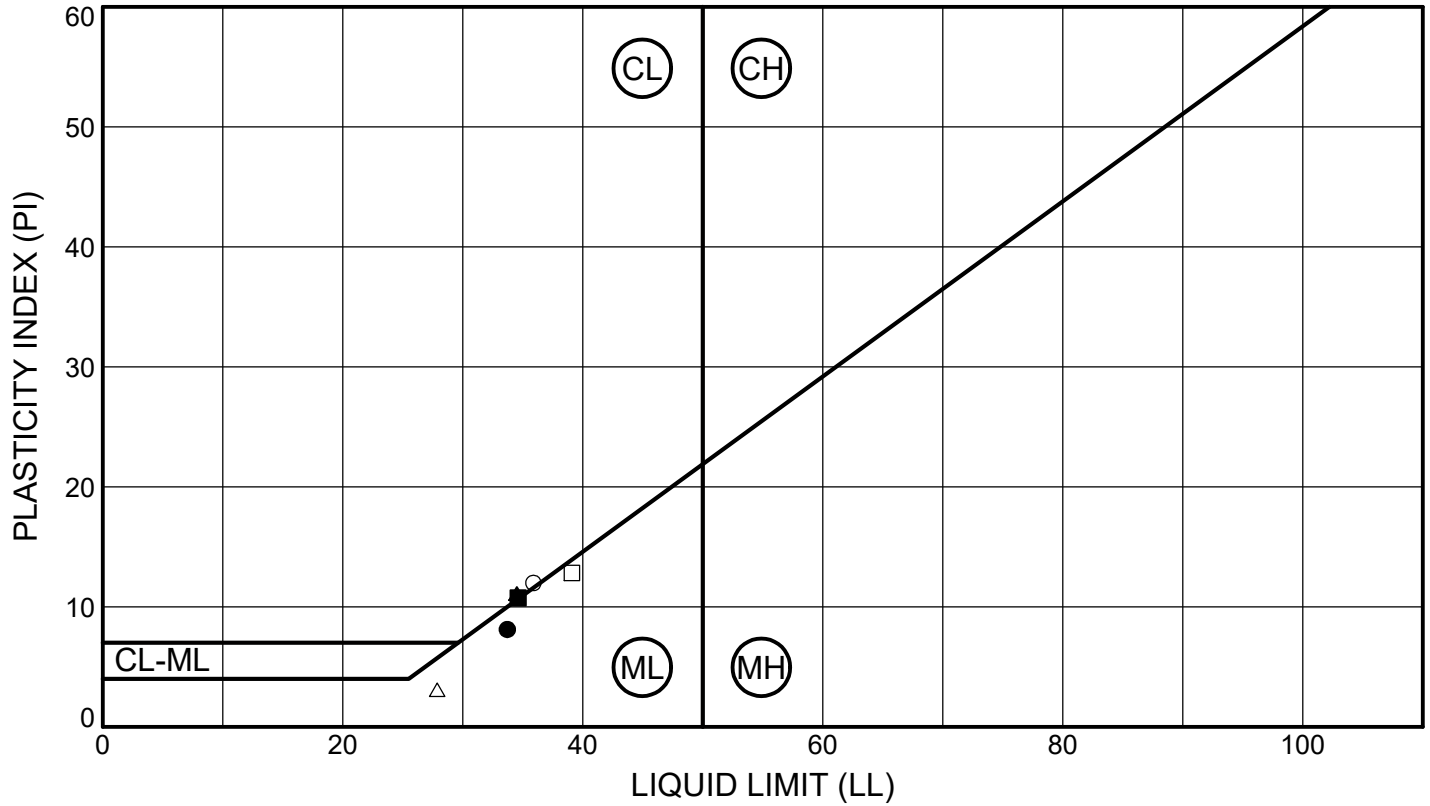
Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

PARTICLE-SIZE ANALYSIS
OF SOILS
METHODS ASTM D6913/D7928/D1140

PROJECT NO.: 2022-144-21 FIGURE: B-9



SYMBOL	SAMPLE		DEPTH (ft)	CLASSIFICATION	% MC	LL	PL	PI	% Fines
●	BH-02	S-4	10.0 - 11.5	(ML) Yellowish-brown, sandy SILT	24	34	26	8	54.4
■	BH-09	S-3	7.5 - 9.0	(SC) Light olive-brown, clayey SAND	19	35	24	11	45.4
▲	BH-09	S-5	12.5 - 14.0	(CL) Light olive-brown, sandy lean CLAY	25	35	23	12	55.6
○	BH-10	S-1	2.5 - 4.0	(SC) Light yellowish-brown, clayey SAND	15	36	24	12	47.8
□	BH-10	S-4	10.0 - 11.5	(ML) Light olive-brown, sandy SILT	22	39	26	13	59.6
△	BH-11	S-5b	16.2 - 16.5	(ML) Dark grayish-brown, SILT with sand	30	28	25	3	75.9

HWA GeoSciences Inc.

Yakama Nation Nason Creek Floodplain
SR 207 Reroute
Chelan County, Washington

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS
METHOD ASTM D4318

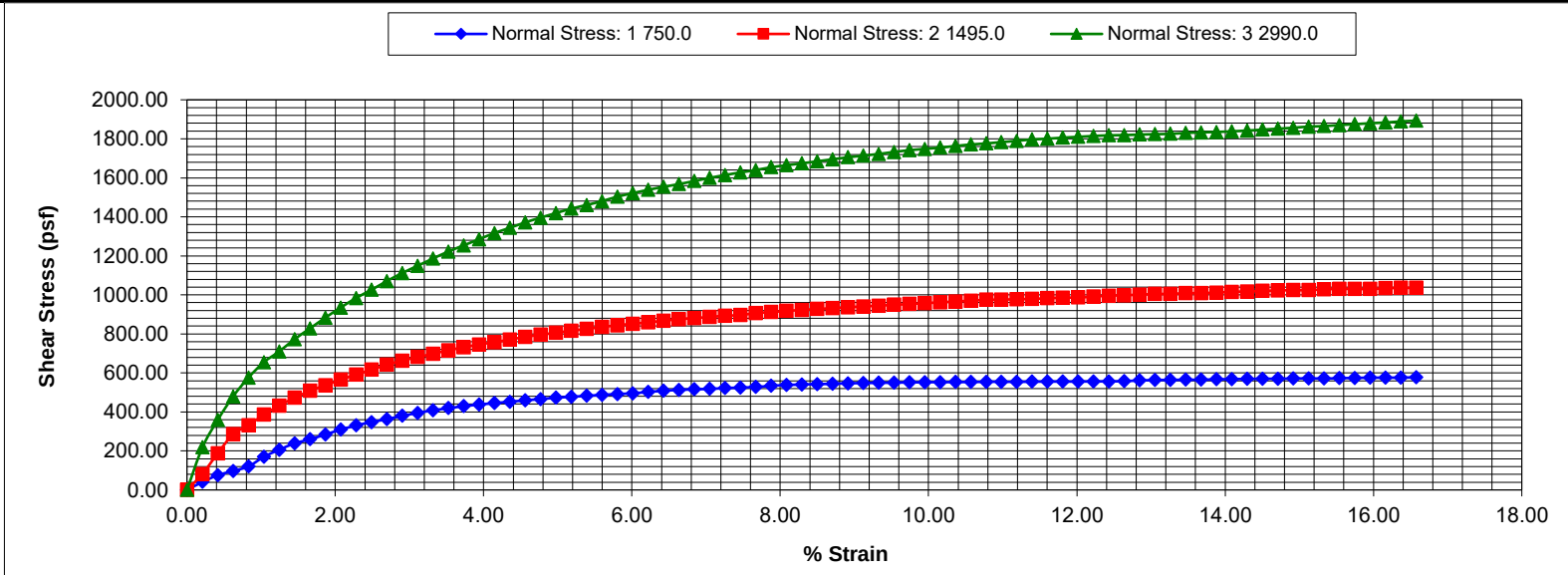
PROJECT NO.: 2022-144-21 FIGURE: B-10

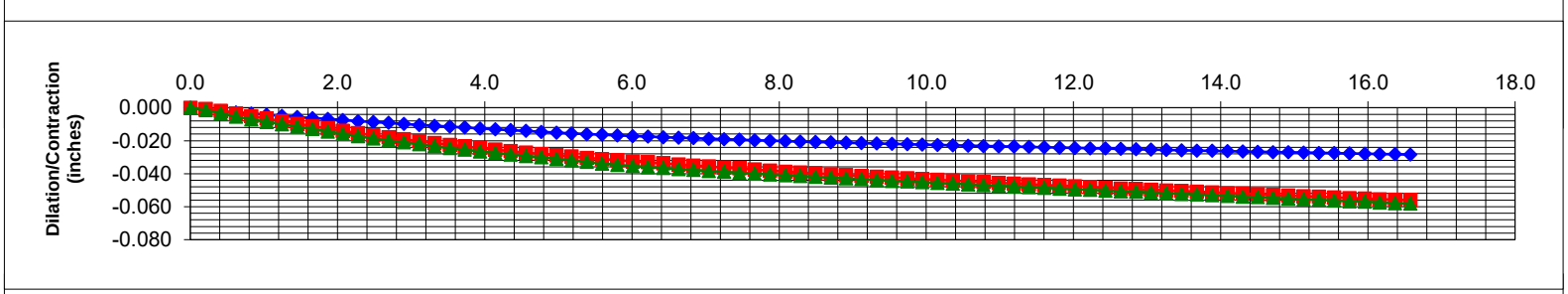
HWA GEOSCIENCES INC. Materials Testing Laboratory

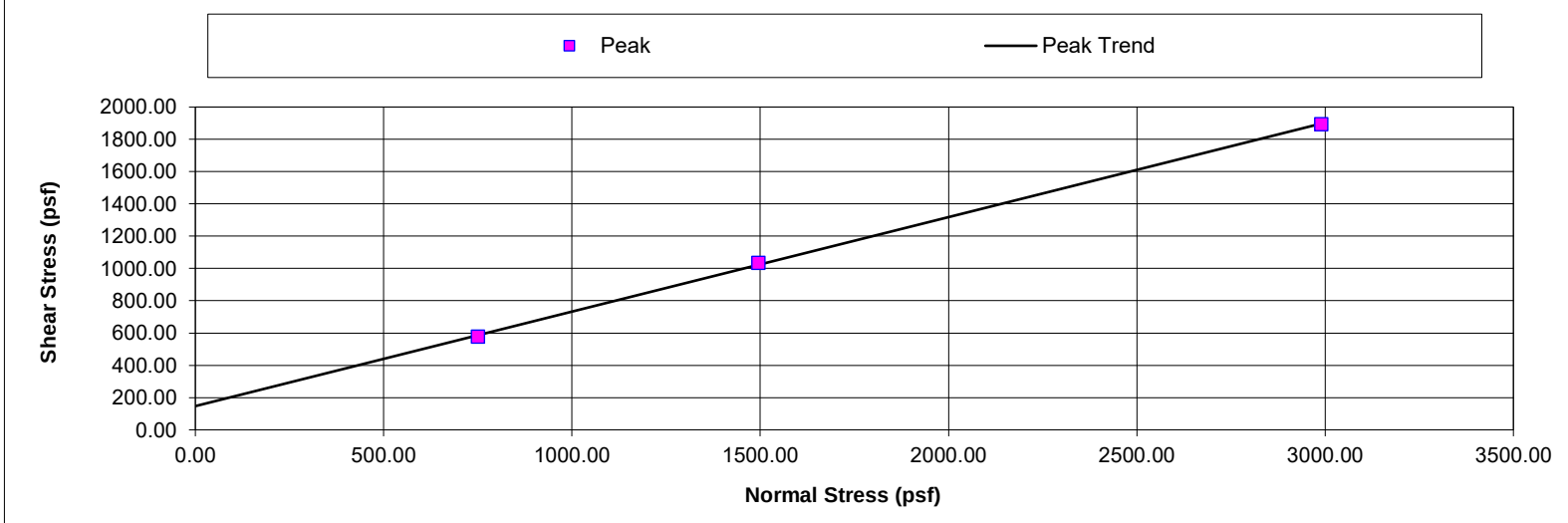
Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D 3080)

Project Name:	Nason Creek Floodplain	**Project Number:**	2022-144
Sample Point:	BH-2 **Sample No.:** S-5	**Sample Depth:**	12.5
Soil Description:	Olive-brown, clayey SAND		
Soil Color:	Olive-brown	Average Strain Rate:	0.5 % per min.
Soil Group Symbol:	SC	Soil Specific Gravity:	2.65 (assumed)

					Indicated Strength Parameters		
Normal Stress (psf)	750.00	1495.00	2990.00	**Average**			
Peak Stress (psf)	577.35	1035.57	1892.98			Cohesion psf	phi Angle (degrees)
Initial Moisture Content (%):	23.3	23.3	23.3	23.3			
Wet Unit Weight (pcf):	111.2	111.1	110.5	110.9			
Dry Unit Weight (pcf):	90.2	90.1	89.6	90.0	Peak	147.2	30.3
Calculated Void Ratio	0.833	0.835	0.845	0.838			
Calculated Porosity	0.454	0.455	0.458	0.456			
Calculated Saturation (%)	74.1	73.9	73.0	73.7			
Final Moisture Content (%)	28.5	27.9	24.5	27.0			







Checked By: SEG Figure B-11

HWA GEOSCIENCES INC. Materials Testing Laboratory

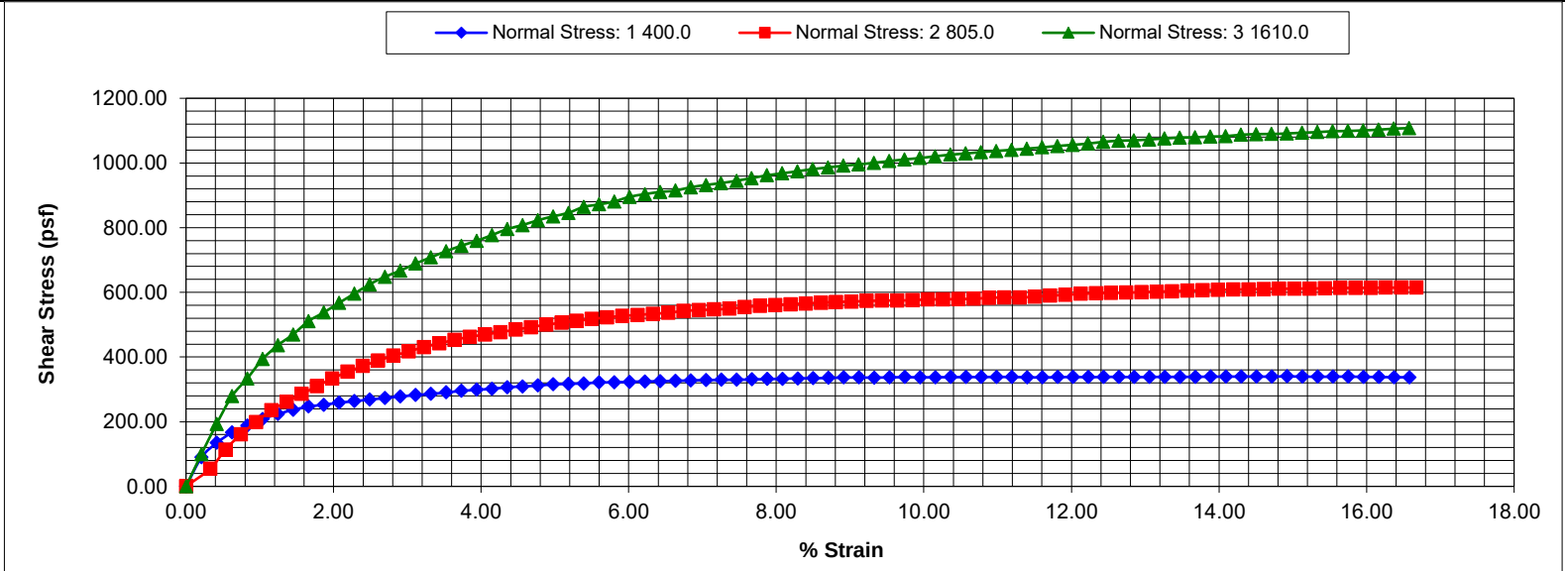
Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D 3080)

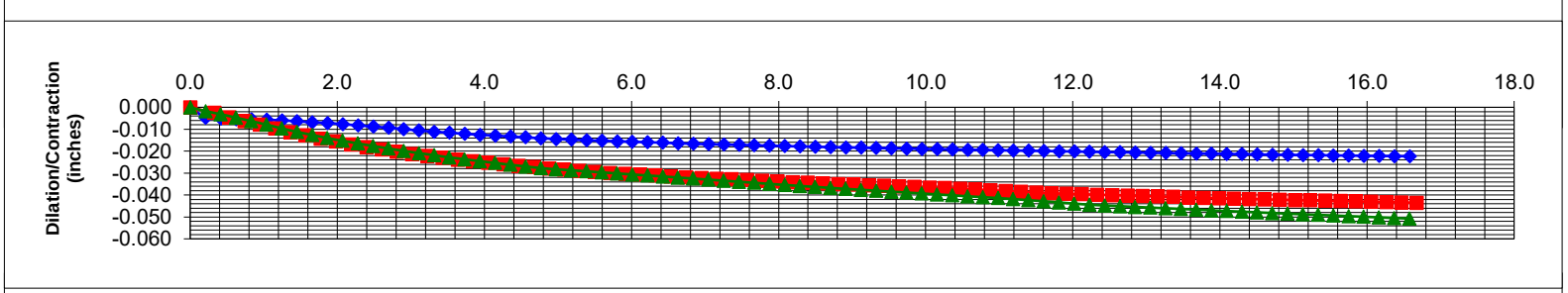
Project Name:	Nason Creek Floodplain	**Project Number:**	2022-144
Sample Point:	BH-4 **Sample No.:** S-2	**Sample Depth:**	5.0
Soil Description:	Olive-brown, lean CLAY with sand		
Soil Color:	Olive-brown	Average Strain Rate:	0.5 % per min.
Soil Group Symbol:	CL	Soil Specific Gravity:	2.65 (assumed)

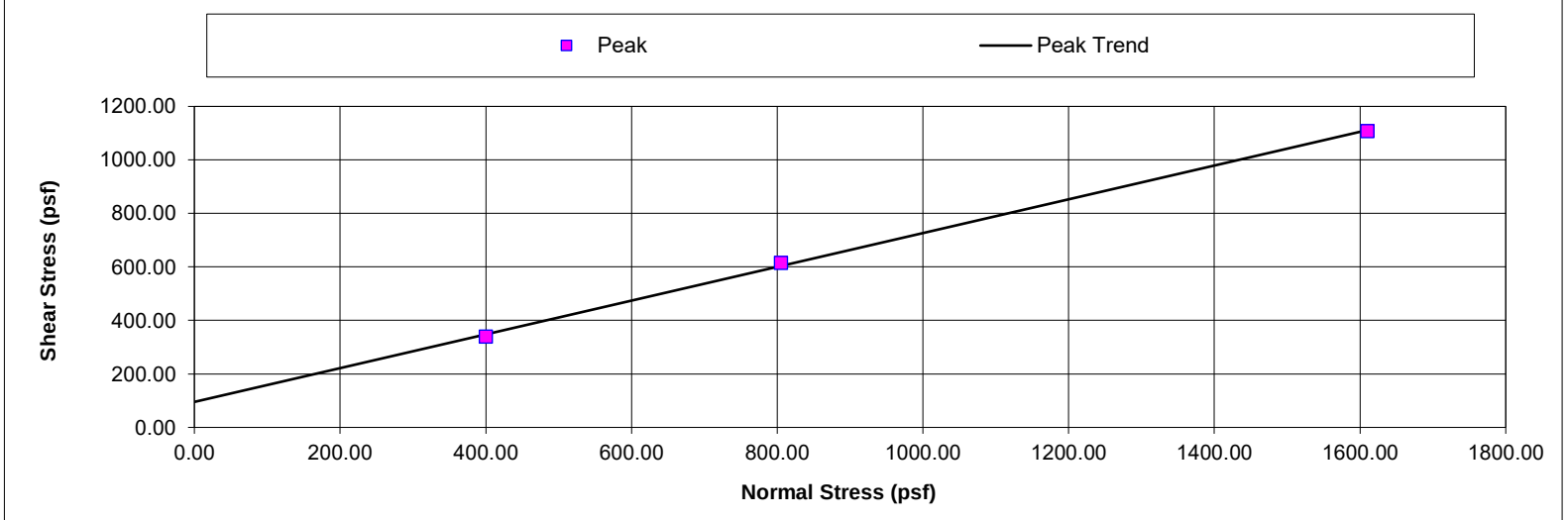
Normal Stress (psf)	400.00	805.00	1610.00	**Average**
Peak Stress (psf)	340.20	614.78	1107.60	
Initial Moisture Content (%):	26.4	26.4	26.4	26.4
Wet Unit Weight (pcf):	108.1	107.0	106.8	107.3
Dry Unit Weight (pcf):	85.5	84.6	84.5	84.9
Calculated Void Ratio	0.934	0.954	0.957	0.948
Calculated Porosity	0.483	0.488	0.489	0.487
Calculated Saturation (%)	75.0	73.4	73.2	73.9
Final Moisture Content (%)	29.8	29.2	27.1	28.7

Indicated Strength Parameters

	Cohesion psf	phi Angle (degrees)
Peak	95.3	32.3



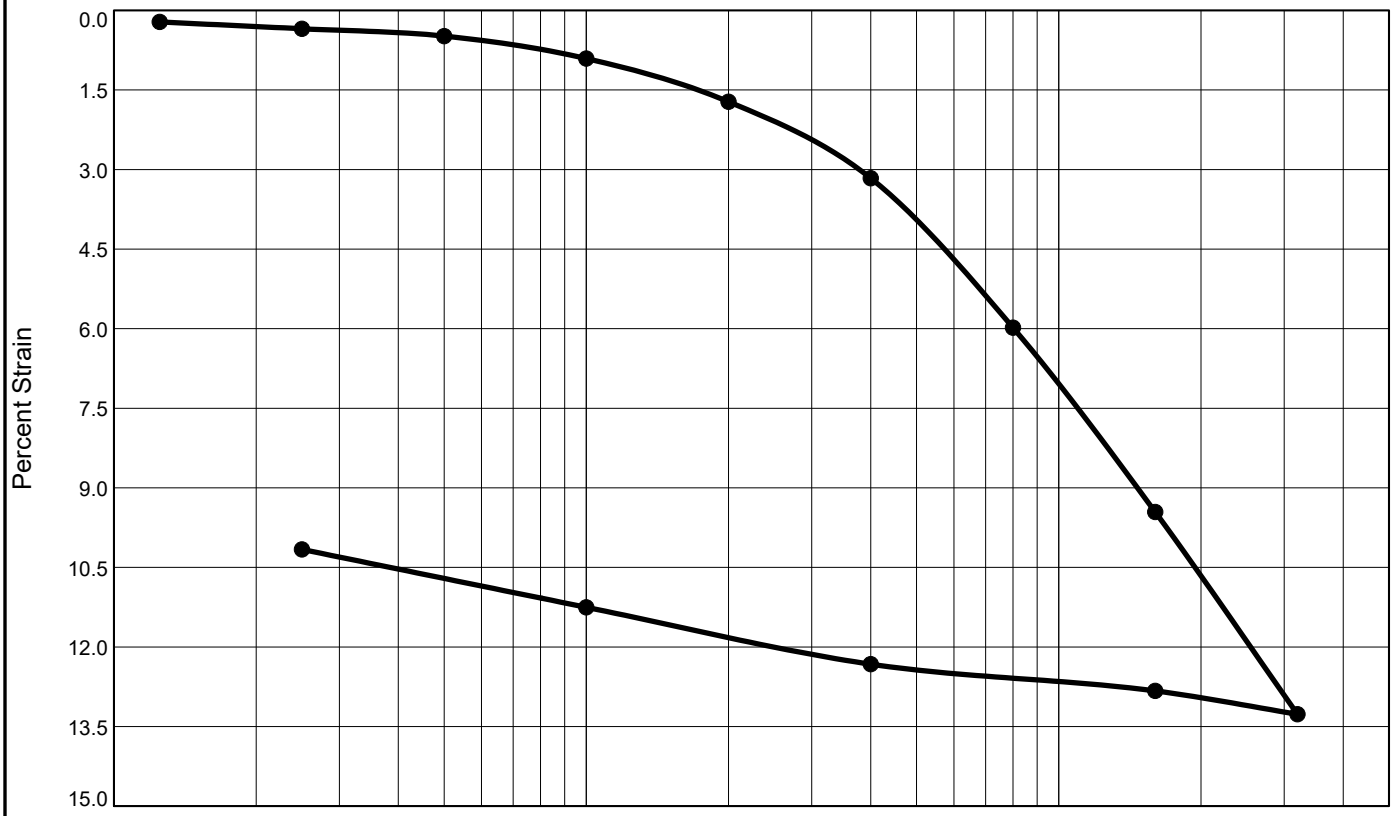


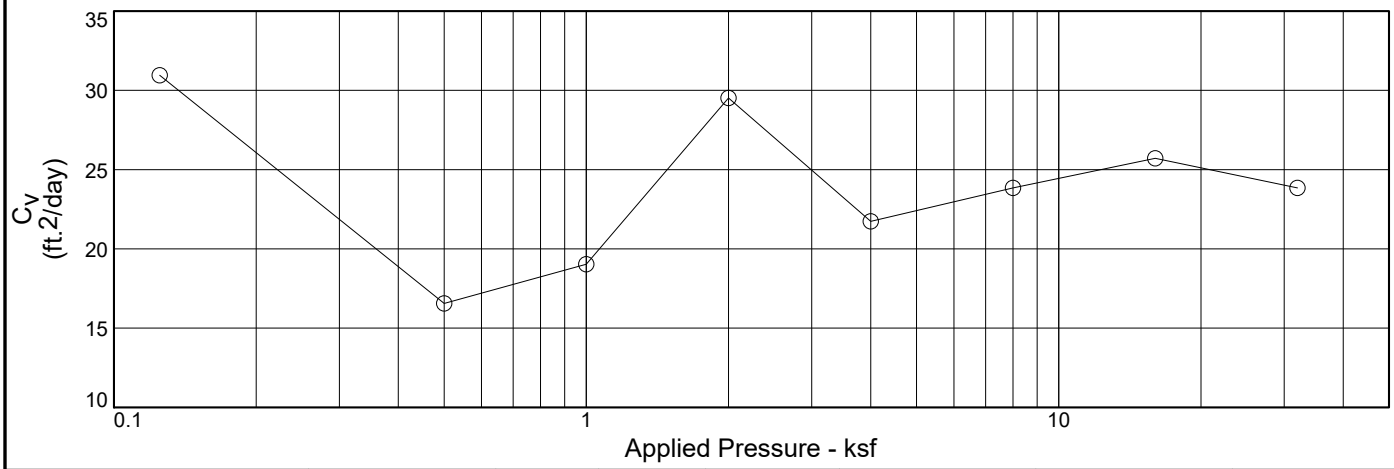


Checked By: SEG

Figure B-12

CONSOLIDATION TEST REPORT





Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
84.9 %	26.3 %	88.6			2.65	CL		0.822

MATERIAL DESCRIPTION

Olive-brown, lean CLAY with sand

Project No. 2022-144 **Client:**

Project: Yakama Nation Nason Creek Floodplain

Source of Sample: BH-4 **Depth:** 5.0 **Sample Number:** S-2

Remarks:
Assumed Specific Gravity

HWA | GEOSCIENCES INC. DBE/MWBE

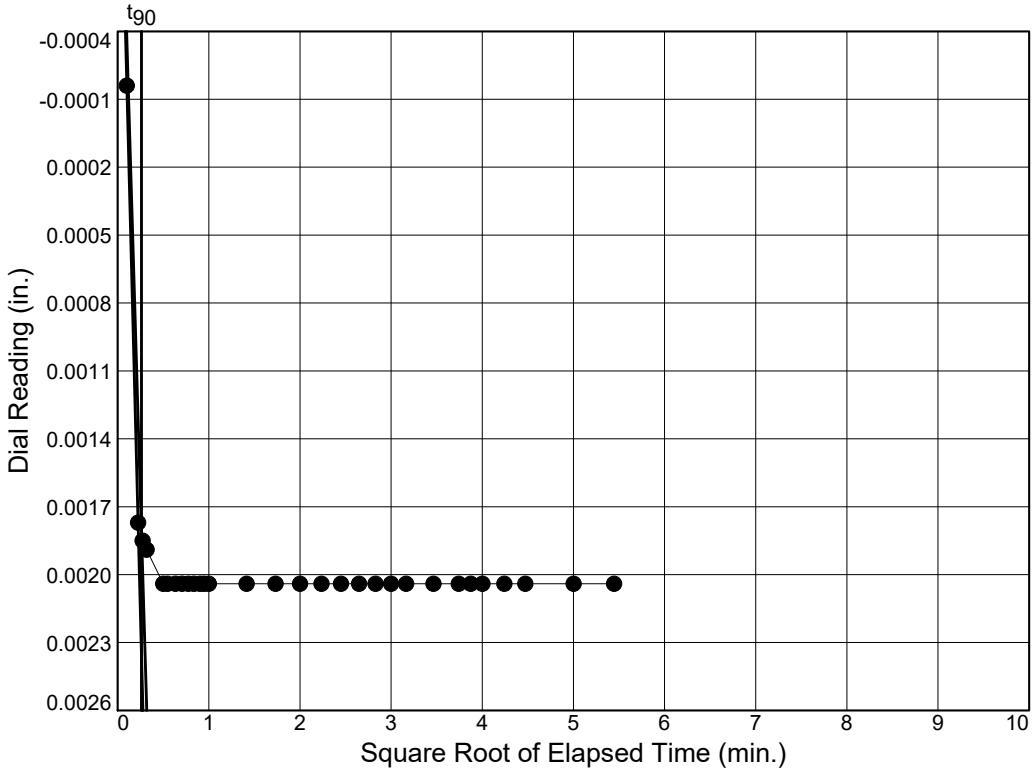
Figure B-13

Tested By: AH **Checked By:** SEG

Dial Reading vs. Time

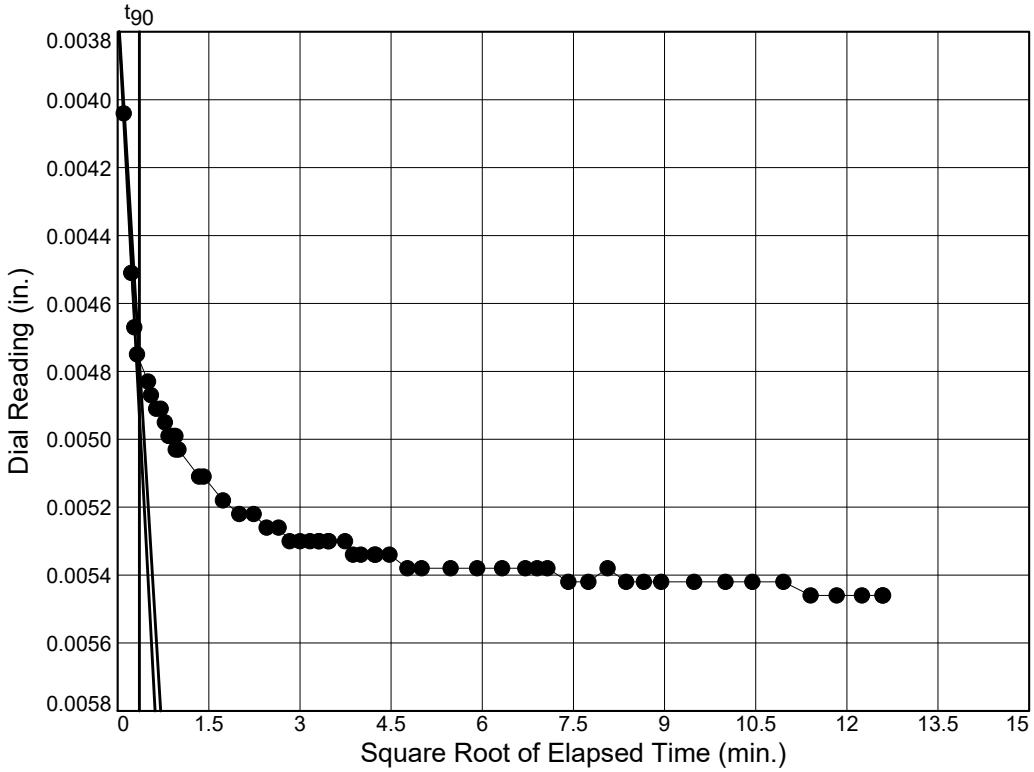
Project No.: 2022-144
Project: Yakama Nation Nason Creek Floodplain

Source of Sample: BH-4 Depth: 5.0 Sample Number: S-2



Load No.= 1
Load= 0.13 ksf
D_0 = -0.0017
D_{90} = 0.0018
D_{100} = 0.0022
T_{90} = 0.07 min.

C_v @ T_{90}
30.950 ft.^{2}/day



Load No.= 3
Load= 0.50 ksf
D_0 = 0.0037
D_{90} = 0.0048
D_{100} = 0.0049
T_{90} = 0.13 min.

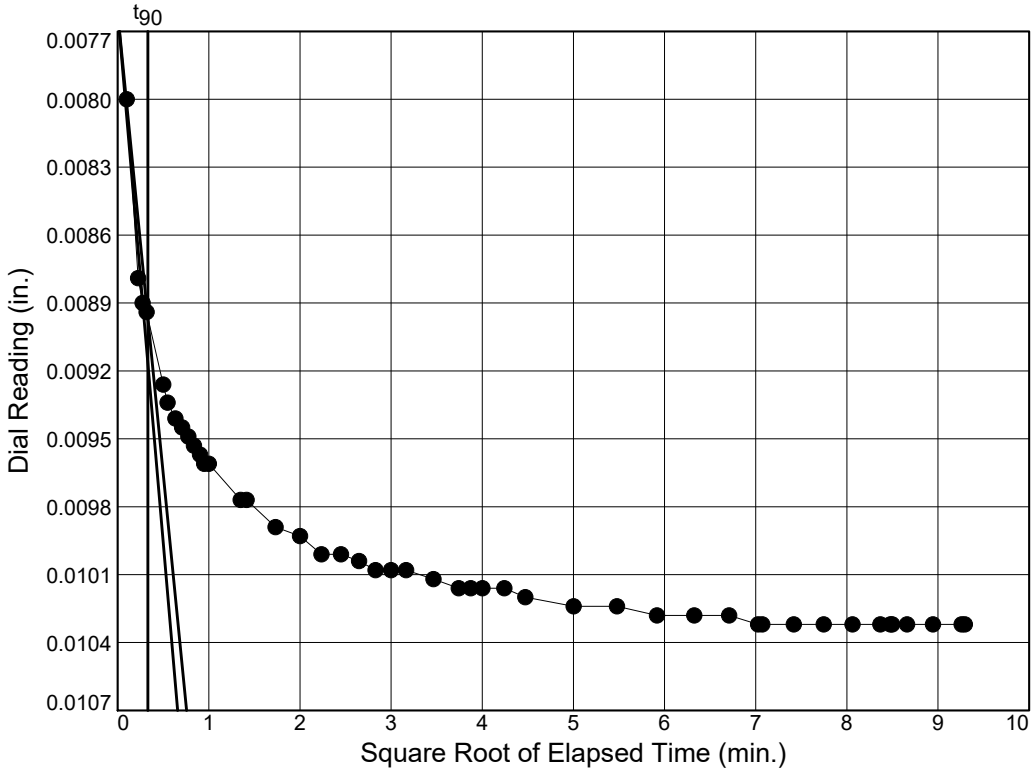
C_v @ T_{90}
16.564 ft.^{2}/day

Figure B-14

Dial Reading vs. Time

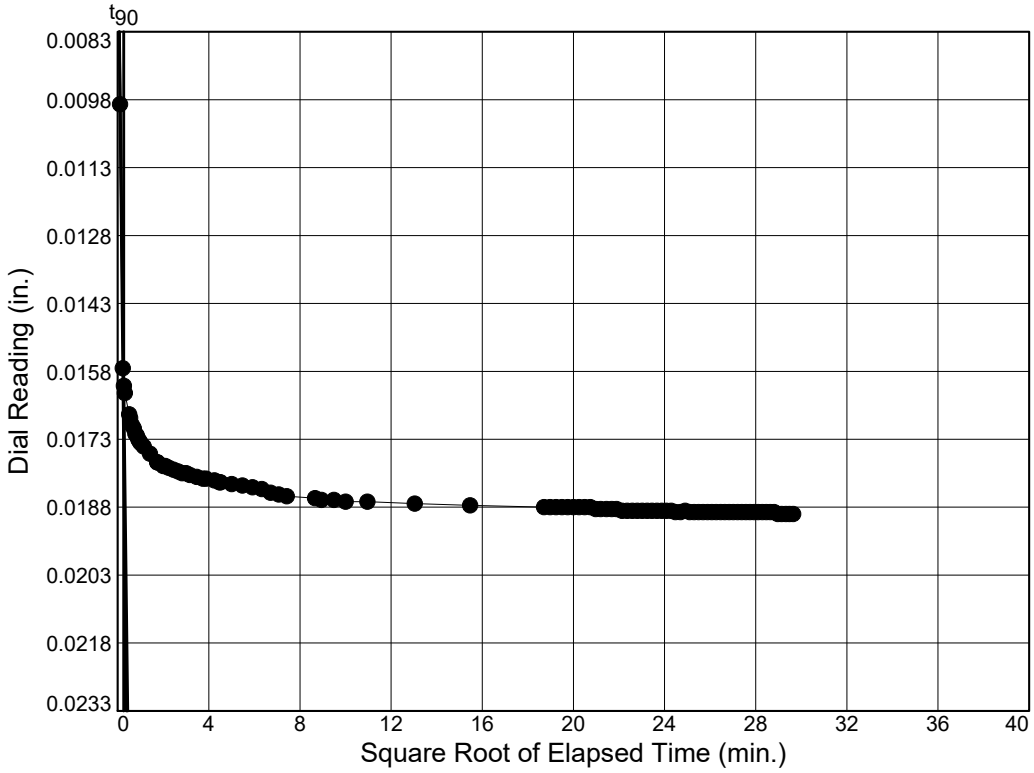
Project No.: 2022-144
Project: Yakama Nation Nason Creek Floodplain

Source of Sample: BH-4 Depth: 5.0 Sample Number: S-2



Load No.= 4
Load= 1.00 ksf
D_0 = 0.0076
D_{90} = 0.0090
D_{100} = 0.0091
T_{90} = 0.11 min.

C_v @ T_{90}
19.029 ft.^{2}/day



Load No.= 5
Load= 2.00 ksf
D_0 = 0.0052
D_{90} = 0.0161
D_{100} = 0.0173
T_{90} = 0.07 min.

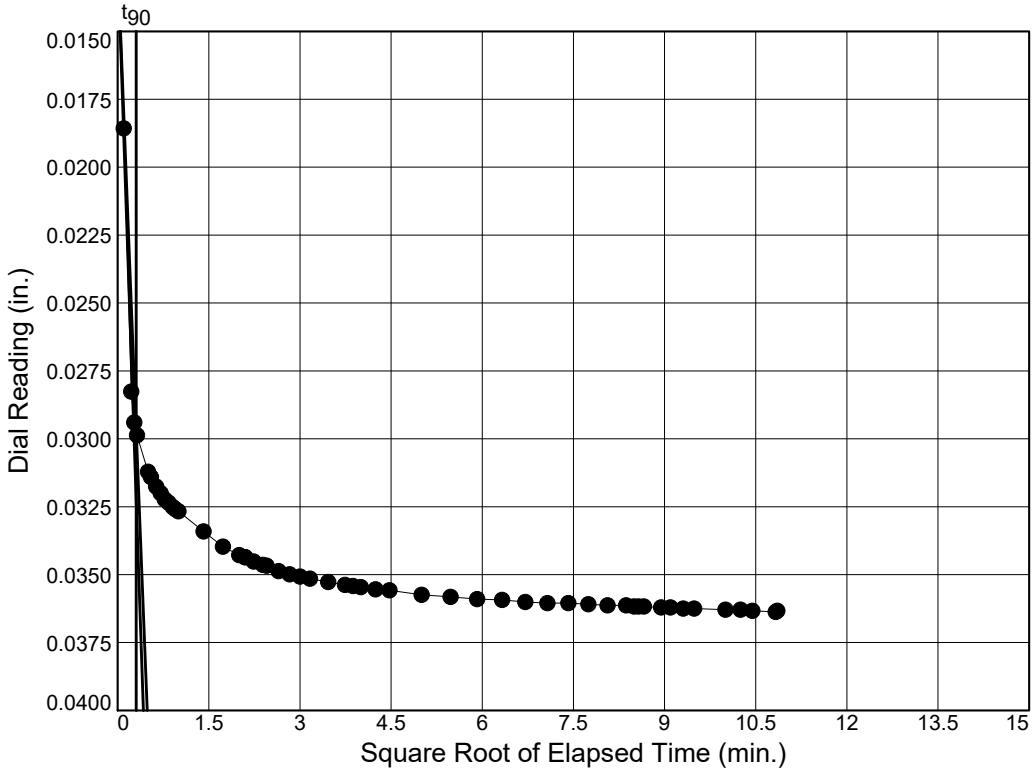
C_v @ T_{90}
29.521 ft.^{2}/day

Figure B-15

Dial Reading vs. Time

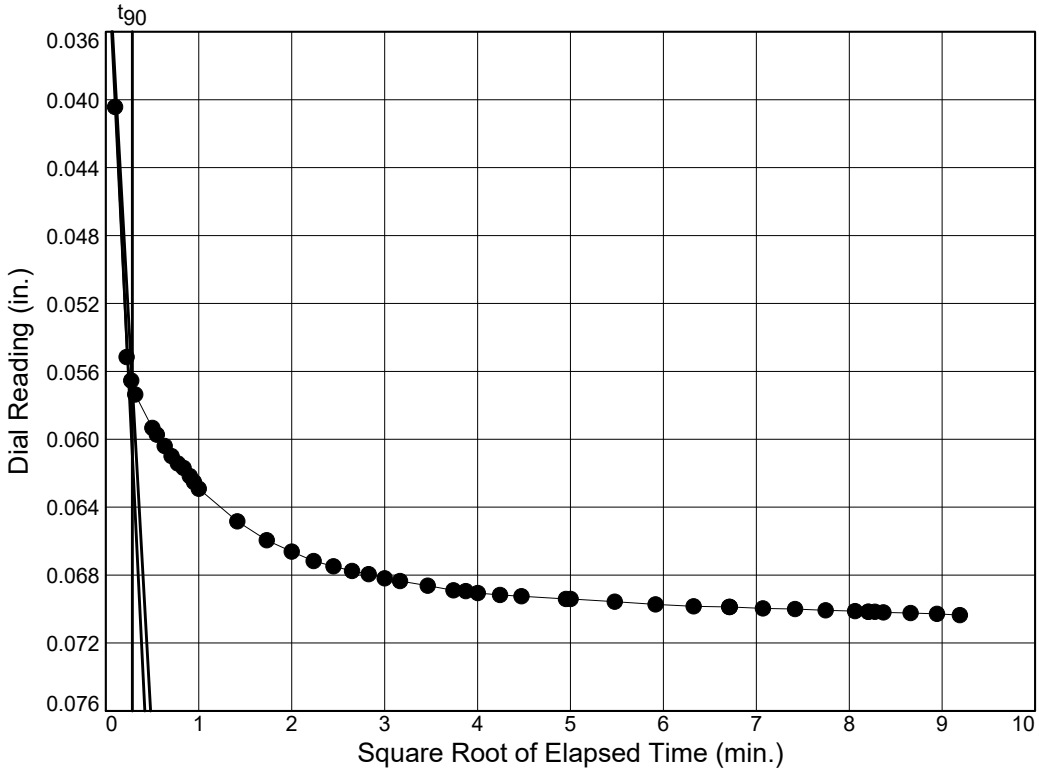
Project No.: 2022-144
Project: Yakama Nation Nason Creek Floodplain

Source of Sample: BH-4 Depth: 5.0 Sample Number: S-2



Load No.= 6
Load= 4.00 ksf
D_0 = 0.0124
D_{90} = 0.0298
D_{100} = 0.0317
T_{90} = 0.09 min.

C_v @ T_{90}
21.735 ft.^{2}/day



Load No.= 7
Load= 8.00 ksf
D_0 = 0.0289
D_{90} = 0.0568
D_{100} = 0.0598
T_{90} = 0.08 min.

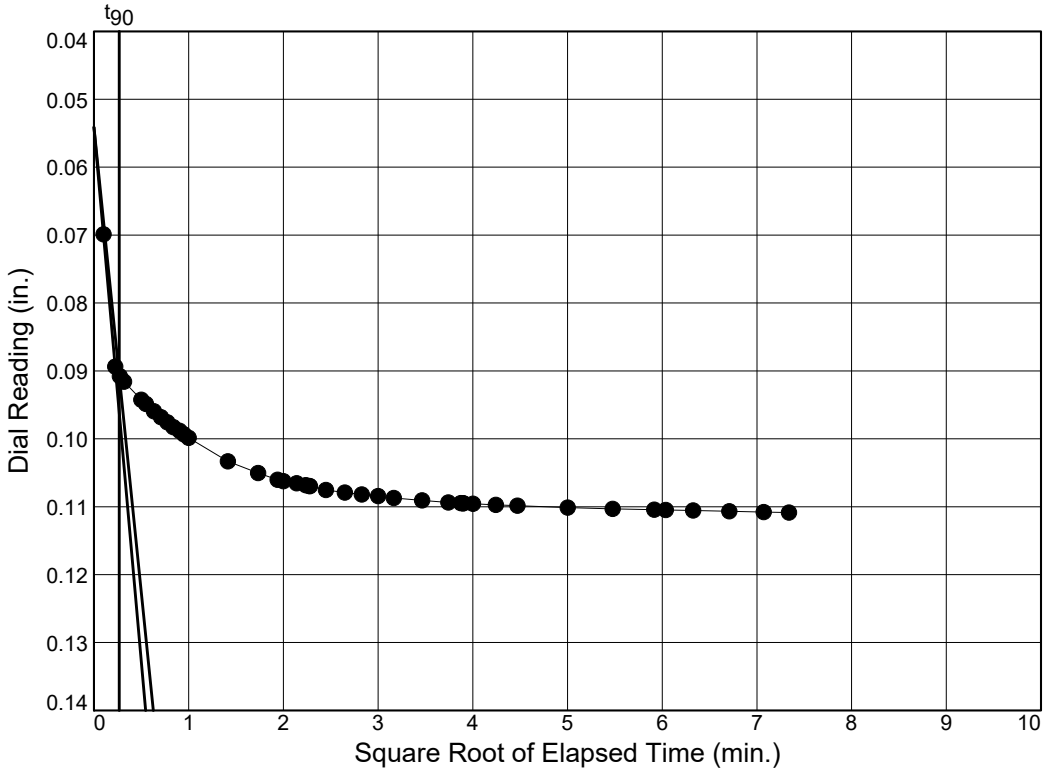
C_v @ T_{90}
23.850 ft.^{2}/day

Figure B-16

Dial Reading vs. Time

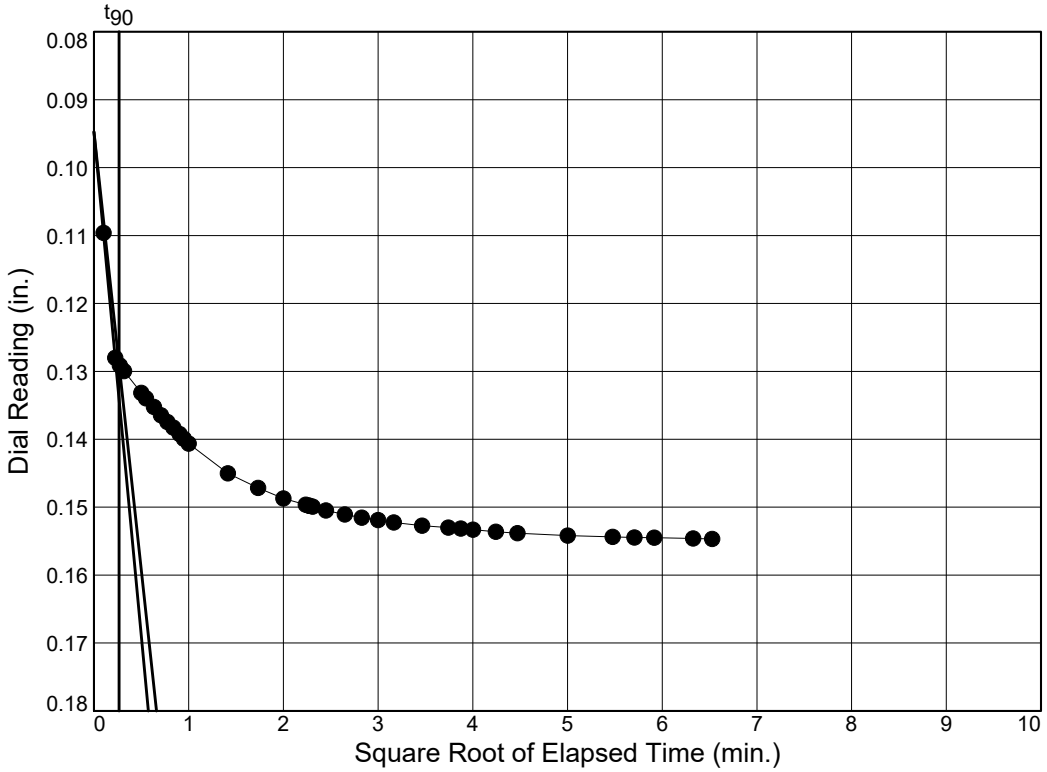
Project No.: 2022-144
Project: Yakama Nation Nason Creek Floodplain

Source of Sample: BH-4 Depth: 5.0 Sample Number: S-2



Load No.= 8
Load= 16.00 ksf
D_0 = 0.0541
D_{90} = 0.0906
D_{100} = 0.0946
T_{90} = 0.07 min.

C_v @ T_{90}
25.718 ft.^{2}/day



Load No.= 9
Load= 32.00 ksf
D_0 = 0.0947
D_{90} = 0.1289
D_{100} = 0.1327
T_{90} = 0.07 min.

C_v @ T_{90}
23.843 ft.^{2}/day

Figure B-17