

Field Report

Project No.: 1213006.020.021

Report No.: 02

Client: Washington Department of Fish and Wildlife

Date: Sept. 26, 2012

Project Name: Cherry Valley Culvert Replacement Projects

Location: 1 mile north of Duvall, Washington

Weather Conditions: Cool, overcast.

Prepared By: Chad T. McMullen P.E.

We were on-site today at the request of WDFW to observe pile re-strike and end-of-driving performance in order to estimate ultimate pile capacity based upon dynamic pile driving formulas. Based upon construction permit requirements, WDFW is required by King County (permitting agency) to demonstrate that the piles installed have the axial capacity required to resist design loads from the replacement bridges.

Pile capacities estimated from driving formula have inherent limitations, though they are considered by FHWA and WSDOT as being appropriate for smaller projects, smaller diameter piles, and where the load-per-pile for a structure is relatively low. Driving formula considered acceptable include the Gates Formula (FHWA), Engineering News Record Formula (FHWA), and the WSDOT Pile Driving Formula (WSDOT), all of which specify the measurement of end-of-driving performance to estimate static ultimate pile capacity. All of these formulas acknowledge that some set-up typically occurs (set-up being an increase in capacity following driving, as pore pressure dissipates over days to weeks following driving); however these formulas have been developed for use in a variety of soils and generally underestimate the amount of set-up that actually occurs, especially for clayey and silty soils. For the clayey and silty soils present at the project site, we expect that the amount of set-up will be substantially higher than what is accounted for in the pile driving formula.

Piles at Work Locations #1, #2, and #4 were tested previously, as documented in Report 01. Today, piles at Work Area #3 (refer to Figure 1) were tested using an MKT #7 double-acting air hammer. Pile testing was conducted in a manner identical to the procedure described in Report 01. Today, all piles demonstrated a penetration rate at end-of-driving (EOD) conditions of between 25 and 35 blows-per-inch for the final 6 inches of penetration. Using the WSDOT Pile Driving Formula (the most conservative of the three formulas identified above), these penetration rates correlate with a nominal resistance per pile of between 82 and 87 kips. At many of the pile locations, the beginning-of-restrike (BOR) penetration rate was observed to be substantially higher, which confirms that a significant amount of set-up occurs after the end of pile driving. WSDOT recommends a resistance factor of 0.55 to determine the factored

resistance of piles using this method, which results in a factored resistance of at least 45 to 47 kips per pile. For the higher than average amount of set-up we expect due to the presence of clayey soils, we expect that the actual factored resistance is likely much higher.

In our opinion, the driving resistance observations made today demonstrate that the piles are adequate to resist loads from the bridge superstructures.

All piles installed for the project have been tested; dynamic pile testing is now complete.

Visitors: - none -

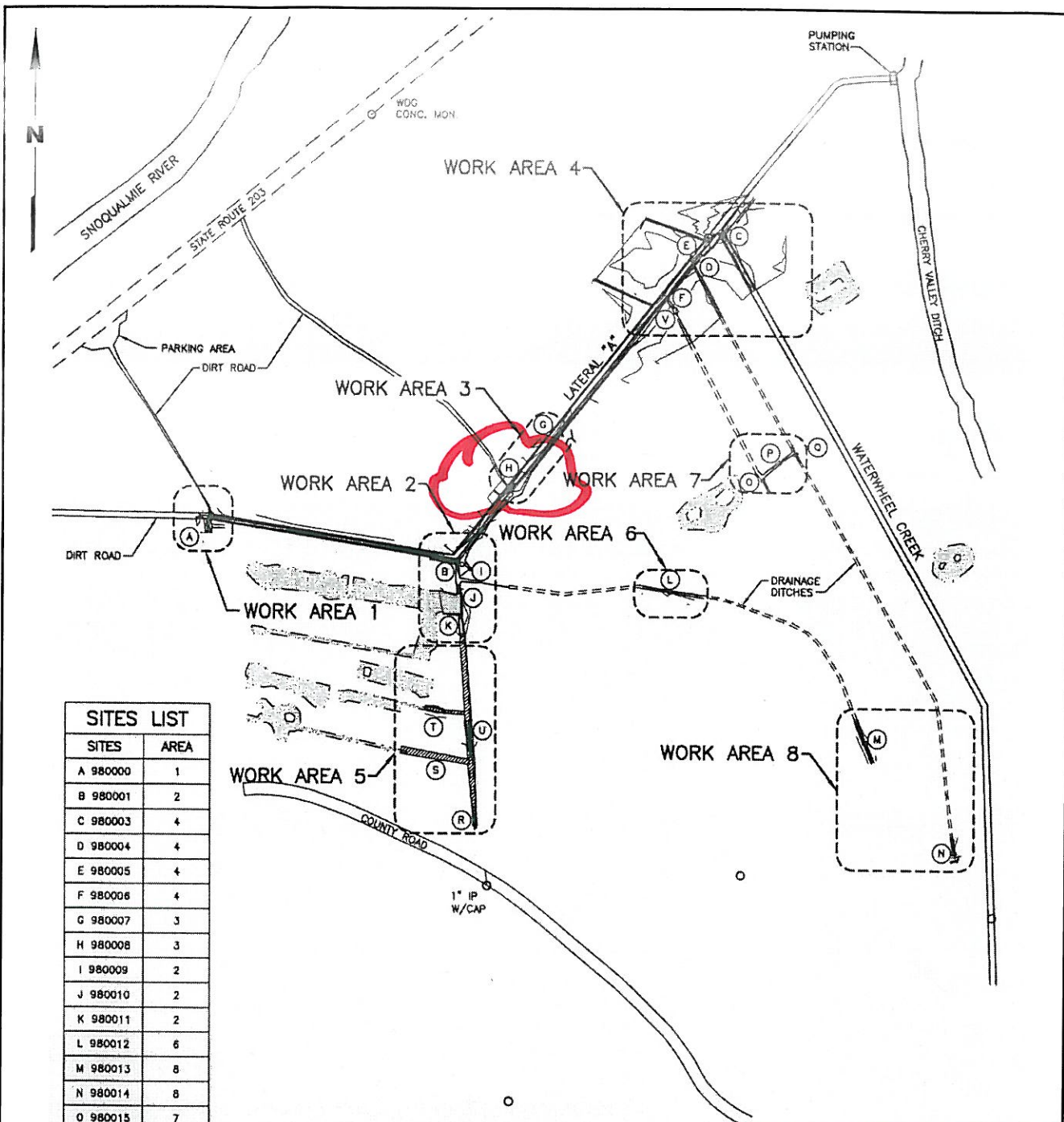
Unsatisfactory Conditions and Recommended Correction: - none -

Attachments: Figure 1

Distribution: K. Kuykendall WDFW

Signed  _____

LANDAU ASSOCIATES, INC. | V:\1213006\010.01\CV_workareas.dwg (A) Figure 2' 3/15/2012



SITES LIST	
SITES	AREA
A 980000	1
B 980001	2
C 980003	4
D 980004	4
E 980005	4
F 980006	4
G 980007	3
H 980008	3
I 980009	2
J 980010	2
K 980011	2
L 980012	6
M 980013	8
N 980014	8
O 980015	7
P 980016	7
Q 980017	7
R 980018	5
S 980019	5
T 980020	5
U 980021	5
V 980071	4

TOTAL CUT/FILL QUANTITIES		
TOTAL CUT	TOTAL FILL	TOTAL NET
-3609.92cy	269.02cy	-3340.90cy

OVERALL SITE PLAN
NOT TO SCALE

FIELD REPORT 02
- WORK AREAS -
FIGURE 1
SEPT. 26, 2012

Source: Washington Department of Fish & Wildlife 10/31/11



WDFW Cherry Valley Culverts
Replacement Project
Duvall, Washington

Work Area Locations

Figure
1