

APPENDIX F

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WOOD RODGERS CONSULTANT
USA Parkway Preliminary Design Report Draft
SUBMITTAL REVIEW COMMENTS
DRAINAGE REPORT RECEIVED 09/19/12

DISCIPLINE: Hydraulics
Activity NO.:9291
PROJECT NO.:73708E1P
REVIEWER: B. Wilson/E. Yount
PROJECT LEVEL: 30%

NO.	VOL. NO.	SHEET/PAGE NO.	REVIEW COMMENTS	*TYPE	DESIGNER RESPONSE
			<i><u>Drainage Report</u></i>		
1		General	Only 24 or so cross culverts are proposed for the 12.5 mile new road. This works out to an average culvert spacing of approximately 2500 lf between culverts. There are 28 subwatersheds draining to the Truckee River, and 45 subwatersheds draining to Lake Lahontan. Thus at first appearance it looks like more cross culverts would be required than what is proposed.		Additional culverts have been included in the design
2		General	To minimize flows in the channels parallel to the road both to lower erosivity, minimize channel excavation/fill etc, it may be more appropriate to not divert large subbasin flows to the road channels and instead install cross culverts to perpetuate the historical drainage flows.		Additional culverts have been included in the design
3		General	Instead of discharging all of the flow at one location far downstream of the parallel road channel, consider multiple discharge points, in effect bleeding off the flow at several locations along the entire channel length.		Additional culverts have been included in the design
4		General	For road design safety considerations, curb and gutter within the clearzone are not desirable for high speed rural highways. Please justify the hydraulic need for including curb and gutter on this project. If no adequate justification can be provided then please remove all non hydraulically required curb and gutter from the design.		Curb and gutter removed from design

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5		Pg 3	The USGS Regression Equations for Region 5 Q25 has a 87 % average standard error of prediction (e.g. roughly equivalent to one standard deviation = 67% confidence interval). Thus for engineering design, should it be appropriate to use a design flow of the mean plus one standard error to be conservative. Please comment and correct design flows as appropriate.		Based on the flows presented in the Manhard Ramsey study it is felt that the flows developed by the regression equations are appropriate and do not need to be adjusted
6		Pg 4	Please include more details on the HEC-RAS analysis than what was provided.		Added text
7		Pg 10	Long channels at supercritical slopes have a good possibility of producing slug flow roll waves. If this phenomena occurs then additional freeboard will be required.		Noted
8		Pg 11	Consideration of armoring the road berm to prevent washout at 100 year overtopping events should be contemplated.		Noted
9		Fig 2.1 and others	It would be helpful to include 25yr/100yr flows to each watershed drainage label per the NDOT Hydraulic Drainage manual Appendix A-4 Item III.iii (existing watershed map showing: ...flow rates).		100 year flows added at concentration points
10		Fig 2.1 and others	It would be helpful for comparison with the Plan Sheets to include the mile point (MP) and Station Numbers at regular intervals along the road alignment.		Added alignment and stationing
11		Fig 2.1 and others	It would be helpful to show proposed new culvert crossings		Shown on figures showing proposed features but not appropriate on existing figures
12		Fig 5.1 and others	It would be helpful to show proposed new culvert label using a consecutive numbering scheme.		Culverts are labeled consecutively and a table of flows was added to the figure.
13		Fig 6.1 and others	Please align the north arrow and Station numbering scheme (left to right, top to bottom) to match that of the set of plan sheets.		The on-site drainage mapping was done prior to the plan set development. Figure 6.1 – 6.29

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					were developed at a larger scale to view onsite conditions.
14		Fig 6.2	The plan sheets D4 shows a culvert at station 56+00.		Removed
15		Fig 6.2 and others	Why is a curb and gutter proposed? For traffic safety considerations and other, may prefer that no curb is installed and let the runoff continuously drain off the road as sheet flow. Please confirm.		Removed
16		Fig 6.3	The plan sheets D4 shows a culvert at station 65+00.		Addressed
17		Fig 6.11	The plan sheets D18 shows a culvert at station 254+00.		Addressed
18		Fig 6.11	The plan sheets D25 shows a culvert at station 357+00.		Addressed
19		Fig 6.20	Sheet 39 is a duplicate of Sheet 40.		Addressed
20		Table 1	A note should be added to indicate specifically which flows were derived from regression analysis, with all others being either SCS or Rational.		Note added
21		App A Ex SCS Curve Number Calcs	CN should be 63 and not 724.7 for Hydro Soil Group A in watershed EWSTR24.		Revised
22		App A Ex Condition Routing Calcs	Please clarify how the channel geometry was determined (e.g. field measured, assumed, etc.).		Added
23		App A Prop SCS Curve Number Calcs	CN should be 63 and not 724.7 for Hydro Soil Group A in watershed WSTR24.		Revised
24		App B Prop Conditions Summary Channels	A column for Velocity should be added for the 25-Year Peak Flow.		Added

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25		App B Prop Conditions Summary Channels	If the flow is diverted off the main channel into the existing natural wash crossings at periodic intervals, then the main channel could be downsized in channel width and depth.		Additional culverts have been included in the design
26		App B Prop Conditions Summary Channels	Due to the potential for high sediment load, it may be desirable to use box culverts (as they are more easily maintained) instead of multiple circular culverts, especially where 4 or more circular culverts are proposed.		Noted, revised in locations where many circular culverts were needed

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DRAINAGE PLAN SHEETS RECEIVED 09/19/12

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PROJECT NO.:73708E1P

REVIEWER: B. Wilson/E. Yount

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			<i><u>Drainage Plan Sheets</u></i>		
1		D1	Even if they are not final designed, new Drainage Structures should be shown at the following stations: 13+00, 17+00, 22+00.		Drainage Structures added at these locations
2		D2	It appears that the channel at Sta 36+00 should be continued to the south to outlet to some defined natural channel.		Roadside channel now continues to the natural channel @ Sta: 23+00
3		D3	To perpetuate historic existing natural flow patterns and to minimize required ditch size, the parallel road ditch should turn out to natural existing outlet points such as at Sta 50+00 Left and others.		Additional Culverts/ channel outlets added to minimize roadway ditch flows.
4		D3	Is 30' clear zone to the ditch flowline required? If so, then should be checked at locations such as at Sta 51+00 Right and others. Verify that hydraulic facilities meet roadside safety requirements.		Roadside Safety has been checked. Jacobs added Rail/6:1 slopes where appropriate.
5		D3	Coordinate proposed ditch alignment with the most latest version of the road alignment to avoid overlap conflicts such as Sta 52+00 Right and others.		Alignment updated and channels/ditches adjusted.
6		D4	It appears that the culvert endpoints need to be shifted to match backslope of road ditch locations such as Sta 56+00 and others. Also, based on contours, it is not evident that this culvert outlets into an existing defined drainage that has historically conveyed concentrated flows. Please verify that this is an appropriate discharge location (see comment 51).		With updated surface & alignment/ Design modified.

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7		D4	The proposed culvert at Sta 65+00 should have it's outlet closer to the existing wash located just to the east of the location shown.		Now outlets to the existing wash
8		D5	A median drain should be located in the median ditch where the cross culvert is located at Sta+00.		Median Drains have been added throughout the project.
9		D5	Fig 6.3 Sht 6 of the Drainage Report shows a watershed divide between WSLH44/WSLH43 near Sta 76+00. That being the case, shouldn't a cross culvert be located at the existing wash located near Sta 73+00 to perpetuate historic flow patterns and also to reduce the required new parallel road ditch?		Culvert added at sta. 73+39
10		D6 Typ	It may pay to put additional cross culverts at major wash crossings such as may be the case at Sta 84+00 and others. Please refer to comment 51 below.		Culverts have been added at various locations
11		D6	It may be of some benefit to coordinate the road sag low point (Sta 86+00) with the cross culvert crossing location (Sta 88+00).		Drop Inlet and culvert has been added at 86+16
12		D7 Typ	Preferable to use single or multi barrel RCB rather than multiple circular RCP such as the 7 conduit structures at Sta 94+00. Where possible, limit multiple culverts to 3 or 4.		Box Culvert to be installed were more than 3 culverts in series are shown
13		D10	Should the riprap for the armored ditch which ends at Sta 139+00 be continued on over the flatter sloped ditch portion downstream?		Cross Culvert added to maintain flow path.
14		D10 Typ	It would be helpful to put the Q25/Q100 flows on the Ditch/Culvert structures for checking purposes.		As per NDOT standards, flows will be shown on DP sheets
15		D14	It appears that Structure notes 4 & 5 have been reversed.		Structure note numbers have been updated
16		D15 Typ	Individual wash flows are transported approx 1700 LF from Sta 211 to Sta 194, even though several other wash crossings are encountered without out letting to any of them. (similar issue to comment 18)		6 Cross Culverts are proposed through this section. Culverts are in place at location where a defined existing drainage path exists.

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17		D15	It is noted that the embankment protector at Sta 219+00 is HDPE rather than CMP. Please confirm other locations are also, as typically NDOT prefers HDPE over CMP for embankment protectors and other.		Currently only RCP or HDPE culverts are present
18		D15 Typ	The distance between cross culverts is over 2600 LF between Sta 220 to Sta 194, even though several other wash crossings are encountered without out letting to any of them.		Additional culverts have been included in the design
19		D17	Fig 6.10 Sht 19 of the Drainage Report shows a watershed divide between WSLH35/WSLH29 near Sta 236+00. That being the case, shouldn't a cross culvert be located at the existing wash located near Sta 237+00 to perpetuate historic flow patterns and also to reduce the required new parallel road ditch?		Culvert added at sta. 238+11
20		D18	Structure note 5 lists 8-60" RCP while the Drainage Report Pg 11 shows 10-60" culverts. Reconcile Discrepancy.		Box Culverts added at this location
21		D18	The culvert at Sta 254+00 has no calculations provided in the Drainage report.		Culverts sizing was done in HEC-RAS. See Drainage Report
22		D19	Structure notes 5&6 should instead be labeled 2&3 correspondingly.		Structure note numbers have been updated
23		D24	It would be helpful to show cut and fill limit lines and in addition to show them with different line types to distinguish between the two.		Contours have had elevation labels added to help see cut fill areas.
24		D27	For the cross culvert at Sta 385+00, the DI should be placed on the uphill (South) side of the crossculvert instead of downhill (North) as shown. Is this culvert outletting in an appropriate location?		Culvert adjusted to flow South to North
25		D28	A median D.I. is needed at the cross culvert located at Sta 391 at this is at the low point in the sag.		DI has been added at 391+58
26		D32 Typ	Need to check the velocity at all cut/fill interface such as Sta 449+00 to 447+00 RT to ascertain whether armoring is required where erosion will occur.		Inlet armoring has been provided in locations where larger flows to cut area occur. Further review will occur

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					in subsequent design.
27		D33	Should a ditch be located at the base of the retaining wall at Sta 467+00.		N/A
28		D34	It appears that the highway road alignment has been shifted from the road ditch alignment at Sta 469+00.		Updated surface shows current alignment
29		D34	There are overlapping conflicting lines at Sta 477+00.		Updated Surface resolved line conflicts
30		D35	It appears that the ditch centerline should be shifted away from the road centerline at Sta 493+00.		Updated
31		D37	Construction note 1 does not point to anything.		Construction note leader has been adjusted (HMS)
32		D38	The riprap ditch at Sta 541 Left is not shown as is depicted on Sheet D39.		Riprap ditch is now present on D38 as depicted on D39 (HMS)
33		D39	Why is the drainage trapezoidal ditch shown next to the roadway grading v-ditch at Sta 549+00 Right.		Surface updated.
34		D41	There is overlapping road and ditch alignments shown at Sta 575+00.		Surface and Ditch updated
35		D45	Why does a trapezoidal ditch empty into the v-ditch at Sta 621+00 Right and not continue as a trapezoidal ditch instead.		Flow moves up station. V-ditch to Trapezoidal Ditch.
36		D45	What is the significance of the line perpendicular to the rip rap ditch boundary at Sta 629+00 Left and others.		Slope Arrows
37		D47	For the cross culvert at Sta 659+00, the DI should be placed on the uphill (South) side of the crossculvert instead of downhill (North) as shown.		Culvert adjusted to flow South to North
38		D49 Typ	It appears that an existing culvert is located at Sta 679+50. All existing culverts should be shown as existing on the plans. What is the rational for not also locating a new		Historic flow path cross the roadway however the flow was captured in

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			culvert at the same exact location.		roadside ditch with previous roadway improvement. A culvert may be beneficial at this location with respect to our channel however this impacts the culverts to the existing system. We have kept the flow paths consistent with the existing drainage and thus have not analyzed the effects downstream.
39		D49	The proposed channel at Sta 682 Right may require a series of rock check dams or other means to slow down the velocity and also to prevent slug flow roll waves from forming.		Currently large rip rap(Class 700+) is required at this location. Future Design will analyze need for additional protection if required.
40		D49	The proposed ditch at Sta 694+00 Left may require a much greater top width than shown as it is located on the side of a hill and thus require more additional grading to blend into the existing topo.		Working with Jacobs to accommodate appropriate grading on roadside channels
41		D50	The proposed ditch abruptly ends at Sta 693+00. Does the flow continue on to the north across the existing tee intersection requiring a new culvert), or does it instead flow East along the south side of the connecting road at Sta 697?		The Current roadside channel ends at station 693 and spreads out. It will run along the south side of the connecting roadway to an existing basin and culvert to the unnamed drainage.
42		D50	The existing cross culverts at Sta 699+00 should be shown.		A series of culverts (6-7) cross the road at station 699+00. Line work added.

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43		DP1	The proposed profile for STA 56+11 to 56+24 (at X Axis =0) Location shows an elev. of 4383.5, while the plans show 4379.5.	IES have been corrected on this profile
44		DP1	The proposed profile for STA 93+11 to 93+91 (at X Axis =0) Location shows an elev. Of 4407.5, while the plans show 4415.0.	IES have been corrected on this profile
45		DP1	It would be helpful to call out the quantity of culverts (such as 7@24”).	Quantity of culverts have been added to notes
46		DP2	The profile for the culvert at Sta 254+00 should also be shown.	Profile has been added
47		DP3	For minimizing clogging potential, an 18” rather than 15” culvert should be used at Sta 457+39 to 457+57.	Culvert has been adjusted to an 18” pipe
48		DPxx Typ	It is noted that in some cases the proposed culvert appear to be buried in the new surface while other cases it appears to be perched above the new surface. Please explain.	Culvert IEs have been adjusted to the new proposed surface.
49		NEW SHEET	Providing typical road cross sections would be helpful in clarification of side slopes for drainage erosion considerations.	Typical Roadway section will be provided in the roadway design (2 sheets from Jacobs)
50		General	Consideration for extra space requirements to allow for other type of energy dissipaters where riprap aprons are not appropriate, especially for the higher flow steeply sloped culverts	Hec 14 Riprap Sizing as used at all outlets. Outlets were placed at existing drainage ways where practicable. Future design will evaluate steep slopes & high flow rates for additional energy dissipation needs.
51		General	In determining the need for culverts at each wash crossing, considerations such as the severity of flow rate and the proximity of adjacent culvert crossings should be evaluated. Creating new conditions of heavily concentrated point flows where the	Additional Culverts added to decrease flow in channels where applicable. Current Culverts were placed at

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			existing condition was dispersed sheet flow is another consideration. To prevent upsetting the natural sediment and hydraulic balance that historically existed to create long term stream stability, one should look carefully at the existing flow patterns and flow magnitudes at each location and to mimic existing conditions as closely as possible. For purposes of the 30%, a very conservative and sensitive approach should be taken so ensure not upsetting the natural balance of existing drainages considering onsite flows will be introduced, impacts to flow rates, and impacts to the manner of flows.		existing flow path to minimize erosion and flow patterns.
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