Appendix G

Drainage

TECHNICAL MEMORANDUM

DATE:	June 6, 2023
TO:	Summer Herrera, PE, NMDOT
FROM:	Sara Lavy, PE, Parametrix
SUBJECT:	Summary of Drainage Reports on I-40 from Milepost (MP) 0 to 150
CC:	Stephanie Miller, Parametrix
PROJECT NUMBER:	CN 6101580

PREVIOUS DRAINAGE REPORTS

Previous drainage reports for the I-40 study area were reviewed as part of data collection and are summarized in this memorandum. These reports were provided to Parametrix by the New Mexico Department of Transportation (NMDOT) and one report was provided by Bohannan-Huston.

Report: Drainage Study Summary Report for the NM-118 Drainage Study, NMDOT CN 6101150 by Bohannan-Huston, dated May 2022, MP 29.5 to MP 36.5.

This report summarizes the findings of a study to evaluate the cause of drainage issues associated with existing major NMDOT drainage structures along I-40 and State Road 118 between MP 29.5 and 36.5. Eight locations were analyzed and it was determined the flooding issues are caused by significant sediment laden flows causing overtopping as well as several structures that do not meet current NMDOT drainage design criteria. The study includes recommendations for improvements to help alleviate the issues.

Report: MP 34.0 to 40.374 - 0.4 mi. E. of McGaffy I-C East, McKinley County Final Drainage Report PCN: 2344, AC IM-040-1(97)34, Roadway Rehabilitation (1993) Drainage Report
Date: 6/11/1992
Prepared by: Raymunda Van Hoven

The project location of the drainage study is located east of the McGaffy interchange in McKinley County extending approximately 6.04 miles long, until the Ciniza interchange. The scope of the project work consisted of pavement rehabilitation, slope flattening, and upgrading interchange ramps to current AASHTO guidelines. There were recommendations given for 59 culverts and storm drain inlets based off the analysis of either extend/raise as required, build, or no work needed. Four median drop inlets had water above grate out of 21 median drop inlets analyzed.

Report: MP 36.456 to 36.928 - Final Drainage Report CN 6100222, PCN: 6100222, Bridge Replacement, Roadway Rehab & Recon (2016) Drainage Report
Date: 12/12/2012
Prepared by: Hashem Faidi

The purpose of the project is Bridge No. 7896 replacement and roadway reconstruction in Cibola County on I-40 east of Gallup, NM starting at MP 36. 519 to 36.928. The Simplified Peak Flow method was used to determine the peak rate of runoff and estimated flood frequencies of 50- and 100-year flows. A hydraulic analysis was performed using HY-8 to obtain flow estimates and capacities of the drainage structures. There were 7 existing structures analyzed. Based off the analysis the following recommendations were provided: extend drainages

structure 1, clean existing drainage structures, place riprap, place concrete rundown, place curb behind guardrail and rundowns for slopes, and place 2 to 18-inch corrugated metal pipe (CMP) under median paved detour crossovers when necessary.

Report: MP 39.9 to 42.5 - Final Drainage Report I-40 Climbing Lane Project – Phase 1, CN 6100901
Date: 5/30/2017
Prepared by: Burke Lokey

The purpose of the project was to construct a 2.6-mile eastbound passing lane in the median and a 0.3-mile acceleration lane from the Ciniza Interchange east. Also included was structural work on Bridge #s 6004, 6005, 6006, an d8678 (Finat Crossing Overpass) along with reconstruction of the interchange ramps and any necessary drainage improvements. Based on District 6 input and budget constraints, the scope was revised and the project split into 4 phases. The report only addresses drainage requirements for Phase 1. There are a total of 18 existing drainage structures within the project limits. Six are concrete box culverts (CBCs) and the other 12 are CMP.

Report: MP 46.98 to 50.45 - I-40, 1-mile West of Continental Divide I/C East of 3.5 miles Final Drainage Report, PCN: 2351, IM-TPA-040-1(98)46, Roadway Rehabilitation (1995) Drainage
Date: 7/28/1994
Prepared by: Raymunda Van Hoven

The project consisted of pavement rehabilitation and safety improvements of 3.5 miles on I-40 from MP 46.98 to 50.48. The drainage basins range from gently to steeply sloped which drain east of the Continental Divide and to the Puerco River west of the Continental Divide. Eighteen structures were evaluated in the report. The recommendations were to extend as required, clean, add MDI, and install stock gate. Adding median drop inlets would alleviate the ponding problem in the region. Additional recommendations were to lover the median flow line 3 feet at station 28+71 and construct a 24-inch pipe on the west side of the existing MDI with a 10:1 slope blanket and to regrade median ditch to a 0.3% slope between station 16+00 and the pipe.

Report: MP 88.5 to 92.7- Final Drainage Report 0.3 miles W. of NM 117, Cibola County, PCN: 1736, IM-040-2(50)89 Roadway Rehabilitation (1996) Drainage Report
Date: 10/24/1995
Prepared by: Reza Afaghpour

The project consists of safety and pavement reconstruction and rehabilitation. The project begins at MP 88.50 on I-40. 0.3 miles west of NM 117 interchange and proceed west for 4 miles to MP 92.70. There were 4 specific recommendations given for 4 locations. The first location at 687+87 will close the existing MDI and build an MDI at the next station. The second location at 695+09 the existing structures to be extended and add riprap. At station 750+00, add a junction and connect the eastbound structure to the westbound structure. At station 790+61 no extensions recommended for the structures. The other structures that had the recommendation to extend as required and clean except one other that needed “no work.” There were 22 structures evaluated in total.

Report: MP 93 to 97- Final Drainage Report CN 2507, IM-040-2(56)93, Shoulder widening and reconstruction (1999) Drainage Report
Date: 11/13/1998
Prepared by: Jose A. Silva

The project consists of surface rehabilitation, reconstruction of subgrade failure areas, horizontal realignment, and drainage improvements on I-40 from 5.8 km east of the NM117 interchange and continuing east 7.66 km in Cibola County. The drainage basins for the structures are north of the I-40 and drain southerly into the project area. The topography varies from flat to rolling hills and high mountains. Thirty-nine structures were analyzed. The recommendations varied from extend as required, raise MDI as required, build structures, and close gaps. The structure at station 25+108 required a structure replacement and three alternatives were provided but

additional investigation was encouraged regardless of the alternative chosen. The alternatives were to build a new CBC in the same location, build a new CBC in a new skewed location, or build a new slip in culvert into the existing culvert.

Report: MP 96.165 to 94.134 - Preliminary Drainage Report CN 6100221, NM124 Bridge Replacement. Interchange Reconstruction (2016) Drainage Report
Date: 3/28/2016
Prepared by: Nicole M. Friedt

The project begins at MP 94.7 to 98 on I-40 in Cibola County. The final scope of the project was to replace the existing modified trumpet interchange including Bridge 6387 with a diamond interchange. Overall improvements to the interchange were to replace or improve the drainage structures as needed. Several structures needed to be extended and new median drop inlets were also needed to accommodate the new configuration. Two culverts needed to be upsized to prevent ponding. The soil corrosivity concerns resulted in the recommendation of using concrete pipes for all improvements. The media needed to be regraded, and erosion protection was likely needed along with a realignment and shoulder widening of NM 124.

Report: MP 104.17 to 105.401- Final Drainage Report I-40 Seama I-C, CN: 2500, BR-IM-040-2(25)104, Interchange Reconstruction (2008) Drainage Report
Date: 6/16/2000
Prepared by: James S. Lowe

The project is located on I-40 at Budville/Seama interchange and consists of bridge replacement and new ramps. The new bridge was relocated 50 feet east of the existing bridge. The recommendation for the geometry of the new bridge was similar to the original proposal but to raise the vertical alignment. The drainage recommendations were to extend the structures as required and to clean as required. The rundowns should be located at the end of each curb. Additional comments are attached to the report with recommendations to pave median ditch without corrugations.

Report: MP 107 to 108 - Preliminary Drainage Report, CN: D6036, IM-040-2(79)107, Roadway Rehab & Widening (2006) Drainage Report
Date: 3/1/2006
Prepared by: Wilson & Company, INC. Engineers & Architects

The roadway and drainage improvements in the report are located on the Laguna Route 22 (L22) and the Exit 108/I-40 interchange in Cibola County. There were 21 drainage structures evaluated for the project. The terrain ranged from generally flat to hilly and/or mountainous. The recommendations were to remove the damage ends of the structures and extend as required with appropriated end structures, and to regularly clean/maintain the structures. The improvements will not change the existing flow patterns in the area.

Report: MP 117 to 122.5 - Final Drainage Report CN: G1416, AC-GRIP-(IM)040-02(73)117, Roadway Reconstruction (2006) Drainage Report
Date: 2/14/2006
Prepared by: Reza Afaghpour

The project consists of reconstruction of roadway on I-40 from MP 117 to 122.5. The terrain consists of low rolling hills with loose soil and without excessive sediment transport. The recommendations were to remove and replace the existing rundowns at Bridge 5986 and 5987 with half pipe rundowns with riprap. It was recommended to pave the medians from the bridge to 100 feet in each direction to alleviate erosion problems.

Report: MP 126.3 to 131.78 - Final Drainage Report CN: G1436, AC-GRIP-(NH)-040-2(68)126, Roadway Reconstruction (2009) Drainage Report & Addendum
Date: 2/28/2008
Prepared by: Reza Afaghpour

The project consists of cold mill of existing surfacing as well as full depth reconstruction of existing roadway shoulders. The project begins at MP 126.30 to 131.782 on I-40. The terrain consists of low rolling hills with loose soil and without excessive sediment transport. The recommendations are to be cleaned because the structures are adequate and the problems are happening because of insufficient slopes, accumulation of water by one bridge, and not enough depth to have an outfall for any proposed improvements. Overall, the recommendations consist of regrading and repaving medians and lowering drop inlets.

Report: MP 139 to 140.5 - Preliminary Drainage Report Rio Puerco Interchange Modifications, CN: G1533, AC-GRIP-NG-(IM)-040-3(176)136, Interchange Reconstruction (2007) Preliminary Drainage Report
Date: 5/31/2005
Prepared by: Bohannan Houston

The location of the project is 19 miles west of Albuquerque. The project consists of roadway improvements of a grade separated intersection between the east bound I-40 off ramp and the north Frontage Road, realignment of west bound I-40 on ramp and south Frontage Road. Fourteen structures were analyzed. Throughout the development of the roadway and interchange within the project area many different types of establishments and businesses were built. The recommendation was to construct a short-term modification to the existing interchange ramps and connections to the interstate for a period of 5 years while the interchange can be reconstructed. The modifications would be connections to the crossroad over I-40, acceleration and deacceleration lanes, and intersection improvements including a roundabout. Through the hydraulic analysis that complies with current criteria it was determined that the existing crossing structures downstream were adequate but there was a local low point where ponded water was noted. The scope of work did not include the upstream crossing concerns. After the analysis overall the crossing structures are adequate and need only need to be cleared of debris except one that needs to be regraded. The realignment of north Frontage Road will require 2 new culverts that will be adequate for that area. It was recommended to regrade the area south of the existing frontage road and north of I-40 and remove the existing westbound on ramp and regrade that area. The roundabout configuration will maintain existing flows patterns with roadway drainage flowing away. The gore area between the roundabout and east bound I-40 will require new drainage facilities of a MDI and outlet pipe connecting to the existing outfall channel

Report: MP 139.9 to 140.65 - Preliminary Drainage Report Rio Puerco Interchange Existing Drainage Analysis, CN: A300660, Reconstruction & Bridge Replacement (2012) Preliminary Drainage Report
Date: September 2011
Prepared by: Vector Engineering, LLC

The report summarizes the hydrologic and hydraulic analysis for the Rio Puerco Interchange Project. The project consists of rebuilding the existing I-40/Rio Puerco interchange near Laguna Pueblo which is approximately 18 miles west of Albuquerque. The existing conditions are detailed, and 4 basins are addressed with their areas with basin 4 being much larger than the other 3 because it is a part of the Canada del Ojo watershed. The drainage calculations are based on the NMDOT Drainage Design Criteria. The existing structures were evaluated and summarized in 4 categories by quadrants. The northwest quadrant is underdeveloped with 14 structures. The southwest quadrant is developed with a casino, I-40, and 2 structure outlets. The northeast quadrant has a gas station, convenience store, westbound off ramp, and a CBC structure. The southeast quadrant has the Rio Puerco with 3 bridges and a CBC outlet. The floodplains within the project were determined and prepared by FEMA. Three zones (A, AE, and AO) were considered to be Special Flood Hazard Areas (SFHA). The other 3 zones were not considered to be SFHA. It was recommended that Structure 4a's overflows be channeled to structure 3 since

it does not have the capacity for the 100-year storm. Options were recommended on how to channel the flows from structure 4a to structure 3. The other structures were found to be adequate.

Report: MP 140 - Final Drainage Report CN: 2041, BR-0-7501(10), Bridge Replacement & Reconstruction (2001) Drainage Report
Date: 11/21/1997
Prepared by: David E. Trujillo

The drainage analysis is for I-40 and frontage road bridge system over the Rio Puerco. The project is located 22.1 kilometers east of the junction of I-40 and NM State Road 6 beginning at MP 3.75 to 4.35. The project consists of building a new 2-lane roadway and a new three span bridge offset to the north of the existing truss bridge with improvements. The hydrological information was provided with flows and surface elevations for the 50-, 100-, and 500- years. All the structures were analyzed with a hydraulics model and did not exceed the allowable parameters. A scour analysis was estimated using a HEC-18 publication and it was determined that extensive slope protection in the vicinity of the bridges was needed and a clearing of debris, removing Keller Jacks, installing riprap, and earthwork. The culvert analysis concluded in recommending extending the existing CBC with a trapezoidal entrance and placing riprap where it is needed. Multiple pages of existing and proposed hydraulic tables and graphs were provided.

Report: MP 140 – I-40, Route 66 Casino Ramps and Access Road Improvements Final Drainage Analysis CN: G2S7499, Ramp Reconstruction (2001) Drainage Report
Date: 10/30/2009
Prepared by: Vector Engineering, LLC

The report summarizes the hydrologic and hydraulic analyses for the I-40, Route 66 Casino Ramps and Access Road Improvements, located at MP 140. The project consists of removing the existing westbound off ramp and relocating it east of its current location and modifying the existing 2- way access road. The offsite and onsite flows discharge in the Rio Puerco, west of the site. The soil type is classified as “D” with poor ground cover. The hydrologic calculations gave the frequency of rainfall for 6 hour and 24 hours in 2-, 5-, 10-, 25-, 50-, 100-, year frequencies. The rational method was used to find the runoff from the basins. Five basins were identified and summarized. The recommendations for improvements were to build new culverts and MDIs as required within each basin.

Report: MP 147.89 to 150.15 – I-40 & West Central Interchange Final Drainage Report CN: G4013
Date: 4/15/2008
Prepared by: Gannett Fleming West, Inc.

The project location in Albuquerque, New Mexico at the I-40 and Central Ave/Paseo Del Volcan interchange. It consists of replacing the existing half diamond interchange configuration with a full diamond interchange, additional roadway construction, and drainage improvements. The design criteria was established using the flood frequency for the 50- and 100- year storm data. The hydrology and hydraulic calculations used were compliant with current criteria. A summary for the land treatments in the area was given in a table. The offsite drainage is documented as the area generally sloping southeast. The existing onsite drainage states there are 2 fully developed systems that convey the runoff through a series of culverts and storm drain pipes. There are a total of 53 structures in the project area. The reconstruction of the interchange will also include the reconstruction of most existing culverts. The culverts will be modified and reconstructed as required based off the analysis. A weir will be used in culvert 11 to allow for minor flows to pass during the 100-year storm. A table and summary show the specific details of the proposed culverts and structures for the project.