EXHIBIT D

DIGITAL FLOOD HAZARD AREA DELINEATION STUDIES REPORT CHECKLIST

Instructions:

1. Engineer shall submit a completed copy of this checklist with all draft and final reports.
2. For deviations from checklist, include a separate sheet with numbered comments and write the corresponding number in the "Note #" column.
3. Clearly label Sections and Subsections (bold items in checklist) in report.
4. Provide both links from Table of Contents and bookmarks.

	REPORT SECTIONS	DRAFT REPORT	FINAL REPORT	NOTE #
PRELIMINARIES	**Cover Sheet**	☐	☐	
	Project Title "Flood Hazard Area Delineation, [*Drainageway Name*]"	☐	☐	
	Project Sponsors List, including logos	☐	☐	
	Engineer's Name/Address	☐	☐	
	Date (Month & Year)	☐	☐	
	"DRAFT" stamp (on all except Final Report)	☐	☐	
	Transmittal Letter	☐	☐	
	Signed and sealed by Engineer transmitting report to District	☐	☐	
	Table of Contents	☐	☐	
	Section titles and page numbers	☐	☐	
	List of Tables (number, title, and location in report)	☐	☐	
	List of Figures (number, title, and location in report)	☐	☐	
	List of Appendices	☐	☐	
SECTION 1 – INTRODUCTION	**Authorization**	☐	☐	
	Identify District and Engineer as contracting parties and identify other sponsors	☐	☐	
	Agreement number	☐	☐	
	Notice to Proceed date	☐	☐	
	Purpose and Scope	☐	☐	
	Describe original scope of Project	☐	☐	
	Include all actions taken by District and Sponsors that modified, limited, or expanded the scope	☐	☐	
	Describe amendments to the scope with reference to agreement number	☐	☐	
	Planning Process			
	Describe how the Project evolved	☐	☐	
	Describe specific goals and objectives for the FHAD	☐	☐	
	Provide summary of progress meetings and other coordination with District, sponsors, and other interested parties (reference Meeting Minutes in Appendix A)	☐	☐	
	Describe public meetings, their purpose, dates, methods of advertisement, minutes, and attendance roster (reference material in Appendix A)	☐	☐	
	Mapping and Surveys	☐	☐	
	Describe mapping source (i.e. mapping firm, USGS, local governments, other)	☐	☐	
	Scale	☐	☐	
	Contour interval	☐	☐	
	Datum (horizontal and vertical)	☐	☐	
	Date of mapping	☐	☐	
	Data Collection	☐	☐	
	Discuss maps, plans, reports, and other information obtained from District, Sponsors, and other agencies (reference Data Collected table in narrative)	☐	☐	

SECTION 1 – INTRO. (CONTINUED)	**Acknowledgements**	☐	☐	
	Acknowledge participants and their role in the Project (reference Project Participants table in narrative)	☐	☐	
	Tables	☐	☐	
	List of Data Collected: maps, plans, or reports used for Project including title, date, and author	☐	☐	
	List of Project Participants and their affiliations	☐	☐	
	Figures (none)			
SECTION 2 – STUDY AREA DESCRIPTION	**Project Area**	☐	☐	
	Describe Project limits (reference Watershed Map in narrative)	☐	☐	
	Describe Project's watershed size	☐	☐	
	Describe jurisdictions and major landmarks	☐	☐	
	List Project Reuse watershed number(s)	☐	☐	
	Describe changes to the Project Area and why; if none, state this	☐	☐	
	Describe hydrologic features	☐	☐	
	Describe NRCS hydrologic soil classification (reference Soils Map in Appendix B)	☐	☐	
	Describe percent of watershed currently developed	☐	☐	
	List highest and lowest watershed elevation, average slope, and watershed shape	☐	☐	
	Land Use	☐	☐	
	Describe existing land use types (reference Existing Land Use Map in Appendix B) and how information was obtained	☐	☐	
	Describe future land use types (reference Future Land Use Map in Appendix B) and how information was obtained	☐	☐	
	Discuss how imperviousness values were determined based on land use types (reference Land Use table in narrative)	☐	☐	
	Discuss overall existing watershed imperviousness (reference Existing Imperviousness Map)	☐	☐	
	Discuss overall future watershed imperviousness (reference Future Imperviousness Map)	☐	☐	
	Reach Description	☐	☐	
	Describe drainageway by reach (reference Reach figure) with reference to typical channel cross sections and photographs	☐	☐	
	Describe problem areas as discovered by observation or anecdotal information, hydrologic and hydraulic calculations, with reference to tables and figures	☐	☐	
	Identify all major crossings including street name, street type and structure type and size (reference Major Crossing Structure Inventory table)	☐	☐	
	Flood History	☐	☐	
	Provide information on past flooding events, bridge scour or stream stability, including stream gage data, literature citations, newspaper articles, anecdotal information	☐	☐	
	Environmental Assessment	☐	☐	
	Describe potential wetland and riparian zones within the Project Area (reference Wetland and Riparian Inventory in Appendix E)	☐	☐	
	Describe flora, fauna and threatened or endangered species identified within the Project Area	☐	☐	
	Tables	☐	☐	
	Land Uses with assigned impervious values	☐	☐	
	Describe soil associations and their NRCS hydrologic classification	☐	☐	
	Major Crossing Structure Inventory	☐	☐	
	Include inventory of known flora, fauna, threatened/endangered species (if applicable)	☐	☐	
	Figures	☐	☐	
	Vicinity Map showing watershed location within District boundaries	☐	☐	
	Watershed Map including jurisdictional boundaries; Identify major public and private facilities, (transportation corridors, golf courses, fairgrounds, existing detention ponds	☐	☐	

	and irrigation facilities)			
	All other Tables and Figures to be included in Appendix B			
SECTION 3 – HYDROLOGIC ANALYSIS	**Overview**	☐	☐	
	Describe general process for developing and routing hydrographs through Project Area	☐	☐	
	Describe CUHP and/or SWMM models used, including version number	☐	☐	
	Describe all calculations, references, and modeling used to develop the hydrology	☐	☐	
	Provide date hydrologic calculations approved by UDFCD	☐	☐	
	Design Rainfall	☐	☐	
	Describe the design rainfall used and source of point rainfall values and distributions (reference Point Rainfall table in narrative and Rainfall Distribution table in Appendix B)	☐	☐	
	Describe any area corrections used (reference Rainfall Area Correction Factors table in narrative)	☐	☐	
	Subwatershed Characteristics	☐	☐	
	Describe subwatershed characteristics and how they were determined (reference CUHP Input table and Subwatershed figure in Appendix B)	☐	☐	
	Discuss number of subwatersheds, range and average size of subwatershed	☐	☐	
	Hydrograph Routing	☐	☐	
	Describe flow-routing element types and geometries for existing and future land use, existing infrastructure conditions (reference SWMM Routing Map and SWMM Schematic figures in Appendix B)	☐	☐	
	Describe all existing detention facilities modeled, including stage-storage-discharge relationships (reference Detention Rating Curve tables in Appendix B)	☐	☐	
	Describe flow diversion relationships for all diversions (reference Flow Diversions table in Appendix B)	☐	☐	
	Describe potential effects of drainageway improvements (channel modifications, inadvertent detention, water quality facilities, etc.) and how addressed.	☐	☐	
	Previous Studies	☐	☐	
	Discuss hydrologic results presented in previous studies and regulatory models	☐	☐	
	Results of Analysis	☐	☐	
	Comparison of future and existing 100-year hydrology to determine if DFIRM required	☐	☐	
	Discuss results of hydrologic analysis; reconcile any deviations from flows presented in previous studies to within 10% (reference Previous Studies Reconciliation table in narrative)	☐	☐	
	Provide results of hydrologic analysis presenting peak flows and volumes (reference Peak Flow table and Runoff Volume table in Appendix B)	☐	☐	
	Provide hydrographs at key locations representing peak flows for both existing and future conditions (reference Hydrograph figures in Appendix B)	☐	☐	
	Provide peak flow profiles along the drainageway centerline for both existing and future conditions (reference Peak Flow Profile figures in Appendix B)	☐	☐	
	Provide typical samples of hydrologic model (reference sample SWMM table in Appendix B)	☐	☐	
	Tables	☐	☐	
	Point Rainfall for each flood return period	☐	☐	
	Rainfall Area Correction Factors	☐	☐	
	Comparison of Existing versus Future Conditions 100-Year Peak Flows			
	Previous Studies Hydrology Reconciliation showing peak flows at key locations from all studies and percent difference	☐	☐	
	Figures (none in narrative)	☐	☐	
	All other Tables and Figures to be included in Appendix B			

SECTION 4 – HYDRAULIC ANALYSIS	**Evaluation of Existing Facilities**	☐	☐	
	Describe procedures used to evaluate capacity of existing road crossings, channels, storm sewers and detention	☐	☐	
	Discuss development of HEC-RAS models used to delineate existing infrastructure and future land use conditions floodplain (reference HEC-RAS Cross Sections in Appendix C); final electronic files for models included in Technical Appendix	☐	☐	
	Discuss how Manning's n-values were determined; include photographs of typical channel sections used to determine values	☐	☐	
	Describe Floodway Analysis	☐	☐	
	Discuss results of hydraulic model, including any split flow conditions, types and number of structures in the future conditions floodplain (reference Flood Maps in Appendix C)	☐	☐	
	Discuss existing drainage facilities, providing a brief description of physical condition and estimated capacity related to future hydrology discharges (reference Existing Facilities table in narrative)	☐	☐	
	Flood Hazards	☐	☐	
	Describe existing and potential future drainage, erosion, water quality and flood hazard problems by reach and/or problem area (with reference to Tables and/or Figures)	☐	☐	
	Previous Analyses	☐	☐	
	Explain difference from previous hydraulic analyses of existing facilities and floodplain delineation	☐	☐	
	Tables	☐	☐	
	Existing Facilities table showing estimated capacity relative to future conditions discharges	☐	☐	
	Figures (none in narrative)	☐	☐	
	All other Tables and Figures to be included in Appendix C			
SECTION 5– REFERENCES	**List of all references used for report**	☐	☐	
APPENDICES	**Appendix A – Project Correspondence**	☐	☐	
	Minutes of progress meetings and public meetings	☐	☐	
	Summary of comments from Sponsors for each submittal and response of how each comment was addressed	☐	☐	
	Any other pertinent correspondence documenting flood hazard area determination process	☐	☐	
	Appendix B – Hydrologic Analysis Support Documents	☐	☐	
	Reach map	☐	☐	
	Soils Conditions map	☐	☐	
	Land Use maps (existing and future)	☐	☐	
	Design Rainfall Distribution table for each flood return period	☐	☐	
	CUHP Input table (subwatershed hydrologic characteristics, including area, length, centroid length, existing and future percent impervious, time of concentration, pervious and impervious storage, and initial, final and decay rate for infiltration)	☐	☐	
	Subwatershed figure showing boundaries, ID, area, existing and future percent sub-watershed imperviousness for each subwatershed	☐	☐	

APPENDICES (CONTINUED)	EPA SWMM Input Table (routing conveyance elements and their parameters detention ponds and rating curves and all diversions and their flow diversion relationships)	☐	☐	
	SWMM Routing Map with aerial image in background (show subwatersheds, conveyance elements, design points, diversions, and detention routing elements)	☐	☐	
	SWMM Schematic with major crossings labeled	☐	☐	
	Detention Rating Curve tables showing stage-storage-discharge relationships for all detention facilities (please include pond layout, description of outlet works and any supporting calculations)	☐	☐	
	Flow-diversion tables for all flow diversions	☐	☐	
	Peak flows along drainageway for future land use conditions (all return periods) including station, routing element, channel reach, and landmark	☐	☐	
	Runoff volumes and accumulated drainage areas at same locations as for peak flow	☐	☐	
	Hydrographs at key locations for existing infrastructure and future land use conditions	☐	☐	
	Peak Flow Profiles along drainageway centerline for existing infrastructure and future land use	☐	☐	
	Sample SWMM (100-yr) output report with full input included	☐	☐	
	Any other hydrology tables and figures not included in Section 3	☐	☐	
	Appendix C – Hydraulic Analysis Support Documents	☐	☐	
	Existing hydraulic structures sections	☐	☐	
	Existing hydraulic structures photographs	☐	☐	
	HEC-RAS sections illustrating design storm flood elevations	☐	☐	
	Any other hydraulic calculations tables and figures not included in Section 4	☐	☐	
	Appendix D – Floodplain and Floodway Data Tables	☐	☐	
	Appendix G – Flood Maps	☐	☐	
	Appendix H – Flood Profiles	☐	☐	