OLIVER WORRELL DRAIN
HYDRAULIC ANALYSIS
HENDRICKS COUNTY, INDIANA

Prepared for:

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1.0 INTRODUCTION

This report documents the results of a Christopher B. Burke Engineering, LLC (CBBEL) hydraulic analysis of Oliver Worrell Drain in Hendricks County, Indiana. This analysis was completed to determine Base Flood Elevations (BFEs) and floodway limits based on detailed-study methodology with updated topographic mapping. The study areas are located on the east side of Hendricks County, Indiana as shown in **Figure 1**.

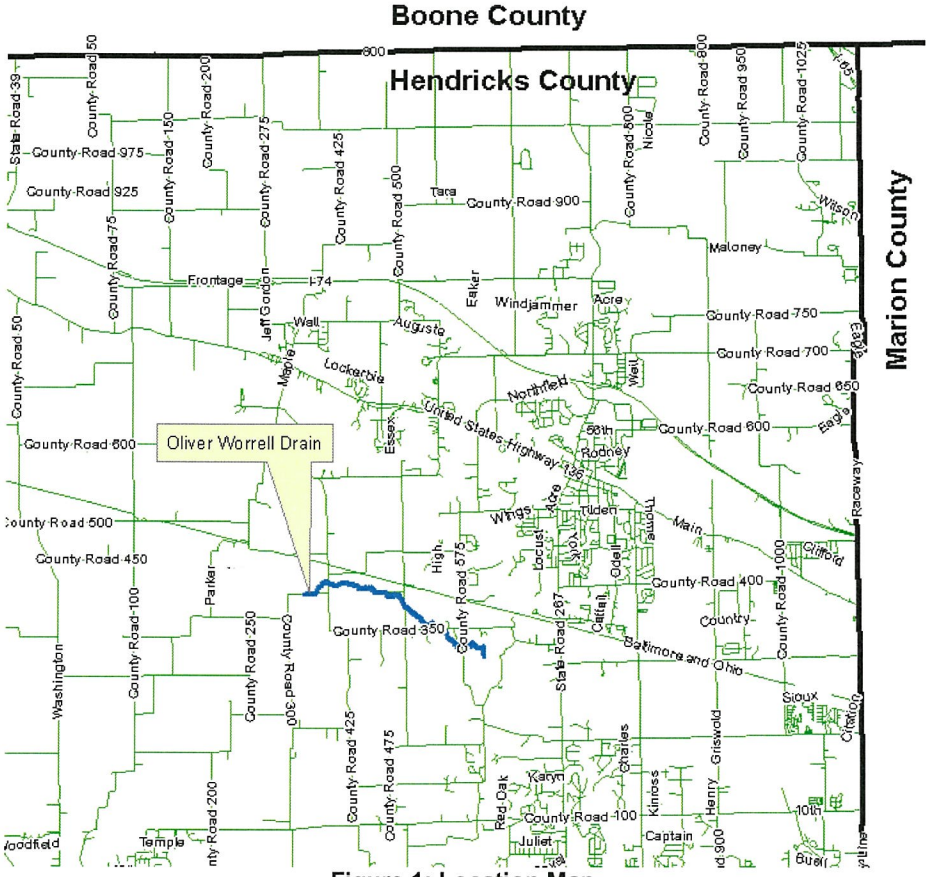

Figure 1: Location Map

This report presents the results of the CBBEL analysis and serves as support documentation for revision of the Hendricks County FIS. The analysis was performed based on the "General Guidelines for the Hydrologic-Hydraulic Assessment of Floodplains in Indiana" (Guidelines) published by the IDNR.

2.0 HYDRAULIC ANALYSIS

2.1 Model

The hydraulic analysis was completed using the Army Corps of Engineers' HEC-RAS computer program, version 4.1. The nature and source of information that was used to develop the model for the analysis of the streams is provided below.

2.2 Topographic Work Map

CBBEL used the 1 ft contour interval and spot topography provided by Hendricks County, dated 2007, as the base map for existing conditions. The vertical datum for the mapping is NAVD 1988. A copy of the map, showing the location and orientation of cross sections used in the hydraulic modeling is provided as **Exhibit 1**.

2.3 Study Reach

The study reach extends from the confluence with White Lick Creek and continues upstream approximately 3.7 miles to the downstream face of CR 400 North. As of the start of the creation of this model, the IDNR permit records do not show any permits within the study reach.

2.4 Flow Data

Flow data used for the simulation of the 10-, 50-, 100- and 500-Year storm events were based on hydrologic analysis performed by CBBEL. A copy of the Coordinated Discharge Curve is provided in **Appendix 1**. **Table 1** summarizes the discharges used in this model.

Table 1 Peak Discharges Used in the STREAM Hydraulic Model

Discharge Determination Location	Drainage Area, sq. mi.	HEC_RAS Cross Section Reach	Peak Discharge, cfs			
			10-yr	50-yr	100-yr	500-yr
Upstream end	0.48	3.676-3.393	80	150	180	280
	0.77	3.348-2.099	140	240	300	470
1 mi^2 cutoff	1.07	2.020-1.280	200	340	430	660
Upstream of confluence with Farmbrook Drain	1.268	1.229-0.663	230	410	510	790
Downstream of confluence	2.197	0.549-0.464	420	740	920	1,430
Mouth	2.641	0.346-0.013	510	900	1,120	1,740

2.5 Starting Water Surface Elevation

The starting water surface elevation for the 10-, 50-, 100-, and 500-year storm events were calculated by using the slope-area method or normal depth.

2.6 Cross Section Geometric Data

Cross-section geometric data was taken directly from the topographic base map described above. Below water channel inverts were estimated by using known elevations at bridges and interpolated slopes based on contour elevations. Full valley plots of the cross sections for the stream are provided in **Appendix 2**. All cross sections were aligned to best represent a perpendicular orientation to flow.

2.7 Manning's Roughness Coefficients

Manning's roughness coefficients through the study reach ranged from 0.04 to 0.05 for the channel and from 0.03 to 0.1 for the overbanks. The Manning's roughness coefficients were determined from the color aerial photography, used as the background of Exhibit 2, and by CBBEL staff when gathering bridge measurements. Photos from the site visit are included on the CD in **Appendix 3**.

2.8 Calibration

No appropriate data was available so no calibration was performed.

2.9 Ineffective Flow and Blocked Obstructions

Ineffective flow limits were added to model sections at appropriate locations based on contraction and expansion from flow obstructions such as upstream or downstream topography or bridges. Cross section-specific comments presenting justification for ineffective flow limits and/or blocked obstructions are contained in the hydraulic model where needed.

2.10 Bridges

CR 400N, CR 400E, CR 350N, CR 575E, and several private crossings exist within the study reach.

2.11 Culverts

CR 500E, and several private crossings exist within the study reach.

2.12 Critical Depths

No critical depths were calculated.

2.13 Floodway

A maximum of 0.14-foot surcharge floodway was determined for the 100-year profile in accordance with IDNR modeling guidelines. The floodway was defined using the equal conveyance option, Method 4, then importing to Method 1.

3.0 FINAL RESULTS OF HYDRAULIC ANALYSIS

Utilizing the input data described above, a HEC-RAS Existing Conditions Model was developed. A copy of the Existing Conditions Model input/output is included in Appendix 2. A disc with digital copies of the model, cross sections, and the floodplain mapping shapefiles is provided in Appendix 3.

The CHECK-RAS program was run for the Existing Conditions HEC-RAS model 100-Year profile. Output is provided in **Appendix 4**. The output has been annotated with remarks to explain some of the messages. Additionally, a completed IDNR Project Evaluation Table and the Hydraulic Modeling Checklist are included in Appendix 4.

The resulting floodplain and floodway are shown in Exhibit 1 with the base map topography. The proposed floodplain and floodway are also shown compared to the effective FIS map in **Exhibit 2**.

4.0 REFERENCES

Hendricks County, 1-foot contour interval topography, NAVD 1988 datum, Dated2007.

Hendricks County, point topography, NAVD 1988 datum, Dated 2007

Effective Flood Zones for Hendricks County, FEMA 2009