

FINAL DRAINAGE REPORT
for
Green River Meadows – Section 2
Vanderburgh County, Indiana
Project No.: 12103.4.001-B
December 5, 2023

Prepared For:

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Introduction

Green River Meadows – Section 2 is a proposed single-family detached residential subdivision. The site is located at 8800 N. Green River Rd., Evansville, IN 47725. The site is part of the Northeast quarter of Section 26, Township 5 South, Range 10 West, in Center Township, Vanderburgh County, Indiana. Please refer to the location map provided within this report for further details.

Existing Conditions

Site Conditions

The current conditions of the 11.03-acre tract is primarily woodlands with rolling to mild-sloped terrain. The existing site has one (1) predominant watershed of surface drainage with runoff primarily sheet-flowing to the southwest corner of the site to an existing ditch running along the south property line. Two (2) existing offsite watersheds lie to the north with runoff sheet-flowing to the south directly onto the project site.

The proposed development intends to maintain the existing ditch along the south property line. There are no existing ponds onsite.

Soils Information

The Soil Survey of Vanderburgh County indicates the soils to be Hosmer silt loam, 2 to 5 percent slopes, eroded (HoB2), Hosmer silt loam, 2 to 5 percent slopes, severely eroded (HoB3), and Iva silt loam (Iv). Please refer to the attached soils map.

Floodplain Information

The project site is located in Flood Zone X. The site was scaled on the Flood Insurance Rate Map (FIRM) for Vanderburgh County, Indiana, Community Panel Number 18163C0140D, dated March 17, 2011. Please refer to the enclosed excerpt from this map.

Proposed Development

The proposed project contains 26 residential lots. Lots are generally 0.27 acres or larger. This development includes typical elements of a single-family detached subdivision: houses, driveways, streets, landscaping, and a storm sewer system. The expected total impervious surface included within the development is approximately 126,720 SF, or 26% of the total project site.

Wetland Preservation Easement and Tree Preservation

The proposed project also includes the dedication of a Wetland Preservation Easement as part of an issued Isolated Wetland Individual Permit (#IWIP 2021-675-82-TMS-V) issued by IDEM on 4/28/2023. As part of the permit, land disturbance and tree clearing is to be minimized in order to maintain the area as in the existing condition.

To lessen environmental impacts in the vicinity of the wetland to be preserved, the proposed wet retention basin banks are proposed to be planted with native grasses and wildflowers, for which a variance is being sought.



The proposed design of the drainage control system

The storm system is designed to closely replicate the existing drainage patterns while capturing a large portion of the runoff created from the site and discharging only a minimal amount of runoff undetained. Only a small portion along the west and south edges of the subdivision are expected to leave the site undetained to the west and south respectively. A minimal portion of the site will leave the site as in the existing condition to be detained by the existing storm/retention system for Green River Meadows – Section 1, as previously designed.

Generally, these areas follow the drainage patterns in the existing condition.

The storm system is comprised of swales, inlets, and pipes that work together to direct runoff to the proposed basin. In general, runoff from an individual lot will be directed either to the gutter of the streets and enter the storm sewer through curb inlets, be directed to backyard swales that will enter the storm sewer through flared end sections, or discharge directly into the proposed basin.

The proposed project will consist of 1 onsite retention basin which will function to reduce the amount of post-developed runoff leaving the site to the allowable release rate as determined by the associated pre-developed sub-basins.

Analysis of runoff conditions from a 10-year pre-developed and 100-year post-developed storm event were analyzed using the Rational Method. The Rational Method is appropriate for estimating peak discharges for small drainage areas of up to 50 acres. Where applicable, guidance for all calculations comes from the Indiana LTAP Stormwater Drainage Manual, previously known as the HERPIC manual. Additionally, calculations were prepared in accordance with the Vanderburgh County Drainage Ordinance.

The 10-year pre-developed runoff rate (Q_{10}) was determined utilizing USDA NRCS TR-55 methodology for urban hydrology for small watersheds (less than 50 acres).

Determination of specific rainfall intensities for each developed sub-basin were calculated using the IDF equation 2.2.13 from LTAP, where the recurrence interval is equal to the design storm. The regional coefficients for Evansville, Indiana were used for storm durations less than one hour.

For the developed conditions, times of concentration were calculated using the Federal Aviation Administration method for overland flow. This method originates from airfield drainage design by the Corps of Engineers but has been used for overland flow in urban areas. The FAA method for overland flow time of concentration is generally a more conservative estimate as compared to Kerby or TR-55 methods for developed conditions. The FAA method is an allowed method by Indiana LTAP.

Overland flow is typically limited to a maximum of 100 feet, after which the flow is considered shallow concentrated flow. Typical areas where shallow flow occurs are in swales between houses and the gutter section of a roadway. USDA NRCS 630.1502 is the guiding source for determining shallow concentrated flow.

Runoff coefficients used were those found in Table 13.04.205-A and Table 13.04.205-B of the Vanderburgh County Drainage Ordinance. These show on the sub-basin drainage calculations in the appendix.

The storm pipe network is sized to the 25-year storm using the Rational Method using a Manning's Roughness, n , equal to 0.012 for HDPE pipe.

Assumptions or Special Conditions

In the analysis of the drainage control system, assumptions made are for the purpose of being conservative. As with most single-family developments, certain assumptions must be made. The following assumptions were used during the analysis:

- Each lot has 3,500 SF of impervious area, typically split evenly between what drains to the front yard and what drains to the back yard.
 - 2,500 SF of which is assumed to be rooftop
 - 500 SF is assumed in both the front and rear yards of each lot to account for driveways, sidewalks, decks, patios, etc.
 - 6 lots in the northwest corner of the site are proposed to drain from the back of the lot to the front.

Results of the Analysis

Analysis of the pre-developed site delineated 3 sub-basins, one (1) onsite and two (2) offsite, as shown on the pre-developed sub-basin exhibit. For the pre-developed site, the runoff coefficient for woodland flat (<2%), woodland flat (2-5%), and minimal structures and pavement (>10%) were used. The Time of Concentration calculations and Q_{10} values are shown for each of the pre-developed sub-basins. Detailed calculations are included as an attachment.

Pre-Developed Sub-Basin 1:

- Area = 11.03 acres
- $C = 0.18$
- $T_c = 25.00$ mins
- $Q_{10} = 6.37$ CFS

Pre-Developed Sub-Basin 2 (Offsite):

- Area = 2.54 acres
- $C = 0.26$
- $T_c = 20.00$ mins
- $Q_{100} = 3.70$ CFS

Pre-Developed Offsite Sub-Basin 3 (Offsite):

- Area = 3.16 acres
- C = 0.25
- $T_c = 17.00$ mins
- $Q_{100} = 5.02$ CFS

Once the project is fully developed, eleven (11) new onsite sub-basins will be created within the resulting drainage area and the existing two (2) off-site sub-basins will be maintained as in the existing condition. The weighted runoff coefficient, C, was calculated for each individual post-developed sub-basin based on the aforementioned impervious area assumptions for each individual lot.

Developed Sub-Basin Summary:

- Sub-Basins 1-2 will be collected and detained in Green Rivier Meadows – Section 1 as previously designed.
- Sub-Basins 3-10 will be collected and detained in the Proposed Retention Basin.
- Sub-Basin 11 will leave the site undetained.
- Offsite Sub-Basins 2 and 3 will be collected and detained in the Proposed Retention Basin.

The following analysis is provided using the Technical Memorandum for regarding undetained drainage areas.

Developed Sub-Basin 11

- Area = 0.54 acres
- C = 0.25

Criteria #1

- Developed Sub-Basin 11 = 0.54 Ac.
11.03 Ac. * 0.1 = 1.10 Ac.
0.54 Ac. < 1.10 Ac.

Criteria # 2

- Pre-Developed Sub-Basin 1
 - 0.54 Ac. < 11.03 Ac.

Criteria #3

- Pre-Developed Sub-Basin 1
 - $A * c_u = 11.03 \text{ Ac.} * 0.18 = 1.99$
 - $A * c_d = 0.54 \text{ Ac.} * 0.25 = 0.135$
 - Therefore, $A * c_d < A * c_u$

Details for the proposed retention basin are provided below. The proposed retention basin is proposed as a wet retention basin and is designed to detain and release runoff from Developed Sub-Basins 3-10 and Offsite Sub-Basins 2 and 3. The release rate of the proposed retention basin from the 100-year storm will not exceed the 10-year storm runoff rate from the portion of Pre-Developed Sub-Basin 1 designed to be routed to the basin (corresponding to Developed Sub-Basins 4-11), as well as Offsite Sub-Basins 2 and 3.

A variance is also being requested at this time to allow for the Top of Bank of the basin to be a minimum width of 6' to allow for the maximum storage footprint while maintaining the proposed Wetland Preservation Easement.

Basin #1 Details:

- Pool Elevation = 388.05
- 100-Yr Storage Elevation = 390.20
- Emergency Overflow = 390.30
 - Depth of Flow through spillway = 4"
- 12" Discharge Pipe
- Q_{100} Release = 5.37 CFS

Curb Inlet Calculations

Curb inlet capacity calculations were performed using LTAP Chapter 5.3 – Flow in Inlets.

A summary of the calculations is provided below:

- i. Minimum Capacity for inlets on a continuous grade = 2.65 CFS
 - a. Equation 5.3.1 LTAP
- ii. Minimum Capacity for sump inlets (single inlet) = 2.76 CFS
 - a. Equation 5.3.2 LTAP
- iii. Minimum Capacity for sump inlets (double inlet) = 4.15 CFS
 - a. Equation 5.3.2 LTAP
- iv. Minimum Capacity for curb opening at sump inlets (single inlet) = 1.06 CFS
 - a. Equation 5.3.8 LTAP
- v. Minimum Capacity for curb opening at sump inlets (double inlet) = 2.13 CFS
 - a. Equation 5.3.8 LTAP

Per Vanderburgh County Code, the inlets were sized for the 10-year storm event. In general, the capacities i-iii above were used to size the inlets throughout the site. These capacities only

take into account the gutter inlets and ignore flow through the curb opening, which will provide additional capacity if the gutter inlets become overwhelmed for any reason.

In unique scenarios, such as DCI202, the double curb inlet was selected, although the Q(10) for that sub-basin was calculated to be 5.28 CFS. On behalf of our client, we would request that the double curb inlet would be allowed, because the curb opening at the back of the double curb inlet will provide additional capacity. Therefore, for scenarios such as DCI202, the capacity of the double curb inlet would be taken to be 6.28 CFS.

Basin Maintenance Report

This brief report will highlight the proposed wet retention basin's design and maintenance in accordance with the latest Vanderburgh County Drainage Ordinance Section 13.04.440, Technical Memorandums and supplements. The wet retention basin will have a maintenance path, slopes leading to the water's edge, emergency overflow weir, and outlet pipe. The outlet pipes will serve to discharge excess storm water stored in the basin at a controlled rate. The emergency overflow weir will act as an automatic spillway should the outlet pipe be obstructed or capacity exceeded.

Maintenance of the basin shall include but is not limited to: removing debris and obstructions, removal of unsuitable vegetation, and mitigating erosion. If the wet basin's bottom fills up with sediment, the excess sediment will need to be removed as directed by the latest Vanderburgh County Drainage Ordinance or as needed.

No tree limbs, trunks, refuse from legally burnt vegetation, nor construction waste, demolition materials, or other man-made material may be buried within the area in which an impounding structure will be located. Notice shall be placed on construction drawings noting the prohibition to the burying of any such materials. Certain natural materials such as large rocks may be located in the bottom of wet basins in order to provide fish habitat or habitat breeding areas provided that such materials are not included within the calculations for required storage volumes and will not block outlet structures.

The banks of the proposed wet detention basin are proposed to be planted with native grasses and wildflowers (e.g. Milkweed) in order to decrease environmental impact. These proposed plantings are to be maintained by bush-hogging on an annual basis. Per 13.04.440 of the Vanderburgh County Drainage Ordinance, wet basins are to be planted with turf equal to residential lawns. Therefore, a variance is being requested from the code to allow for native plantings on the banks of the wet basin. As previously mentioned, a variance is also being requested to allow for the Top of Bank of the basin to be a minimum width of 6'.

Responsibility for Drainage Facility Maintenance

The developer intends to utilize Plan "A" for the maintenance of drainage facilities outside of County Right-of-Way. No pipes are designed to straddle the Right-of-Way line.

A detailed description, depiction, and log of all hydrologic and hydraulic calculations or modeling, and the results obtained thereby; together with the input and output files for all computer runs

All calculations, logs, exhibits, and modeling are enclosed within this report.

Maps showing individual drainage areas within the project subdivided for use in the analysis thereof

All calculations, logs, exhibits, and modeling are enclosed within this report.

Summary

This report has provided analysis and proposed conditions which ultimately lessen the overall drainage impact of the project site and its downstream adjoiners.

Total Pre-Developed Release Q (Including Offsite Pass Through Q_{100}) = 15.09 CFS

Onsite Basin Developed Release Q_{100} = 5.37 CFS

Undetained Sub-Basin 11 Developed Release Q_{100} = 0.60 CFS

Total Developed Release Q_{25} = 5.97 CFS

Overall, the developed project will release less stormwater runoff during the 100-year storm than its pre-developed area during the 10-year storm. Variances are also being requested from the code to allow for native plantings on the banks of the wet basin, and to allow for the Top of Bank of the basin to be a minimum width of 6'.

Green River Meadows - Section 2

13.04.085 Request by applicant for plan review and approval.

A. All requests for drainage plan approval shall be made by the applicant to the drainage board through the county surveyor's office by the presentation to the surveyor of the drainage plan and the supporting data, all in duplicate, by the close of the business day two full weeks prior to the meeting at which approval of the drainage plan shall be sought.

Drainage Plan submitted on 12-5-2023

C. Included with the Drainage Plan shall be the following information regarding the applicant that shall be provided on FORM 801.

- 1. For an individual(s), legal name, current mailing address, email address, name of project and general location of the project. The application must be signed by the individual(s) making such application.

- 2. For a partnership, corporation or other private entity the legal name of the partnership, corporation or other private entity, mailing address, email address, name of project and general location of the project. For a partnership, the application must be signed by the managing or senior partner or if none exists by all partners. For a Limited Liability Company (LLC), the application must be signed by the manager, or senior member or if one does not exist, by all members. For a corporation, the application must be signed by;
 - i) the President or Vice-President of the corporation or
 - ii) by a person whose authority has been delegated to sign such application. If the signature is by a person with a delegation of authority, a copy of such delegation must be included with the application.

D. In all cases the person signing the application will affirm that;

- i) the information provided on the application FORM 801 is true and correct and

- ii) that the applicant is committing with their signature that an as built plan or record drawing or certification statement will be provided upon completion of the project and that failure to provide an as built plan or record drawing or certification could result in fines under Section [13.04.110](#) and/or declaring the applicant ineligible for future drainage plan approvals for any project within the County Drainage Board's jurisdiction until such time as an as built drawing or certification is submitted. The County Surveyor or other Technical Advisors to the Board will inform the Drainage Board of any applicants that are not in compliance with submittal of an as built drawing or certification statement prior to any action being taken against such applicant.

13.04.095 Conditions of drainage plan approval.

In order for an applicant to obtain approval of a final drainage plan, the following requirements must be met:

- A. The applicant shall be eligible under the terms of this chapter to apply for and obtain drainage plan approval.
- B. The drainage plan and supporting submittals required by this chapter shall have been prepared and submitted in a timely and proper manner in accordance with the provisions of this chapter.

Drainage Plan submitted on 12-5-2023

- C. The drainage plan and supporting submittals shall reflect compliance with the requirements of this chapter, and compliance with any conditions of approval applied to the plan by the drainage board.
- D. The submitted data shall be gathered, analyzed, assembled into the drainage plan and supporting submittals; and shall be certified, and presented to the drainage board all by a civil engineer or land surveyor regularly engaged in stormwater drainage design, and registered to practice in the state of Indiana.
- E. An easement has been dedicated to house any off-site drainage facilities if such facilities are required to serve the project's stormwater drainage system.

This project does not contain any off-site drainage facilities that necessitate an easement to be dedicated.

- F. The person, persons, partnership, corporation, or other entity to whom approval of the drainage plan is granted must be the person, persons, partnership, corporation, or entity who will be responsible for accomplishing the project for which the drainage plan is developed.

CWK - Green River Park, LLC

13.04.125 Building permits conditioned.

The Vanderburgh County building commissioner shall not allow construction of buildings, or other impervious structures or facilities to commence at the site of a project requiring final drainage plan approval until:

- A. Such approval has been expressed by the drainage board;
- B. And all storm drainage facilities are constructed.

13.04.130 Phased development of large projects allowed.

Large projects may be divided into phases for the purpose of constructing drainage facilities and obtaining permits in accordance with the requirements of this chapter.

This project will not be developed in phases.

13.04.140 Information submittal and review schedule.

The required drainage plan and supporting data shall be submitted and reviewed by a schedule as follows:

H. For all new major subdivisions as defined in Title 16 of this code, which major subdivisions are shown to discharge an amount of stormwater in addition to that which is discharged prior to new development and all minor subdivisions, C-0 Through M-3, as defined in Title 16 of this code, which minor subdivisions are zoned for commercial use, the applicant shall notify all adjoining landowners and Registered Neighborhood Associations within 1/2 mile of any development of the proposed Drainage Plan.

This project is a major subdivision.

13.04.165 Contents of the final drainage plan.

A. Soils Map. The soil types based on the most current information available from the SWCD. A soils map indicating soils names and their hydrologic classification must be provided for a proposed project.

See Appendix of Drainage Report.

B. Location and Topographic Map. In addition, a location and topographic map must be provided showing the land to be developed, and such adjoining land whose location and topography may affect or be affected by the layout or drainage of the project. The map must also identify all adjoining landowners.

See Grading and Drainage Plans submitted with this report.

C. Contour Intervals.

1. The contour intervals shown on the topographic map shall be two and one-half feet for slopes less than four percent; and five feet for slopes four percent or greater; or best available;

Contour intervals are every one foot.

2. Zone "A" floodplain based on the current FIRM panels. The location of streams and other stormwater conveyance channels, both natural and man-made; and the vertical and horizontal limits of the one hundred (100) year floodplain, according to FIRM panels, and/or the building commissioner; all properly identified;

See Appendix of Drainage Report.

3. The normal shoreline of lakes, ponds, swamps, and basins, their floodplains, and lines of inflow and outflow;

See Grading and Drainage Plans submitted with this report.

4. The location of exiting regulated drains, farm drains, inlets and outfalls;

See Grading and Drainage Plans submitted with this report.

5. Storm, sanitary, and combined sewers, and outfalls;

See Grading and Drainage Plans submitted with this report.

6. Wells, septic tank systems, and outfalls, if any;

There will be no wells, septic tank systems, or outfalls on this project.

7. Seeps, springs, sinkholes, caves, shafts, faults, or other such geological features visible, or of record;

No visible geological features are present at this project site.

8. The limits of the entire proposed project and the limits of the expected extent of land disturbance required to accomplish the project;

See Grading and Drainage Plans submitted with this report.

9. The location of the streets, lot lines, and easements;

See Grading and Drainage Plans submitted with this report.

10. A scale, preferably one inch equals fifty (50) feet;

11. An arrow indicating North.;

- D. On-Site Bench Mark Required. A benchmark determined by "Mean Sea Level Datum 1929," is required to be located within the project limits.

See Grading and Drainage Plans submitted with this report.

13.04.170 Final drainage plan layout (Includes information from preliminary).

- A. In addition to the requirements listed for a preliminary drainage plan, the final drainage plan shall depict the following:

1. The extent and area of each watershed affecting the design of the drainage facilities for the project; The extent and area of each watershed tributary to the drainage facilities within the project; The existing man-made and natural waterways, ponds, basins, pipes, culverts, and other drainage facilities or features within or affecting the project.

See Appendix of the Drainage Report for watershed exhibits.

2. The final layout and design of proposed storm sewers, their inlet and outfall locations and elevations, the receiving streams or channels; all with the basis of their design;

See Grading and Drainage Plans and Appendix of this Drainage Report.

3. The location and design of the proposed street system, including depressed pavements used to convey or detain overflow from storm sewers and over-the-curb runoff resulting from heavier rainstorms, and the outlets for such overflows; all with their designed elevations;

See Grading and Drainage Plans submitted with this report.

4. The locations, cross sections, and profiles of existing streams, floodways, and floodplains to be maintained, and the same for all new channels to be constructed;

See Grading and Drainage Plans submitted with this report.

5. The materials, elevations, waterway openings, size, and basis for design of the proposed culverts and bridges;

See Grading and Drainage Plans and Appendix of this Drainage Report

6. Existing ponds and basins to be altered, enlarged, filled, or maintained; and new ponds, basins, swales, to be built, and the basis of their design;

See Grading and Drainage Plans and Appendix of this Drainage Report.

7. The location and percentage of impervious surfaces existing and expected to be constructed;

See Appendix for location and percentage of impervious surfaces existing and expected to be constructed.

8. The material types, sizes, slopes, grades and other details of all the stormwater drainage facilities;

See Grading and Drainage Plans submitted with this report.

9. The estimated depth and amount of storage required in the new ponds or basins, the freeboard above the normal pool and highwater pool of wet basins, and details of the emergency overflows from the basins;

See Grading and Drainage Plans submitted with this report.

10. For all controlled release basins, a plot or tabulation of the storage volumes with corresponding water surface elevations, and a plot or tabulation of the basin outflow rates for those water surface elevations;

See Appendix of the Drainage Report

11. The location of any applicable "impacted drainage areas" or other areas designated to remain totally undisturbed, natural, or for common and/or recreational use.

The site is not located in any applicable "impacted drainage areas".

B. Protection of Structures From One Hundred Year Flooding. All structures to be occupied as residences or businesses shall have finished floor elevations two feet above the high water calculated to occur during a one hundred (100) year return period storm for the subject building site; and the required floor elevations shall be depicted on the plan drawings for such affected sites.

All structures are above the 100 year floodplain shown on plans.

13.04.175 Submittal of a written drainage design report.

13.04.180 Typical cross sections of the drainage facilities.

One or more typical cross sections must be provided for each existing and proposed channel, basin, pond, or other open drainage facility, which cross sections:

See Grading and Drainage Plans submitted with this report.

13.04.440 General detention/retention basin design requirements.

The following design principles shall be observed for detention and retention basins:

- | | |
|----------|--|
| Provided | A. Duration of Storage. The maximum volume of water stored and subsequently released at the design release rate shall not result in a storage duration in excess of forty-eight (48) hours, unless additional storms occur within the period. |
| Provided | B. Depth of Stored Water. The maximum depth of stormwater to be stored, without a permanent pool shall not exceed four feet; and the maximum depth of stormwater to be stored above a permanent pool shall not exceed four feet. |
| Provided | C. Finished Floor Elevations Adjacent to Basins. The lowest floor of any building or structure occupied by humans must be at least two (2) feet above the one-hundred (100) year storm water elevation of detention/retention basins. |
| Provided | D. Earthen Side Slopes 4:1 Maximum Steepness for Basins. All detention and retention basins with grassed, earthen side slopes shall have side slopes no steeper than four horizontal units of measurement to one vertical unit of measurement (4:1) to the base of dry basins, and to the typical low waterline of wet basins. |

- N/A E. Riprap Side Slopes 2:1 Maximum Steepness for Basins. Wet retention basins with riprap armored side slopes shall have slopes no steeper than two horizontal units of measurements to one vertical unit of measurement (2:1) at any point in the side slope.
- N/A F. Riprap to Extend Two Vertical Feet Below Waterline. The armored portion of the side slope must extend to a minimum depth below the permanent pool elevation of two vertical feet.
- Provided G. Underwater Earthen Side Slopes 2:1 Maximum Steepness. Nonarmored earthen side slopes shall have slopes no steeper than two horizontal units of measurement to one vertical unit of measurements from a point two vertical feet below permanent pool, thence downward.
- N/A H. Minimum Depth of Riprap Application. Riprap side slope armor shall be a minimum twelve (12) inches in depth at all points of application.
- N/A I. Drain Recommended for Maintenance of Wet Basins. If possible, a drain should be installed to lower the pool of wet basins to a level sufficient to repair any wave action erosion along the waterline, and to perform other periodic maintenance.
- Provided J. Safety Ledges and/or Fencing of Wet Basins. Safety fencing surrounding the basin, and/or shallow safety ledges shall be provided if deemed necessary by the design engineer or the board.
- Provided K. Outlet Controls to Operate Automatically. Outlet control structures shall be designed to operate as simply as possible, and shall require little or no maintenance for proper operation.
- Provided L. Designed Water Level Control Required. A controlled positive outlet shall be required to maintain the designed water level in wet basins, and provide the required detention storage above the designed low water level. Wet basins shall have a minimum depth of 6 feet over 50% of the basin area and no extensive shallow areas shall be allowed except as required for the safety ledge.
- M. Emergency Spillway Requirements.
- Provided 1. An emergency overflow spillway shall be provided for the release of storm runoffs exceeding the designed maximum detention volume, or all overflow volumes in emergency conditions, should the normal discharge devices become totally or partially inoperative.
- Provided 2. A minimum freeboard of one-half foot above the calculated elevation of the design storm detention high water level to the elevation of the spillway flowline peak is required as a safety factor for all basins.

Provided	N. Automatically Operating Emergency Spillway Required. The emergency overflow spillway shall be designed so that it operates openly, automatically, does not require manual attention, and will pass all the one hundred (100) year return period storm flow with a one-half foot vertical minimum above the one hundred (100) year return storm flow to the lowest dirt elevation in the surrounding earthwork.
N/A	O. All Permanent Pools Require Water Quality Provisions. Designers of basins with permanent pools shall consult available manuals from the soil and water conservation district, and incorporate provisions therefrom for maintaining water quality, safety, and soil stability.
N/A	P. Dry Basin Cover and Maintenance. Dry basins shall be planted and maintained in vegetative cover equal to that of residential lawns.
Provided	Q. Side Slopes to Remain Stable. All side slopes of a basin shall be constructed stable and shall be maintained in a stable condition by the same criteria as specified herein for open channels.
Provided	R. Wet Basin Cover and Maintenance. The earthen side slopes of wet basins shall be provided with grass cover above the low water elevation, which shall be maintained equal to turfed residential lawns, and in no case shall the cover growth exceed twelve (12) inches in height, or the most current county standard.
See Report	S. Maintenance Pathway for Basins. A flat pathway with a minimum width of ten (10) feet shall be constructed completely around the top of the embankment of all detention/retention basins.
See Plan	T. Maintenance Easement for Basins. An easement dedicated for the purpose of accessing and maintaining the basin and its appurtenances shall be provided, and the easement shall be configured so that it includes the entire basin, the entire earthwork encompassing the basin, the maintenance pathways into and around the basin, and all inletting and outletting appurtenances of the basin. The basins and maintenance easements shall not be located with the right of way of any county, state or federal road or highway.
	U. Maintenance Report Required for Basin.
Provided	1. A brief and concise report shall be prepared, by the design engineer, consisting of a description of the location, intended function of all parts appurtenant to the basin, together with a description of the ways in which the basin and its appurtenances should be maintained, all worded in language easily understood by residential or commercial property owners; and;
Provided	2. The report shall be attached to the restrictions for the property on which the basin and its parts are located.

Provided 3. Such restrictions shall be shown to exist prior to the board's final approval of the drainage plan for a project whose plans include a basin.

N/A V. Copy of Report Must be Submitted With the As-Builts. A copy of the maintenance report described above shall be included with the as-built plans required to be submitted hereinabove.

N/A W. Elevation of Dry Basin Bottom Marked. A continuous concrete liner at least equal in characteristics to that described in Section 13.04.315F shall be installed in all dry basins from the point of inflow of each channel entering a basin to the point of outflow from the basin. The concrete liner shall be installed at an elevation slightly lower than the earthen floor of the basin, so that it may serve as a trickle trough or low flow liner.

N/A X. No tree limbs, trunks, refuse from legally burnt vegetation, nor construction waste, demolition materials, or other man made material may be buried within the area in which an impounding structure will be located. Notice shall be placed on construction drawings noting the prohibition to the burying of any such materials. Certain natural materials such as large rocks may be located in the bottom of wet basins in order to provide fish habitat or habitat breeding areas provided that such materials are not included within the calculations for required storage volumes and will not block outlet structures.

N/A Y. For small sites of less than 5 acres, infiltration trenches may be utilized instead of a wet or dry basin. In utilizing an infiltration trench, the storage volume is equal to the void ratio multiplied by the total volume of the trench. Information must be provided in advance validating the void ratio as well as testing proposal to validate the void ratio. The infiltration trench must have an outlet that restricts the flow per code provisions.

N/A Z. No retention basin shall be allowed within the flowline of a Regulated Drain of Vanderburgh County. The Drainage Board cannot use its rights to discretionary decisions granted under Section [13.04.025](#) to exempt this restriction.

Other comments:

APPENDIX 'A'

Vicinity Map A.01

USDA Soil Survey A.02

Flood Insurance Rate Map (FIRM) A.03

HUC 14 Map A.04

Wetlands Inventory Map A.05

Vicinity Map



Approximate Site Location



Soil Map—Vanderburgh County, Indiana
(Soils Map)



Map Scale: 1:2,260 if printed on A landscape (11" x 8.5") sheet.




Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84



Soil Map—Vanderburgh County, Indiana
(Soils Map)

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils


 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water


 Perennial Water

 Rock Outcrop


 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip


 Sodic Spot


 Spoil Area

 Stony Spot


 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Vanderburgh County, Indiana

Survey Area Data: Version 22, Sep 2, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 15, 2022—Jul 21, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

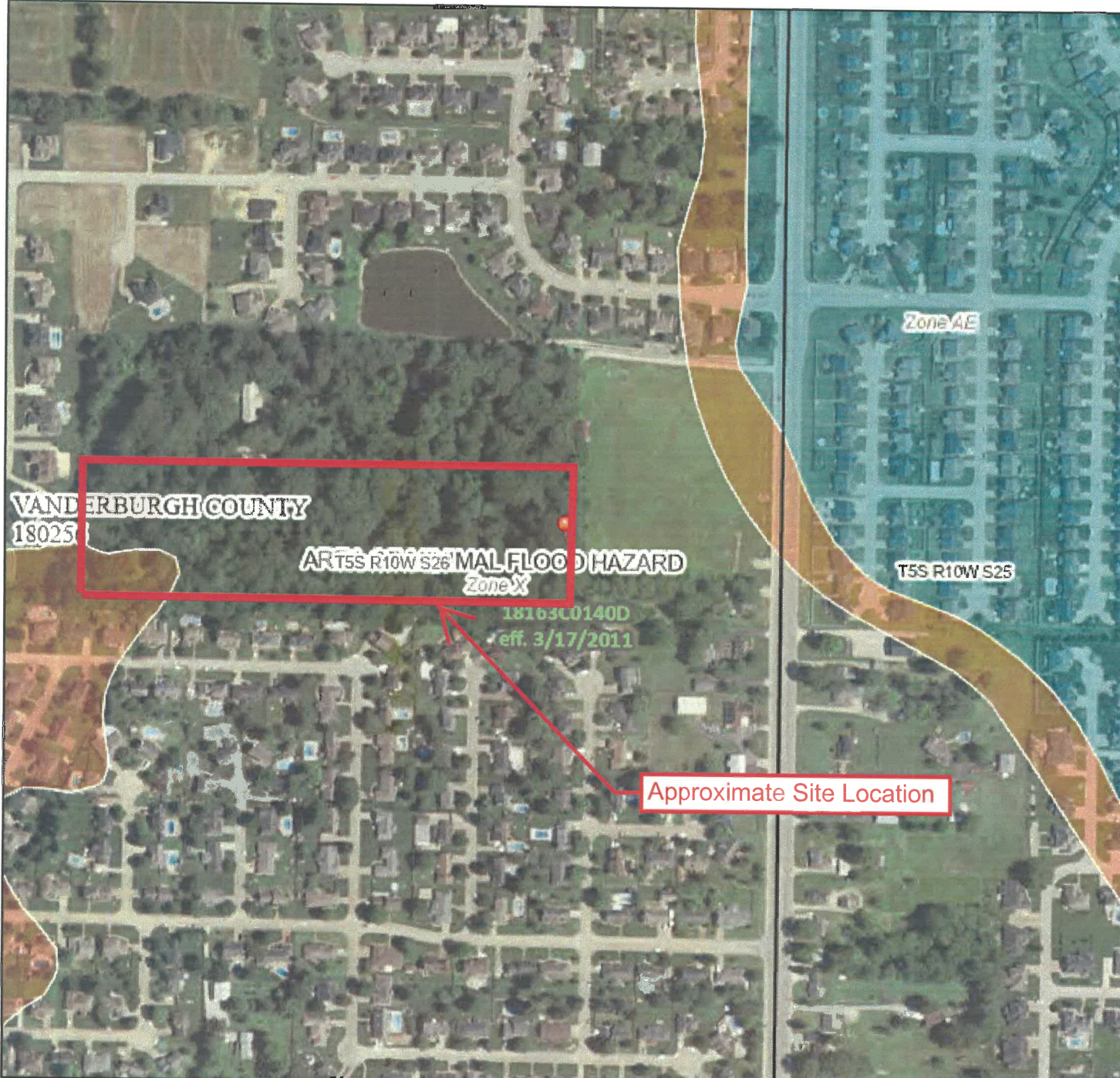
Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HoB2	Hosmer silt loam, 2 to 5 percent slopes, eroded	5.2	42.7%
HoB3	Hosmer silt loam, 2 to 5 percent slopes, severely eroded	0.0	0.2%
Iv	Iva silt loam	6.9	57.1%
Totals for Area of Interest		12.2	100.0%

National Flood Hazard Layer FIRMette



87°29'55"W 38°3'41"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i> With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i> Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i> Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i> Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i> Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i> Effective LOMRs Area of Undetermined Flood Hazard <i>Zone</i>
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer Levee, Dike, or Floodwall
OTHER FEATURES	20.2 Cross Sections with 1% Annual Chance Water Surface Elevation 17.5 Coastal Transect Base Flood Elevation Line (BFE) Limit of Study Jurisdiction Boundary Coastal Transect Baseline Profile Baseline Hydrographic Feature
MAP PANELS	Digital Data Available No Digital Data Available Unmapped

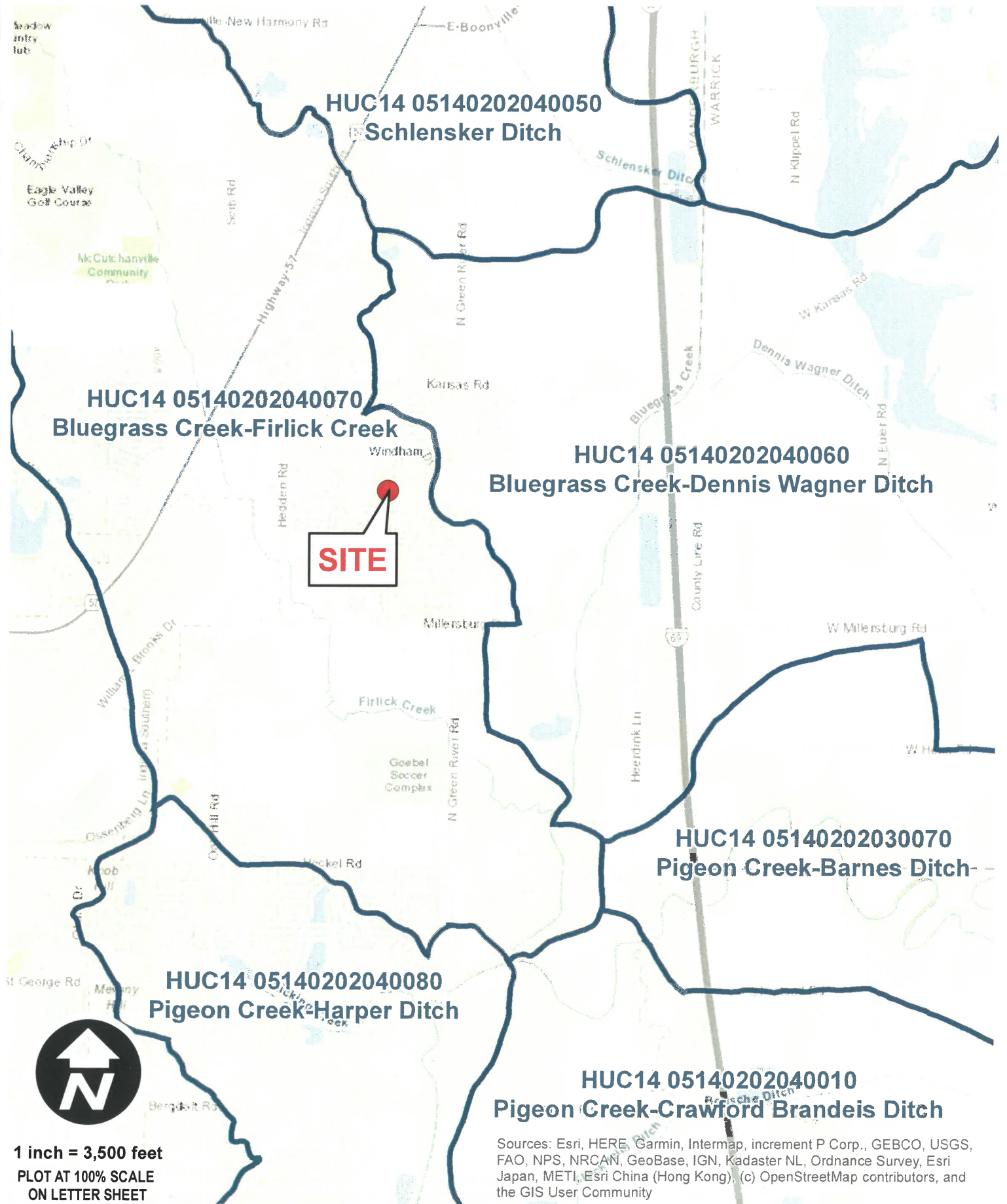
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

0 250 500 1,000 1,500 2,000 Feet 1:6,000 87°29'18"W 38°3'12"N

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/14/2023 at 12:19 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



SITE



1 inch = 3,500 feet
PLOT AT 100% SCALE
ON LETTER SHEET

HUC14 05140202040010
Pigeon Creek-Crawford Brandeis Ditch

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

4800 Rosebud Ln.
 Newburgh, IN 47630
 812.464.9585 Phone
 812.464.2514 Fax
 morleycorp.com

TOPOGRAPHIC MAPPING
WITH USGS HUC 14
WATERSHED DESIGNATIONS
VANDERBURGH CO, INDIANA

Designed By: WF	Job Number: 12103
Drawn By: MJS	Date: 14AUG2023
Filename: HUC14.mxd	



August 11, 2023

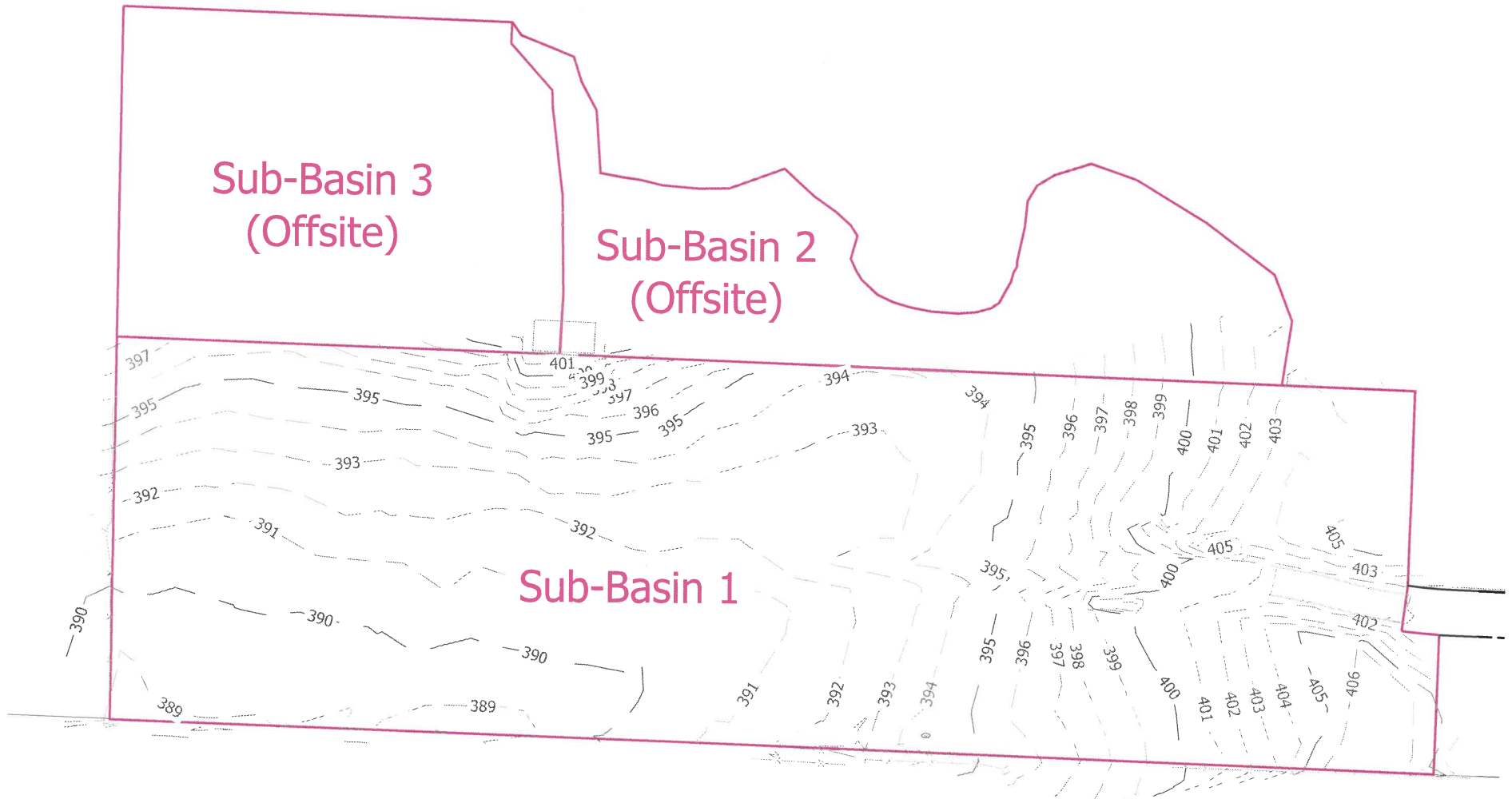
Wetlands

- | | | | | | |
|---|--------------------------------|---|-----------------------------------|---|----------|
|  | Estuarine and Marine Deepwater |  | Freshwater Emergent Wetland |  | Lake |
|  | Estuarine and Marine Wetland |  | Freshwater Forested/Shrub Wetland |  | Other |
| | |  | Freshwater Pond |  | Riverine |

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

APPENDIX 'B'

- Pre-Developed Drainage Information B.01
- Developed Drainage Information B.02
- Drainage Calculations B.03
- Form 800 B.04
- Detention Calculations B0.5



SCALE 1" = 150'



ARCHITECTS | ENGINEERS | SURVEYORS

4800 Rosebud Ln.
Newburgh, IN 47630
812.464.9585 Phone
812.464.2514 Fax
morleycorp.com

Pre-Developed Subbasins

Green River Meadows - Section 2

8800 N. Green River Road

Designed By: JEM	Job Number: 12103.4.001-B
Drawn By: KJL	Date: 12.05.2023
Filename: 12103 Civil Base	

Morley
Pre-Developed Time of Concentration (Tc)
Based on TR-55 Methodology

Project: 12103.4.001-B
Location: 8800 N. Green River Rd.

Prepared By: KJL **Date:** 11/21/2023
Checked By: JEM **Date:** 11/21/2023

NOTES: Purple values are entered by the user
Blue values are calculated by the spreadsheet

Sheet Flow (Applicable to Tc only)

1. Surface description (Table 3.2.6)
2. Manning's roughness coefficient for sheet flow, n (Table 3.2.6)
3. Flow Length, L (total L <= 100 ft)
4. Two year 24-hour rainfall, P2 (NOAA Table)
5. Land slope, s
6. $T_t = [0.007 (n L)^{0.8}] / [P_2^{0.5} s^{0.4}]$

		Subbasins		
		1	2 (Offsite)	3 (Offsite)
Segment ID		A	A	A
		Woods	Woods	Woods
		0.4	0.4	0.4
	ft	100	100	100
	in	3.3	3.3	3.3
	ft/ft	0.030	0.031	0.039
	hr	0.2997	0.2958	0.2698

Shallow Concentrated Flow

7. Surface Description (paved or unpaved)
8. Flow Length, L
9. Watercourse slope, s
10. Average Velocity, V (NRCS 630.1502 Table 15-3)
11. $T_t = L / (3600 V)$

Segment ID		B	B	B
		Unpaved	Unpaved	Unpaved
	ft	840	400	280
	ft/ft	0.0158	0.0367	0.0504
	ft/s	2.03	3.09	3.62
	hr	0.1151	0.0359	0.0215

Channel Flow

12. Width of ditch bottom
13. Ratio of Horizontal to Vertical of left ditch side slope (XH:1V)
14. Ratio of Horizontal to Vertical of right ditch side slope (XH:1V)
15. Bankfull depth of flow:
16. Cross sectional flow area, a
17. Wetted Perimeter, p_w
18. Hydraulic radius, r=a/p_w
19. Channel slope, s
20. Manning's roughness coeff. for channel flow, n (VC 13.04.220)
21. $V = [1.49 r^{0.67} s^{0.5}] / n$
22. Flow Length, L
23. $T_t = L / (3600 V)$

Segment ID				
	ft			
	ft			
	ft ²			
	ft ²			
	ft ²			
	ft/ft			
	ft/s			
	ft			
	hr			

24. Total Time of Concentration or Travel Time

Tc/Tt for area in hours	0.415	0.332	0.291
Tc/Tt for area in minutes (5 minutes is minimum)	25.0	20.0	17.0

Morley
Pre Developed Weighted Runoff Coefficient
Rational Method

Project: 12103.4.001-B
Location: 8800 N. Green River Rd.

Prepared By: KJL
Checked By: JEM

Date: 12/5/2023
Date: 12/5/2023

NOTES: Purple values are entered by the user
 Blue values are calculated by the spreadsheet

Return Period (Years)

Subbasins

Surface	C	1
Structures & Pavement (<2%)	0.92	0
Structures & Pavement (2-5%)	0.94	0
Structures & Pavement (5-10%)	0.96	0
Structures & Pavement (>10%)	0.98	0
Gravel (10 yr storm)	0.50	0
Gravel (25 yr storm)	0.60	0
Gravel (50-100 yr storm)	0.65	0
Lawn (<2%)	0.15	0
Lawn (2-5%)	0.25	0
Lawn (5-10%)	0.40	0
Lawn (>10%)	0.55	0
Woodland Flat (<2%)	0.12	246,981
Woodland Flat (2-5%)	0.24	233,396
Woodland Rolling (5-10%)	0.36	0
Woodland Hilly (>10%)	0.48	0
Pasture Flat (<2%)	0.12	0
Pasture Flat (2-5%)	0.25	0
Pasture Rolling (5-10%)	0.36	0
Pasture Hilly (>10%)	0.48	0
Cultivated Flat (<2%)	0.20	0
Cultivated Flat (2-5%)	0.35	0
Cultivated Rolling (5-10%)	0.50	0
Cultivated Hilly (>10%)	0.65	0
Bare Soil	0.72	0
Water	1.00	0
Total SF		480,377
Total Acres		11.03
Weighted C		0.18

Time of Concentration (min.)

I(10)
 Q(10)

Morley
Pre Developed Weighted Runoff Coefficient
Rational Method

Project: 12103.4.001-B
Location: 8800 N. Green River Rd.

Prepared By: KJL
Checked By: JEM

Date: 12/5/2023
Date: 12/5/2023

NOTES: Purple values are entered by the user
 Blue values are calculated by the spreadsheet

Return Period (Years)

Subbasins

Surface	C	2 (Offsite)	3 (Offsite)
Structures & Pavement (<2%)	0.92	0	0
Structures & Pavement (2-5%)	0.94	0	0
Structures & Pavement (5-10%)	0.96	0	0
Structures & Pavement (>10%)	0.98	2,775	2,775
Gravel (10 yr storm)	0.50	0	0
Gravel (25 yr storm)	0.60	0	0
Gravel (50-100 yr storm)	0.65	0	0
Lawn (<2%)	0.15	0	0
Lawn (2-5%)	0.25	0	0
Lawn (5-10%)	0.40	0	0
Lawn (>10%)	0.55	0	0
Woodland Flat (<2%)	0.12	0	0
Woodland Flat (2-5%)	0.24	107,717	135,060
Woodland Rolling (5-10%)	0.36	0	0
Woodland Hilly (>10%)	0.48	0	0
Pasture Flat (<2%)	0.12	0	0
Pasture Flat (2-5%)	0.25	0	0
Pasture Rolling (5-10%)	0.36	0	0
Pasture Hilly (>10%)	0.48	0	0
Cultivated Flat (<2%)	0.20	0	0
Cultivated Flat (2-5%)	0.35	0	0
Cultivated Rolling (5-10%)	0.50	0	0
Cultivated Hilly (>10%)	0.65	0	0
Bare Soil	0.72	0	0
Water	1.00	0	0
Total SF		110,492	137,835
Total Acres		2.54	3.16
Weighted C		0.26	0.25

Time of Concentration (min.)

I(100)	5.64	6.23
Q(100)	3.70	5.02



INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

We Protect Hoosiers and Our Environment.

100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • www.idem.IN.gov

Eric J. Holcomb
Governor

Brian C. Rockensuess
Commissioner

ISOLATED WETLAND INDIVIDUAL PERMIT

VIA ELECTRONIC MAIL:

PERMIT NO.: IWIP 2021-675-82-TMS-V
PROJECT NAME: Green River Meadows
AUTHORITY: IC 13-18-22-3
DATE OF ISSUANCE: April 28, 2023
DATE OF EXPIRATION: April 27, 2025

APPROVED:

Brian Wolff, Branch Chief
Surface Water, Operations, and Enforcement
Office of Water Quality

APPLICANT AND PERMITTEE: CWK-Green River Park, LLC
Attention: Wayne Kinney
9210 Petersburg Road
Evansville, IN 47725

AGENT: Meristem, LLC
Attention: Marc Woernle
877 Port Drive
Avon, IN 46123

PROJECT LOCATION: Vanderburgh County
NE ¼, Section 26, Township 5 South, Range 10 West
Daylight USGS Quad

Received by the
Vanderburgh County
Surveyor's Office

DEC - 1 2023



A State that Works

The project is located on the west side of Green River Road, south of Windham Drive, Latitude: 38.057901, Longitude: -87.492433

ISOLATED WETLANDS
ON PROPERTY:

1MW1	Class I	0.23 acre	NF
1MW2	Class III	4.77 acres	FO
Total acreage:		5.00 acres	

ISOLATED WETLANDS
EXEMPT:

1MW1	Class I	0.23 acre	NF
Total exemption:		0.23 acre	

REGULATED ISOLATED
WETLAND IMPACTS:

1MW2	Class III	4.27 acres	FO
Total regulated impact:		4.27 acres	

PERMITTED ACTIVITY:

Discharge clean earthen fill material into 4.27 acres of Class III forested isolated wetland.

The purpose of the fill is to complete a residential development.

MITIGATION:

Onsite preservation of 0.50 acre of forested wetland and the purchase and preservation of an offsite wetland complex approximately 20 acres in size.

MITIGATION LOCATION:

Posey County

Latitude: 37.954502, Longitude: -87.982918

The mitigation property is part of the Pitcher Lake Slough and is located on the west side of Raben Road north of Upper Upton Road.

MITIGATION RATIOS:

Class of Wetland Impacts: III
Type of Wetland Impacts: Forested
Class of Wetland Replacement: III

Type of Wetland Replacement: Forested
On-site Preservation and Off-site Mitigation
Required Ratio: 3:1
Total Class III Mitigation: 20 acres

Conditions of the Isolated Wetland Individual Permit

1.0 General

- (a) Implement the project as depicted and described in the application for an Isolated Wetland Individual Permit.
- (b) Complete all approved discharges no later than two (2) years after the date of issuance of this Isolated Wetland Individual Permit. You may request a one (1) year extension to the Isolated Wetland Individual Permit by submitting a written request ninety (90) days prior to the deadline stated above. The written request shall contain an account of which discharges and mitigation have been completed and list the reasons an extension is requested.
- (c) Allow the commissioner or an authorized representative of the commissioner (including an authorized contractor), upon the presentation of credentials:
 - (1) to enter your property, including impact and mitigation site(s);
 - (2) to have access to and copy at reasonable times any records that must be kept under the conditions of this permit;
 - (3) to inspect, at reasonable times, any monitoring or operational equipment or method; collection, treatment, pollution management or discharge facility or device; practices required by this permit and any mitigation wetland site;
 - (4) to sample or monitor any discharge of pollutants or any mitigation site.

2.0 Mitigation

- (a) Implement the mitigation plan as described in the application received November 29, 2022, and modifications received February 18, 2023, March 21, 2023, and April 27, 2023 (referred to collectively hereinafter as the "mitigation plan"), and as modified by the conditions of this permit.
- (b) Implement the onsite preservation and seeding plan as specified in the application received November 29, 2022, and modifications received March 21, 2023, and April 27, 2023.

- (c) Install signs or markers clearly identifying all onsite preservation areas and areas being planted to native grasses and wildflowers.
- (d) Submit Proof of purchase of the offsite mitigation property as specified in the off-site mitigation plan dated February 18, 2023, by December 31, 2023.

3.0 Mitigation Monitoring

- (a) Submit as-built plans within three (3) months of completing the onsite preservation and seeding plan. The as-built plans shall include:
 - (1) The locations and photographic documentation of the markers specified in Condition 2.0(c) above.
 - (2) Final locations of all areas seeded as part of the onsite mitigation.
 - (3) The species and quantities of each species that were planted. Deviations from the approved mitigation plan must be highlighted and explained.
- (b) Monitor the onsite mitigation site annually for a minimum period of two (2) continuous years after completion of the plantings to ensure the plantings meet the following success criteria:
 - (1) All mitigation seeding areas exhibit 90% vegetative cover by native species.
 - (2) The plantings are free from the following: *Lythrum salicaria* (purple loosestrife), *Phragmites australis* (common reed), *Elaeagnus umbellata* (autumn olive), *Elaeagnus angustifolia* (Russian olive), *Rosa multiflora* (multiflora rose), *Lonicera maackii* (honeysuckle), *Lonicera morrowii* (honeysuckle), *Lonicera tatarica* (honeysuckle), and *Pyrus calleryana* (callery pear).
- (c) Mitigation monitoring reports must include the following:
 - (1) The IDEM identification number.
 - (2) Discussion of plant community development at the mitigation site.
 - (3) Discussion of methods or means used to determine compliance with the success criteria.
 - (4) Photographs representative of the mitigation site and sampling points.
 - (5) Confirmation that areas designated for preservation have remained undisturbed.
 - (6) Identification of any problems with meeting the success criteria.
 - (7) Corrective actions for identified problems.
- (d) Once you believe that the site meets or exceeds all of the success criteria, you may submit a proposed final monitoring report to IDEM and suspend monitoring. IDEM will not release the site until you have demonstrated, through monitoring reports that the site is compliant. If IDEM confirms that the mitigation site meets or exceeds all of the success criteria, IDEM will notify you that the mitigation is complete and that you may permanently discontinue

monitoring. If the site does not meet the specified success criteria, corrective actions must be implemented and additional monitoring may be necessary. Extended monitoring may constitute the sole corrective action if IDEM believes that the site needs more time to meet the success criteria. Other corrective actions may also include additional plantings, maintenance activities, or other actions deemed necessary by IDEM to meet the success criteria.

4.0 Erosion and Sediment Control

- (a) Implement erosion and sediment control measures on the construction site prior to land disturbance to minimize soil from leaving the site or entering a waterbody. Erosion and sediment control measures shall be implemented using an appropriate order of construction (sequencing) relative to the land-disturbing activities associated with the project. Appropriate measures include, but are not limited to, silt fence, diversions, and sediment traps.
- (b) Monitor and maintain erosion control measures and devices regularly, especially after rain events, until all soils disturbed by construction activities have been permanently stabilized.
- (c) Install and make appropriate modifications to erosion and sediment control measures based on current site conditions as construction progresses on the site. The Indiana Storm Water Quality Manual or similar guidance documents are available to assist in the selection of measures that are applicable to individual project sites.
- (d) Cut and fill slopes located adjacent to wetlands and streams (including encapsulated streams) or that directly discharge to these aquatic features are to be stabilized using rapid/incremental seeding or other appropriate stabilization measures.
- (e) As work progresses, areas void of protective ground cover shall be re-vegetated or stabilized using mulch that is anchored, or under more extreme conditions an appropriate grade of erosion control blanket must be used. Erosion control blanket shall be used for areas associated with concentrated flow. The selection of material must be made based on site conditions and all applicable permit requirements. If a construction site run-off permit (327 IAC 15-5) has been obtained, implement the stabilization plan as specified in the stormwater pollution prevention plan (SWPPP).

5.0 Construction

- (a) Do not clear trees within the project boundaries during April 1 through September 30 in order to protect any habitat suitable for the federally endangered Indiana Bat (*Myotis sodalis*) and the federally threatened Northern Long Eared Bat (*Myotis septentrionalis*) unless a waiver has been issued by the US Fish and Wildlife Service.
- (b) Clearly mark wetlands and streams that are to remain undisturbed on the project site.
- (c) Deposit any dredged material in a contained upland (non-wetland) disposal area to prevent sediment run-off to any waterbody.
- (d) Stabilize all disturbed areas upon completion of the project.

Other Applicable Permits

Based on the proposed land disturbance, a construction site run-off general permit is required for the project. Permit coverage must be obtained prior to the initiation of land-disturbing activities. Information related to obtaining permit coverage is available at www.in.gov/idem/stormwater or by contacting the IDEM, Stormwater Program at 317-233-1864 or via email at Stormwat@idem.IN.gov.

This permit approval does not relieve you from the responsibility of obtaining any other permits or authorizations that may be required for this project or related activities from IDEM or any other agency or person. You may wish to contact the Indiana Department of Natural Resources at 317-232-4160, or toll free at 877-928-3755, concerning the possible requirement of a Natural Freshwater Lake or Construction in a Floodway Permit, or the IDEM Stormwater Permits Section at 317-233-1864 concerning the possible need for construction stormwater general permit coverage permits if you plan to disturb greater than one (1) acre of soil during construction.

This permit does not:

- (1) authorize impacts or activities outside the scope of this permit;
- (2) authorize any injury to persons or private property or invasion of other private rights, or any infringement of federal, state or local laws or regulations;
- (3) convey any property rights of any sort, or any exclusive privileges;
- (4) preempt any duty to obtain federal, state or local permits or authorizations required by law for the execution of the project or related activities; or
- (5) authorize changes in the plan design detailed in the application.

Failure to comply with the terms and conditions of this permit may result in enforcement action against you. If an enforcement action is pursued, you could be assessed up to \$25,000 per day in civil penalties. You may also be subject to criminal liability if it is determined that the permit was violated willfully or negligently.

This permit is effective 18 days from the mailing of this notice unless a petition for review and a petition for stay of effectiveness are filed within this 18-day period. If a petition for review and a petition for stay of effectiveness are filed within this period, any part of the permit within the scope of the petition for stay is stayed for 15 days, unless or until an Environmental Law Judge further stays the permit in whole or in part.

Notice of Right to Administrative Review (Permits)

If you wish to challenge this permit, you must file a Petition for Administrative Review with the Office of Environmental Adjudication (OEA), and serve a copy of the petition upon IDEM. The requirements for filing a Petition for Administrative Review are found in IC 4-21.5-3-7, IC 13-15-6-1 and 315 IAC 1-3-2. A summary of the requirements of these laws is provided below.

A Petition for Administrative Review must be filed with the Office of Environmental Adjudication (OEA) within fifteen (15) days of the issuance of this notice (eighteen (18) days if you received this notice by U.S. Mail), and a copy must be served upon IDEM. Addresses are:

Director	Commissioner
Office of Environmental Adjudication	Indiana Dept. of Environmental Management
Indiana Government Center North	Indiana Government Center North
100 North Senate Avenue, Room N103	100 North Senate Avenue, Room 1301
Indianapolis, Indiana 46204	Indianapolis, Indiana 46204

The petition must contain the following information:

- (a) The name, address and telephone number of each petitioner.
- (b) A description of each petitioner's interest in the permit.
- (c) A statement of facts demonstrating that each petitioner is:
 - (1) a person to whom the order is directed;
 - (2) aggrieved or adversely affected by the permit; or
 - (3) entitled to administrative review under any law.
- (d) The reasons for the request for administrative review.
- (e) The particular legal issues proposed for review.
- (f) The alleged environmental concerns or technical deficiencies of the permit.
- (g) The permit terms and conditions that the petitioner believes would be appropriate and would comply with the law.
- (h) The identity of any persons represented by the petitioner.

- (i) The identity of the person against whom administrative review is sought.
- (j) A copy of the permit that is the basis of the petition.
- (k) A statement identifying petitioner's attorney or other representative, if any.

Failure to meet the requirements of the law with respect to a Petition for Administrative Review may result in a waiver of your right to seek administrative review of the permit. Examples are:

- (a) Failure to file a Petition by the applicable deadline;
- (b) Failure to serve a copy of the Petition upon IDEM when it is filed; or
- (c) Failure to include the information required by law.

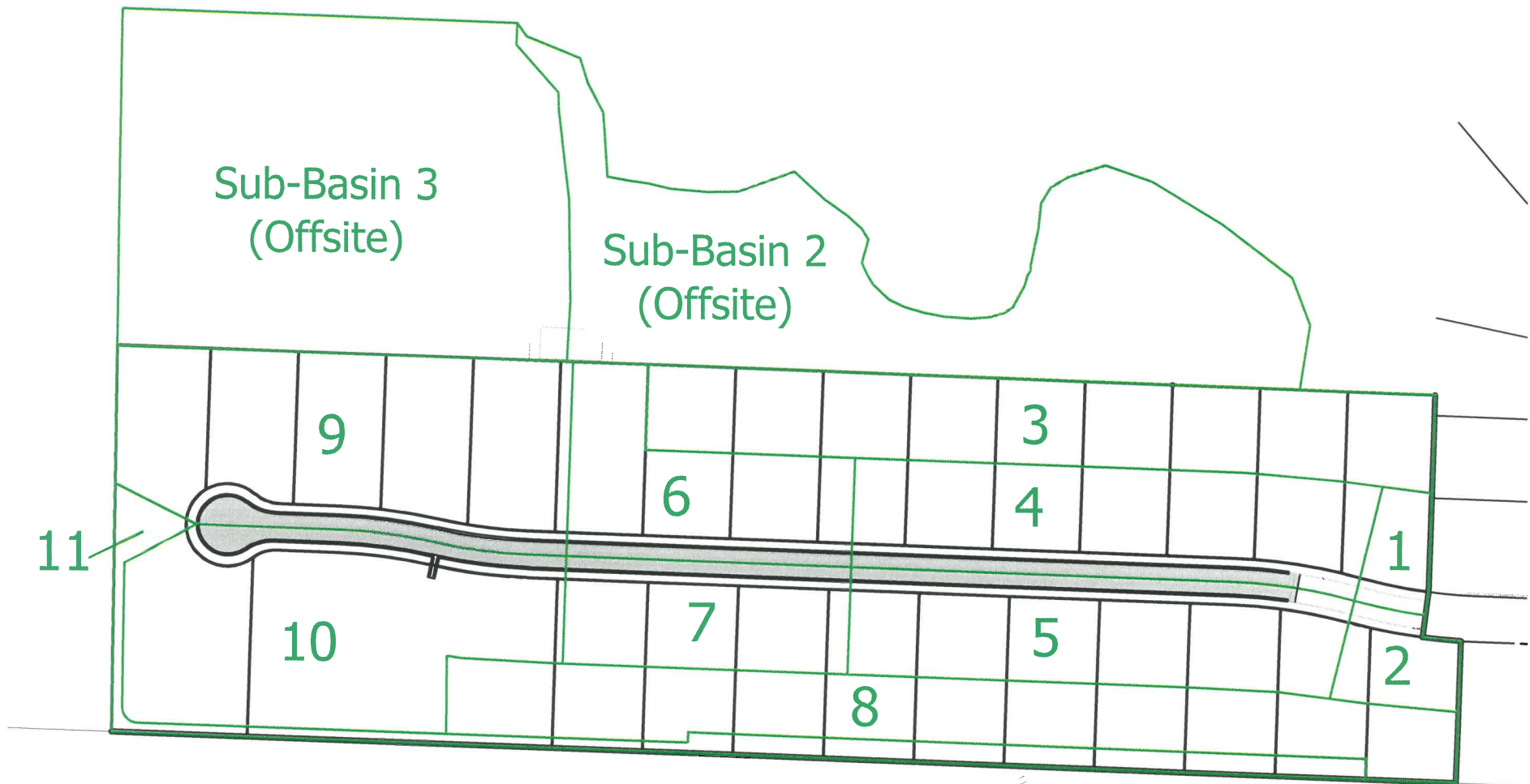
If you seek to have a permit stayed during the administrative review, you may need to file a Petition for a Stay of Effectiveness. The specific requirements for such a Petition can be found in 315 IAC 1-3-2 and 315 IAC 1-3-2.1.

Pursuant to IC 4-21.5-3-17, OEA will provide all parties with notice of any pre-hearing conferences, preliminary hearings, hearings, stays, or orders disposing of the review of this action. If you are entitled to notice under IC 4-21.5-3-5(b) and would like to obtain notices of any pre-hearing conferences, preliminary hearings, hearings, stays, or orders disposing of the review of this action without intervening in the proceeding you must submit a written request to OEA at the address above.

If you have procedural or scheduling questions regarding your Petition for Administrative Review, additional information on the review process is available at the website of the Office of Environmental Adjudication at <http://www.in.gov/oea>.

If you have any questions about this permit, please contact Jason Randolph, Project Manager, by e-mail at jrandolp@idem.in.gov by phone at 317-409-7580.

cc: Marc Woernle, Meristem, LLC



SCALE 1" = 150'



4800 Rosebud Ln.
Newburgh, IN 47630
812.464.9585 Phone
812.464.2514 Fax
morleycorp.com

Developed Subbasins
Green River Meadows - Section 2
8800 N. Green River Road

Designed By: JEM	Job Number: 12103.4.001-B
Drawn By: K.JL	Date: 12.05.2023
Filename: 12103 Civil Base	

Morley
Post Developed Time of Concentration (Tc)
Based on TR-55 Methodology

Project: 12103.4.001-B
Location: 8800 N. Green River Rd.

Prepared By: KJL **Date:** 12/1/2023
Checked By: JEM **Date:** 12/1/2023

NOTES: Purple values are entered by the user
 Blue values are calculated by the spreadsheet

Sheet Flow (Applicable to Tc only)

1. Surface description (Table 3.2.6)
2. Manning's roughness coefficient for sheet flow, n (Table 3.2.6)
3. Flow Length, L (total L <= 100 ft)
4. Two year 24-hour rainfall, P2
5. Land slope, s
6. $Tt = [0.007 (n L)^{0.8}] / [p_2^{0.5} s^{0.4}]$

		Subbasins										
		1	2	3	4	5	6	7	8	9	10	11
Segment ID		A	A	A	A	A	A	A	A	A	A	A
		Dense Grass	Dense Grass	Dense Grass	Dense Grass	Dense Grass	Dense Grass	Dense Grass	Dense Grass	Dense Grass	Woods	Woods
		0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.4	0.4
	ft	100	100	100	100	85	90	90	100	100	100	100
	in	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
	ft/ft	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.100	0.010	0.010
	hr	0.1623	0.1623	0.1623	0.1623	0.1425	0.1492	0.1492	0.1623	0.1230	0.4650	0.4650

Shallow Concentrated Flow

7. Surface Description (paved or unpaved)
8. Flow Length, L
9. Watercourse slope, s
10. Average Velocity, V (NRCS 630.1502 Table 15-3)
11. $Tt = L / (3600 V)$

Segment ID		B	B	B	B	B	B	B	B		
		Paved	Paved	Unpaved	Paved	Paved	Paved	Unpaved	Paved		
	ft	65	60	465	450	440	175	175	786	290	
	ft/ft	0.0100	0.0100	0.0200	0.0250	0.0250	0.0065	0.0065	0.0225	0.0650	
	ft/s	2.03	2.03	2.28	3.21	3.21	1.64	1.64	2.42	5.18	
	hr	0.0089	0.0082	0.0566	0.0389	0.0380	0.0297	0.0297	0.0902	0.0155	

Channel Flow

12. Width of ditch bottom
13. Ratio of Horizontal to Vertical of left ditch side slope (XH:1V)
14. Ratio of Horizontal to Vertical of right ditch side slope (XH:1V)
15. Bankfull depth of flow:
16. Cross sectional flow area, a
17. Wetted Perimeter, p_w
18. Hydraulic radius, $r = a / p_w$
19. Channel slope, s
20. Manning's roughness coeff. for channel flow, n (VC 13.04.220)
21. $V = [1.49 r^{0.67} s^{0.5}] / n$
22. Flow Length, L
23. $Tt = L / (3600 V)$

Segment ID											
	ft										
	ft										
	ft ²										
	ft ²										
	ft ²										
	ft/ft										
	ft/s										
	ft										
	hr										

24. Total Time of Concentration or Travel Time

Tc/Tt for area in hours	0.171	0.171	0.219	0.201	0.181	0.179	0.179	0.253	0.139	0.465	0.465
Tc/Tt for area in minutes (5 minutes is minimum)	10.0	10.0	13.0	12.0	11.0	11.0	11.0	15.0	8.0	28.0	28.0

Morley
Post Developed Weighted Runoff Coefficient
Rational Method

Project: 12103.4.001-B
Location: 8800 N. Green River Rd.

Prepared By: KJL
Checked By: JEM

Date: 12/5/2023
Date: 12/5/2023

NOTES: Purple values are entered by the user
 Blue values are calculated by the spreadsheet

Return Period (Years)

Surface	C	Subbasins										
		1	2	3	4	5	6	7	8	9	10	11
Structures & Pavement (<2%)	0.92	0	0	0	0	0	0	0	0	0	0	0
Structures & Pavement (2-5%)	0.94	1,258	1,783	4,500	10,331	9,795	6,000	5,486	5,500	10,833	6,296	0
Structures & Pavement (5-10%)	0.96	0	0	0	0	0	0	0	0	0	0	0
Structures & Pavement (>10%)	0.98	625	1,875	11,250	8,125	6,875	5,000	3,750	13,750	12,500	1,250	0
Gravel (10 yr storm)	0.50	0	0	0	0	0	0	0	0	0	0	0
Gravel (25 yr storm)	0.60	0	0	0	0	0	0	0	0	0	0	0
Gravel (50-100 yr storm)	0.65	0	0	0	0	0	0	0	0	0	0	0
Lawn (<2%)	0.15	0	0	0	0	0	0	0	0	0	51,851	0
Lawn (2-5%)	0.25	5,056	6,264	0	34,233	33,162	17,988	19,597	44,308	26,036	0	23,523
Lawn (5-10%)	0.40	0	0	48,175	0	0	5,996	0	0	26,036	0	0
Lawn (>10%)	0.55	0	0	0	0	0	0	0	0	0	0	0
Woodland Flat (<2%)	0.12	0	0	0	0	0	0	0	0	0	0	0
Woodland Flat (2-5%)	0.24	0	0	0	0	0	0	0	0	0	0	0
Woodland Rolling (5-10%)	0.36	0	0	0	0	0	0	0	0	0	0	0
Woodland Hilly (>10%)	0.48	0	0	0	0	0	0	0	0	0	0	0
Pasture Flat (<2%)	0.12	0	0	0	0	0	0	0	0	0	0	0
Pasture Flat (2-5%)	0.25	0	0	0	0	0	0	0	0	0	0	0
Pasture Rolling (5-10%)	0.36	0	0	0	0	0	0	0	0	0	0	0
Pasture Hilly (>10%)	0.48	0	0	0	0	0	0	0	0	0	0	0
Cultivated Flat (<2%)	0.20	0	0	0	0	0	0	0	0	0	0	0
Cultivated Flat (2-5%)	0.35	0	0	0	0	0	0	0	0	0	0	0
Cultivated Rolling (5-10%)	0.50	0	0	0	0	0	0	0	0	0	0	0
Cultivated Hilly (>10%)	0.65	0	0	0	0	0	0	0	0	0	0	0
Bare Soil	0.72	0	0	0	0	0	0	0	0	0	0	0
Water	1.00	0	0	0	0	0	0	0	0	0	11,370	0
Total SF		6,939	9,922	63,925	52,689	49,832	34,984	28,833	63,558	75,405	70,767	23,523
Total Acres		0.16	0.23	1.47	1.21	1.14	0.80	0.66	1.46	1.73	1.62	0.54
Weighted C		0.44	0.51	0.54	0.50	0.49	0.50	0.48	0.47	0.52	0.37	0.25

Time of Concentration (min.)	10.0	10.0	13.0	12.0	11.0	11.0	11.0	15.0	8.0	28.0	28.0
------------------------------	------	------	------	------	------	------	------	------	-----	------	------

I(25)	6.32	6.32	5.63	5.85	6.08	6.08	6.08	5.24	6.86	3.49	3.49
Q(25)	0.44	0.74	4.47	3.52	3.38	2.43	1.92	3.58	6.20	2.11	0.47

Morley
Storm Sewer Design Sheet
Rational Method

Project: 12103.4.001-B
Location: 8800 N. Green River Rd.

Prepared By: KJL
Checked By: JEM

Date: 12/1/2023
Date: 12/1/2023

NOTES: Purple values are entered by the user
 Blue values are calculated by the spreadsheet

Return Period (Years)

Pipe #	Length (ft)	Manning's n	Sub-Basin no.	Cj	Aj (ac.)	CjAj	Sum CjAj	Tj (min) (5.0 min.)	Tcum (min) (5.0 min.)	I(25) in/hr	Q(25) (cfs)	Pipe Diameter (in)	Pipe Slope (ft/ft)	Pipe Cap. (cfs)	Velocity at Capacity (ft/sec)	Travel Time (min)	% Of Capacity
*113	162	0.012	3	0.54	1.47	1.58	1.58	17.00	17.00	4.89	7.74	15	1.64%	8.96	7.30	0.37	86%
111	27	0.012	4	0.50	1.21	0.60	2.18	12.00	17.37	4.83	10.55	18	1.10%	11.93	6.75	0.07	88%
109	7	0.012	5	0.49	1.14	0.56	2.74	11.00	17.44	4.82	13.21	24	0.40%	15.49	4.93	0.02	85%
107	254	0.012	-	-	-	-	2.74	-	17.46	4.81	13.20	24	0.40%	15.49	4.93	0.86	85%
105	194	0.012	-	-	-	-	3.46	-	18.32	4.68	16.17	30	0.20%	19.86	4.05	0.80	81%
103	87	0.012	-	-	-	-	5.02	-	20.15	4.41	22.13	30	0.30%	24.51	5.00	0.29	90%
101	13	0.012	-	-	-	-	5.02	-	20.44	4.37	21.93	30	0.30%	24.51	5.00	0.04	89%
*201	41	0.012	9	0.52	1.73	1.56	1.56	20.00	20.00	4.43	6.93	18	0.50%	8.04	4.55	0.15	86%
303	27	0.012	6	0.50	0.80	0.40	0.40	11.00	11.00	6.08	2.43	12	0.50%	2.73	3.48	0.13	89%
301	7	0.012	7	0.48	0.66	0.32	0.72	11.00	11.13	6.05	4.33	15	0.50%	4.95	4.03	0.03	87%

*Denotes Pipes accepting Offsite Water in Proposed Condition



"Integrity is the essence of everything successful."

—Richard B. Brimster Fuller, U.S. engineer and architect 1898-1961

SHEET 1 OF 3
PROJECT: Willow Crossing
COMPLETED BY: CFS
DATE: 7/5/23

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LTAP Chapter 5.3 Flow in Inlets

Equation 5.3.1 LTAP (Continuous Grade)

$$Q = Kd^{5/3}$$

Where Q = Inlet Capacity
K = Capacity Coefficient
d = depth of flow

K = 16 for $S_L = 1\%$
 $S_T = 2.6\%$

d = 0.34' @ 10' upstream of inlet

0.25' per Vanderburgh County Code
0.02' from gutter grade to F/G
0.07' for 10' @ 0.7%

$$Q = 16(0.34)^{5/3}$$

$$Q = \underline{2.65 \text{ CFS}}$$

Equation 5.3.2 LTAP (Single Inlet Sump Condition)

$$Q = 3.0(P)(dw)^{1.5}$$

Where Q = Inlet Capacity
P = Perimeter of grate
dw = depth of water

P = $17\frac{5}{8}'' + 17\frac{5}{8}'' + 35\frac{1}{2}''$
= 70.75"
= 5.90'

→ EJIW
7030

CORPORATE HEADQUARTERS

1717 16th Street NE | Willmar, MN 56201 | Phone: 320.222.6800 | Toll Free: 800.992.1725 | Fax: 320.222.6820



"Integrity is the essence of everything successful."

Prinsco, Inc. is an Equal Opportunity Employer. 1995-1997

SHEET **2** OF **3** DATE: 7/5/23
PROJECT: Willow Crossing
COMPLETED BY: **CPS**

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$d = 0.29'$ @ 10' upstream of inlet
 0.25' per Vanderburgh County Code
 0.02' from gutter grade to F/G
 0.02' for 10' upstream of inlet
 per profile

$$Q = 3.0 (5.90) (0.29')^{1.5}$$

$$Q = \underline{2.76 \text{ CFS}}$$

Equation 5.3.2 LTAP (Double Inlet Sump Condition)

$$Q = 3.0 (P) (d_w)^{1.5} \quad \text{Where } Q = \text{inlet capacity}$$

$$P = 17\frac{5}{8}'' + 17\frac{5}{8}'' + 35\frac{1}{2}'' + 35\frac{1}{2}''$$

$$= 106.25''$$

$$= 8.85'$$

P = Perimeter of grate
 d_w = depth of water

$d = 0.29'$ @ 10' upstream of inlet

0.25' per Vanderburgh County Code

0.02' from gutter grade to F/G

0.02' for 10' upstream of inlet

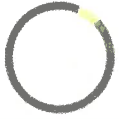
per profile

$$Q = 3.0 (8.85) (0.29')^{1.5}$$

$$Q = \underline{4.15 \text{ CFS}}$$

CORPORATE HEADQUARTERS

1717 16th Street NE | Willmar, MN 56201 | Phone: 320.222.6800 | Toll Free: 800.992.1725 | Fax: 320.222.6820



"Integrity is the essence of everything successful."

-Richard Buckminster Fuller, U.S. engineer and architect, 1893-1983

SHEET **3** OF **3** DATE: 7/5/23
PROJECT: Willow Crossing
COMPLETED BY: **CPS**

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Equation 5.3.8 LTAP (curb opening sump condition)
- conservative (not accounting for inlet depression)

$$Q = C_w L d^{1.5}$$

Where C_w = Weir coefficient
 L = Length of opening
 d = depth of flow

$$C_w = 2.3 \text{ (LTAP)}$$

$$L = 35.5'' \rightarrow \frac{EJ1W}{7030}$$

$$= 2.96'$$

$$d = 0.29' \text{ @ } 10' \text{ upstream of inlet}$$

0.25' per Vanderburgh County Code

0.02' from gutter grade to F/G

0.02' for 10' upstream of inlet per profile

$$Q = 2.3(2.96)(0.29)^{1.5}$$

$$Q = \underline{1.06 \text{ CFS}}$$

Use same equation for double inlet in sump condition

$$L = 35.5'' + 35.5'' = 71'' = 5.92'$$

$$Q = 2.3(5.92)(0.29)^{1.5}$$

$$Q = \underline{2.13 \text{ CFS}}$$

CORPORATE HEADQUARTERS

1717 16th Street NE | Willmar, MN 56201 | Phone: 320.222.6800 | Toll Free: 800.992.1725 | Fax: 320.222.6820

Morley
Post Developed Weighted Runoff Coefficient
Rational Method

Project: 12103.4.001-B
Location: 8800 N. Green River Rd.

Prepared By: KJL
Checked By: JEM

Date: 12/5/2023
Date: 12/5/2023

NOTES: Purple values are entered by the user
 Blue values are calculated by the spreadsheet

Return Period (Years)

Surface	C	Subbasins										
		1	2	3	4	5	6	7	8	9	10	11
Structures & Pavement (<2%)	0.92	0	0	0	0	0	0	0	0	0	0	0
Structures & Pavement (2-5%)	0.94	1,258	1,783	4,500	10,331	9,795	6,000	5,486	5,500	10,833	6,296	0
Structures & Pavement (5-10%)	0.96	0	0	0	0	0	0	0	0	0	0	0
Structures & Pavement (>10%)	0.98	625	1,875	11,250	8,125	6,875	5,000	3,750	13,750	12,500	1,250	0
Gravel (10 yr storm)	0.50	0	0	0	0	0	0	0	0	0	0	0
Gravel (25 yr storm)	0.60	0	0	0	0	0	0	0	0	0	0	0
Gravel (50-100 yr storm)	0.65	0	0	0	0	0	0	0	0	0	0	0
Lawn (<2%)	0.15	0	0	0	0	0	0	0	0	0	51,851	0
Lawn (2-5%)	0.25	5,056	6,264	0	34,233	33,162	17,988	19,597	44,308	26,036	0	23,523
Lawn (5-10%)	0.40	0	0	48,175	0	0	5,996	0	0	26,036	0	0
Lawn (>10%)	0.55	0	0	0	0	0	0	0	0	0	0	0
Woodland Flat (<2%)	0.12	0	0	0	0	0	0	0	0	0	0	0
Woodland Flat (2-5%)	0.24	0	0	0	0	0	0	0	0	0	0	0
Woodland Rolling (5-10%)	0.36	0	0	0	0	0	0	0	0	0	0	0
Woodland Hilly (>10%)	0.48	0	0	0	0	0	0	0	0	0	0	0
Pasture Flat (<2%)	0.12	0	0	0	0	0	0	0	0	0	0	0
Pasture Flat (2-5%)	0.25	0	0	0	0	0	0	0	0	0	0	0
Pasture Rolling (5-10%)	0.36	0	0	0	0	0	0	0	0	0	0	0
Pasture Hilly (>10%)	0.48	0	0	0	0	0	0	0	0	0	0	0
Cultivated Flat (<2%)	0.20	0	0	0	0	0	0	0	0	0	0	0
Cultivated Flat (2-5%)	0.35	0	0	0	0	0	0	0	0	0	0	0
Cultivated Rolling (5-10%)	0.50	0	0	0	0	0	0	0	0	0	0	0
Cultivated Hilly (>10%)	0.65	0	0	0	0	0	0	0	0	0	0	0
Bare Soil	0.72	0	0	0	0	0	0	0	0	0	0	0
Water	1.00	0	0	0	0	0	0	0	0	0	11,370	0
Total SF		6,939	9,922	63,925	52,689	49,832	34,984	28,833	63,558	75,405	70,767	23,523
Total Acres		0.16	0.23	1.47	1.21	1.14	0.80	0.66	1.46	1.73	1.62	0.54
Weighted C		0.44	0.51	0.54	0.50	0.49	0.50	0.48	0.47	0.52	0.37	0.25

Time of Concentration (min.)	10.0	10.0	13.0	12.0	11.0	11.0	11.0	15.0	8.0	28.0	28.0
------------------------------	------	------	------	------	------	------	------	------	-----	------	------

I(10)	5.39	5.39	4.80	4.98	5.18	5.18	5.18	4.47	5.84	2.98	2.98
Q(10)	0.38	0.63	3.81	3.00	2.88	2.07	1.63	3.05	5.28	1.80	0.40

Swale Capacity Table

Side slope = 4
 Average Manning's Coefficient = 0.035 *Note: Capacity checked at 3:1, but design is for 4:1 typical

Swale	Subbasin no.	Q(100) cfs	Channel Capacity (cfs)	Full Depth Velocity (ft/s)	% of Capacity	Slope (ft/ft)	Slope (%)	Length (ft)	Channel Depth (ft)	Bottom Width (ft)	Wetted Perimeter (ft)	Area (ft ²)	Hydraulic Radius (ft)	Hydraulic Depth (ft)	Travel Time (min)	US Elev.	DS Elev.	Measures
1.1	Portion of 3	1.90	20.30	4.06	9.4%	0.021	2.06	248.50	1.00	1.00	9.25	5.00	0.54	0.56	1.02	397.85	392.72	Staked Sod
1.2	Portion of 3	3.79	18.67	3.73	20.3%	0.017	1.75	500.00	1.00	1.00	9.25	5.00	0.54	0.56	2.23	401.45	392.72	ECB
2.1	8	4.35	27.58	4.60	15.8%	0.024	2.38	655.18	1.00	2.00	10.25	6.00	0.59	0.60	2.38	405.63	390.04	Staked Sod
2.2	8	4.35	15.97	2.66	27.2%	0.008	0.80	249.35	1.00	2.00	10.25	6.00	0.59	0.60	1.56	390.04	388.05	Staked Sod

**MORLEY
FORM 800**

PROJECT: **Green River Meadows - Section 2** DETENTION FACILITY DESIGN RETURN PERIOD: **100 YRS**

DESIGNER: **JEM** 12103.4.001-B RELEASE RATE RETURN PERIOD: **10 YRS**

UNDEVELOPED WATERSHED AREA (Au)	11.03	ACRES
TIME OF CONCENTRATION (UNDEVELOPED WATERSHED)	25.0	MINUTES
RAINFALL INTENSITY (Iu):	3.24	INCHES/HR
UNDEVELOPED RUNOFF COEFFICIENT (Cu):	0.18	
UNDEVELOPED RUNOFF RATE (Q = Cu*Iu*A):	6.37	CFS
DEVELOPED WATERSHED AREA (Ad) - contributing to basin	10.10	ACRES
DEVELOPED RUNOFF COEFFICIENT (Cd):	0.48	

ALLOWABLE OFFSITE PASS THROUGH RATE (Offsite Sub-basins 2 & 3)	8.72	CFS
DEVELOPED UNDETAINED RELEASE RATE	0.60	CFS
ALLOWABLE PIPE RELEASE RATE	14.49	CFS
ACTUAL DISCHARGE PIPE OUTFLOW	5.37	CFS

STORM DURATION Td (HRS)	RAINFALL INTENSITY Id (INCH/HR)	INFLOW RATE I(Td) (Cd*Id*Ad) (CFS)	OUTFLOW RATE Q (actual) (CFS)	STORAGE RATE I(Td)-Q (CFS)	REQUIRED STORAGE ((I(Td)-Q)*Td/12) (ACRE.FT)			
0.08	9.951	48.24	5.37	42.87	0.30			
0.17	8.053	39.04	5.37	33.67	0.46			
0.25	6.677	32.37	5.37	27.00	0.56			
0.50	4.214	20.43	5.37	15.06	0.62			
0.67	3.289	15.94	5.37	10.57	0.58			
0.75	2.943	14.27	5.37	8.90	0.55			
1.00	2.560	12.41	5.37	7.04	0.58			
1.50	2.252	10.92	5.37	5.55	0.69			
2.00	1.844	8.94	5.37	3.57	0.59			
2.50	1.571	7.61	5.37	2.24	0.46			
3.00	1.374	6.66	5.37	1.29	0.32			
4.00	1.107	5.37	5.37	0.00	0.00			
5.00	0.933	4.53	5.37	-0.84	-0.35			
6.00	0.811	3.93	5.37	-1.44	-0.71			
7.00	0.719	3.49	5.37	-1.88	-1.09			
8.00	0.648	3.14	5.37	-2.23	-1.47			
9.00	0.590	2.86	5.37	-2.51	-1.87			
10.00	0.543	2.63	5.37	-2.74	-2.26			

PEAK STORAGE (ACRE-FT)	0.69
PEAK STORAGE (CUBIC FT)	29,950

BASIN DISCHARGE

Pipe Flow: $Q = A_p \left(\frac{h_p}{\frac{K_e + K_o}{2g} + \frac{2.87n^2L}{D^{4/3}}} \right)^{1/2}$ (LTAP 6.3.5)

Pipe Dia.	12	(inch)
Ap (s.f.)	0.79	Area of Pipe
n	0.012	Manning roughness coef.
g (f/s ²)	32.2	Acceleration due to gravity
H (ft)	2.15	Head at invert
h _p (ft)	1.65	Head at center of pipe
L (ft)	16	Length of pipe
K _e	0.85	Entrance Loss
K _o	1.00	Outlet Loss
Q=	5.37	CFS

STAGE STORAGE VOLUME

Stage	Surface Area (S.F.)	Cum. Storage Vol. (C.F.)	Notes
388.05	11,370		Normal Pool
389.30	14,670	16,275	25 Year Water Elev.
389.90	17,200	25,836	
390.20	32,300	33,261	100 Year Water Elev.
390.30	34,200	36,586	EO FL

Available Storage:	33,261	0.76	AC-FT
Required Storage:	29,950	0.69	AC-FT
	90%		Basin Capacity

Morley
Post Developed Weighted Runoff Coefficient
Rational Method

Project: 12103.4.001-B
Location: 8800 N. Green River Rd.

Prepared By: KJL
Checked By: JEM

Date: 12/1/2023
Date: 12/1/2023

NOTES: Purple values are entered by the user
 Blue values are calculated by the spreadsheet

Return Period (Years)

Subbasins

Surface	C	Ret. Basin
Structures & Pavement (<2%)	0.92	0
Structures & Pavement (2-5%)	0.94	58,741
Structures & Pavement (5-10%)	0.96	0
Structures & Pavement (>10%)	0.98	62,500
Gravel (10 yr storm)	0.50	0
Gravel (25 yr storm)	0.60	0
Gravel (50-100 yr storm)	0.65	0
Lawn (<2%)	0.15	51,851
Lawn (2-5%)	0.25	175,324
Lawn (5-10%)	0.40	80,207
Lawn (>10%)	0.55	0
Woodland Flat (<2%)	0.12	0
Woodland Flat (2-5%)	0.24	0
Woodland Rolling (5-10%)	0.36	0
Woodland Hilly (>10%)	0.48	0
Pasture Flat (<2%)	0.12	0
Pasture Flat (2-5%)	0.25	0
Pasture Rolling (5-10%)	0.36	0
Pasture Hilly (>10%)	0.48	0
Cultivated Flat (<2%)	0.20	0
Cultivated Flat (2-5%)	0.35	0
Cultivated Rolling (5-10%)	0.50	0
Cultivated Hilly (>10%)	0.65	0
Bare Soil	0.72	0
Water	1.00	11,370
Total SF		439,993
Total Acres		10.10
Weighted C		0.48

Time of Concentration (min.)

Morley
Post Developed Weighted Runoff Coefficient
Rational Method

Project: 12103.4.001-B
Location: 8800 N. Green River Rd.

Prepared By: KJL
Checked By: JEM

Date: 12/5/2023
Date: 12/5/2023

NOTES: Purple values are entered by the user
 Blue values are calculated by the spreadsheet

Return Period (Years)

Surface	C	Subbasins											
		1	2	3	4	5	6	7	8	9	10	11	
Structures & Pavement (<2%)	0.92	0	0	0	0	0	0	0	0	0	0	0	0
Structures & Pavement (2-5%)	0.94	1,258	1,783	4,500	10,331	9,795	6,000	5,486	5,500	10,833	6,296	0	0
Structures & Pavement (5-10%)	0.96	0	0	0	0	0	0	0	0	0	0	0	0
Structures & Pavement (>10%)	0.98	625	1,875	11,250	8,125	6,875	5,000	3,750	13,750	12,500	1,250	0	0
Gravel (10 yr storm)	0.50	0	0	0	0	0	0	0	0	0	0	0	0
Gravel (25 yr storm)	0.60	0	0	0	0	0	0	0	0	0	0	0	0
Gravel (50-100 yr storm)	0.65	0	0	0	0	0	0	0	0	0	0	0	0
Lawn (<2%)	0.15	0	0	0	0	0	0	0	0	0	0	51,851	0
Lawn (2-5%)	0.25	5,056	6,264	0	34,233	33,162	17,988	19,597	44,308	26,036	0	23,523	0
Lawn (5-10%)	0.40	0	0	48,175	0	0	5,996	0	0	26,036	0	0	0
Lawn (>10%)	0.55	0	0	0	0	0	0	0	0	0	0	0	0
Woodland Flat (<2%)	0.12	0	0	0	0	0	0	0	0	0	0	0	0
Woodland Flat (2-5%)	0.24	0	0	0	0	0	0	0	0	0	0	0	0
Woodland Rolling (5-10%)	0.36	0	0	0	0	0	0	0	0	0	0	0	0
Woodland Hilly (>10%)	0.48	0	0	0	0	0	0	0	0	0	0	0	0
Pasture Flat (<2%)	0.12	0	0	0	0	0	0	0	0	0	0	0	0
Pasture Flat (2-5%)	0.25	0	0	0	0	0	0	0	0	0	0	0	0
Pasture Rolling (5-10%)	0.36	0	0	0	0	0	0	0	0	0	0	0	0
Pasture Hilly (>10%)	0.48	0	0	0	0	0	0	0	0	0	0	0	0
Cultivated Flat (<2%)	0.20	0	0	0	0	0	0	0	0	0	0	0	0
Cultivated Flat (2-5%)	0.35	0	0	0	0	0	0	0	0	0	0	0	0
Cultivated Rolling (5-10%)	0.50	0	0	0	0	0	0	0	0	0	0	0	0
Cultivated Hilly (>10%)	0.65	0	0	0	0	0	0	0	0	0	0	0	0
Bare Soil	0.72	0	0	0	0	0	0	0	0	0	0	0	0
Water	1.00	0	0	0	0	0	0	0	0	0	0	11,370	0
Total SF		6,939	9,922	63,925	52,689	49,832	34,984	28,833	63,558	75,405	70,767	23,523	0
Total Acres		0.16	0.23	1.47	1.21	1.14	0.80	0.66	1.46	1.73	1.62	0.54	0
Weighted C		0.44	0.51	0.54	0.50	0.49	0.50	0.48	0.47	0.52	0.37	0.25	0

Time of Concentration (min.)	10.0	10.0	13.0	12.0	11.0	11.0	11.0	15.0	8.0	28.0	28.0
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I(100)	8.05	8.05	7.18	7.45	7.74	7.74	7.74	6.68	8.74	4.45	4.45
Q(100)	0.57	0.94	5.69	4.49	4.31	3.10	2.44	4.56	7.89	2.69	0.60

MORLEY
FORM 800 (Emergency Overflow)

PROJECT: **Green River Meadows - Section 2** DETENTION FACILITY DESIGN RETURN PERIOD: **100** YRS

DESIGNER: **JEM** 12103.4.001-B RELEASE RATE RETURN PERIOD: **10** YRS

UNDEVELOPED WATERSHED AREA (Au)		ACRES
TIME OF CONCENTRATION (UNDEVELOPED WATERSHED)		MINUTES
RAINFALL INTENSITY (Iu):		INCHES/HR
UNDEVELOPED RUNOFF COEFFICIENT (Cu):		
UNDEVELOPED RUNOFF RATE (Q = Cu*Iu*A):		CFS
DEVELOPED WATERSHED AREA (Ad) - contributing to basin	15.80	ACRES
DEVELOPED RUNOFF COEFFICIENT (Cd):	0.40	
DEVELOPED UNDETAINED RELEASE RATE		CFS
ALLOWABLE PIPE RELEASE RATE	0.00	CFS
ACTUAL DISCHARGE PIPE OUTFLOW	0.00	CFS

STORM DURATION Td (HRS)	RAINFALL INTENSITY Id (INCH/HR)	INFLOW RATE I(Td) (Cd*Id*Ad) (CFS)	OUTFLOW RATE Q (actual) (CFS)	STORAGE RATE I(Td)-Q (CFS)	REQUIRED STORAGE ((I(Td)-Q)*Td/12) (ACRE.FT)			
0.08	9.951	62.56	0.00	62.56	0.43			
0.17	7.990	50.23	0.00	50.23	0.71			
0.25	6.677	41.98	0.00	41.98	0.87			
0.50	4.214	26.49	0.00	26.49	1.09			
0.67	3.289	20.67	0.00	20.67	1.14			
0.75	2.943	18.50	0.00	18.50	1.15			
1.00	2.560	16.09	0.00	16.09	1.33			
1.50	2.252	14.16	0.00	14.16	1.75			
2.00	1.844	11.59	0.00	11.59	1.92			
2.50	1.571	9.87	0.00	9.87	2.04			
3.00	1.374	8.64	0.00	8.64	2.14			
4.00	1.107	6.96	0.00	6.96	2.30			
5.00	0.933	5.87	0.00	5.87	2.42			
6.00	0.811	5.10	0.00	5.10	2.53			
7.00	0.719	4.52	0.00	4.52	2.61			
8.00	0.648	4.07	0.00	4.07	2.69			
9.00	0.590	3.71	0.00	3.71	2.76			
10.00	0.543	3.41	0.00	3.41	2.82			

Weir Report

Emergency OverFlow Report

Trapezoidal Weir

Crest = Sharp
Bottom Length (ft) = 28.00
Total Depth (ft) = 0.83
Side Slope (z:1) = 4.00

Highlighted

Depth (ft) = 0.33
Q (cfs) = 14.16
Area (sqft) = 9.68
Velocity (ft/s) = 1.46
Top Width (ft) = 30.64

Calculations

Weir Coeff. Cw = 2.60
Compute by: Known Q
Known Q (cfs) = 14.16

Q(100) = 14.16 CFS

