Drainage Calculations

Proposed C-Mart & Retail Shops

8562 Lafayette Rd.
Indianapolis, Indiana

Prepared for: Three Mile Properties, LLC

Job #: TMP.001

Revised: 04/03/2015

Prepared by: Daniel B. Schnur
Reviewed by: Roger C. Ward, Jr., PE

ROGER WARD ENGINEERING INCORPORATED

7474 Noel Road
Indianapolis, IN 46278
(317) 251-1738
(Fax) 251-1923

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A. Project Title

Proposed C-Mart & Retail Shops, 8562 Lafayette Rd., Indianapolis, IN

B. Project Description

This project is located at 8562 Lafayette Road in Indianapolis, Indiana. The site is approximately 5.06 acres with a total disturbed area of 2.60 acres. The site is zoned C3. The existing site is improved with a single-family residential structure. The proposed improvements will consist of a 16,515 SF building, parking lot, fuel islands and canopy. The existing site will be demolished. The western half of the site is primarily flood plan with steep topography and will not be developed.

The existing land uses adjacent to the site are as follows:

North:	Commercial (C1/C3)
West:	Residential (DA)
South:	Residential (D2)
East:	School (SU-2)

C. Design Method and Criteria

1. Soil Type: Soil maps from the United States Department of Agriculture, Soil Conservation Service, identify Crosby silt loam, 0 to 2 percent slopes, (CrA – 39% site), Miami silt loam, 2 to 6 percent slopes, eroded (MmB2 – 26% site) and Miami complex, 18 to 24 percent slopes, eroded (MxE2 - 35% site). This soil profile only accounts for the portion of the site that is to be developed. The Miami soil is a Type "B" soil and the Crosby soil is a Type "C" soil.

Miami soils nearly level, very poorly drained soils. Runoff is generally slow to medium. Miami soils have slight to moderate limitations for most non-farm uses.

Crosby silt loam soils are nearly level soils. Runoff is generally slow and permeability is slow. The soil has severe limitations for most nonfarm uses.

2. Design Storm: The 2-year, 10-year, 25-year and 100-year storm events have been analyzed for both the existing and proposed conditions. The Rational Method was used in the calculations.

3. Overall Watershed: Fishback Creek (Eagle Creek Reservoir)
(HUC14: 05120201120090)

D. References

1. TR55 Stormwater Design Manual.
2. City of Indianapolis Stormwater Design and Construction Specifications Manual.
3. Marion County Soil Survey.
4. ICPR drainage software by Streamline Technologies.

E. Existing Conditions

The eastern portion of the site is currently improved with a small single-family residential structure. The western half of the site is primarily flood plan with steep topography and is not suitable for development. The entire site drains to Fishback Creek, which cuts through the western portion of the property

Hydrologic calculations for the existing site are provided in the Appendix. The following are the computed peak storm event flows for the 2-year and 10-year peak run-off rates for each on-site basin.

On-Site Basins

Run-off	EX1	EX2	TOTAL
2-year storm	**0.15 cfs**	**0.04 cfs**	**0.19 cfs**
10-year storm	**0.52 cfs**	**0.14 cfs**	**0.66 cfs**

F. Proposed Conditions

The proposed improvements will consist of a 16,515 SF building, fuel islands and canopy. A new asphalt parking lot will be constructed adjacent to the proposed building. The proposed improvements will increase the impervious coverage of the site and therefore, the total peak discharge rate or volume. The site runoff will be collected by the proposed storm sewer system and will discharge to a new dry detention basin located to the west of the building. The detention basin will discharge to the creek via a new 12-inch pipe and outlet control structure.

Pursuant to section 302.03 of the City of Indianapolis Stormwater Specifications Manual, detention/retention facilities must be designed to meet the following release rates for developed run-off.

2 year – less than or equal to 0.5 times the 2 year pre-developed conditions
10 year – less than or equal to 0.5 times the 10 year pre-developed conditions
25 year – less than or equal to 0.75 times the 10 year pre-developed conditions
100 year – less than or equal to the 10 year pre-developed conditions

Hydrologic calculations for the proposed site are provided in the Appendix. The following are the computed peak storm event flows for the 2-year, 10-year, 25-year and 100-year peak run-off rates for the developed site.

On-Site Basins

Run-off	DIR-W	POND	TOTAL
2-year storm	**0.04 cfs**	**0.05 cfs**	**0.09 cfs**
10-year storm	**0.14 cfs**	**0.16 cfs**	**0.30 cfs**
25-year storm	**0.22 cfs**	**0.19 cfs**	**0.41 cfs**
100-year storm	**0.41 cfs**	**0.23 cfs**	**0.64 cfs**

Pond – EX1
Q_{2p} (**0.09 cfs**) ≤ 0.5 Q_{2e} (**0.10 cfs**)
Q_{10p} (**0.30 cfs**) ≤ 0.5 Q_{10e} (**0.33 cfs**)
Q_{25p} (**0.41 cfs**) ≤ 0.75 Q_{10e} (**0.50 cfs**)
Q_{100p} (**0.64 cfs**) ≤ Q_{10e} (**0.66 cfs**)

The above release rates can only be achieved using a 1-inch low flow orifice and a 2-inch high flow orifice in the outlet control structure. Pursuant to section 302.03 Clarification #28 of the City of Indianapolis Stormwater Specifications Manual, the minimum orifice size allowed for any outlet control structure is 2 inches. Hydrologic calculations for the proposed site with the 2-inch orifice and a 3.5-inch orifice are provided in the Appendix. The following are the computed peak storm event flows for the 2-year, 10-year, 25-year and 100-year peak run-off rates for the developed site.

On-Site Basins

Run-off	DIR-W	POND	TOTAL	STAGE
2-year storm	**0.04 cfs**	**0.17 cfs**	**0.21 cfs**	**877.82**
10-year storm	**0.14 cfs**	**0.30 cfs**	**0.44 cfs**	**879.05**
25-year storm	**0.22 cfs**	**0.43 cfs**	**0.65 cfs**	**879.38**
100-year storm	**0.41 cfs**	**0.56 cfs**	**0.96 cfs**	**880.00**

Pond – EX1
Q_{2p} (**0.21 cfs**) ≤ 0.5 Q_{2e} (**0.10 cfs**)x
Q_{10p} (**0.44 cfs**) ≤ 0.5 Q_{10e} (**0.33 cfs**)x
Q_{25p} (**0.65 cfs**) ≤ 0.75 Q_{10e} (**0.50 cfs**)x
Q_{100p} (**0.96 cfs**) ≤ Q_{10e} (**0.66 cfs**)x

Since the allowable release rates are exceeded using the 2-inch orifice, a variance is being requested from the Department of Code Enforcement. Given that the downstream facility receiving this discharge is an open channel and the runoff rates are so small, no adverse effects are anticipated by the granting of this variance.

G. Permit History

The site was originally developed as a single-family residence in approximately 1939 and that remains its current use. There are no zoning petitions or drainage permits associated with this property.

H. Stormwater Quality and BMP Design

Per section 104.02, Stormwater Quality, the control of stormwater quality will be based on the management of total suspended solids (TSS) and Floatables. Each Best Management Practice (BMP) must also be designed to treat the water quality volume (WQv), or "first flush."

Stormwater will be treated before discharging into the existing stream west of the site. Inlet inserts will be utilized during construction to capture some sediment.

Before stormwater discharges into the existing stream, it will be treated by 1 stormwater quality structure. We are recommending a type of BMP called Aqua-Swirl™. This BMP is a combination area inlet/manhole containing specialized internal separation and filtering components to treat the incoming storm water by removing suspended solids. The site has strict space limitations; the Aqua-Swirl™ is a perfect fit. The off-line structure allows for larger storm event water volumes to bypass the off-line Aqua-Swirl™ so the system does not back up. Structure **AS5** is sized to only serve the proposed development.

AS5 Sizing Information (WQ):

Calculated Treatment Discharge Rate: **1.29 cfs** (WQ, Huff-50% distribution – 15 minute, 0.3-inch rainfall).

Aqua-Swirl™ Model #AS5 allowable Treatment Flow Rate: **1.47 cfs**.

1.29 < 1.47 → OK

SECTION II: APPENDIX

A. SITE INFORMATION

THIS IS NOT A PERMIT

Indiana Department of Natural Resources / Division of Water
Floodplain Analysis and Regulatory Assessment

File Number: GN-30839-0
Request Date: 01/21/2015
County: Marion
Waterbody: Fishback Creek

402 West Washington Street, Room W264
Indianapolis, IN 46204-2641
Telephone: (317) 232-4160 or (877) 928-3755
Fax: (317) 233-4579 Website: www.in.gov/dnr/water

Site Location: 8562 Lafayette Road, at the southwest corner of 86th Street and Lafayette Road, extending 950' west and 230' south, Pike Township, Section 20, Township 17N, Range 2E

Discharge Recommendation: Upstream: Not Requested
Downstream: Not Requested

Drainage Area: Upstream: Not Requested
Downstream: Not Requested

Base Flood Elevation (BFE): Upstream: 839.1 Feet (NAVD88) Source: Limited Information
Downstream: 838.3 Feet (NAVD88) Source: Limited Information

Additional Waterbody Information

- The base flood elevation (BFE) at the existing structure is 838.9 feet (NAVD88).

Floodplain Mapping Indicators

Special Flood Hazard Area: Any natural ground levels that have an elevation lower than the base flood elevation are considered floodway area. Construction in the floodway area requires a permit from the DNR, Division of Water. Local floodplain ordinances may require local construction permits. Flood insurance is strongly recommended and is required by FEMA for any building that has a federally backed mortgage. See Special Information.

- The Special Flood Hazard Area is the land subject to the 1% annual chance flood. The 1% chance flood, also known as the base flood, has a 1% chance of being equaled to or exceeded in any given year. Land in the Special Flood Hazard Area is considered to have a high flood risk. Land outside the Special Flood Hazard Area, including the 0.2% annual chance flood hazard area, is considered to have a low to moderate flood risk.

Disclaimers

- As a cautionary note, please understand that the determination of the base flood elevation was based on limited detailed information. Due to lack of stream data at your site, the computed flood elevations may be subject to change if a detailed floodway analysis is completed.

  If you choose to pursue obtaining a detailed hydraulic model, the model needs to be developed by an engineering consultant with experience in stream modeling. When selecting an engineering consultant, it is important to evaluate the experience, expertise, and references among potential consultants. Inquiring about the engineer's familiarity with developing hydraulic models in accordance with the General Guidelines for the Hydrologic-Hydraulic Assessment of Floodplains in Indiana may help you determine if the engineer has sufficient experience. Contacting a professional society for civil engineers or engineering consulting firms may also facilitate the selection process in choosing a qualified engineer.

Special Information

Division of Water Permitting

- The Flood Control Act (IC 14-28-1) requires the prior approval of the DNR, Division of Water for any construction in the floodway area including an obstruction, fill, excavation, or the construction of a building.
  A permit application form and permit application assistance manual can be obtained from our website at: www.in.gov/dnr/water/2455.htm. You may choose to file an electronic application through our website at: www.in.gov/dnr/water/4998.htm. Please be aware that in addition to the application fee, there is a $15.00 Enhanced Access Fee to submit an electronic application.

Flood Insurance

- Under the federal regulations of FEMA, the National Flood Insurance Program (NFIP) requires the purchase of flood insurance on buildings in the Special Flood Hazard Area that have a federally backed mortgage. The final decision regarding flood insurance is left to the mortgage lending institution.

Map Change Instructions

- If the property owner wishes to have the federal requirement to purchase flood insurance waived, they must prove that 1) the structure or property is on natural ground levels with an elevation higher than the base flood elevation (BFE); or that 2) the structure or property is located outside of a Special Flood Hazard Area (SFHA). If one of those conditions exists, the property owner can apply for a Letter of Map Amendment (LOMA) from the Federal Emergency Management Agency (FEMA). A LOMA is a letter which allows a mortgage lender to waive federal flood insurance requirements by stating that an existing structure, property, or portion of a property that has not been elevated by fill is not located in the SFHA.

  If the structure or property is located inside of the SFHA, the property owner may apply for a LOMA if it can be demonstrated that it is located on natural ground levels with an elevation higher than the base flood elevation (BFE). Specific elevation information must be submitted with the LOMA application, typically documented by a licensed surveyor or registered engineer.

  If the structure or property is located outside of the Special Flood Hazard Area (SFHA), the property owner may apply for a Letter of Map Amendment Out-As-Shown (LOMA-OAS). Elevation information is not required in this review process. If requesting a LOMA-OAS, please write "Out-As-Shown" at the top of the application form.

  Visit www.fema.gov/online-lomc to submit a LOMA application online or to obtain the LOMA application form, instructions, and Elevation Certificate form. These can also be obtained by contacting FEMA toll free at 1-877-336-2627.There is no fee for a LOMA application, although fees may be associated with hiring a surveyor to obtain the elevation information for the Elevation Certificate.

  If the LOMA is issued by FEMA and the mortgage lender accepts the LOMA determination, the property owner may be reimbursed up to one year of flood insurance payments.

  Be aware that regardless if FEMA issues a LOMA, the mortgage lender has the final decision regarding flood insurance requirements.

This Floodplain Analysis and Regulatory Assessment is not a building permit, approval of any project, or a waiver of provisions of local or zoning ordinances. Additionally, projects must comply with all other applicable federal, state, and local permit requirements.

If you have any questions concerning this letter, please contact Bryan Denman at (317) 234-1124.

Markita Shepherdson

Markita Shepherdson, CFM 02/16/2015

Copies Sent To: Donna Price (Floodplain Administrator), Daniel Schnur (Requestor), Gurpreet Singh (Property Owner)

Attachments: DNR_FloodplainMap.pdf

Additional Permitting Agencies

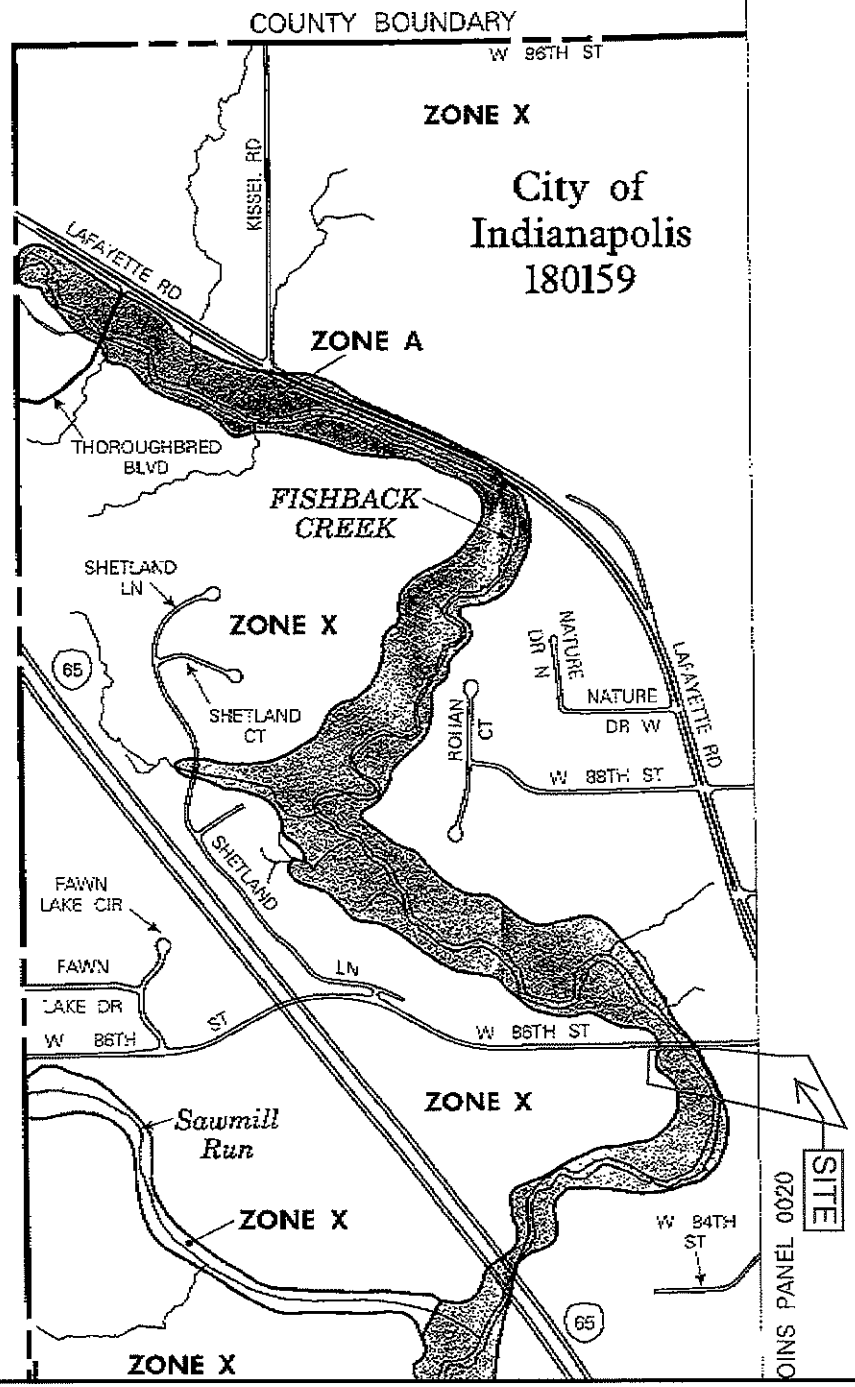
- Local Ordinances / Permitting: For proposed construction on this tract, you may also be required to obtain permits from or coordinate with the local floodplain administrator, plan commission, zoning office, and county drainage board.

  Construction permitting by local government entities is independent of the State's permitting authority. Local floodplain ordinances may require that the lowest floor of a new building or an addition to an existing building proposed in the Special Flood Hazard Area (SFHA) be elevated at least 2 feet above the base flood elevation (BFE). If a basement is included, the basement floor should be considered to be the lowest floor.

  Indiana Department of Environmental Management: You may also be required to obtain construction permits from the Indiana Department of Environmental Management. Call (317) 233-8488 or (800) 451-6027 or visit their webpage at www.in.gov/idem.

  U.S. Army Corps' of Engineers: You may have to obtain a permit from the Corps of Engineers under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act. Information relative to the Corps' of Engineers permits may be obtained by contacting:
  U.S. Army Corps of Engineers, Louisville District Office, Regulatory Branch
  P.O. Box 59, Louisville, Kentucky 40201-0059 Telephone: (502) 315-6686

  Contacting these agencies is your responsibility.



APPROXIMATE SCALE

1000 0 1000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARION COUNTY, INDIANA

(ALL JURISDICTIONS)

PANEL 15 OF 296

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

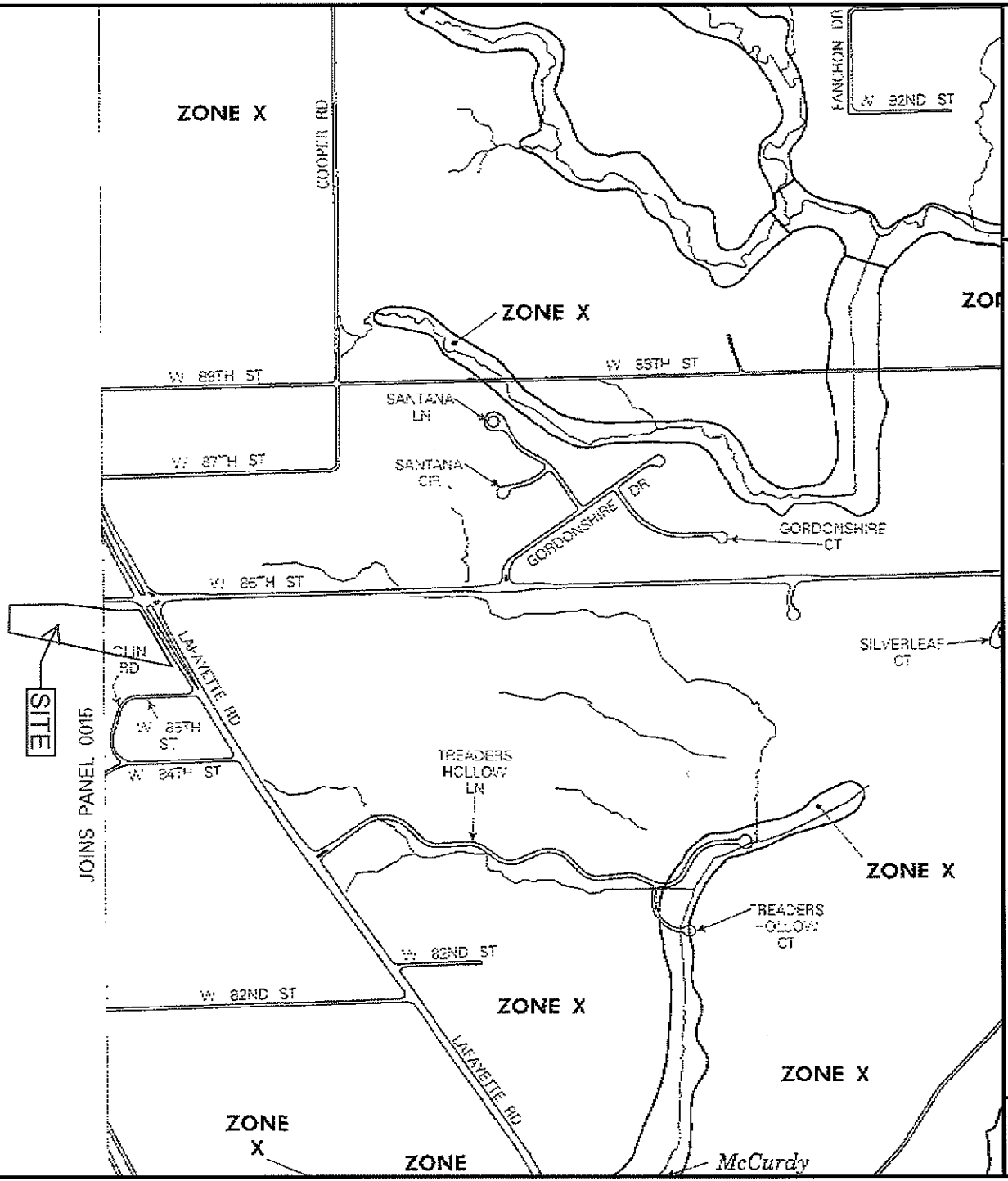
COMMUNITY	NUMBER	PANEL	SUFFIX
INDIANAPOLIS, CITY OF	180159	0015	E

Notice to User: The MAP NUMBER shown below should be used when placing map orders; the COMMUNITY NUMBER shown above should be used on insurance applications for the subject community.

MAP NUMBER
18097C0015 E

EFFECTIVE DATE:
JANUARY 5, 2001

Federal Emergency Management Agency



APPROXIMATE SCALE

1000 0 1000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARION COUNTY, INDIANA

(ALL JURISDICTIONS)

PANEL 20 OF 290

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
INDIANAPOLIS, CITY OF	180159	0020	E

MAP NUMBER
18097C0020 E

EFFECTIVE DATE:
JANUARY 5, 2001

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Hydrologic Soil Group—Marion County, Indiana

Map Scale: 1:1,640 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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: http://websoilsurvey.nrcs.usda.gov
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: Marion County, Indiana
Survey Area Data: Version 18, Sep 9, 2014

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

Date(s) aerial images were photographed: Jun 27, 2014—Aug 28, 2014

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.

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher