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## STAFF REPORT

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**TO:** Members of the Stormwater Hearing Board

**FROM:** Edward Kemp (662-323-2525 ext. 111)

**SUBJECT:** Louisville Street Mini Storage Variance Request

**DATE:** Wednesday June 24, 2015

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**AREA:**

The subject property is located at 1769 Louisville Street in a C-2 zone. Subject property is approximately +/- 4.23 ac. A map of the pre-developed, existing site is shown in Attachment 1.

**PROPOSED USE & BACKGROUND:**

The property was formerly used by the Shriner's Club. The facility experienced substantial fire damage on 11/16/13. The property sat vacant for several months and the applicant purchased the building in 2014.

He has proposed to offer climate controlled storage in the previous Shriners building, construct 5 new mini storage buildings to the south of the primary facility as well as a proposed RV storage building to the north of the building and 6 RV pads to the east of the building. A site plan is attached as Attachment 2.

The parking lots and drive aisles proposed are a mixture of concrete and crushed limestone.

There is a large oak tree in the NE area of the site which is also the location of the stormwater detention pond. Since this tree may be affected, a landscape plan has also been included as Attachment 3.

**CITY REVIEW MEETINGS:**

City Staff met with the applicant on March 17 at which time he brought a conceptual sketch showing the proposed layout. It was communicated to Mr. Moreland that stormwater mitigation would be required. A copy of the Development Review Committee (DRC) comments are attached as Attachment 4.

Mr. Moreland subsequently retained Pritchard Engineering to prepare a set of site plan documents for full review of the DRC. This project was reviewed at the 5/21/15 DRC meeting. In the submittal for that meeting, Pritchard Engineering provided a full set of stormwater calculations and showed a proposed stormwater detention pond in the NE corner of the site. The site plan also included the necessary details and information regarding the outlet control structure. Should the detention pond be located in this area, it would affect the landscaping calculations due to the impact on the existing large oak tree. A copy of the 5/21/15 DRC comments is provided as attachment 5 and the grading and drainage plan is provided as attachment 6. One comment included in that review involved the paving material of the parking lot and drive aisles. The Design Standards ordinance requires the parking in front of the building must be paved; however, Mr. Moreland is also seeking a variance from that code requirement in Board of Adjustments and Appeals (BOAA). Since the pavement type can affect stormwater runoff, the decision of BOAA may have bearing on this variance request.

#### **RELIEF REQUESTED:**

Mr. Moreland has requested that his project be exempt from providing stormwater mitigation. His request and justification is provided as Attachment 7.

#### **CODE REFERENCES:**

The applicability of the Stormwater Management Ordinance to this proposed project is outlined in the code highlighted below:

*Chapter 54- ENVIRONMENT, Article VI.- STORMWATER MANAGEMENT  
ORDINANCE, Sec. 54-163. - General criteria and standards.*

- 1. Applicability. This article shall be applicable within the City of Starkville's jurisdictional area and shall apply to:*
  - i. New development or redevelopment that is two acres or greater;*
  - ii. New development or redevelopment that is at least one acre, but less than two acres and having 50 percent or greater impervious surface; and*
  - iii. Land development activities that are smaller than the minimum applicability criteria established in subsection(1)i.—ii. above, if such activities are part of a larger common plat (plan of development), even though multiple separate and distinct land development activities may take place at different times on different schedules (such as a phased residential subdivision).*

*The following development activities are exempted from this article:*

- i. Individual single family residential lots. Provided, however, that single family lots that are part of a new subdivision or phased development project are not exempt from this article.);*
- ii. Additions or modifications to existing single family structures;*
- iii. Developments or redevelopments that are less than an acre, provided they are not part of a larger common development plan;*
- iv. Any logging and agricultural activity.*

- v. *Land disturbing activities conducted for the purpose of restoration of streams, stream banks, riparian zones, or other environmentally protected areas;*
- vi. *Repairs and/or construction deemed emergency in nature; and*
- vii. *Repairs to any stormwater management facility deemed necessary by the city engineer.*

The requirements of the Stormwater Management Ordinance for this proposed project is outlined in the code below:

- 2. *Mitigation of excess stormwater runoff. The increased stormwater runoff resulting from the proposed development meeting the minimum applicability criteria of subsection (1) shall be mitigated by proper stormwater management facilities;*
- 3. *Storage capacity. Stormwater management facilities shall be designed with sufficient capacity to accommodate all runoff caused by the development in excess of that runoff which would occur from the site if left in its pre-development state. This storage shall be sufficient to store all excess flows for the two-year and ten-year storms of 24-hour duration. The stormwater management facilities shall be designed so that the peak flow rate at any exit point in the post-developed condition shall be less than or equal to the peak flow rate for that exit point in the pre-developed condition for the two- and ten-year storms.*

The applicant's Engineer has previously submitted stormwater calculations to accompany the grading and drainage plan which included the detention pond. Those calculations are included as attachment 8. The stormwater ordinance requires evaluation of pre-development and post-development runoff flows in cubic feet per second (cfs) for the 2 year (Q2) and the 10 year (Q10) storm events. A recap of those is below:

|     | Pre-development | Post-development | % Increase |
|-----|-----------------|------------------|------------|
| Q2  | 5.40 cfs        | 7.01 cfs         | 29.8%      |
| Q10 | 6.55 cfs        | 9.31 cfs         | 42.1%      |

#### **EVALUATION STATEMENT FROM CITY ENGINEER:**

A hardship due to space limitations does not exist as the applicant has proposed a stormwater detention plan in the NE corner of the property in a previously submitted plan thereby showing that the pond can fit within the development if required.

The applicant has expressed concern about the safety, appearance, and maintenance of a detention pond. City Staff has expressed that the stormwater management facility should be designed and constructed to fully drain after rain events thereby not holding water. Further, landscaping can be incorporated into the pond to provide an aesthetic benefit to the property.

This project is positioned near the current city limit and there are three property owners that are between this property and the nearest receiving stream: Starkville School District Timberland, Prairie Opportunity Head Start facility, and the First United Pentecostal Church. It is believed that the roadside ditch along Louisville Street will be capable of conveying the additional stormwater from this development if no mitigation is provided; however, the SHB should consider the precedent that this variance sets.

## **VARIANCE PROCESS:**

Per Code section 54-166, The following procedures shall apply to all applications for a variance to the Stormwater Hearing Board:

- (1) The application for variance shall state the specific variances sought and the reasons for the variance. (See Attachment 7)*
- (2) It shall be the applicant's responsibility to provide sufficient justification for granting the variance. (See Attachment 7)*
- (3) The city engineer shall prepare an evaluation statement concerning each application for variance. The evaluation shall consider the circumstances and supporting documents supplied by the applicant and other generally available technical information pertaining to the variance request. The evaluation statement may include recommendations by the city engineer concerning the variance to the SHB. (See Statement in report above)*
- (4) In passing upon such applications, the SHB shall consider all technical evaluation and relevant factors presented by the applicant and city staff through the governing statutes and the standards specified in other sections of this article.*
- (5) After hearing and upon consideration of the application, evidence and applicable law, the SHB may attach such conditions to the granting of variances as it deems necessary to further the purpose of this article.*

Should the Stormwater Hearing Board grant a variance, it shall be granted upon findings that the following standards have been met:

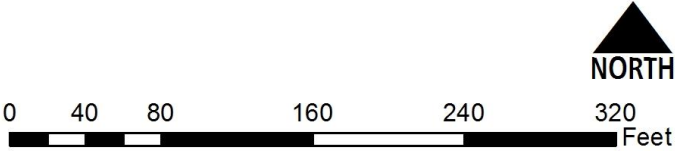
- (1) That failure to grant the variance could result in exceptional hardship to the applicant; and*
- (2) That granting the variance will not result in increased stormwater runoff greater than ten percent (10%), increased flood elevations, additional threats to public safety, extraordinary public expense, or create nuisances, cause fraud on or victimization of the public;*
- (3) That the necessity for a variance is not the result of conditions on the property which have been self-imposed by the applicant; and*
- (4) That the variance is the minimum necessary, considering the adverse impacts of stormwater runoff.*

Attachment 1  
Aerial

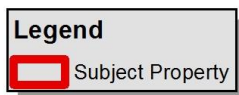
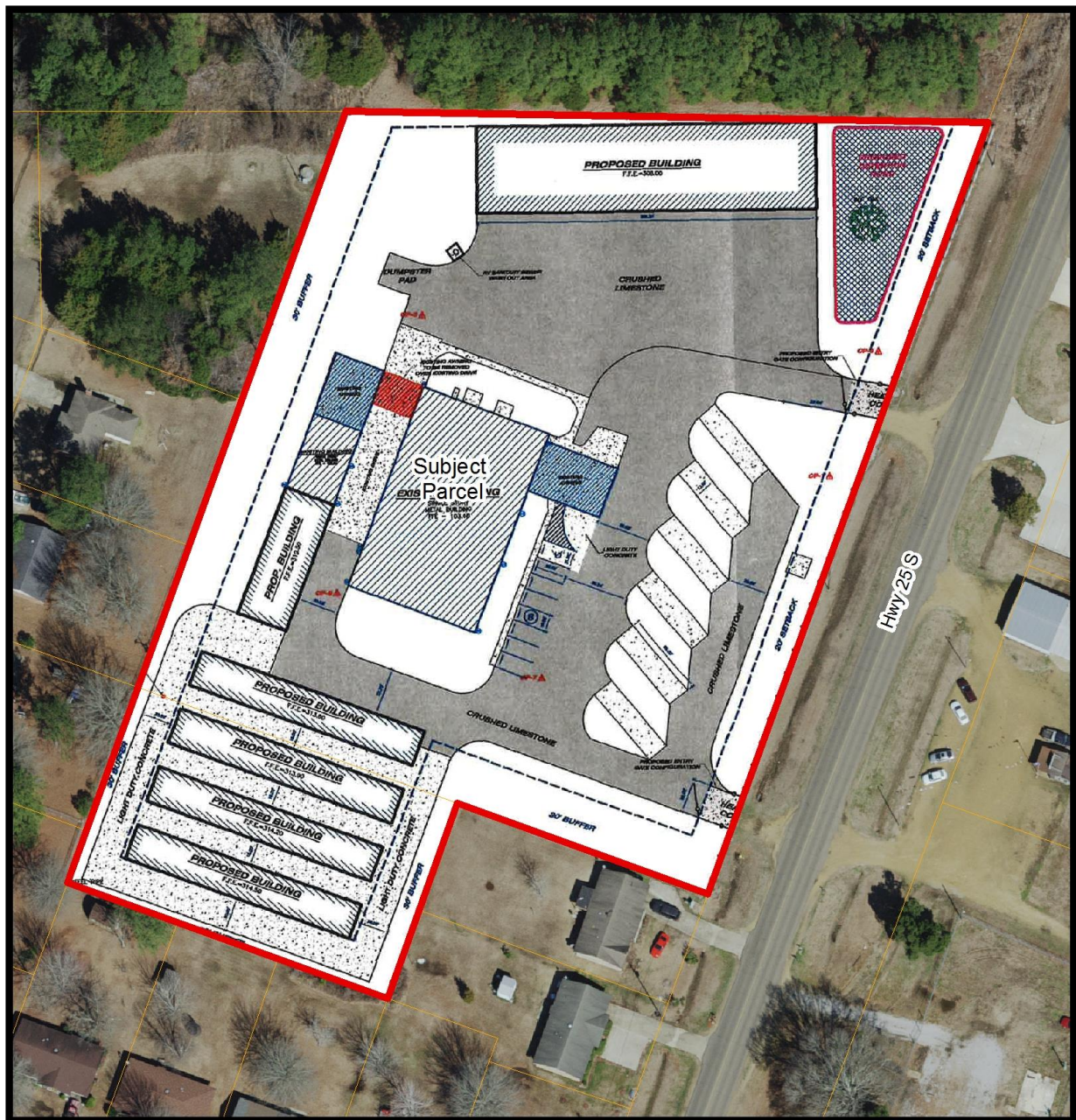


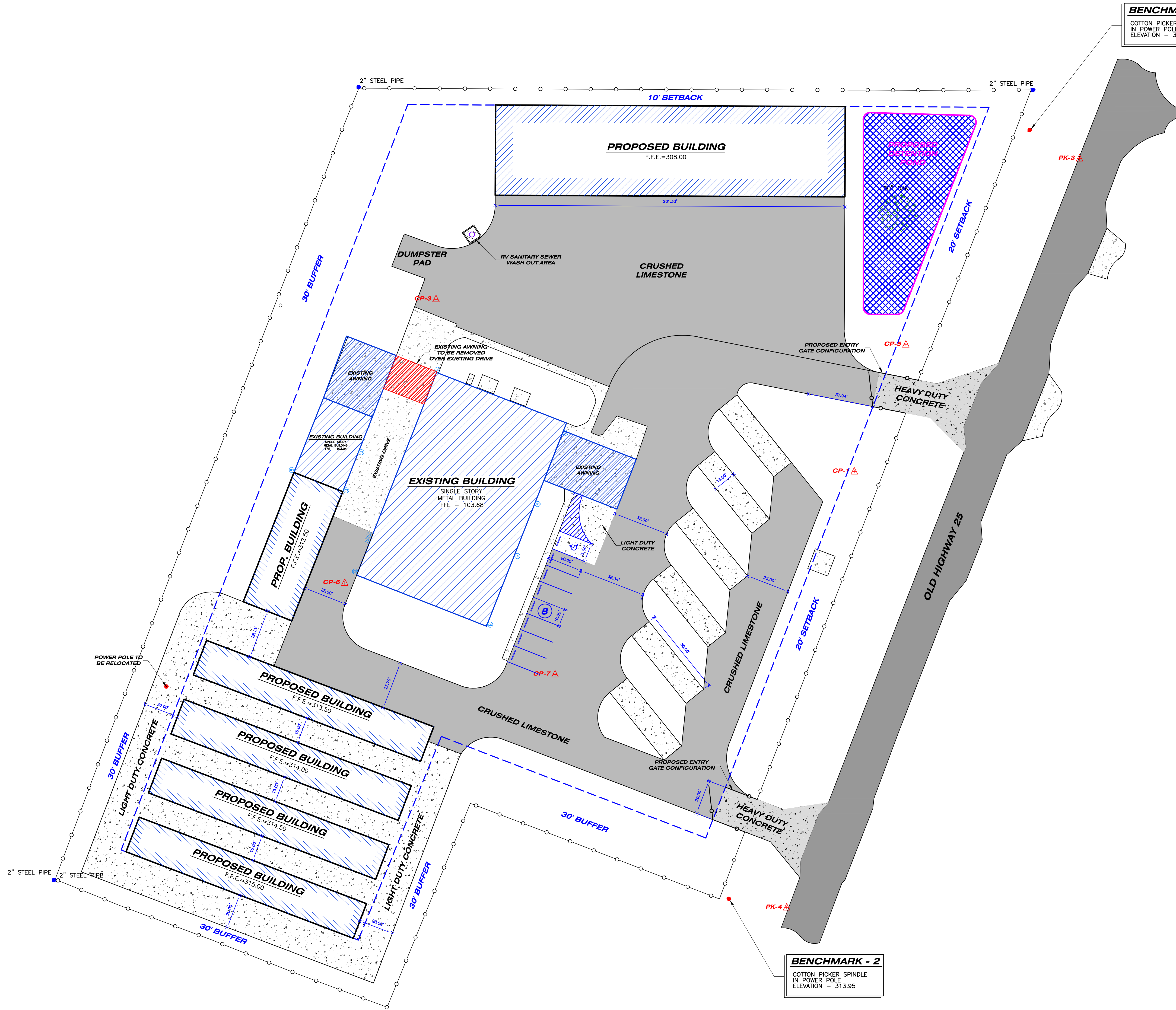
**Legend**

 Subject Property



Attachment 2  
Site Plan



[illegible]

**GENERAL NOTES:**

FIELD SURVEY COMPLETED - 4/20/2015

BENCHMARK ESTABLISHED ON SITE IS:

BM-1 COTTON PICKER SPINDLE SET IN POWER POLE  
ELEVATION - 306.76

BM-2 COTTON PICKER SPINDLE SET IN POWER POLE  
ELEVATION - 313.95

UTILITY LOCATIONS DEPICTED ARE BASED ON VISIBLE EVIDENCE DISCERNED BY FIELD SURVEY PERSONNEL AND MISSISSIPPI ONE CALL DELINEATION EXECUTION NO. 15041413420775. THE DEPICTION OF UNDERGROUND UTILITIES IS AS THE SOURCES ALLOW. ANY CONTRACTOR PERFORMING WORK ON THIS SITE IS RESPONSIBLE FOR EXECUTING THE MISSISSIPPI ONE-CALL SYSTEM (1-800-227-6477) AND CONTACTING THE APPROPRIATE ENTITIES PRIOR TO INITIATING CONSTRUCTION.

| HORIZONTAL CONTROL: |          |          |           |             |
|---------------------|----------|----------|-----------|-------------|
| POINT #             | NORTHING | EASTING  | ELEVATION | DESCRIPTION |
| CP-1                | 10000.00 | 10000.00 | 309.08    | CP-1        |
| CP-2                | 10099.21 | 9759.13  | 309.36    | CP-2        |
| PK-3                | 10180.23 | 10129.73 | 308.58    | PK-3        |
| PK-4                | 9748.85  | 9961.09  | 314.17    | PK-4        |
| CP-5                | 10073.10 | 10029.73 | 307.57    | CP-5        |
| CP-6                | 9935.85  | 9706.60  | 312.44    | CP-6        |
| CP-7                | 9883.13  | 9827.69  | 311.97    | CP-7        |

WATERLINE DATA OBTAINED FROM: MISSISSIPPI 1-CALL  
 SANITARY SEWER LINE DATA OBTAINED FROM: VISUAL EVIDENCE  
 GAS LINE DATA OBTAINED FROM: MISSISSIPPI 1-CALL  
 COMMUNICATION LINE DATA OBTAINED FROM: MISSISSIPPI 1-CALL  
 IRRIGATION LINE DATA OBTAINED FROM: N/A  
 STORMDRAIN DATA OBTAINED FROM: N/A

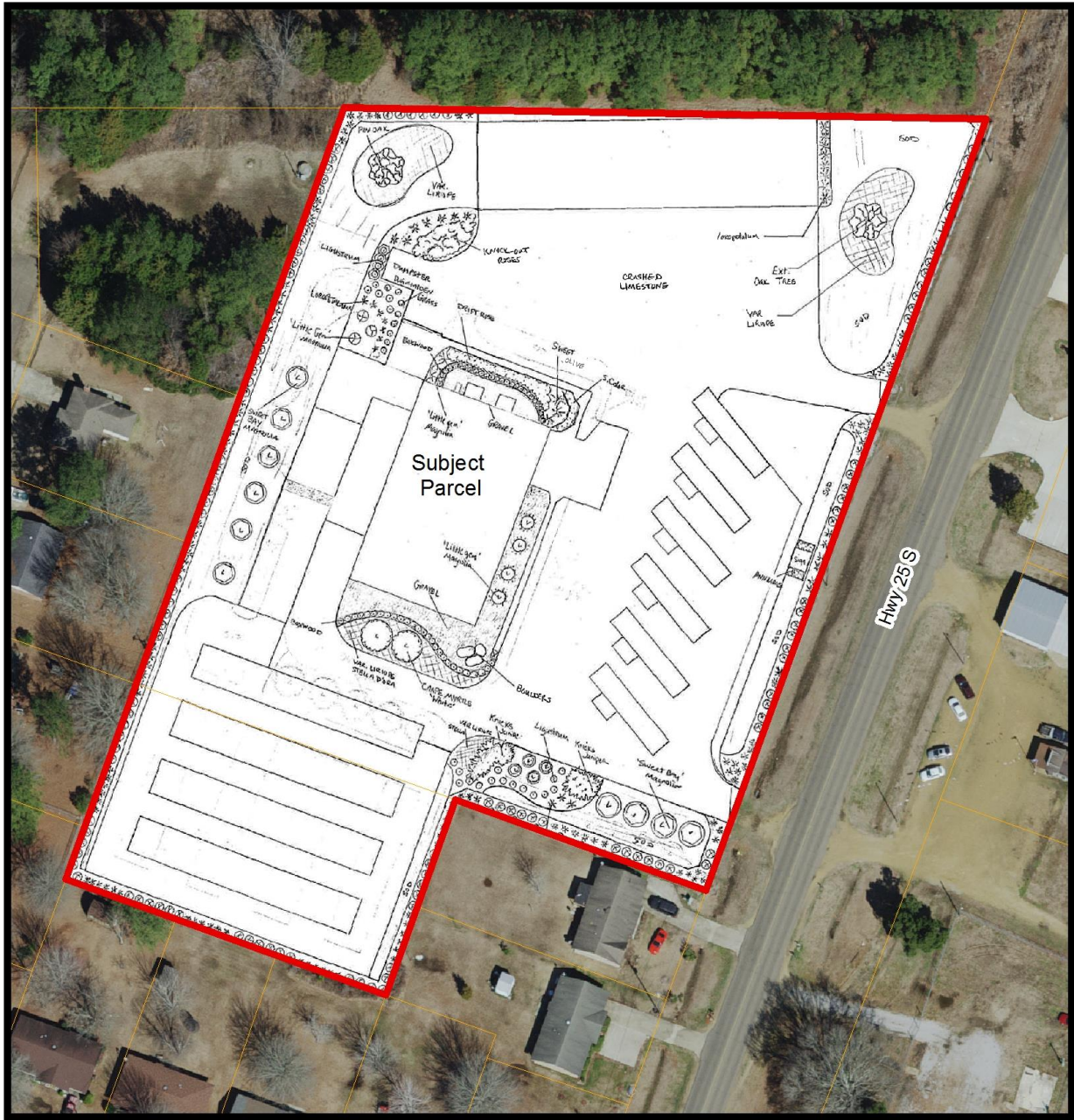
**SITE PLAN NOTES:**

- 1.) EXISTING BUILDING AREA = 11,491 SQUARE FEET.  
PROPOSED BUILDING AREA = 19,117 SQUARE FEET.
- 2.) PARKING REQ'D = N/A  
(DRIVE THRU UNLOADING ZONE PROVIDED)
- 3.) C-2 ZONING  
SETBACKS: FRONT & REAR = 20 FT.  
SIDE = 10 FT (20 FT TOTAL)
- 4.) LOT AREA = 181,645.20 SQ.FT.  
FLOOR AREA RATIO =  $30,608 / 181,645.20 = 0.17$
- 5.) REFER TO LANDSCAPE PLAN FOR REQUIRED GREENSPACE  
AND PLANTING REQUIREMENTS.

6/16/2015 - PRELIMINARY DRAWING - FOR PUBLIC HEARING - NOT FOR CONSTRUCTION!

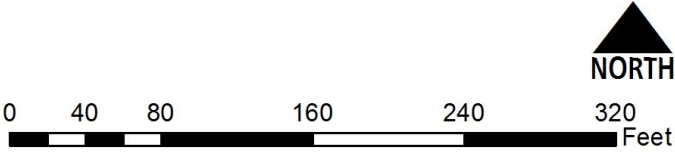
|                                                                                                                  |                                                                            |                                                                      |                                                                     |
|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------|
| <b>RECORD</b>                                                                                                    | <b>SHEET PLAN</b>                                                          | <b>CLIENT</b>                                                        | <b>SUBMITTED TO</b>                                                 |
| <b>PROJ. #</b> 4596SD-1845-15<br><b>FILE NAME:</b> _4596 DESIGN<br><b>DRAWN BY:</b> JM<br><b>CHECKED BY:</b> CLP | <b>DATE:</b> 5/11/15<br><b>REVISION:</b> 6/16/15<br><b>SCALE:</b> 1" = 30' | STARKVILLE, MISSISSIPPI<br><br><i><b>OLD HWY 25 MINI STORAGE</b></i> | MORELAND HOLDINGS<br>STARKVILLE, MS<br><br><u>MORELAND HOLDINGS</u> |
| <b>MR. DAN MORELAND</b><br>STARKVILLE, MISSISSIPPI                                                               |                                                                            |                                                                      |                                                                     |
|                                                                                                                  |                                                                            |                                                                      |                                                                     |

Attachment 3  
Landscape Plan



**Legend**

 Subject Property



Attachment 4  
3/17/15 Development Review Committee Comments



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**COMMITTEE MEMBER COMMENTS**

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**TO:** Dan Moreland  
**FROM:** Daniel Havelin, City Planner, City of Starkville  
**SUBJECT:** **PR 15-05** Storage Units on Louisville, Site Plan Approval, 1769 Louisville Street, Zoned C-2, Ward 2, Storage Units, Applicant: Dan Moreland, Owner: Moreland Real Estate LLC  
**DATE:** MARCH 17, 2015

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The following information is provided to assist you in expediting your plan approval process. These comments are from the Development Review Committee, which represent the various City Departments and area utility providers that are involved in the review of your plans.

**Community Development/Planning:** Daniel Havelin, City Planner  
(662) 323-2525, ext. 136 [d.havelin@cityofstarkville.org](mailto:d.havelin@cityofstarkville.org)

- 30' buffer yard required between residentially zoned property and C-2 zone property. Condition of rezoning approved by the Board of Aldermen on January 6<sup>th</sup> 2015. 120 plant units required per 100 linear feet. Approximately 1,155 plant units required in buffer yard.
- Landscape plan is required for site plan approval. See checklist for landscape plan requirement. See current landscape ordinance for landscape requirements.
- Parking lots adjacent to public right of way are to be paved with asphalt, concrete, porous pavement, concrete pavers, or brick pavers
- All building facades visible from the public right of way or residentially zoned property must adhere to the minimum design standards.
- Several required plans are missing from the submitted set: Survey, Grading and Drainage, Utilities, Erosion Prevention and Sediment Control Plan
- **Send copy of DRC Ordinance and DRC checklist to Mr. Moreland**

**Atmos Energy:** Wade Shultice, Project Specialist  
662-323-2742 [wade.shultice@atmosenergy.com](mailto:wade.shultice@atmosenergy.com)

**AT&T:** Dean Goodman, Manager OSP Planning & Engineering Design  
662-329-1962 662-327-8320 [cg5876@att.com](mailto:cg5876@att.com)

**Community Development Department/Development:** Joyner Williams, Building Official/ADA Coordinator 662-323-8012, ext. 132 [jo.williams@cityofstarkville.org](mailto:jo.williams@cityofstarkville.org)

- **ADA parking with signage will be required for main building**
- **No sidewalks along road required. Outside of sidewalk zone**

**Community Development Department/Engineering Division:** Edward Kemp, PE, City Engineer  
662-323-2525, ext. 111 [e.kemp@cityofstarkville.org](mailto:e.kemp@cityofstarkville.org)

- What is the total acreage of the project? Stormwater mitigation will be required if
  - New development or redevelopment is two acres or greater;
  - New development or redevelopment is at least one acre, but less than two acres and having 50 percent or greater impervious surface; and
- **15' apron of concrete at driveways that connect to a public street.**

**Fire Department:** Stein A McMullen, Fire Marshall

662-323-1212 ext. 12 [smcmullen@cityofstarkville.org](mailto:smcmullen@cityofstarkville.org)

- Needs to see dimensions on plan for fire access
- Gate controller (if automatic) needs to have Emergency Access Control for Emergency Vehicles

~~**Fire Department:** Mark McCurdy, Fire Marshall~~

~~662-323-1212 ext. 21 [mmccurdy@cityofstarkville.org](mailto:mmccurdy@cityofstarkville.org)~~

**MaxxSouth:** Doug Keel,

662-259-3221, [douglas.keel@maxxsouth.com](mailto:douglas.keel@maxxsouth.com)

~~**Police Department:** Mark Ballard, Patrol Division Commander~~

~~662-323-4131 [mballard@cityofstarkville.org](mailto:mballard@cityofstarkville.org)~~

**Police Department:** Andy Fultz, Sergeant Special Operations Group

662-323-4131 [afultz@cityofstarkville.org](mailto:afultz@cityofstarkville.org)

**Public Services Department:** Andrew Nagel

662-323-2525 [a.nagel@cityofstarkville.org](mailto:a.nagel@cityofstarkville.org)

**Sanitation & Environmental Services Department:** Emma Gandy

662-323-2652 [sanitation@cityofstarkville.org](mailto:sanitation@cityofstarkville.org)

- Need to have a dumpster located on the site plan
- Curbside pickup at this facility is not allowed

~~**Starkville Electric Department:** Jason Horner, System Engineer~~

~~662-323-3133, ext. 114 [jasonh@starkvilleelectric.com](mailto:jasonh@starkvilleelectric.com)~~

**4-County Electric Power:** Bill Caldwell

662-324-4300 [CaldwellB@4county.org](mailto:CaldwellB@4county.org)

Attachment 5  
5/21/15 Development Review Committee Comments



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**COMMITTEE MEMBER COMMENTS**

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**TO:** Pritchard Engineering, INC  
**FROM:** Daniel Havelin, City Planner, City of Starkville  
**SUBJECT:** Highway 25 Mini Storage  
**DATE:** MAY 21, 2015

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The following information is provided to assist you in expediting your plan approval process. These comments are from the Development Review Committee, which represent the various City Departments and area utility providers that are involved in the review of your plans.

**Community Development/Planning:** Daniel Havelin, City Planner  
(662) 323-2525, ext. 136 [d.havelin@cityofstarkville.org](mailto:d.havelin@cityofstarkville.org)

1. 30' buffer yard required between residentially zoned property and C-2 zone property. Condition of rezoning approved by the Board of Aldermen on January 6<sup>th</sup> 2015. 120 plant units required per 100 linear feet. Approximately 1,155 plant units required in buffer yard.
2. Landscape plan is required for site plan approval. See checklist for landscape plan requirement. See current landscape ordinance for landscape requirements.
3. Parking lots adjacent to public right of way are to be paved with asphalt, concrete, porous pavement, concrete pavers, or brick pavers
4. All building facades visible from the public right of way or residentially zoned property must adhere to the minimum design standards.

**Atmos Energy:** Wade Shultice, Project Specialist  
662-323-2742 [wade.shultice@atmosenergy.com](mailto:wade.shultice@atmosenergy.com)

**AT&T:** Dean Goodman, Manager OSP Planning & Engineering Design  
662-329-1962 662-327-8320 [cg5876@att.com](mailto:cg5876@att.com)

**Community Development Department/Development:** Joyner Williams, Building Official/ADA Coordinator 662-323-8012, ext. 132 [jo.williams@cityofstarkville.org](mailto:jo.williams@cityofstarkville.org)

**Community Development Department/Engineering Division:** Edward Kemp, PE, City Engineer  
662-323-2525, ext. 111 [e.kemp@cityofstarkville.org](mailto:e.kemp@cityofstarkville.org)

1. All stormwater comments are based on proposed parking lot being composed of crushed limestone (1.42 AC). If parking lot is required to be paved, a revised stormwater report must be submitted that reflects this alteration.
2. Discharge Calculations:
  - a. Calculations for proposed site yield improbable values for time of concentration and discharge into pond. It is suggested that time of concentration be decreased to reflect a shorter flow path and added impervious area. TR-55 Method for calculating time of concentration is suggested.

- b. Detention pond storage volume may need to be increased once discharge values into pond have been recalculated.
3. Proposed pipe (16 LF of 12" HDPE) should be able to accommodate the 25-year event. Show in stormwater report a comparison of 25-year discharge into pipe versus proposed pipe's capacity.
4. Detention pond should have 12" allowable freeboard from the 10-year pond elevation.
5. Provide note on plans indicating that safe velocities & capacities of downstream receiving streams are not exceeded by proposed onsite stormwater runoff.

**Fire Department:** Stein A McMullen, Fire Marshall  
662-323-1212 ext. 12 [smcmullen@cityofstarkville.org](mailto:smcmullen@cityofstarkville.org)

**Fire Department:** Mark McCurdy, Fire Marshall  
662-323-1212 ext. 21 [mmccurdy@cityofstarkville.org](mailto:mmccurdy@cityofstarkville.org)

**MaxxSouth:** Doug Keel,  
662-259-3221, [douglas.keel@maxxsouth.com](mailto:douglas.keel@maxxsouth.com)

**Police Department:** Andy Fultz, Sergeant Special Operations Group  
662-323-4131 [afultz@cityofstarkville.org](mailto:afultz@cityofstarkville.org)

**Public Services Department:** Andrew Nagel  
662-323-2525 [a.nagel@cityofstarkville.org](mailto:a.nagel@cityofstarkville.org)

**Sanitation & Environmental Services Department:** Emma Gandy  
662-323-2652 [sanitation@cityofstarkville.org](mailto:sanitation@cityofstarkville.org)

**Starkville Electric Department:** Jason Horner, System Engineer  
662-323-3133, ext. 114 [jasonh@starkvilleelectric.com](mailto:jasonh@starkvilleelectric.com)

**4-County Electric Power:** Bill Caldwell  
662-324-4300 [CaldwellB@4county.org](mailto:CaldwellB@4county.org)

Attachment 6  
Previously submitted Grading and Drainage Plan



Attachment 7  
Request Letter from applicant and justification



P.O. Box 2523  
Starkville, MS 39760  
Phone: 662.324.2205  
Fax: 662.324.2092

JUNE 11, 2015

STORM WATER HEARING BOARD  
101 EAST LAMPKIN ST.  
STARKVILLE, MS 39759

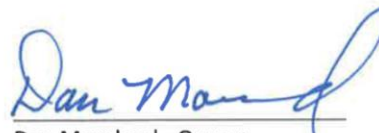
RE: OLD HIGHWAY 25 MINI STORAGE  
1769 LOUISVILLE ST.  
STARKVILLE, MS 39759

On behalf of our client, Moreland Holdings, Pritchard Engineering is requesting variance from the City of Starkville storm water ordinance for the following reasons:

Elimination of storm water detention pond. All existing storm water runoff discharges at the North end of the property into a natural/existing swale. This swale is located on the property line between the subject property and 16<sup>th</sup> section land, which then discharges into an established drainage ditch on the highway right-of-way. All proposed storm water runoff will discharge from the site in the same location(s) as existing storm water.

Respectfully,

  
Jason T. Morgan, E.I.  
Pritchard Engineering, Inc.

  
Dan Moreland - Owner  
Old Highway 25 Mini Storage

enclosure

Attachment 8  
Stormwater Calculations



*professional engineering services*  
civil design & development  
quality assurance testing  
surveying & mapping  
construction staking  
site development  
geotechnical

**MAY 11, 2015**

**DESIGN REVIEW COMMITTEE  
ATTN: MR. EDWARD KEMP- PE, CITY ENGINEER  
101 EAST LAMPKIN STREET  
STARKVILLE, MS 39759**

**RE: DETENTION POND ANALYSIS  
HIGHWAY 25 MINI STORAGE  
STARKVILLE, OKTIBBEHA COUNTY, MISSISSIPPI**

Dear Mr. Kemp:

We have performed a site analysis and detention pond design on the Highway 25 Mini Storage site per City Ordinance – Chapter 54-Environment – Article VI-Stormwater Management Ordinance.

Total pre-existing site runoff of the 4.18 acre site was calculated to be 4.29 cfs (2 yr) and 5.69 cfs (10 yr). This yielded a site intensity of 3.70 in/hr (2 yr) and 4.75 in/hr (10 yr).

We elected to use a detention pond for this project site. A 4.18 acre area of post development flow is routed through the detention pond. The proposed runoff surfaces include roof area, concrete paving, gravel, and grass/landscaped areas.

The new post development discharge from the site to the pond was calculated to be 7.01 cfs (2 yr) and 9.31 cfs (10 yr) for the entire 4.18 acres.

The total post development runoff of the pond discharge yielded a flow of 4.12 cfs (2 yr) and 5.46 cfs (10 yr). These discharge values account for the total post development discharge from the site which are lower than the existing runoff conditions of 4.29 cft (2 yr) and 5.69 (10 yr)

Reports generated by the hydrographs module of Autocad Civil 3d 2014 are attached for your review.

Feel free to contact us should you have any questions or comments concerning the contents of this report or if we may be of additional service.

Respectfully,

  
Thomas E. Allen, P.E., P.L.S.  
Pritchard Engineering, Inc. 13599  


  
Jason T. Morgan, E.I.  
Pritchard Engineering, Inc.

enclosure

# Hydraflow Table of Contents

detention.gpw

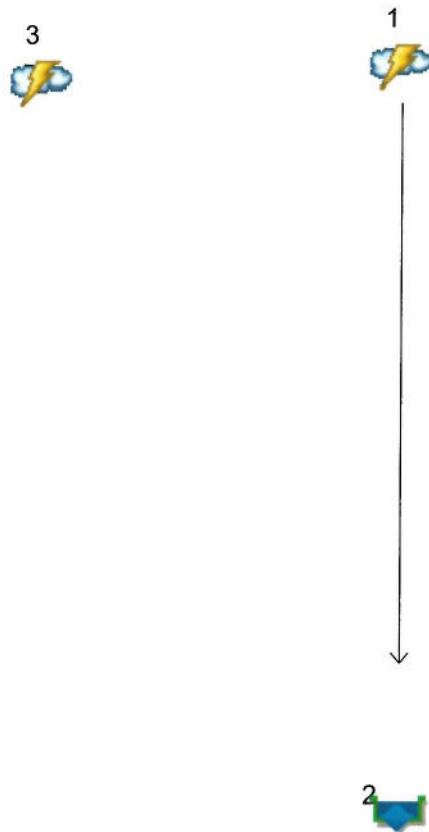
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Friday, 05 / 8 / 2015

|                                            |           |
|--------------------------------------------|-----------|
| <b>Watershed Model Schematic.....</b>      | <b>1</b>  |
| <b>Hydrograph Return Period Recap.....</b> | <b>2</b>  |
| <b>2 - Year</b>                            |           |
| <b>Summary Report.....</b>                 | <b>3</b>  |
| <b>Hydrograph Reports.....</b>             | <b>4</b>  |
| Hydrograph No. 1, Rational, POST.....      | 4         |
| Hydrograph No. 2, Reservoir, Pond.....     | 5         |
| Pond Report - pond1.....                   | 6         |
| Hydrograph No. 3, Rational, PRE.....       | 8         |
| <b>10 - Year</b>                           |           |
| <b>Summary Report.....</b>                 | <b>9</b>  |
| <b>Hydrograph Reports.....</b>             | <b>10</b> |
| Hydrograph No. 1, Rational, POST.....      | 10        |
| Hydrograph No. 2, Reservoir, Pond.....     | 11        |
| Hydrograph No. 3, Rational, PRE.....       | 12        |
| <b>IDF Report.....</b>                     | <b>13</b> |

# Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3



## Legend

| Hyd. | Origin    | Description |
|------|-----------|-------------|
| 1    | Rational  | POST        |
| 2    | Reservoir | Pond        |
| 3    | Rational  | PRE         |

## Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

| Hyd. No.      | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft)               | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---------------|--------------------------|-----------------|---------------------|--------------------|----------------------------------|---------------|------------------------|-------------------------|------------------------|
| 1             | Rational                 | 7.012           | 1                   | 28                 | 11,780                           | ----          | ----                   | -----                   | POST                   |
| 2             | Reservoir                | 4.121           | 1                   | 40                 | 11,778                           | 1             | 307.09                 | 4,649                   | Pond                   |
| 3             | Rational                 | 4.285           | 1                   | 28                 | 7,199                            | ----          | ----                   | -----                   | PRE                    |
| detention.gpw |                          |                 |                     |                    | Return Period: 2 Year<br>Page 21 |               |                        | Friday, 05 / 8 / 2015   |                        |

# Hydrograph Report

4

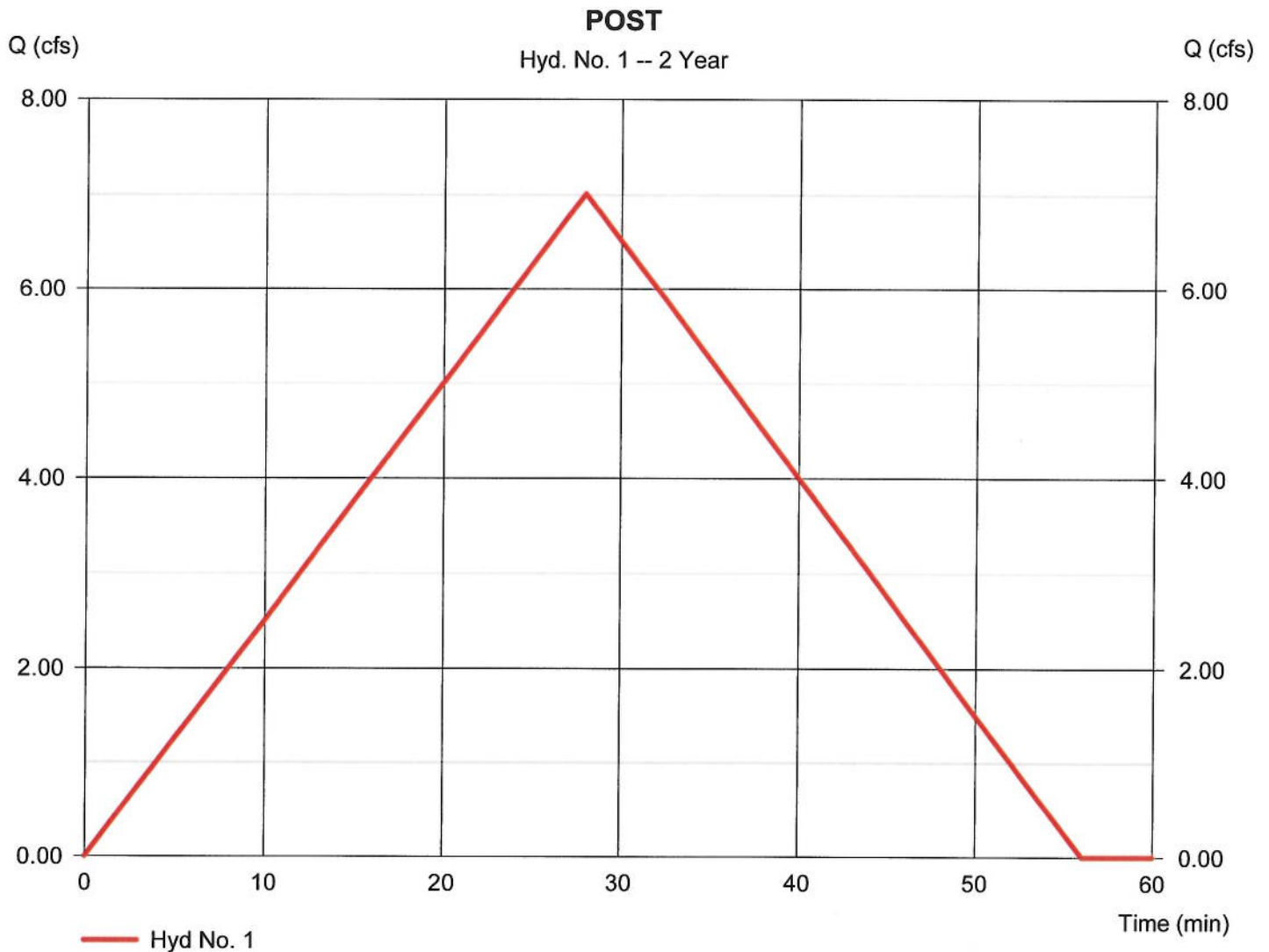
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Friday, 05 / 8 / 2015

## Hyd. No. 1

### POST

|                 |                    |                   |               |
|-----------------|--------------------|-------------------|---------------|
| Hydrograph type | = Rational         | Peak discharge    | = 7.012 cfs   |
| Storm frequency | = 2 yrs            | Time to peak      | = 28 min      |
| Time interval   | = 1 min            | Hyd. volume       | = 11,780 cuft |
| Drainage area   | = 4.180 ac         | Runoff coeff.     | = 0.54        |
| Intensity       | = 3.106 in/hr      | Tc by User        | = 28.00 min   |
| IDF Curve       | = oktibbeha-ms.IDF | Asc/Rec limb fact | = 1/1         |



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Friday, 05 / 8 / 2015

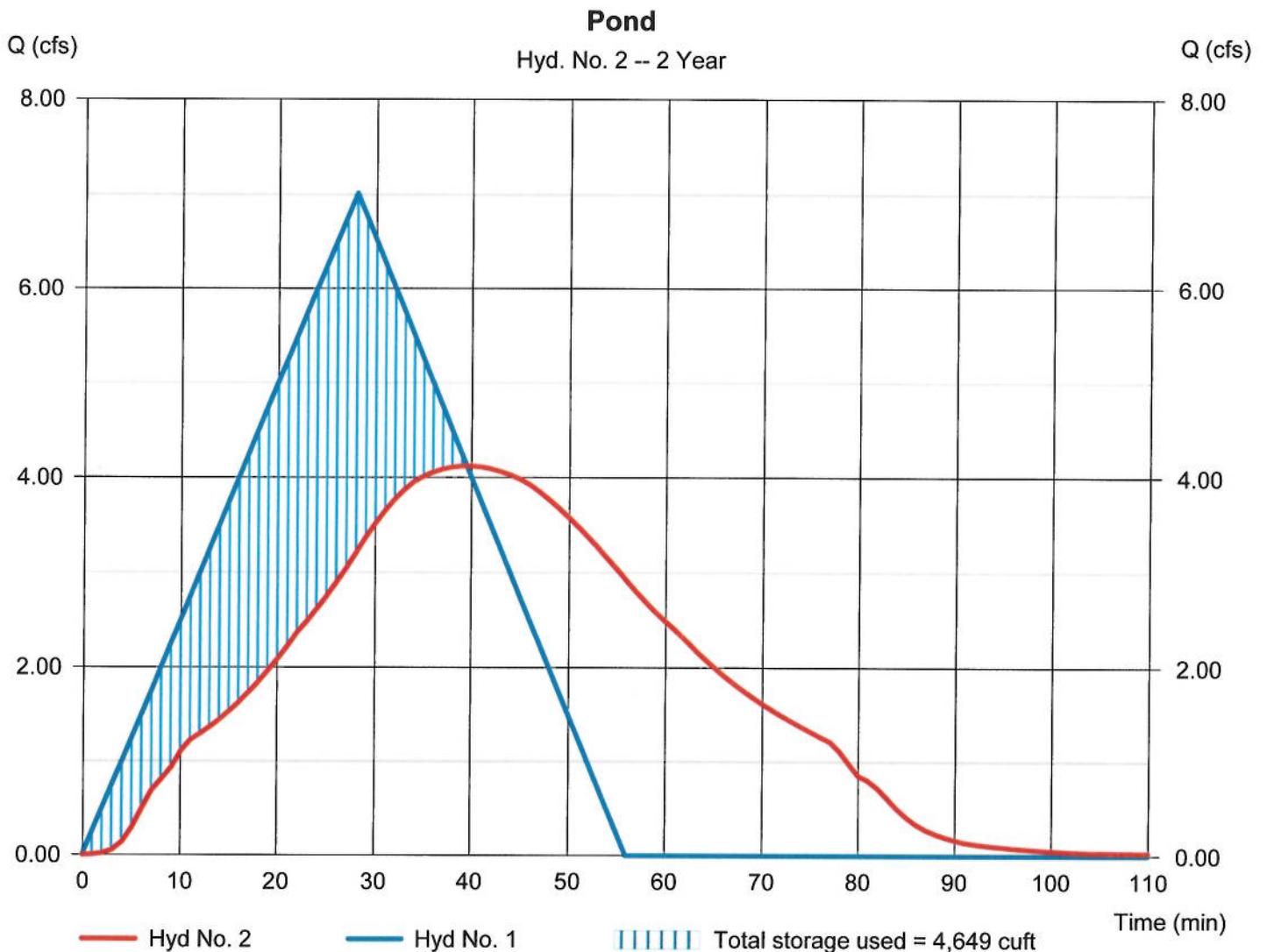
## Hyd. No. 2

Pond

Hydrograph type = Reservoir  
 Storm frequency = 2 yrs  
 Time interval = 1 min  
 Inflow hyd. No. = 1 - POST  
 Reservoir name = pond1

Peak discharge = 4.121 cfs  
 Time to peak = 40 min  
 Hyd. volume = 11,778 cuft  
 Max. Elevation = 307.09 ft  
 Max. Storage = 4,649 cuft

Storage Indication method used.



# Pond Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Friday, 05 / 8 / 2015

## Pond No. 1 - pond1

### Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 304.00 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|------------|----------------|---------------------|----------------------|----------------------|
| 0.00       | 304.00         | 40                  | 0                    | 0                    |
| 1.00       | 305.00         | 1,393               | 556                  | 556                  |
| 2.00       | 306.00         | 1,903               | 1,641                | 2,198                |
| 3.00       | 307.00         | 2,488               | 2,189                | 4,386                |
| 4.00       | 308.00         | 3,149               | 2,812                | 7,198                |

### Culvert / Orifice Structures

|                 | [A]      | [B]  | [C]  | [PrfRsr] |
|-----------------|----------|------|------|----------|
| Rise (in)       | = 8.00   | 0.00 | 0.00 | 0.00     |
| Span (in)       | = 8.00   | 0.00 | 0.00 | 0.00     |
| No. Barrels     | = 1      | 1    | 0    | 0        |
| Invert El. (ft) | = 304.00 | 0.00 | 0.00 | 0.00     |
| Length (ft)     | = 60.00  | 0.00 | 0.00 | 0.00     |
| Slope (%)       | = 0.50   | 0.00 | 0.00 | n/a      |
| N-Value         | = .012   | .013 | .013 | n/a      |
| Orifice Coeff.  | = 0.60   | 0.60 | 0.60 | 0.60     |
| Multi-Stage     | = n/a    | No   | No   | No       |

### Weir Structures

|                | [A]                   | [B]  | [C]  | [D]  |
|----------------|-----------------------|------|------|------|
| Crest Len (ft) | = 0.00                | 0.00 | 0.00 | 0.00 |
| Crest El. (ft) | = 304.00              | 0.00 | 0.00 | 0.00 |
| Weir Coeff.    | = 0.11                | 3.33 | 3.33 | 3.33 |
| Weir Type      | = 5 degV              | ---  | ---  | ---  |
| Multi-Stage    | = No                  | No   | No   | No   |
| Exfil.(in/hr)  | = 0.000 (by Wet area) |      |      |      |
| TW Elev. (ft)  | = 0.00                |      |      |      |

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

### Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | PrfRsr cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | User cfs | Total cfs |
|----------|--------------|--------------|-----------|-----------|-----------|------------|----------|----------|----------|----------|-----------|----------|-----------|
| 0.00     | 0            | 304.00       | 0.00      | ---       | ---       | ---        | ---      | ---      | ---      | ---      | ---       | ---      | 0.000     |
| 0.10     | 56           | 304.10       | 0.04 ic   | ---       | ---       | ---        | 0.00     | ---      | ---      | ---      | ---       | ---      | 0.036     |
| 0.20     | 111          | 304.20       | 0.13 ic   | ---       | ---       | ---        | 0.00     | ---      | ---      | ---      | ---       | ---      | 0.137     |
| 0.30     | 167          | 304.30       | 0.28 ic   | ---       | ---       | ---        | 0.01     | ---      | ---      | ---      | ---       | ---      | 0.290     |
| 0.40     | 223          | 304.40       | 0.47 ic   | ---       | ---       | ---        | 0.01     | ---      | ---      | ---      | ---       | ---      | 0.483     |
| 0.50     | 278          | 304.50       | 0.65 oc   | ---       | ---       | ---        | 0.02     | ---      | ---      | ---      | ---       | ---      | 0.669     |
| 0.60     | 334          | 304.60       | 0.76 oc   | ---       | ---       | ---        | 0.03     | ---      | ---      | ---      | ---       | ---      | 0.792     |
| 0.70     | 389          | 304.70       | 0.79 oc   | ---       | ---       | ---        | 0.05     | ---      | ---      | ---      | ---       | ---      | 0.833     |
| 0.80     | 445          | 304.80       | 0.90 oc   | ---       | ---       | ---        | 0.06     | ---      | ---      | ---      | ---       | ---      | 0.962     |
| 0.90     | 501          | 304.90       | 1.00 oc   | ---       | ---       | ---        | 0.09     | ---      | ---      | ---      | ---       | ---      | 1.082     |
| 1.00     | 556          | 305.00       | 1.09 oc   | ---       | ---       | ---        | 0.11     | ---      | ---      | ---      | ---       | ---      | 1.197     |
| 1.10     | 720          | 305.10       | 1.17 oc   | ---       | ---       | ---        | 0.14     | ---      | ---      | ---      | ---       | ---      | 1.309     |
| 1.20     | 885          | 305.20       | 1.25 oc   | ---       | ---       | ---        | 0.18     | ---      | ---      | ---      | ---       | ---      | 1.420     |
| 1.30     | 1,049        | 305.30       | 1.32 oc   | ---       | ---       | ---        | 0.21     | ---      | ---      | ---      | ---       | ---      | 1.532     |
| 1.40     | 1,213        | 305.40       | 1.39 oc   | ---       | ---       | ---        | 0.26     | ---      | ---      | ---      | ---       | ---      | 1.644     |
| 1.50     | 1,377        | 305.50       | 1.45 oc   | ---       | ---       | ---        | 0.31     | ---      | ---      | ---      | ---       | ---      | 1.758     |
| 1.60     | 1,541        | 305.60       | 1.51 oc   | ---       | ---       | ---        | 0.36     | ---      | ---      | ---      | ---       | ---      | 1.874     |
| 1.70     | 1,705        | 305.70       | 1.58 oc   | ---       | ---       | ---        | 0.42     | ---      | ---      | ---      | ---       | ---      | 1.993     |
| 1.80     | 1,869        | 305.80       | 1.63 oc   | ---       | ---       | ---        | 0.48     | ---      | ---      | ---      | ---       | ---      | 2.116     |
| 1.90     | 2,033        | 305.90       | 1.69 oc   | ---       | ---       | ---        | 0.55     | ---      | ---      | ---      | ---       | ---      | 2.242     |
| 2.00     | 2,198        | 306.00       | 1.74 oc   | ---       | ---       | ---        | 0.63     | ---      | ---      | ---      | ---       | ---      | 2.371     |
| 2.10     | 2,416        | 306.10       | 1.80 oc   | ---       | ---       | ---        | 0.71     | ---      | ---      | ---      | ---       | ---      | 2.505     |
| 2.20     | 2,635        | 306.20       | 1.85 oc   | ---       | ---       | ---        | 0.80     | ---      | ---      | ---      | ---       | ---      | 2.644     |
| 2.30     | 2,854        | 306.30       | 1.90 oc   | ---       | ---       | ---        | 0.89     | ---      | ---      | ---      | ---       | ---      | 2.787     |
| 2.40     | 3,073        | 306.40       | 1.95 oc   | ---       | ---       | ---        | 0.99     | ---      | ---      | ---      | ---       | ---      | 2.936     |
| 2.50     | 3,292        | 306.50       | 1.99 oc   | ---       | ---       | ---        | 1.10     | ---      | ---      | ---      | ---       | ---      | 3.089     |
| 2.60     | 3,511        | 306.60       | 2.04 oc   | ---       | ---       | ---        | 1.21     | ---      | ---      | ---      | ---       | ---      | 3.249     |
| 2.70     | 3,730        | 306.70       | 2.08 oc   | ---       | ---       | ---        | 1.33     | ---      | ---      | ---      | ---       | ---      | 3.413     |
| 2.80     | 3,949        | 306.80       | 2.13 oc   | ---       | ---       | ---        | 1.46     | ---      | ---      | ---      | ---       | ---      | 3.584     |
| 2.90     | 4,167        | 306.90       | 2.17 oc   | ---       | ---       | ---        | 1.59     | ---      | ---      | ---      | ---       | ---      | 3.761     |
| 3.00     | 4,386        | 307.00       | 2.21 oc   | ---       | ---       | ---        | 1.73     | ---      | ---      | ---      | ---       | ---      | 3.944     |
| 3.10     | 4,667        | 307.10       | 2.26 oc   | ---       | ---       | ---        | 1.88     | ---      | ---      | ---      | ---       | ---      | 4.133     |
| 3.20     | 4,949        | 307.20       | 2.30 oc   | ---       | ---       | ---        | 2.03     | ---      | ---      | ---      | ---       | ---      | 4.329     |
| 3.30     | 5,230        | 307.30       | 2.34 oc   | ---       | ---       | ---        | 2.20     | ---      | ---      | ---      | ---       | ---      | 4.532     |
| 3.40     | 5,511        | 307.40       | 2.38 oc   | ---       | ---       | ---        | 2.37     | ---      | ---      | ---      | ---       | ---      | 4.742     |
| 3.50     | 5,792        | 307.50       | 2.41 oc   | ---       | ---       | ---        | 2.54     | ---      | ---      | ---      | ---       | ---      | 4.959     |

Continues on next page...

pond1

**Stage / Storage / Discharge Table**

| Stage<br>ft | Storage<br>cuft | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PrfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | User<br>cfs | Total<br>cfs |
|-------------|-----------------|-----------------|--------------|--------------|--------------|---------------|-------------|-------------|-------------|-------------|--------------|-------------|--------------|
| 3.60        | 6,073           | 307.60          | 2.45 oc      | ---          | ---          | ---           | 2.73        | ---         | ---         | ---         | ---          | ---         | 5.182        |
| 3.70        | 6,354           | 307.70          | 2.49 oc      | ---          | ---          | ---           | 2.92        | ---         | ---         | ---         | ---          | ---         | 5.414        |
| 3.80        | 6,636           | 307.80          | 2.53 oc      | ---          | ---          | ---           | 3.12        | ---         | ---         | ---         | ---          | ---         | 5.652        |
| 3.90        | 6,917           | 307.90          | 2.56 oc      | ---          | ---          | ---           | 3.33        | ---         | ---         | ---         | ---          | ---         | 5.898        |
| 4.00        | 7,198           | 308.00          | 2.60 oc      | ---          | ---          | ---           | 3.55        | ---         | ---         | ---         | ---          | ---         | 6.152        |

...End

# Hydrograph Report

8

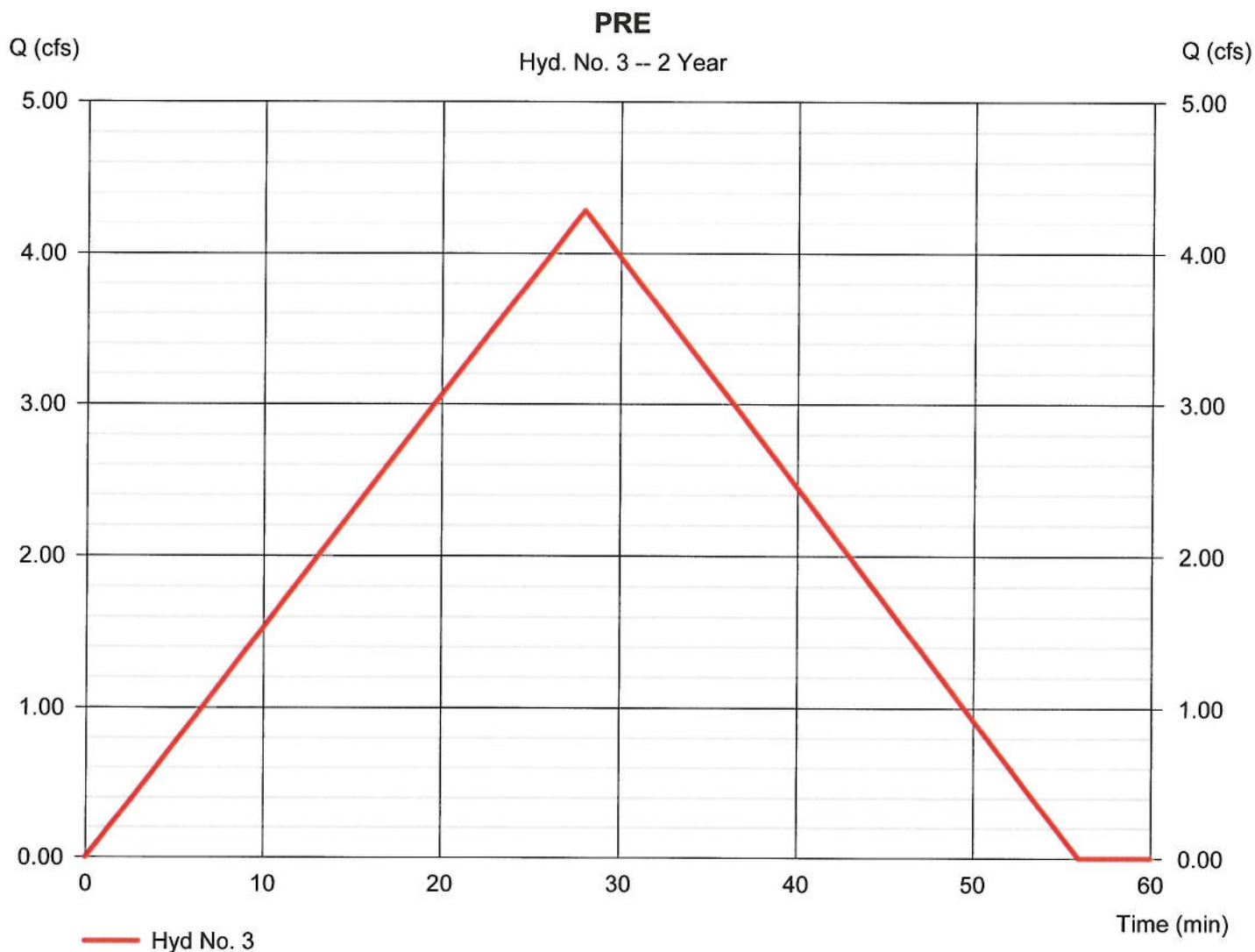
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Friday, 05 / 8 / 2015

## Hyd. No. 3

PRE

|                 |                    |                   |              |
|-----------------|--------------------|-------------------|--------------|
| Hydrograph type | = Rational         | Peak discharge    | = 4.285 cfs  |
| Storm frequency | = 2 yrs            | Time to peak      | = 28 min     |
| Time interval   | = 1 min            | Hyd. volume       | = 7,199 cuft |
| Drainage area   | = 4.180 ac         | Runoff coeff.     | = 0.33       |
| Intensity       | = 3.106 in/hr      | Tc by User        | = 28.00 min  |
| IDF Curve       | = oktibbeha-ms.IDF | Asc/Rec limb fact | = 1/1        |



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|----------|--------------------------|-----------------|---------------------|--------------------|--------------------|---------------|------------------------|-------------------------|------------------------|
| 1        | Rational                 | 9.314           | 1                   | 28                 | 15,648             | ----          | ----                   | ----                    | POST                   |
| 2        | Reservoir                | 5.457           | 1                   | 40                 | 15,646             | 1             | 307.72                 | 6,406                   | Pond                   |
| 3        | Rational                 | 5.692           | 1                   | 28                 | 9,562              | ----          | ----                   | ----                    | PRE                    |
|          |                          |                 |                     |                    |                    |               |                        |                         |                        |
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# Hydrograph Report

10

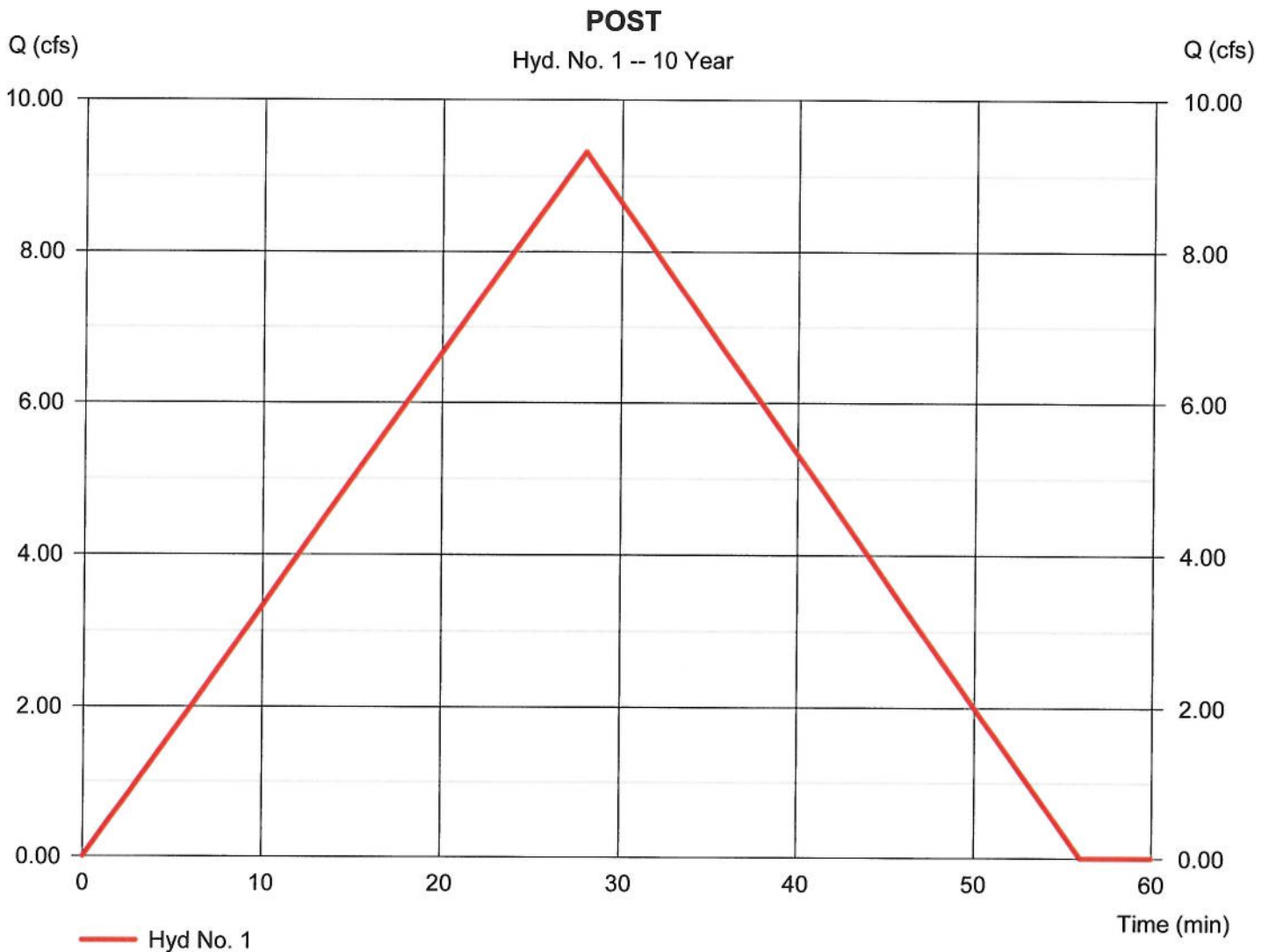
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Friday, 05 / 8 / 2015

## Hyd. No. 1

### POST

|                 |                    |                   |               |
|-----------------|--------------------|-------------------|---------------|
| Hydrograph type | = Rational         | Peak discharge    | = 9.314 cfs   |
| Storm frequency | = 10 yrs           | Time to peak      | = 28 min      |
| Time interval   | = 1 min            | Hyd. volume       | = 15,648 cuft |
| Drainage area   | = 4.180 ac         | Runoff coeff.     | = 0.54        |
| Intensity       | = 4.126 in/hr      | Tc by User        | = 28.00 min   |
| IDF Curve       | = oktibbeha-ms.IDF | Asc/Rec limb fact | = 1/1         |



# Hydrograph Report

11

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Friday, 05 / 8 / 2015

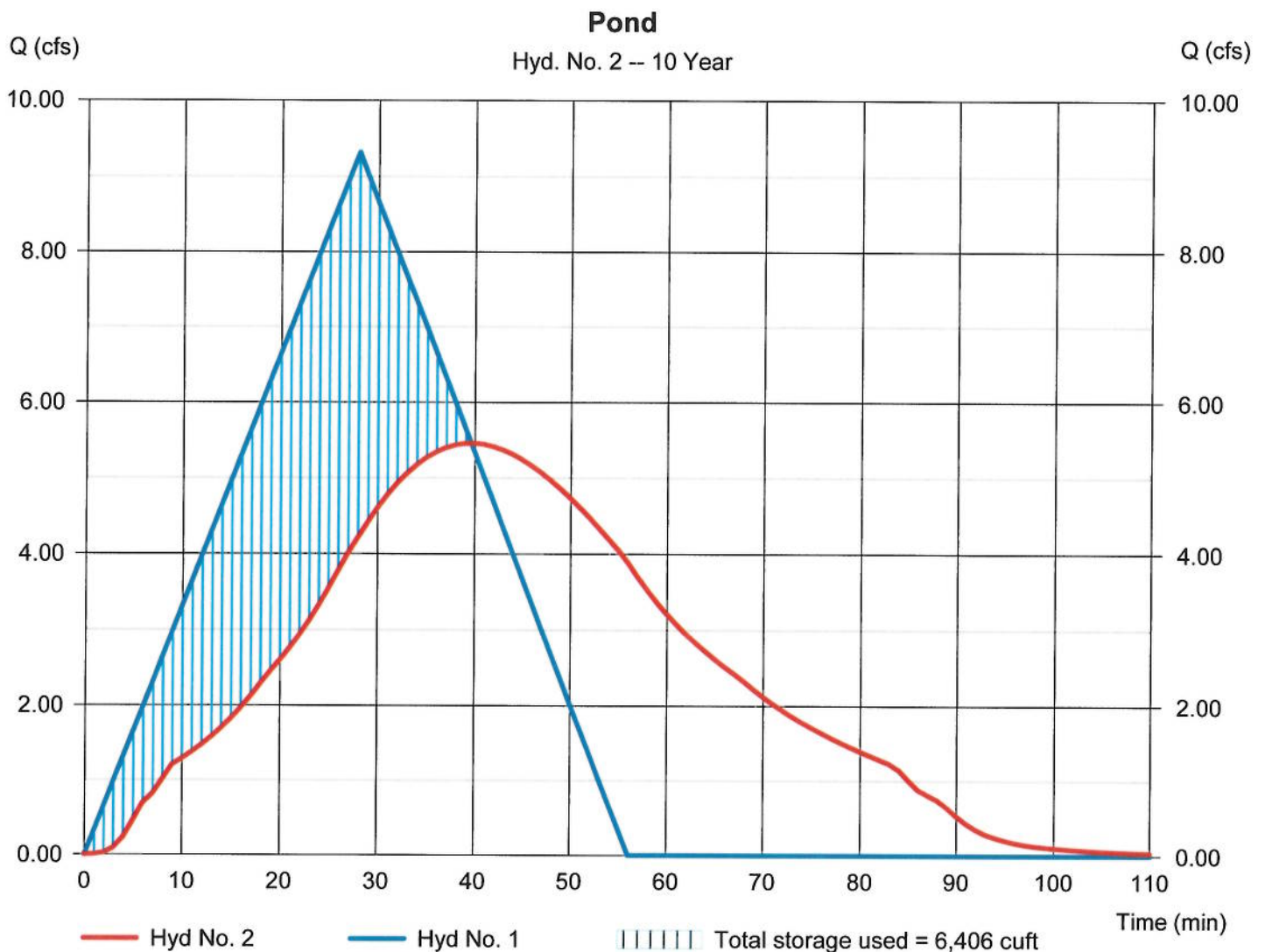
## Hyd. No. 2

Pond

Hydrograph type = Reservoir  
Storm frequency = 10 yrs  
Time interval = 1 min  
Inflow hyd. No. = 1 - POST  
Reservoir name = pond1

Peak discharge = 5.457 cfs  
Time to peak = 40 min  
Hyd. volume = 15,646 cuft  
Max. Elevation = 307.72 ft  
Max. Storage = 6,406 cuft

Storage Indication method used.



# Hydrograph Report

12

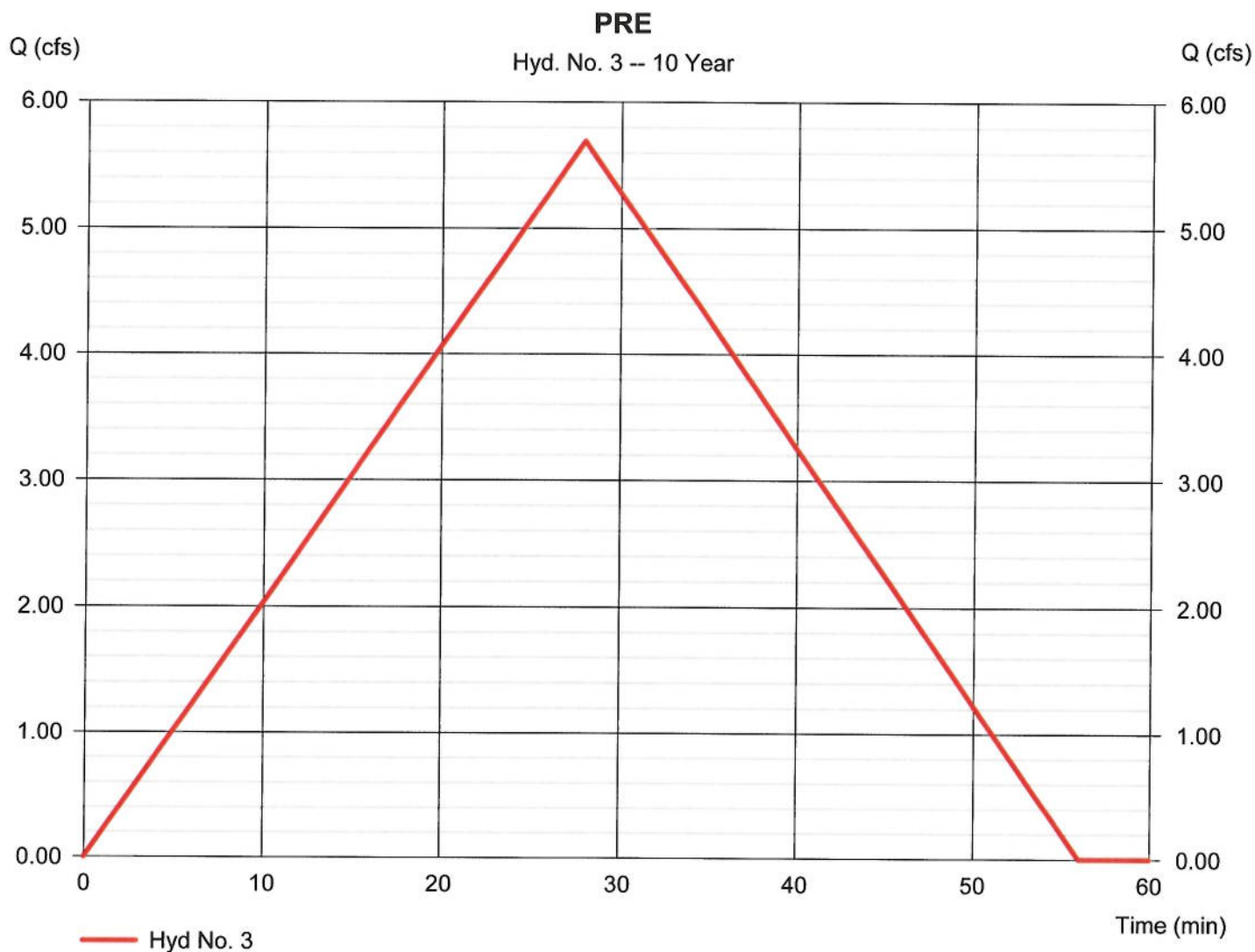
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Friday, 05 / 8 / 2015

## Hyd. No. 3

PRE

|                 |                    |                   |              |
|-----------------|--------------------|-------------------|--------------|
| Hydrograph type | = Rational         | Peak discharge    | = 5.692 cfs  |
| Storm frequency | = 10 yrs           | Time to peak      | = 28 min     |
| Time interval   | = 1 min            | Hyd. volume       | = 9,562 cuft |
| Drainage area   | = 4.180 ac         | Runoff coeff.     | = 0.33       |
| Intensity       | = 4.126 in/hr      | Tc by User        | = 28.00 min  |
| IDF Curve       | = oktibbeha-ms.IDF | Asc/Rec limb fact | = 1/1        |



# Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Friday, 05 / 8 / 2015

| Return Period<br>(Yrs) | Intensity-Duration-Frequency Equation Coefficients (FHA) |         |        |       |
|------------------------|----------------------------------------------------------|---------|--------|-------|
|                        | B                                                        | D       | E      | (N/A) |
| 1                      | 0.0000                                                   | 0.0000  | 0.0000 | ----- |
| 2                      | 85.5719                                                  | 14.9000 | 0.8822 | ----- |
| 3                      | 0.0000                                                   | 0.0000  | 0.0000 | ----- |
| 5                      | 88.3733                                                  | 15.5000 | 0.8415 | ----- |
| 10                     | 93.5778                                                  | 15.9000 | 0.8253 | ----- |
| 25                     | 103.5653                                                 | 16.4000 | 0.8118 | ----- |
| 50                     | 111.7455                                                 | 16.7000 | 0.8041 | ----- |
| 100                    | 120.3529                                                 | 17.0000 | 0.7985 | ----- |

File name: oktibbeha-ms.IDF

$$\text{Intensity} = B / (T_c + D)^E$$

| Return Period<br>(Yrs) | Intensity Values (in/hr) |      |      |      |      |      |      |      |      |      |      |      |
|------------------------|--------------------------|------|------|------|------|------|------|------|------|------|------|------|
|                        | 5 min                    | 10   | 15   | 20   | 25   | 30   | 35   | 40   | 45   | 50   | 55   | 60   |
| 1                      | 0.00                     | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2                      | 6.12                     | 5.02 | 4.27 | 3.73 | 3.31 | 2.98 | 2.72 | 2.50 | 2.31 | 2.16 | 2.02 | 1.90 |
| 3                      | 0.00                     | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5                      | 6.96                     | 5.79 | 4.98 | 4.38 | 3.92 | 3.56 | 3.26 | 3.01 | 2.80 | 2.62 | 2.46 | 2.32 |
| 10                     | 7.61                     | 6.38 | 5.51 | 4.87 | 4.37 | 3.98 | 3.65 | 3.38 | 3.15 | 2.95 | 2.78 | 2.63 |
| 25                     | 8.61                     | 7.26 | 6.31 | 5.60 | 5.04 | 4.60 | 4.23 | 3.92 | 3.66 | 3.44 | 3.24 | 3.07 |
| 50                     | 9.41                     | 7.96 | 6.94 | 6.17 | 5.56 | 5.08 | 4.68 | 4.35 | 4.06 | 3.81 | 3.60 | 3.41 |
| 100                    | 10.20                    | 8.66 | 7.56 | 6.73 | 6.08 | 5.56 | 5.13 | 4.77 | 4.46 | 4.19 | 3.96 | 3.75 |

T<sub>c</sub> = time in minutes. Values may exceed 60.

Precip. file name: Sample.pcp

| Storm Distribution | Rainfall Precipitation Table (in) |      |      |      |       |       |       |        |
|--------------------|-----------------------------------|------|------|------|-------|-------|-------|--------|
|                    | 1-yr                              | 2-yr | 3-yr | 5-yr | 10-yr | 25-yr | 50-yr | 100-yr |
| SCS 24-hour        | 0.00                              | 2.20 | 0.00 | 3.30 | 4.25  | 5.77  | 6.80  | 7.95   |
| SCS 6-Hr           | 0.00                              | 1.80 | 0.00 | 0.00 | 2.60  | 3.00  | 0.00  | 4.00   |
| Huff-1st           | 0.00                              | 1.55 | 0.00 | 2.75 | 4.00  | 5.38  | 6.50  | 8.00   |
| Huff-2nd           | 0.00                              | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.00   |
| Huff-3rd           | 0.00                              | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.00   |
| Huff-4th           | 0.00                              | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.00   |
| Huff-Indy          | 0.00                              | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.00   |
| Custom             | 0.00                              | 1.75 | 0.00 | 2.80 | 3.90  | 5.25  | 6.00  | 7.10   |

4596 - Storm Water Calcs (4.18 Ac)

5-6-15

Existing Drainage Areas

$$\text{Roof } (C=0.95) = 14,543 \text{ ft}^2 = 0.33 \text{ Ac}$$

$$\text{Gravel } (C=0.50) = 23,210 \text{ ft}^2 = 0.53 \text{ Ac}$$

$$\text{Grass } (C=0.22) = 140,067 \text{ ft}^2 = 3.22 \text{ Ac}$$

$$\text{Concrete } (C=0.95) = 4,261 \text{ ft}^2 = 0.10 \text{ Ac}$$

Proposed Drainage Areas

$$\text{Roof } (C=0.95) = 27,858 \text{ ft}^2 = 0.63 \text{ Ac}$$

$$\text{Gravel } (C=0.50) = 61,857 \text{ ft}^2 = 1.42 \text{ Ac}$$

$$\text{Grass } (C=0.22) = 65,899 \text{ ft}^2 = 1.51 \text{ Ac}$$

$$\text{Concrete } (C=0.95) = 26,884 \text{ ft}^2 = 0.62 \text{ Ac}$$

Existing Runoff

$$\text{High Elev.} = 314.50$$

$$\text{Site Area} = 182,081 \text{ ft}^2 = 4.18 \text{ Ac}$$

$$\text{Low Elev.} = 304.64$$

$$\text{Flow Length} = 678 \text{ ft}$$

$$\text{Avg. Slope} = 0.01454 = 1.45\%$$

→ Intensity:

$$\text{(Kinematic Wave)} \quad t_c = \frac{0.93 L^{0.6} m^{0.6}}{I^{0.4} S^{0.3}} \quad m = 0.15 \text{ (MDOT FIG 7-4C)}$$

$$\text{Assume } I_2 = 5.0 \text{ IN/HR} \Rightarrow \frac{0.93 (678)^{0.6} (0.15)^{0.6}}{5^{0.4} 0.0145^{0.3}} = \frac{(46.48) (0.3204)}{(1.9037) (0.2808)}$$

$$= \frac{14.892}{0.5346} = 27.86 = t_c \quad I_2 = 3.7 \text{ IN/HR}$$

4596 - Storm Water Calcs. (Cont'd)

$$I_2 = 3.7 \text{ IN/HR} \Rightarrow \frac{14.892}{3.7^{0.4} 0.01454^{0.3}} = \frac{14.892}{0.4743} = 31.40 = t_c \quad I_2 = 3.5 \text{ IN/HR}$$

$$I_2 = 3.7 \text{ IN/HR}$$

$$\text{Assume } I_{10} = 6.0 \text{ IN/HR} \Rightarrow \frac{0.93(678)^{0.6} (0.15)^{0.6}}{6^{0.4} 0.01454^{0.3}} = \frac{14.892}{(2.0477)(0.2810)}$$

$$= \frac{14.892}{0.5755} = 25.88 = t_c \quad I_{10} = 4.75 \text{ IN/HR}$$

$$I_{10} = 4.75 \text{ IN/HR} \Rightarrow \frac{14.892}{4.75^{0.4} 0.01454^{0.3}} = \frac{14.892}{(1.865)(0.2810)} = 28.42 = t_c \quad I_{10} = 4.6 \text{ IN/HR}$$

$$I_{10} = 4.75 \text{ IN/HR}$$

→ Existing Runoff Coefficient

$$\bar{C} = \frac{(0.95)(14,543 + 4,261) + (0.50)(23,210) + (0.22)(140,067)}{182,081}$$

$$\bar{C} = \frac{17,863.8 + 11,605 + 30,814.74}{182,081} = 0.33 = \bar{C}$$

## 4596 - Storm Water Calcs (cont'd)

→ Existing Runoff

$$Q_2 = CIA = (0.33)(3.7)(4.18) = 5.40 \text{ cfs}$$

$$Q_{10} = CIA = (0.33)(4.75)(4.18) = 6.55 \text{ cfs}$$

Proposed Conditions→ Runoff Coefficient

$$\bar{C} = \frac{(0.95)(26,884 + 27,858) + (0.50)(61,857) + (0.22)(65,899)}{182,081}$$

$$\bar{C} = \frac{52,004.9 + 30,928.5 + 14,497.78}{182,081} = 0.54 = \bar{C}$$

→ Parameters

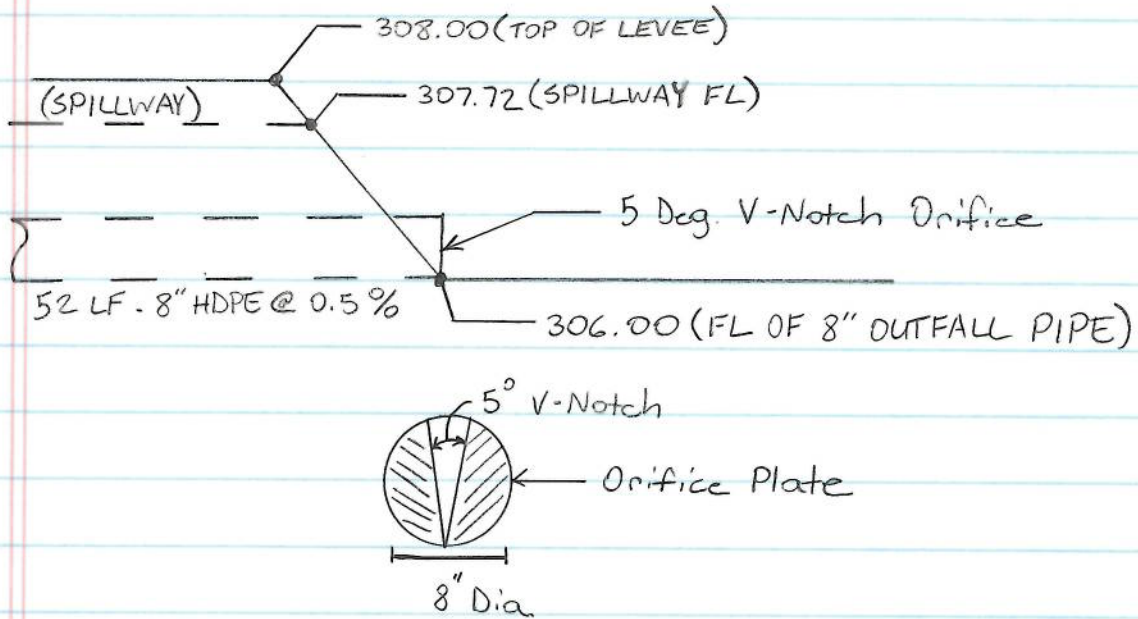
$$\text{High Elev.} = 314.50 \quad \text{Length} = 550 \text{ ft}$$

$$\text{Low Elev.} = 306.00 \quad \text{Slope} = 1.55 \% = 0.01545$$

→ Pond Parameters

| <u>Pond Elev.</u> | <u>Area (A<sup>2</sup>)</u> |
|-------------------|-----------------------------|
| 308               | 3,149                       |
| 307               | 2,488                       |
| 306               | 1,903                       |
| 305               | 1,393                       |

## 4596 - Storm Water Calcs (Cont'd)

→ Post Runoff Into Detention Pond

$$Q_2 = 7.012 \text{ cfs} \quad Q_{10} = 9.314 \text{ cfs}$$

→ Post Runoff Out of Detention Pond

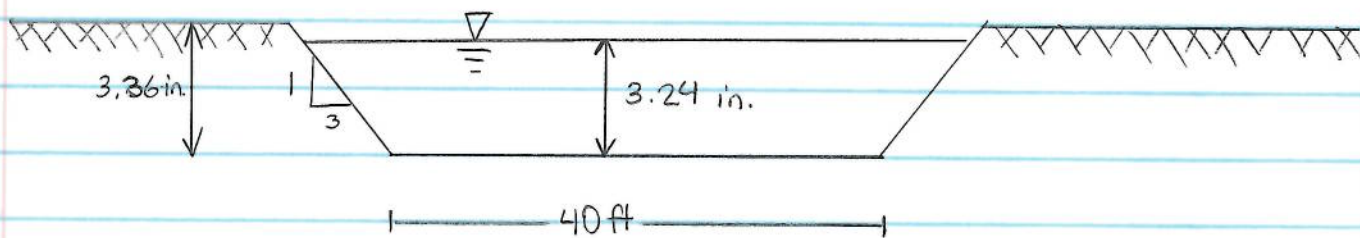
$$Q_2 = 4.121 \text{ cfs} \quad Q_{10} = 5.457$$

## 4596 - Storm Water Calcs (Cont'd)

→ Emergency Spillway

Assume  $I_{100} = 7.5 \text{ IN/HR}$      $t_c = 14 \text{ Min. (MDOT FIG 7-4C)}$

$$Q_{100} = CIA = (0.54)(7.5)(4.18) = 16.93 \text{ cfs}$$



Attachment 9  
Complete Stormwater Management Ordinance

## ARTICLE VI. - STORMWATER MANAGEMENT ORDINANCE

### FOOTNOTE(S):

--- (5) ---

**Editor's note**—Ord. No. 2010-07, §§ A—F, adopted April 20, 2010, repealed the former Art. VI, §§ 54-161—54-164, and enacted a new Art. VI as set out herein. The former Art. VI pertained to similar subject matter and derived from Ord. No. 2006-7, §§ A—D, 8-1-06.

**Cross reference**— Discharge of stormwater and other unpolluted drainage, § 110-91; prohibited discharges, § 110-92.

#### Sec. 54-161. - Purpose.

The purpose of this article is to diminish threats to public health and safety caused by the runoff of excessive stormwater; reduce economic losses to individuals and the community at large; and protect, conserve and promote the orderly development of land and water resources. The provisions of this article further regulate, guide and control:

- (1) The subdivision layout, redevelopment and improvement of lands located within the City of Starkville.
- (2) The construction of buildings and drainage of the sites on which structures are located, including parking and other paved areas.
- (3) The design, construction and maintenance of stormwater drainage facilities and systems.

(Ord. No. 2010-07, § A, 4-20-10)

#### Sec. 54-162. - Definitions.

The following words, terms and phrases, when used in this article, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

CFS. Cubic feet per second.

Design year storm. The design year storm is a statistical definition of the percent chance that a storm has of occurring in any given year. That year should not be considered as an actual number of years between occurrences. For example, the "100-year flood" is not the flood that will occur once every 100 years. Rather, it is the flood elevation that has a one percent chance or greater of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The 100-year flood, which is the standard used by most federal and state agencies, is used by the National Flood Insurance Program as the standard for floodplain management and to determine the need for flood insurance.

FEMA. Federal Emergency Management Agency.

Impervious surface area. Impervious surface area means a surface composed of any material that significantly impedes or prevents the natural infiltration of water into soil. Impervious surfaces are defined as those having a runoff coefficient greater than 0.5 and include, but are not limited to, rooftops, buildings, streets and roads, and any concrete or asphalt surface.

Land disturbance/land disturbing activities. Any activity involving the clearing, cutting, excavating, filling, or grading of land or any other activity that alters land topography or vegetative cover.

MDOT. Mississippi Department of Transportation.

New development. New development is defined as land disturbing activities, structural development (construction, installation or expansion of a building or other structure), and/or creation of impervious surfaces on a previously undeveloped site.

NRCS. Natural resource conservation service is the federal agency that works in partnership with private landowners to conserve and sustain natural resources on private lands. It was previously known as the soil conservation service.(SCS).

Post-development. Post-development refers to the time period, or the conditions that may reasonably be expected or anticipated to exist based on the proposed project, after completion of the land development activity on a site.

Pre-development. Pre-development refers to the time period, or the conditions that exist, on a site prior to the commencement of a land development project and at the time that plans for the land development of a site are approved by the plan approving authority. Where phased development or plan approval occurs (preliminary grading, roads and utilities, etc.), the existing conditions at the time prior to the first item being approved or permitted shall establish pre-development conditions.

Redevelopment. Redevelopment is defined as structural development (construction, installation or expansion of a building or other structure), creation or addition of impervious surfaces, replacement of impervious surface not part of routine maintenance, and land disturbing activities associated with structural or impervious development. Redevelopment does not include such activities as exterior remodeling.

SCS. Soil conservation service is the original organization developed in 1935 by the Federal Government to work to conserve and sustain natural resources on private land through education and partnership and it is now known as the natural resource conservation service (NRCS).

Stormwater management facilities. Devices, construction methods, fixtures, that are designed to diminish threats to public health and safety caused by the runoff of excessive stormwater; reduce economic losses to individuals and the community at large; and protect, conserve and promote the orderly development of land and water resources, i.e. retention and detention ponds, rain barrels, swales, etc.

100-year/24-hour storm. See MDOT frequency/duration curve.

10-year/24-hour storm. See MDOT frequency/duration curve.

5-Year/24-hour storm. See MDOT frequency/duration curve.

2-year/24-hour storm. See MDOT frequency/duration curve.

100-year floodplain. The 100-year floodplain shall be determined to be that area which is inundated by water during the 100-year/24-hour rainfall event.

NRCS (or SCS) TR-55. United States Department of Agriculture, Natural Resources Conservation Service, Engineering Division, Technical Release 55, dated June 1986, Urban Hydrology for Small Watersheds.

| Table 1: Runoff Coefficient Values - Rational Method                                                                                                                                                                                                                                                                                                                      |   |          |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----------|---|
| Runoff Coefficients indicated in Column 2 should only be used for conceptual planning and watershed planning. For individual sites and developments, a weighted runoff coefficient should be calculated using the values in column 4. Design professional may submit calculations and performance testing reports to justify runoff coefficients for surfaces not listed. |   |          |   |
| Land Use                                                                                                                                                                                                                                                                                                                                                                  | C | Land Use | C |

|                      |      |                             |      |
|----------------------|------|-----------------------------|------|
| Business:            |      | Lawns:                      |      |
| Downtown areas       | 0.95 | Sandy soil, flat, 2%        | 0.10 |
|                      |      | Sand soil, average, 2—7%    | 0.15 |
|                      |      | Sandy soil, steep, >7%      | 0.20 |
|                      |      | Clay soil, flat, 2%         | 0.17 |
|                      |      | Clay soil, average, 2—7%    | 0.22 |
|                      |      | Clay soil, steep, >7%       | 0.35 |
| Residential Zoning:  |      | Graded or no plant cover    |      |
| R-1                  | 0.50 | Sandy soil, flat, 0—5%      | 0.30 |
| R-2A                 | 0.60 | Sandy soil, flat, 5—10%     | 0.40 |
| R-3, R-3A, R-4, R-4A | 0.70 | Clayey soil, flat, 0—5%     | 0.50 |
| R-5, R-6             | 0.70 | Clayey soil, average, 5—10% | 0.60 |
| Industrial:          |      | Streets:                    |      |
| Light areas          | 0.70 | Asphalt and concrete        | 0.95 |
| Heavy areas          | 0.80 | Brick                       | 0.85 |
| Parks, cemeteries    | 0.25 | Drives, walks and roofs     | 0.95 |
| Playgrounds          | 0.35 | Gravel areas                | 0.50 |

| Table 2: Runoff Curve Numbers <sup>1</sup> |                 |       |
|--------------------------------------------|-----------------|-------|
| Cover description                          | Average percent | Curve |

| Cover type and hydrologic condition <sup>2</sup>                               | impervious area | Number   |
|--------------------------------------------------------------------------------|-----------------|----------|
| Cultivated land: without conservation treatment<br>with conservation treatment |                 | 88<br>78 |
| Pasture or range land: poor condition<br>good condition                        |                 | 86<br>74 |
| Wood or forest land: thin stand, poor cover<br>good cover                      |                 | 77<br>70 |
| Open space (lawns, parks, golf courses, cemeteries, etc.) <sup>3</sup>         |                 |          |
| Poor condition (grass cover <50%)                                              |                 | 86       |
| Fair condition (grass cover 50% to 75%)                                        |                 | 79       |
| Good condition (grass cover > 75%)                                             |                 | 74       |
| Impervious areas:                                                              |                 |          |
| Paved parking lots, roofs, driveways, etc. (excluding right-of-way)            |                 | 98       |
| Streets and roads:                                                             |                 |          |
| Paved; curbs and storm drains (excluding right-of-way)                         |                 | 98       |
| Paved; open ditches (including right-of-way)                                   |                 | 92       |
| Gravel (including right-of-way)                                                |                 | 89       |
| Dirt (including right-of-way)                                                  |                 | 87       |
| Urban districts:                                                               |                 |          |
| Commercial and business                                                        | 85%             | 94       |
| Industrial                                                                     | 72%             | 91       |

|                                                                                    |     |    |
|------------------------------------------------------------------------------------|-----|----|
| Residential districts by average lot size:                                         |     |    |
| 1/8 acre or less (town houses)                                                     | 65% | 90 |
| ¼ acre                                                                             | 38% | 83 |
| 1/3 acre                                                                           | 30% | 81 |
| ½ acre                                                                             | 25% | 80 |
| 1 acre                                                                             | 20% | 79 |
| 2 acres                                                                            | 12% | 77 |
| Developing urban areas and newly graded areas (pervious areas only, no vegetation) |     | 91 |

1 Average runoff condition, and la - 0.2S.

2 The average percent impervious area shown was used to develop the composite curve numbers (CNs). Other assumptions are as follows: Impervious areas are directly connected to the drainage system, impervious areas have a CN of 98 , and pervious areas are considered equivalent to open space in good hydrologic condition. If the impervious area is not connected, the SCS method has an adjustment to reduce the effect.

3 CNs shown are equivalent to those of pasture. Composite CNs may be computed for other combinations of open space cover type.

(Ord. No. 2010-07, § B, 4-20-10)

Sec. 54-163. - General criteria and standards.

- (1) Applicability. This article shall be applicable within the City of Starkville's jurisdictional area and shall apply to:
- i. New development or redevelopment that is two acres or greater;
  - ii. New development or redevelopment that is at least one acre, but less than two acres and having 50 percent or greater impervious surface; and
  - iii. Land development activities that are smaller than the minimum applicability criteria established in subsection(1)i.—ii. above, if such activities are part of a larger common plat (plan of development), even though multiple separate and distinct land development activities may take place at different times on different schedules (such as a phased residential subdivision).

The following development activities are exempted from this article:

- i. Individual single family residential lots. Provided, however, that single family lots that are part of a new subdivision or phased development project are not exempt from this article.);
  - ii. Additions or modifications to existing single family structures;
  - iii. Developments or redevelopments that are less than an acre, provided they are not part of a larger common development plan;
  - iv. Any logging and agricultural activity.
  - v. Land disturbing activities conducted for the purpose of restoration of streams, stream banks, riparian zones, or other environmentally protected areas;
  - vi. Repairs and/or construction deemed emergency in nature; and
  - vii. Repairs to any stormwater management facility deemed necessary by the city engineer.
- (2) Mitigation of excess stormwater runoff. The increased stormwater runoff resulting from the proposed development meeting the minimum applicability criteria of subsection (1) shall be mitigated by proper stormwater management facilities;
- (3) Storage capacity. Stormwater management facilities shall be designed with sufficient capacity to accommodate all runoff caused by the development in excess of that runoff which would occur from the site if left in its pre-development state. This storage shall be sufficient to store all excess flows for the two-year and ten-year storms of 24-hour duration. The stormwater management facilities shall be designed so that the peak flow rate at any exit point in the post-developed condition shall be less than or equal to the peak flow rate for that exit point in the pre-developed condition for the two- and ten-year storms.
- (4) Stormwater management facilities in floodplains. If stormwater storage is provided within any floodplain, no facility or storage volume may be provided below the 100-year base flood elevation (BFE) established for that floodplain. If not established, a study prepared by a design professional registered or licensed in the state of Mississippi utilizing standard engineering practices approved by FEMA may be submitted to determine the base flood elevation.
- (5) Stormwater bypass. Drainage systems shall have adequate capacity to bypass, through the development, the existing flow from all upstream areas. Bypass conveyance should be designed to accommodate the 100-year flow rates. Bypass flow should not be conveyed through stormwater management facilities.
- (6) Drainage maintenance. It shall be unlawful to dump trash, debris, landscape waste and other deleterious materials in any and all drainage ways in the city.

(Ord. No. 2010-07, § C, 4-20-10)

Sec. 54-164. - Improvement regulation.

- (1) Required information. The following information and data prepared and certified by a registered landscape architect or a professional engineer licensed in the State of Mississippi that shall be furnished with the plans of each proposed development.
- (a) Contour map: A topographic map with two-foot minimum interval contours, meeting National Map Accuracy Standards, of the land to be developed and such adjoining land whose topography may affect the layout or drainage of the developed. On such a map, the following shall be shown:
- i. The banks and centerline of streams and channels;
  - ii. The normal shoreline of lakes, ponds and retention/detention basins, and lines of in-flow and outflow;

- iii. The locations, size and slope of stormwater conduits and drainage swales;
  - iv. Storm, sanitary and combined sewers and outfalls of record;
  - v. Delineation of upstream and downstream drainage features, watersheds, and existing flow calculations (including area, runoff coefficient, and time of concentration) which might be affected by the development;
  - vi. Base flood (100-year) elevation (BFE) and floodways for the property, established pursuant to the City of Starkville Flood Plain Ordinance.
  - vii. Environmental features including the limits of wetland areas and any designated natural areas.
- (b) Pre-development conditions calculations. Calculations shall be provided which show the pre-development rate of runoff for the two- and ten-year storms. These calculations shall use either the rational or the SCS/NRCS curve number method. Recommended runoff coefficient values are at Table 1 (rational method) and Table 2 (SCS method). Other runoff coefficients may be used if the design professional provides supporting calculations.
- (c) Post-development calculations (without mitigation). Calculations shall be provided which show the post-development rate of runoff for the two- and ten-year storms. These calculations shall use the same methodology that was used to calculate the existing peak flow rates.
- (d) Drainage plan: A comprehensive drainage plan shall be designed to safely and completely accommodate existing stormwater runoff, handle the proposed stormwater runoff and to manage increased stormwater runoff. This plan shall provide and be accompanied by maps and/or other descriptive aerial showing the following:
- i. The extent of area of each sub-basin in the development;
  - ii. The storm sewers and other storm drains to be built, the basis of their design, the outfall and outlet locations and elevations, receiving stream or channel and its high water elevation, and the functioning of the drains during high water conditions;
  - iii. Existing streams and floodplains to be maintained and new channels to be constructed including their locations, cross-sections and profiles;
  - iv. Proposed culverts and bridges to be built including their materials, elevations, waterway opening and basis of design;
  - v. Existing stormwater management facilities to be maintained, enlarged or altered and new facilities to be built including their design;
  - vi. The estimated location and percentage of impervious surfaces existing and expected to be constructed when the development is completed;
  - vii. The slope, type, size, and 25-year storm peak flow and velocity of storm sewers, and other waterways;
  - viii. Any proposed environmental enhancement or mitigation features;
  - ix. Stormwater management facilities to be built including a plot or tabulation of storage volumes with corresponding water surface elevation and of the basin outflow rates for those water surface elevations;
  - x. For all stormwater management facilities, design hydrographs of inflow and outflow for the two- and ten-year peak flows from the site under pre- and post-development conditions;
  - xi. The formula for determining the storage for a stormwater management facility basin is: The storage capacity of the proposed detention basin shall be computed in cubic feet (in conjunction with its proposed spillway if applicable) so that the Q-2 and Q-10 post-development runoff in cfs shall be reduced to no more than the Q-2 and Q-10 pre-development runoff in cfs.

- xii. Time of concentration path including length, slope and type (overland, channel, closed conduit) of flow. Calculation method for time of concentration shall be performed in accordance with the Mississippi Department of Transportation current roadway design manual.
  - xiii. The existing and proposed runoff coefficient (rational method) or curve number (SCS method) for type of surface within each sub-basin;
- (2) Stormwater management facilities: Acceptable stormwater management facilities may be designed by reference to such creative methods as are provided in the Georgia Stormwater Management Manual (latest version) or reference manuals or texts utilizing the most current methods of design and construction or in accordance with the detention basins and retention basins described below. Utilization of such optional methods will in no way alter the intent and spirit of the requirements for stormwater management and will continue to be subject to the calculations necessary to meet the intent of the ordinance.
- (a) Detention basins: Detention basins shall be constructed to temporarily detain the stormwater runoff in excess of the volumes of runoff occurring on the site before development and will conform to the following standards:
- i. Storage volumes. The volume of storage provided in these basins, together with such storage as may be authorized in other detention facilities, shall be sufficient to control the excess runoff from the two- and ten-year storm of any duration;
  - ii. Maximum depth. The maximum planned depth of stormwater shall not exceed four feet unless approved by the city engineer. When approved, ponds greater than four feet deep require a safety bench that is at least five feet wide and with a five percent slope.
  - iii. Approach slopes. The approach slopes of the basin shall conform as closely as possible to natural land contours.  
  
Re-grading is preferable if necessary to keep the slopes under 3:1. Erosion control measures shall be provided as well as devices or measures to insure public safety.
  - iv. Outlet control structures. Outlet control structures shall be designed as simply as possible and shall operate automatically. They will be designed to limit discharges into existing or planned downstream channels or conduits so as not to exceed predetermined safe capacities, and not in excess of flows which would have occurred with the land in its pre-development condition. If necessary, velocity dissipation measures shall be employed to ensure that the discharge does not increase downstream erosion. Such structures should be either a weir or a perforated riser with gravel type structures.
  - v. Spillway. Emergency overflow facilities that will accommodate the 100-year storm shall be provided.
  - vi. Appearance. Detention facilities shall, where possible, use natural topography and natural vegetation. In lieu thereof, these facilities shall have planted trees and vegetation such as shrubs and permanent ground cover on their borders. The purpose of said plantings will be for screening and absorption therefore both elements should be considered in the design phase.
  - vii. Fencing. Fencing of detention basins is not permitted unless written justification is submitted to and approved by the city engineer. The preferred method is to manage the contours of the pond through the inclusion of a safety bench to eliminate drop-offs and reduce the potential for accidental drowning. In addition, the safety bench may be landscaped to deter access to the pool.
  - viii. Freeboard. There shall be a freeboard of at least 12 inches from the maximum detention elevation to the top of levee and the spillway structure should be capable of passing the 100-year storm.

- (b) Retention basins: Basins designed with permanent pools shall conform to the standards for detention basins as specified, unless modified or amended as follows:
- i. Minimum depths. The minimum normal depth of water before the introduction of excess stormwater shall be three feet.
  - ii. Facilities for emptying. For emergency purposes, cleaning or shoreline maintenance, facilities shall be provided or plans prepared for the use of auxiliary equipment to permit emptying and drainage.
  - iii. Pollution abatement. Aeration facilities may be required, dependent on the quality of the influent and detention time.
  - iv. Side slopes. The side slopes shall be of non-erosive material with a slope of 3:1 or flatter. The ledge shall be four to six feet wide, three feet below normal water depth and sloping gently toward the shore to prevent people or objects from sliding into deep water. There shall be a freeboard of 12 inches above the high water elevation on all retention basins. Alternate designs for side slopes may be considered under special circumstances where good engineering practice is demonstrated. Sediment storage adequate area for sediment storage shall be provided in all retention basins.
- (c) Maintenance of facilities: All improvements, including landscaping, shall be maintained in perpetuity and cannot be developed for any other use which would limit or cause to limit the use of the improvements. In the case of shared stormwater management facilities, the improvements shall be owned and/or maintained by the property owner's association of the development. A special note to this effect shall appear on any final plat of subdivision or any plat of condominium and their declarations. The property owner's association shall be formed by the developer in perpetuity for the maintenance of the improvements. Membership shall be mandatory for all property owners. Articles of agreement of the property owner's association must be approved by the Board of Aldermen of the City of Starkville before recording. When problems arise due to inadequate maintenance, the city engineer or his designated agent of the City of Starkville may inspect the improvements and compel the correction of the problem by written notice and issue a written notice of violation to the owner of the property. If abatement of the violation and/or restoration of affected property is required, the notice shall set forth a deadline of 90 days within which such remediation or restoration must be completed. In accordance with the authority of the municipality granted by MCA 1972 § 21-17-5, said notice shall further advise that, should the violator fail to remediate or restore within the established deadline, the work will be done by a designated governmental agency or a contractor and the expense thereof shall be charged to the violator.
- (d) Inspection of facilities: The city engineer or his designated agent shall inspect all drainage facilities while under construction. Upon completion of a project or a phase of a phased project, the registered landscape architect or the licensed professional engineer is responsible for submitting a signed/stamped certification that the completed project is in accordance with the approved stormwater management plan. All applicants are required to submit actual "as built" plans for any stormwater management facilities or practices after final construction is completed. The plan must show the final design specifications for all stormwater management facilities and practices and must be certified by a design professional registered and/or licensed in the State of Mississippi. A final inspection by the city engineer or his designated representative is required before the release of any performance securities can occur. When facilities are not constructed according to the approved plans, the City of Starkville has the explicit authority to compel compliance and have any situations corrected which are not according to the approved plans. All drainage facilities located on private property shall be accessible at all times for inspection by the city engineer or other responsible public official.

(Ord. No. 2010-07, § D, 4-20-10)

Sec. 54-165. - Miscellaneous.

- (1) Penalties for violation. Any responsible party found to be in violation of any of the terms and provisions of this article shall be notified in writing of the violation. If abatement of the violation and/or restoration of affected property is required, the notice shall set forth a deadline of 90 days within which such remediation or restoration must be completed. Said notice shall further advise that, should the violator fail to remediate or restore within the established deadline, the work will be done by a designated governmental agency or a contractor and the expense thereof and a civil penalty of not more than \$500.00 per day of continuing violation shall be charged to the violator.
- (2) Validity. If any term or provision of this article shall be held to be unconstitutional or otherwise unenforceable, the remainder thereof shall not be affected thereby and shall remain in full force and effect.
- (3) Conflict. All ordinances heretofore adopted on the subject which are in conflict herewith are hereby repealed and the application of this article as will not be contrary to the public interest.
- (4) Variance. No variance from the strict application of any provision shall be granted unless it is found that:
  - (a) Literal interpretation of the provision of this article would deprive the owner of reasonable use of their land; and
  - (b) Granting the variance would be in harmony with the general purpose and intent of this article and will not be injurious to the neighborhood or otherwise detrimental to the public welfare.

(Ord. No. 2010-07, § E, 4-20-10)

Sec. 54-166. - Stormwater hearing board and appeals.

There is hereby created a stormwater hearing board (SHB) consisting of three members who shall hear and decide all variance requests for stormwater related matters. A formal written application for a variance shall be filed with the city engineer for submittal to the SHB.

- (1) Waivers to stormwater management requirements. The stormwater hearing board (SHB) shall sit in a quasi-judicial capacity to hear and decide all variance requests from the requirements of this article. A formal written application for a variance shall be filed with the city engineer for submittal to the stormwater hearing board.
  - (a) The following procedures shall apply to all applications for a variance:
    - (1) The application for variance shall state the specific variances sought and the reasons for the variance.
    - (2) It shall be the applicant's responsibility to provide sufficient justification for granting the variance.
    - (3) The city engineer shall prepare an evaluation statement concerning each application for variance. The evaluation shall consider the circumstances and supporting documents supplied by the applicant and other generally available technical information pertaining to the variance request. The evaluation statement may include recommendations by the city engineer concerning the variance to the SHB.
    - (4) In passing upon such applications, the SHB shall consider all technical evaluation and relevant factors presented by the applicant and city staff through the governing statutes and the standards specified in other sections of this article.
    - (5) After hearing and upon consideration of the application, evidence and applicable law, the SHB may attach such conditions to the granting of variances as it deems necessary to further the purpose of this article.
  - (b) If a variance is granted, it shall be granted upon findings by the SHB that the following standards have been met:

- (1) That failure to grant the variance could result in exceptional hardship to the applicant; and
  - (2) That granting the variance will not result in increased stormwater runoff greater than ten percent, increased flood elevations, additional threats to public safety, extraordinary public expense, or create nuisances, cause fraud on or victimization of the public;
  - (3) That the necessity for a variance is not the result of conditions on the property which have been self-imposed by the applicant; and
  - (4) That the variance is the minimum necessary, considering the adverse impacts of stormwater runoff.
- (c) If a variance is not granted, the decision may be appealed to the Board of Aldermen for the City of Starkville. Said appeal shall be filed in writing by the aggrieved party within ten working days of the denial by the stormwater hearing board and shall be filed with the city engineer. The appeal shall be heard at the next regularly scheduled board of aldermen meeting following the receipt of the notice of the appeal.

(Ord. No. 2010-07, § F, 4-20-10)