BANNING ENGINEERING

Beginning a Second Decade Making ..."Your Project, Our Priority"

Hydrology and Hydraulic Study

of

City of Franklin Spec Building

In

Franklin
Johnson County, Indiana

Prepared for:

Runnebohm Construction
144 East Rampart Street
Shelbyville, IN 46176

September 2012

Revised: October 5, 2012

Banning Engineering, P.C. • 853 Columbia Road, Suite 101 • Plainfield, IN 46168
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Job #11191R

Drainage Narrative for:
City of Franklin Spec Building

Existing Characteristics:

The purpose of the project is to develop approximately 11 acres of ground into an industrial spec building development. The concept includes construction of a 51,340 square feet shell building, entrance drive and small dock area for temporary parking. Due to the uncertainty of the end user, minimal improvements will be constructed at this time however, this report does make provisions for full build-out of the parcel using the City of Franklin Zoning Ordinance maximum allowable impervious lot coverage of 85%. A detention pond will be constructed to accommodate the 85% impervious coverage and is oversized to obtain the necessary fill required to build the building and future addition pads. The proposed site is located on the east side of Graham Street just north of the intersection with Bryant Drive in Franklin, Section 11, Township 11 North, Range 4 East, Franklin Township, Johnson County.

Design Criteria:

Adjoining land conditions:
North: Cultivated / Future Industrial
South: Cultivated / Future Industrial
East: Developed Industrial
West: Developed Residential

Major Existing Soil Name & Types:

CrA – Crosby (C)
Br – Brookston (B/D)

Site Drainage Analysis: (See Existing Basin Map)

After review of soil types and on site characteristics, we have determined that there are 2 drainage basins draining the parcel. A small 3.7 acre basin (Basin A1) drains to the east across a partially developed property eventually to the Commerce Parkway roadside ditch. A larger 7.5 acre basin (Basin B1) drains southeasterly eventually to the Commerce Parkway roadside ditch. There is approximately 1.5 acres of offsite drainage associated with Basin B1. Both Basins A1 and B1 are within the same watershed area and will be analyzed collectively to the Commerce Parkway roadside ditch. The entire site is currently in row crops. For the purposes of the existing conditions analysis this will be viewed as pasture using the NRCS runoff curve number methodology.

Proposed Drainage Analysis: (See Proposed Basin Map)

In the proposed developed state most site run-off will be collected via storm sewer infrastructure and routed to a proposed detention basin located in the southeast corner of the parcel. Some areas of the site will be left in it's natural state until an end user is acquired at which time parking and additional dock needs will be known and designed to route to the detention basin. The basin will also function as the main BMP for the development. The basin outlet will is designed to meet the City of Franklin

Subdivision Control Ordinance requirements and the outlet will route via pipe along the south property line to the Commerce Parkway roadside ditch. Provisions have been made in this analysis for future parking lots, docks and building expansions. Allowable discharge calculations and proposed discharges are shown in the tabulated data shown below and in attached appendices.

Proposed Model Summary:

ICPR3 was used to design the detention pond for the required 1, 2, 3, 6, 12 and 24 hour storm durations with the outlet rate for the developed 10 year and 100 year meeting the 2 year and 10 year pre-developed respectively. The pond exceeds the minimum 0.5 acre normal pool area and minimum 25% 10 feet of depth as required by the Ordinance and was oversized to utilize borrow to balance the site.

Allowable Discharges:

Design Point	Acres	2-Year Existing
Outlet	11.2	1.12 cfs

Discharges 100-Year:

Discharge Point	10-Year Allowable	10-Yr Proposed	Storage Requirements (acre*ft)
Outlet	1.12 cfs	1.05 cfs	See ICPR Input

Design Point	Acres	10-Year Existing
Outlet	11.2	3.34 cfs

Discharges 100-Year:

Discharge Point	100-Year Allowable	100-Yr Proposed	Storage Requirements (acre*ft)	
			Required	Designed
Outlet	3.34 cfs	2.18 cfs	4.0	4.0

Post Construction BMPs:
A wet pond on the southeast portion of the site will serve as the post construction BMP for development; refer to the Operation and Maintenance Manual separate from this report.

References:

Design data and methods are based on the following reference materials:

1. City of Franklin Subdivision Control Ordinance, Article 6.18 & 6.19
2. City of Franklin Zoning Ordinance, Article 7.9 (G)
3. Johnson County Soils Map
4. USGS Mapping
5. TR-55, NRCS
6. HERPICC Stormwater Drainage Manual
7. CulvertMaster V3.0, Haestad Methods, Inc.
8. FlowMaster V7.0, Haestad Methods, Inc.
9. ICPR3, Streamline Technologies

LIST OF APPENDICES

1. LOCATION MAP
2. SOILS MAP
3. FLOODPLAIN MAPPING
4. EXISTING BASIN MAP
5. EXISTING CALCULATIONS
6. EXISTING ICPR INPUT
7. PROPOSED BASIN MAP
8. PROPOSED CALCULATIONS
9. PROPOSED ICPR INPUT
10. Tc & CN CACLUATIONS
11. STORM SEWER DESIGN
12. BMP CALCULATIONS
13. EMERGENCY OVERFLOW CALCULATIONS

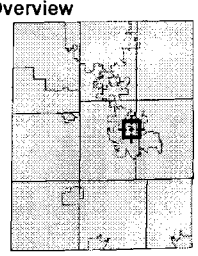
LOCATION MAP

Johnson County, IN

beacon™

Date Created: 9/7/2012

Overview



Legend

- Cities
- Townships
- Parcels

Roads

- ACCESS RAMP
- INTERSTATE
- LOCAL
- MAJOR ARTERIAL
- MAJOR COLLECTOR
- MINOR ARTERIAL
- MINOR COLLECTOR
- PRIVATE ROAD

Last Data Upload: 9/7/2012 12:09:57 AM

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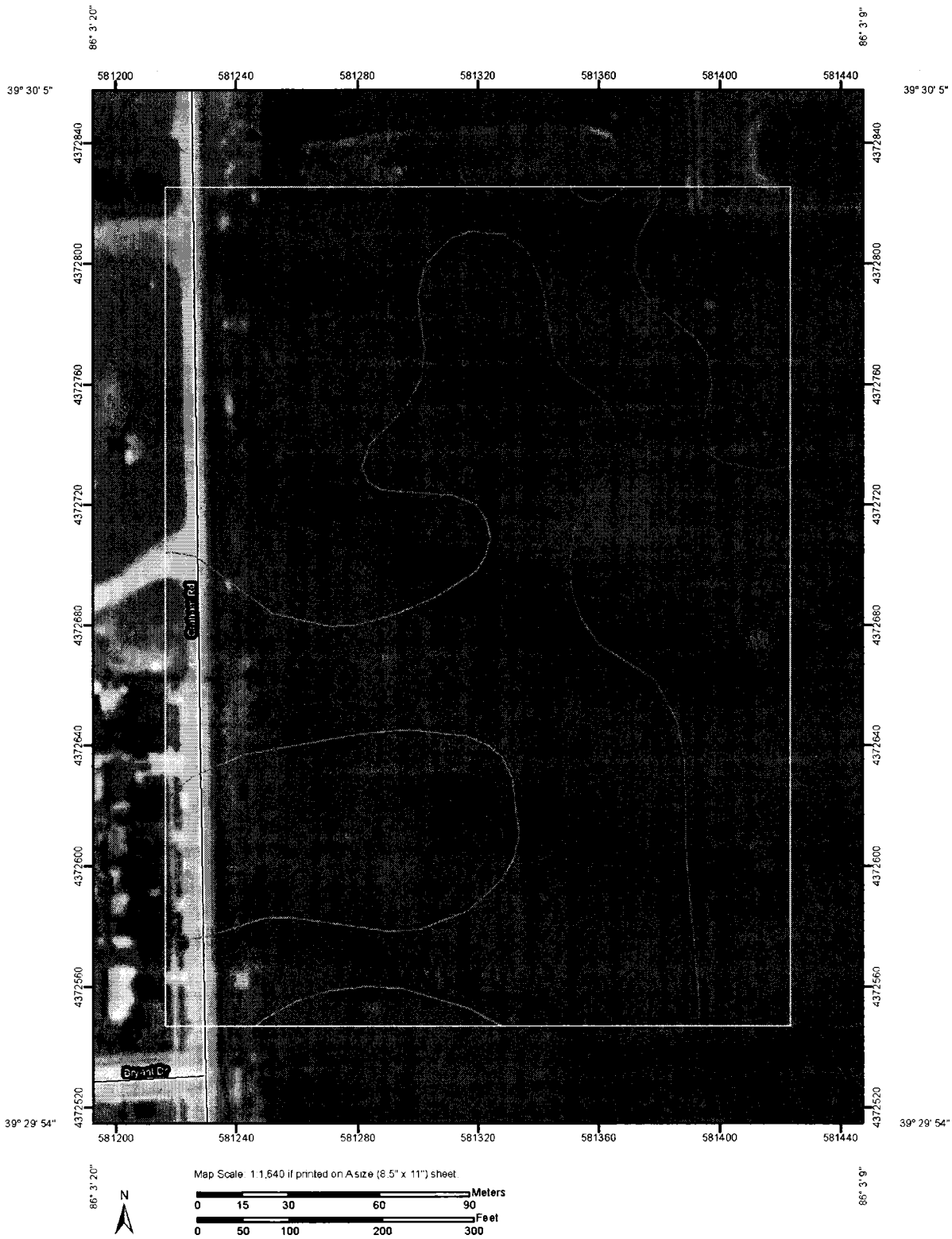
SOILS MAP

Soil Map—Johnson County, Indiana



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MAP LEGEND

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

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

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

The soil surveys that comprise your AOI were mapped at 1:15,840.

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 accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 16N NAD83

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

Soil Survey Area: Johnson County, Indiana
Survey Area Data: Version 16, Dec 12, 2011

Date(s) aerial images were photographed: 8/18/2003

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

Map Unit Legend

Johnson County, Indiana (IN081)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Br	Brookston silty clay loam	6.4	44.6%
CrA	Crosby silt loam, 0 to 2 percent slopes	7.9	55.4%
Totals for Area of Interest		**14.2**	**100.0%**

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FLOODPLAIN MAPPING

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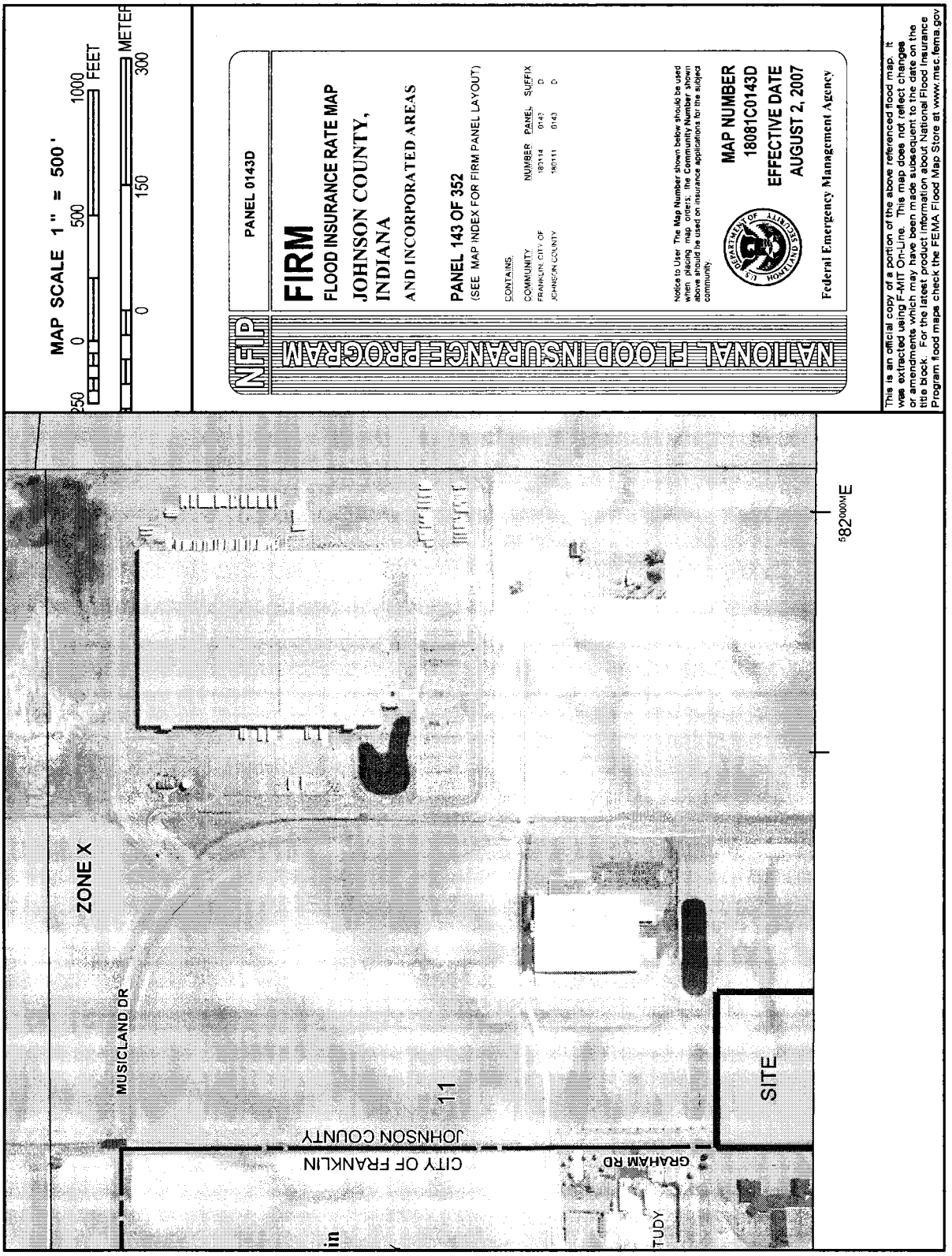
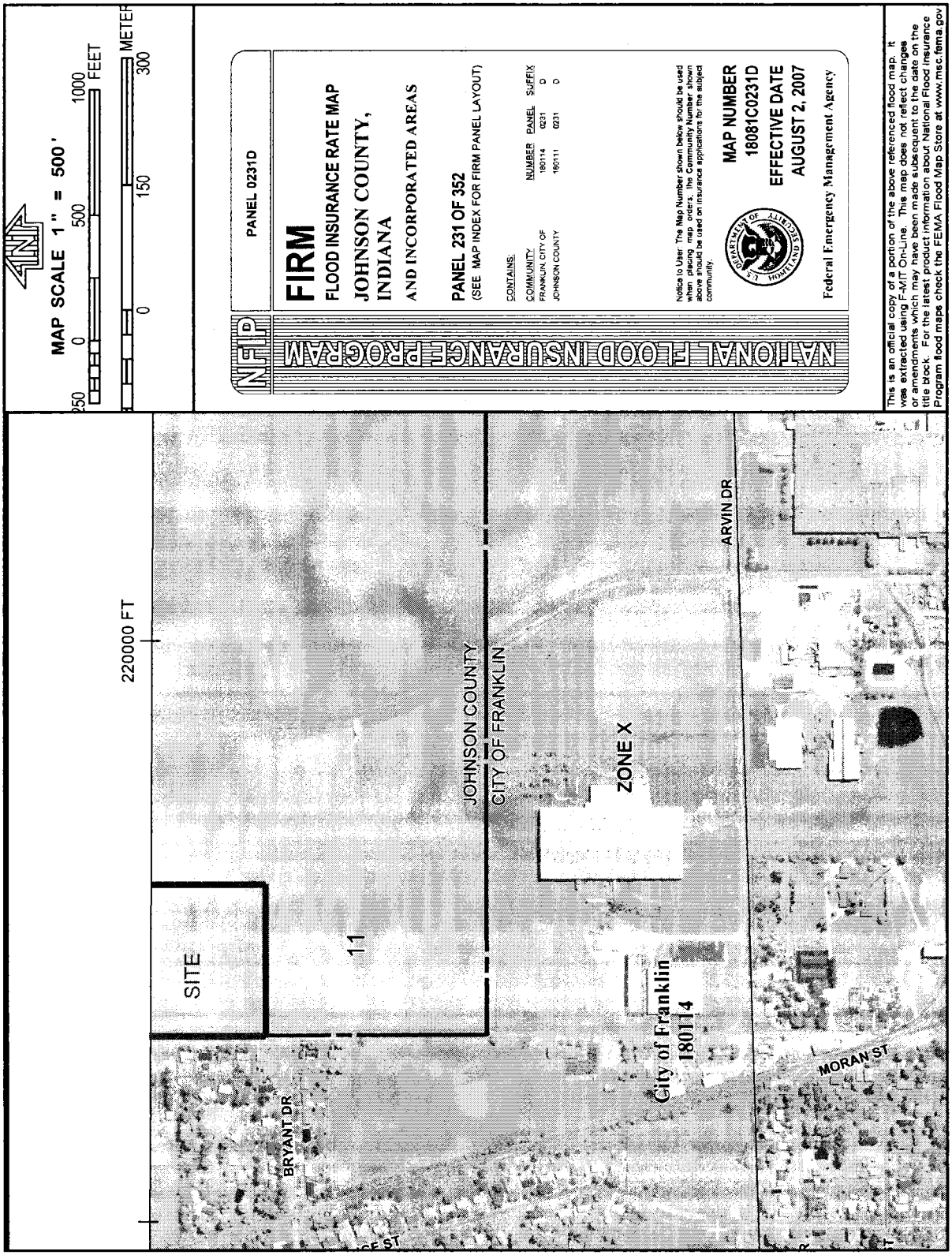

MAP SCALE 1" = 500'
250 0 500 1000 FEET
0 150 300 METER
NFIP
PANEL 0143D
FIRM
FLOOD INSURANCE RATE MAP
JOHNSON COUNTY, INDIANA
AND INCORPORATED AREAS
PANEL 143 OF 352
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
FRANKLIN, CITY OF 180114 0143 D
JOHNSON COUNTY 180111 0143 D
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
18081C0143D
EFFECTIVE DATE
AUGUST 2, 2007
Federal Emergency Management Agency
NATIONAL FLOOD INSURANCE PROGRAM
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
ZONE X
MUSICLAND DR
11
JOHNSON COUNTY
CITY OF FRANKLIN
GRAHAM RD
SITE
S82°00'00"E



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EXISTING BASIN MAP

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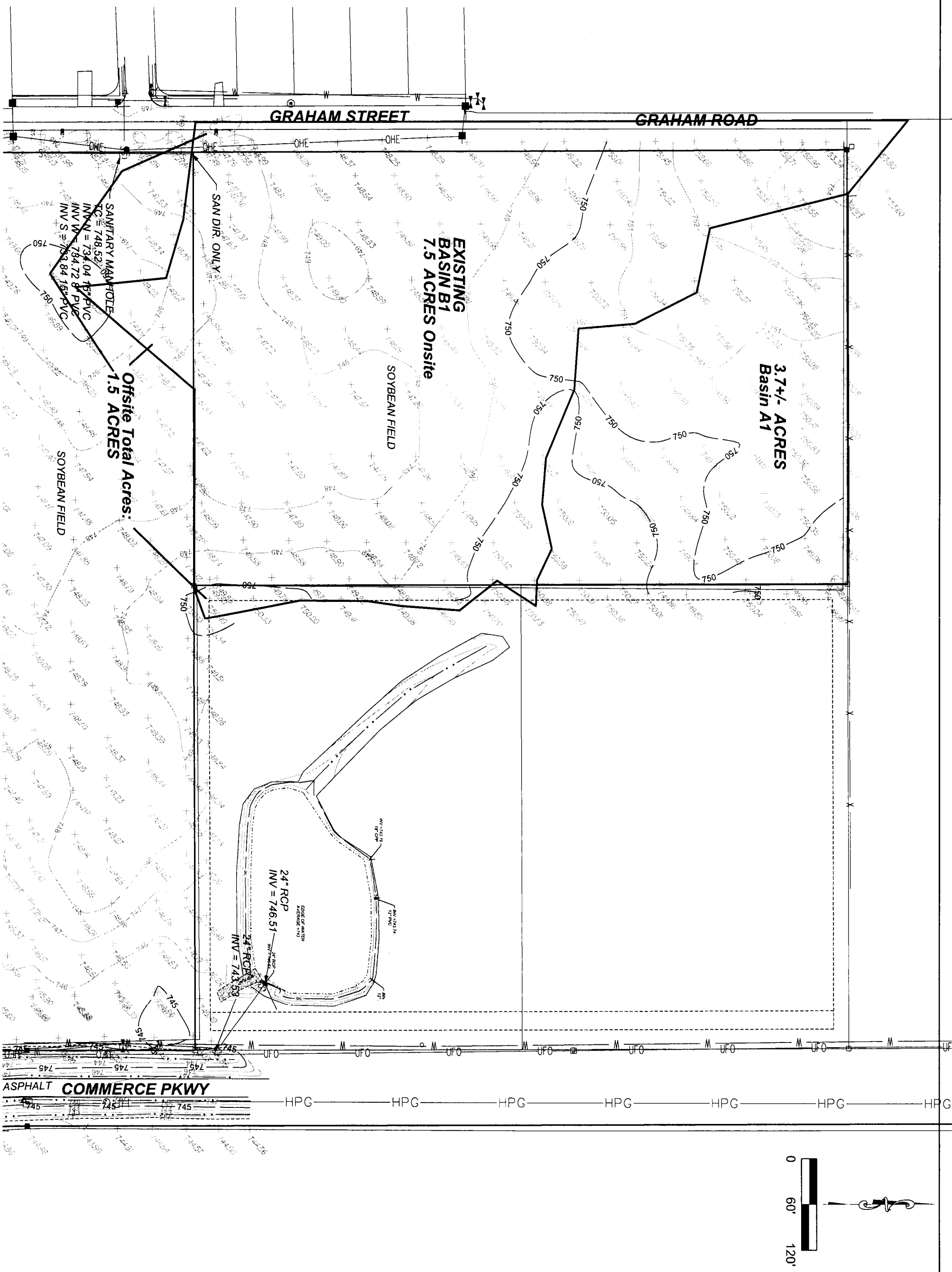


Sheet No: 1 of 1	Project No: 11191R	BANNING ENGINEERING 853 COLUMBIA ROAD, SUITE #101 PLAINFIELD, IN 46168 BUS: (317) 707-3700, FAX: (317) 707-3800 E-MAIL: Banning@BanningEngineering.com WEB: www.BanningEngineering.com	EXISTING DRAINAGE BASIN MAP CITY OF FRANKLIN SPEC BUILDING CITY OF FRANKLIN JOHNSON COUNTY, INDIANA

Designed: RRL	Sym.	Revisions	Date
Drawn: RRL			
Checked:			
Scale: 1"=120'			
Date: 9-14-12			

EXISTING CALCULATIONS

JLM
9-11-12
2-Year Existing

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
Outlet	BASEhuff_002yr_01hr		0.00	730.00	746.00	0.00	0	1.08	0.78	0.00	0.00
Outlet	BASEhuff_002yr_02hr		0.00	730.00	746.00	0.00	0	2.00	1.12	0.00	0.00
Outlet	BASEhuff_002yr_03hr		0.00	730.00	746.00	0.00	0	2.50	1.05	0.00	0.00
Outlet	BASEhuff_002yr_06hr		0.00	730.00	746.00	0.00	0	4.83	0.85	0.00	0.00
Outlet	BASEhuff_002yr_12hr		0.00	730.00	746.00	0.00	0	6.00	0.80	0.00	0.00
Outlet	BASEhuff_002yr_24hr		0.00	730.00	746.00	0.00	0	16.75	1.02	0.00	0.00

JLM
9-11-12
10-Year Existing

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
Outlet	BASEhuff_010yr_01hr		0.00	730.00	746.00	0.00	0	1.00	3.34	0.00	0.00
Outlet	BASEhuff_010yr_02hr		0.00	730.00	746.00	0.00	0	1.75	3.11	0.00	0.00
Outlet	BASEhuff_010yr_03hr		0.00	730.00	746.00	0.00	0	2.50	2.68	0.00	0.00
Outlet	BASEhuff_010yr_06hr		0.00	730.00	746.00	0.00	0	4.83	1.91	0.00	0.00
Outlet	BASEhuff_010yr_12hr		0.00	730.00	746.00	0.00	0	5.50	2.05	0.00	0.00
Outlet	BASEhuff_010yr_24hr		0.00	730.00	746.00	0.00	0	16.75	2.14	0.00	0.00

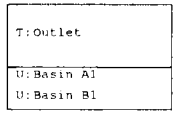
EXISTING ICPR INPUT

JLM
9-11-12
Existing Node Schematic

Nodes
A Stage/Area
V Stage/Volume
T Time/Stage
M Manhole

Basins
O Overland Flow
U SCS Unit CN
S SBUH CN
Y SCS Unit GA
Z SBUH GA

Links
P Pipe
W Weir
C Channel
D Drop Structure
B Bridge
R Rating Curve
H Breach
E Percolation
F Filter
X Exfil Trench



```
==========================================================================================
==== Basins ==============================================================================
==========================================================================================

        Name: Basin A1                  Node: Outlet                  Status: Onsite
       Group: BASE                      Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh484                    Peaking Factor: 484.0
         Rainfall File:                     Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000                Time of Conc(min): 15.40
              Area(ac): 3.700                   Time Shift(hrs): 0.00
          Curve Number: 68.00             Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00


------------------------------------------------------------------------------------------
        Name: Basin B1                  Node: Outlet                  Status: Onsite
       Group: BASE                      Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh484                    Peaking Factor: 484.0
         Rainfall File:                     Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000                Time of Conc(min): 25.20
              Area(ac): 7.500                   Time Shift(hrs): 0.00
          Curve Number: 68.00             Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00


==========================================================================================
==== Nodes ===============================================================================
==========================================================================================

      Name: Outlet              Base Flow(cfs): 0.000          Init Stage(ft): 730.000
     Group: BASE                                               Warn Stage(ft): 746.000
      Type: Time/Stage


      Time(hrs)       Stage(ft)
--------------- ---------------
           0.00         730.000
          60.00         730.000

==========================================================================================
==== Hydrology Simulations ===============================================================
==========================================================================================

         Name: huff_002yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_01hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 1.00
         Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.37

Time(hrs)       Print Inc(min)
--------------- ---------------
2.000           5.00

------------------------------------------------------------------------------------------
         Name: huff_002yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_02hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 2.00
         Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.69

Time(hrs)       Print Inc(min)
--------------- ---------------
4.000           5.00

------------------------------------------------------------------------------------------
         Name: huff_002yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_03hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 3.00
         Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.87

Time(hrs)       Print Inc(min)
```

```
--------------- ---------------
6.000           5.00

-----------------------------------------------------------------------------------------------
         Name: huff_002yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_06hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 6.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 2.19

Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.00

-----------------------------------------------------------------------------------------------
         Name: huff_002yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_12hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 12.00
          Rainfall File: Huff-indy2-50
    Rainfall Amount(in): 2.54

Time(hrs)       Print Inc(min)
--------------- ---------------
20.000          10.00

-----------------------------------------------------------------------------------------------
         Name: huff_002yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_24hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: huff_indy3-50
    Rainfall Amount(in): 2.92

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00

-----------------------------------------------------------------------------------------------
         Name: huff_010yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_01hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 1.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 2.00

Time(hrs)       Print Inc(min)
--------------- ---------------
2.000           5.00

-----------------------------------------------------------------------------------------------
         Name: huff_010yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_02hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 2.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 2.46

Time(hrs)       Print Inc(min)
--------------- ---------------
4.000           5.00

-----------------------------------------------------------------------------------------------
         Name: huff_010yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_03hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 3.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 2.72

Time(hrs)       Print Inc(min)
--------------- ---------------
6.000           5.00

-----------------------------------------------------------------------------------------------
         Name: huff_010yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_06hr.R32
```

```
      Override Defaults: Yes
    Storm Duration(hrs): 6.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.19

Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.00

-----------------------------------------------------------------------------------------------
         Name: huff_010yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_12hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 12.00
          Rainfall File: Huff-indy2-50
    Rainfall Amount(in): 3.70

Time(hrs)       Print Inc(min)
--------------- ---------------
20.000          10.00

-----------------------------------------------------------------------------------------------
         Name: huff_010yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_24hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: huff_indy3-50
    Rainfall Amount(in): 4.25

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00

-----------------------------------------------------------------------------------------------
         Name: huff_100yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_01hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 1.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.21

Time(hrs)       Print Inc(min)
--------------- ---------------
2.000           5.00

-----------------------------------------------------------------------------------------------
         Name: huff_100yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_02hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 2.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.97

Time(hrs)       Print Inc(min)
--------------- ---------------
4.000           5.00

-----------------------------------------------------------------------------------------------
         Name: huff_100yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_03hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 3.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 4.38

Time(hrs)       Print Inc(min)
--------------- ---------------
6.000           5.00

-----------------------------------------------------------------------------------------------
         Name: huff_100yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_06hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 6.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 5.13
```

```
Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.00

-----------------------------------------------------------------------------------------------
         Name: huff_100yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_12hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 12.00
          Rainfall File: Huff-indy2-50
    Rainfall Amount(in): 5.95

Time(hrs)       Print Inc(min)
--------------- ---------------
20.000          10.00

-----------------------------------------------------------------------------------------------
         Name: huff_100yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_24hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: huff_indy3-50
    Rainfall Amount(in): 6.84

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00

===============================================================================================
==== Routing Simulations ======================================================================
===============================================================================================

         Name: huff_002yr_01hr     Hydrology Sim: huff_002yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_01hr.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                      End Time(hrs): 5.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                           Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
5.000           10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_002yr_02hr     Hydrology Sim: huff_002yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_02hr.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                      End Time(hrs): 6.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                           Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
6.000           10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
```

```
         Name: huff_002yr_03hr     Hydrology Sim: huff_002yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_03hr.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                      Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                      End Time(hrs): 10.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                           Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_002yr_06hr     Hydrology Sim: huff_002yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_06hr.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                      Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                      End Time(hrs): 15.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                           Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
15.000          10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_002yr_12hr     Hydrology Sim: huff_002yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_12hr.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                      Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                      End Time(hrs): 30.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                           Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_002yr_24hr     Hydrology Sim: huff_002yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_24hr.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                      Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                      End Time(hrs): 60.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                           Boundary Flows:
```

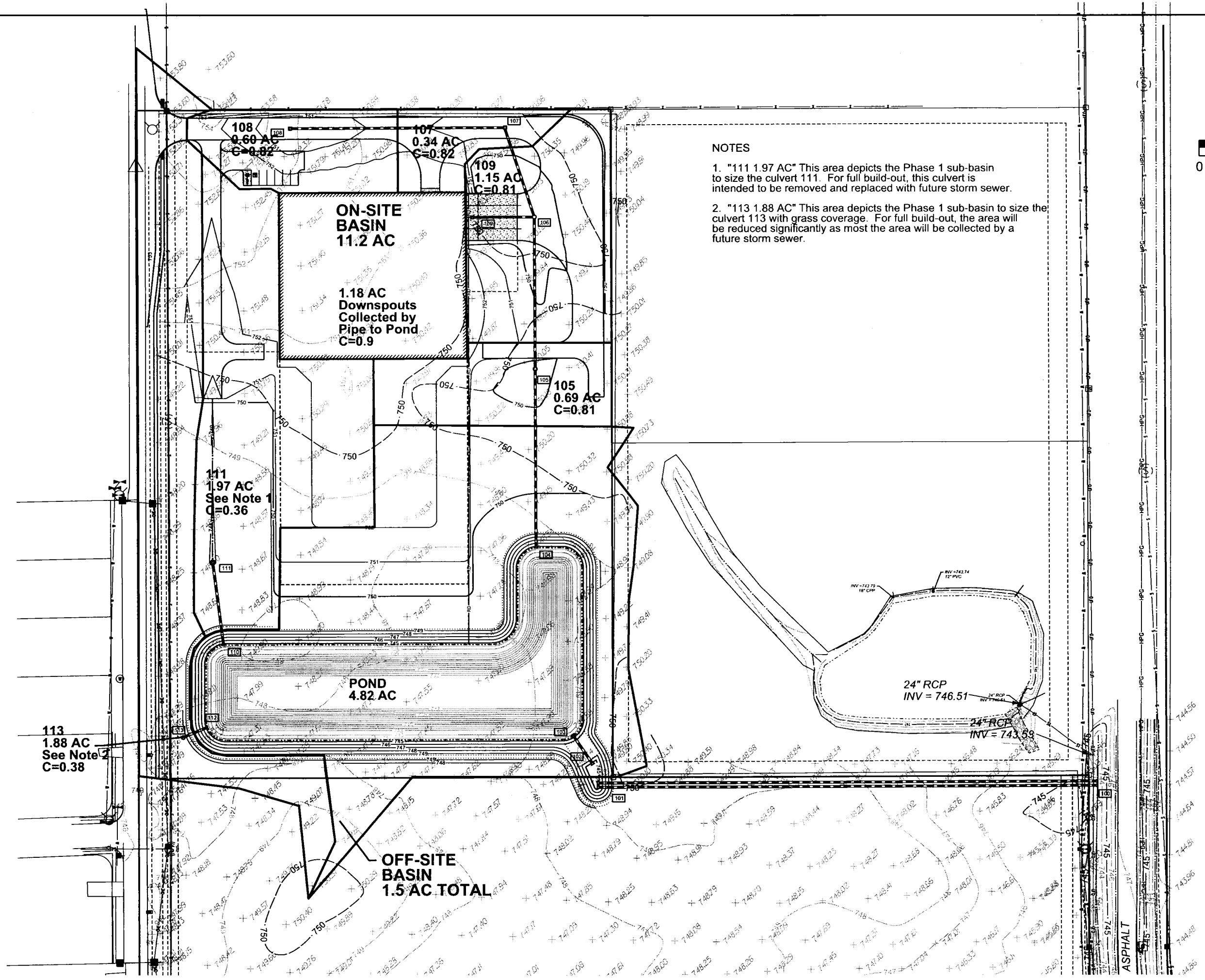
```
Time(hrs)       Print Inc(min)
--------------- ---------------
60.000          15.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_010yr_01hr     Hydrology Sim: huff_010yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_01hr.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 5.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
5.000           10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_010yr_02hr     Hydrology Sim: huff_010yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_02hr.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 6.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
6.000           10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_010yr_03hr     Hydrology Sim: huff_010yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_03hr.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 10.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.000

Group           Run
--------------- -----
BASE            Yes
```

```
-----------------------------------------------------------------------------------------------
         Name: huff_010yr_06hr     Hydrology Sim: huff_010yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_06hr.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                      Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                      End Time(hrs): 15.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                           Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
15.000          10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_010yr_12hr     Hydrology Sim: huff_010yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_12hr.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                      Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                      End Time(hrs): 30.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                           Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_010yr_24hr     Hydrology Sim: huff_010yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_24hr.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                      Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                      End Time(hrs): 60.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                           Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
60.000          15.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_100yr_01hr     Hydrology Sim: huff_100yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_01hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                      Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                      End Time(hrs): 5.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
```

```
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
5.000           10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------------
         Name: huff_100yr_02hr     Hydrology Sim: huff_100yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_02hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 6.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
6.000           10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------------
         Name: huff_100yr_03hr     Hydrology Sim: huff_100yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_03hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 10.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------------
         Name: huff_100yr_06hr     Hydrology Sim: huff_100yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_06hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 15.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
15.000          10.000

Group           Run
--------------- -----
```

```
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_100yr_12hr     Hydrology Sim: huff_100yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_12hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 30.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_100yr_24hr     Hydrology Sim: huff_100yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_24hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 60.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
60.000          15.000

Group           Run
--------------- -----
BASE            Yes
```

PROPOSED BASIN MAP



NOTES

1. "111 1.97 AC" This area depicts the Phase 1 sub-basin to size the culvert 111. For full build-out, this culvert is intended to be removed and replaced with future storm sewer.

2. "113 1.88 AC" This area depicts the Phase 1 sub-basin to size the culvert 113 with grass coverage. For full build-out, the area will be reduced significantly as most the area will be collected by a future storm sewer.

Sym	Revisions	Date

Designed: RRL
Drawn: RRL
Checked
Scale: 1"=120'
Date: 10-2-12

PHASE 1 DRAINAGE BASIN MAP
CITY OF FRANKLIN SPEC BUILDING
CITY OF FRANKLIN
JOHNSON COUNTY, INDIANA

BANNING ENGINEERING
853 COLUMBIA ROAD, SUITE #101
PLAINFIELD, IN. 46168
BUS: (317) 707-3700, FAX: (317) 707-3800
E-MAIL: Banning@BanningEngineering.com
WEB: www.BanningEngineering.com

Project No: 11191R
Sheet No: 1 of 1

10\05\2012, 03:11 PM
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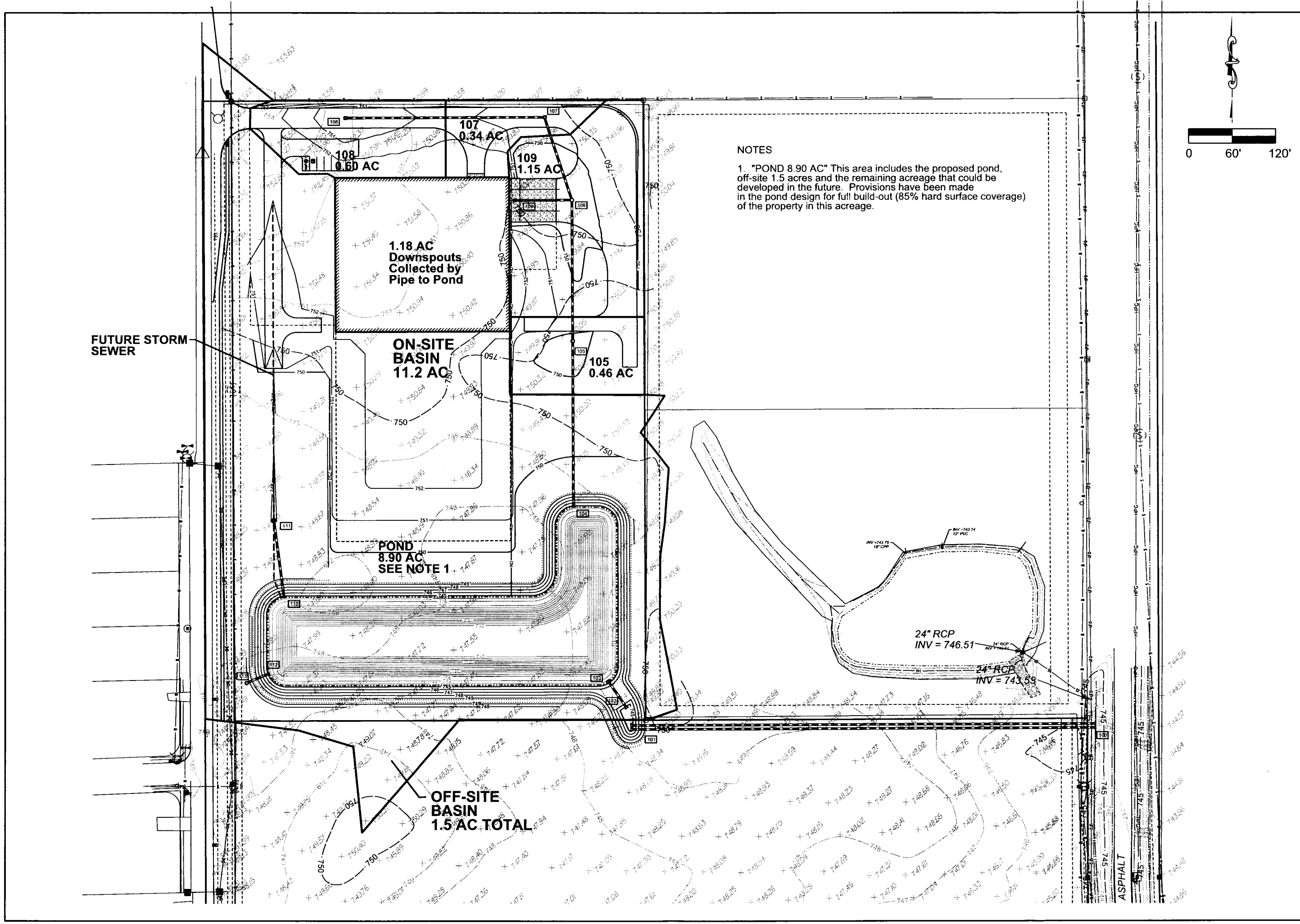

NOTES

1. "POND 8.90 AC" This area includes the proposed pond, off-site 1.5 acres and the remaining acreage that could be developed in the future. Provisions have been made in the pond design for full build-out (85% hard surface coverage) of the property in this acreage.

Sym	Revisions	Date

Designed: RRL
Drawn: RRL
Checked:
Scale: 1"=120'
Date: 10-2-12

FULL BUILD-OUT DRAINAGE BASIN MAP
CITY OF FRANKLIN SPEC BUILDING
CITY OF FRANKLIN
JOHNSON COUNTY, INDIANA

BANNING ENGINEERING
853 COLUMBIA ROAD, SUITE #101
PLAINFIELD, IN 46168
BUS: (317) 707-3700, FAX: (317) 707-3800
E-MAIL: Banning@BanningEngineering.com
WEB: www.BanningEngineering.com

Project No: 11191R
Sheet No: 1 of 1

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SCALE: 120.0000 ' / in.

PROPOSED CALCULATIONS

JLM
10-5-12
100-Year Proposed (Onsite Only)

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
Outlet	BASEhuff_100yr_01hr		0.00	743.10	746.00	0.00	45	1.46	1.00	0.00	0.00
Outlet	BASEhuff_100yr_02hr		0.00	743.10	746.00	0.00	45	2.38	1.31	0.00	0.00
Outlet	BASEhuff_100yr_03hr		0.00	743.10	746.00	0.00	45	3.36	1.59	0.00	0.00
Outlet	BASEhuff_100yr_06hr		0.00	743.10	746.00	0.00	45	6.23	1.92	0.00	0.00
Outlet	BASEhuff_100yr_12hr		0.00	743.10	746.00	0.00	45	12.03	2.08	0.00	0.00
Outlet	BASEhuff_100yr_24hr		0.00	743.10	746.00	0.00	45	19.63	2.18	0.00	0.00
Pond	BASEhuff_100yr_01hr		1.49	745.80	747.00	0.00	75614	0.42	38.32	1.49	1.00
Pond	BASEhuff_100yr_02hr		2.37	746.14	747.00	0.00	77530	0.58	32.09	2.37	1.31
Pond	BASEhuff_100yr_03hr		3.32	746.31	747.00	0.00	78564	0.67	26.73	3.32	1.59
Pond	BASEhuff_100yr_06hr		6.23	746.52	747.00	0.00	79815	1.17	17.58	6.23	1.92
Pond	BASEhuff_100yr_12hr		12.05	746.61	747.00	0.00	80380	3.66	10.03	12.05	2.08
Pond	BASEhuff_100yr_24hr		19.72	746.69	747.00	0.00	80858	14.25	6.41	19.72	2.18
Str 101	BASEhuff_100yr_01hr		1.55	744.76	747.50	0.00	722	1.49	1.00	1.46	1.00
Str 101	BASEhuff_100yr_02hr		2.40	744.82	747.50	0.00	757	2.37	1.31	2.38	1.31
Str 101	BASEhuff_100yr_03hr		3.36	744.87	747.50	0.00	783	3.32	1.59	3.36	1.59
Str 101	BASEhuff_100yr_06hr		6.28	744.92	747.50	0.00	808	6.23	1.92	6.23	1.92
Str 101	BASEhuff_100yr_12hr		12.03	744.95	747.50	0.00	820	12.05	2.08	12.03	2.08
Str 101	BASEhuff_100yr_24hr		19.72	744.96	747.50	0.00	826	19.72	2.18	19.63	2.18

JLM
10-5-12
10-Year Proposed (Onsite Only)

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
Outlet	BASEhuff_010yr_01hr		0.00	743.10	746.00	0.00	45	1.54	0.58	0.00	0.00
Outlet	BASEhuff_010yr_02hr		0.00	743.10	746.00	0.00	45	2.39	0.75	0.00	0.00
Outlet	BASEhuff_010yr_03hr		0.00	743.10	746.00	0.00	45	3.37	0.83	0.00	0.00
Outlet	BASEhuff_010yr_06hr		0.00	743.10	746.00	0.00	45	6.32	0.93	0.00	0.00
Outlet	BASEhuff_010yr_12hr		0.00	743.10	746.00	0.00	45	12.17	0.99	0.00	0.00
Outlet	BASEhuff_010yr_24hr		0.00	743.10	746.00	0.00	45	21.85	1.05	0.00	0.00
Pond	BASEhuff_010yr_01hr		1.49	745.20	747.00	0.00	73280	0.42	19.48	1.49	0.58
Pond	BASEhuff_010yr_02hr		2.37	745.41	747.00	0.00	73824	0.58	16.76	2.37	0.75
Pond	BASEhuff_010yr_03hr		3.33	745.53	747.00	0.00	74192	0.75	14.11	3.33	0.83
Pond	BASEhuff_010yr_06hr		6.27	745.68	747.00	0.00	74976	1.17	9.61	6.27	0.93
Pond	BASEhuff_010yr_12hr		12.13	745.78	747.00	0.00	75526	3.67	5.66	12.13	0.99
Pond	BASEhuff_010yr_24hr		21.90	745.87	747.00	0.00	75974	14.25	3.83	21.90	1.05
Str 101	BASEhuff_010yr_01hr		1.54	744.66	747.50	0.00	653	1.49	0.58	1.54	0.58
Str 101	BASEhuff_010yr_02hr		2.42	744.70	747.50	0.00	684	2.37	0.75	2.39	0.75
Str 101	BASEhuff_010yr_03hr		3.37	744.72	747.50	0.00	697	3.33	0.83	3.37	0.83
Str 101	BASEhuff_010yr_06hr		6.32	744.75	747.50	0.00	711	6.27	0.93	6.32	0.93
Str 101	BASEhuff_010yr_12hr		12.17	744.76	747.50	0.00	720	12.13	0.99	12.17	0.99
Str 101	BASEhuff_010yr_24hr		21.85	744.77	747.50	0.00	727	21.90	1.05	21.85	1.05

JLM
10-5-12
100-Year Proposed (Onsite & Offsite)

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
Outlet	BASEhuff_100yr_01hr		0.00	743.10	746.00	0.00	45	1.53	1.07	0.00	0.00
Outlet	BASEhuff_100yr_02hr		0.00	743.10	746.00	0.00	45	2.36	1.55	0.00	0.00
Outlet	BASEhuff_100yr_03hr		0.00	743.10	746.00	0.00	45	3.33	1.84	0.00	0.00
Outlet	BASEhuff_100yr_06hr		0.00	743.10	746.00	0.00	45	6.21	2.20	0.00	0.00
Outlet	BASEhuff_100yr_12hr		0.00	743.10	746.00	0.00	45	11.11	2.68	0.00	0.00
Outlet	BASEhuff_100yr_24hr		0.00	743.10	746.00	0.00	45	19.38	3.28	0.00	0.00
Pond	BASEhuff_100yr_01hr		1.47	745.91	747.00	0.00	76203	0.42	41.04	1.47	1.07
Pond	BASEhuff_100yr_02hr		2.35	746.29	747.00	0.00	78430	0.58	34.95	2.35	1.55
Pond	BASEhuff_100yr_03hr		3.31	746.47	747.00	0.00	79558	0.67	29.19	3.31	1.84
Pond	BASEhuff_100yr_06hr		6.21	746.70	747.00	0.00	80924	1.17	19.36	6.21	2.20
Pond	BASEhuff_100yr_12hr		11.11	746.77	747.00	0.00	81377	3.66	11.03	11.11	2.68
Pond	BASEhuff_100yr_24hr		19.37	746.83	747.00	0.00	81732	14.25	7.17	19.37	3.28
Str 101	BASEhuff_100yr_01hr		1.53	744.78	747.50	0.00	730	1.47	1.07	1.53	1.07
Str 101	BASEhuff_100yr_02hr		2.39	744.87	747.50	0.00	779	2.35	1.55	2.36	1.55
Str 101	BASEhuff_100yr_03hr		3.33	744.91	747.50	0.00	803	3.31	1.84	3.33	1.84
Str 101	BASEhuff_100yr_06hr		6.26	744.97	747.50	0.00	827	6.21	2.20	6.21	2.20
Str 101	BASEhuff_100yr_12hr		11.12	745.03	747.50	0.00	854	11.11	2.68	11.11	2.68
Str 101	BASEhuff_100yr_24hr		19.38	745.11	747.50	0.00	882	19.37	3.28	19.38	3.28

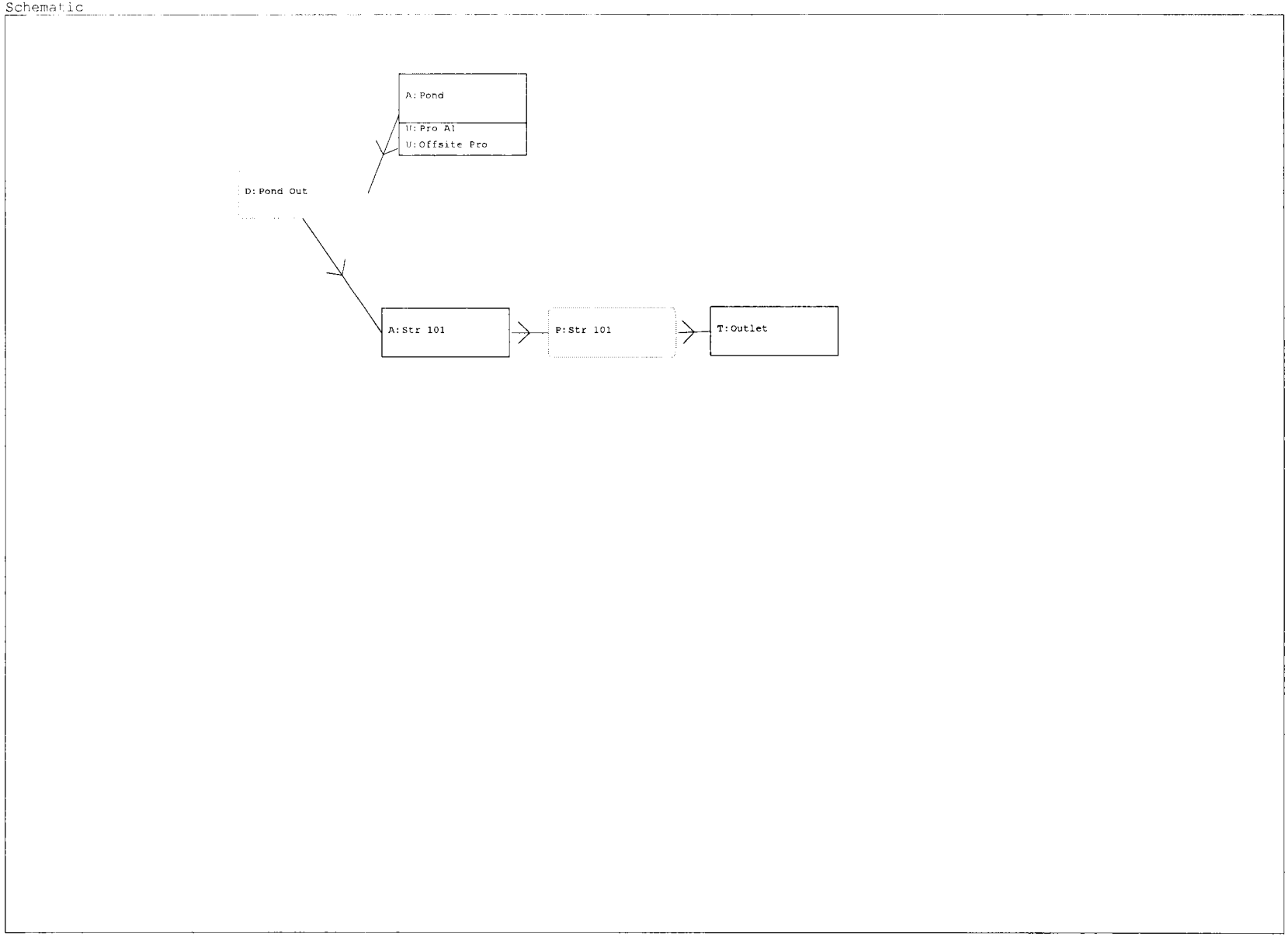
PROPOSED ICPR INPUT

JLM
10-5-12
Proposed ICPR Node Schematic

Nodes
A Stage/Area
V Stage/Volume
T Time/Stage
M Manhole

Basins
O Overland Flow
U SCS Unit CN
S SBUH CN
Y SCS Unit GA
Z SBUH GA

Links
P Pipe
W Weir
C Channel
D Drop Structure
B Bridge
R Rating Curve
H Breach
E Percolation
F Filter
X Exfil Trench



==== Basins ====

```
        Name: Offsite Pro              Node: Pond                    Status: Offsite
       Group: BASE                     Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh484                   Peaking Factor: 484.0
         Rainfall File:                   Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000               Time of Conc(min): 6.00
              Area(ac): 1.500                 Time Shift(hrs): 0.00
          Curve Number: 83.00            Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00
```

```
        Name: Pro A1                   Node: Pond                    Status: Onsite
       Group: BASE                     Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh484                   Peaking Factor: 484.0
         Rainfall File:                   Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000               Time of Conc(min): 18.40
              Area(ac): 11.200                Time Shift(hrs): 0.00
          Curve Number: 93.00            Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00
```

==== Nodes ====

```
      Name: Outlet              Base Flow(cfs): 0.000          Init Stage(ft): 743.100
     Group: BASE                                               Warn Stage(ft): 746.000
      Type: Time/Stage


      Time(hrs)       Stage(ft)
--------------- ---------------
           0.00         743.100
          60.00         743.100
```

```
      Name: Pond                Base Flow(cfs): 0.000          Init Stage(ft): 744.500
     Group: BASE                                               Warn Stage(ft): 747.000
      Type: Stage/Area

745.5□1.27
746□1.33
747□1.46
748□1.58
749□1.72


      Stage(ft)        Area(ac)
--------------- ---------------
        744.500          1.6400
        745.500          1.7000
        746.000          1.7600
        747.000          1.9000
        748.000          2.0300
        749.000          2.1700
```

```
      Name: Str 101             Base Flow(cfs): 0.000          Init Stage(ft): 744.350
     Group: BASE                                               Warn Stage(ft): 747.500
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
        743.000          0.0003
        749.000          0.0003
```

==== Pipes ====

```
        Name: Str 101            From Node: Str 101            Length(ft): 640.00
       Group: BASE                 To Node: Outlet                  Count: 2
```

```
                                                    Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM             Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                          Flow: Both
     Span(in): 30.00          30.00                Entrance Loss Coef: 0.50
     Rise(in): 30.00          30.00                    Exit Loss Coef: 1.00
   Invert(ft): 744.350        743.100                  Bend Loss Coef: 0.00
  Manning's N: 0.012000       0.012000               Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                   Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                 Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


==========================================================================================
==== Drop Structures =====================================================================
==========================================================================================

         Name: Pond Out            From Node: Pond              Length(ft): 44.00
        Group: BASE                  To Node: Str 101                Count: 1

              UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
     Geometry: Circular       Circular             Solution Algorithm: Most Restrictive
     Span(in): 12.00          12.00                             Flow: Both
     Rise(in): 12.00          12.00                Entrance Loss Coef: 0.500
   Invert(ft): 744.500        744.400                  Exit Loss Coef: 1.000
  Manning's N: 0.012000       0.012000               Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                   Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                     Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


*** Weir 1 of 3 for Drop Structure Pond Out ***
                                                                                TABLE
                 Count: 1                      Bottom Clip(in): 0.000
                  Type: Vertical: Mavis           Top Clip(in): 0.000
                  Flow: Both                    Weir Disc Coef: 3.200
              Geometry: Circular              Orifice Disc Coef: 0.600

              Span(in): 7.00                        Invert(ft): 744.500
              Rise(in): 7.00                   Control Elev(ft): 744.500

*** Weir 2 of 3 for Drop Structure Pond Out ***
                                                                                TABLE
                 Count: 1                      Bottom Clip(in): 0.000
                  Type: Vertical: Mavis           Top Clip(in): 0.000
                  Flow: Both                    Weir Disc Coef: 3.200
              Geometry: Circular              Orifice Disc Coef: 0.600

              Span(in): 7.00                        Invert(ft): 745.900
              Rise(in): 7.00                   Control Elev(ft): 745.900

*** Weir 3 of 3 for Drop Structure Pond Out ***
                                                                                TABLE
                 Count: 1                      Bottom Clip(in): 0.000
                  Type: Horizontal                Top Clip(in): 0.000
                  Flow: Both                    Weir Disc Coef: 3.200
              Geometry: Rectangular           Orifice Disc Coef: 0.600

              Span(in): 24.00                       Invert(ft): 746.700
              Rise(in): 24.00                  Control Elev(ft): 746.700


==========================================================================================
==== Hydrology Simulations ===============================================================
==========================================================================================

         Name: BMP
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_24hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
```

```
          Rainfall File: huff_indy3-50
    Rainfall Amount(in): 1.25

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00

-----------------------------------------------------------------------------------------------
         Name: huff_002yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_01hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 1.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.37

Time(hrs)       Print Inc(min)
--------------- ---------------
2.000           5.00

-----------------------------------------------------------------------------------------------
         Name: huff_002yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_02hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 2.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.69

Time(hrs)       Print Inc(min)
--------------- ---------------
4.000           5.00

-----------------------------------------------------------------------------------------------
         Name: huff_002yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_03hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 3.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.87

Time(hrs)       Print Inc(min)
--------------- ---------------
6.000           5.00

-----------------------------------------------------------------------------------------------
         Name: huff_002yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_06hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 6.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 2.19

Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.00

-----------------------------------------------------------------------------------------------
         Name: huff_002yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_12hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 12.00
          Rainfall File: Huff-indy2-50
    Rainfall Amount(in): 2.54

Time(hrs)       Print Inc(min)
--------------- ---------------
20.000          10.00

-----------------------------------------------------------------------------------------------
         Name: huff_002yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_24hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: huff_indy3-50
    Rainfall Amount(in): 2.92

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00
```

```
---------------------------------------------------------------------------------------------------
         Name: huff_010yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_01hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 1.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 2.00

Time(hrs)       Print Inc(min)
--------------- ---------------
2.000           5.00

---------------------------------------------------------------------------------------------------
         Name: huff_010yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_02hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 2.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 2.46

Time(hrs)       Print Inc(min)
--------------- ---------------
4.000           5.00

---------------------------------------------------------------------------------------------------
         Name: huff_010yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_03hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 3.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 2.72

Time(hrs)       Print Inc(min)
--------------- ---------------
6.000           5.00

---------------------------------------------------------------------------------------------------
         Name: huff_010yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_06hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 6.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.19

Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.00

---------------------------------------------------------------------------------------------------
         Name: huff_010yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_12hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 12.00
          Rainfall File: Huff-indy2-50
    Rainfall Amount(in): 3.70

Time(hrs)       Print Inc(min)
--------------- ---------------
20.000          10.00

---------------------------------------------------------------------------------------------------
         Name: huff_010yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_24hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: huff_indy3-50
    Rainfall Amount(in): 4.25

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00

---------------------------------------------------------------------------------------------------
         Name: huff_100yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_01hr.R32

      Override Defaults: Yes
```

```
    Storm Duration(hrs): 1.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.21

Time(hrs)       Print Inc(min)
--------------- ---------------
2.000           5.00

-----------------------------------------------------------------------------------------------------
         Name: huff_100yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_02hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 2.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.97

Time(hrs)       Print Inc(min)
--------------- ---------------
4.000           5.00

-----------------------------------------------------------------------------------------------------
         Name: huff_100yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_03hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 3.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 4.38

Time(hrs)       Print Inc(min)
--------------- ---------------
6.000           5.00

-----------------------------------------------------------------------------------------------------
         Name: huff_100yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_06hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 6.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 5.13

Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.00

-----------------------------------------------------------------------------------------------------
         Name: huff_100yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_12hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 12.00
          Rainfall File: Huff-indy2-50
    Rainfall Amount(in): 5.95

Time(hrs)       Print Inc(min)
--------------- ---------------
20.000          10.00

-----------------------------------------------------------------------------------------------------
         Name: huff_100yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_24hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: huff_indy3-50
    Rainfall Amount(in): 6.84

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00

=====================================================================================
==== Routing Simulations ============================================================
=====================================================================================

         Name: BMP                 Hydrology Sim: BMP
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\pro\BMP.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
```

```
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 48.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
48.000          15.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_002yr_01hr     Hydrology Sim: huff_002yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_01hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                      Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 5.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
5.000           10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_002yr_02hr     Hydrology Sim: huff_002yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_02hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                      Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 6.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
6.000           10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_002yr_03hr     Hydrology Sim: huff_002yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_03hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                      Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 10.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.000
```

```
Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_002yr_06hr     Hydrology Sim: huff_002yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_06hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                      Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                      End Time(hrs): 15.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                           Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
15.000          10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_002yr_12hr     Hydrology Sim: huff_002yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_12hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                      Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                      End Time(hrs): 30.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                           Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_002yr_24hr     Hydrology Sim: huff_002yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_24hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                      Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                      End Time(hrs): 60.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                           Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
60.000          15.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_010yr_01hr     Hydrology Sim: huff_010yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_01hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No
```

```
        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 5.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
5.000           10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_010yr_02hr     Hydrology Sim: huff_010yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_02hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 6.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
6.000           10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_010yr_03hr     Hydrology Sim: huff_010yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_03hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 10.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_010yr_06hr     Hydrology Sim: huff_010yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_06hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 15.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
```

```
--------------- ---------------
15.000          10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_010yr_12hr     Hydrology Sim: huff_010yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_12hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 30.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_010yr_24hr     Hydrology Sim: huff_010yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_24hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 60.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
60.000          15.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_100yr_01hr     Hydrology Sim: huff_100yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_01hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 5.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
5.000           10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_100yr_02hr     Hydrology Sim: huff_100yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_02hr.I32
```

```
     Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                     End Time(hrs): 6.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
6.000           10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_100yr_03hr     Hydrology Sim: huff_100yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_03hr.I32

     Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                     End Time(hrs): 10.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_100yr_06hr     Hydrology Sim: huff_100yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_06hr.I32

     Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                     End Time(hrs): 15.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
15.000          10.000

Group           Run
--------------- -----
BASE            Yes


-----------------------------------------------------------------------------------------------
         Name: huff_100yr_12hr     Hydrology Sim: huff_100yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_12hr.I32

     Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                     End Time(hrs): 30.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                          Boundary Flows:
```

Time(hrs)	Print Inc(min)
30.000	10.000

Group	Run
BASE	Yes

```
         Name: huff_100yr_24hr     Hydrology Sim: huff_100yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_24hr.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 60.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:
```

Time(hrs)	Print Inc(min)
60.000	15.000

Group	Run
BASE	Yes

Job #11191R
Hydrology and Hydraulic Study of
City of Franklin Spec Building
Sept. 2012
Revised: October 5, 2012

Tc & CN CALCULATIONS

BANNING ENGINEERING

JLM 11191R

Existing & Proposed Conditions Franklin Building
Johnson County, Indiana

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Exz A1							
SHEET	100	0.0200	0.150				0.180
SHALLOW	450	0.0100	0.050				0.077
					Time of Concentration		0.257
Exz B1							
SHEET	100	0.0100	0.150				0.237
SHALLOW	750	0.0100	0.050				0.129
					Time of Concentration		0.366
Offsite Pr							
SHEET	30	0.0110	0.011				0.011
					Time of Concentration		0.100
Pro A1							
SHEET	70	0.0100	0.240				0.260
CHANNEL	500					3.000	0.046
					Time of Concentration		0.306

JLM 11191R

Existing & Proposed Conditions Franklin Building
Johnson County, Indiana

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Exz A1	Pasture, grassland or range	(good)	B	1.85	61
	Pasture, grassland or range	(good)	C	1.85	74
	Total Area / Weighted Curve Number			3.7	68
				===	==
Exz B1	Pasture, grassland or range	(good)	B	3.75	61
	Pasture, grassland or range	(good)	C	3.75	74
	Total Area / Weighted Curve Number			7.5	68
				===	==
Offsite Pr	Commercial & business		B	.225	92
	Commercial & business		C	.225	94
	Residential districts (1/4 acre)		B	.525	75
	Residential districts (1/4 acre)		C	.525	83
	Total Area / Weighted Curve Number			1.5	83
				===	==
Pro A1	Commercial & business		B	5.6	92
	Commercial & business		C	5.6	94
	Total Area / Weighted Curve Number			11.2	93
				====	==

Job #11191R
Hydrology and Hydraulic Study of
City of Franklin Spec Building
Sept. 2012
Revised: October 5, 2012

STORM SEWER CALCULATIONS

BANNING ENGINEERING

STORM SEWER DESIGN CALCULATIONS
-RATIONAL METHOD-

PROJECT:	Franklin	STORM:	10 Year
JOB #:	11191R	COMPUTED BY:	RRL
DATE:	10/2/12	SHEET NO.:	

STRUCTURE		BASINS							COMPOSITE BASINS				TRAVEL
FROM	TO	BASIN #	c	A (acres)	c*A	Tc (min)	I (in/hr)	Q (cfs)	SUM (c*A)	Tc (min)	I (in/hr)	Q (cfs)	TIME (min)
113	112	113	0.38	1.88	0.71	23	3.62	2.59	0.71	23	3.62	2.59	0.17
111	110	111	0.36	1.97	0.71	17	4.27	3.03	0.71	17	4.27	3.03	0.60
108	107	108	0.82	0.60	0.49	11	5.26	2.59	0.49	11	5.26	2.59	1.53
107	106	107	0.82	0.34	0.28	11	5.26	1.47	0.77	13	4.88	3.76	0.67
106	105	106	0.00	0.00	0.00	5	6.98	0.00	1.70	14	4.71	8.01	1.09
105	104	105	0.81	0.69	0.56	5	6.98	3.90	2.26	15	4.55	10.29	1.28
109	106	109	0.81	1.15	0.93	10	5.48	5.10	0.93	10	5.48	5.10	0.44

STORM SEWER DESIGN CALCULATIONS
-COMPOSITE C-VALUES-

PROJECT:	Franklin	STORM:	10 Year
JOB #:	11191R	COMPUTED BY:	RRL
DATE:	10/2/12	SHEET NO.:	

BASINS					COMPOSITE BASINS			
BASIN #	c	Area (ft^2)	Area (acres)	c*A	BASIN #	c	Area (acres)	c*A
						0	0	0
113	0.85	17424	0.40	0.34	113	0.38	1.88	0.71
113	0.25	64469	1.48	0.37		0	0	0
					111	0.36	1.97	0.71
111	0.90	8586	0.20	0.18		0	0	0
111	0.30	77227	1.77	0.53		0	0	0
					108	0.82	0.6	0.49
108	0.90	22216	0.51	0.46	107	0.82	0.34	0.28
108	0.30	3902	0.09	0.03	106	0	0	0
					105	0.81	0.69	0.56
107	0.90	12589	0.29	0.26		0	0	0
107	0.30	2221	0.05	0.02		0	0	0
					109	0.81	1.15	0.93
109	0.90	42580	0.98	0.88		0	0	0
109	0.30	7514	0.17	0.05		0	0	0
						0	0	0
105	0.90	25548	0.59	0.53		0	0	0
105	0.30	4508	0.10	0.03		0	0	0
						0	0	0
						0	0	0
						0	0	0
						0	0	0
						0	0	0
						0	0	0
						0	0	0
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						0	0	0
						0	0	0
						0	0	0
						0	0	0
						0	0	0
						0	0	0

Time of Concentration Worksheet
Based on TR-55

PROJECT: Franklin
JOB #: 11191R

Typical values for Manning's n			
Overland Flow		Channel Flow	
short grass	0.15	grass	0.03
dense grass	0.24	concrete	0.015
pavement	0.011	rip-rap	0.035

2 year, 24 hour rainfall = 2.66 inches
minimum T_c = 5 minutes

	Overland flow			seg. 1	Overland flow			seg. 2	Shallow Concentrated Flow					Channel Flow								T_c
Basin name	Length (ft)	S %	n	T_t (min)	Length (ft)	S %	n	T_t (min)	Length (ft)	S %	Paved/Un (P or U)	Vel. (ft/s)	T_t (min)	Length (ft)	a (s.f.)	Pw (ft)	r (ft)	S %	n	Vel. (ft/s)	T_t (min)	(min)
				0				0					0								0	
113	100	1	0.15	14				0	730	0.8	U	1.4	9								0	23
				0				0					0								0	
111	76	1	0.15	11				0	260	0.5	P	1.4	3	200						1.50	2	17
				0				0					0								0	
				0				0					0								0	
108	66	1	0.15	10				0	160	1	P	2	1								0	11
107	66	1	0.15	10				0	140	1	P	2	1								0	11
106				0				0					0								0	5
105	100	1	0.01	2				0	70	0.5	P	1.4	1								0	5
				0				0					0								0	
				0				0					0								0	
109	50	1	0.15	8				0	140	0.5	P	1.4	2								0	10
				0				0					0								0	
				0				0					0								0	
				0				0					0								0	
				0				0					0								0	
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				0				0					0								0	

STORM SEWER DESIGN CALCULATIONS
-PIPE DESIGN-

PROJECT:	Franklin	STORM:	10 Year
JOB #:	11191R	COMPUTED BY:	RRL
DATE:	10/2/12	SHEET NO.:	

STRUCTURE FROM	STRUCTURE TO	DESIGN Q (cfs)	L (ft)	DIA. (in)	SLOPE %	CAP. Q (cfs)	VEL. (ft/s)	RIM ELEV. UP	RIM ELEV. DOWN	INVERT ELEV. UP	INVERT ELEV. DOWN	COVER (ft)	down-stream cover
113	112	2.59	30	12	0.67	2.93	3.74	747.00	749.00	744.70	744.50	1.13	3.33
111	110	3.03	108	15	0.30	3.56	2.90	747.00	749.00	744.82	744.50	0.76	3.08
108	107	2.59	275	12	0.55	2.66	3.38	750.00	750.00	747.57	746.06	1.26	2.77
107	106	3.76	121	15	0.40	4.11	3.35	750.00	749.68	746.06	745.58	2.52	2.68
106	105	8.01	196	21	0.26	8.13	3.38	749.68	749.50	745.58	745.07	2.14	2.47
105	104	10.29	230	24	0.25	11.38	3.62	749.50	749.00	745.07	744.50	2.20	2.27
109	106	5.10	79	15	0.65	5.24	4.27	748.85	749.68	746.09	745.58	1.34	2.68

STR'S 107 & 108

Inlet Capacity for Neenah R-3402-E 24x24-inch opening 2 5/8 X 6 1/2 inch openings

Area = 2.1 square feet Weir = 8 linear feet

Head,ft	Orifice Q, cfs	Weir Q, cfs	Actual Dishchage, cfs	50% Clogged
0	0.0	0.0	0.0	0.0
0.1	3.2	0.8	0.8	0.4
0.2	4.5	2.2	2.2	1.1
0.25	5.1	3.1	3.1	1.6
0.3	5.5	4.1	4.1	2.0
0.4	6.4	6.3	6.3	3.1
*0.5	7.1	8.8	7.1	3.6*
0.58	7.7	11.0	7.7	3.9
0.67	8.3	13.6	8.3	4.1
0.8	9.0	17.7	9.0	4.5
1	10.1	24.8	10.1	5.1
1.25	11.3	34.7	11.3	5.7
1.5	12.4	45.6	12.4	6.2
1.75	13.4	57.4	13.4	6.7
2	14.3	70.1	14.3	7.1

STR'S 105, 111, 113

Inlet Capacity for Neenah R-4342 23 inch round Ditch Casting

Area = 2 square feet Weir = 6 linear feet

Head,ft	Orifice Q, cfs	Weir Q, cfs	Actual Dishchage, cfs	50% Clogged
0	0.0	0.0	0.0	0.0
0.1	3.0	0.6	0.6	0.3
0.2	4.3	1.7	1.7	0.8
0.25	4.8	2.3	2.3	1.2
0.3	5.3	3.1	3.1	1.5
0.4	6.1	4.7	4.7	2.4
0.5	6.8	6.6	6.6	3.3
* 0.75	8.3	12.1	8.3	4.2 *
1	9.6	18.6	9.6	4.8
1.25	10.8	26.0	10.8	5.4
1.5	11.8	34.2	11.8	5.9
1.75	12.7	43.1	12.7	6.4
2	13.6	52.6	13.6	6.8

STR 109

Inlet Capacity for Neenah R-3403-F 24x36-inch opening 1 5/8 X 10 1/2 inch openings

Area = 3.2 square feet Weir = 10.6 linear feet

Head,ft	Orifice Q, cfs	Weir Q, cfs	Actual Dishchage, cfs	50% Clogged
0	0.0	0.0	0.0	0.0
0.1	4.9	1.0	1.0	0.5
0.2	6.9	2.9	2.9	1.5
0.25	7.7	4.1	4.1	2.1
0.3	8.4	5.4	5.4	2.7
0.4	9.7	8.3	8.3	4.2
* 0.5	10.9	11.6	10.9	5.4 *
0.58	11.8	14.6	11.8	5.9
0.67	12.6	18.0	12.6	6.3
0.8	13.8	23.5	13.8	6.9
1	15.4	32.9	15.4	7.7
1.25	17.2	45.9	17.2	8.6
1.5	18.9	60.4	18.9	9.4
1.75	20.4	76.1	20.4	10.2
2	21.8	92.9	21.8	10.9

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	Roof Drains
Flow Element	Circular Chann
Method	Manning's Forr
Solve For	Discharge

Input Data		
Mannings Coeffic	0.010	
Channel Slope	004500	ft/ft
Depth	1.75	ft
Diameter	21.0	in

Results		
Discharge	13.82	cfs
Flow Area	2.4	ft²
Wetted Perime	5.50	ft
Top Width	0.00	ft
Critical Depth	1.38	ft
Percent Full	100.0	%
Critical Slope	0.004832	ft/ft
Velocity	5.74	ft/s
Velocity Head	0.51	ft
Specific Energ	2.26	ft
Froude Numbe	0.00	
Maximum Disc	14.86	cfs
Discharge Full	13.82	cfs
Slope Full	0.004500	ft/ft
Flow Type	Subcritical	

PHASE 1 BLDG + FUTURE ADDITION

$C = 0.9$

$I = 5.48$ ($T_c = 10$ min)

$A = 240' \times 504' = 2.78$ AC.

$Q = CIA$

$= .9(5.48)(2.78)$

$Q = 13.71$ CFS < 13.82 CFS $\rightarrow$ OK

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	Roof Drains
Flow Element	Circular Chann
Method	Manning's Forr
Solve For	Discharge

Input Data		
Mannings Coeffic	0.010	
Channel Slope	004500	ft/ft
Depth	1.50	ft
Diameter	18.0	in

Results		
Discharge	9.16	cfs
Flow Area	1.8	ft²
Wetted Perime	4.71	ft
Top Width	0.00	ft
Critical Depth	1.17	ft
Percent Full	100.0	%
Critical Slope	0.004955	ft/ft
Velocity	5.18	ft/s
Velocity Head	0.42	ft
Specific Energ	1.92	ft
Froude Numbe	0.00	
Maximum Disc	9.85	cfs
Discharge Full	9.16	cfs
Slope Full	0.004500	ft/ft
Flow Type	Subcritical	

A = 1.79 AC

Q = CIA

= .9(5.48) 1.79

Q = 8.83 CFS < 9.16 CFS → OK

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	Roof Drains
Flow Element	Circular Chann
Method	Manning's Forr
Solve For	Discharge

Input Data		
Mannings Coeffic	0.010	
Channel Slope	004500	ft/ft
Depth	1.25	ft
Diameter	15.0	in

Results		
Discharge	5.63	cfs
Flow Area	1.2	ft²
Wetted Perime	3.93	ft
Top Width	0.00	ft
Critical Depth	0.96	ft
Percent Full	100.0	%
Critical Slope	0.005112	ft/ft
Velocity	4.59	ft/s
Velocity Head	0.33	ft
Specific Energ	1.58	ft
Froude Numbe	0.00	
Maximum Disc	6.06	cfs
Discharge Full	5.63	cfs
Slope Full	0.004500	ft/ft
Flow Type	Subcritical	

A = 1.10 CFS

Q = CIA
= .9(5.48)(1.1)

Q = 5.43 cfs < 5.63 cfs → OK

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	Roof Drains
Flow Element	Circular Chann
Method	Manning's Forr
Solve For	Discharge

Input Data		
Mannings Coeffic	0.010	
Channel Slope	004500	ft/ft
Depth	1.00	ft
Diameter	12.0	in

Results		
Discharge	3.11	cfs
Flow Area	0.8	ft²
Wetted Perime	3.14	ft
Top Width	0.00	ft
Critical Depth	0.76	ft
Percent Full	100.0	%
Critical Slope	0.005322	ft/ft
Velocity	3.96	ft/s
Velocity Head	0.24	ft
Specific Energ	1.24	ft
Froude Numbe	0.00	
Maximum Disc	3.34	cfs
Discharge Full	3.11	cfs
Slope Full	0.004500	ft/ft
Flow Type	Subcritical	

$A = 0.55$ AC

$Q = CIA$

$= .9(5.48)(.55)$

$Q = 2.71$ CFS < 3.11 CFS $\rightarrow$ OK

BMP CALCULATIONS

JLM
9-11-12
BMP Basin Summary

Basin Name:	Pro A1
Group Name:	BASE
Simulation:	BMP
Node Name:	Pond
Basin Type:	SCS Unit Hydrograph
Unit Hydrograph:	Uh484
Peaking Fator:	484.0
Spec Time Inc (min):	2.45
Comp Time Inc (min):	2.45
Rainfall File:	huff_indy3-50
Rainfall Amount (in):	1.25
Storm Duration (hrs):	24.00
Status:	Onsite
Time of Conc (min):	18.40
Time Shift (hrs):	0.00
Area (ac):	11.200
Vol of Unit Hyd (in):	1.00
Curve Number:	93.000
DCIA (%):	0.000
Time Max (hrs):	16.80
Flow Max (cfs):	0.88
Runoff Volume (in):	0.65
Runoff Volume (ft3):	26466.12 ~ 0.61 ACRE X FT TOTAL RUNOFF

X 0.20 REQUIRED AFTER 24HR

0.122 AC X FT

JLM
10-5-12
BMP Time Series

Simulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
BMP	Pond	BASE	0.00	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	0.26	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	0.50	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	0.77	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	1.02	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	1.27	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	1.52	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	1.77	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	2.02	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	2.27	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	2.52	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	2.77	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	3.02	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	3.27	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	3.52	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	3.77	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	4.02	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	4.27	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	4.52	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	4.77	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	5.02	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	5.27	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	5.52	744.50	747.00	71439	0.01	0.00	0.0	0.0
BMP	Pond	BASE	5.77	744.50	747.00	71439	0.01	0.00	0.0	0.0
BMP	Pond	BASE	6.02	744.50	747.00	71439	0.02	0.00	0.0	0.0
BMP	Pond	BASE	6.27	744.50	747.00	71440	0.02	0.00	0.0	0.0
BMP	Pond	BASE	6.52	744.50	747.00	71441	0.03	0.00	0.0	0.0
BMP	Pond	BASE	6.77	744.50	747.00	71442	0.03	0.00	0.0	0.0
BMP	Pond	BASE	7.02	744.50	747.00	71443	0.04	0.00	0.0	0.0
BMP	Pond	BASE	7.27	744.50	747.00	71445	0.05	0.00	0.0	0.0
BMP	Pond	BASE	7.52	744.50	747.00	71446	0.06	0.00	0.0	0.0
BMP	Pond	BASE	7.77	744.50	747.00	71449	0.07	0.00	0.0	0.0
BMP	Pond	BASE	8.02	744.50	747.00	71451	0.08	0.00	0.0	0.0
BMP	Pond	BASE	8.27	744.51	747.00	71454	0.09	0.00	0.0	0.0
BMP	Pond	BASE	8.52	744.51	747.00	71457	0.10	0.00	0.0	0.0
BMP	Pond	BASE	8.77	744.51	747.00	71460	0.10	0.00	0.0	0.0
BMP	Pond	BASE	9.02	744.51	747.00	71464	0.11	0.00	0.0	0.0
BMP	Pond	BASE	9.27	744.51	747.00	71467	0.12	0.00	0.0	0.0
BMP	Pond	BASE	9.52	744.51	747.00	71471	0.12	0.00	0.0	0.0
BMP	Pond	BASE	9.77	744.51	747.00	71476	0.16	0.00	0.0	0.0
BMP	Pond	BASE	10.02	744.52	747.00	71483	0.25	0.00	0.0	0.0
BMP	Pond	BASE	10.27	744.52	747.00	71491	0.28	0.00	0.0	0.0
BMP	Pond	BASE	10.52	744.52	747.00	71501	0.30	0.00	0.0	0.0
BMP	Pond	BASE	10.77	744.53	747.00	71511	0.32	0.00	0.0	0.0
BMP	Pond	BASE	11.02	744.53	747.00	71522	0.33	0.00	0.1	0.0
BMP	Pond	BASE	11.27	744.54	747.00	71533	0.35	0.00	0.1	0.0
BMP	Pond	BASE	11.52	744.54	747.00	71544	0.36	0.00	0.1	0.0
BMP	Pond	BASE	11.77	744.55	747.00	71557	0.38	0.00	0.1	0.0
BMP	Pond	BASE	12.02	744.55	747.00	71569	0.40	0.00	0.1	0.0
BMP	Pond	BASE	12.27	744.56	747.00	71585	0.54	0.01	0.1	0.0
BMP	Pond	BASE	12.52	744.56	747.00	71604	0.64	0.01	0.1	0.0
BMP	Pond	BASE	12.77	744.57	747.00	71625	0.67	0.01	0.1	0.0
BMP	Pond	BASE	13.02	744.58	747.00	71647	0.70	0.01	0.1	0.0
BMP	Pond	BASE	13.27	744.59	747.00	71670	0.72	0.01	0.1	0.0
BMP	Pond	BASE	13.52	744.60	747.00	71693	0.74	0.02	0.2	0.0
BMP	Pond	BASE	13.77	744.61	747.00	71717	0.76	0.02	0.2	0.0
BMP	Pond	BASE	14.02	744.62	747.00	71742	0.78	0.02	0.2	0.0

JLM
10-5-12
BMP Time Series

Simulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af	
BMP	Pond	BASE	14.27	744.63	747.00	71767	0.80	0.03	0.2	0.0	
BMP	Pond	BASE	14.52	744.64	747.00	71792	0.81	0.03	0.2	0.0	
BMP	Pond	BASE	14.77	744.65	747.00	71817	0.80	0.04	0.2	0.0	
BMP	Pond	BASE	15.02	744.65	747.00	71842	0.81	0.04	0.3	0.0	
BMP	Pond	BASE	15.27	744.66	747.00	71868	0.82	0.05	0.3	0.0	
BMP	Pond	BASE	15.52	744.67	747.00	71893	0.83	0.05	0.3	0.0	
BMP	Pond	BASE	15.77	744.68	747.00	71919	0.84	0.06	0.3	0.0	
BMP	Pond	BASE	16.02	744.69	747.00	71945	0.85	0.06	0.3	0.0	
BMP	Pond	BASE	16.27	744.70	747.00	71970	0.86	0.07	0.3	0.0	
BMP	Pond	BASE	16.52	744.71	747.00	71996	0.87	0.08	0.4	0.0	
BMP	Pond	BASE	16.77	744.72	747.00	72022	0.87	0.08	0.4	0.0	
BMP	Pond	BASE	17.02	744.73	747.00	72045	0.70	0.09	0.4	0.0	
BMP	Pond	BASE	17.27	744.74	747.00	72062	0.52	0.10	0.4	0.0	
BMP	Pond	BASE	17.52	744.74	747.00	72075	0.49	0.10	0.4	0.0	
BMP	Pond	BASE	17.77	744.75	747.00	72088	0.49	0.10	0.4	0.0	
BMP	Pond	BASE	18.02	744.75	747.00	72100	0.49	0.11	0.4	0.0	
BMP	Pond	BASE	18.27	744.76	747.00	72113	0.49	0.11	0.5	0.0	
BMP	Pond	BASE	18.52	744.76	747.00	72125	0.50	0.12	0.5	0.0	
BMP	Pond	BASE	18.77	744.77	747.00	72138	0.50	0.12	0.5	0.0	
BMP	Pond	BASE	19.02	744.77	747.00	72150	0.50	0.12	0.5	0.0	
BMP	Pond	BASE	19.27	744.78	747.00	72162	0.49	0.13	0.5	0.0	
BMP	Pond	BASE	19.52	744.78	747.00	72172	0.36	0.13	0.5	0.0	
BMP	Pond	BASE	19.77	744.78	747.00	72179	0.32	0.13	0.5	0.0	
BMP	Pond	BASE	20.02	744.79	747.00	72185	0.32	0.13	0.5	0.0	
BMP	Pond	BASE	20.27	744.79	747.00	72191	0.32	0.14	0.5	0.0	
BMP	Pond	BASE	20.52	744.79	747.00	72196	0.32	0.14	0.5	0.0	
BMP	Pond	BASE	20.77	744.79	747.00	72202	0.32	0.14	0.5	0.1	
BMP	Pond	BASE	21.02	744.79	747.00	72208	0.32	0.14	0.5	0.1	
BMP	Pond	BASE	21.27	744.80	747.00	72214	0.32	0.14	0.5	0.1	
BMP	Pond	BASE	21.52	744.80	747.00	72219	0.32	0.15	0.6	0.1	
BMP	Pond	BASE	21.77	744.80	747.00	72224	0.29	0.15	0.6	0.1	
BMP	Pond	BASE	22.02	744.80	747.00	72228	0.24	0.15	0.6	0.1	
BMP	Pond	BASE	22.27	744.80	747.00	72231	0.23	0.15	0.6	0.1	
BMP	Pond	BASE	22.52	744.80 PEAK	747.00	72234	0.23	0.15	0.6	0.1	
BMP	Pond	BASE	22.77	744.81	747.00	72236	0.23	0.15	0.6	0.1	PEAK ELEVATION
BMP	Pond	BASE	23.02	744.81	747.00	72239	0.23	0.15	0.6	0.1	
BMP	Pond	BASE	23.27	744.81	747.00	72241	0.23	0.15	0.6	0.1	
BMP	Pond	BASE	23.52	744.81	747.00	72244	0.23	0.15	0.6	0.1	
BMP	Pond	BASE	23.77	744.81	747.00	72246	0.23	0.16	0.6	0.1	
BMP	Pond	BASE	24.02	744.81	747.00	72248	0.22	0.16	0.6	0.1	
BMP	Pond	BASE	24.27	744.81	747.00	72248	0.06	0.16	0.6	0.1	
BMP	Pond	BASE	24.52	744.81	747.00	72244	0.01	0.15	0.6	0.1	
BMP	Pond	BASE	24.77	744.81	747.00	72239	0.00	0.15	0.6	0.1	
BMP	Pond	BASE	25.02	744.80	747.00	72234	0.00	0.15	0.6	0.1	
BMP	Pond	BASE	25.27	744.80	747.00	72229	0.00	0.15	0.6	0.1	
BMP	Pond	BASE	25.52	744.80	747.00	72224	0.00	0.15	0.6	0.1	
BMP	Pond	BASE	25.77	744.80	747.00	72219	0.00	0.15	0.6	0.1	
BMP	Pond	BASE	26.02	744.80	747.00	72215	0.00	0.14	0.6	0.1	
BMP	Pond	BASE	26.27	744.80	747.00	72210	0.00	0.14	0.6	0.1	
BMP	Pond	BASE	26.52	744.79	747.00	72205	0.00	0.14	0.6	0.1	
BMP	Pond	BASE	26.77	744.79	747.00	72201	0.00	0.14	0.6	0.1	
BMP	Pond	BASE	27.02	744.79	747.00	72196	0.00	0.14	0.6	0.1	
BMP	Pond	BASE	27.27	744.79	747.00	72192	0.00	0.14	0.6	0.1	
BMP	Pond	BASE	27.52	744.79	747.00	72187	0.00	0.14	0.6	0.1	
BMP	Pond	BASE	27.77	744.78	747.00	72183	0.00	0.13	0.6	0.1	
BMP	Pond	BASE	28.02	744.78	747.00	72179	0.00	0.13	0.6	0.1	
BMP	Pond	BASE	28.27	744.78	747.00	72174	0.00	0.13	0.6	0.1	

JLM
10-5-12
BMP Time Series

Simulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
BMP	Pond	BASE	28.52	744.78	747.00	72170	0.00	0.13	0.6	0.1
BMP	Pond	BASE	28.77	744.78	747.00	72166	0.00	0.13	0.6	0.1
BMP	Pond	BASE	29.02	744.78	747.00	72162	0.00	0.13	0.6	0.2
BMP	Pond	BASE	29.27	744.78	747.00	72158	0.00	0.13	0.6	0.2
BMP	Pond	BASE	29.52	744.77	747.00	72154	0.00	0.12	0.6	0.2
BMP	Pond	BASE	29.77	744.77	747.00	72150	0.00	0.12	0.6	0.2
BMP	Pond	BASE	30.02	744.77	747.00	72146	0.00	0.12	0.6	0.2
BMP	Pond	BASE	30.27	744.77	747.00	72142	0.00	0.12	0.6	0.2
BMP	Pond	BASE	30.52	744.77	747.00	72138	0.00	0.12	0.6	0.2
BMP	Pond	BASE	30.77	744.77	747.00	72134	0.00	0.12	0.6	0.2
BMP	Pond	BASE	31.02	744.76	747.00	72130	0.00	0.12	0.6	0.2
BMP	Pond	BASE	31.27	744.76	747.00	72126	0.00	0.12	0.6	0.2
BMP	Pond	BASE	31.52	744.76	747.00	72122	0.00	0.11	0.6	0.2
BMP	Pond	BASE	31.77	744.76	747.00	72119	0.00	0.11	0.6	0.2
BMP	Pond	BASE	32.02	744.76	747.00	72115	0.00	0.11	0.6	0.2
BMP	Pond	BASE	32.27	744.76	747.00	72111	0.00	0.11	0.6	0.2
BMP	Pond	BASE	32.52	744.76	747.00	72108	0.00	0.11	0.6	0.2
BMP	Pond	BASE	32.77	744.75	747.00	72104	0.00	0.11	0.6	0.2
BMP	Pond	BASE	33.02	744.75	747.00	72101	0.00	0.11	0.6	0.2
BMP	Pond	BASE	33.27	744.75	747.00	72097	0.00	0.11	0.6	0.2
BMP	Pond	BASE	33.52	744.75	747.00	72094	0.00	0.11	0.6	0.2
BMP	Pond	BASE	33.77	744.75	747.00	72090	0.00	0.10	0.6	0.2
BMP	Pond	BASE	34.02	744.75	747.00	72087	0.00	0.10	0.6	0.2
BMP	Pond	BASE	34.27	744.75	747.00	72084	0.00	0.10	0.6	0.2
BMP	Pond	BASE	34.52	744.75	747.00	72080	0.00	0.10	0.6	0.2
BMP	Pond	BASE	34.77	744.74	747.00	72077	0.00	0.10	0.6	0.2
BMP	Pond	BASE	35.02	744.74	747.00	72074	0.00	0.10	0.6	0.2
BMP	Pond	BASE	35.27	744.74	747.00	72071	0.00	0.10	0.6	0.2
BMP	Pond	BASE	35.52	744.74	747.00	72067	0.00	0.10	0.6	0.2
BMP	Pond	BASE	35.77	744.74	747.00	72064	0.00	0.10	0.6	0.2
BMP	Pond	BASE	36.02	744.74	747.00	72061	0.00	0.10	0.6	0.2
BMP	Pond	BASE	36.27	744.74	747.00	72058	0.00	0.09	0.6	0.2
BMP	Pond	BASE	36.52	744.74	747.00	72055	0.00	0.09	0.6	0.2
BMP	Pond	BASE	36.77	744.73	747.00	72052	0.00	0.09	0.6	0.2
BMP	Pond	BASE	37.02	744.73	747.00	72049	0.00	0.09	0.6	0.2
BMP	Pond	BASE	37.27	744.73	747.00	72046	0.00	0.09	0.6	0.2
BMP	Pond	BASE	37.52	744.73	747.00	72043	0.00	0.09	0.6	0.2
BMP	Pond	BASE	37.77	744.73	747.00	72040	0.00	0.09	0.6	0.2
BMP	Pond	BASE	38.02	744.73	747.00	72037	0.00	0.09	0.6	0.2
BMP	Pond	BASE	38.27	744.73	747.00	72034	0.00	0.09	0.6	0.2
BMP	Pond	BASE	38.52	744.73	747.00	72031	0.00	0.09	0.6	0.2
BMP	Pond	BASE	38.77	744.73	747.00	72028	0.00	0.09	0.6	0.2
BMP	Pond	BASE	39.02	744.72	747.00	72026	0.00	0.09	0.6	0.2
BMP	Pond	BASE	39.27	744.72	747.00	72023	0.00	0.08	0.6	0.2
BMP	Pond	BASE	39.52	744.72	747.00	72020	0.00	0.08	0.6	0.2
BMP	Pond	BASE	39.77	744.72	747.00	72017	0.00	0.08	0.6	0.2
BMP	Pond	BASE	40.02	744.72	747.00	72015	0.00	0.08	0.6	0.2
BMP	Pond	BASE	40.27	744.72	747.00	72012	0.00	0.08	0.6	0.2
BMP	Pond	BASE	40.52	744.72	747.00	72009	0.00	0.08	0.6	0.2
BMP	Pond	BASE	40.77	744.72	747.00	72007	0.00	0.08	0.6	0.2
BMP	Pond	BASE	41.02	744.72	747.00	72004	0.00	0.08	0.6	0.3
BMP	Pond	BASE	41.27	744.72	747.00	72001	0.00	0.08	0.6	0.3
BMP	Pond	BASE	41.52	744.71	747.00	71999	0.00	0.08	0.6	0.3
BMP	Pond	BASE	41.77	744.71	747.00	71996	0.00	0.08	0.6	0.3
BMP	Pond	BASE	42.02	744.71	747.00	71994	0.00	0.08	0.6	0.3
BMP	Pond	BASE	42.27	744.71	747.00	71991	0.00	0.08	0.6	0.3
BMP	Pond	BASE	42.52	744.71	747.00	71989	0.00	0.08	0.6	0.3

JLM
10-5-12
BMP Time Series

Simulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
BMP	Pond	BASE	42.77	744.71	747.00	71986	0.00	0.08	0.6	0.3
BMP	Pond	BASE	43.02	744.71	747.00	71984	0.00	0.07	0.6	0.3
BMP	Pond	BASE	43.27	744.71	747.00	71981	0.00	0.07	0.6	0.3
BMP	Pond	BASE	43.52	744.71	747.00	71979	0.00	0.07	0.6	0.3
BMP	Pond	BASE	43.77	744.71	747.00	71977	0.00	0.07	0.6	0.3
BMP	Pond	BASE	44.02	744.71	747.00	71974	0.00	0.07	0.6	0.3
BMP	Pond	BASE	44.27	744.70	747.00	71972	0.00	0.07	0.6	0.3
BMP	Pond	BASE	44.52	744.70	747.00	71970	0.00	0.07	0.6	0.3
BMP	Pond	BASE	44.77	744.70	747.00	71967	0.00	0.07	0.6	0.3
BMP	Pond	BASE	45.02	744.70	747.00	71965	0.00	0.07	0.6	0.3
BMP	Pond	BASE	45.27	744.70	747.00	71963	0.00	0.07	0.6	0.3
BMP	Pond	BASE	45.52	744.70	747.00	71960	0.00	0.07	0.6	0.3
BMP	Pond	BASE	45.77	744.70	747.00	71958	0.00	0.07	0.6	0.3
BMP	Pond	BASE	46.02	744.70	747.00	71956	0.00	0.07	0.6	0.3
BMP	Pond	BASE	46.27	744.70	747.00	71954	0.00	0.07	0.6	0.3
BMP	Pond	BASE	46.52	744.70	747.00	71952	0.00	0.07	0.6	0.3
BMP	Pond	BASE	46.77	744.70	747.00	71949	0.00	0.07	0.6	0.3
BMP	Pond	BASE	47.02	744.69	747.00	71947	0.00	0.07	0.6	0.3
BMP	Pond	BASE	47.27	744.69	747.00	71945	0.00	0.06	0.6	0.3
BMP	Pond	BASE	47.52	744.69	747.00	71943	0.00	0.06	0.6	0.3
BMP	Pond	BASE	47.77	744.69	747.00	71941	0.00	0.06	0.6	0.3
BMP	Pond	BASE	48.01	744.69	747.00	71939	0.00	0.06	0.6	0.3

— PEAK ELEVATION TIME + 24 HOURS

0.3 AC*FT REMAINING

0.12 REQUIRED

ADEQUATE

Job #11191R
Hydrology and Hydraulic Study of
City of Franklin Spec Building
Sept. 2012
Revised: October 5, 2012

EMERGENCY OVERFLOW CALCULATIONS

BANNING ENGINEERING

Worksheet for Pressure Pipe - 1

Project Description

Friction Method	Manning Formula
Solve For	Elevation at 1

Input Data

Pressure 1	0.00	psi
Pressure 2	0.00	psi
Elevation 2	744.60	ft
Length	598.00	ft
Roughness Coefficient	0.012	
Diameter	2.50	ft
Discharge	25.65	ft^3/s X2 = 51.3 CFS REQUIRED

Results

Elevation 1	746.59	ft
Headloss	1.99	ft
Energy Grade 1	747.02	ft *
Energy Grade 2	745.02	ft
Hydraulic Grade 1	746.59	ft
Hydraulic Grade 2	744.60	ft
Flow Area	4.91	ft^2
Wetted Perimeter	7.85	ft
Velocity	5.23	ft/s
Velocity Head	0.42	ft
Friction Slope	0.00333	ft/ft

WEIR CAPACITY

PROJECT NAME:	Franklin Building	DATE:	10/5/2012
DESIGNER:	JLM	JOB No.:	11191R

Purpose: To compute the maximum discharge for a weir section and compare it to the requied design discharge.

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 _____ _________ _________ _________ _________ _
|                                               |
|                                               |
|          \_____ _____                  /      |
|           \       |                   /       |
|      S:1   \      | allow. Depth (H)  /  S:1  |
|             \___ _|_________ _________/       |
|                     B                         |
|                                               |
|                TRAPEZOIDAL  WEIR              |
|_____ _________ _________ _________ _________ _|
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======== ======== ======== ======== ======== ======== ======== ========

INPUT:

Enter Weir No. :	Pond Overflow	
Enter Bottom Width, (B):	30	ft.
Enter Side Slopes, (S):	4 : 1	
Enter Allowable Depth (H):	0.65	ft.

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OUTPUT CALCULATIONS:

Area :	21.19	sft.	
Velocity :	2.50	fps.	
Discharge :	52.9	cfs.	Q=3.367(b)(H)^(3/2) Cipolletti Weir Equation

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SUMMARY:

Pond Inflow :	41.04		
Design Discharge :	51	cfs. } |	SATISFACTORY
Maximum Discharge :	53	cfs. } |	

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DITCH CAPACITY

Worksheet for Trapezoidal Channel - 1

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.300	
Channel Slope	0.00200	ft/ft
Normal Depth	3.00	ft
Left Side Slope	5.50	ft/ft (H:V)
Right Side Slope	6.00	ft/ft (H:V)
Bottom Width	5.00	ft

Results

Discharge	20.80	ft^3/s ← DITCH CAPACITY
Flow Area	66.75	ft^2
Wetted Perimeter	40.02	ft
Top Width	39.50	ft
Critical Depth	0.63	ft
Critical Slope	1.73654	ft/ft
Velocity	0.31	ft/s
Velocity Head	0.00	ft
Specific Energy	3.00	ft
Froude Number	0.04	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

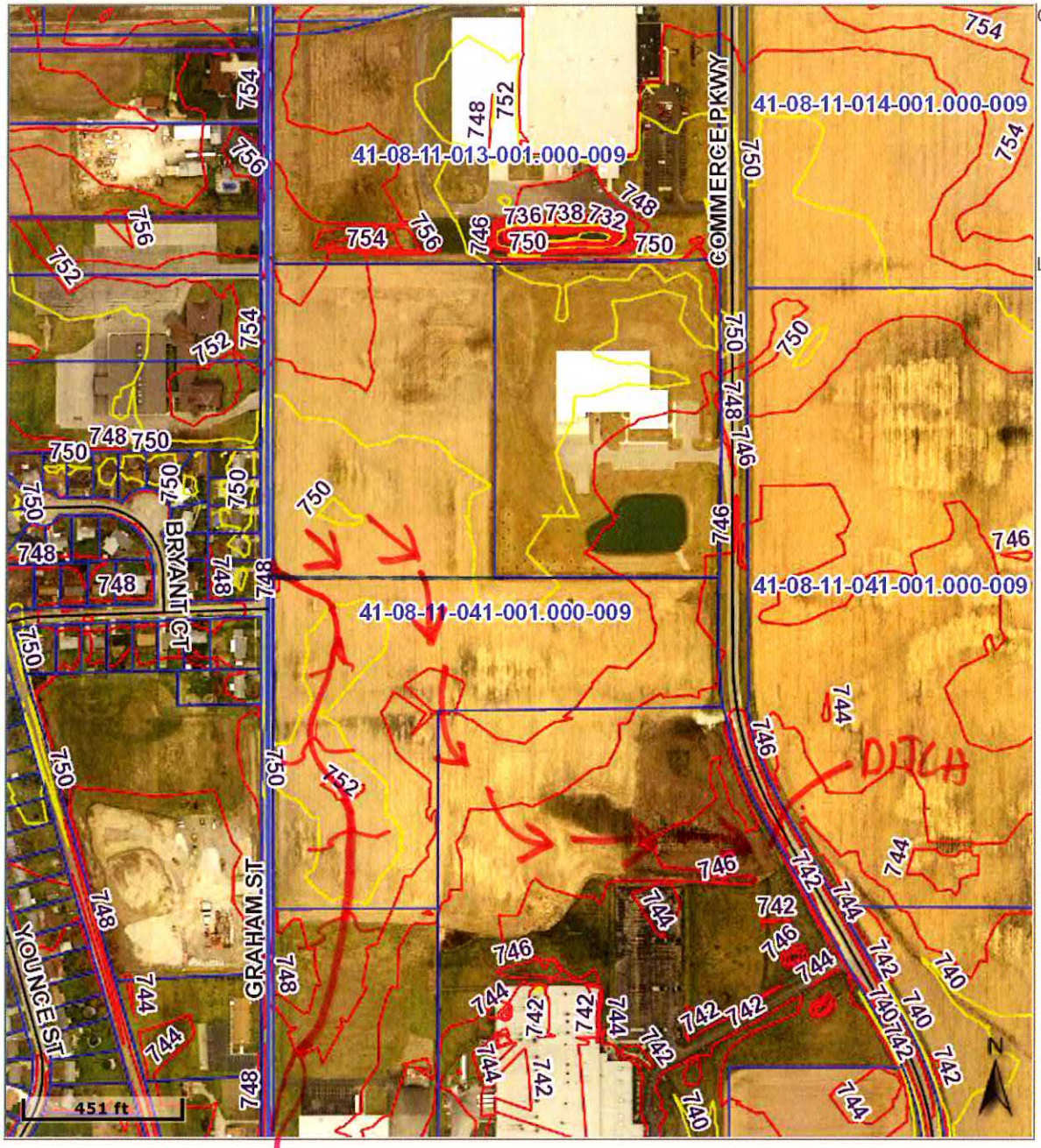
GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.00	ft
Critical Depth	0.63	ft
Channel Slope	0.00200	ft/ft
Critical Slope	1.73654	ft/ft

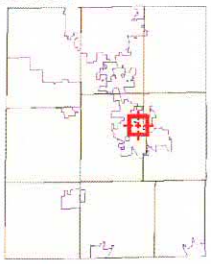
Johnson County, IN

beacon™

Date Created: 10/5/2012



Overview



Legend

- Cities
- Townships
- Parcels

Roads

- ACCESS RAMP
- INTERSTATE
- LOCAL
- MAJOR ARTERIAL
- MAJOR COLLECTOR
- MINOR ARTERIAL
- MINOR COLLECTOR
- PRIVATE ROAD

1997 Contours

- 10
- 2
- 20

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