Omaha City Planning Department

APPLICATION

SUBDIVISION PLAT

Name of Addition  Blue Sage Creek 2  SID #  575

<table>
<thead>
<tr>
<th>Preliminary</th>
<th>Revised Preliminary</th>
<th>Final</th>
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Property Owner(s)  Darlene Backhaus 5002 S 237 Cir Omaha, NE  68022

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>Zip</th>
<th>Phone #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darlene Backhaus</td>
<td>5002 S 237 Cir Omaha, NE</td>
<td>68022</td>
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Applicant  Lanoha Pacific, Inc. c/o Dave Lanoha 19111 W Center Rd Omaha, NE  68130

<table>
<thead>
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<th>Name</th>
<th>Address</th>
<th>Zip</th>
<th>Phone #</th>
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<tbody>
<tr>
<td>John Coolidge</td>
<td>19111 W Center Rd Omaha, NE</td>
<td>68130</td>
<td>402-289-5528</td>
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Contact  John Coolidge c/o Lamp Rynearson 14710 W. Dodge Rd Omaha, NE  68154

<table>
<thead>
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<th>Name</th>
<th>Address</th>
<th>Zip</th>
<th>Phone #</th>
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</thead>
<tbody>
<tr>
<td>John Coolidge</td>
<td>14710 W. Dodge Rd Omaha, NE</td>
<td>68154</td>
<td>402-496-2498</td>
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General Location/Address  George B Lake Parkway & F St. Omaha, NE (Attach Legal Description)

**Total Area**  30.833 (Acres)  **Total Lots**  69

Existing Zoning  AG

Projected Total Taxable Valuation

**Development Plans:**

<table>
<thead>
<tr>
<th>Lot#s</th>
<th>Zoning</th>
<th>Total Lots</th>
<th>Acres</th>
<th>Residential (No. of Units)</th>
<th>Office/Commercial (Square Feet)</th>
<th>Value/Price (w/Improvements)</th>
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<tbody>
<tr>
<td>1-66</td>
<td>R4</td>
<td>66</td>
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Total 66  30.833  66

Yes  No

☐  ☒ A property owners' association is to be formed. If yes, attach copies of covenants.

☐  ☒ Exceptions to the standard form subdivision agreement are proposed. If yes, attach a statement of changes.

☐  ☒ Waivers to design standards, improvements or plat certifications are proposed. If yes, attach a request letter.

☐  ☒ This subdivision will be processed as a series of phased final plats. If yes, include phase boundaries on the preliminary plat. Changes in boundaries will require a revised preliminary.

If you have any questions about this application form or submission dates, please contact the Current Planning Division at 444-5150.

Owner’s Signature  Applicant Signature (If not the property owner, the applicant certifies with this signature to be the authorized agent of the property owner.)
**Source and Use of Funds:** (Provide a separate sheet for the preliminary plat and for each final plat phase.)

<table>
<thead>
<tr>
<th>Proposed Improvements</th>
<th>Quantity</th>
<th>Construction Cost</th>
<th>Total (1) Cost</th>
<th>Financing (2)</th>
<th>General Obligation</th>
<th>Special</th>
<th>Reimbursable</th>
<th>Private</th>
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<tr>
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(1) Total cost includes the addition of legal, engineering, and fiscal fees, and interest.
(2) Attach a statement of assumptions used as a basis for preliminary projections.
(3) Indicate any need to relocate on- or off-site lines.

Date ______________________________
July 17, 2017

John Coolidge, Jr., PE
Lamp, Rynearson & Associates
14710 West Dodge Road, Suite 100
Omaha, NE 68154

Re: Northeast of 212th and “F” Streets
Pre-application letter

Dear Mr. Coolidge:

Thank you for submitting your concept proposal for review. The development review process works best when we are able to clearly communicate our expectations so you can resolve any issues identified during the review. Brief comments from the Planning, Parks and Public Works Departments are provided below. They are intended to help you receive a timely approval of your project. Additional comments may result from the specific and detailed application submittal.

1. The subject property is approximately 23.54 acres in size and currently zoned AG-Agricultural District.

2. The property will need to be subdivided. Approval of a separate preliminary and final plat, in compliance with Chapter 53 Subdivision of the Omaha Municipal Code, will be required to be approved by the Planning Board and City Council.

3. The property is designated as low density residential in the Future Land Use Element of the City’s Master Plan. The property can be rezoned to a low density residential zoning classification (R1-R5).

4. Coordinate with the Public Works Department regarding the necessary improvements and right-of-way dedication for “F” Street.

5. Prepare and submit drainage computations with the project grading plan. That plan should include provisions for erosion and sediment control acceptable to the Public Works Department.

6. Either provide the noise attenuation easement on all lots adjacent to “F” Street or construct the arterial street to the ultimate section.

7. Proposed Lots 7-10 will not be allowed to back up to the future George B. Lake Parkway programmed to the east of these lots.

8. If the development is to include a portion of George B. Lake Parkway, the necessary right-of-way will need to be 65’, along with a 35’ no-build easement on each side of the right-of-way.
9. A wetland analysis will be required to be submitted with an application for preliminary plat approval. If the analysis indicates that mitigation will be necessary, a mitigation plan will need to be submitted and approved prior to a final plat being recommended for approval by the Planning Board.

10. A tree canopy analysis will be required to be submitted with an application for preliminary plat approval. If the analysis indicates that mitigation will be necessary, a mitigation plan will need to be submitted and approved prior to a final plat being recommended for approval by the Planning Board.

11. All drainageways must be encapsulated within outlots that are adequately sized to encompass the 3:1+20' (3:1 = 50' where applicable) or the 100 year storm, whichever is greater.

12. Traffic calming must be provided on all streets in excess of 1,000 feet.

13. Direct access to “F” Street from individual lots will not be allowed and will be required to be so noted on the plat.

14. Sidewalks will need to be provided as required by the Municipal Code. Provisions for installation and maintenance of sidewalks along both sides of double fronted lots will be required to be included in the subdivision agreement.

15. All public improvement costs over the allowed 4.0 debt ratio must be covered as a private cost.

16. Compliance with all applicable stormwater management ordinances and policies will be required.

17. The project must comply with all other provisions of the Zoning (Chap. 55) and Subdivision (Chap. 53) Ordinances.

The Department recommends that you meet with the property owners of record, at a minimum, within 300 feet of the subject property regarding your proposal prior to submitting any application to the Planning Board for approval.

If you have any questions or want to schedule a follow-up meeting, please contact Eric Englund, Acting Manager, Current Planning at 402-444-5150, ext. 2058.

Sincerely,
OMAHA CITY PLANNING DEPARTMENT

David K. Fanslau
Planning Director
## BLUE SAGE CREEK 2 (LOTS 1-66)  
ORDER OF MAGNITUDE COST ESTIMATE  
EXHIBIT D (1 OF 2)

<table>
<thead>
<tr>
<th>Proposed Improvement</th>
<th>Quantity</th>
<th>Unit</th>
<th>Construction Cost</th>
<th>Total Cost</th>
<th>General Obligation</th>
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<td>700</td>
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|                    | Total |     |                  |            |                   |         |             |
|                    | $3,175,000.00 | $4,322,520.00 | $2,168,620.00 | $1,705,100.00 | $448,800.00 |

Specials per Lot $25,800.00  
Debt Ratio 7.06%

### ASSESSABLE VALUATION

<table>
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<tr>
<th>% of Valuation</th>
<th>Residential Lot 66 Units</th>
<th>Total 66 Units</th>
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<tr>
<td>100%</td>
<td>$490,000.00</td>
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<tr>
<td>95%</td>
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<td>75%</td>
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<td>50%</td>
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Specials $25,835
# Blue Sage Creek All Phases

## ORDER OF MAG. COST ESTIMATE

**EXHIBIT D (2 OF 2) - FOR INFORMATION ONLY**

<table>
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<tr>
<th>Proposed Improvement</th>
<th>Phase</th>
<th>Debt Ratio</th>
<th>Construction Cost</th>
<th>Total Cost</th>
<th>General Obligation</th>
<th>Special</th>
<th>Reimbursable</th>
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<tbody>
<tr>
<td>Blue Sage Creek (Phase 1)</td>
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<td>4.59%</td>
<td>$7,646,758</td>
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<td>$4,735,412</td>
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<td>Blue Sage Creek 2 (Phase 2)</td>
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<td>Blue Sage Creek (Phase 3)</td>
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SubTotal | $15,945,958 | $22,058,648 | $8,978,132 | $10,504,186 | $1,307,661 |

**NUMBER OF LOTS = 465**

## ASSESSABLE VALUATION

<table>
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<th>3 - Phases</th>
<th>% of Phases</th>
<th>% of Valuation</th>
<th>100%</th>
<th>95%</th>
<th>Debt Ratio</th>
<th>Specials</th>
<th>Avg</th>
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<td>Blue Sage Creek 2 (Phase 2)</td>
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<td>13.6%</td>
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<td>3.98%</td>
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**Debt Ratio 3.98%**
August 12, 2019

Mr. Dave Fanslau  
Planning Department  
1819 Farnam Street, Suite 1110  
Omaha, NE 68183-1110

REFERENCE:  
Blue Sage Creek 2, Lots 1-66  
Preliminary Plat Application  
Job No. 0118064.02-002

Dear Mr. Fanslau:

Submitted herewith are application materials for Blue Sage Creek 2 (Lots 1 – 66), a proposed development to be located approximately at George B Lake Parkway and F St, on the north side of F St directly to the east of Blue Sage Creek (Lots 1-216) and west of Grandview Ridge Estates. It is our intent to annex Blue Sage Creek 2 into SID 575 Blue Sage Creek.

Documents enclosed are as follows:

1. Application for Subdivision Plat (Preliminary Plat) with Associated Application Fee  
   ($1,225 Base Fee) + ($12.50/Lot * (66 Lots + 3 outlots) = $2,087.50) + (T&T Fee = $50) = $2,137.50.
2. Preliminary Plat Exhibits (10 Copies Each);  
   a. Preliminary Plat;  
   b. Sanitary Sewer & Paving Plan;  
   c. Storm Sewer, Grading & Erosion Control Plan; and  
3. Street Profiles (4 sets, 7 sheets each set).
4. Source and Use of Funds-Total – 3 copies.
5. Cul-de-sac Justification and Exhibits.
6. Tree Canopy Analysis Plan – 3 copies.
7. Draft Subdivision Agreement.
10. Pre-application Letter.
11. A CD with a Complete Copy of this Submittal in PDF Format.
Below are our responses to comments received from the City of Omaha Planning Department during the preapplication meeting on June 17, 2017.

1. **Comment:** The subject property is approximately 23.54 acres in size and currently zoned AG-Agriculture District.

   **Response:** Agreed.

2. **Comment:** The property will need to be subdivided. Approval of a separate preliminary and final plat, in compliance with Chapter 53 Subdivision of the Omaha Municipal Code, will be required to be approved by the Planning Board and City Council.

   **Response:** Agree.

3. **Comment:** The property is designated as low density residential in the Future Land Use Element of the City’s Master Plan. The property can be rezoned to a low density zoning classification (R1-R5).

   **Response:** Agree. We are proposing to rezone the property to an R4 zoning to match Blue Sage Creek (Lots 1–216).

4. **Comment:** Coordinate with the Public Works Department regarding the necessary improvements and right-of-way dedication for “F” Street.

   **Response:** We are proposing to dedicate 17’ of right-of-way along Blue Sage Creek 2’s F St frontage. We have also met with Douglas County to discuss the necessary “F” Street improvements. The current plan is to construct “F” Street to the ultimate three lane curb and gutter section.

5. **Comment:** Prepare and submit drainage computation with the project grading plan. That plan should include provisions for erosion and sediment control acceptable to the Public Works Department.

   **Response:** Agreed. A stormwater pollution prevention plan will be prepared and submitted for the city’s review and approval.

6. **Comment:** Either provide the noise attenuation easement on all lots adjacent to “F” Street or construct the arterial street to ultimate section.

   **Response:** We are proposing to construct “F” Street to the ultimate section so a noise attenuation easement would not be warranted.

7. **Comment:** Proposed Lots 7-10 will not be allowed to back up to the future George B. Lake Parkway programmed to the east of these lots.
Response: We have revised the layout so there are no lots backing up to George B. Lake Parkway.

8. Comment: If the development is to include a portion of George B. Lake Parkway, the necessary right-of-way will need to be 65’, along with a 35’ no-build easement on each side of the right-of-way.

Response: The necessary right-of-way and no-build easement has been provided.

9. Comment: A wetland analysis will be required to be submitted with an application for preliminary plat. If the analysis indicates that mitigation will be necessary, a mitigation plan will need to be submitted and approved prior to the final plat being recommended for approval by the Planning Board.

Response: A wetland delineation and assessment has been included stating the site contained no waters of the U.S.

10. Comment: A tree canopy analysis will be required to be submitted with an application for preliminary plat approval. If the analysis indicates that mitigation will be necessary, a mitigation plan will need to be submitted and approved prior to the final plat being recommended for approval by the Planning Board.

Response: A tree canopy analysis has been included with the preliminary plat submittal.

11. Comment: All drainageways must be encapsulated within outlots that are adequately sized to encompass the 3:1+20’ (3:1 = 50’ where applicable) or the 100-year storm, whichever is greater.

Response: The current plat limits do not encompass any drainage ways.

12. Comment: Traffic calming must be provided on all streets in excess of 1,000 ft.

Response: Agreed.

13. Comment: Direct access to “F” Street from individual lots will not be allowed and will be required to be so noted on the plat.

Response: Agreed.

14. Comment: Sidewalks will need to be provided as required by the Municipal Code. Provisions for installation and maintenance of sidewalks along both sides of double fronted lots will be required to be included in the subdivision agreement.

Response: The layout has been revised eliminating double fronted lots.
15. **Comment:** All public improvement costs over the allowed 4.0 debt ratio must be covered as a private cost.

   **Response:** The current debt ratio we are showing is below 4%. We will continue to coordinate with city staff to determine an acceptable debt ratio.

16. **Comment:** Compliance with all applicable stormwater management ordinances and policies will be required.

   **Response:** Agreed.

17. **Comment:** The project must comply with all other provisions of the Zoning (Chap. 55) and Subdivision (Chap. 53) ordinances.

   **Response:** Agreed.

Please call if you have any questions.

Sincerely,

LAMP RYNARSON

Caleb Snyder, P.E.
Senior Project Engineer

Enclosures
August 12, 2019

Mr. Dave Fanslau  
City of Omaha, Planning Department  
1819 Farnam Street, Suite 1110  
Omaha, NE 68183-1110

REFERENCE:  Blue Sage Creek 2  
             Cul-de-sac Justification  
             Job No. 0116028.02-002

Dear Mr. Fanslau:

During our pre-application meeting for Blue Sage Creek 2 on July 23, 2019, we discussed the layout, specifically pertaining to the two (2) proposed cul-de-sacs. City staff requested the project demonstrate the need for more than one (1) cul-de-sac. This letter serves as a summary of the challenges encountered during the design and how we arrived at the multiple cul-de-sac layout. The site presents itself with challenges for development which limit the layout options. Discussed below, in detail, are four (4) significant challenges which were encountered.

The first significant constraint is a large 54” M.U.D. water main which runs north to south along the entire length of the eastern edge of the site. M.U.D. must be able to access and perform maintenance on the line, therefore there are strict limitations to the amount of fill or cut which can occur over the water line and regarding the water line location in relation to a lot or street. One of the main goals in laying out the neighborhood was to minimize the number of times the development crossed the main, either with roads or sewers while providing MUD with adequate access.

The second significant constraint is the three (3) fixed connection points for a relatively small (30 acre) project. These occur to the south at F Street, to the west at Blue Sage Creek, and to the east at George B Lake Parkway. Connections to the adjacent neighborhoods must occur at these locations. The fixed locations and small project limit the flexibility to design the project. The result is the locations of the interior roads are relatively fixed.

The third significant constraint is the significant elevation change which occurs across the relatively small site. The site generally slopes from the west to east and in the most extreme case there is approximately 70’ of elevation change. This results in existing site slopes which range from 8% up to 15%.

The fourth significant constraint is the large amount of general obligation expenses which are attached to the development of the site. There are significant improvements to F Street which must occur, and George B Lake Parkway must be extended to Grandview Ridge Estates. As part of this extension, a large culvert is required for the creek crossing. To accommodate the significant amount of general obligation expenses, a certain valuation is needed. To reach this valuation a certain number of lots are required to keep the debt ratio to an acceptable level.

These four constraints all played a part in the design development of the site and ultimately to the layout which is shown on the preliminary plat. As requested during the pre-application meeting, we have evaluated alternative
Blue Sage Creek 2
Cul-de-sac Justification
Job No. 0116028.02-002
August 12, 2019
Page 2

options to the current layout which eliminate the Howe Circle cul-de-sac. A total of three (3) different options were evaluated and discussed in more detail below.

Option 1 consists of connecting Howe Circle to South 210th Circle. See the enclosed street connection exhibit, Option 1. To make the connection between the two (2) streets, 12’ of fill would be placed over the existing MUD water line, which is more than M.U.D. would allow. This option also adds another permanent crossing to the water main which has the potential for future street closures for water main maintenance.

Option 2 connected Howe Circle to E Street. See the enclosed street connection exhibit, Option 2. This connection eliminated an existing site drainage pattern. In evaluating the feasibility of this option, it was determined relocating this existing drainage path resulted in a large amount of additional fill required, which in turn kept the site earthwork volumes from balancing on-site. Proceeding with this option would have resulted in fills exceeding 10’ in this area and required over 50,000 cubic yards of soil to be imported to the site. The cost of importing this soil would make the project financially unfeasible.

Option 3 connected Howe Circle to D Street. See the enclosed street connection exhibit, Option 3. This option resulted in an extremely inefficient lot layout which resulted in a loss of three (3) lots. The elimination of these three (3) lots resulted in a loss of $1,470,000 in valuation, resulting in a higher than 4% debt ratio. The reduction in lots also increased the specially assessed cost per lot to a point which call into question the project feasibility.

Given the existing constraints on the site and having evaluated numerous alternatives, we have determined the two (2) cul-de-sac layout is the only viable solution to meet the needs of the development and the SID. The prosed layout meets the 4% max debt ratio, accommodates the existing M.U.D. water main, does not create a need for soil to be imported on site, utilizes the existing sanitary sewer connection point, and maintains existing drainage patterns.

Thank you for your consideration of this important item.

Please call if you have any questions.

Sincerely,

LAMP RYNARSON

Caleb Snyder, P.E.
Senior Project Engineer

Enclosures
BLUE SAGE CREEK 2
LAMP RYNEARSON JOB 0116028.22-040

PRELIMINARY DRAINAGE STUDY

PREPARED BY LAMP RYNEARSON

August 12, 2019

______________________________
Caleb Snyder, P.E.
Senior Project Engineer

______________________________
John E. Coolidge, Jr., P.E.
Senior Project Engineer
TABLE OF CONTENTS

Introduction and Storm Drainage Methods  A
Preliminary Storm Sewer Design Calculations  B
Design Tables and Graphs  C
Preliminary Drainage and PCSMP Map  D
A
INTRODUCTION
AND
STORM DRAINAGE METHODS
INTRODUCTION

Blue Sage Creek 2 is a proposed 20-acre residential development located within the SE ¼ of the SW ¼ and SE ¼ of the SW ¼ of Section 36, Township 14 North, Range 10, East of the 6th Prime Meridian of Douglas County, Nebraska. The development contains 66 single family residential lots.

The site is bounded on the east by Grandview Ridge Estates an existing residential development and on the west by Blue Sage Creek an existing residential development. It is bounded on the north by farm ground owned by Papio-Missouri NRD and to the south by Rohwer Brothers LLC. As part of a separate project F St is being improved to a three-lane curb and gutter section. The F St project will be completing and submitting a separate drainage study for review and comments.

DRAINAGE STUDY

Per City of Omaha regulations, the peak flow of the 2, 10, and 100-year storm events in post construction conditions must meet the corresponding 2, 10 and 100 year peak flow in pre-construction conditions. In additions, a Post Construction Stormwater Management Plan must be developed to treat the first 1/2” of rainfall runoff onsite to the maximum extent practical.

Storm flows on site are split into 3 areas. Two areas will drain into a proposed regional combination stormwater detention/water quality ponds at designated areas. Due to site constraints one of the areas are unable to be captured. Drainage area B. The site will maintain a no net increase in pre-construction conditions. The locations of the ponds are identified in the Preliminary Drainage and PCSMP Map (See Section E).

<table>
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<tr>
<th>BLUE SAGE CREEK 2</th>
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<tr>
<td><strong>PRE DEVELOPMENT</strong></td>
</tr>
<tr>
<td><strong>BASIN</strong></td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
</tr>
</tbody>
</table>

| **POST DEVELOPMENT** |
| **BASIN** | **TOTAL BASIN AREA (SF)** | **TOTAL BASIN AREA (ACRES)** | **COMPOSIT RUNOFF COEFFICIENT** | **COMPOSIT CURVE NUMBER** |
| A | 640,332 | 14.70 | 0.52 | 72 |
| B | 341,075 | 7.83 | 0.52 | 72 |
| C | 183,823 | 4.22 | 0.52 | 72 |
| **TOTAL** | **26.75** | **0.52** | **72** |
Offsite drainage from the property has been accounted for. This area is shown on the Preliminary Drainage and PCSMP Map as Area B.

**STORM DRAINAGE METHODS**

Storm flows for Blue Sage Creek 2 were analyzed according to the standards and practices as outlined in the *Omaha Regional Stormwater Design Manual* using the Soil Conservation Service (SCS) unit hydrograph method. Proposed basins and detention ponds were modeled with the Hydraflow Hydrographs computer program. Curve numbers for each basin were determined using Tables 2-8, 2-9, and 2-10, *Runoff Curve Numbers – Urban Areas, Cultivated Agricultural Land and Other Agricultural Lands from the Design Manual* (as taken for the USDA Urban Hydrology for Small Watersheds TR-55 manual). For existing site conditions, a curve number of 70 was used, this corresponds to a Class B soil group with existing row crops assumed to be contoured and terraced (2014 Omaha Regional Stormwater Design Manual). For post-construction conditions, a curve number of 72 was used, this corresponds to 1/3 acre lots and a Class B soil group.

Times of concentration for existing and proposed conditions were calculated using the TR-55 method, taking into account shallow concentrated flow, sheet flow, and channel flow across the site. The predevelopment and post development hydraulic flow paths were determined by analyzing the existing topography and proposed topography and also utilizing the proposed storm sewer. In order to determine the channel flow for the storm sewer, the average pipe size of the run was determined and assumed that the pipe was flowing half full. Assuming that the pipes were flowing half full is a conservative approach due to the fact that when flowing half full the pipes capacity is greater than flowing full, thus decreasing the channel flow time which increased the time of concentration. These assumptions were then used to determine a channel flow time that was then used to determine the time of concentration. For predevelopment sheet flow, a Manning’s value of 0.06 was used which corresponds to cultivated soils residue less than or equal to 20% and for post development a value of 0.24 was used which corresponds to dense grass.

A summary of pre- and post-conditions is shown below. In all cases, the post-construction peak flow release from the water quality/stormwater detention basins is at or below the pre-construction peak flow.
The internal storm sewer system for Blue Sage Creek 2 was analyzed according to the standards and practices as outlined in the *Omaha Regional Stormwater Design Manual* and was sized for a 10-year frequency storm event in a non-pressurized flow condition. The rational method (Q=CiA) is an approved method for pipe sizing for drainage areas less than 200 acres and was used to design the storm system. The runoff coefficient was assumed using the ultimate development of the site, using Table 2-3 of the *Omaha Regional Stormwater Design Manual*. The resulting coefficient used for this study was 0.52 for residential areas per the current *Omaha Regional Stormwater Design Manual*. An initial time of concentration of 10 minutes was used for the residential area. From the *Omaha Regional Stormwater Design Manual*, a time of concentration of 10 minutes yields an intensity of 6.9 in/hr. The storm sewer sizing is shown on the attached Computation Form.

**WATER QUALITY**

The stormwater detention basins will serve a dual purposed of providing water quality with the pond being designed to hold the first ½-inch volume that is required to be treated. The outlet structure will be designed to provide a slow release of the water quality volume over a 48-hour period as well as release the two-year storm flows to levels at or below pre-construction rates. Below is a summary of 1/2" volume required per basin and what is provided.

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<td>C</td>
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SUMMARY

Blue Sage Creek 2 is a proposed 20-acre residential development that will be constructed on the site being studied. Per City of Omaha regulations, the peak flow of 2, 10, and 100-year peak flow in pre-construction conditions. In addition, a Post Construction Stormwater Management Plan must be developed to treat the first $\frac{1}{2}''$ of rainfall runoff onsite to the maximum extent practical. To satisfy this requirement, a stormwater detention pond will be constructed that will also provide treatment for the first $\frac{1}{2}''$ of rainfall runoff onsite to the maximum extent practical. Based on these measures, the proposed storm sewer system will adequately provide the proper infrastructure for storm drainage as required by the methods and procedures of the *Omaha Regional Stormwater Design Manual*. 
B
PRELIMINARY STORM

SEWER DESIGN

CALCULATIONS
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T.O.C at Beginning of Pipe

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T.O.C at Beginning of Pipe

REMINDER: Check Storm Drain System Design For Major Storm Provisions

NOTES:
- Storm Frequency = 10 Year
- Manning's n = 0.013

8/8/2019 1:49 PM
Page 1

0116028-Omaha Storm Sewer Flow Design1.xlsm
### Storm Drainage System Design

#### By the Rational Method

**Pipe #3**

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**NOTES:**
- Storm Frequency = 10 Year
- Manning’s n = 0.013
- Storm Drainage System Design For Major Storm Provisions

**Watercourse Legend Fig. 2-C**
- FOR - Forest
- NBG - Bare Ground
- GWW - Grass Waterway
- GRA - Grass/Lawn
- SGF - Shallow Gutter Flow

**COMPUTATION FORM**

**Some SubDivision**

**Calculated By:**

**Name:**

**Prelim Design Date:**

**Drainage Area:**

**Final Design City Project No.:**

**Computed By:**

**Manager:**

**Date:**

**City Project No.:**

**City Project No.:**

**Some Area**

**LRA Project No.:**

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REMINDER: Check Storm Drain System Design For Major Storm Provisions

Watercourse Legend Fig. 2-2
FOR - Forest
NBG - Bare Ground
FAL - Fallow
GRA - Grass/Lawn
GWW - Grass Waterway
SGF - Shallow Gutter Flow

NOTES:
Storm Frequency = 10 Year
Manning's n = 0.013

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<td>1.732</td>
<td>729</td>
<td>12,373</td>
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<td>3,167</td>
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<tr>
<td>9</td>
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<td>28.66</td>
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</tbody>
</table>
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2 Thursday, 08 / 8 / 2019

Hyd. No. 1
Post_Dev_A

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 14.700 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 3.00 in
Storm duration = 24 hrs

Peak discharge = 18.28 cfs
Time to peak = 720 min
Hyd. volume = 43,120 cuft
Curve number = 72
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

Post_Dev_A
Hyd. No. 1 -- 2 Year
Hydrograph Report

Hyd. No. 2
POND A- POST

Hydrograph type = Reservoir
Storm frequency = 2 yrs
Time interval = 1 min
Inflow hyd. No. = 1 - Post_Dev_A
Reservoir name = Pond A

Peak discharge = 2.407 cfs
Time to peak = 748 min
Hyd. volume = 43,105 cuft
Max. Elevation = 1192.39 ft
Max. Storage = 14,788 cuft

Storage Indication method used.

POND A- POST
Hyd. No. 2 -- 2 Year

Hyd No. 2

Total storage used = 14,788 cuft
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Thursday, 08 / 8 / 2019

Hyd. No. 3

Pre Dev_A

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 14.700 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 3.00 in
Storm duration = 24 hrs

Peak discharge = 15.75 cfs
Time to peak = 720 min
Hyd. volume = 38,115 cuft
Curve number = 70
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

Pre Dev_A

Hyd. No. 3 -- 2 Year

Q (cfs)
0.00 3.00 6.00 9.00 12.00 15.00 18.00

Time (min)
0 120 240 360 480 600 720 840 960 1080 1200 1320 1440 1560

Q (cfs)
0.00 3.00 6.00 9.00 12.00 15.00 18.00

Hyd No. 3
Hyd. No. 4

Pre_Dev_B

Hydrograph type = SCS Runoff  Peak discharge = 8.390 cfs
Storm frequency = 2 yrs  Time to peak = 720 min
Time interval = 1 min  Hyd. volume = 20,302 cuft
Drainage area = 7.830 ac  Curve number = 70
Basin Slope = 0.0 %  Hydraulic length = 0 ft
Tc method = User  Time of conc. (Tc) = 10.00 min
Total precip. = 3.00 in  Distribution = Type II
Storm duration = 24 hrs  Shape factor = 484
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Thursday, 08 / 8 / 2019

Hyd. No. 5

Post_Dev_B

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 7.830 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 3.00 in
Storm duration = 24 hrs

Peak discharge = 9.738 cfs
Time to peak = 720 min
Hyd. volume = 22,968 cuft
Curve number = 72
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

---

**Post_Dev_B**

Hyd. No. 5 -- 2 Year

---

**Q (cfs)**

0.00 0.00 2.00 2.00 4.00 4.00 6.00 6.00 8.00 8.00 10.00

**Time (min)**

0 120 240 360 480 600 720 840 960 1080 1200 1320 1440 1560

---

**Hyd No. 5**
# Hyd. No. 6

**Pre_Dev_C**

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<tr>
<td>Time interval</td>
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</tr>
<tr>
<td>Drainage area</td>
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<td>Basin Slope</td>
<td>0.0 %</td>
</tr>
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<td>Tc method</td>
<td>User</td>
</tr>
<tr>
<td>Total precip.</td>
<td>3.00 in</td>
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<tr>
<td>Storm duration</td>
<td>24 hrs</td>
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<td>Peak discharge</td>
<td>4.522 cfs</td>
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<tr>
<td>Time to peak</td>
<td>720 min</td>
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<td>Hyd. volume</td>
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<td>0 ft</td>
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<td>Time of conc. (Tc)</td>
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<tr>
<td>Distribution</td>
<td>Type II</td>
</tr>
<tr>
<td>Shape factor</td>
<td>484</td>
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</tbody>
</table>

![Graph](image_url)
Hyd. No. 7

Post_Dev_C

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 4.220 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 3.00 in
Storm duration = 24 hrs

Peak discharge = 5.248 cfs
Time to peak = 720 min
Hyd. volume = 12,379 cuft
Curve number = 72
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484
Hyd. No. 8

Pond C- Post

Hydrograph type = Reservoir
Storm frequency = 2 yrs
Time interval = 1 min
Inflow hyd. No. = 7 - Post_Dev_C
Reservoir name = Pond C

Peak discharge = 1.732 cfs
Time to peak = 729 min
Hyd. volume = 12,373 cuft
Max. Elevation = 1210.40 ft
Max. Storage = 3,167 cuft

Storage Indication method used.

Pond C- Post

Hyd. No. 8 -- 2 Year

Total storage used = 3,167 cuft
Hyd. No. 9

Total Site Pre

Hydrograph type = Combine
Storm frequency = 2 yrs
Time interval = 1 min
Inflow hyds. = 3, 4, 6

Peak discharge = 28.66 cfs
Time to peak = 720 min
Hyd. volume = 69,359 cuft
Contrib. drain. area = 26.750 ac
Hyd. No. 10

Total Site Post

Hydrograph type = Combine
Storm frequency = 2 yrs
Time interval = 1 min
Inflow hyds. = 2, 5, 8

Peak discharge = 12.83 cfs
Time to peak = 720 min
Hyd. volume = 78,446 cuft
Contrib. drain. area = 7.830 ac
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<tr>
<th>Hyd. No.</th>
<th>Hydrograph type (origin)</th>
<th>Peak flow (cfs)</th>
<th>Time interval (min)</th>
<th>Time to Peak (min)</th>
<th>Hyd. volume (cuft)</th>
<th>Inflow hyd(s)</th>
<th>Maximum elevation (ft)</th>
<th>Total strge used (cuft)</th>
<th>Description</th>
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<tr>
<td>2</td>
<td>Reservoir</td>
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<td>1</td>
<td>725</td>
<td>101,082</td>
<td>1</td>
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<td>26,713</td>
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<td>720</td>
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<td>-----</td>
<td>-----</td>
<td>Pre_Dev_B</td>
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<tr>
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<td>SCS Runoff</td>
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<td>1</td>
<td>720</td>
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<td>-----</td>
<td>-----</td>
<td>Pre_Dev_C</td>
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<tr>
<td>7</td>
<td>SCS Runoff</td>
<td>12.82</td>
<td>1</td>
<td>720</td>
<td>29,022</td>
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<td>-----</td>
<td>-----</td>
<td>Post_Dev_C</td>
</tr>
<tr>
<td>8</td>
<td>Reservoir</td>
<td>11.04</td>
<td>1</td>
<td>723</td>
<td>29,017</td>
<td>7</td>
<td>1211.41</td>
<td>6,129</td>
<td>Pond C- Post</td>
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<tr>
<td>9</td>
<td>Combine</td>
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<td>1</td>
<td>720</td>
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<td>Total Site Pre</td>
</tr>
<tr>
<td>10</td>
<td>Combine</td>
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<td>1</td>
<td>722</td>
<td>183,949</td>
<td>2, 5, 8,</td>
<td>-----</td>
<td>-----</td>
<td>Total Site Post</td>
</tr>
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</table>

Return Period: 10 Year  
Thursday, 08 / 8 / 2019
Hyd. No. 1
Post_Dev_A

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 14,700 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 4.60 in
Storm duration = 24 hrs

Peak discharge = 44.65 cfs
Time to peak = 720 min
Hyd. volume = 101,097 cuft
Curve number = 72
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

Post_Dev_A
Hyd. No. 1 -- 10 Year

0.00 0.00 10.00 10.00 20.00 20.00 30.00 30.00 40.00 40.00 50.00 50.00

0.00 120 240 360 480 600 720 840 960 1080 1200 1320 1440 1560

Hyd No. 1
Hyd. No. 2

POND A- POST

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyd. No. = 1 - Post_Dev_A
Reservoir name = Pond A
Peak discharge = 27.42 cfs
Time to peak = 725 min
Hyd. volume = 101,082 cuft
Max. Elevation = 1193.81 ft
Max. Storage = 26,713 cuft

Storage Indication method used.

Total storage used = 26,713 cuft
Hyd. No. 3
Pre_Dev_A

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 14,700 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 4.60 in
Storm duration = 24 hrs

Peak discharge = 41.00 cfs
Time to peak = 720 min
Hyd. volume = 93,109 cuft
Curve number = 70
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484
**Hyd. No. 4**

**Pre_Dev_B**

Hydrograph type = SCS Runoff  
Storm frequency = 10 yrs  
Time interval = 1 min  
Drainage area = 7.830 ac  
Basin Slope = 0.0 %  
Tc method = User  
Total precip. = 4.60 in  
Storm duration = 24 hrs  

Peak discharge = 21.84 cfs  
Time to peak = 720 min  
Hyd. volume = 49,595 cuft  
Curve number = 70  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 10.00 min  
Distribution = Type II  
Shape factor = 484  

---

**Plot:**

Q (cfs)

0.00 4.00 8.00 12.00 16.00 20.00 24.00

0 120 240 360 480 600 720 840 960 1080 1200 1320 1440 1560

Time (min)

Hyd No. 4
Hyd. No. 5

Post_Dev_B

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<td>1 min</td>
</tr>
<tr>
<td>Drainage area</td>
<td>7.830 ac</td>
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<tr>
<td>Basin Slope</td>
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<td>Tc method</td>
<td>User</td>
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<tr>
<td>Total precip.</td>
<td>4.60 in</td>
</tr>
<tr>
<td>Storm duration</td>
<td>24 hrs</td>
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<tr>
<td>Peak discharge</td>
<td>23.78 cfs</td>
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<tr>
<td>Time to peak</td>
<td>720 min</td>
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<tr>
<td>Hyd. volume</td>
<td>53,850 cuft</td>
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<td>Curve number</td>
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<td>Time of conc. (Tc)</td>
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<tr>
<td>Shape factor</td>
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</tbody>
</table>

![Graph of Post_Dev_B Hydrograph](image-url)
Hyd. No. 6

**Pre_Dev_C**

- **Hydrograph type**: SCS Runoff
- **Peak discharge**: 11.77 cfs
- **Storm frequency**: 10 yrs
- **Time to peak**: 720 min
- **Time interval**: 1 min
- **Hyd. volume**: 26,729 cuft
- **Drainage area**: 4.220 ac
- **Curve number**: 70
- **Basin Slope**: 0.0%
- **Hydraulic length**: 0 ft
- **Tc method**: User
- **Time of conc. (Tc)**: 10.00 min
- **Total precip.**: 4.60 in
- **Distribution**: Type II
- **Storm duration**: 24 hrs
- **Shape factor**: 484

---

![Graph](image_url)
Hyd. No. 7

Post_Dev_C

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 4.220 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 4.60 in
Storm duration = 24 hrs

Peak discharge = 12.82 cfs
Time to peak = 720 min
Hyd. volume = 29,022 cuft
Curve number = 72
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484
Hyd. No. 8
Pond C- Post

Hydrograph type = Reservoir  Peak discharge = 11.04 cfs
Storm frequency = 10 yrs  Time to peak = 723 min
Time interval = 1 min  Hyd. volume = 29,017 cuft
Inflow hyd. No. = 7 - Post_Dev_C  Max. Elevation = 1211.41 ft
Reservoir name = Pond C  Max. Storage = 6,129 cuft

Storage Indication method used.

Pond C- Post
Hyd. No. 8 -- 10 Year

Hyd No. 8  Hyd No. 7  Total storage used = 6,129 cuft
Hyd. No. 9
Total Site Pre

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyds. = 3, 4, 6

Peak discharge = 74.61 cfs
Time to peak = 720 min
Hyd. volume = 169,433 cuft
Contrib. drain. area = 26.750 ac
Hyd. No. 10

Total Site Post

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyds. = 2, 5, 8

Peak discharge = 58.00 cfs
Time to peak = 722 min
Hyd. volume = 183,949 cuft
Contrib. drain. area = 7.830 ac
<table>
<thead>
<tr>
<th>Hyd. No.</th>
<th>Hydrograph type (origin)</th>
<th>Peak flow (cfs)</th>
<th>Time interval (min)</th>
<th>Time to Peak (min)</th>
<th>Hyd. volume (cuft)</th>
<th>Inflow hyd(s)</th>
<th>Maximum elevation (ft)</th>
<th>Total strge used (cuft)</th>
<th>Hydrograph Description</th>
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<td>722</td>
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<td>1</td>
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Return Period: 100 Year

Thursday, 08 / 8 / 2019
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Thursday, 08 / 8 / 2019

Hyd. No. 1

Post_Dev_A

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 14,700 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 6.67 in
Storm duration = 24 hrs

Peak discharge = 83.60 cfs
Time to peak = 719 min
Hyd. volume = 189,406 cuft
Curve number = 72
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

Q (cfs)

Hyd. No. 1 -- 100 Year

Q (cfs)
Hyd. No. 2
POND A- POST

Hydrograph type = Reservoir  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyd. No. = 1 - Post_Dev_A  
Reservoir name = Pond A

Peak discharge = 75.13 cfs  
Time to peak = 722 min  
Hyd. volume = 189,391 cuft  
Max. Elevation = 1194.83 ft  
Max. Storage = 36,847 cuft

Storage Indication method used.

POND A- POST
Hyd. No. 2 – 100 Year

Total storage used = 36,847 cuft
Hydr. No. 3
Pre_Develop_A

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<tr>
<th>Hydrograph type</th>
<th>SCS Runoff</th>
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<th>78.92 cfs</th>
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<tbody>
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<td>Time to peak</td>
<td>719 min</td>
</tr>
<tr>
<td>Time interval</td>
<td>1 min</td>
<td>Hyd. volume</td>
<td>178,543 cuft</td>
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<tr>
<td>Drainage area</td>
<td>14,700 ac</td>
<td>Curve number</td>
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<tr>
<td>Basin Slope</td>
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<td>Hydraulic length</td>
<td>0 ft</td>
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<td>Tc method</td>
<td>User</td>
<td>Time of conc. (Tc)</td>
<td>10.00 min</td>
</tr>
<tr>
<td>Total precip.</td>
<td>6.67 in</td>
<td>Distribution</td>
<td>Type II</td>
</tr>
<tr>
<td>Storm duration</td>
<td>24 hrs</td>
<td>Shape factor</td>
<td>484</td>
</tr>
</tbody>
</table>

![Graph showing hydrograph for Pre_Develop_A for Hyd. No. 3 -- 100 Year]
Hyd. No. 4

Pre_Dev_B

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 7.830 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 6.67 in
Storm duration = 24 hrs

Peak discharge = 42.04 cfs
Time to peak = 719 min
Hyd. volume = 95,102 cuft
Curve number = 70
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

Q (cfs)

Pre_Dev_B
Hyd. No. 4 -- 100 Year

Time (min)

Hyd No. 4
Hyd. No. 5

Post_Dev_B

Hydrograph type = SCS Runoff  Peak discharge = 44.53 cfs
Storm frequency = 100 yrs  Time to peak = 719 min
Time interval = 1 min  Hyd. volume = 100,888 cuft
Drainage area = 7.830 ac  Curve number = 72
Basin Slope = 0.0 %  Hydraulic length = 0 ft
Tc method = User  Time of conc. (Tc) = 10.00 min
Total precip. = 6.67 in  Distribution = Type II
Storm duration = 24 hrs  Shape factor = 484
Hyd. No. 6

Pre_Dev_C

Hydrograph type = SCS Runoff  Peak discharge = 22.66 cfs
Storm frequency = 100 yrs  Time to peak = 719 min
Time interval = 1 min  Hyd. volume = 51,255 cuft
Drainage area = 4.220 ac  Curve number = 70
Basin Slope = 0.0 %  Hydraulic length = 0 ft
Tc method = User  Time of conc. (Tc) = 10.00 min
Total precip. = 6.67 in  Distribution = Type II
Storm duration = 24 hrs  Shape factor = 484

Pre_Dev_C
Hyd. No. 6 -- 100 Year
Hyd. No. 7

Post_Dev_C

Hydrograph type = SCS Runoff  Peak discharge = 24.00 cfs
Storm frequency = 100 yrs  Time to peak = 719 min
Time interval = 1 min  Hyd. volume = 54,374 cuft
Drainage area = 4.220 ac  Curve number = 72
Basin Slope = 0.0 %  Hydraulic length = 0 ft
Tc method = User  Time of conc. (Tc) = 10.00 min
Total precip. = 6.67 in  Distribution = Type II
Storm duration = 24 hrs  Shape factor = 484
Hyd. No. 8
Pond C- Post

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyd. No. = 7 - Post_Dev_C
Reservoir name = Pond C

Peak discharge = 21.63 cfs
Time to peak = 722 min
Hyd. volume = 54,368 cuft
Max. Elevation = 1211.93 ft
Max. Storage = 7,880 cuft

Storage Indication method used.
Hyd. No. 9

Total Site Pre

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyds. = 3, 4, 6

Peak discharge = 143.61 cfs
Time to peak = 719 min
Hyd. volume = 324,900 cuft
Contrib. drain. area = 26.750 ac
**Hyd. No. 10**

Total Site Post

Hydrograph type = Combine  
Peak discharge = 138.07 cfs  

Storm frequency = 100 yrs  
Time to peak = 721 min  

Time interval = 1 min  
Hyd. volume = 344,647 cuft  

Inflow hyds. = 2, 5, 8  
Contrib. drain. area = 7.830 ac
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