

DRAINAGE PLAN  
**NORTHGATE COMMERCIAL  
ADDITION & NORTHGATE  
COMMERCIAL 2<sup>ND</sup> ADDITION**  
TO  
WICHITA, SEDGWICK COUNTY, KANSAS

**PREPARED BY**



**16 NOVEMBER 2007**

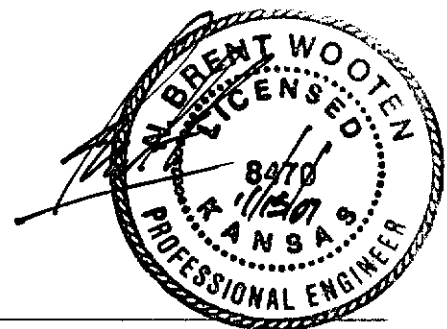


**DRAINAGE PLAN  
NORTHGATE COMMERCIAL ADDITION  
&  
NORTHGATE COMMERCIAL 2<sup>ND</sup> ADDITION**

**FINAL REPORT**

**Prepared by Baughman Company, P.A.  
16 November 2007**

**By N. Brent Wooten, P.E.  
Trevor R. Kurth, I.E.  
Nicholas H. Jefferson, I.E.**



# REPORT CONTENTS

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## City of Wichita Subdivision Checklist

### Project Narrative

- Existing Conditions
- Proposed Conditions
- Offsite Conditions
- Exhibit 1: Site Location Map
- Exhibit 2: Plat — Half Scale
- Exhibit 3: Preliminary 4-Lot Corner Grading Plan – Half Scale

### Existing Conditions Runoff Calculations

- Drainage Methods & Standards
- Site Characteristics
- Existing Conditions Hydrologic Analysis
- Downstream Drainage Capacity
- Exhibit 4: Aerial Photo Exhibit with Topography

### Post-Development Hydrologic Analysis

- Drainage Methods & Standards
- Detention Facilities
- Detention Summary
- Discharge Points Summary
- Potential Upstream/Downstream Impacts
- Exhibit 5: Drainage Plan – Half Scale

### Floodplain Submittal

- Source of Floodplain Information
- Exhibit 6: Floodplain Location

### Federal, State, & Local Permitting

- US Army Corps of Engineers
- Kansas Dept of Agriculture – DWR Permitting
- FEMA
- Kansas Dept of Transportation
- Sedgwick County ROW

### Appendices: Supporting Calculations

- Appendix A: USGS Soils Survey
- Appendix B: Hydraflow Storm Sewer
- Appendix C: PondPack Routing

### Plan Sheets

- Drainage & Grading Plans 1:100 Scale



WICHITA

Adopted: February 23, 2007

Public Works, Engineering Division
Final Drainage Plan Submittal Checklist

Reviewer: \_\_\_\_\_ Date: \_\_\_\_\_
Subdivision Name: NORTHGATE COMMERCIAL 2ND Location: N of 53rd & Meridian
Total Land Area Of Ownership: ± 6 Acres
Type: Residential [X] Commercial \_\_\_\_\_ Industrial \_\_\_\_\_ Recreation \_\_\_\_\_ Municipal \_\_\_\_\_ Other \_\_\_\_\_
Applicant: RIR Realty Contact: \_\_\_\_\_ Phone #: 722-2417
Engineer: BAUGHMAN Co., PA Contact: TREVOR KURTZ Phone #: 262-7271

Please check the appropriate box: I = Included; NA = Non-Applicable; R= Required prior to development (If "NA" is checked, an explanation must be entered)

Table with 5 columns: Tab 1. Project Narrative, I, NA, Applicant Explanation / Location in Plan, Engr I, Engr NA. Rows include Site Location Map, Discussion of development, Discussion of offsite conditions, Summary of runoff calculations, Narrative description of BMPs, Copy of the plat, Preliminary grading plan, Professional Engineer seal, and CD of drainage plan.

Table with 5 columns: Tab 2. Existing Conditions Runoff Calculations, I, NA, Applicant Explanation / Location in Plan, Engr I, Engr NA. Rows include Copy of applicable orthophoto, Runoff Method, Existing topography, Total Site Area and Total Impervious Area, Benchmarks used for site control, Streams, creeks, and waterway labeled, Predominant soils, Location and boundaries of natural features, and Location of existing roads, buildings, parking lots and other impervious areas.



J. Location of existing utilities (e.g., water, sewer, gas, electric) and easements	X				
K. Location of existing conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	X				
L. Flow paths	X				
M. Location and dimensions of existing channels, bridges or culvert crossings	X				
N. Existing conditions hydrologic analysis for runoff rates, volumes and velocities showing methodologies used and supporting calculations (2, 5, 10, 25 & 100 year, 24-hour storm events) or Critical Duration	X				
O. Assumed pre-developed runoff curve numbers	X				
P. Existing time of concentrations used in calculations	X				
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site	X				
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)	X				
S. Cross-section data for open channels	X				
T. Ground water elevations, if applicable	X				

Tab 3. Post-Development Hydrologic Analysis	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Proposed (post-development) conditions hydrologic and hydraulic analysis for runoff rates, volumes, HGL, and velocities showing the methodologies used and supporting calculations for all applicable design storms (2, 5, 10, 25 & 100 year, 24-hour storm events)	X				
B. Proposed time of concentrations used in calculations	X				
C. Assumed post-developed runoff curve numbers	X				
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)	X				
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration	X				
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities	X				
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary	X				
H. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)	X				
I. Design water surface elevations and normal pool elevation for ponds.	X				
J. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.	X				
K. Proposed limits of clearing and grading	X				
L. Location of existing and proposed roads, buildings, parking lots and other impervious areas.	X				
M. Location of existing and proposed utilities (e.g., water, sewer) and easements		X	See Utility Plan		
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	X				
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings	X				



WICHITA

P. Preliminary selection and location of stormwater controls	x				
Q. Emergency overflow structure's flow path	x				
R. Detention facility provides one-foot of freeboard above the HWL and emergency outfall shown (top of berm elevation shown)	x				
S. The 100-year 24-hour HWL delineated on the plan for detention pond	x				
T. Lowest opening elevations table on the plat for structures located adjacent to channels or ponds	x				
U. Stormwater Management Facilities located within a Reserve	x				
V. Maintenance responsibility of stormwater management facility shall be specified in the plat text. (e.g. HOA, Lot Owners Association, or lot)	x				
W. Off-site drainage easements or agreements required, where necessary	x				

Tab 4. Floodplain Submittal	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Provide source of flood profile		x	No SFHA		
B. Nearest base flood elevations		x	..		
C. Delineation of pre-developed regulatory floodplain/floodway limits		x	..		
D. Delineation of post-developed regulatory floodplain and floodway limits		x	..		
E. Floodplain boundary determination per elevation (project limits shown)		x	..		
F. Provide source of floodway data table and discharges		x	..		
G. Provide all hydrologic and hydraulic study information for site-specific floodplain studies, unnumbered Zone A area elevation determinations and flood plain map revisions or required permits		x	..		
H. Provide regulatory floodway and four natural profile models (10,50,100, and 500-yr) for existing and future watershed conditions		x	..		
I. Location of floodplain/floodway limits and relationship of site to upstream/downstream properties (floodplain limits to be per elevation and scaled location)		x	..		
J. Flood plains and floodways located within a Reserve, where necessary		x	..		

Tab 5. Federal, State and Local Permits (to be provided prior to construction unless otherwise specified)	Applicant			Engr	
	I/R	NA	Explanation / Location in Plan	I/R	NA
A. US Army Corps of Engineers - Regulatory program permits (404 water quality certification)		x	None Expected		
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)		x	..		
C. Federal Emergency Management Agency (FEMA) Letter of Map Changes (LOMA, LOMR, LOMR-f, CLOMR, etc.) Shall be included and approved when project modifies the limits of the floodway.		x	..		
D. Kansas Department of Transportation		x	..		
E. Sedgwick County Right-of-way Permit	x		Meridian Row discharge		



# WICHITA

## Public Works, Engineering Division Final Drainage Plan Submittal Checklist

Reviewer: \_\_\_\_\_ Date: \_\_\_\_\_  
 Subdivision Name: NORTHGATE COMMERCIAL Location: 53<sup>RD</sup> N 1/2 MERIDIAN AVE  
 Total Land Area Of Ownership: 48 Acres  
 Type: \_\_\_\_\_ Residential  Commercial \_\_\_\_\_ Industrial \_\_\_\_\_ Recreation \_\_\_\_\_ Municipal \_\_\_\_\_ Other \_\_\_\_\_  
 Applicant: P & P Realty Contact: \_\_\_\_\_ Phone #: 722-2417  
 Engineer: BAUGHMAN CO, PA Contact: TREVOR KURTH Phone #: 262-7271

Please check the appropriate box:

I = Included; NA = Non-Applicable; R= Required prior to development  
(If "NA" is checked, an explanation must be entered)

Tab 1. Project Narrative	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Site Location Map, using USGS Map	<input checked="" type="checkbox"/>				
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain	<input checked="" type="checkbox"/>				
C. Discussion of offsite conditions	<input checked="" type="checkbox"/>				
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series	<input checked="" type="checkbox"/>				
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design	<input checked="" type="checkbox"/>				
F. Copy of the plat	<input checked="" type="checkbox"/>				
G. Preliminary grading plan (The final grading plan shall be sealed, signed and dated prior to Engineering receiving the final sanitary sewer plans. One plan sheet and PDF shall be submitted to the Subdivision Engineer.)	<input checked="" type="checkbox"/>				
H. Professional Engineer seal, signature and date on cover of report	<input checked="" type="checkbox"/>				
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover	<input checked="" type="checkbox"/>				

Tab 2. Existing Conditions Runoff Calculations	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Copy of applicable orthophoto showing proposed project boundaries (preferable in color)	<input checked="" type="checkbox"/>				
B. Runoff Method (Rational, Hydrograph Method, or other approved methods by Engineering)	<input checked="" type="checkbox"/>				
C. Existing topography (no greater than 2-foot contours, 1-foot recommend)	<input checked="" type="checkbox"/>				
D. Total Site Area and Total Impervious Area (acres)	<input checked="" type="checkbox"/>				
E. Benchmarks used for site control	<input checked="" type="checkbox"/>				
F. Streams, creeks, and waterway labeled	<input checked="" type="checkbox"/>				
G. Predominant soils from USDA soil surveys, and/or on site soil borings	<input checked="" type="checkbox"/>				
H. Location and boundaries of natural features such as wetlands, lakes, and ponds with the normal water elevation noted	<input checked="" type="checkbox"/>				
I. Location of existing roads, buildings, parking lots and other impervious areas.	<input checked="" type="checkbox"/>				

# PROJECT NARRATIVE

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## **EXISTING CONDITIONS**

Both sites are located at the northeast corner 53<sup>rd</sup> Street North and Meridian Avenue.

The proposed Northgate Commercial Addition consists of approximately 48 acres of farmland/open space with a drainage channel dissecting the sight north to south. The site generally drains to the south and into a newly constructed Double 8'x4' RCBC. The drainage ditch is located in a temporary drainage easement which will be vacated with this plat.

The proposed Northgate Commercial 2<sup>nd</sup> Addition is located to the north of the intersection and fronts Meridian Avenue. This site consists of farmland/open space and generally drains to the east and into the Meridian Avenue Right of Way. There is an existing RCBC in Meridian that conveys runoff to the south. Based on historical Sedgwick County designs, the box is assumed to be sized for the 100' adjacent to the respective ROW.

Both overall sites are a part of a master drainage plan which was submitted and approved in Northgate Addition. This master plan consists of 5 lakes/ponds, which detain site and offsite runoff, and ultimately discharges to the south through a Double 8'x4' RCBC and newly constructed channel.

There is no FEMA Special Flood Hazard Area located on the property as of this report. Existing trees will be retained and left as existing grades, where applicable.

## **PROPOSED CONDITIONS**

Both of the commercial additions, as well as Northgate Addition, were modeled in the master drainage plan submitted in Northgate Addition. Detention was provided for all the subject properties at that time in the entire pond system.

The proposed Northgate Commercial Addition will consist of 9 commercial lots and associated ponds and utilities. The will drain into the proposed ponds via stormwater sewer. Stormwater sewer stubs are shown and sized for each lots drainage and are subject to change upon site plans. There are two ponds which serve this addition. The upper pond, Long Pond in Reserve C, Northgate Addition; will be utilized for onsite as well as offsite runoff detention. This pond will drain to the south into another pond on the property via a Double 8'x4' RCBC. This pond system will then drain to the south through an existing Double 8'x4' RCBC under 53<sup>rd</sup> Street North. This box will be extended to directly convey the ponds discharge.

The proposed Northgate Commercial 2<sup>nd</sup> Addition will consist of 3 lots to be developed into commercial property. The lots will be served with SWS by extending the proposed SWS from Northgate Addition along the south line of the property. This system will then drain into the proposed Long Pond in Reserve C (Northgate Addition). The front 100' of the developed commercial lots is expected to continue to drain into the Meridian Avenue ROW.

The proposed ponds will serve as sedimentation basins as well as storage for storm water runoff.

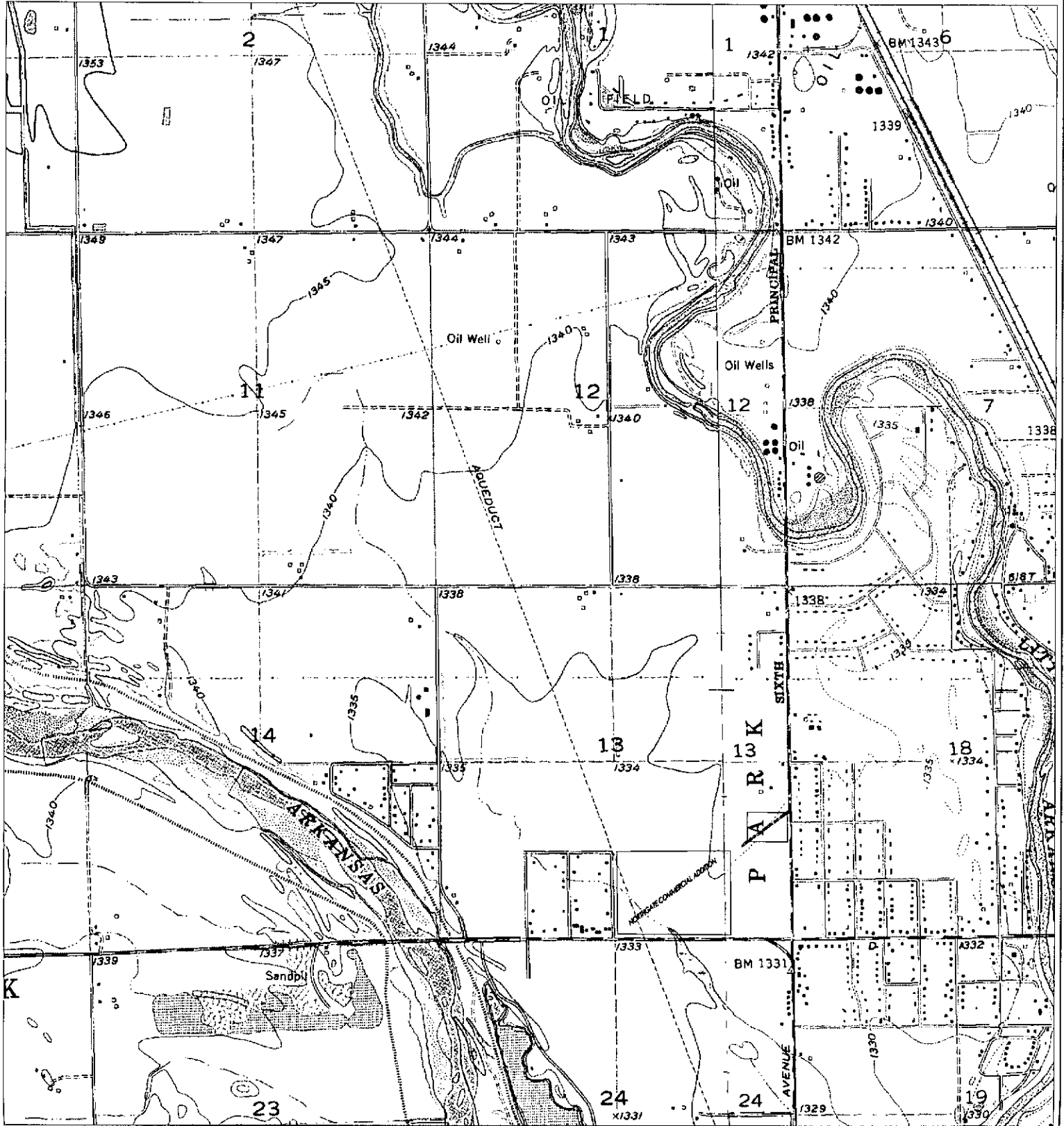
For a half-scale copy of the Plat, see Exhibit 2.

## **OFFSITE CONDITIONS**

The south offsite conditions consist of a newly constructed RCBC and a drainage ditch. The drainage ditch was sized and constructed in the Northgate Addition and

conveys runoff to the existing RCBC under Meridian approximately 2000' south of the intersection of 53<sup>rd</sup> North and Meridian. Offsite runoff from the west enters the property just north of the site in the proposed Long Pond in Reserve C. The adjacent property to the east, Wal-Mart, detains all of its site runoff. The discharge for the Wal-Mart sites detention facility, located at the corner of 53<sup>rd</sup> & Meridian, will directly tie into the existing Double 8'x4' RCBC along north side of Meridian Avenue. The proposed Northgate Commercial 2<sup>nd</sup> Addition generally drains to the east and into the Meridian ROW. Upon development, we expect to discharge the front 100' feet and re-direct the developed runoff to the west and into the overall pond system. There is an existing structure in Meridian Avenue which conveys runoff to the south. We expect the discharge to Meridian Avenue to be greatly reduced upon development.

SITE LOCATION EXHIBIT  
**NORTHGATE COMMERCIAL ADDITION**  
**NORTHGATE COMMERCIAL 2ND ADDITION**  
**WICHITA, SEDGWICK COUNTY, KANSAS**



1937 QUADRANGLE SHEETS  
 - SAKE, KANSAS  
 - VALLEY CENTER, KANSAS



**SITE LOCATION EXHIBIT**  
**NORTHGATE COMMERCIAL ADDITION**  
**NORTHGATE COMMERCIAL 2ND ADDITION**

15 NOVEMBER 2007

**Baughman Company, P.A.**  
 315 WEST 10th Street, Wichita, KS 67202 P 316.263.1121 F 316.263.1149  
 SURVEYING | PLANNING | ENGINEERING

# EXISTING CONDITIONS RUNOFF CALCULATIONS

## **DRAINAGE METHODS & STANDARDS**

The following methods and standards, although not a complete list, were used in calculating the existing conditions runoff values.

- STORM SERIES
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 100-yr Storm Events Modeled
  - 2-yr Rainfall Depth = 3.5 in
  - 5-yr Rainfall Depth = 4.5 in
  - 10-yr Rainfall Depth = 5.3 in
  - 25-yr Rainfall Depth = 6.1 in
  - 100-yr Rainfall Depth = 7.9 in
  
- FLOW DATA
  - Existing Conditions modeled in Northgate Addition
  - Areas per USGS Quadrangle Sheet, Aerial Photos, and Site Visits
  - PondPack software for existing offsite flows
  - Rational Method for on-site flows
  - Runoff Coefficient: C = 0.70, CN = 80 (Type D Soils, Agricultural Pasture)
  - Time of Concentration: TR-55 method

## **SITE CHARACTERISTICS**

The proposed sites are currently agricultural farmland. The primary soil type on the site is Type D.

The proposed Northgate Commercial site has an existing channel running from the north to the south and is part of the master drainage plan which was a part of Northgate Addition. This channel will be converted into ponds with this development. The ditch is located in a temporary drainage easement which will be vacated with this plat. When completed, the entire basins runoff will be conveyed through the pond system. The system drains via a Double 8'x4' RCBC under 53<sup>rd</sup> Street North and into a drainage channel, which was proposed and constructed with the master plan.

The proposed Northgate Commercial 2<sup>nd</sup> Addition site generally drains to the east and into the Meridian Avenue ROW. The site is bounded by the (platted) proposed 55<sup>th</sup> Street North, which is designed to be the entrance into Northgate Addition. The west edge of the site is bounded by Northgate Addition. A Wal-Mart is currently being constructed along the south of the property.

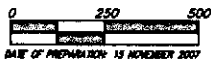
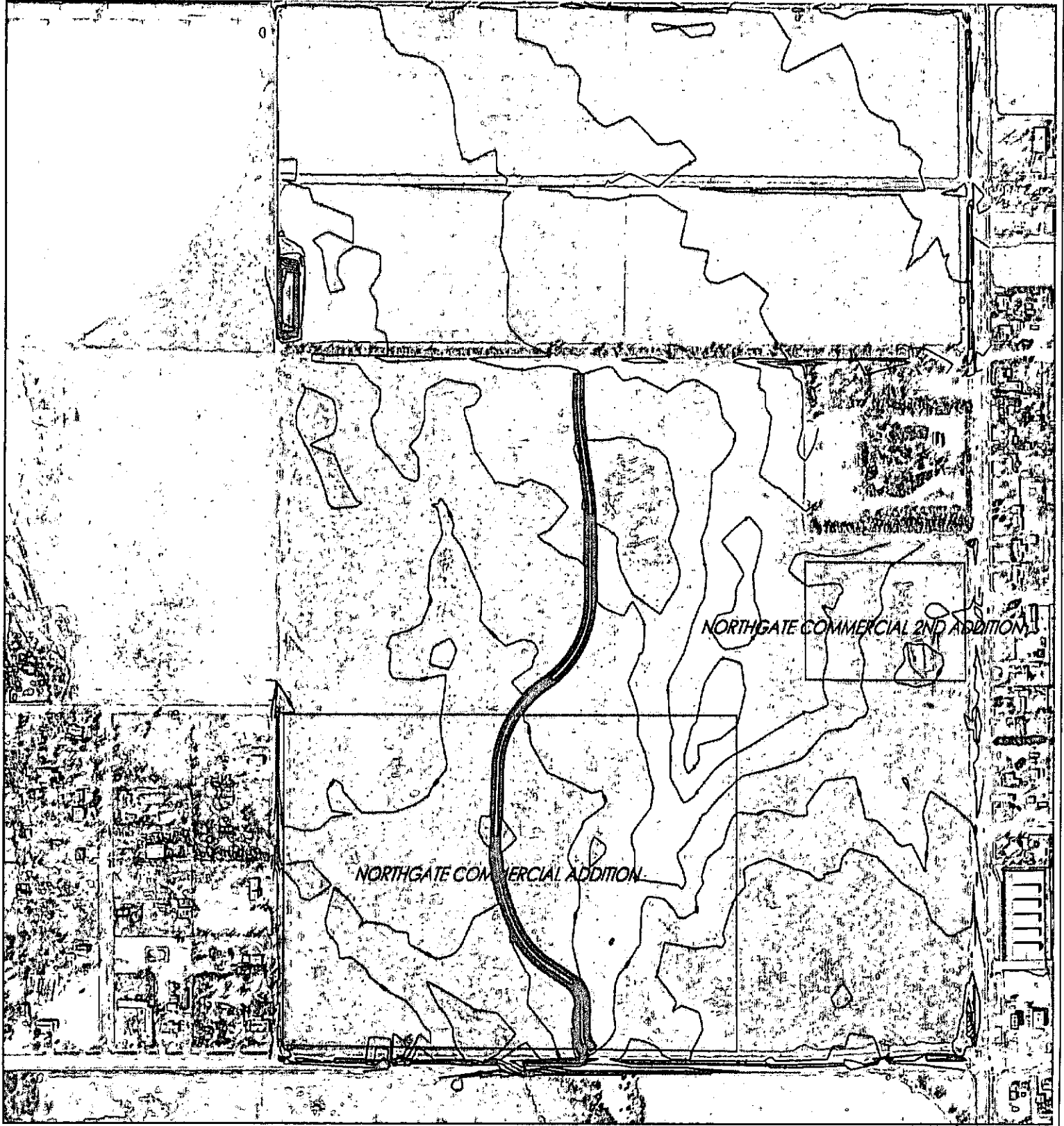
## **EXISTING CONDITIONS HYDROLOGIC ANALYSIS**

The site was analyzed for pre-development conditions using the hydrograph method for the 2, 5, 10, 25, and 100 year storm events. The time of concentration was calculated using TR-55 with a minimum time of concentration of 15 minutes. There is currently one location where offsite drainage encroaches upon the Northgate Commercial Addition. This flow is concentrated in a ditch section and drains Northgate Addition.

**DOWNSTREAM DRAINAGE CAPACITY**

There is adequate downstream capacity for both additions. Northgate Commercial 2<sup>nd</sup> Addition drains via SWS to the west and into the proposed pond in Northgate Addition. This pond was proposed in Northgate Addition and included the runoff from this property at that time. Northgate Commercial Addition drains to the south under 53<sup>rd</sup> Street North and is then conveyed through a drainage channel. These downstream conditions were proposed and constructed as part of Northgate Addition also.

**AERIAL EXHIBIT**  
**NORTHGATE COMMERCIAL ADDITION**  
**NORTHGATE COMMERCIAL 2ND ADDITION**  
**WICHITA, SEDGWICK COUNTY, KANSAS**



**AERIAL EXHIBIT**  
**NORTHGATE COMMERCIAL ADDITION**  
**NORTHGATE COMMERCIAL 2ND ADDITION**  
13 NOVEMBER 2007

**Baughman** **Baughman Company, P.A.**  
 311 824 St. Wichita, KS 67211 781-625-2211 781-625-2148  
ARCHITECTURE | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

# POST-DEVELOPMENT HYDROLOGIC ANALYSIS

## DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in developing the drainage and grading plans.

- **STORM SERIES**
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 100-yr Storm Events Modeled
  - PondPack software for existing flows
  - Runoff Coefficient; C = 0.90 (Type D Soils, Commercial)
  - Time of Concentration; TR-55 method, minimum Tc = 15min
- **STORM WATER SEWER PIPES**
  - Rational Method for proposed flows
  - Soil Type = D
  - Developed 'C' = 0.90
  - Minimum Tc = 15 min
  - 24-hr, 2-yr Storm Event contained in underground (HGL underground)
- **GRADING CONSTRAINTS**
  - Minimum 0.5% Street & Pavement Grades
  - Site assumed to be asphalt paved with buildings
  - Double Curb Inlets utilized at all street sump locations
  - Emergency Overflows for 24-hr, 100-yr Storm Event
- **POND ROUTING / GRADING**
  - PondPack software utilized for modeling master drainage pond system
  - Minimum 1' Freeboard from 100-yr Water Surface Elevations to adjacent lot corners

## DETENTION FACILITIES

The detention facilities located in these additions were proposed and approved as part of Northgate Addition. A copy of the PondPack routing can be found in the Appendix. The following is an overview of the ponds as they relate to these additions.

- **LONG POND (RESERVE C, NORTHGATE ADDITION)**

This pond is located in Reserve C in Northgate Addition and will have a 'finger' extend down into the Northgate Commercial Addition in Reserve A. This pond will accept developed discharge from the north as well as offsite discharge from the west. This pond will have a static water surface of a 1327.0 and a 100-yr water surface of a 1331.8. The pond will discharge into the south pond via a Double 8'x4' RCBC.
- **SOUTH POND**

The South Pond is located in Reserve A and will accept developed runoff from the proposed commercial lots as well as discharge from the Long Pond to the north. This pond is expected to have a static water surface elevation of a 1327.0 and a corresponding 100-yr water surface of a 1331.1. The pond will discharge into an extension of the existing Double 8'x4' RCBC.

**DETENTION SUMMARY**

Overall basin detention was provided (including these additions) in Northgate Addition. The ponds adjacent to these additions as well as the pond on the Northgate Commercial Addition property is a portion of the master drainage/detention plan proposed earlier (i.e. Northgate Addition). These ponds, as well as the north ponds in Northgate Addition, detain developed runoff to below existing conditions. The PondPack routing is included in Appendix C, and can also be viewed in the drainage plan for Northgate Addition.

**DISCHARGE POINTS SUMMARY**

The main discharge point for the Northgate Commercial Addition is the newly constructed box under 53<sup>rd</sup> Street North. This box is sized accordingly to accommodate the flow from the north.

The main discharge point for Northgate Commercial 2<sup>nd</sup> Addition is a proposed SWS which will extend through Northgate Addition and discharge into the proposed Long Pond in Reserve C. This pond is adequately sized for this sites developed runoff. A small portion of developed property is expected to drain, as it does today, into the Meridian Avenue ROW. This amount will be greatly reduced with the re-direction of runoff to the west.

**POTENTIAL UPSTREAM/DOWNSTREAM IMPACTS**

No potential upstream impacts are expected with this development.

Due to detention and the construction of a new box and channel to the south, no downstream impacts are expected with the development of these properties.

Due to detention on the proposed site and the previously approved Northgate Addition, there are no downstream impacts expected.

**FLOODPLAIN SUBMITTAL**

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**SOURCE OF FLOODPLAIN INFORMATION**

The site lies within a FEMA Zone X. The site is not located within a mapped FEMA SFHA. The location of the property, on FEMA FIRM Panels 195 and 211 of 700, is attached as Exhibit 6 (for Sedgwick County, Kansas; effective February 2, 2007).

## FEDERAL, STATE, & LOCAL PERMITTING

### US ARMY CORPS OF ENGINEERS

The USACOE was contacted regarding this property, as well as surrounding properties, at the time of platting in Northgate Addition. No jurisdictional waters are present on the proposed property.

### KANSAS DEPT OF AGRICULTURE – DWR PERMITTING

There does not appear to be any DWR permitting needed on the proposed site at this time.

### FEMA

There is no mapped floodplain located upon the proposed site. Therefore, no FEMA permitting is expected at this time.

### KANSAS DEPT OF TRANSPORTATION

There does not appear to be any KDOT permitting needed on the proposed project.

### SEDGWICK COUNTY ROW

A discharge permit may be required for discharge into the Meridian Avenue ROW. No permits are expected for discharge into the 53<sup>rd</sup> Street North ROW.

## SUPPORTING CALCULATIONS

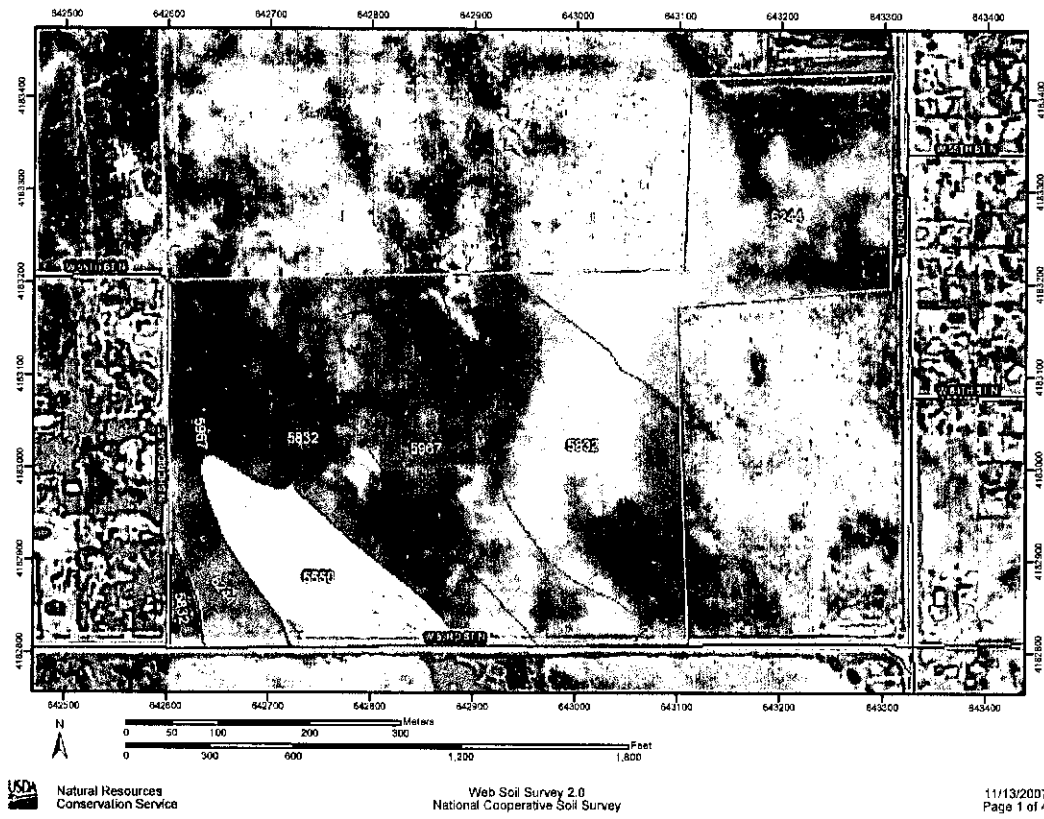
**APPENDIX A: USGS Soils Survey**

**APPENDIX B: Hydraflow Storm Sewer  
- 2-yr Storm Event  
SWS Systems 1-5**

**APPENDIX C: PondPack Routing  
-Overall Pond System  
(as shown in Northgate Addition)**

**USGS Soils Survey**

Hydrologic Soil Group—Sedgwick County, Kansas  
(Northgate Comm & Comm 2nd)



Hydrologic Soil Group—Sedgwick County, Kansas  
(Northgate Comm & Comm 2nd)

MAP LEGEND		MAP INFORMATION
<p><b>Area of Interest (AOI)</b></p> <p>□ Area of Interest (AOI)</p> <p><b>Soils</b></p> <p>□ Soil Map Units</p> <p><b>Soil Ratings</b></p> <p>□ A</p> <p>□ A/D</p> <p>□ B</p> <p>□ B/O</p> <p>□ C</p> <p>□ C/D</p> <p>□ D</p> <p>□ Not rated or not available</p> <p><b>Political Features</b></p> <p><b>Municipalities</b></p> <p>● Cities</p> <p>□ Urban Areas</p> <p><b>Water Features</b></p> <p>□ Oceans</p> <p>~ Streams and Canals</p> <p><b>Transportation</b></p> <p>— Rails</p> <p><b>Roads</b></p> <p>— Interstate Highways</p> <p>— US Routes</p> <p>— State Highways</p>	<p>Local Roads</p> <p>Other Roads</p>	<p>Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.</p> <p>Source of Map: Natural Resources Conservation Service Web Soil Survey URL: <a href="http://websoilsurvey.nrcs.usda.gov">http://websoilsurvey.nrcs.usda.gov</a> Coordinate System: UTM Zone 14N</p> <p>This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.</p> <p>Soil Survey Area: Sedgwick County, Kansas Survey Area Data: Version 3, Dec 21, 2006</p> <p>Date(s) aerial images were photographed: 8/17/1991; 9/26/1991; 10/1/1991; 3/20/1998; 3/31/1998</p> <p>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.</p>

## Hydrologic Soil Group

Hydrologic Soil Group—Summary by Map Unit — Sedgewick County, Kansas				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
5550	Inano clay loam, occasionally flooded	C	6.7	9.9%
5832	Purkin-Tower complex, 0 to 1 percent slopes	D	27.8	40.5%
5967	Tobler silty clay loam, 0 to 1 percent slopes	D	15.0	21.9%
6244	Etandon silt loam, rarely flooded	B	19.2	27.9%
Totals for Area of Interest (AOI)			68.8	100.0%

### Description

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

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

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

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

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

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

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

### Rating Options

*Aggregation Method:* Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

*Component Percent Cutoff:* None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

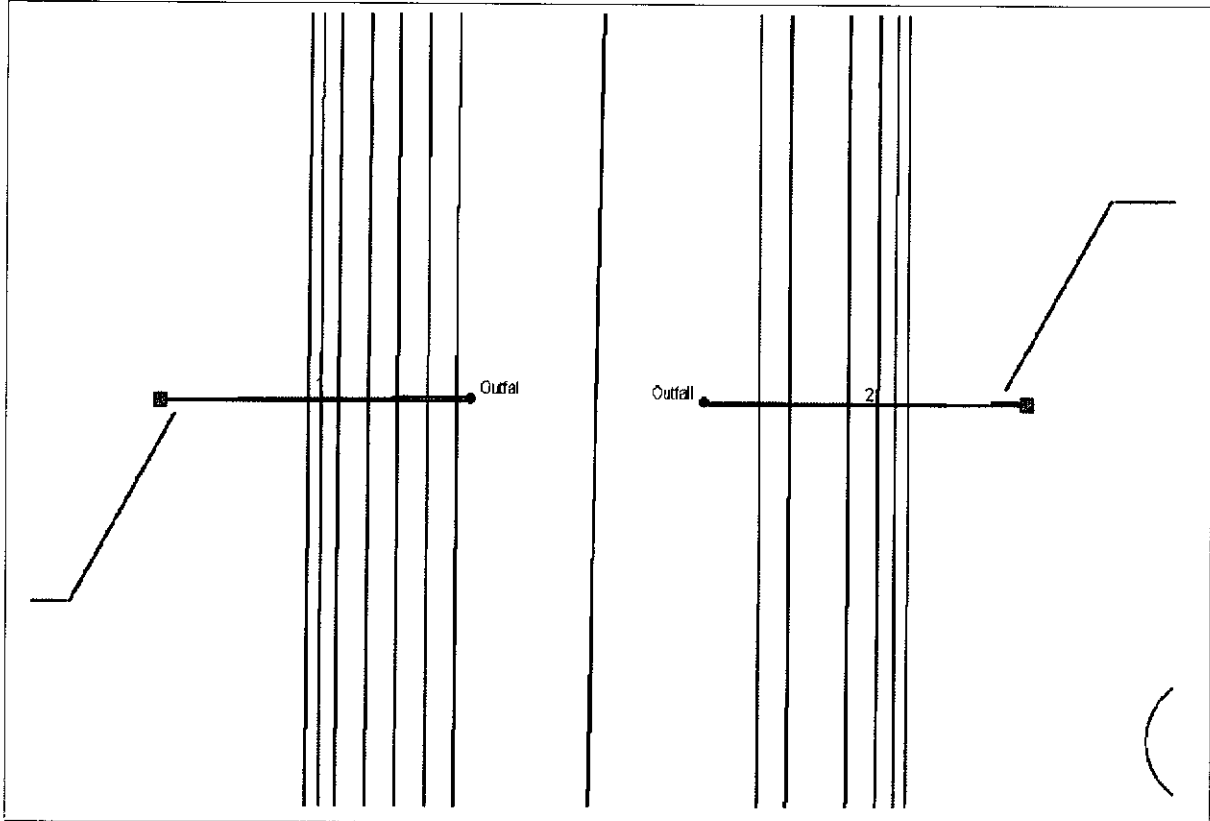
*Tie-break Rule:* Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

# **Hydraflow Storm Sewer**

**SWS Systems 1-5**

# Hydraflow Plan View



Project File: sws1.stm

No. Lines: 2

11-15-2007

Hydraflow Storm Sewers 2005

## Storm Sewer Inventory Report

Page 1

Line No.	Alignment				Flow Data				Physical Data							Line ID	
	Distr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Dmg area (ac)	Runoff coeff (C)	Inlet time (min)	Invert EI Dn (ft)	Line slope (%)	Invert EI Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)		Inlet/Rim EI (ft)
2	End	54.2	0.3	DrGrt	30.00	0.00	0.00	0.0	1326.00	1.84	1327.00	36	Cir	0.013	1.00	1332.00	
1	End	52.3	179.6	DrGrt	26.00	0.00	0.00	0.0	1326.00	1.91	1327.00	36	Cir	0.013	1.00	1332.00	

Project File: sws1.stm

Number of Lines: 2

Date: 11-15-2007

Hydraflow Storm Sewers 2005

# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL. On (ft)	Invert EL. Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Data line No.
2		30.00	36 c	54.2	1326.00	1327.00	1.845	1327.75	1328.75	n/a	1329.971	End
1		26.00	36 c	52.3	1326.00	1327.00	1.913	1327.63	1328.63	n/a	1329.601	End

Project File: sws1.stm  
 Number of lines: 2  
 Run Date: 11-15-2007

NOTES: c = cir, e = ellip, b = box, Return period = 2 Yrs, :1 = Inlet Control.

Hydraulic Storm Sewers 2005

# Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet			Grate Inlet			Gutter					Inlet			Bye line No	
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)
2		30.00*	0.00	30.00	0.00	DrGrt	5.0	6.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.013	7.79	313.71	7.79	313.71	0.00	Off
1		26.00*	0.00	26.00	0.00	DrGrt	5.0	6.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.013	5.85	236.13	5.85	236.13	0.00	Off

Project File: sws1.stm  
 Number of lines: 2  
 Run Date: 11-15-2007

NOTES: Inlet N-Values = 0.016 ; Intensity = 69.87 / (Inlet time + 13.10) ^ 0.87; Return period = 2 Yrs. ; \* Indicates Known Q added

Hydraulic Storm Sewers 2005

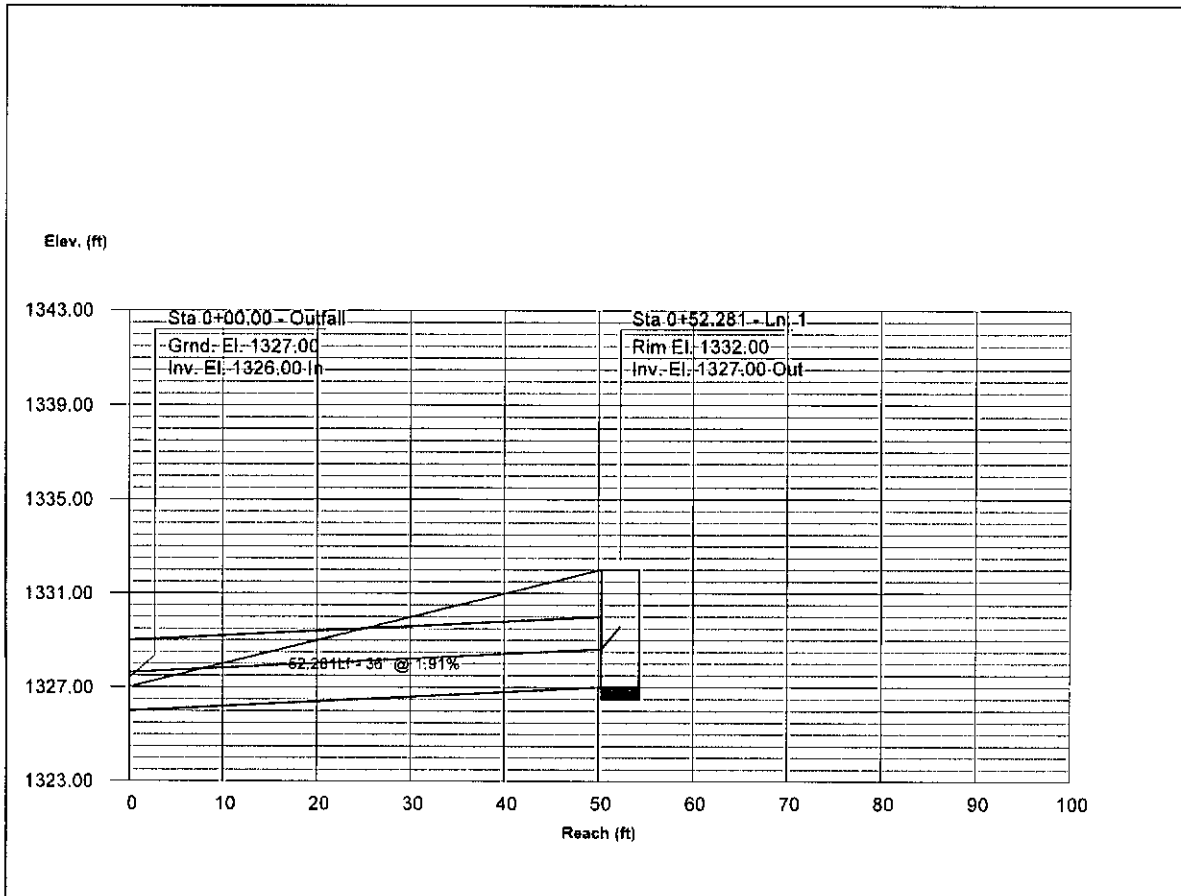
# Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
2	36	30.00	1328.00	1327.75	1.75*	4.27	7.03	0.77	1328.51	n/a	54.2	1327.00	1328.75	1.75**	4.27	7.03	0.77	1328.51	n/a	n/a	n/a	1.00	n/a
1	36	26.00	1326.00	1327.83	1.63	3.91	6.65	0.69	1328.31	n/a	52.3	1327.00	1328.63	1.63**	3.91	6.65	0.69	1328.31	n/a	n/a	n/a	1.00	n/a

Project File: sws1.stm      Number of lines: 2      Run Date: 11-15-2007

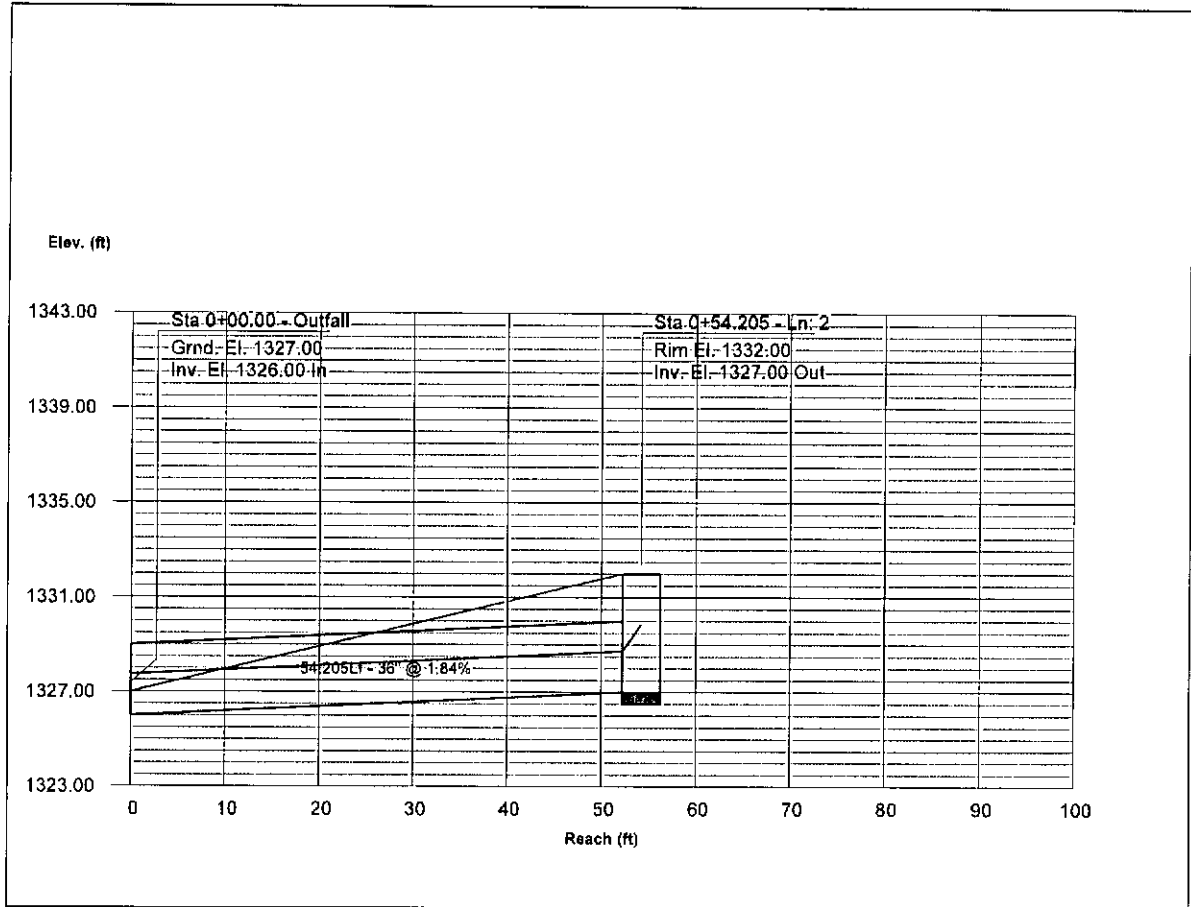
Notes: \* Normal depth assumed.; \*\* Critical depth.

## Storm Sewer Profile

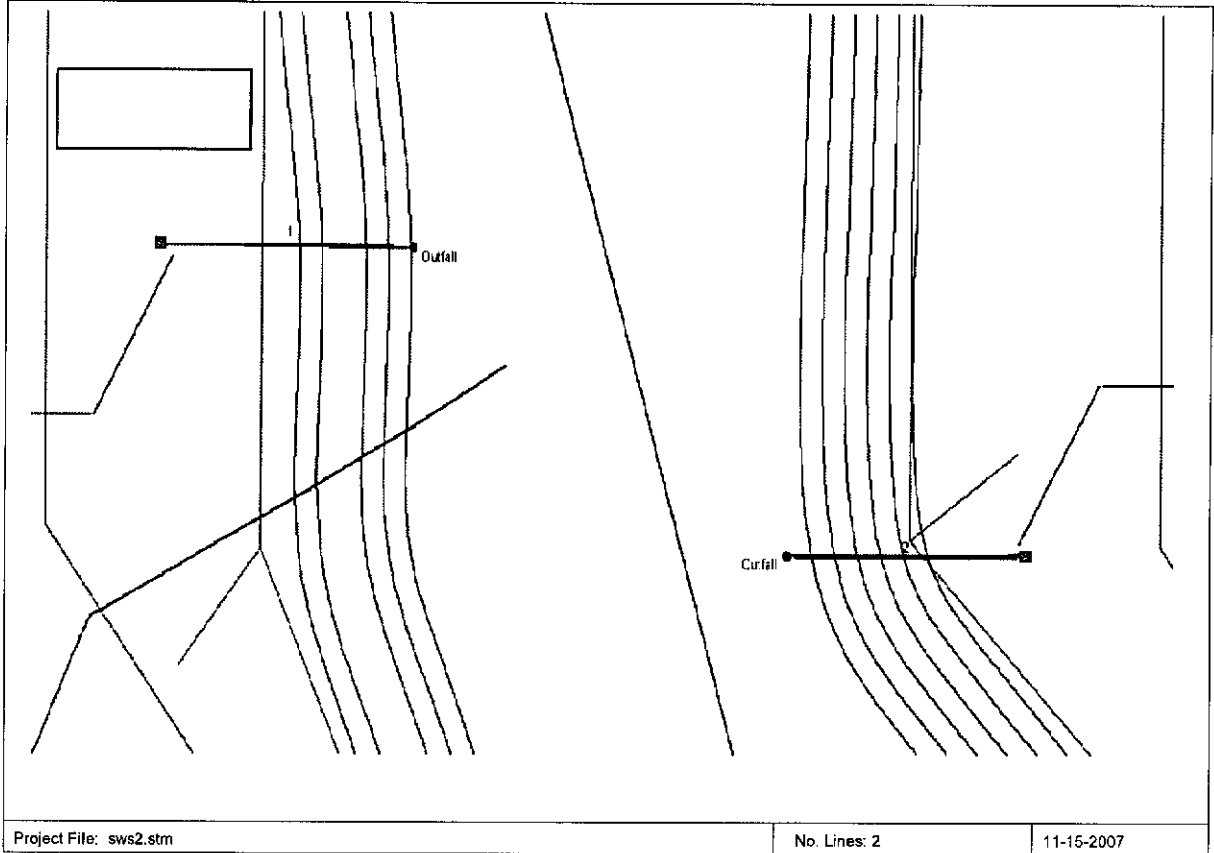


# Storm Sewer Profile

Proj. file: sws1.stm



# Hydraflow Plan View



Project File: sws2.stm

No. Lines: 2

11-15-2007

Hydraflow Storm Sewers 2005

## Storm Sewer Inventory Report

Page 1

Line No.	Alignment				Flow Data				Physical Data							Line ID	
	Distr line No.	Line length (ft)	Dell angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El On (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)		Inlet/Rim El (ft)
2	End	53.3	0.0	DrGrt	30.00	0.00	0.00	0.0	1326.00	1.88	1327.00	42	Cir	0.013	1.00	1332.00	
1	End	56.7	-179.4	DrGrt	27.00	0.00	0.00	0.0	1326.00	1.76	1327.00	36	Cir	0.013	1.00	1332.00	

Project File: sws2.stm

Number of lines: 2

Date: 11-15-2007

Hydraflow Storm Sewers 2005

# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert El. Dn (ft)	Invert El. Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Drns line No.
2		30.00	42 c	53.3	1326.00	1327.00	1.877	1327.68	1328.68	n/a	1329.981	End
1		27.00	36 c	56.7	1326.00	1327.00	1.763	1327.66	1328.66	n/a	1329.671	End

Project File: sws2.stm  
 Number of lines: 2  
 Run Date: 11-15-2007

NOTES: c = cft; e = elev; b = box; Return period = 2 Yrs. ; - Inlet control.

HydroCAD Storm Sewers 2005

# Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet			Grate Inlet			Gutter					Inlet			Byp line No	
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)
2		30.00	0.00	30.00	0.00	DrGr	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.013	7.79	313.71	7.79	313.71	0.00	Off
1		27.00	0.00	27.00	0.00	DrGr	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.013	6.31	254.48	6.31	254.48	0.00	Off

Project File: sws2.stm  
 Number of lines: 2  
 Run Date: 11-15-2007

NOTES: Inlet N-Values = 0.015; Intensity = 69.87 / (Inlet time + 13.10) ^ 0.87; Return period = 2 Yrs. ; \* Indicates Known Q added

HydroCAD Storm Sewers 2005

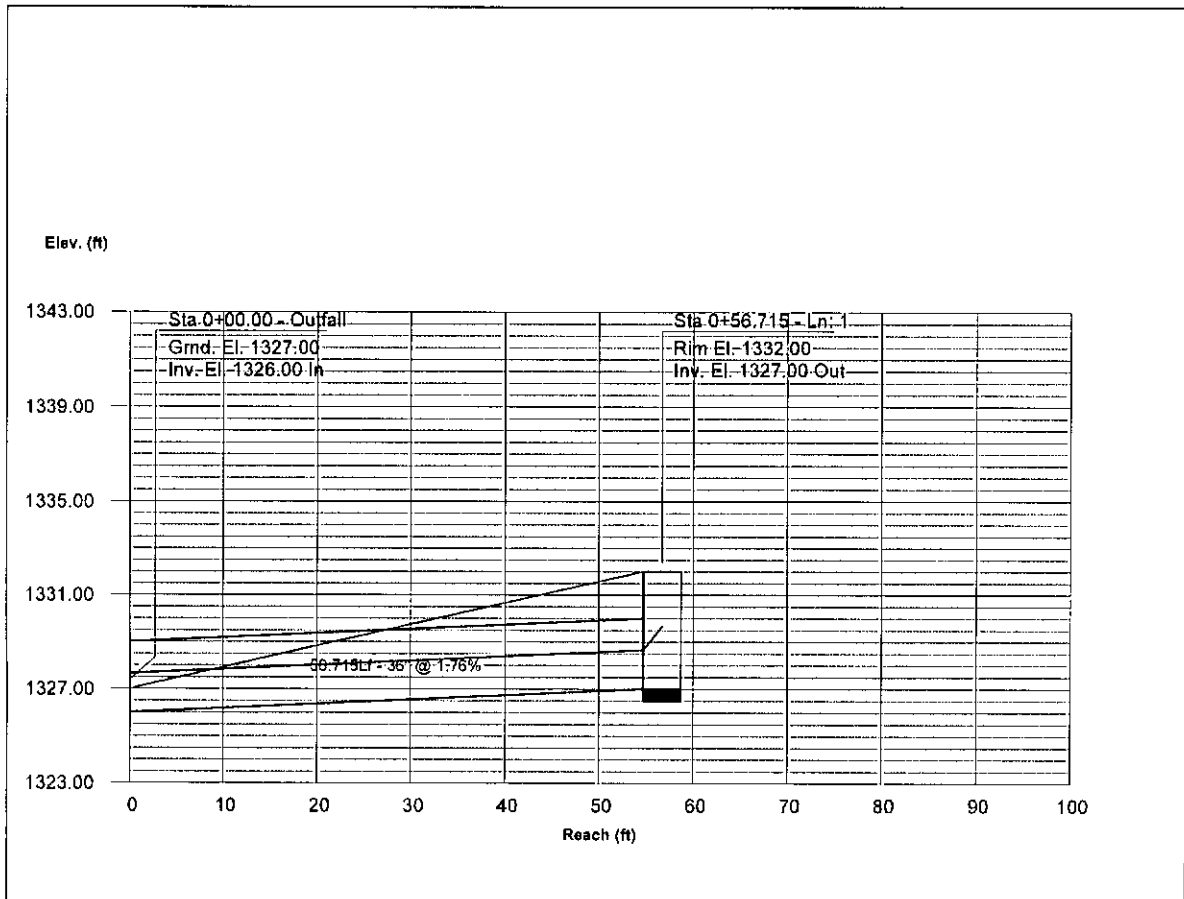
# Hydraulic Grade Line Computations

Line	Size (In)	Q (cfs)	Downstream								Len (ft)	Upstream								Check		JL coeff (K)	Minor loss (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Energy loss (ft)		
2	42	30.00	1326.00	1327.68	1.68*	4.56	6.58	0.67	1328.35	n/a	53.3	1327.00	1328.68	1.68**	4.56	6.58	0.67	1329.35	n/a	n/a	n/a	1.00	n/a
1	36	27.00	1326.00	1327.66	1.66	4.00	6.75	0.71	1328.38	n/a	56.7	1327.00	1328.66	1.66**	4.00	6.75	0.71	1329.36	n/a	n/a	n/a	1.00	n/a

Project File: sws2.stm Number of lines: 2 Run Date: 11-15-2007

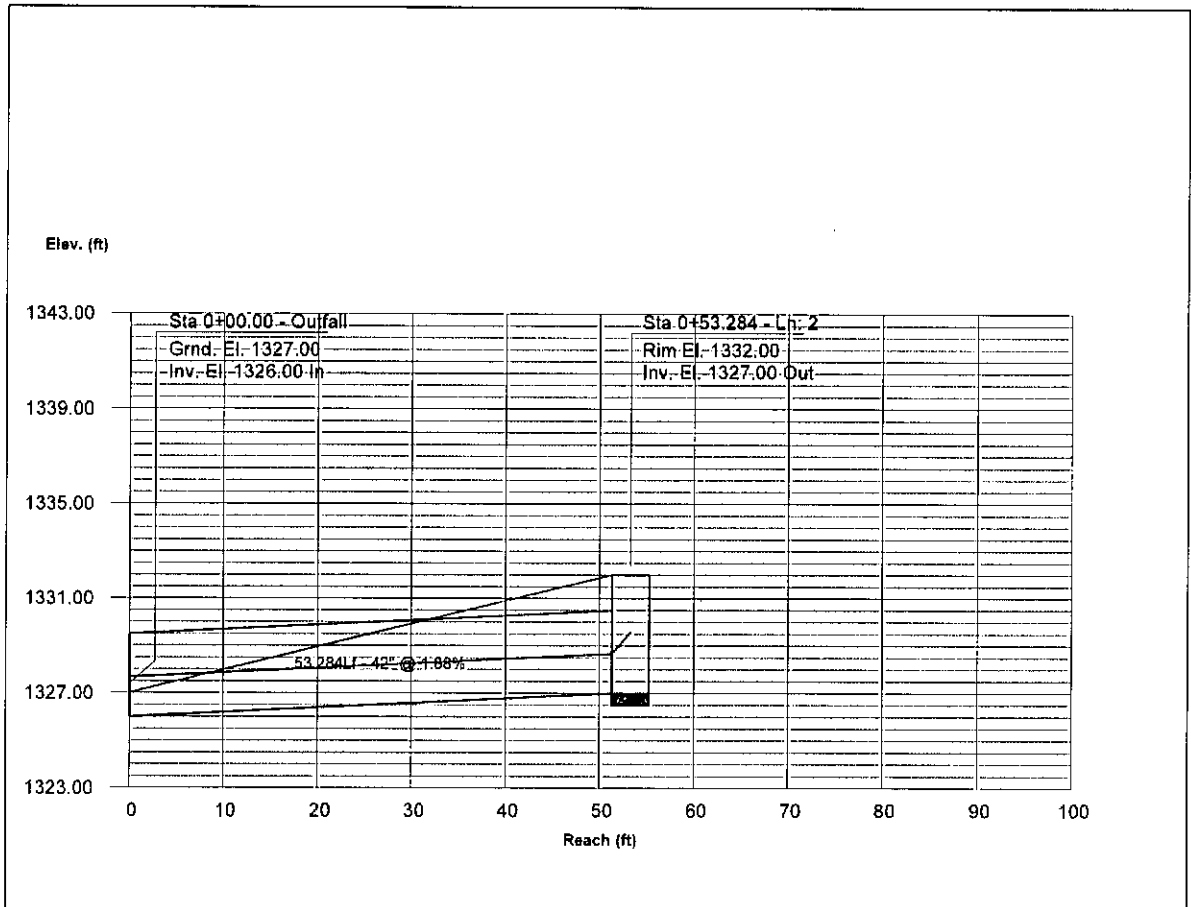
Notes: \* Normal depth assumed.; \*\* Critical depth.

## Storm Sewer Profile

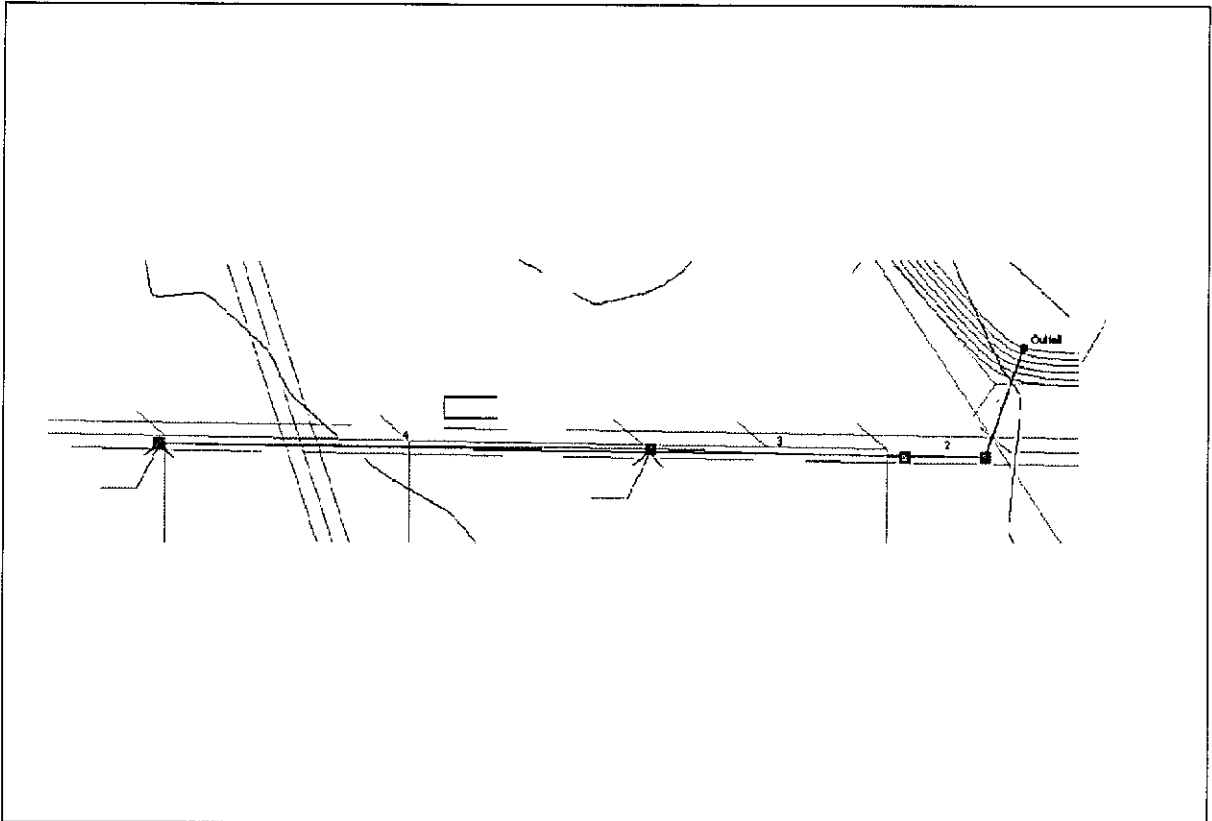


# Storm Sewer Profile

Proj. file: sws2.stm



# Hydraflow Plan View



Project File: sws3.stm      No. Lines: 4      11-15-2007

Hydraflow Storm Sewers 2005

## Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data							Line ID	
	Distr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-Joss coeff (K)		Inlet/ Rlm El (ft)
4	3	405.1	-0.9	DrGrT	11.00	0.00	0.00	0.0	1327.66	0.17	1328.57	24	Cir	0.013	1.00	1331.50	
3	2	208.2	1.4	DrGrT	11.00	0.00	0.00	0.0	1328.85	0.10	1326.88	36	Cir	0.013	0.50	1331.50	
2	1	66.2	89.1	Curb	4.00	0.00	0.00	0.0	1328.59	0.10	1326.65	36	Cir	0.013	0.50	1332.00	
1	End	86.7	110.9	Curb	4.00	0.00	0.00	0.0	1326.00	0.10	1326.09	36	Cir	0.013	1.42	1332.00	

Project File: sws3.stm      Number of lines: 4      Date: 11-15-2007

Hydraflow Storm Sewers 2005

# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junc (ft)	Dns line No.
4		11.00	24 c	405.1	1327.86	1328.57	0.174	1330.12*	1331.08*	0.19	1331.27	3
3		22.00	36 c	206.2	1326.65	1328.86	0.101	1329.82*	1330.05*	0.08	1330.12	2
2		26.00	36 c	66.2	1326.59	1326.65	0.101	1329.58	1329.65	0.11	1329.76	1
1		30.00	36 c	66.7	1326.00	1326.09	0.104	1327.75	1328.42	0.57	1328.00	End

Project File: sws3.sbn  
 Number of lines: 4  
 Run Date: 11-15-2007

NOTES: c = cir, e = ellip, b = box, Return period = 2 Yrs, \* Surcharged (HGL above crown),  
 Hydroflow Storm Sewers 2005

# Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet			Grate Inlet			Gutter					Inlet			Byp line No	
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)
4		11.00*	0.00	11.00	0.00	DrGr	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.013	1.05	43.91	1.05	43.91	0.00	3
3		11.00*	0.00	11.00	0.00	DrGr	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.013	1.05	43.91	1.05	43.91	0.00	2
2		4.00*	0.00	4.00	0.00	Curb	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.38	6.37	0.49	6.37	2.00	1
1		4.00*	0.00	4.00	0.00	Curb	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.38	6.37	0.49	6.37	2.00	Off

Project File: sws3.sbn  
 Number of lines: 4  
 Run Date: 11-15-2007

NOTES: Inlet N-Values = 0.016 ; Intensity = 69.87 / (Inlet time + 13.10) ^ 0.87; Return period = 2 Yrs. ; \* Indicates Known Q added

Hydroflow Storm Sewers 2005

# Hydraulic Grade Line Computations

Line	Size	Q	Downstream									Len	Upstream									Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Invert elev (ft)		HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)				
4	24	11.00	1327.86	1330.12	2.00	3.14	3.50	0.19	1330.31	0.237	406	1326.57	1331.08	2.00	3.14	3.50	0.18	1331.27	0.237	0.237	0.958	1.00	0.19		
3	36	22.00	1326.65	1329.82	3.00	7.07	3.11	0.15	1329.97	0.109	208	1326.86	1330.05	3.00	7.07	3.11	0.15	1330.20	0.109	0.109	0.227	0.50	0.08		
2	36	26.00	1326.59	1329.59	3.00*	7.07	3.68	0.21	1329.80	0.152	66.2	1326.65	1329.65	3.00	7.07	3.68	0.21	1329.86	0.151	0.151	0.100	0.50	0.11		
1	36	30.00	1326.00	1327.75	1.75	4.27	7.03	0.77	1328.51	0.493	66.7	1326.09	1328.42	2.33	5.90	5.08	0.40	1328.83	0.224	0.358	0.311	1.42	0.57		

Project File: sws3.stm

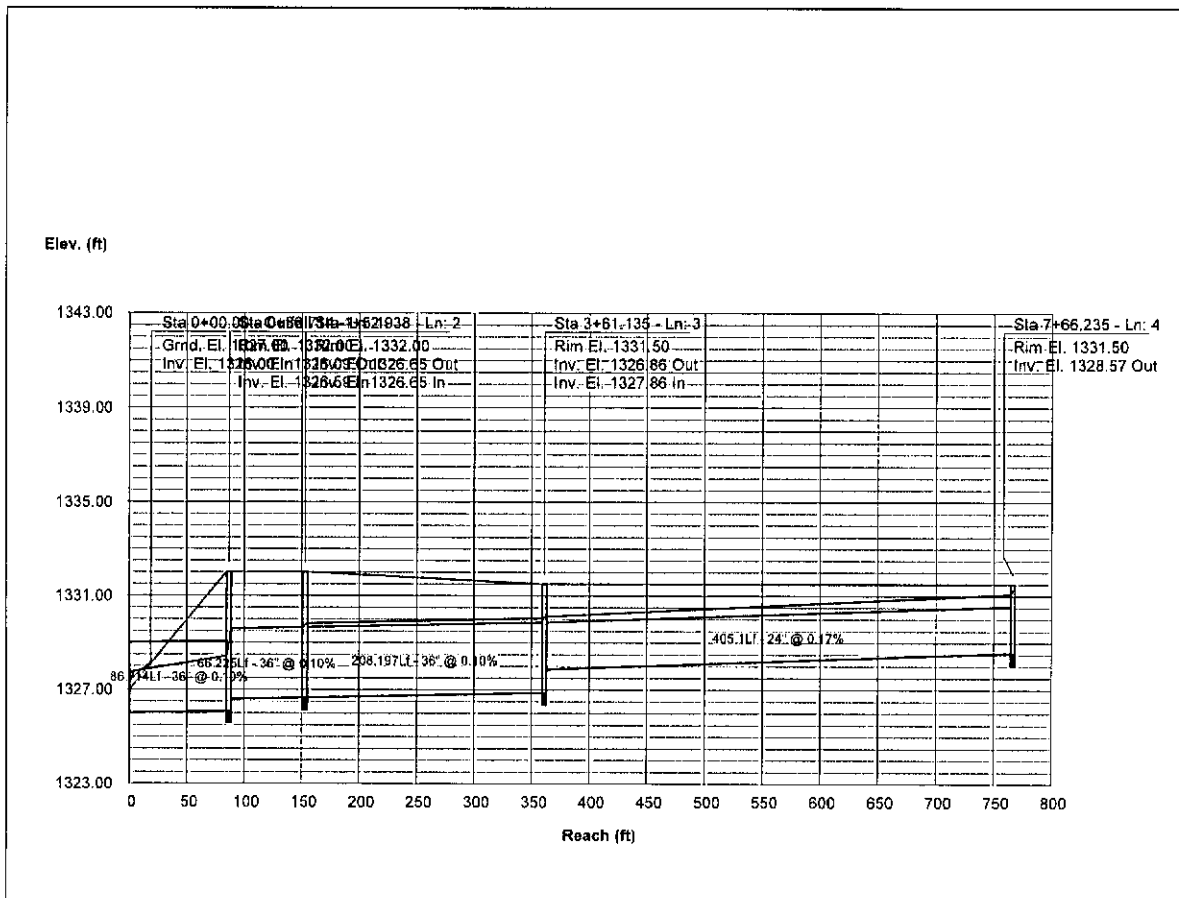
Number of lines: 4

Run Date: 11-15-2007

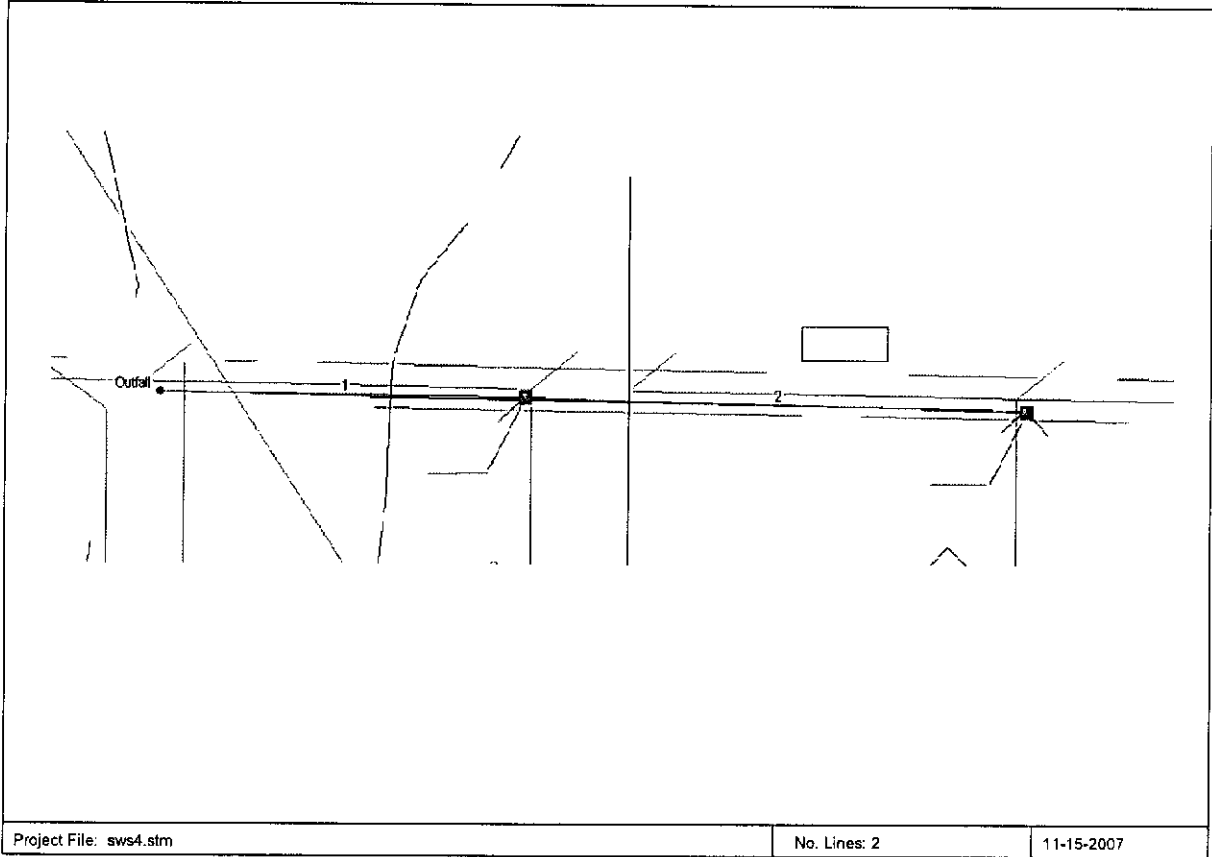
Notes: \* Normal depth assumed.

## Storm Sewer Profile

Proj. file: sws3.stm



# Hydraflow Plan View



Project File: sws4.stm

No. Lines: 2

11-15-2007

Hydraflow Storm Sewers 2005

## Storm Sewer Inventory Report

Page 1

Line No.	Alignment				Flow Data				Physical Data							Line ID	
	Distr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)		Inlet/ Rlm El (ft)
2	1	258.3	0.8	DrGrt	10.00	0.00	0.00	0.0	1328.47	0.17	1328.91	24	Cir	0.013	1.00	1331.50	
1	End	189.1	0.6	DrGrt	10.00	0.00	0.00	0.0	1327.60	0.12	1327.72	30	Cir	0.013	0.50	1332.00	

Project File: sws4.stm

Number of Lines: 2

Date: 11-15-2007

Hydraflow Storm Sewers 2005

# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert Elev. Dr (ft)	Invert Elev. Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dist line No.
2		10.00	24 c	256.3	1328.47	1328.51	0.173	1330.33	1330.77	0.17	1330.94	1
1		20.00	30 c	199.1	1327.50	1327.72	0.116	1329.00	1330.09	0.13	1330.22	End
Project File: sws4.stm Number of lines: 2 Run Date: 11-15-2007												

## Inlet Report

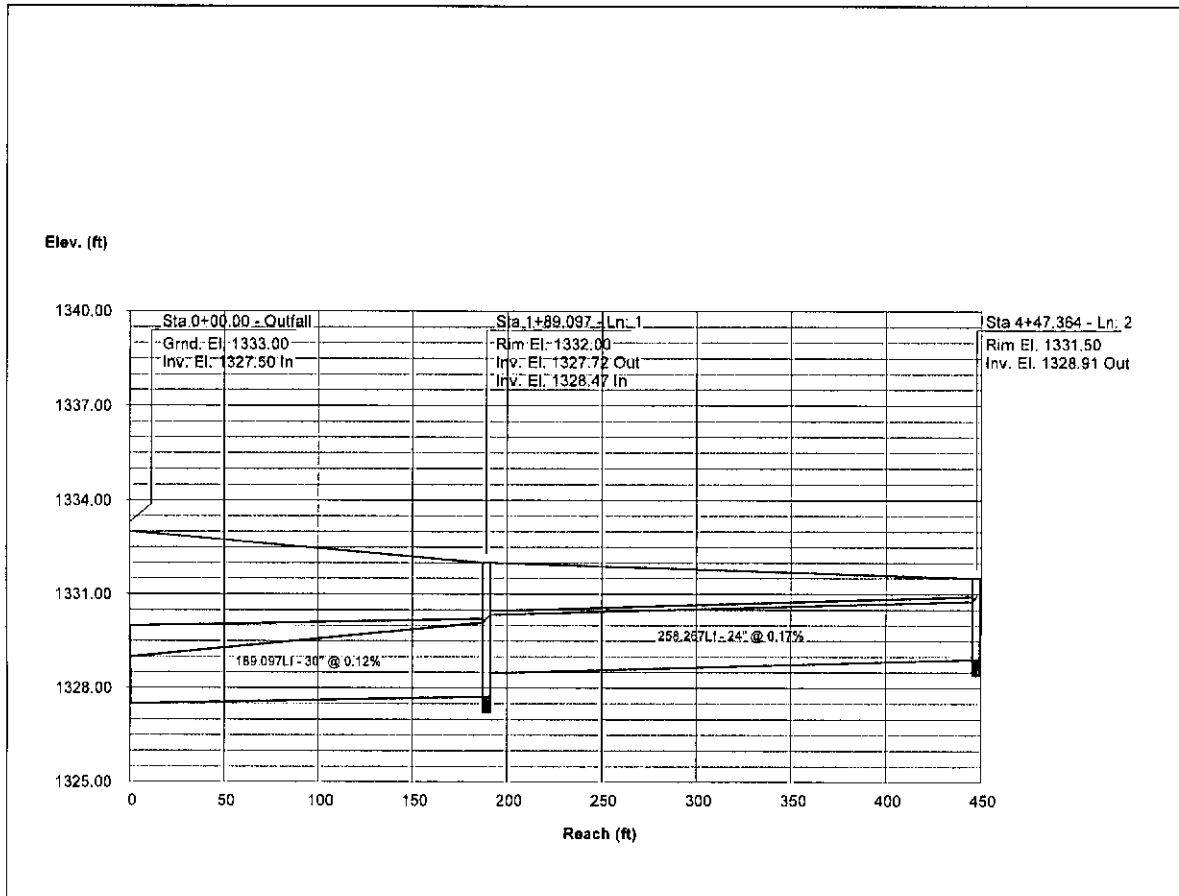
Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet			Grate Inlet			Gutter						Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
2		10.00*	0.00	10.00	0.00	DrGr	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.013	0.87	36.63	0.87	36.63	0.00	1
1		10.00*	0.00	10.00	0.00	DrGr	6.0	6.00	2.00	4.00	2.00	Sky	2.00	0.050	0.050	0.013	0.87	36.63	0.87	36.63	0.00	Off
Project File: sws4.stm Number of lines: 2 Run Date: 11-15-2007																						
NOTES: Inlet N-Values = 0.015 ; Intensity = 69.87 / (Inlet time + 13.10) ^ 0.87; Return period = 2 Yrs. ; * Indicates Known Q added																						

# Hydraulic Grade Line Computations

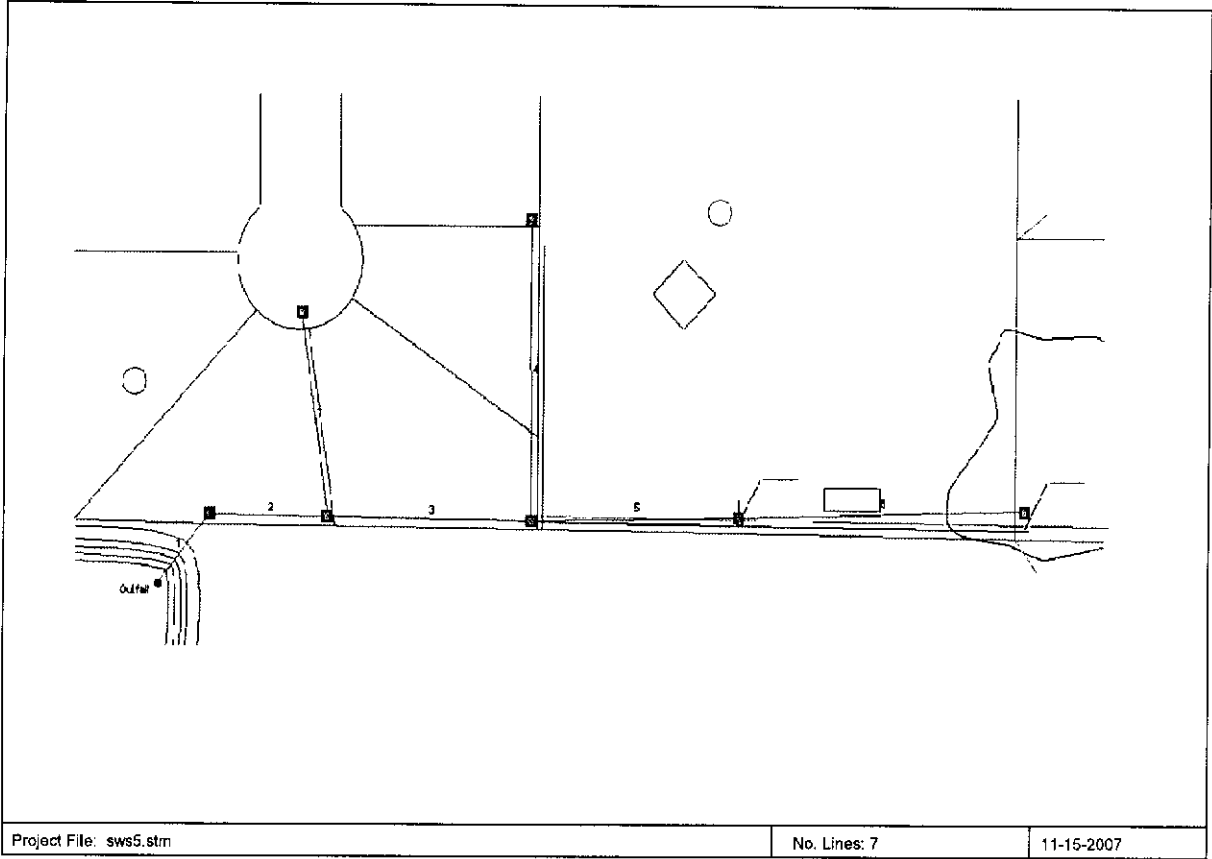
Line	Size (In)	Q (cfs)	Downstream								Len (ft)	Upstream								Check		JL coeff (K)	Minor loss (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
2	24	10.00	1328.47	1330.33	1.87	3.05	3.27	0.17	1330.50	0.169	258	1328.91	1330.77	1.85	3.04	3.29	0.17	1330.94	0.169	0.169	0.437	1.00	0.17
1	30	20.00	1327.60	1329.00	1.49	3.08	6.53	0.66	1329.66	0.533	189	1327.72	1330.09	2.37	4.81	4.16	0.27	1330.36	0.208	0.369	0.698	0.50	0.13

Project File: sws4.stm Number of lines: 2 Run Date: 11-15-2007

## Storm Sewer Profile



# Hydraflow Plan View



Hydraflow Storm Sewers 2005

## Storm Sewer Inventory Report

Page 1

Line No.	Alignment				Flow Data				Physical Data							Line ID
	Distr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	
7	2	147.8	-99.1	Curb	4.00	0.00	0.00	0.0	1326.91	0.32	1327.39	15	Cir	0.013	1.00	1337.60
6	6	227.0	-0.4	DrGr	6.50	0.00	0.00	0.0	1327.08	0.26	1327.64	18	Cir	0.013	1.00	1332.00
5	3	165.4	-1.7	DrGr	10.30	0.00	0.00	0.0	1326.85	0.13	1326.06	24	Cir	0.013	0.50	1333.50
4	3	216.0	-91.1	DrGr	2.00	0.00	0.00	0.0	1327.35	0.44	1328.29	15	Cir	0.013	1.00	1333.60
3	2	162.1	-0.1	DrGr	1.00	0.00	0.00	0.0	1325.41	0.12	1325.60	30	Cir	0.013	1.50	1335.50
2	1	94.4	51.6	DrGr	2.00	0.00	0.00	0.0	1326.07	0.10	1325.16	36	Cir	0.013	1.50	1334.20
1	End	64.8	-50.6	DrGr	1.00	0.00	0.00	0.0	1325.00	0.11	1325.07	36	Cir	0.013	1.23	1336.00

Project File: sws5.stm

Number of lines: 7

Date: 11-15-2007

Hydraflow Storm Sewers 2005

# Storm Sewer Summary Report

Line No.	Line ID	Flow Rate (cfs)	Line size (in)	Line length (ft)	Invert Elev. (ft)	Invert Elev. Up (ft)	Line Slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Drain line No.
7		4.00	15 c	147.8	1326.91	1327.39	0.325	1326.56	1328.13	0.17	1329.30	2
6		6.50	18 c	227.0	1327.06	1327.64	0.265	1330.65	1331.52	0.21	1331.73	5
5		16.80	24 c	165.4	1325.85	1326.06	0.127	1329.28	1330.19	0.22	1330.41	3
4		2.00	15 c	216.0	1327.35	1328.29	0.435	1328.49	1329.70	0.04	1329.74	3
3		19.80	30 c	162.1	1325.41	1325.60	0.117	1328.52	1328.90	0.38	1329.28	2
2		25.80	36 c	94.4	1325.07	1325.16	0.095	1328.07	1328.21	0.31	1328.52	1
1		26.50	36 c	84.8	1325.00	1325.07	0.108	1327.00	1327.22	0.47	1327.68	End

Project File: sws5.stm  
 Number of lines: 7  
 Run Date: 11-15-2007

NOTES: c = cft; s = slp; h = box; Return period = 2 Yrs.; Surcharge (HGL above crown);  
 Hydraulic Storm Sewers 2005

# Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet			Grate Inlet			Gutter					Inlet			Byp line No	
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)
7		4.00	0.00	4.00	0.00	Curb	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.38	6.37	0.49	6.37	2.00	2
6		6.50	0.00	6.50	0.00	DrGr	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.013	0.37	16.63	0.37	16.63	0.00	5
5		10.30	0.00	10.30	0.00	DrGr	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.013	0.92	36.74	0.92	36.74	0.00	3
4		2.00	0.00	2.00	0.00	DrGr	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.013	0.15	7.82	0.15	7.82	0.00	3
3		1.00	0.00	1.00	0.00	DrGr	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.013	0.09	5.66	0.09	5.66	0.00	2
2		2.00	0.00	2.00	0.00	DrGr	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.013	0.15	7.82	0.15	7.82	0.00	1
1		1.00	0.00	1.00	0.00	DrGr	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.013	0.09	5.66	0.09	5.66	0.00	Off

Project File: sws5.stm  
 Number of lines: 7  
 Run Date: 11-15-2007

NOTES: Inlet N-Values = 0.016 ; Intensity = 69.87 / (inlet time + 13.10) ^ 0.87; Return period = 2 Yrs.; \* Indicates Known Q added

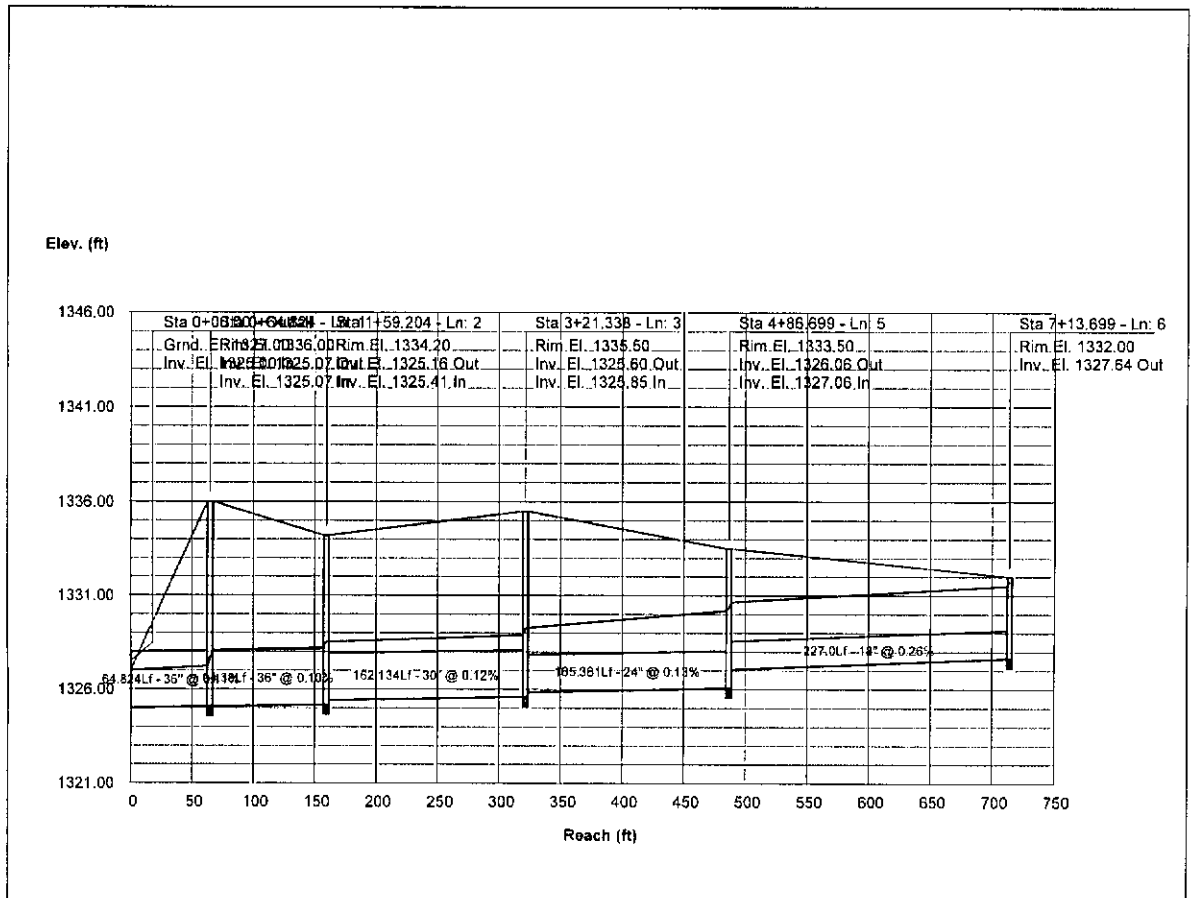
Hydraulic Storm Sewers 2005

# Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Energy loss (ft)		
7	15	4.00	1326.91	1328.56	1.25	1.23	3.26	0.17	1328.73	0.384	148	1327.39	1329.13	1.25	1.23	3.26	0.17	1329.30	0.384	0.384	0.567	1.00	0.17
6	18	6.50	1327.06	1330.65	1.60	1.77	3.68	0.21	1330.85	0.383	227	1327.64	1331.52	1.60	1.77	3.68	0.21	1331.73	0.383	0.383	0.870	1.00	0.21
6	24	16.80	1325.85	1329.28	2.00	3.14	5.35	0.44	1329.72	0.552	185	1326.06	1330.19	2.00	3.14	5.35	0.44	1330.64	0.552	0.552	0.913	0.50	0.22
4	15	2.00	1327.35	1328.49	1.25	1.23	1.63	0.04	1329.53	0.096	216	1328.29	1329.70	1.25	1.23	1.63	0.04	1329.74	0.096	0.096	0.207	1.00	0.04
3	30	19.80	1325.41	1328.52	2.50	4.91	4.03	0.25	1328.78	0.233	182	1325.60	1328.90	2.50	4.91	4.03	0.25	1329.15	0.233	0.233	0.378	1.50	0.38
2	36	25.50	1325.07	1328.07	3.00	7.07	3.65	0.21	1328.28	0.150	84.4	1325.16	1328.21	3.00	7.07	3.65	0.21	1328.42	0.150	0.150	0.141	1.50	0.31
1	36	26.80	1325.00	1327.00	2.00	5.01	6.35	0.45	1327.45	0.263	64.8	1325.07	1327.22	2.15	5.43	4.94	0.38	1327.60	0.216	0.239	0.155	1.23	0.47

Project File: sws5.stm  
 Number of lines: 7  
 Run Date: 11-15-2007  
 Notes: \* Normal depth assumed.

## Storm Sewer Profile



# PondPack Routing

Overall Pond System  
(as shown in Northgate Addition)

Table of Contents

\*\*\*\*\* MASTER SUMMARY \*\*\*\*\*

Watershed ... Master Network Summary ... 1.01

\*\*\*\*\* DESIGN STORMS SUMMARY \*\*\*\*\*

Sedawick24... Design Storms ... 2.01

Sedawick24... 10 yr Design Storms ... 2.02

\*\*\*\*\* TC CALCULATIONS \*\*\*\*\*

NORTH OFFSITE... Tc Calcs ... 3.01

WEST OFFSITE... Tc Calcs ... 3.03

\*\*\*\*\* POND VOLUMES \*\*\*\*\*

ENTRY POND ... Vol Elev-Area ... 4.01

LONG POND ... Vol Elev-Area ... 4.02

MAIN POND ... Vol Elev-Area ... 4.03

SOUTH POND... Vol: Elev-Area ... 4.04

\*\*\*\*\* OUTLET STRUCTURES \*\*\*\*\*

NEW BOX... Outlet Input Data ... 5.01

MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID SEDGWICK.RNQ Sedgwick24

Return Event	Total Depth In	Rainfall Type	RNF File	RNF ID
10 yr	5.0000	Synthetic Curve	SCSTYPES	Type11 24hr
2 yr	2.8000	Synthetic Curve	SCSTYPES	Type11 24hr
100	7.9000	Synthetic Curve	SCSTYPES	Type11 24hr

ICPM CALCULATION TOLERANCES

Target Convergence= .000 cfs +/-  
 Max. Iterations = 35 loops  
 ICPM Time Step = .0500 hrs  
 Output Time Step = .0500 hrs  
 ICPM Ending Time = 35.0000 hrs

MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
 (Trun= HYG Truncation; Blank=None; L=Left; R=Rt; LR=Left&Rt)

Storage Node ID	Return Type Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
53RD COMMERCIAL AREA	10	5.815		12.0500	80.68		
53RD COMMERCIAL AREA	2 yr	2.702		12.0500	38.84		
53RD COMMERCIAL AREA	100	10.061		12.0500	135.17		
COMMERCIAL AREA	10	9.691		12.0500	134.47		
COMMERCIAL AREA	2 yr	4.503		12.0500	64.73		
COMMERCIAL AREA	100	16.768		12.0500	225.28		
EAST ENTRY LOTS AREA	10	1.633		12.0500	23.73		
EAST ENTRY LOTS AREA	2 yr	.555		12.0500	7.64		
EAST ENTRY LOTS AREA	100	3.301		12.0500	47.58		
ENTRY POND POND	10	1.633		12.0500	23.73		
ENTRY POND POND	2 yr	.555		12.0500	7.64		
ENTRY POND POND	100	3.301		12.0500	47.58		

S/N: 121201A06A8A Baughman Company PA  
 PondPack Ver. 7.5 (767) Compute Time: 15:26:21 Date: 11/12/2007

S/N: 121201A06A8A Baughman Company PA  
 PondPack Ver. 7.5 (767) Compute Time: 15:26:21 Date: 11/12/2007

Type... Master Network Summary Page 1.02  
 Name... Watershed  
 File... F:\HYDRO\PROJECTS\NORTHGATE\PONDPACK\PONDS-TK3-20-07.PPW

MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
 (Trun= HYG Truncation; Blank=None; L=Left; R=Rt; LR=Left&Rt)

Storage Node ID	Return Type Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
ENTRY POND	OUT POND 10	1.595		12.1500	15.62	1333.70	
416	ENTRY POND	OUT POND 2 yr		.532	13.7500	.54	1333.45
266	ENTRY POND	OUT POND 100		3.252	12.1500	37.33	1333.98
586	EXISTING AREA	10	202.843	20.3000	197.16		
	EXISTING AREA	2 yr	54.979	20.3500	50.20		
	EXISTING AREA	100	454.328	18.9000	449.30		
	*EXISTING BOX	JCT 10	202.843	20.3000	197.16		
	*EXISTING BOX	JCT 2 yr	54.979	20.3500	50.20		
	*EXISTING BOX	JCT 100	454.328	18.9000	449.30		
	LONG POND	POND 10	169.157	20.3500	139.42		
	LONG POND	POND 2 yr	44.051	12.0500	64.56		
	LONG POND	POND 100	383.188	20.3000	328.70		
	LONG POND	OUT POND 10	162.447	21.8000	137.29	1329.81	
15.486	LONG POND	OUT POND 2 yr	40.607	22.6500	33.13	1328.20	
6.536	LONG POND	OUT POND 100	373.084	20.9000	320.45	1331.79	
27.461	LONG POND	OUT POND 10	-.444	12.1500	-21.83(-0)		
	MAIN POND	POND 10	32.160	12.0500	256.88		
	MAIN POND	POND 2 yr	11.643	12.0000	88.29		
	MAIN POND	POND 100	63.479	12.0000	524.13		
	MAIN POND	OUT POND 10	22.312	13.6000	46.67	1329.88	
17.099	MAIN POND	OUT POND 2 yr	5.606	15.1500	8.60	1328.22	
7.215	MAIN POND	OUT POND 100	49.621	13.3500	109.94	1331.91	
29.149	MAIN POND	OUT POND 10	-.225	19.6000	-1.81(-0)		
	MAIN POND 5	POND 10	22.312	13.6000	46.67		
	MAIN POND 5	POND 2 yr	5.606	15.1500	8.60		
	MAIN POND 5	POND 100	49.621	13.3500	109.94		
	MAIN POND 5	POND 10	-.225	19.6000	-1.81(-0)		

S/N: 121201A06A8A Baughman Company PA  
 PondPack Ver. 7.5 (767) Compute Time: 15:26:21 Date: 11/12/2007

S/N: 121201A06A8A Baughman Company PA  
 PondPack Ver. 7.5 (767) Compute Time: 15:26:21 Date: 11/12/2007

MASTER NETWORK SUMMARY  
 SC5 Unit Hydrograph Method  
 (\*Node=Outlet), (+Node=Diverston.)  
 (Trun= HYG Truncation Blank=None; L=Left; R=Right; LR=Left&Right)

File... C:\HAESTAD\PPK\MRAIN\FALL\SEDGWICK.RNQ  
 Title...

JOB TITLE NOT SPECIFIED  
 Click Project Summary on the File Menu to enter title

DESIGN STORMS SUMMARY

Design Storm File ID = SEDGWICK.RNQ Sedgwick24

Storage Node ID	Return Type Event	HYG Vol ac-ft	Qpeak Trun hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
16.743	MAIN POND 5 OUT POND	10 17.979	29.4500	18.38	1329.82	
7.055	MAIN POND 5 OUT POND	2 yr 2.894	35.0000	4.69	1328.19	
28.571	MAIN POND 5 OUT POND	100 44.203	14.5000	61.05	1331.81	
	MAIN POND 5 OUT POND	10 -5.231	19.2000	-14.37(-Q)		
	*NEW BOX JCT	10 167.120	21.9000	138.26		
	*NEW BOX JCT	2 yr 42.714	22.7000	33.65		
	*NEW BOX JCT	100 381.602	21.1000	322.11		
	NORTH OFFSITE AREA	10 13.675	12.7000	72.67		
	NORTH OFFSITE AREA	2 yr 4.646	12.7000	22.37		
	NORTH OFFSITE AREA	100 27.645	12.7000	148.71		
	NORTHGATE SUBDIVS AREA	10 12.655	12.0500	183.92		
	NORTHGATE SUBDIVS AREA	2 yr 4.302	12.0500	59.18		
	NORTHGATE SUBDIVS AREA	100 25.583	12.0500	368.71		
	POND RAINFALL AREA	10 4.235	11.9000	71.26		
	POND RAINFALL AREA	2 yr 2.160	11.9000	37.68		
	POND RAINFALL AREA	100 6.987	11.9000	114.81		
	SOUTH POND POND	10 167.817	21.8000	138.35		
	SOUTH POND POND	2 yr 43.038	12.0000	33.87		
	SOUTH POND POND	100 382.753	20.9000	322.25		
	SOUTH POND OUT POND	10 167.120	21.9000	138.26	1329.31	
1.366	SOUTH POND OUT POND	2 yr 42.714	22.7000	33.65	1327.89	
489	SOUTH POND OUT POND	100 381.602	21.1000	322.11	1331.07	
2.823						
	WEST OFFSITE AREA	10 152.508	20.3000	148.24		
	WEST OFFSITE AREA	2 yr 41.336	20.3500	37.74		
	WEST OFFSITE AREA	100 341.588	18.9000	337.81		

Storm Tag Name = 10 yr  
 Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr  
 Storm Frequency = 10 yr  
 Total Rainfall Depth= 5.0000 in  
 Duration Multiplier = 1  
 Resulting Duration = 24.0000 hrs  
 Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 2 yr  
 Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr  
 Storm Frequency = 2 yr yr  
 Total Rainfall Depth= 2.8000 in  
 Duration Multiplier = 1  
 Resulting Duration = 24.0000 hrs  
 Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100  
 Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr  
 Storm Frequency = 100 yr  
 Total Rainfall Depth= 7.9000 in  
 Duration Multiplier = 1  
 Resulting Duration = 24.0000 hrs  
 Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

DESIGN STORMS SUMMARY

Design Storm File ID = SEDGWICK.RNQ Sedgwick24

TIME OF CONCENTRATION CALCULATOR

Storm Tag Name = 10 yr  
 Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr  
 Storm Frequency = 10 yr  
 Total Rainfall Depth= 5.0000 in  
 Duration Multiplier = 1  
 Resulting Duration = 24.0000 hrs  
 Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Segment #1: Tc TR-55 Shallow  
 Hydraulic Length 2300.00 ft  
 Slope .001000 ft/ft  
 Unpaved  
 Avg. Velocity .51 ft/sec

Storm Tag Name = 2 yr  
 Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr  
 Storm Frequency = 2 yr yr  
 Total Rainfall Depth= 2.8000 in  
 Duration Multiplier = 1  
 Resulting Duration = 24.0000 hrs  
 Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Segment #1 Time: 1.2522 hrs  
 Total Tc: 1.2522 hrs

Storm Tag Name = 100  
 Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr  
 Storm Frequency = 100 yr  
 Total Rainfall Depth= 7.9000 in  
 Duration Multiplier = 1  
 Resulting Duration = 24.0000 hrs  
 Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

File.... F:\HYDRO\PROJECTS\NORTHGATE\PONDPACK\PONDS-TK3-20-07.PPW

Tc Equations used...

==== SCS TR-55 Shallow Concentrated Flow =====

Unpaved surface  
 $V = 16.1345 * (Sf^{.5})$

Paved surface:  
 $V = 20.3282 * (Sf^{.5})$

$Tc = (Lf / V) / (.3600sec/hr)$

where V = Velocity, ft/sec  
 Sf = Slope, ft/ft  
 Tc = Time of concentration, hrs  
 Lf = Flow length, ft

File.... F:\HYDRO\PROJECTS\NORTHGATE\PONDPACK\PONDS-TK3-20-07.PPW

Tc Equations used...

==== SCS TR-55 Shallow Concentrated Flow =====

Unpaved surface:  
 $V = 16.1345 * (Sf^{.5})$

Paved surface:  
 $V = 20.3282 * (Sf^{.5})$

$Tc = (Lf / V) / (.3600sec/hr)$

where: V = Velocity, ft/sec  
 Sf = Slope, ft/ft  
 Tc = Time of concentration, hrs  
 Lf = Flow length, ft

File.... F:\HYDRO\PROJECTS\NORTHGATE\PONDPACK\PONDS-TK3-20-07.PPW

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Shallow

Hydraulic Length 20000.00 ft  
 Slope .001000 ft/ft  
 Unpaved

Avg. Velocity .51 ft/sec

Segment #1 Time 10.5886 hrs

=====  
 Total Tc 10.5886 hrs  
 =====

File.... F:\HYDRO\PROJECTS\NORTHGATE\PONDPACK\PONDS-TK3-20-07.PPW

Elevation (ft)	Planimeter (sq. in)	Area (acres)	A1+A2+sqrt(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
1333.00	-----	.5000	.0000	.000	.000
1334.00	-----	.7000	1.7916	.597	.597
1335.00	-----	.9000	2.3937	.796	1.395
1336.00	-----	1.1000	2.9950	.998	2.393

POND VOLUME EQUATIONS

\* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) \* (EL2-EL1) \* (Area1 + Area2 + sqrt(Area1\*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment  
 Area1, Area2 = Areas computed for EL1, EL2, respectively  
 Volume = Incremental volume between EL1 and EL2

Elevation (ft)	Planimeter (sq. in)	Area (acres)	A1+A2+sqrt(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
1327.00	-----	5.4000	.0000	.000	.000
1329.00	-----	5.5000	16.3498	10.900	10.900
1330.00	-----	5.8000	16.9480	5.649	16.549
1331.00	-----	6.1000	17.8481	5.949	22.499
1332.00	-----	6.4000	18.7482	6.249	28.748
1333.00	-----	6.7000	19.6483	6.549	35.297
1334.00	-----	7.0000	20.5484	6.849	42.147
1335.00	-----	7.2000	21.3993	7.100	49.247

POND VOLUME EQUATIONS

\* Incremental volume computed by the Conic Method for Reservoir Volumes.

$$\text{Volume} = (1/3) * (EL2-EL1) * (\text{Area1} + \text{Area2} + \text{sq. rt.}(\text{Area1} * \text{Area2}))$$

where: EL1, EL2 = Lower and upper elevations of the increment  
 Area1, Area2 = Areas computed for EL1, EL2, respectively  
 Volume = Incremental volume between EL1 and EL2

Elevation (ft)	Planimeter (sq. in)	Area (acres)	A1+A2+sqrt(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
1327.00	-----	4.5000	.0000	.000	.000
1335.00	-----	7.5000	17.8095	47.492	47.492

POND VOLUME EQUATIONS

\* Incremental volume computed by the Conic Method for Reservoir Volumes.

$$\text{Volume} = (1/3) * (EL2-EL1) * (\text{Area1} + \text{Area2} + \text{sq. rt.}(\text{Area1} * \text{Area2}))$$

where: EL1, EL2 = Lower and upper elevations of the increment  
 Area1, Area2 = Areas computed for EL1, EL2, respectively  
 Volume = Incremental volume between EL1 and EL2

Elevation (ft)	Planimeter (sq. in)	Area (acres)	A1+A2+sqrt(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
1327.00	-----	.5000	.0000	.000	.000
1328.00	-----	.6000	1.6477	.549	.549
1329.00	-----	.6000	1.8000	.600	1.149
1330.00	-----	.8000	2.0928	.698	1.847
1331.00	-----	1.0000	2.6944	.898	2.745
1332.00	-----	1.2000	3.2954	1.098	3.843

POND VOLUME EQUATIONS

\* Incremental volume computed by the Conic Method for Reservoir Volumes.

$$\text{Volume} = (1/3) * (EL2-EL1) * (\text{Area1} + \text{Area2} + \text{sq. rt.}(\text{Area1} * \text{Area2}))$$

where: EL1, EL2 = Lower and upper elevations of the increment  
 Area1, Area2 = Areas computed for EL1, EL2, respectively  
 Volume = Incremental volume between EL1 and EL2

REQUESTED POND WS ELEVATIONS:

Min. Elev. = 1327.00 ft  
 Increment = .50 ft  
 Max. Elev. = 1332.00 ft

OUTLET CONNECTIVITY

----> Forward Flow Only (UpStream to DnStream)  
 <--- Reverse Flow Only (DnStream to UpStream)  
 <---> Forward and Reverse Both Allowed

Structure	No.	Outfall	E1, ft	E2, ft
Culvert-Box	BX	---->	TW 1327.000	1332.000
TW SETUP, DS Channel				

OUTLET STRUCTURE INPUT DATA

Structure ID = BX  
Structure Type = Culvert-Box  
-----  
No. Barrels = 2  
Barrel Height = 4.00 ft  
Barrel Width = 8.00 ft  
Upstream Invert = 1327.00 ft  
Dnstream Invert = 1324.00 ft  
Horiz. Length = 600.00 ft  
Barrel Length = 600.01 ft  
Barrel Slope = .00500 ft/ft

OUTLET CONTROL DATA...  
Mannings n = .0130  
Ke = .5000 (forward entrance loss)  
Kb = .003356 (per ft of full flow)  
Kr = .5000 (reverse entrance loss)  
HW Convergence = .001 +/- ft

INLET CONTROL DATA...  
Equation form = 1  
Inlet Control K = .0260  
Inlet Control M = 1.0000  
Inlet Control c = .03950  
Inlet Control Y = .8100  
T1 ratio (HW/D) = 1.176  
T2 ratio (HW/D) = 1.424  
Slope Factor = -.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.  
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,  
interpolate between flows at T1 & T2...  
At T1 Elev = 1331.70 ft --> Flow = 224.00 cfs  
At T2 Elev = 1332.69 ft --> Flow = 256.00 cfs

OUTLET STRUCTURE INPUT DATA

Structure ID = TW  
Structure Type = TW SETUP, DS Channel  
-----

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...  
Maximum Iterations = 30  
Min. TW tolerance = .01 ft  
Max. TW tolerance = .01 ft  
Min. HW tolerance = .01 ft  
Max. HW tolerance = .01 ft  
Min. Q tolerance = .10 cfs  
Max. Q tolerance = .10 cfs

Appendix A

A-1

Index of Starting Page Numbers for ID Names

----- E -----  
ENTRY POND... 4.01  
----- L -----  
LONG POND... 4.02  
----- M -----  
MAIN POND... 4.03  
----- N -----  
NEW BOX... 5.01  
NORTH OFFSITE... 3.01  
----- S -----  
Sedgwick24... 2.01, 2.02  
SOUTH POND... 4.04  
----- W -----  
Watershed... 1.01  
WEST OFFSITE... 3.03

**PLAN SHEETS**

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**DRAINAGE & GRADING PLANS**

**Scale 1:100**



# ONE-SHEET FINAL PLAN

## NORTHGATE COMMERCIAL 2ND ADDITION WICHITA, SEDGWICK COUNTY, KANSAS

State of Kansas) SS The Sedgewick Company, P.A., Surveyor in  
Sedgewick County and state on the 1st day of August, 2007, that  
we have caused to be surveyed and laid out in the City of  
Wichita, Kansas, the following described parcel, to-wit: A certain  
parcel of land in the City of Wichita, Kansas, bounded on the  
north by the east line of said SE 1/4 of Block B, 440.37 feet to the NE corner of Lot 1 in said Block B, said NE  
corner also being on the south right-of-way line of 5th St. N. as  
described in said Northgate Commercial 2nd Addition, thence S87°02'14"E along the south  
right-of-way line of said SE 1/4 of Block B, 440.37 feet to a point on the east line of said SE 1/4 of Block B, 440.37 feet to the point of beginning, of  
being subject to road rights-of-way of record.  
Existing public easements and dedications  
being located by reference to A.S.A. 79-2123.

Sedgewick Company, P.A.

Michael G. Doney, Surveyor

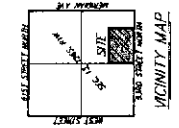
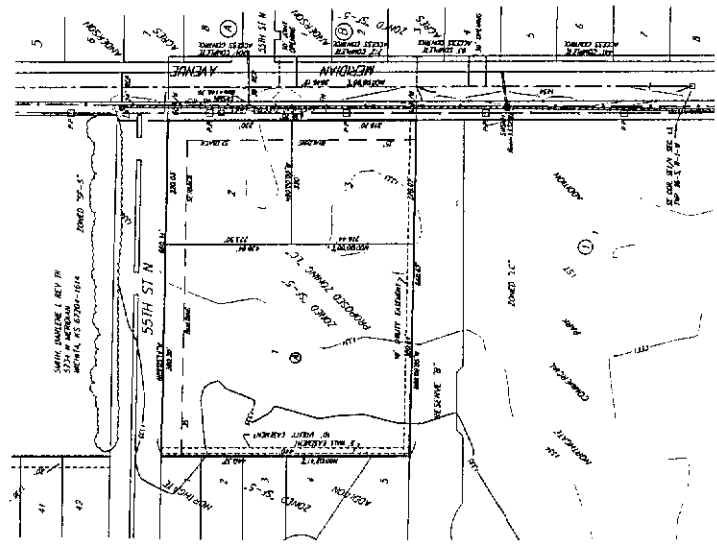
Know all men by these presents that we, the undersigned, have caused the land in the foregoing certificate to be  
surveyed into lots and blocks, to be known as "NORTHGATE COMMERCIAL  
2ND ADDITION", Wichita, Sedgewick County, Kansas. The utility easements  
shown on this plan are shown for the purpose of indicating the location of  
all public utilities. Access easements and the easements shown on the face of  
this plan and as hereby granted to the City of Wichita, Kansas, the  
permitted opening locations shall be as determined by the City Engineer  
of the City of Wichita, Kansas.

R. A. R. Realty, LLC,  
a Kansas limited liability company

Jay W. Hussain, Manager

Niche Associates, Inc., Manager

Aradh M. Madan, President



- LEGEND**
- 1 - 1/4 Acre (108,900 sq. ft.)
  - 2 - 1/4 Acre (108,900 sq. ft.)
  - 3 - 1/4 Acre (108,900 sq. ft.)
  - 4 - 1/4 Acre (108,900 sq. ft.)
  - 5 - 1/4 Acre (108,900 sq. ft.)
  - 6 - 1/4 Acre (108,900 sq. ft.)
  - 7 - 1/4 Acre (108,900 sq. ft.)
  - 8 - 1/4 Acre (108,900 sq. ft.)
  - 9 - 1/4 Acre (108,900 sq. ft.)
  - 10 - 1/4 Acre (108,900 sq. ft.)
  - 11 - 1/4 Acre (108,900 sq. ft.)
  - 12 - 1/4 Acre (108,900 sq. ft.)
  - 13 - 1/4 Acre (108,900 sq. ft.)
  - 14 - 1/4 Acre (108,900 sq. ft.)
  - 15 - 1/4 Acre (108,900 sq. ft.)
  - 16 - 1/4 Acre (108,900 sq. ft.)
  - 17 - 1/4 Acre (108,900 sq. ft.)
  - 18 - 1/4 Acre (108,900 sq. ft.)
  - 19 - 1/4 Acre (108,900 sq. ft.)
  - 20 - 1/4 Acre (108,900 sq. ft.)

NEED TO BE FILED WITH THE CITY ENGINEER'S OFFICE AND THE COUNTY ENGINEER'S OFFICE WITHIN 30 DAYS OF THE DATE OF RECORDING.

SS The undersigned holders of a mortgage on  
the above described property, to-wit: North-  
gate Commercial 2nd Addition, Wichita, Sedgewick County, Kansas,  
Legacy Bank.

Chair \_\_\_\_\_  
M. S. Mitchell  
Secretary \_\_\_\_\_  
Ann L. Schwegel

This plan approved and all conditions  
shown herein accepted by the City Council of the City of Wichita,  
Kansas, this \_\_\_\_\_ day of \_\_\_\_\_, 2007.

Mayor \_\_\_\_\_  
Carl Brewer  
City Clerk \_\_\_\_\_  
Norm Sublett

Reviewed in accordance with K.S.A. 58-2205  
on this \_\_\_\_\_ day of \_\_\_\_\_, 2007.

Trace L. Hawkins, L.S. 5740  
County Surveyor  
Sedgewick County, Kansas

Entered on transfer record this \_\_\_\_\_ day  
of \_\_\_\_\_, 2007.

Dea Bruce \_\_\_\_\_  
County Clerk

State of Kansas) SS This is to certify that this plan has been  
recorded in the office of the County Clerk of Sedgewick County,  
Kansas, on the \_\_\_\_\_ day of \_\_\_\_\_, 2007, and is duly recorded.

Register of Deeds \_\_\_\_\_  
BW Meek  
Deputy \_\_\_\_\_  
Tanya Bickelham

State of Kansas) SS The foregoing instrument acknowledged before me,  
Sedgewick County) on this \_\_\_\_\_ day of \_\_\_\_\_, 2007, by Aradh M. Madan, President of  
Niche Associates, Inc., as manager of R. A. R. Realty, LLC, a Kansas limited  
liability company, on behalf of the limited liability company.

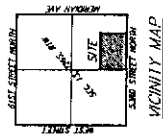
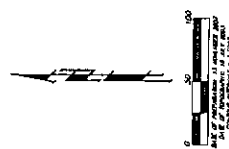
My Exp. \_\_\_\_\_  
Notary Public \_\_\_\_\_

This plan of "NORTHGATE COMMERCIAL 2ND  
ADDITION", Wichita, Sedgewick County, Kansas has been submitted to and  
approved by the Wichita-Sedgewick County Metropolitan Area Planning  
Commission on the \_\_\_\_\_ day of \_\_\_\_\_, 2007.  
Wichita-Sedgewick County Metropolitan Area Planning Commission

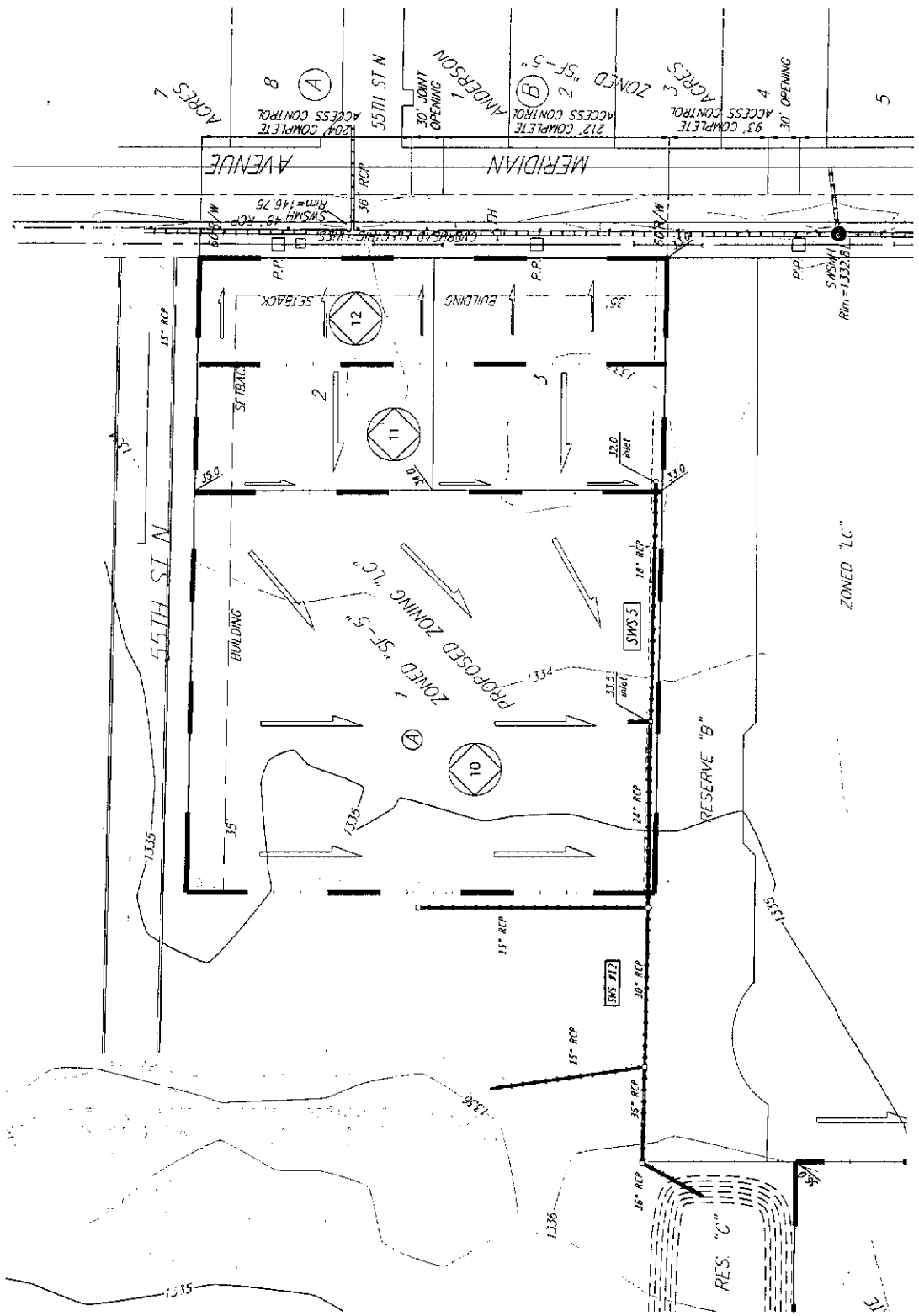
# DRAINAGE & GRADING PLAN

## NORTHGATE COMMERCIAL 2ND ADDITION

### WICHITA, SEDGWICK COUNTY, KANSAS



NOTE: Mr. FEM 5214 visits on this property on November 11, 2007 for FEMA visit. The site is located at the intersection of 55th Street and Meridian Avenue, Sedgewick County, Kansas, effective February 2, 2007. Stormwater sewer is expected at the developed lots. The on-site stormwater will tie into the stormwater as shown. Final location to be determined upon development. This plan is to be used in conjunction with Northgate Addition as well as Northgate Commercial Addition.



Developed	2yr	10yr	100yr
Intensity	3.8	5.14	7.38
Rainfall "C"	0.85	0.81	0.9

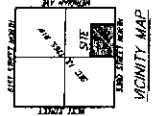
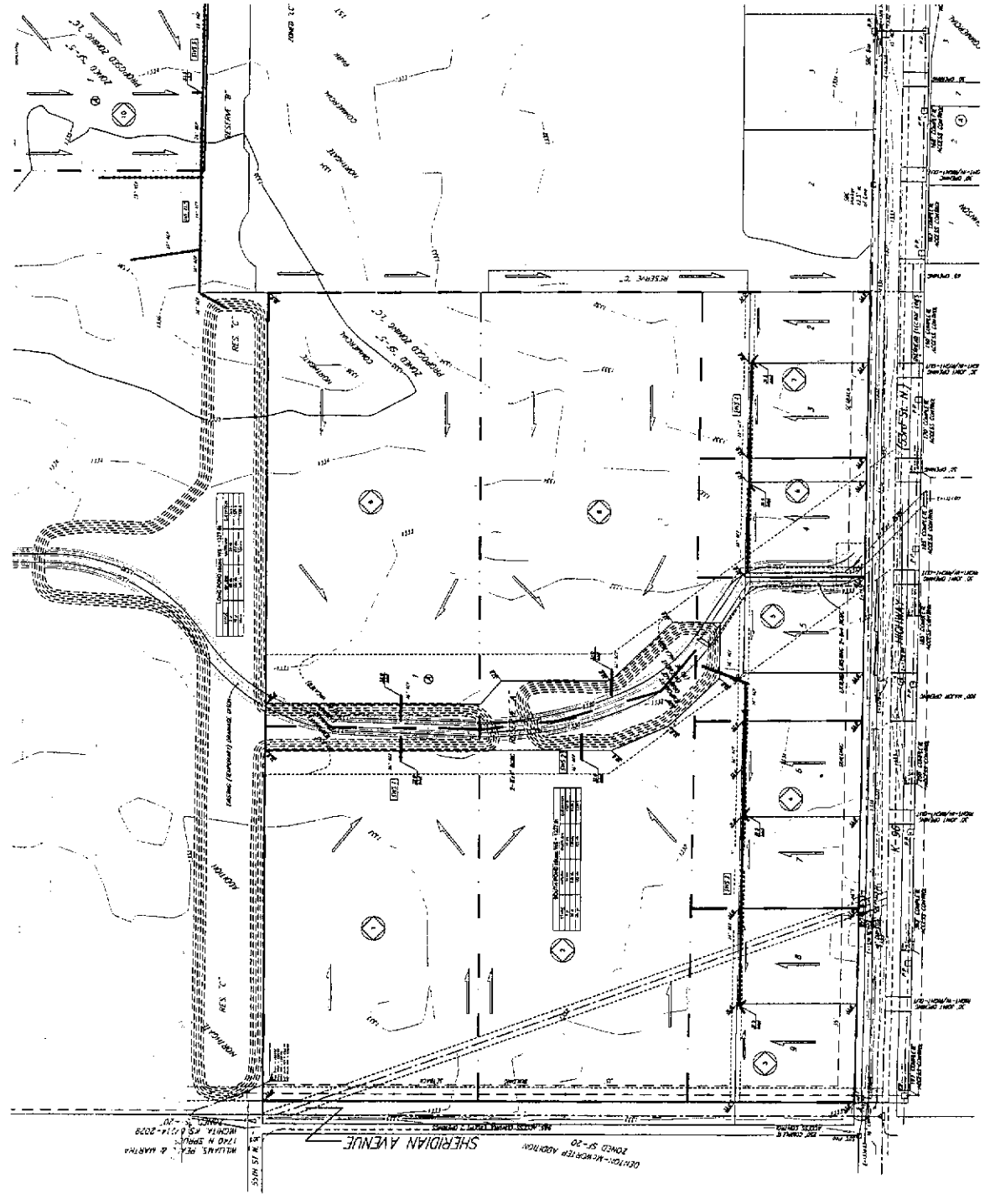
  

Basin ID	Area	Developed Encumbrance		
		2yr	10yr	100yr
1	8.0	26	37	53
2	6.4	21	30	43
3	3.2	10	15	22
4	3.2	10	15	22
5	2.4	7.8	11	16
6	2.0	6.5	9.1	13
7	2.8	9.0	13	19
8	8.5	28	40	58
9	3.2	10	15	21
10	3.2	10	15	21
11	2.0	6.5	9.1	13
12	1.0	3.2	4.6	6.6
13	1.0	3.2	4.6	6.6
TOTAL	54.7	177	250	362

# DRAINAGE & GRADING PLAN

## NORTHGATE COMMERCIAL ADDITION

### WICHITA, SEDGWICK COUNTY, KANSAS



NOTE: All FEMA FEMA units on this property as November 1987, for FEMA units 1974 & 211 of 700 for Sedgewick County, Kansas, effective February 2, 2007.

Stormwater Sewer is expected on the developed lots. The on-site stormwater will tie into the stormwater as shown. Final location to be determined upon development.

This plan to be used in conjunction with Northgate Addition as well as Northgate Commercial 2nd Addition.

Development	ST	150'	100'	1500'
Submittal C	3.8	5.18	7.0	0.3
Submittal C	0.02	0.02	0.02	0.3

Block #	Area	Developed Footcandle		
		2 1/2'	18 1/2'	18 1/2'
1	8.4	2.0	5.8	2.8
2	8.4	2.0	5.8	2.8
3	8.4	2.0	5.8	2.8
4	8.4	2.0	5.8	2.8
5	8.4	2.0	5.8	2.8
6	8.4	2.0	5.8	2.8
7	8.4	2.0	5.8	2.8
8	8.4	2.0	5.8	2.8
9	8.4	2.0	5.8	2.8
10	8.4	2.0	5.8	2.8
11	8.4	2.0	5.8	2.8
12	8.4	2.0	5.8	2.8
13	8.4	2.0	5.8	2.8
14	8.4	2.0	5.8	2.8
15	8.4	2.0	5.8	2.8
16	8.4	2.0	5.8	2.8
17	8.4	2.0	5.8	2.8
18	8.4	2.0	5.8	2.8
19	8.4	2.0	5.8	2.8
20	8.4	2.0	5.8	2.8
TOTAL	167.2	42.0	116.4	54.4

**DRAINAGE & GRADING PLAN**

**NORTHGATE COMMERCIAL ADDITION**

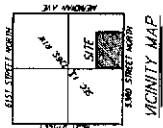
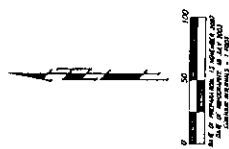
WICHITA, SEDGWICK COUNTY, KANSAS

Baughman Company, P.A.  
Professional Engineer  
Baughman Water Management, Inc.

# NORTHGATE COMMERCIAL 2ND ADDITION

WICHITA, SEDGWICK COUNTY, KANSAS

DRAINAGE & GRADING PLAN



NOTE: No FEMA SFMA exists on the property as November 13, 2007 per FEMA Flood Panels 195 & 211 of FPO for Sedgewick County, Kansas, effective February 2, 2007.

Stormwater Sewer is depicted on the developed lots. The stormwater sewer is shown as a dashed line with arrows. Final location to be determined upon development.

This plan to be used in conjunction with Northgate Addition as well as Northgate Commercial Addition.

Developed	2yr	10yr	100yr
Area	10,000	10,000	10,000
Runoff Co.	0.35	0.35	0.35
Runoff	3,500	3,500	3,500
Flow	100	100	100

Station	Developed Flow Rates	
	10-yr	100-yr
1	28	37
2	28	37
3	11	14
4	10	13
5	7.8	11
6	8.5	11
7	9.1	12
8	9.1	12
9	3.0	4.2
10	3.2	4.5
11	3.3	4.5
12	3.3	4.5
TOTAL	54.7	77.7

