



Baughman

TRANSMITTAL

TO: Vicky Huang COMPANY: City of Wichita ADDRESS: 7 th Floor City Hall CITY/ STATE: Wichita, Kansas	FROM: Trevor Kurth DATE: 11-16-07 PROJECT: Northgate Comm Properties PROJECT NUMBER:
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RE:
Northgate Comm & Comm 2nd Additions

VIA: DELIVERY

We are sending you ATTACHED UNDER SEPARATE COVER

PLANS PRINTS SHOP DRAWINGS SAMPLES SPECS
 COPY OF LETTER CHANGE ORDER DISK OTHER

COPIES	DATE	DESCRIPTION
2	11-16-07	Northgate Comm & Comm 2 nd Additions

URGENT FOR APPROVAL FOR YOUR INFO FOR REVIEW & COMMENT

APPROVED, AS NOTED REVISE AS NOTED REVISE AND RETURN

AS REQUESTED PLEASE REPLY FOR BIDS DUE

NOTES/ COMMENTS:

Vicky,
Attached is two copies of the Northgate Commercial Addition and Northgate Commercial 2nd Addition. The two reports are combined, with separate plan sheets, due to them being part of the master drainage which was proposed in Northgate Addition. There is a copy for each file. If there are any questions let me know. Thanks.

SIGNED: _____
Trevor R. Kurth, I.E.

Copy: file

ENGINEERING
SURVEYING
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LANDSCAPE
ARCHITECTURE

B a u g h m a n
C o m p a n y , P . A .
315 Ellis Street
Wichita, Kansas 67203
P 316.262.7271
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DRAINAGE PLAN

**NORTHGATE COMMERCIAL
ADDITION & NORTHGATE
COMMERCIAL 2ND ADDITION**

TO

WICHITA, SEDGWICK COUNTY, KANSAS

PREPARED BY



16 NOVEMBER 2007

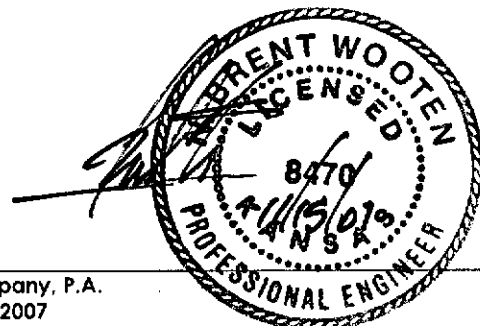


**DRAINAGE PLAN
NORTHGATE COMMERCIAL ADDITION
&
NORTHGATE COMMERCIAL 2ND ADDITION**

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.**



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WICHITA

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: Item, I, NA, Applicant Explanation / Location in Plan, Engr I, Engr NA. Rows include Project Narrative items A through I.

Table with 5 columns: Item, I, NA, Applicant Explanation / Location in Plan, Engr I, Engr NA. Rows include Existing Conditions Runoff Calculations items A through I.



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	Y				
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings	X				



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: 53RD N & MERIDIAN AVE
 Total Land Area Of Ownership: 48 Acres
 Type: _____ Residential Commercial _____ Industrial _____ Recreation _____ Municipal _____ Other _____
 Applicant: P & F Realty Contact: _____ Phone #: 722-2417
 Engineer: BAUGEMAN 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"/>				



WICHITA

Final Drainage Plan Submittal Checklist
Adopted: February 23, 2007

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	NA	

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

Final Drainage Plan Submittal Checklist

Adopted: February 23, 2007

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 platters 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	I	NA
A. Provide source of flood profile		X		
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	I/R	NA
A. US Army Corps of Engineers - Regulatory program permits (404 water quality certification)	X			
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			

PROJECT NARRATIVE

EXISTING CONDITIONS

Both sites are located at the northeast corner 53rd 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 2nd 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 53rd Street North. This box will be extended to directly convey the ponds discharge.

The proposed Northgate Commercial 2nd 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.

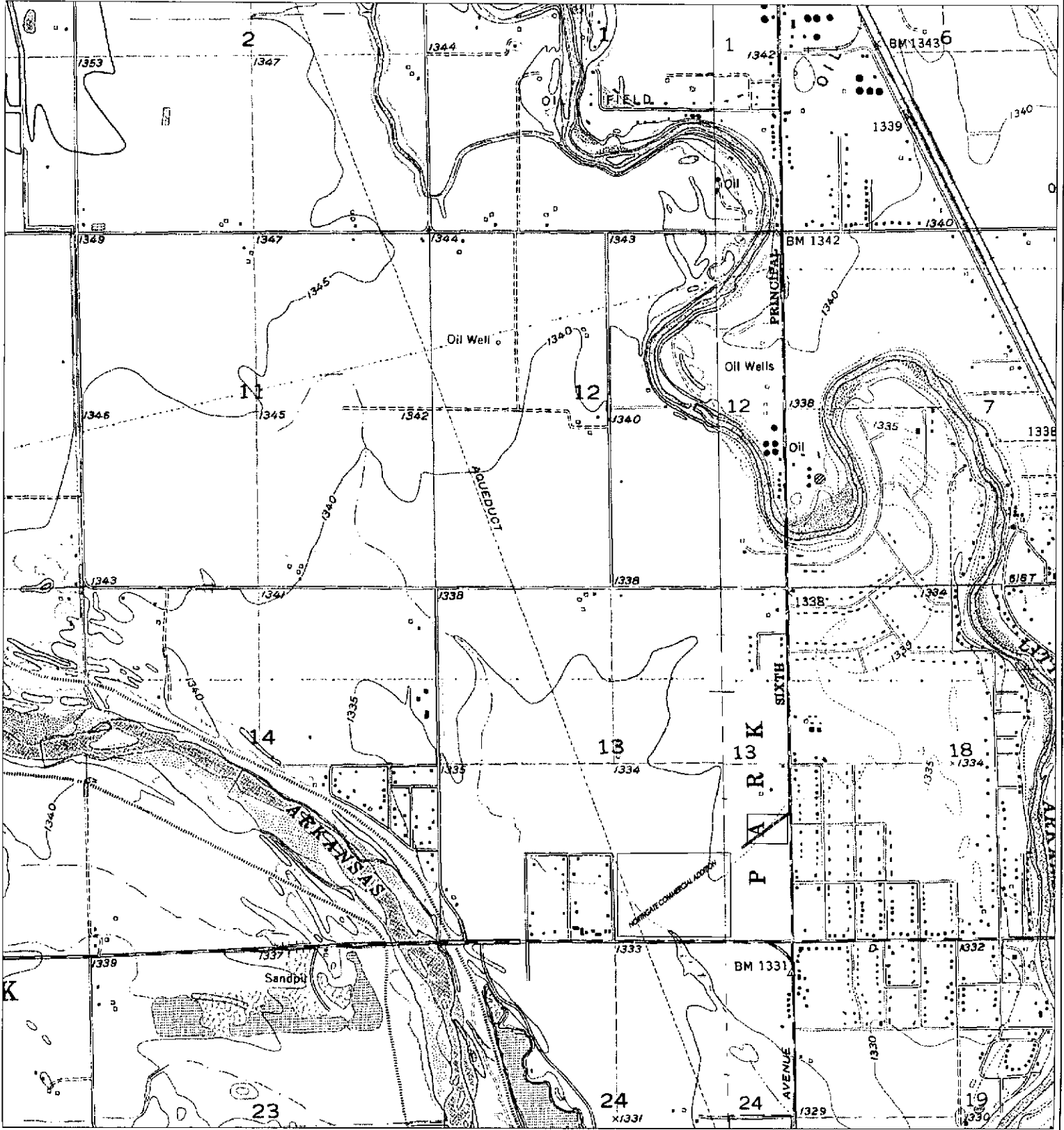
For a half-scale copy of the Plat, see Exhibit 2.

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 53rd 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 53rd & Meridian, will directly tie into the existing Double 8'x4' RCBC along north side of Meridian Avenue. The proposed Northgate Commercial 2nd 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



USGS QUADRANGLE SHEETS
 - WAKE, KANSAS
 - VALLEY CENTER, KANSAS

0 1000 2000
 SCALE
 DATE OF PREPARATION: 15 NOVEMBER 2007



SITE LOCATION EXHIBIT
NORTHGATE COMMERCIAL ADDITION
NORTHGATE COMMERCIAL 2ND ADDITION
 15 NOVEMBER 2007


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 115 E. 12th St., Wichita, KS 67202 | P 316.263.1271 | F 316.263.1199
 ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

P:\PROJECTS\115125\115125.dwg 11/15/07 10:00 AM

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 53rd Street North and into a drainage channel, which was proposed and constructed with the master plan.

The proposed Northgate Commercial 2nd Addition site generally drains to the east and into the Meridian Avenue ROW. The site is bounded by the (platted) proposed 55th 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 2nd Addition drains via SWS to the west and into the proposed pond in Northgate Addition. This was pond was proposed in Northgate Addition and included the runoff from this property at that time. Northgate Commercial Addition drains to the south under 53rd Street North and is then conveyed through a drainage channel. These downstream conditions were proposed and constructed as part of Northgate Addition also.

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 53rd Street North. This box is sized accordingly to accommodate the flow from the north.

The main discharge point for Northgate Commercial 2nd 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

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 53rd Street North ROW.

SUPPORTING CALCULATIONS

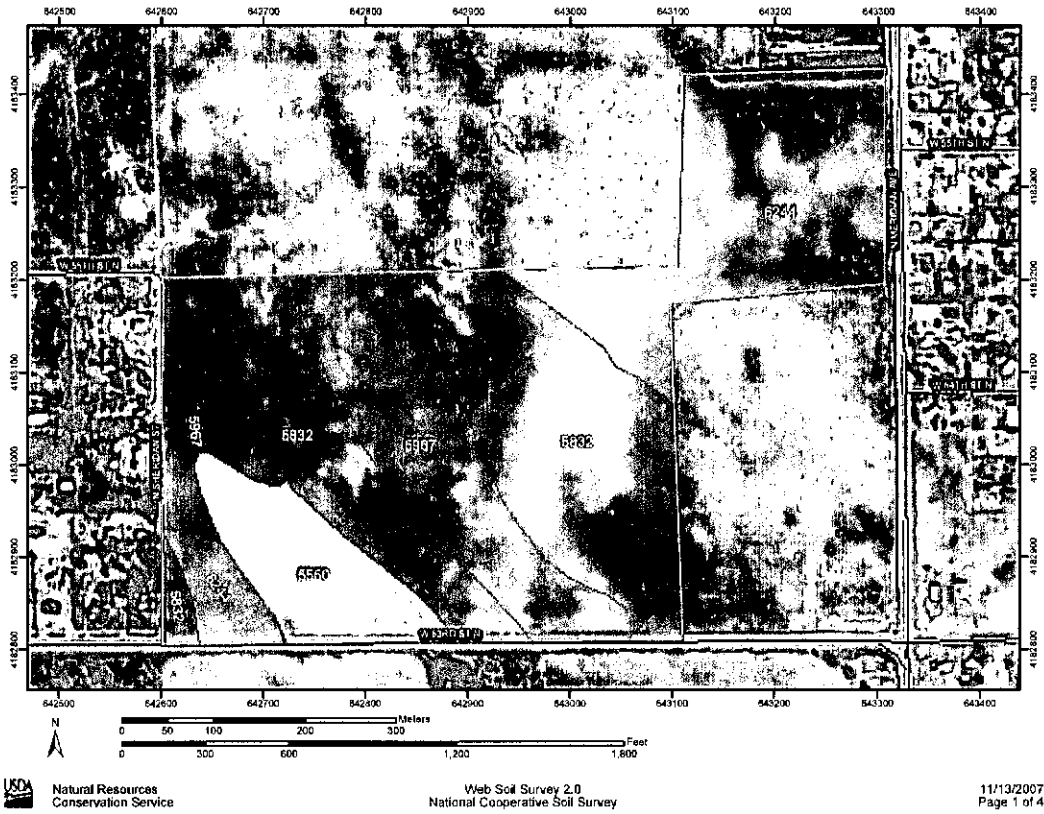
APPENDIX A: USGS Soils Survey

**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>Area of Interest (AOI)</p> <p> Area of Interest (AOI)</p> <p>Soils</p> <p> Soil Map Units</p> <p>Soil Ratings</p> <p> A</p> <p> A/D</p> <p> B</p> <p> B/D</p> <p> C</p> <p> C/D</p> <p> D</p> <p> Not rated or not available</p> <p>Political Features</p> <p>Municipalities</p> <p> Cities</p> <p> Urban Areas</p> <p>Water Features</p> <p> Oceans</p> <p> Streams and Canals</p> <p>Transportation</p> <p> Rails</p> <p>Roads</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: http://websoilsurvey.nrcs.usda.gov 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, 2005</p> <p>Date(s) aerial images were photographed: 8/17/1991; 9/26/1991; 10/1/1991; 3/20/1998; 3/31/1996</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	Inman clay loam, occasionally flooded	C	6.7	9.9%
5632	Purkin-Taver complex, 0 D to 1 percent slopes	D	27.6	40.5%
5967	Talbot silty clay loam, 0 to 1 percent slopes	D	15.0	21.8%
6244	Elston silt loam, rarely flooded	B	19.2	27.9%
Totals for Areas 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 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.

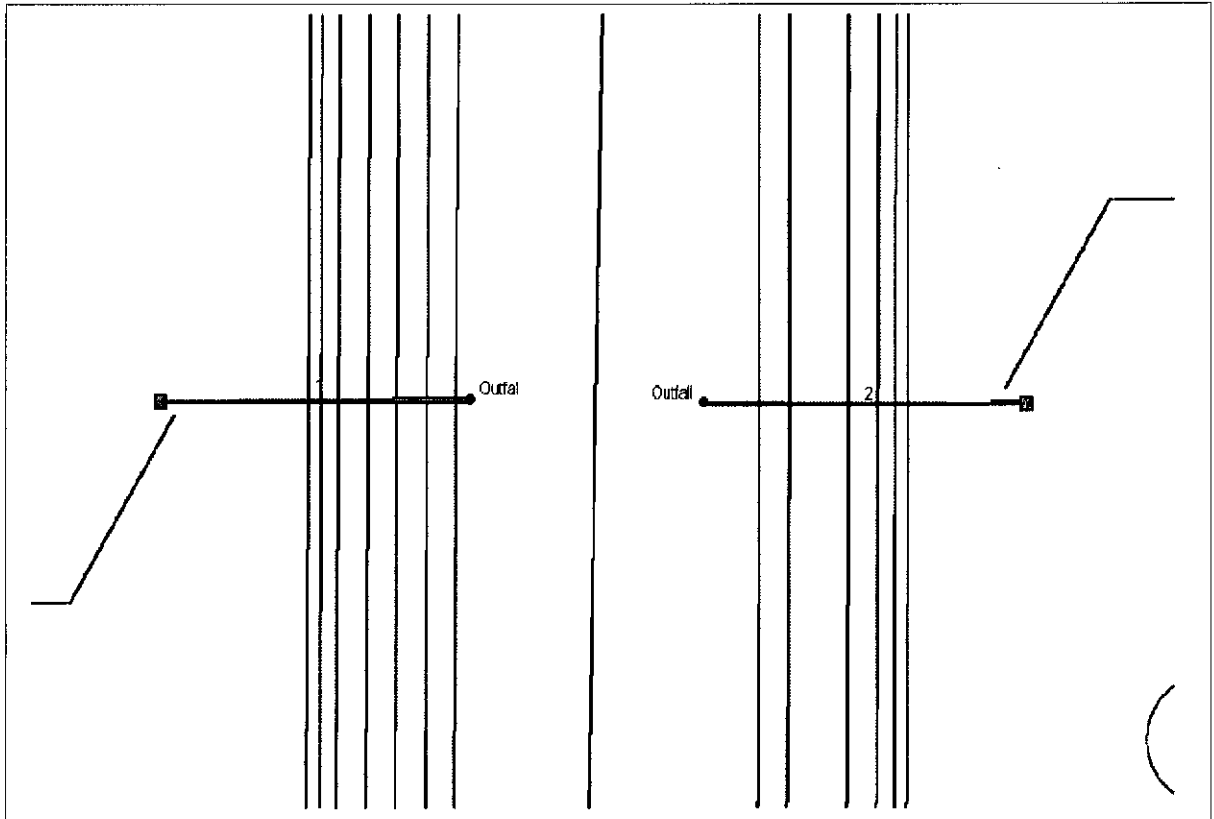
Tie-break Rule: Lower

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)	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	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. Dn (ft)	Invert El. Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dis 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	1329.901	End

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

NOTES: c = cfi, e = ellip, b = box, Return period = 2 Yrs, ! - Inlet control.

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)
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		26.00*	0.00	26.00	0.00	DrGr	6.0	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.slm
 Number of lines: 2
 Run Date: 11-15-2007

NOTES: Inlet N-Values = 0.016 ; Intensity = 59.87 / (inlet time + 13.10) ^ 0.87 ; Return period = 2 Yrs. ; * Indicates Known Q added

HydroFlow Storm Sewers 2005

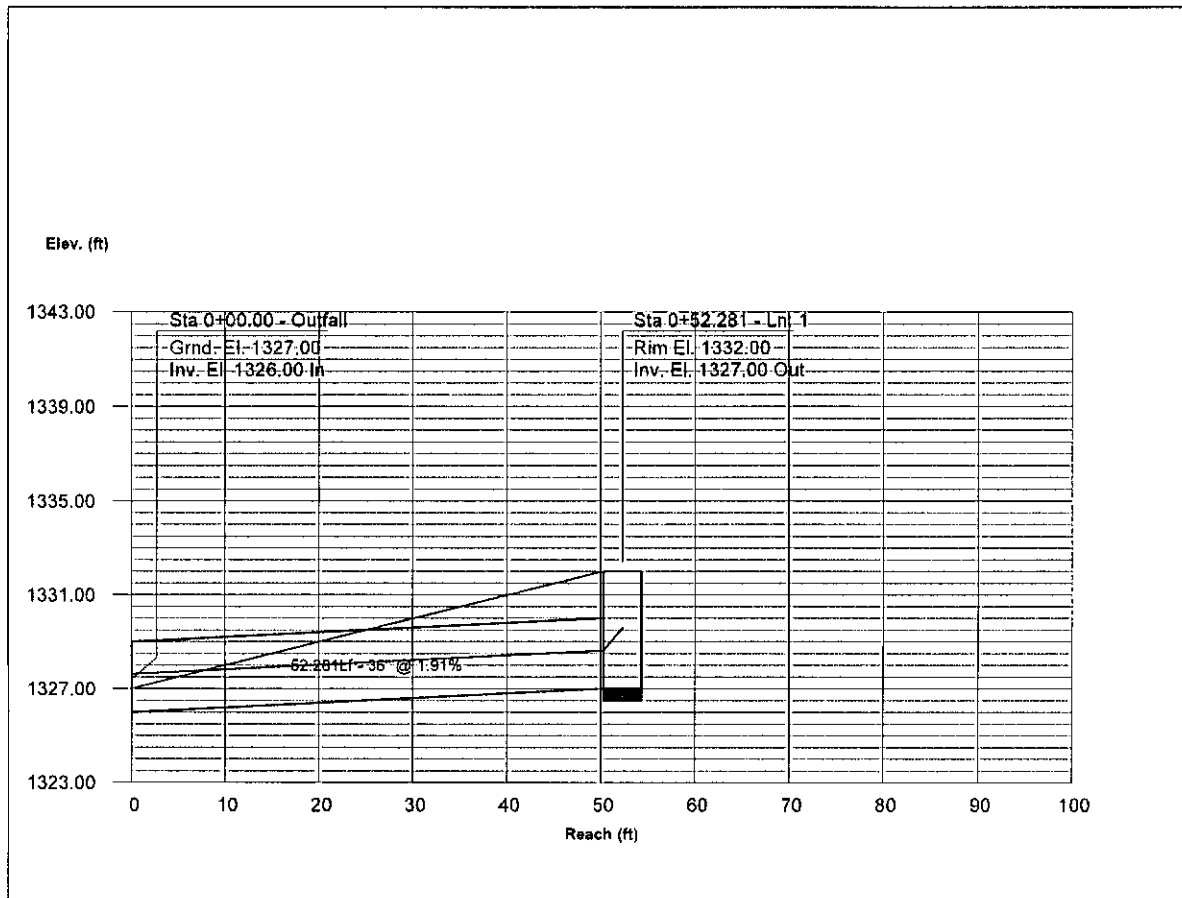
Hydraulic Grade Line Computations

Line	Size (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	36	30.00	1326.00	1327.75	1.75*	4.27	7.03	0.77	1326.51	n/a	54.2	1327.00	1328.75	1.75**	4.27	7.03	0.77	1329.51	n/a	n/a	n/a	1.00	n/a
1	36	26.00	1326.00	1327.83	1.83	3.91	6.65	0.89	1326.31	n/a	52.3	1327.00	1328.63	1.63**	3.91	6.65	0.69	1329.31	n/a	n/a	n/a	1.00	n/a

Project File: sww1.stm Number of lines: 2 Run Date: 11-15-2007

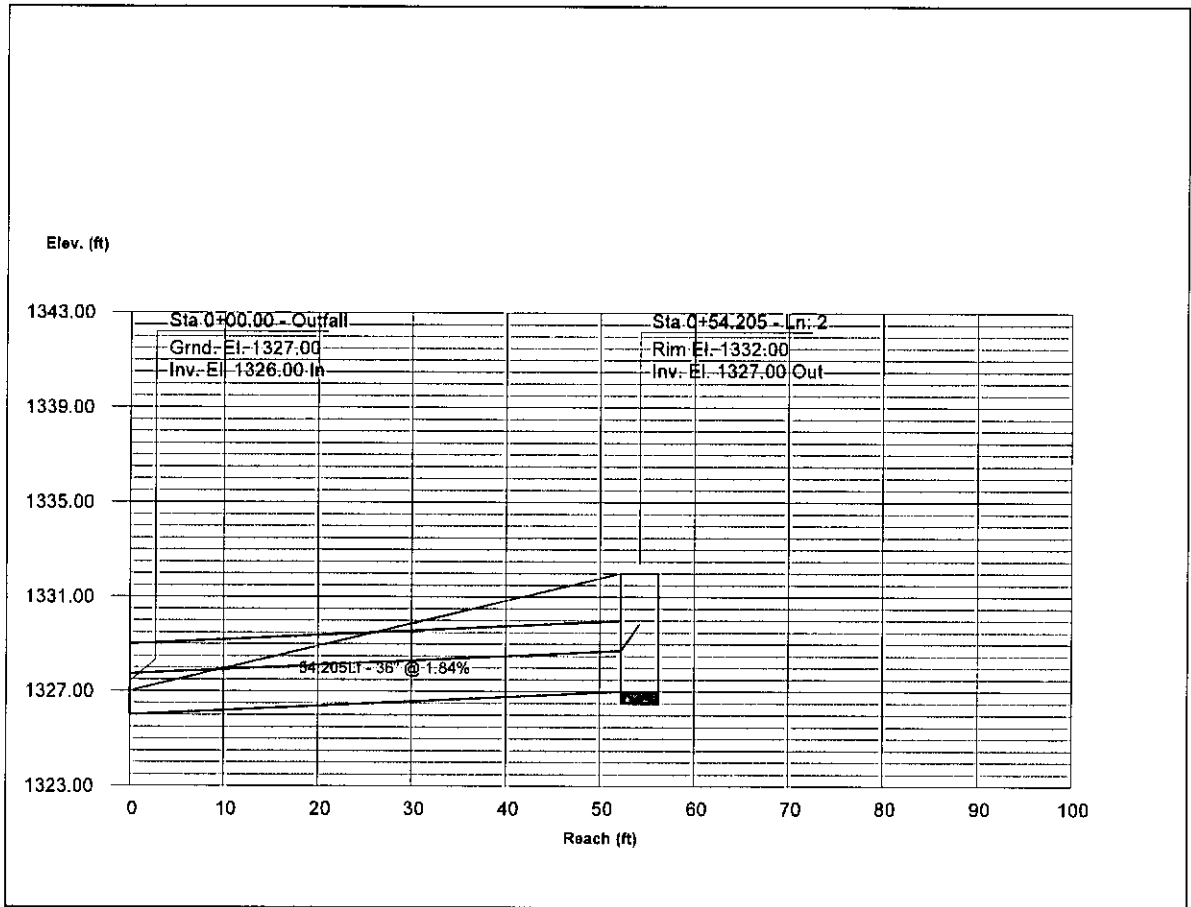
Notes: * Normal depth assumed.; ** Critical depth.

Storm Sewer Profile

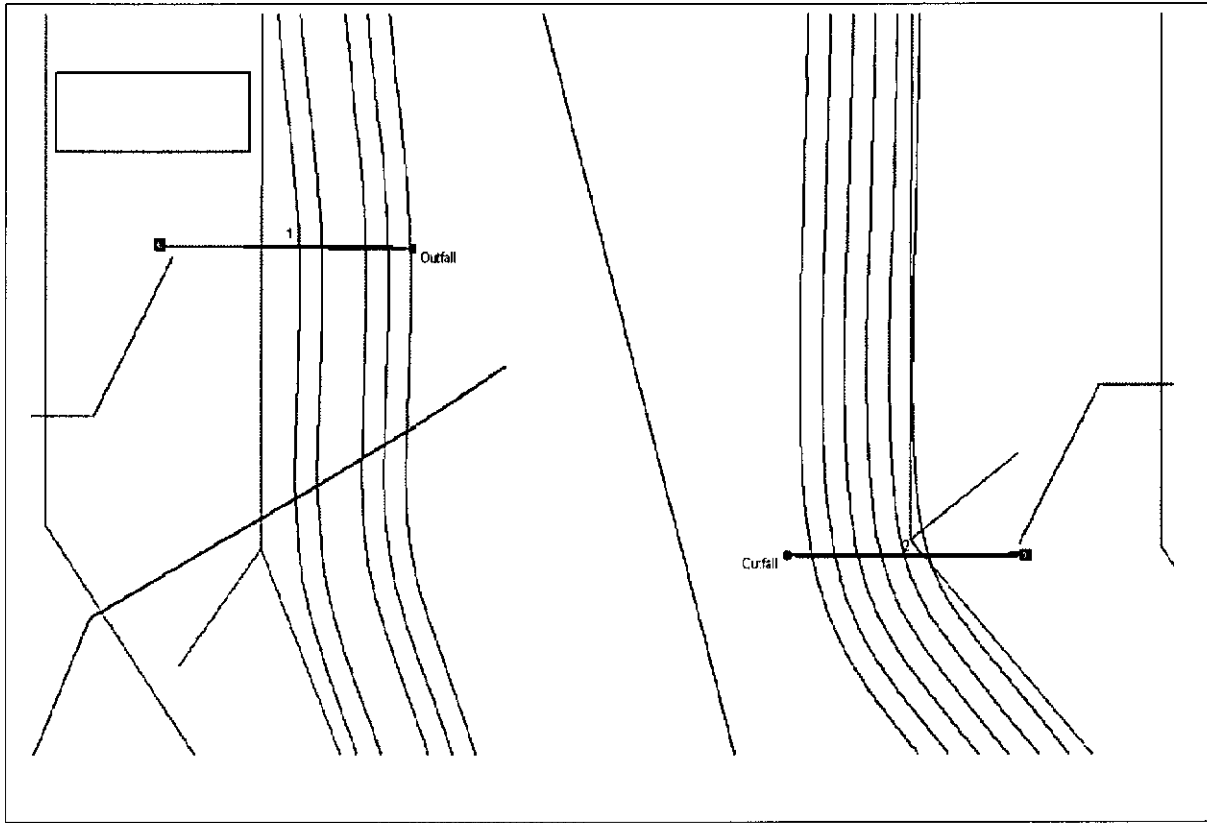


Storm Sewer Profile

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)	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/ Rim El (ft)
2	End	53.3	0.0	DrGr	30.00	0.00	0.00	0.0	1326.00	1.86	1327.00	42	Cir	0.013	1.00	1332.00	
1	End	56.7	-179.4	DrGr	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 Junc (ft)	Line Dns No.
2		30.00	42 c	53.3	1326.00	1327.00	1.877	1327.68	1328.68	0.9	1329.591	End
1		27.00	36 c	56.7	1326.00	1327.00	1.763	1327.66	1328.66	0.9	1329.671	End

Project File: sww2.stm
 Number of lines: 2
 Run Date: 11-15-2007

NOTES: c = cfr, e = ellip, b = box, Return period = 2 Yrs. ; ' - Inlet control
 Hydrus 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	DrGrt	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	DrGrt	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: sww2.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 O added
 Hydrus Storm Sewers 2005

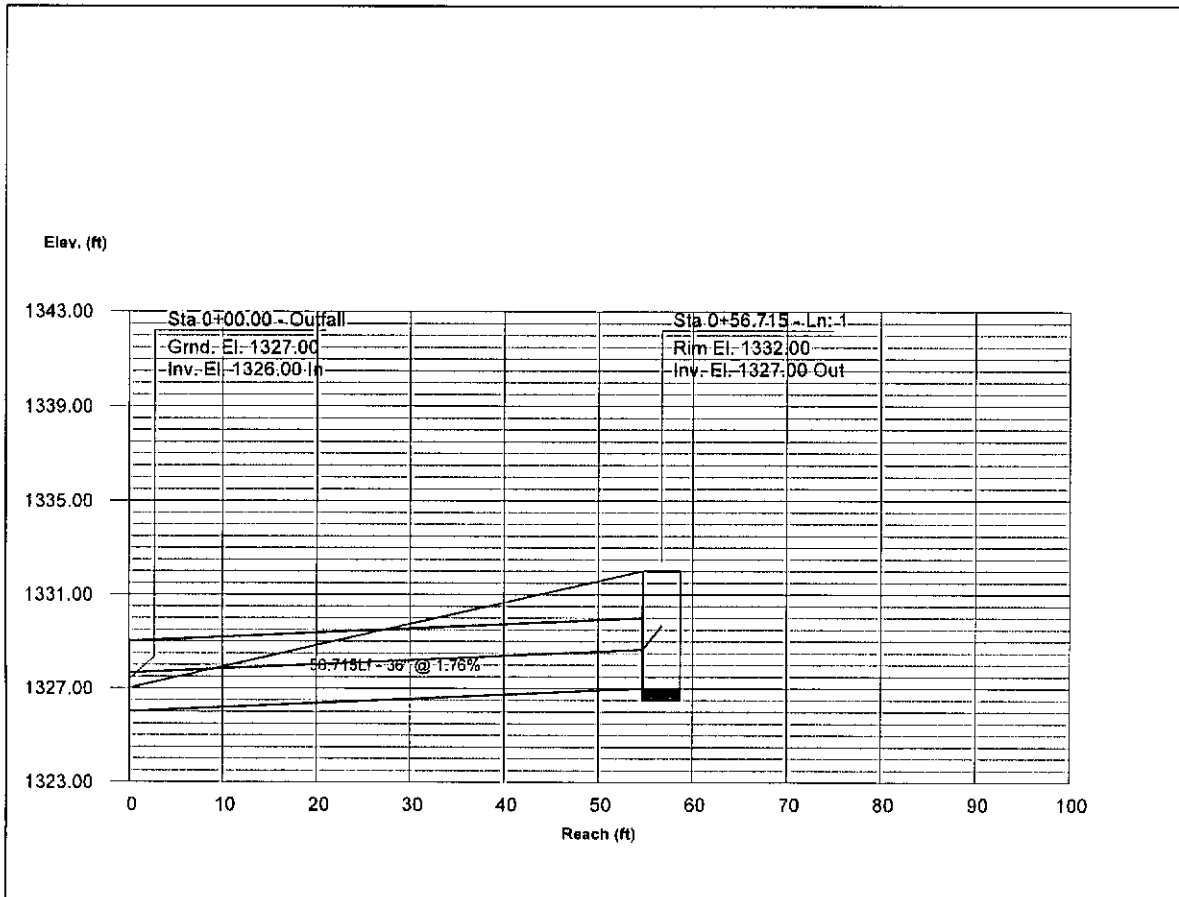
Hydraulic Grade Line Computations

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	1327.66	1.68*	4.56	6.68	0.67	1328.35	n/a	53.3	1327.00	1328.66	1.66**	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	1.68	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

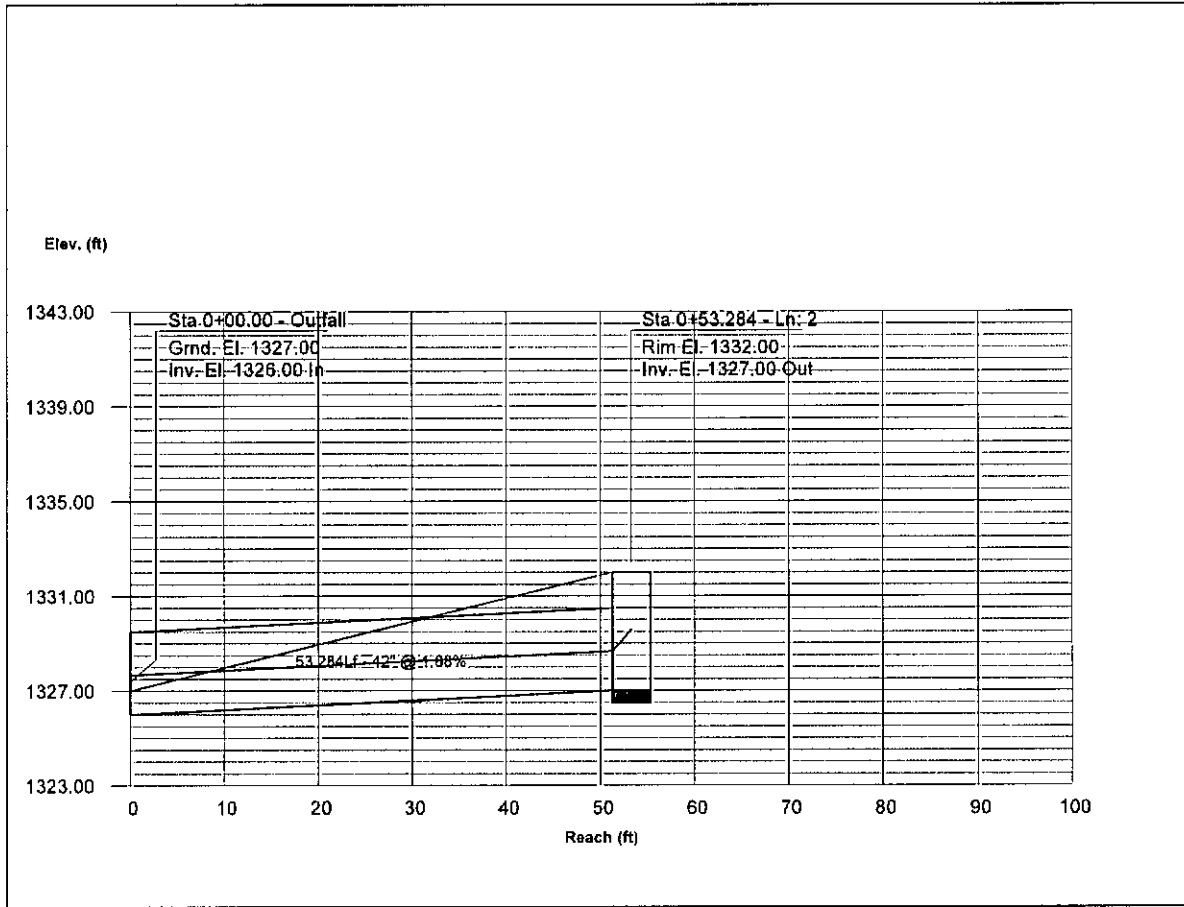
Notes: * Normal depth assumed; ** Critical depth.

Storm Sewer Profile

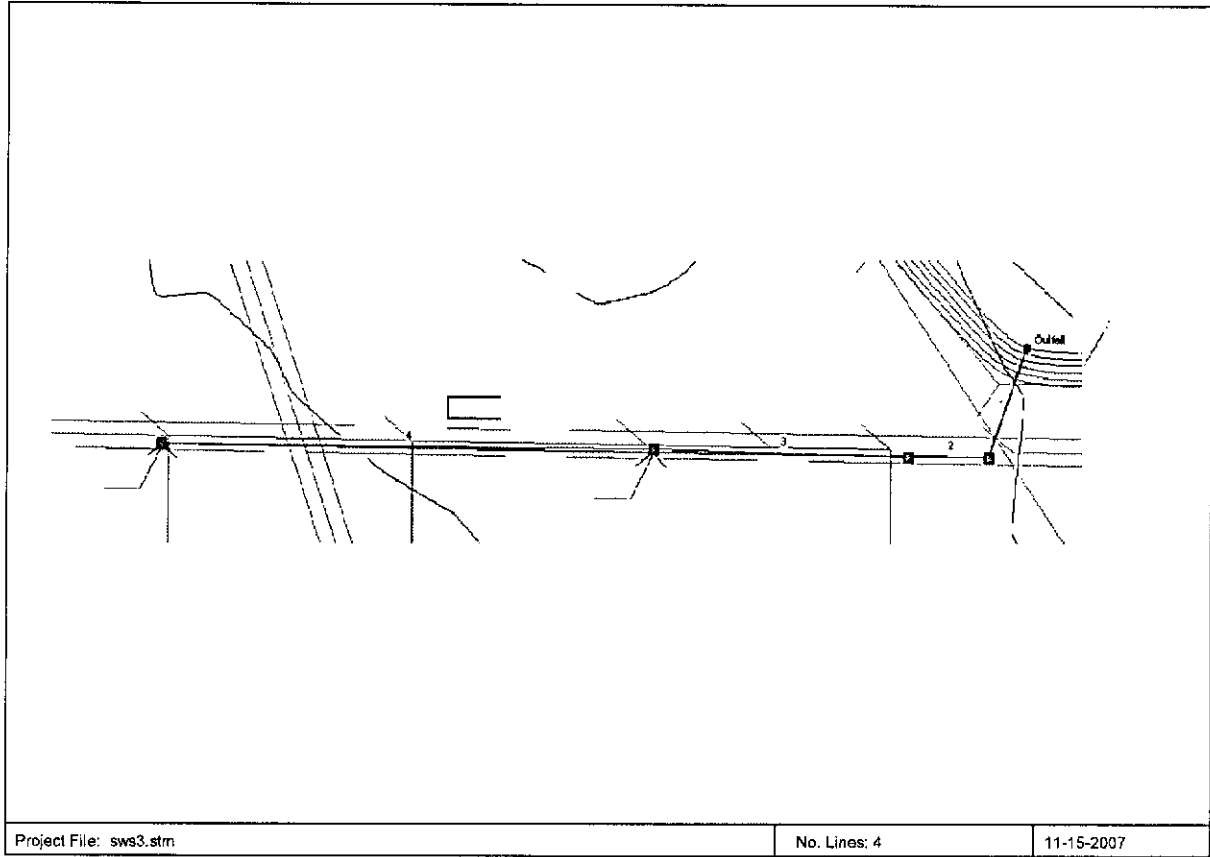


Storm Sewer Profile

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

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/ Rim El (ft)
4	3	405.1	-0.9	DrGrt	11.00	0.00	0.00	0.0	1327.86	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	1328.65	0.10	1328.86	36	Cir	0.013	0.50	1331.50	
2	1	68.2	69.1	Curb	4.00	0.00	0.00	0.0	1326.59	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 Junct (ft)	Dns line No.
4		11.00	24 c	405.1	1327.96	1328.57	0.174	1330.12*	1331.05*	0.19	1331.27	3
3		22.00	36 c	208.2	1326.65	1326.86	0.101	1328.82*	1330.05*	0.08	1330.12	2
2		26.00	36 c	68.2	1326.59	1326.65	0.101	1326.59	1326.65	0.11	1326.76	1
1		30.00	36 c	85.7	1326.00	1326.09	0.104	1327.75	1328.42	0.57	1329.00	End

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

NOTES: c = cfs, e = ellip, b = box, Return period = 2 Yrs. ; *Surcharged (HGL above crown);
 Hydrus 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	DrGrt	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	DrGrt	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

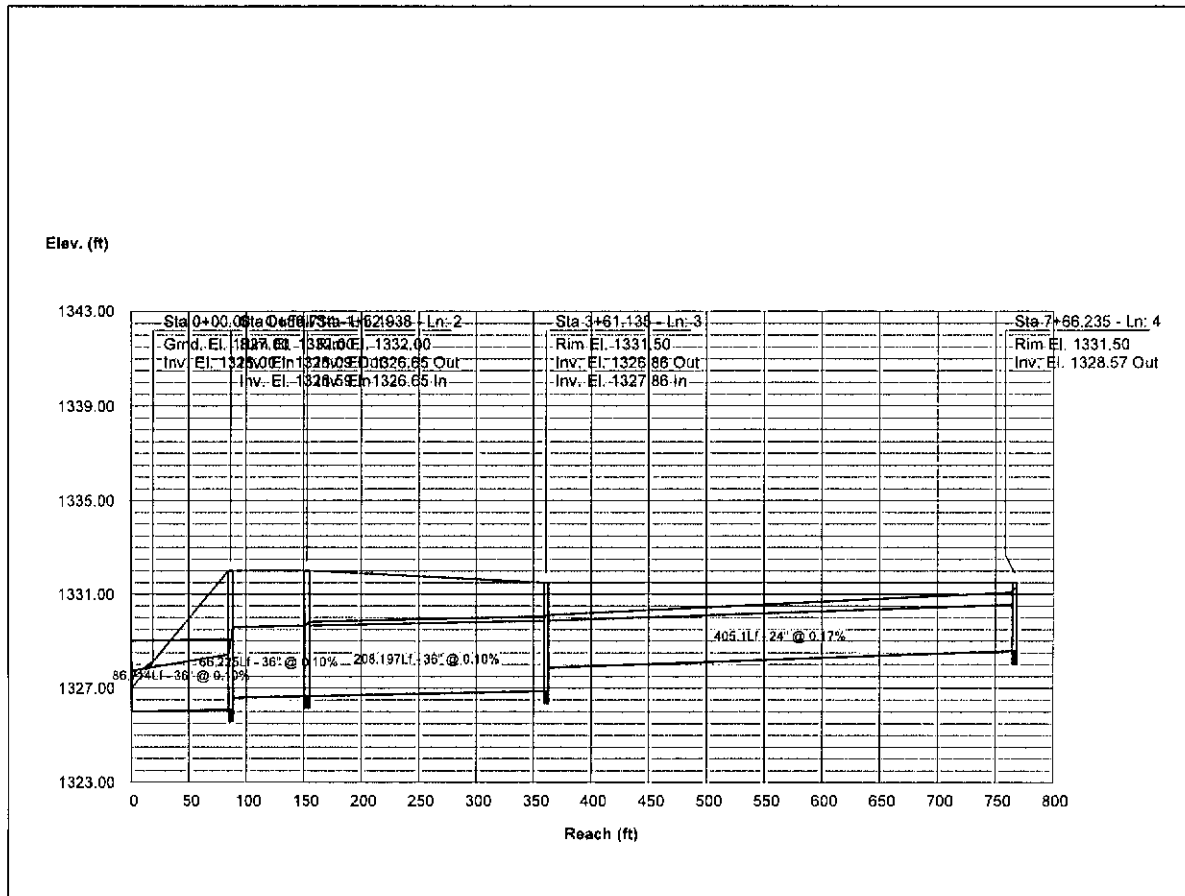
Hydraulic Grade Line Computations

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)		
4	24	11.00	1327.86	1330.12	2.00	3.14	3.50	0.19	1330.31	0.237	405	1328.57	1331.08	2.00	3.14	3.50	0.19	1331.27	0.237	0.237	0.958	1.00	0.19
3	36	22.00	1328.65	1329.82	3.00	7.07	3.11	0.15	1329.97	0.109	208	1328.86	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	1328.58	1329.59	3.00*	7.07	3.68	0.21	1329.80	0.152	66.2	1328.65	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	1329.51	0.493	86.7	1326.09	1328.42	2.33	5.90	5.08	0.40	1328.83	0.224	0.358	0.311	1.42	0.57

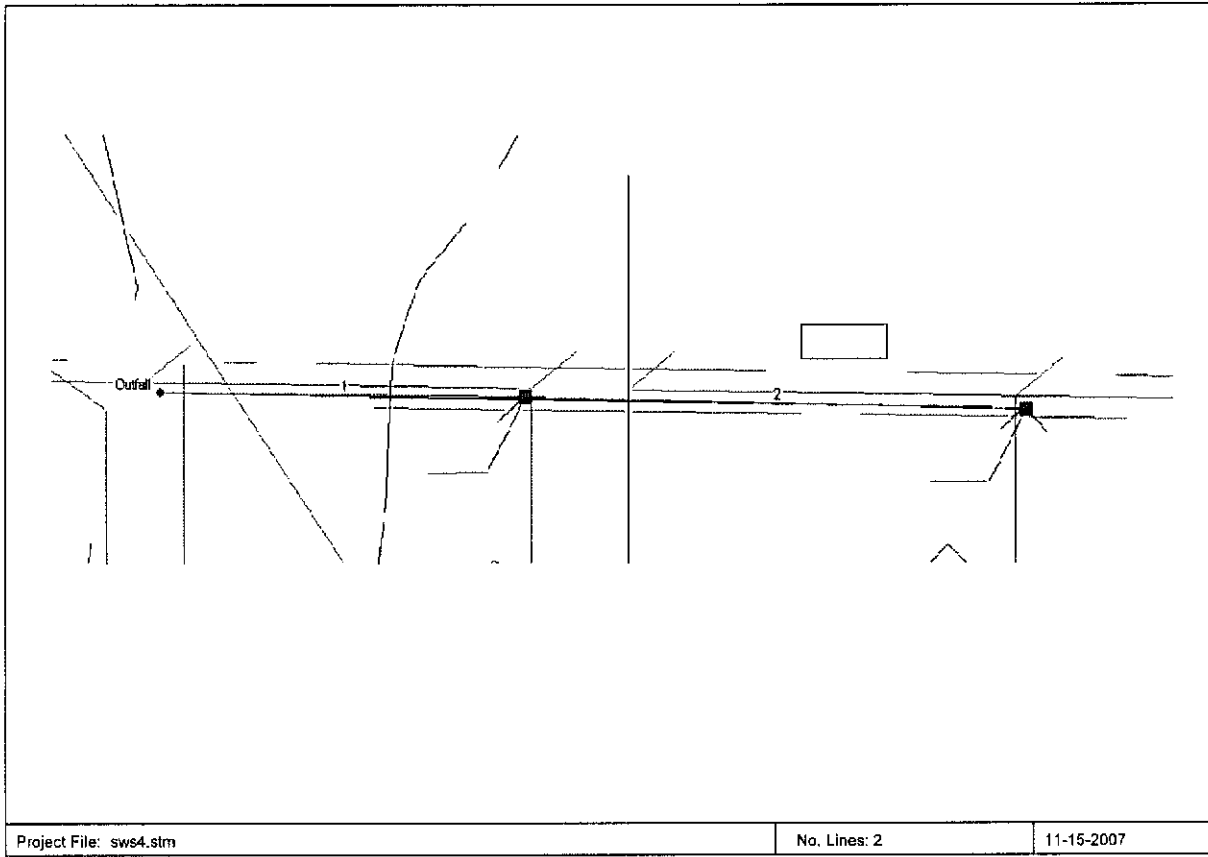
Project File: sws3.stm Number of lines: 4 Run Date: 11-15-2007

Notes: * Normal depth assumed.

Storm Sewer Profile



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/Rim 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	0.8	DrGrt	10.00	0.00	0.00	0.0	1327.50	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 EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dis line No.
2		10.00	24 c	256.3	1328.47	1328.91	0.173	1330.33	1330.77	0.17	1330.94	1
1		20.00	30 c	189.1	1327.50	1327.72	0.116	1329.00	1330.09	0.13	1330.22	End

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

NOTES: c = cir, e = ellip, b = box, Return period = 2 Yrs

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)
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	Sag	2.00	0.050	0.050	0.013	0.87	36.63	0.87	36.63	0.00	Off

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

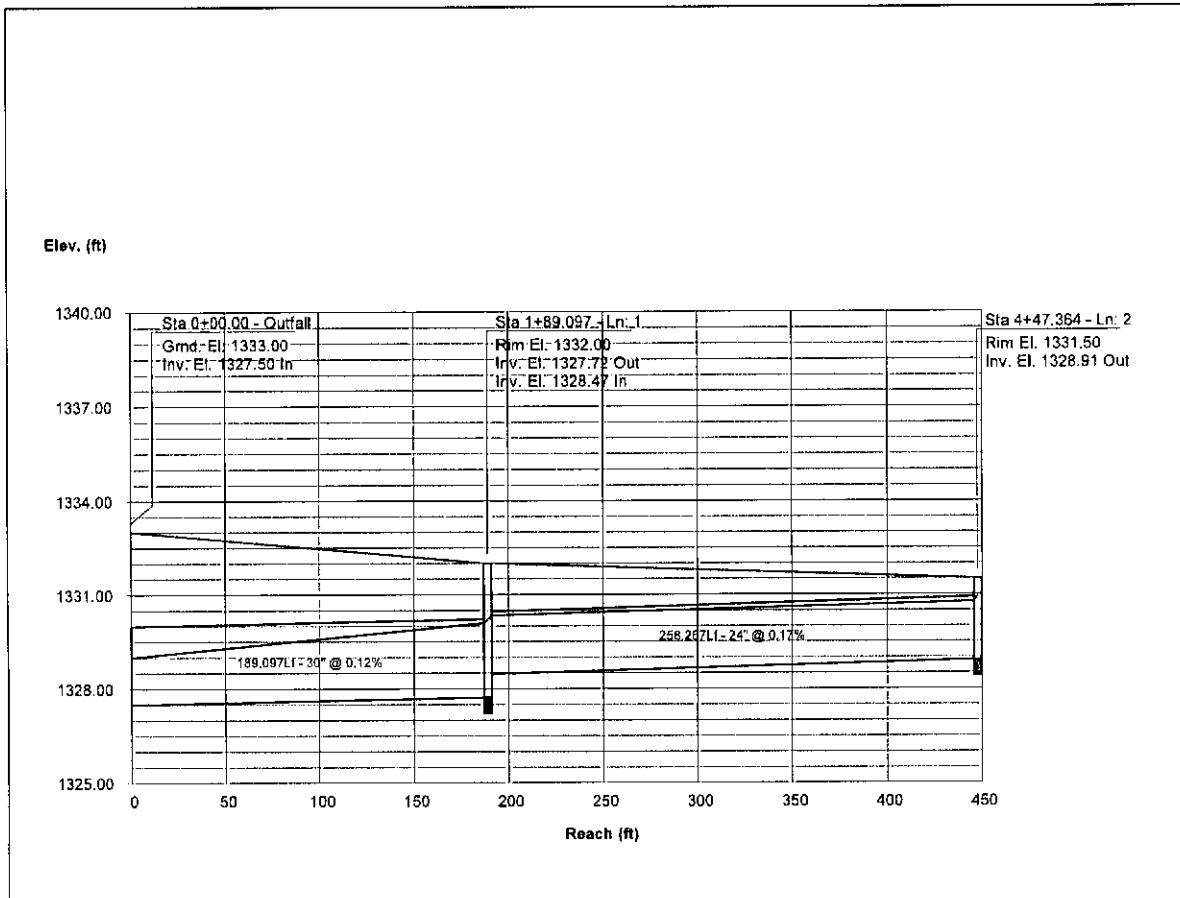
NOTES: Inlet N-Values = 0.013; Intens-ty = 89.87 / (inlet time + 13.10) ^ 0.87; Return period = 2 Yrs. ; * Indicates Known Q added

Hydraulic Grade Line Computations

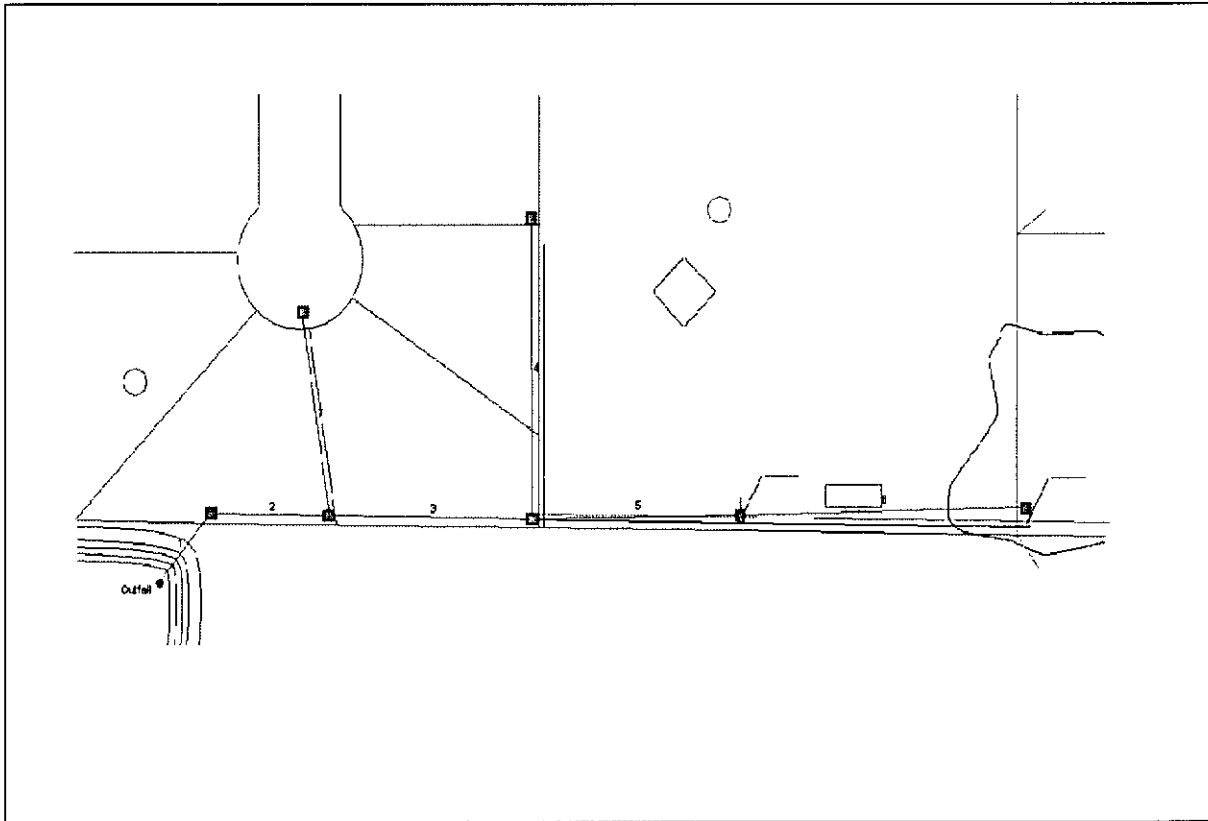
Line	Size (in)	Q (cfs)	Downstream								Len (ft)	Upstream								Check		JL coeff (K)	Minor loss (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	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	1.86	3.04	3.29	0.17	1330.94	0.169	0.169	0.437	1.00	0.17
1	30	20.00	1327.50	1329.00	1.49	3.08	6.53	0.66	1329.68	0.533	189	1327.72	1330.09	2.37	4.61	4.15	0.27	1330.35	0.208	0.389	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



Project File: sws5.stm

No. Lines: 7

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 El On (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	5	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	1325.85	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	1325.07	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	1338.00

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 EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dis line No.
7		4.00	15 c	147.8	1326.91	1327.39	0.325	1328.96*	1329.13*	0.17	1329.30	2
6		6.50	18 c	227.0	1327.06	1327.84	0.285	1330.66*	1331.52*	0.21	1331.73	5
5		16.00	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	1327.95	1328.29	0.435	1329.49*	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	1328.28	2
2		25.80	36 c	94.4	1325.97	1325.16	0.095	1328.07*	1328.21*	0.31	1328.52	1
1		26.80	36 c	64.8	1325.00	1325.07	0.108	1327.00	1327.22	0.47	1327.69	End

Project File: swws5.stm
 Number of lines: 7
 Run Date: 11-15-2007

NOTES: c = cir, e = ellip, b = box, Return period = 2 Yrs. ; Surcharged (HGL above crown)

HydroView 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	DrGrt	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	DrGrt	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.050	0.050	0.013	0.92	38.74	0.92	38.74	0.00	3
4		2.00*	0.00	2.00	0.00	DrGrt	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	DrGrt	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	DrGrt	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	DrGrt	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: swws5.stm
 Number of lines: 7
 Run Date: 11-15-2007

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

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)		
7	15	4.00	1326.91	1326.56	1.25	1.23	3.28	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	1.50	1.77	3.68	0.21	1330.86	0.383	227	1327.64	1331.62	1.50	1.77	3.66	0.21	1331.73	0.383	0.383	0.870	1.00	0.21
5	24	16.80	1325.85	1329.26	2.00	3.14	5.35	0.44	1329.72	0.552	165	1328.08	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	1329.49	1.26	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	1328.62	2.50	4.91	4.03	0.25	1328.78	0.233	162	1325.60	1326.90	2.50	4.91	4.03	0.25	1329.15	0.233	0.233	0.378	1.50	0.38
2	36	25.60	1325.07	1328.07	3.00	7.07	3.65	0.21	1328.28	0.150	94.4	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	5.35	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	0.156	1.23	0.47

Project File: sww5.stm

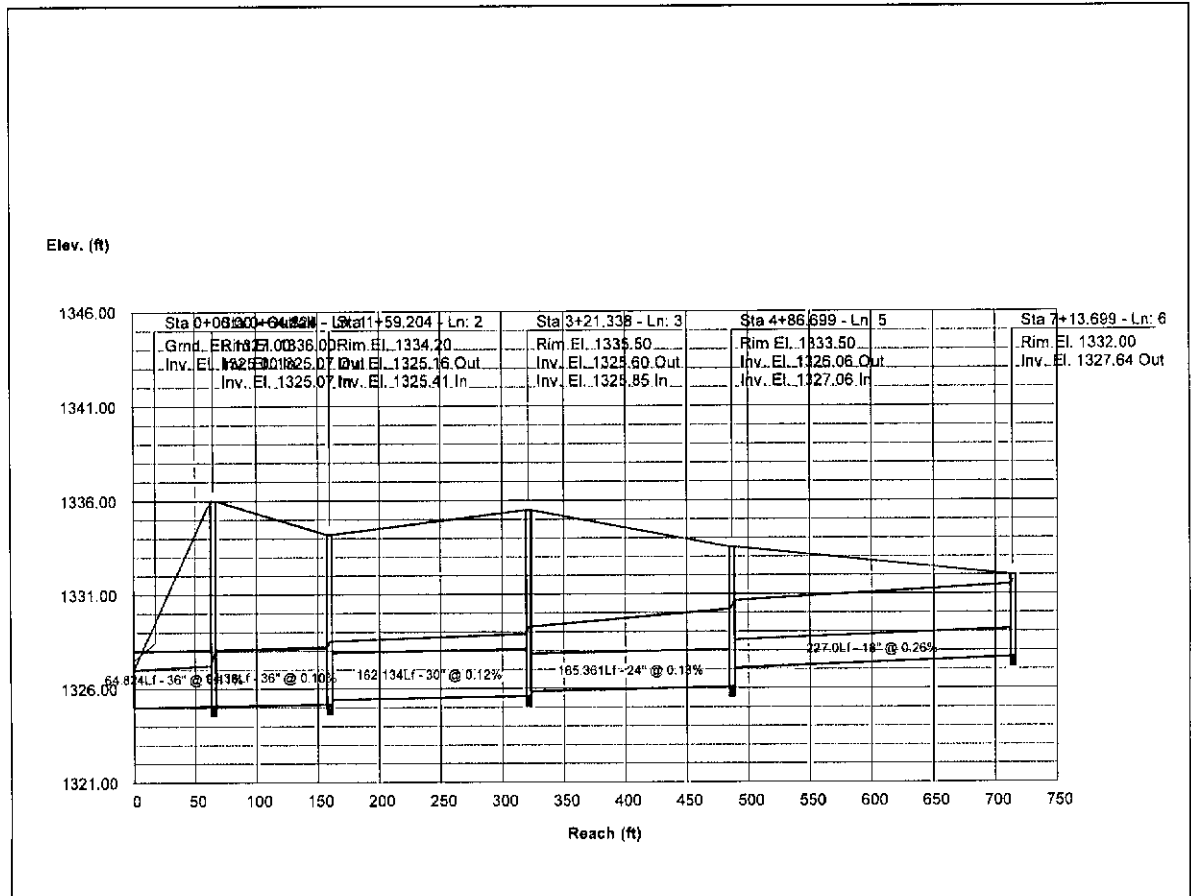
Number of lines: 7

Run Date: 11-15-2007

Notes: * Normal depth assumed.

Storm Sewer Profile

Proj. file: sww5.stm



PondPack Routing

Overall Pond System
(as shown in Northgate Addition)

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NEW BOX..... Outlet Input Data 5.01

MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID SEDGWICK.RNQ Sedwick24

Return Event	Total Depth In	Rainfall Type	RNF File	RNF ID
10 yr	5.0000	Synthetic Curve	SCSTYPES	TypeII 24hr
2 yr	2.8000	Synthetic Curve	SCSTYPES	TypeII 24hr
100	7.9000	Synthetic Curve	SCSTYPES	TypeII 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=Diverston;)
 (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

MASTER NETWORK SUMMARY

SCS Unit Hydrograph Method

(*Node=Outfall; *Node=Diverston;)
 (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		13.7500	.54	1333.45	
266	ENTRY POND	OUT POND 100		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		383.186	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
6.538	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
2.215	MAIN POND	OUT POND 100		49.621	13.3500	109.94	1331.91
25.149	MAIN POND	OUT POND 10		-.225	19.6000	-1.81(-0)	
	MAIN POND S	POND 10		22.312	13.6000	46.67	
	MAIN POND S	POND 2 yr		5.606	15.1500	8.60	
	MAIN POND S	POND 100		49.621	13.3500	109.94	
	MAIN POND S	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
 SCS Unit Hydrograph Method
 (*Node=Outfall, +Node=Diverston;)
 (Trun= HYG Truncation Blank=None; L=Left, R=Right, LR=Left&Rt)

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 S OUT POND	10 17.979	29.4500	18.38	1329.82	
7.058	MA14 POND S OUT POND	2 yr 2.894	35.0000	4.69	1328.19	
28.571	MA14 POND S OUT POND	100 44.203	14.5000	61.05	1331.81	
	MAIN POND S 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 18.675	12.7000	72.67		
	NORTH OFFSITE AREA	2 yr 4.648	12.7000	22.37		
	NORTH OFFSITE AREA	100 27.646	12.7000	148.71		
	NORTHGATE SUBDVS AREA	10 12.655	12.0500	183.92		
	NORTHGATE SUBDVS AREA	2 yr 4.302	12.0500	59.18		
	NORTHGATE SUBDVS 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 6.997	11.9000	114.81		
	SOUTH POND POND	10 167.120	21.8000	138.26	1329.31	
1.366	SOUTH POND POND	2 yr 43.038	12.0000	33.87		
489	SOUTH POND POND	100 382.753	20.9000	322.23		
2.823	SOUTH POND OUT POND	10 167.120	21.9000	138.26	1329.31	
	SOUTH POND OUT POND	2 yr 42.714	22.7000	33.65	1327.89	
	SOUTH POND OUT POND	100 381.602	21.1000	322.11	1331.07	
	WEST OFFSITE AREA	10 152.508	20.3000	148.24		
	WEST OFFSITE AREA	2 yr 43.336	20.3500	37.74		
	WEST OFFSITE AREA	100 341.588	18.9000	337.81		

S/N 121201A06ABA Baughman Company PA
 PondPack Ver. 7.5 (767) Compute Time: 15:26:21 Date: 11/12/2007

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

Design Storm File, ID = SEDGWICK.RNQ Sedgwick24
 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

S/N 121201A06ABA Baughman Company PA
 PondPack Ver. 7.5 (767) Compute Time: 15:26:21 Date: 11/12/2007

DESIGN STORMS SUMMARY
 Design Storm File, ID = SEDGWICK.RNQ Sedgwick24
 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

TIME OF CONCENTRATION CALCULATOR
 Segment #1 Tc TR-55 Shallow
 Hydraulic Length 2300.00 ft
 Slope .001000 ft/ft
 Unpaved
 Avg. Velocity .51 ft/sec
 Segment #1 Time 1.2522 hrs
 Total Tc 1.2522 hrs

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

Tc Equations used...

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

Unpaved surface
 $V = 16.1345 * (Sf^{.6667})$

Paved surface:
 $V = 20.3282 * (Sf^{.6667})$

$Tc = (Lf / V) / (3600 \text{sec/hr})$

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:
 $V = 16.1345 * (Sf^{.6667})$

Paved surface:
 $V = 20.3282 * (Sf^{.6667})$

$Tc = (Lf / V) / (3600 \text{sec/hr})$

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 10.8886 hrs

Total Tc: 10.8886 hrs

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

Elevation (ft)	Planimeter (sq. in)	Area (acres)	A1+A2+sq.(A1*A2) (ac-ft)	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	.798	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 + sq.rt.(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

File.... F:\HYDRO\PROJECTS\NORTHGATE\FONDPACK\FONDS-TK3-20-07.PPW

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	16.3488	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	-----	7.2600	21.2993	7.100	49.247

POND VOLUME EQUATIONS

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

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

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

File.... F:\HYDRO\PROJECTS\NORTHGATE\FONDPACK\FONDS-TK3-20-07.PPW

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.

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

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

File.... F:\HYDRO\PROJECTS\NORTHGATE\FONDPACK\FONDS-TK3-20-07.PPW

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.

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

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

File.... F:\HYDRO\PROJECTS\NORTHGATE\FONDPACK\FONDS-TK3-20-07.PPW

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				

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

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 = 1224.00 ft
Horiz. Length = 600.00 ft
Barrel Length = 600.01 ft
Barrel Slope = .00500 ft/ft

OUTLET CONTROL DATA...
Manning's 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 = .03850
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

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

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

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

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

Appendix A

A-1

Index of Starting Page Numbers for ID Names

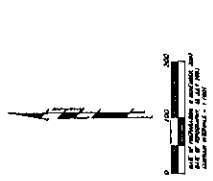
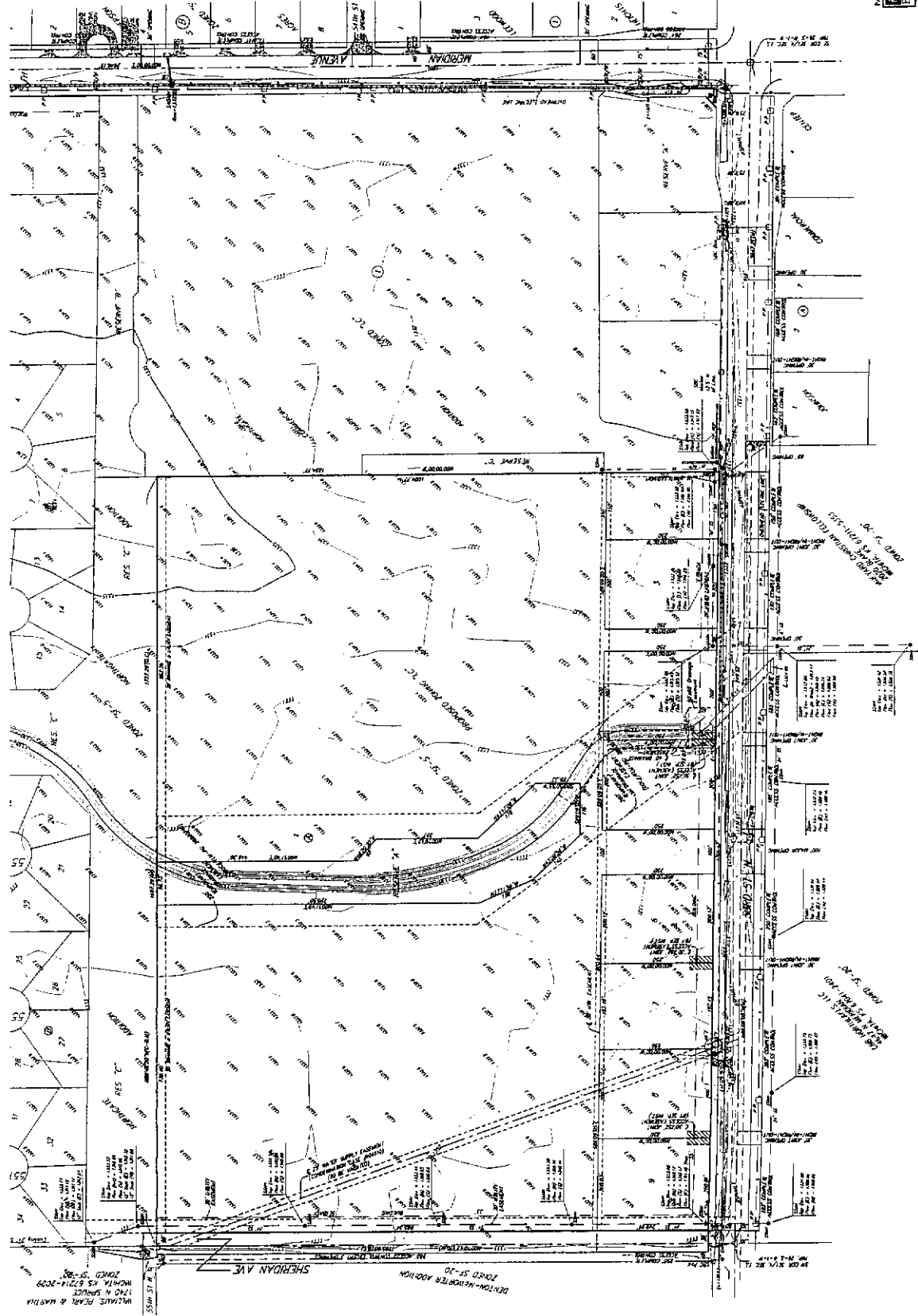
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ENTRY POND... 4.01
----- L -----
LONG POND... 4.02
----- M -----
MAIN POND... 4.03
----- N -----
NEW BOX... 5.01
NORTH OFFSITE... 3.01
----- S -----
SOUTH POND... 4.04
----- W -----
Watershed... 1.01
WEST OFFSITE... 3.03

PLAN SHEETS

DRAINAGE & GRADING PLANS

Scale 1:100

ONE-STAGE FINAL PLAN
NORTHGATE COMMERCIAL ADDITION
 WICHITA, SEDGWICK COUNTY, KANSAS



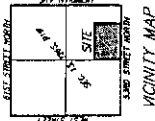
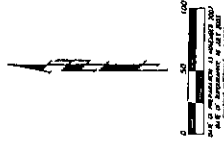
THIS PLAN WAS PREPARED BY THE SURVEYOR AND IS SUBJECT TO THE REVISIONS AND CORRECTIONS MADE BY HIM OR HIS SUCCESSORS IN ACCORDANCE WITH THE PROVISIONS OF THE KANSAS SURVEYING ACT, CH. 245, SECT. 245.01, AS AMENDED. THIS PLAN IS NOT TO BE CONSIDERED A GUARANTEE OF THE ACCURACY OF THE INFORMATION HEREON. THE SURVEYOR'S LIABILITY IS LIMITED TO THE PROFESSIONAL SERVICE RENDERED BY HIM OR HIS SUCCESSORS. THE SURVEYOR'S LIABILITY IS NOT TO BE CONSIDERED A GUARANTEE OF THE ACCURACY OF THE INFORMATION HEREON. THE SURVEYOR'S LIABILITY IS LIMITED TO THE PROFESSIONAL SERVICE RENDERED BY HIM OR HIS SUCCESSORS. THE SURVEYOR'S LIABILITY IS NOT TO BE CONSIDERED A GUARANTEE OF THE ACCURACY OF THE INFORMATION HEREON.



AREA	ACRES	FEET	INCHES
1	1.00	100	100
2	1.00	100	100
3	1.00	100	100
4	1.00	100	100
5	1.00	100	100
6	1.00	100	100
7	1.00	100	100
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9	1.00	100	100
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NORTHGATE COMMERCIAL 2ND ADDITION WICHITA, SEDGWICK COUNTY, KANSAS

DRAINAGE & GRADING PLAN



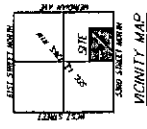
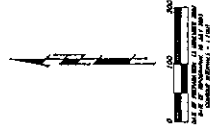
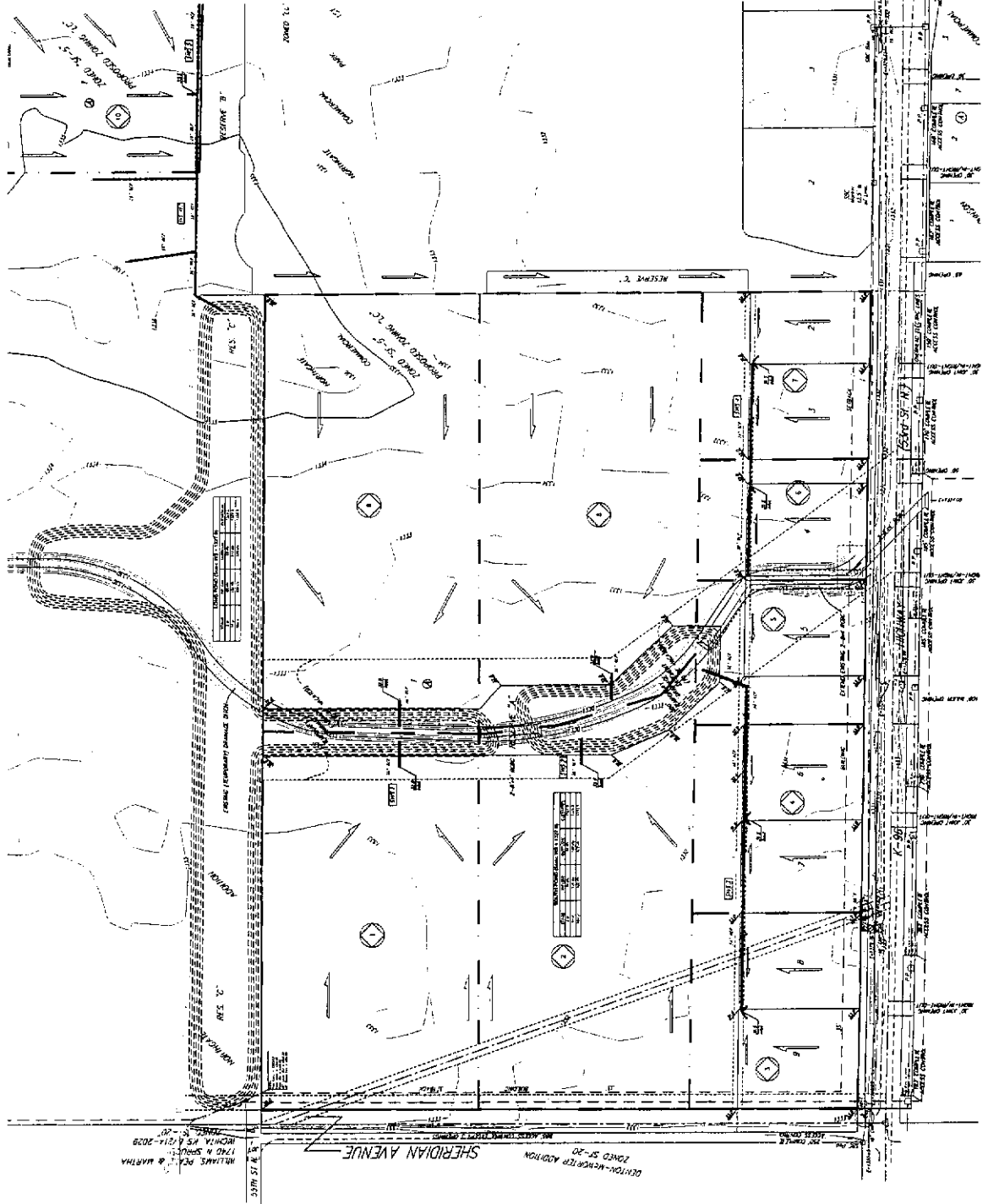
NOTE: No FEMA STHA exists on this property as November 13, 2007 per FEMA Flood Panels 195 & 211 of 700 for Sedgewick County, Kansas, effective February 2, 2007.

Stormwater Sewer is expected on the developed lots. The on-site stormwater will be 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 Addition.

Developed Intensity	Runoff Coefficient	Developed Footcandle	
		100% CFS	100% CFS
2.4	0.31	100	100
3.1	0.31	131	131
3.8	0.31	162	162
4.5	0.31	193	193
5.2	0.31	224	224
5.9	0.31	255	255
6.6	0.31	286	286
7.3	0.31	317	317
8.0	0.31	348	348
8.7	0.31	379	379
9.4	0.31	410	410
10.1	0.31	441	441
10.8	0.31	472	472
11.5	0.31	503	503
12.2	0.31	534	534
12.9	0.31	565	565
13.6	0.31	596	596
14.3	0.31	627	627
15.0	0.31	658	658
15.7	0.31	689	689
16.4	0.31	720	720
17.1	0.31	751	751
17.8	0.31	782	782
18.5	0.31	813	813
19.2	0.31	844	844
19.9	0.31	875	875
20.6	0.31	906	906
21.3	0.31	937	937
22.0	0.31	968	968
22.7	0.31	999	999
23.4	0.31	1030	1030
24.1	0.31	1061	1061
24.8	0.31	1092	1092
25.5	0.31	1123	1123
26.2	0.31	1154	1154
26.9	0.31	1185	1185
27.6	0.31	1216	1216
28.3	0.31	1247	1247
29.0	0.31	1278	1278
29.7	0.31	1309	1309
30.4	0.31	1340	1340
31.1	0.31	1371	1371
31.8	0.31	1402	1402
32.5	0.31	1433	1433
33.2	0.31	1464	1464
33.9	0.31	1495	1495
34.6	0.31	1526	1526
35.3	0.31	1557	1557
36.0	0.31	1588	1588
36.7	0.31	1619	1619
37.4	0.31	1650	1650
38.1	0.31	1681	1681
38.8	0.31	1712	1712
39.5	0.31	1743	1743
40.2	0.31	1774	1774
40.9	0.31	1805	1805
41.6	0.31	1836	1836
42.3	0.31	1867	1867
43.0	0.31	1898	1898
43.7	0.31	1929	1929
44.4	0.31	1960	1960
45.1	0.31	1991	1991
45.8	0.31	2022	2022
46.5	0.31	2053	2053
47.2	0.31	2084	2084
47.9	0.31	2115	2115
48.6	0.31	2146	2146
49.3	0.31	2177	2177
50.0	0.31	2208	2208
50.7	0.31	2239	2239
51.4	0.31	2270	2270
52.1	0.31	2301	2301
52.8	0.31	2332	2332
53.5	0.31	2363	2363
54.2	0.31	2394	2394
54.9	0.31	2425	2425
55.6	0.31	2456	2456
56.3	0.31	2487	2487
57.0	0.31	2518	2518
57.7	0.31	2549	2549
58.4	0.31	2580	2580
59.1	0.31	2611	2611
59.8	0.31	2642	2642
60.5	0.31	2673	2673
61.2	0.31	2704	2704
61.9	0.31	2735	2735
62.6	0.31	2766	2766
63.3	0.31	2797	2797
64.0	0.31	2828	2828
64.7	0.31	2859	2859
65.4	0.31	2890	2890
66.1	0.31	2921	2921
66.8	0.31	2952	2952
67.5	0.31	2983	2983
68.2	0.31	3014	3014
68.9	0.31	3045	3045
69.6	0.31	3076	3076
70.3	0.31	3107	3107
71.0	0.31	3138	3138
71.7	0.31	3169	3169
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73.1	0.31	3231	3231
73.8	0.31	3262	3262
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75.9	0.31	3355	3355
76.6	0.31	3386	3386
77.3	0.31	3417	3417
78.0	0.31	3448	3448
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79.4	0.31	3510	3510
80.1	0.31	3541	3541
80.8	0.31	3572	3572
81.5	0.31	3603	3603
82.2	0.31	3634	3634
82.9	0.31	3665	3665
83.6	0.31	3696	3696
84.3	0.31	3727	3727
85.0	0.31	3758	3758
85.7	0.31	3789	3789
86.4	0.31	3820	3820
87.1	0.31	3851	3851
87.8	0.31	3882	3882
88.5	0.31	3913	3913
89.2	0.31	3944	3944
89.9	0.31	3975	3975
90.6	0.31	4006	4006
91.3	0.31	4037	4037
92.0	0.31	4068	4068
92.7	0.31	4099	4099
93.4	0.31	4130	4130
94.1	0.31	4161	4161
94.8	0.31	4192	4192
95.5	0.31	4223	4223
96.2	0.31	4254	4254
96.9	0.31	4285	4285
97.6	0.31	4316	4316
98.3	0.31	4347	4347
99.0	0.31	4378	4378
99.7	0.31	4409	4409
100.4	0.31	4440	4440
101.1	0.31	4471	4471
101.8	0.31	4502	4502
102.5	0.31	4533	4533
103.2	0.31	4564	4564
103.9	0.31	4595	4595
104.6	0.31	4626	4626
105.3	0.31	4657	4657
106.0	0.31	4688	4688
106.7	0.31	4719	4719
107.4	0.31	4750	4750
108.1	0.31	4781	4781
108.8	0.31	4812	4812
109.5	0.31	4843	4843
110.2	0.31	4874	4874
110.9	0.31	4905	4905
111.6	0.31	4936	4936
112.3	0.31	4967	4967
113.0	0.31	4998	4998
113.7	0.31	5029	5029
114.4	0.31	5060	5060
115.1	0.31	5091	5091
115.8	0.31	5122	5122
116.5	0.31	5153	5153
117.2	0.31	5184	5184
117.9	0.31	5215	5215
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119.3	0.31	5277	5277
120.0	0.31	5308	5308
120.7	0.31	5339	5339
121.4	0.31	5370	5370
122.1	0.31	5401	5401
122.8	0.31	5432	5432
123.5	0.31	5463	5463
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125.6	0.31	5556	5556
126.3	0.31	5587	5587
127.0	0.31	5618	5618
127.7	0.31	5649	5649
128.4	0.31	5680	5680
129.1	0.31	5711	5711
129.8	0.31	5742	5742
130.5	0.31	5773	5773
131.2	0.31	5804	5804
131.9	0.31	5835	5835
132.6	0.31	5866	5866
133.3	0.31	5897	5897
134.0	0.31	5928	5928
134.7	0.31	5959	5959
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136.1	0.31	6021	6021
136.8	0.31	6052	6052
137.5	0.31	6083	6083
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143.8	0.31	6362	6362
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145.2	0.31	6424	6424
145.9	0.31	6455	6455
146.6	0.31	6486	6486
147.3	0.31	6517	6517
148.0	0.31	6548	6548
148.7	0.31	6579	6579
149.4	0.31	6610	6610
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151.5	0.31	6703	6703
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159.2	0.31	7044	7044
159.9	0.31	7075	7075
160.6	0.31	7106	7106
161.3	0.31	7137	7137
162.0	0.31	7168	7168
162.7	0.31	7199	7199
163.4	0.31	7230	7230
164.1	0.31	7261	7261
164.8	0.31	7292	7292
165.5	0.31	7323	7323
166.2	0.31	7354	7354
166.9	0.31	7385	7385
167.6	0.31	7416	7416
168.3	0.31	7447	7447
169.0	0.31	7478	7478
169.7	0.31	7509	7509
170.4	0.31	7540	7540
171.1	0.31	7571	7571
171.8	0.31	7602	7602
172.5	0.31	7633	7633
173.2	0.31	7664	7664
173.9	0.31	7695	7695
174.6	0.31	7726	7726
175.3	0.31	7757	7757
176.0	0.31	7788	7788
176.7	0.31	7819	7819

DRAINAGE & GRADING PLAN NORTHGATE COMMERCIAL ADDITION WICHITA, SEDGWICK COUNTY, KANSAS



NOTE: No FEMA SFHA exists on this property as November 13, 2007 per FEMA Flood Panels 195 & 211 of 700 for Sedgewick County, Kansas, effective February 2, 2007.

Stormwater flow is depicted on this drainage plan. The on-site stormwater will flow into this stormwater on when final location to be determined upon development.

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

Quantity	Unit	Quantity	Unit	Quantity
Excavation	cu yd	3.8	5.10	1.30
Backfill	cu yd	0.0	0.00	0.00
Gravel	cu yd	0.0	0.00	0.00
Asphalt	sq yd	0.0	0.00	0.00
Concrete	cu yd	0.0	0.00	0.00
Rebar	lb	0.0	0.00	0.00
Manhole	each	0.0	0.00	0.00
Stormwater	each	0.0	0.00	0.00
Drainage	each	0.0	0.00	0.00
Grading	sq ft	0.0	0.00	0.00
Other	sq ft	0.0	0.00	0.00
TOTAL		3.8	5.10	1.30

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0195E
FIRM
 FLOOD INSURANCE RATE MAP
 SEDGWICK COUNTY,
 KANSAS
 AND INCORPORATED AREAS
 PANEL 195 OF 700
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

COMMUNITY: SEDGWICK COUNTY, KANSAS
 MAP NUMBER: 20173C0195E
 EFFECTIVE DATE: FEBRUARY 2, 2007
 FEDERAL Emergency Management Agency

Notes to User: This map number shown below should be used when checking map orders. The Community Number shown above should be used when determining the appropriate rate schedule for the subject community.

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