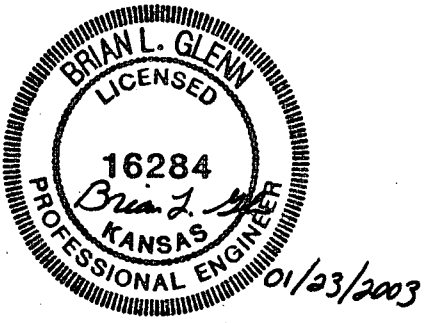


DRAINAGE PLAN  
FOR  
SEALPAK ADDITION  
TO  
WICHITA, SEDGWICK COUNTY, KANSAS



Prepared By

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January 23, 2003

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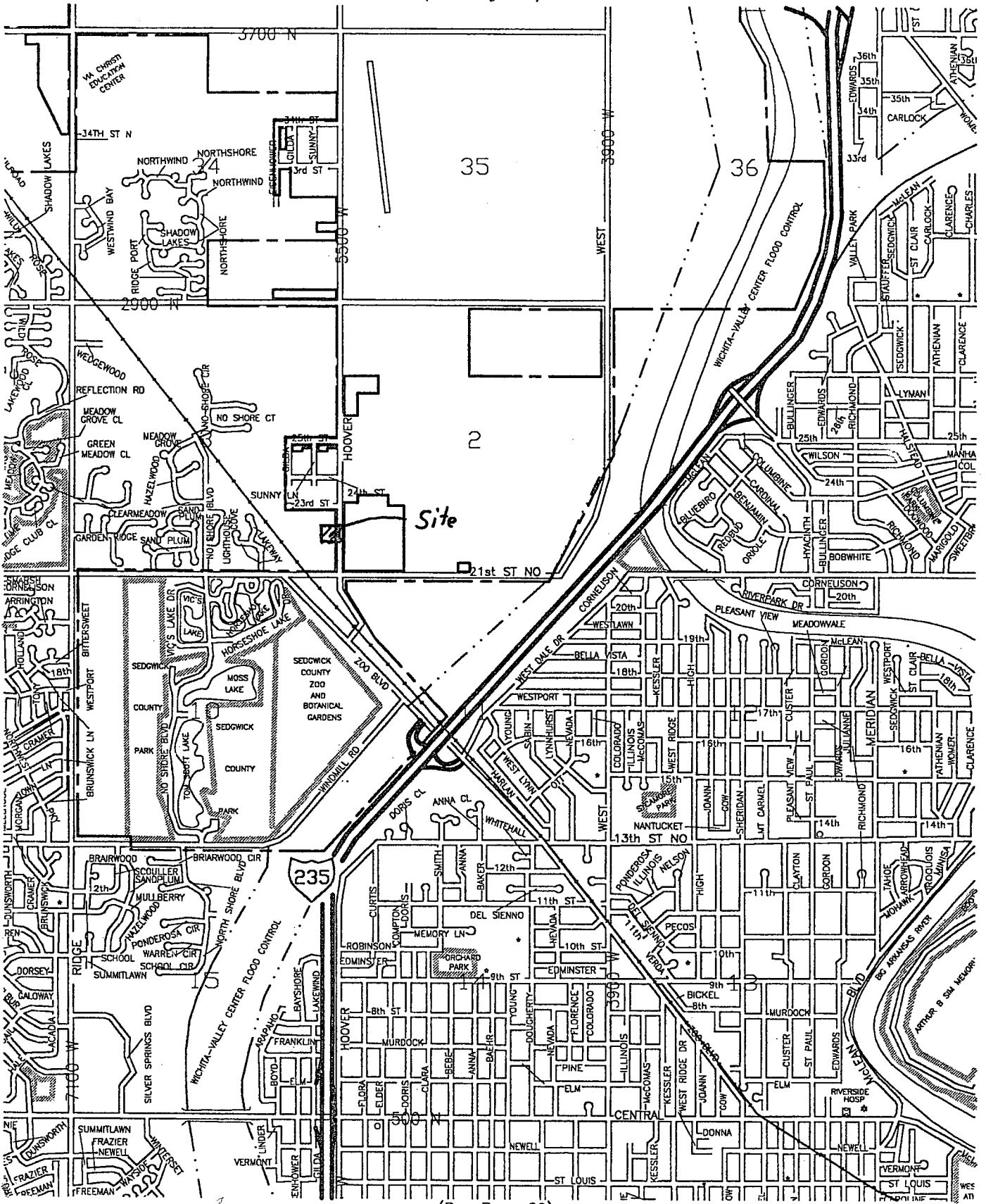
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## **Introduction**

This report provides information and supporting documentation to support the "Drainage Plan" for the proposed "SealPak" Addition to the City of Wichita. The subject property is located within the SE ¼ of Sec 3, TWP-27-S, R-1-W, more commonly north of 21<sup>st</sup> St. North on Hoover Road.

The "Drainage Plan" being submitted herein is intended to serve as a guide for the design of detention facilities, parking lots, and storm water sewer improvements to the proposed developments. Modifications to structures, pipes, etc. may be made as necessary during the final design in order to obtain the most economical design and construction possible.

(See Page 15)



Site

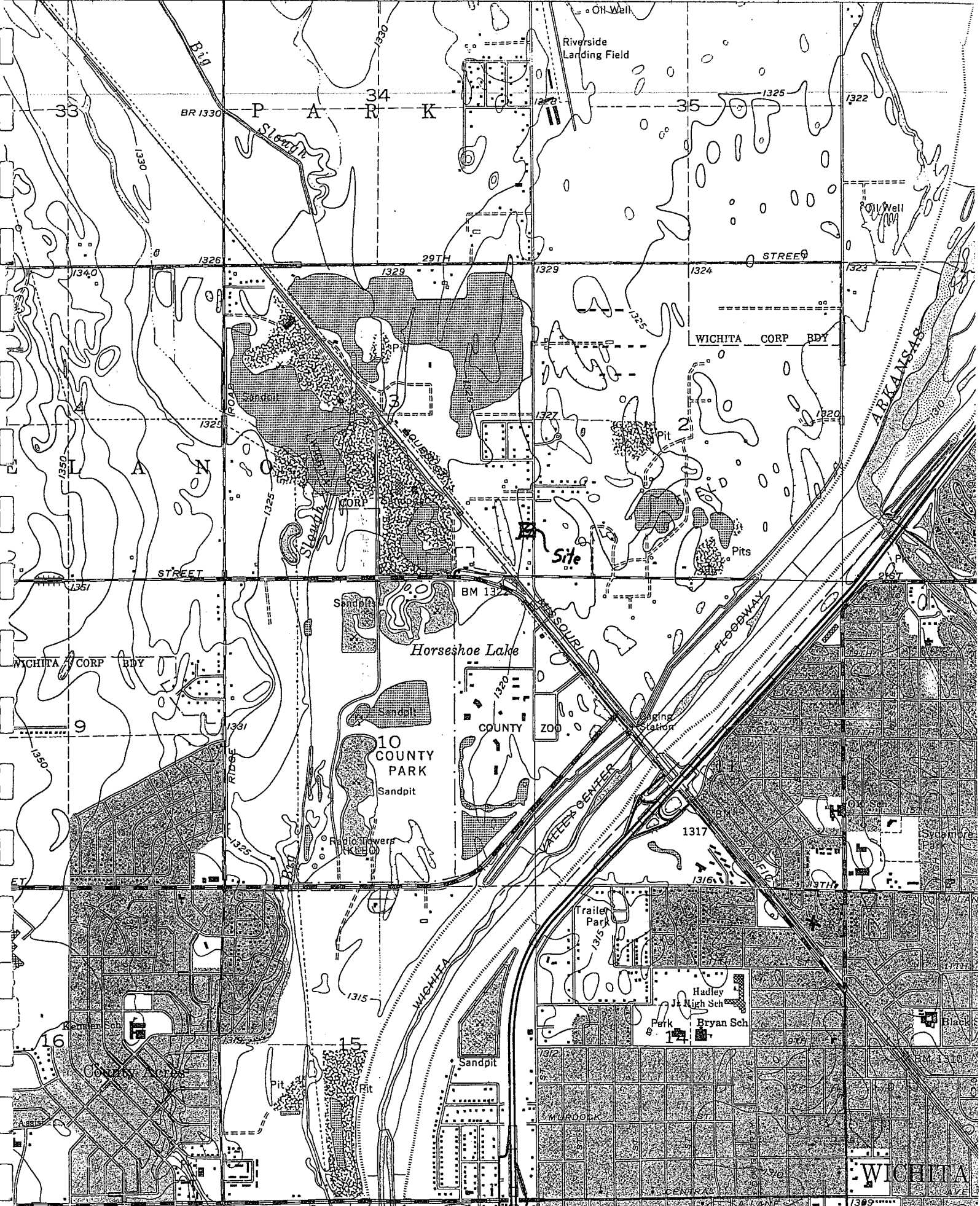
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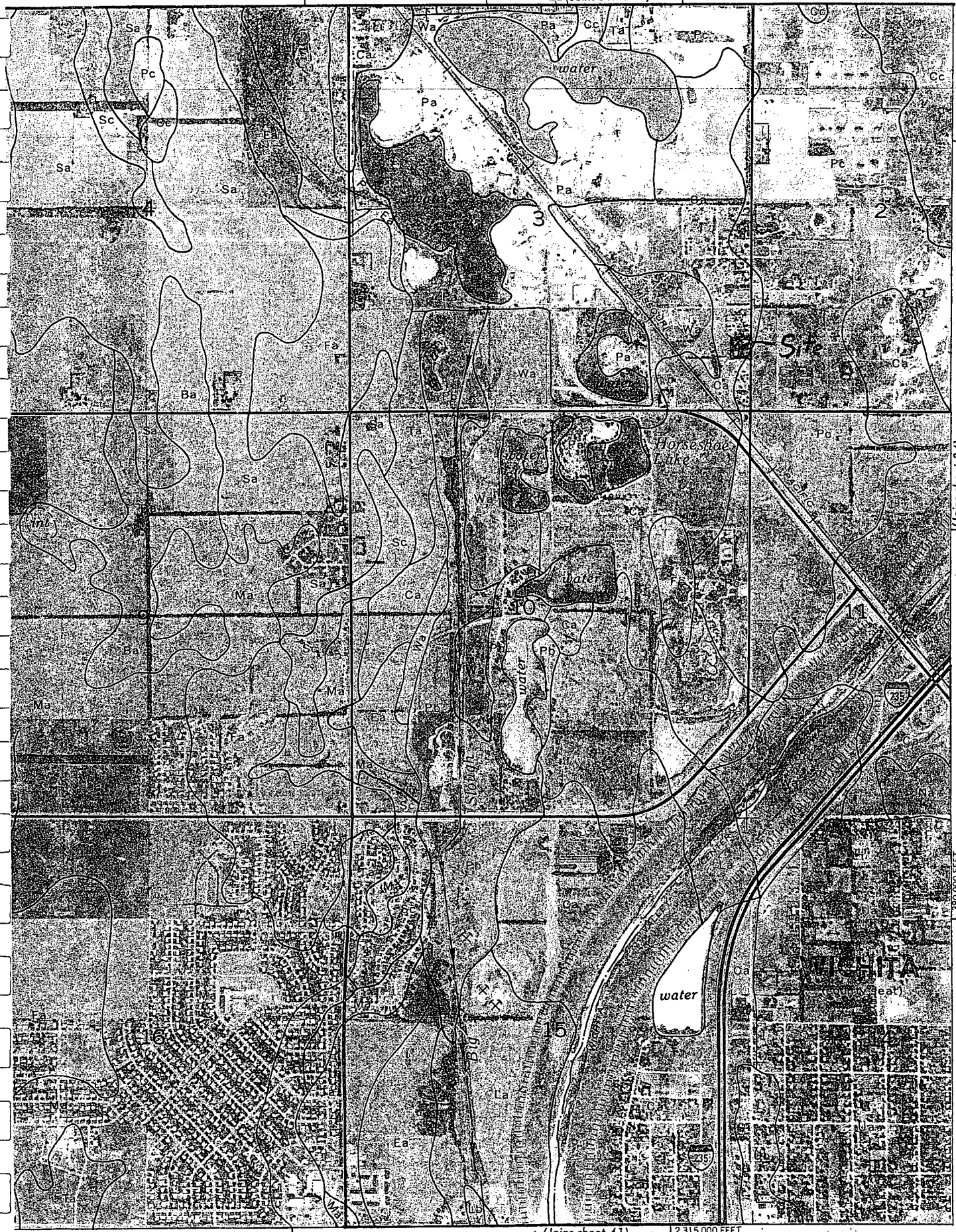
21

9 IV SW (AIZE) 638 SEDGWICK 12 MI. 25' 640 641 | 2 320 000 FEET

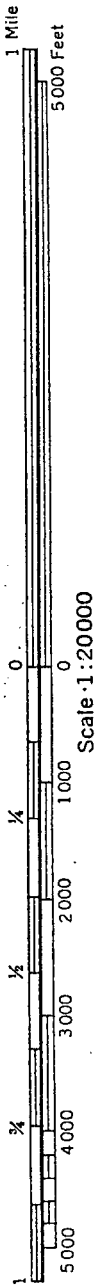


WICHITA

Pb La (Joins sheet 25)



(Joins sheet 34)



(Joins sheet 41) 2 315 000 FEET

## Existing Conditions

Presently this property sheds stormwater runoff to the adjacent property on the west. Field surveys indicate that the project site has a moderate slope of approximately 1.5 per cent. By methods outlined in TR-55, the time of concentration was calculated to be 12 minutes, however for analysis, the City of Wichita's 15-minute minimum will be used.

The soils in the area are of hydrologic type "B" as determined in the *Soil Survey of Sedgwick County*. This soil has been assigned a SCS curve number of 69 as derived from the attached table. These values were used as input to the commercial software "PondPak" distributed by Haestad Methods. Analysis for this project will be done using variable return periods for the 24-hour duration. The rainfall depths for the variable return periods were obtained from TP-40. The resulting calculated peak discharges for existing conditions are:

| Return Period yr. | 24-hr Rainfall depth in. | Existing Peak Flowrate cfs |
|-------------------|--------------------------|----------------------------|
| 2                 | 3.5                      | 1.7                        |
| 5                 | 4.5                      | 3                          |
| 10                | 5.3                      | 4.2                        |
| 100               | 7.9                      | 8.3                        |

## Developed Conditions

Preliminary site plans for this project indicate that 0.6 acres of impervious areas will be created due to construction. Again, the City of Wichita's 15 minute minimum time of concentration will be used. The SCS curve number for developed conditions is based on a weighted average of the existing condition curve number for those areas to remain pervious, and a curve number of 98 for the proposed impervious areas. The resulting curve number for developed conditions has been calculated to be 80.

Inputting the developed values into PondPak, the developed peak flowrates for the project, prior to detention are:

| Return Period yr. | 24-hr Rainfall depth in. | Developed Peak Flowrate cfs |
|-------------------|--------------------------|-----------------------------|
| 2                 | 3.5                      | 3.2                         |
| 5                 | 4.5                      | 4.8                         |
| 10                | 5.3                      | 6.1                         |
| 100               | 7.9                      | 10.6                        |

### **On-Site Detention**

Initial conceptual designs for detention explored the possibility of collecting only the developed portion of the project in a detention facility, while allowing the undeveloped areas to naturally discharge to the west. These concepts would utilize a detention pond located in the southeast corner of the property.

The first scenario was to create a "wet" surface pond, in which the static water level would be controlled by the presence of groundwater. Research of the Water Well Completion Record Database revealed that a nearby domestic water well has a recorded depth to groundwater of 15 feet. Since the project site is relatively small, excavation to intercept the groundwater would be impractical.

The second scenario was to create a "dry" detention pond with an outlet pipe crossing Hoover Road and discharging directly into the eastern right-of-way ditch. This scenario, however, is not a viable solution due to the existing elevations of the ditch flow, along with the potential of utility conflicts.

The third scenario was to locate the detention facility near the southwest corner of the property and allow the pond discharge to remain in its natural drainage basin.

A "dry" facility was initially proposed for this location. However, after calculating an annual water budget for the site, it was determined that a "wet" facility could be sustained with minimal supplemental water supply. In addition to creating an amenity to the project, the excavation will also serve as a borrow pit to obtain the necessary fill material for construction. Preliminary estimates indicate that 2,800 to 3,000 cubic yards of material will be needed for construction.

Converting the borrow requirement into a pond volume, assuming a static pool depth of seven feet. The resulting pond area was calculated at 0.3 acres. This area was used as the initial size for the detailed detention calculations.

### **Detention Calculation**

In order to create storage volume and maintain gravity discharge, an 18-inch earthen berm will be constructed. Routing results from PondPak indicate that a 5-foot earthen weir section will provide the necessary restriction, to reduce peak discharges equal to or less than existing conditions. The following are the routing results:

| Based on Static WS = 135.0 |                                  |                                            |
|----------------------------|----------------------------------|--------------------------------------------|
| Return Period<br>yr.       | Peak<br>Pond<br>Discharge<br>cfs | Maximum<br>Pond<br>Elevation<br>city datum |
| 2                          | 1.3                              | 135.2                                      |
| 5                          | 2.4                              | 135.3                                      |
| 10                         | 3.2                              | 135.4                                      |
| 100                        | 6.4                              | 135.6                                      |

## Summary

The proposed drainage plan for the property will direct stormwater runoff from the site to a "wet" surface detention pond located in the southwest corner of the property. Discharge for the detention pond will occur at the natural grade elevation with the storage volume being created by the construction of an earthen berm. The outlet shall be constructed as a 5-foot earthen weir section allowing for positive gravity flow for the site.

Due to the sandy nature of the soils in this area, it is recommended that a clay liner be installed in the pond to prevent leakage. The pond size for the project has been estimated based on detention requirements as well as the need of fill material. Since the installation of the detention facility will alter the natural flow of runoff and concentrate the discharge point, it is recommended that the owner obtain an off-site drainage agreement with the adjacent property owner. The following is a summary of the pre-project and post-project conditions:

| Return Period yr. | 24-hr Rainfall depth in. | Existing Peak Flowrate cfs | Developed Peak Flowrate cfs | Proposed Peak Discharge cfs | Maximum Pond Elevation city datum |
|-------------------|--------------------------|----------------------------|-----------------------------|-----------------------------|-----------------------------------|
| 2                 | 3.5                      | 1.7                        | 3.2                         | 1.3                         | 135.2                             |
| 5                 | 4.5                      | 3                          | 4.8                         | 2.4                         | 135.3                             |
| 10                | 5.3                      | 4.2                        | 6.1                         | 3.2                         | 135.4                             |
| 100               | 7.9                      | 8.3                        | 10.6                        | 6.4                         | 135.6                             |

Appendix A  
Time of Concentration Calculation

## Time of Concentration

sheet flow

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} S_0^{0.4}}$$

$$n = 0.15$$

$$L = 100'$$

$$P_2 = 3.5''$$

$$S_0 = 0.015 \text{ ft/ft}$$

$$T_t = \frac{0.007 [(0.15)(100)]^{0.8}}{(3.5)^{0.5} (0.015)^{0.4}}$$

$$T_{t_1} = 0.175 \text{ hr}$$

shallow concentrated flow

$$T_{t_2} = \frac{L}{3600 V}$$

where  $L = \text{flow length} = 250'$ 

$$V = 16.1345 \sqrt{S_0} = 2 \text{ ft/s}$$

$$T_{t_2} = \frac{250}{3600 (2)} = 0.035 \text{ hr}$$

$$T_c = T_{t_1} + T_{t_2} = 0.175 + 0.035 = 0.21 \text{ hr} = 12.6 \text{ min}$$

use City of Wichita minimum  $T_c = 15 \text{ min}$

---

Appendix B  
Curve Number Reference  
And  
Water Well Data

TABLE 2.1  
**Runoff Curve Numbers for Selected Agricultural, Suburban, and  
 Urban Land Use (Antecedent moisture condition II;  $I_a = 0.25$ )**

| LAND USE DESCRIPTION                                      | HYDROLOGIC SOIL GROUP |    |    |    |
|-----------------------------------------------------------|-----------------------|----|----|----|
|                                                           | A                     | B  | C  | D  |
| Cultivated land <sup>1</sup>                              |                       |    |    |    |
| Without conservation treatment                            | 72                    | 81 | 88 | 91 |
| With conservation treatment                               | 62                    | 71 | 78 | 81 |
| Pasture or range land                                     |                       |    |    |    |
| Poor condition                                            | 68                    | 79 | 86 | 89 |
| Good condition                                            | 39                    | 61 | 74 | 80 |
| Meadow                                                    |                       |    |    |    |
| Good condition                                            | 30                    | 58 | 71 | 78 |
| Wood or forest land                                       |                       |    |    |    |
| Thin stand, poor cover, no mulch                          | 45                    | 66 | 77 | 83 |
| Good cover <sup>2</sup>                                   | 25                    | 55 | 70 | 77 |
| Open spaces, lawns, parks, golf courses, cemeteries, etc. |                       |    |    |    |
| Good condition: grass cover on 75% or more of the area    | 39                    | 61 | 74 | 80 |
| Fair condition: grass cover on 50-75% of the area         | 49                    | 69 | 79 | 84 |
| Commercial and business areas (85% impervious)            | 89                    | 92 | 94 | 95 |
| Industrial districts (72% impervious)                     | 81                    | 88 | 91 | 93 |
| Residential <sup>3</sup>                                  |                       |    |    |    |
| Average lot size      Average % impervious <sup>4</sup>   |                       |    |    |    |
| 1/8 ac or less      65                                    | 77                    | 85 | 90 | 92 |
| 1/4 ac              38                                    | 61                    | 75 | 83 | 87 |
| 1/3 ac              30                                    | 57                    | 72 | 81 | 86 |
| 1/2 ac              25                                    | 54                    | 70 | 80 | 85 |
| 1 ac                20                                    | 51                    | 68 | 79 | 84 |
| Paved parking lots, roofs, driveways, etc. <sup>5</sup>   | 98                    | 98 | 98 | 98 |
| Streets and roads                                         |                       |    |    |    |
| Paved with curbs and storm sewers <sup>5</sup>            | 98                    | 98 | 98 | 98 |
| Gravel                                                    | 76                    | 85 | 89 | 91 |
| Dirt                                                      | 72                    | 82 | 87 | 89 |

1. For a more detailed description of agricultural land use curve numbers, refer to *National Engineering Handbook*, Section 4, "Hydrology," Chapter 9, Aug. 1972.

2. Good cover is protected from grazing and litter and brush cover soil.

3. Curve numbers are computed assuming that the runoff from the house and driveway is directed toward the street with a minimum of roof water directed to lawns where additional infiltration could occur.

4. The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

5. In some warmer climates of the country a curve number of 95 may be used.



Specific Water Well Detail

**Well T27S, R1W, Sec. 3, NENESE, Action: Constructed**

|                                                        |                                            |
|--------------------------------------------------------|--------------------------------------------|
| <b>Location Info</b>                                   |                                            |
| <b>County:</b> Sedgwick                                | <b>Location:</b> T27S, R1W, Sec. 3, NENESE |
| <b>Owner:</b> NICHOLS                                  | <b>Status:</b> Constructed                 |
| <b>Directions:</b> 2528 N GLIDA WICHITA KANSAS         |                                            |
| <b>Longitude:</b> -97.40878                            | <b>Latitude:</b> 37.72968                  |
| <b>General Info</b>                                    |                                            |
| <b>Well Depth:</b> 30 ft.                              | <b>Elevation:</b> ft.                      |
| <b>Static Water Level:</b> 15 ft.                      | <b>Well Use:</b> Domestic                  |
| <b>Est. Yield:</b> 0 gpm.                              |                                            |
| <b>Driller Info</b>                                    |                                            |
| <b>Driller:</b> Todd S. Harp Well & Pump Service, Inc. | <b>License #:</b> 236                      |
| <b>Comp. Date:</b> 04-Sep-1986                         | <b>DWR Applic. #:</b>                      |
| <b>Chemical Sample Submitted?:</b> N                   |                                            |
| <b>Casing Info</b>                                     |                                            |
| <b>Casing Type:</b> RMP(SR)                            |                                            |
| <b>Diam:</b> 5 in. to 20 ft.                           |                                            |
| <b>Diam:</b> 0 in. to 0 ft.                            |                                            |
| <b>Diam:</b> 0 in. to 0 ft.                            |                                            |
| <b>Grout Info</b>                                      |                                            |
| <b>Grout used:</b> CEMENT GROUT                        |                                            |
| <b>From:</b> 4 to 14 ft.                               |                                            |
| <b>From:</b> 0 to 0 ft.                                |                                            |
| <b>From:</b> 0 to 0 ft.                                |                                            |
| <b>Contamination Info</b>                              |                                            |
| <b>Contamination type:</b> SEPTIC TANK                 |                                            |
| <b>Direction:</b>                                      | <b>Distance:</b> 0                         |
| <b>Screen and Perforation Info</b>                     |                                            |
| <b>Screen Type:</b> SAW CUT                            | <b>Screen Openings:</b> SAW CUT            |
| <b>From:</b> 20 ft. to 30 ft.                          | <b>From:</b> 0 ft. to 0 ft.                |
| <b>From:</b> 0 ft. to 0 ft.                            | <b>From:</b> 0 ft. to 0 ft.                |
| <b>Lithologic Log</b>                                  |                                            |

|                               |                          |
|-------------------------------|--------------------------|
| <b>From: 0 ft. to 7 ft.</b>   | <b>Type: CLAY</b>        |
| <b>From: 7 ft. to 21 ft.</b>  | <b>Type: FINE SAND</b>   |
| <b>From: 21 ft. to 30 ft.</b> | <b>Type: MEDIUM SAND</b> |

Kansas Geological Survey  
Comments to [webadmin@kgs.ku.edu](mailto:webadmin@kgs.ku.edu)  
URL=<http://www.kgs.ku.edu/Magellan/WaterWell/index.html>  
Display Programs Updated June 17, 2002  
Data added continuously.

*Faint, illegible text, possibly a signature or date.*

# Appendix C

## Existing Conditions PondPak Model

Job File: F:\HYDRO\PROJECTS\SEALPAK\PONDPACK\SEALPAK\_EXISTING.PPW  
Rain Dir: C:\HAESTAD\PPKW\RAINFALL\

=====  
JOB TITLE  
=====

Existing Conditions Model for SealPak project site on N. Hoover

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SCS Unit Hyd. Summary ..... 3.01

EXISTING BASIN.. Pre..5  
SCS Unit Hyd. Summary ..... 3.02

EXISTING BASIN.. Pre.10  
SCS Unit Hyd. Summary ..... 3.03

EXISTING BASIN.. Pre100  
SCS Unit Hyd. Summary ..... 3.04

MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID SEDGWICK.RNQ Sedgwick24

| Return Event | Total Depth in | Rainfall Type   | RNF File | RNF ID |      |
|--------------|----------------|-----------------|----------|--------|------|
| Pre..5       | 4.5000         | Synthetic Curve | SCSTYPES | TypeII | 24hr |
| Pre100       | 7.9000         | Synthetic Curve | SCSTYPES | TypeII | 24hr |
| Pre.10       | 5.3000         | Synthetic Curve | SCSTYPES | TypeII | 24hr |
| Pre..2       | 3.5000         | Synthetic Curve | SCSTYPES | TypeII | 24hr |

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 |
|-----------------|-------------------|---------------|------|-----------|-----------|-------------|----------------|
| EXISTING BASIN  | AREA              | 5             |      | 12.0600   | 3.04      |             |                |
| EXISTING BASIN  | AREA              | 100           |      | 12.0400   | 8.29      |             |                |
| EXISTING BASIN  | AREA              | 10            |      | 12.0600   | 4.19      |             |                |
| EXISTING BASIN  | AREA              | 2             |      | 12.0600   | 1.73      |             |                |
| *OUTLET         | JCT               | 5             |      | 12.0600   | 3.04      |             |                |
| *OUTLET         | JCT               | 100           |      | 12.0400   | 8.29      |             |                |
| *OUTLET         | JCT               | 10            |      | 12.0600   | 4.19      |             |                |
| *OUTLET         | JCT               | 2             |      | 12.0600   | 1.73      |             |                |

Type... Design Storms  
Name... Sedgwick24

Page 2.01

File... C:\HAESTAD\PPKW\RAINFALL\SEDGWICK.RNQ  
Title... Existing Conditions Model for SealPak project site on  
N. Hoover

DESIGN STORMS SUMMARY

Design Storm File, ID = SEDGWICK.RNQ Sedgwick24

Storm Tag Name = Pre..5  
Description: Sedgwick County 5-yr 24 hour Duration

-----  
Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr  
Storm Frequency = 5 yr  
Total Rainfall Depth= .0000 in  
Duration Multiplier = 1  
Resulting Duration = -.1000 hrs  
Resulting Start Time= .0000 hrs Step= .1000 hrs End= -.1000 hrs

Storm Tag Name = Pre100  
Description: Sedgwick County 100-yr 24 hour Duration

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

Storm Tag Name = Pre.10  
Description: Sedgwick County 10-yr 24 hour Duration

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

Storm Tag Name = Pre..2  
Description: Sedgwick County 2-yr 24 hour Duration

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

Type.... SCS Unit Hyd. Summary Page 3.01  
 Name.... EXISTING BASIN Tag: Pre..2 Event: 2 yr  
 File.... F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\SEALPAK\_EXISTING.PPW  
 Storm... TypeII 24hr Tag: Pre..2

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm  
 Duration = 24.0000 hrs Rain Depth = 3.5000 in  
 Rain Dir = C:\HAESTAD\PPKW\RAINFALL\  
 Rain File -ID = SCSTYPES.RNF - TypeII 24hr  
 Unit Hyd Type = Default Curvilinear  
 HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
 HYG File - ID = SEALPAKX.HYG - EXISTING BASIN Pre..2  
 Tc = .2500 hrs  
 Drainage Area = 1.600 acres Runoff CN= 69

=====  
 Computational Time Increment = .03333 hrs  
 Computed Peak Time = 12.0667 hrs  
 Computed Peak Flow = 1.74 cfs

Time Increment for HYG File = .0200 hrs  
 Peak Time, Interpolated Output = 12.0601 hrs  
 Peak Flow, Interpolated Output = 1.73 cfs  
 =====

DRAINAGE AREA

-----  
 ID:None Selected  
 CN = 69  
 Area = 1.600 acres  
 S = 4.4928 in  
 0.2S = .8986 in

Cumulative Runoff

-----  
 .9540 in  
 .127 ac-ft

HYG Volume... .127 ac-ft (area under HYG curve)

\*\*\*\*\* UNIT HYDROGRAPH PARAMETERS \*\*\*\*\*

Time Concentration, Tc = .25000 hrs (ID: None Selected)  
 Computational Incr, Tm = .03333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)  
 K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))  
 Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.25 cfs  
 Unit peak time Tp = .16667 hrs  
 Unit receding limb, Tr = .66667 hrs  
 Total unit time, Tb = .83333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm  
 Duration = 24.0000 hrs Rain Depth = 4.5000 in  
 Rain Dir = C:\HAESTAD\PPKW\RAINFALL\  
 Rain File -ID = SCSTYPES.RNF - TypeII 24hr  
 Unit Hyd Type = Default Curvilinear  
 HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
 HYG File - ID = SEALPAKX.HYG - EXISTING BASIN Pre..5  
 Tc = .2500 hrs  
 Drainage Area = 1.600 acres Runoff CN= 69

=====  
 Computational Time Increment = .03333 hrs  
 Computed Peak Time = 12.0667 hrs  
 Computed Peak Flow = 3.05 cfs

Time Increment for HYG File = .0200 hrs  
 Peak Time, Interpolated Output = 12.0601 hrs  
 Peak Flow, Interpolated Output = 3.04 cfs  
 =====

DRAINAGE AREA

-----  
 ID:None Selected  
 CN = 69  
 Area = 1.600 acres  
 S = 4.4928 in  
 0.25 = .8986 in

Cumulative Runoff

-----  
 1.6024 in  
 .214 ac-ft

HYG Volume... .214 ac-ft (area under HYG curve)

\*\*\*\*\* UNIT HYDROGRAPH PARAMETERS \*\*\*\*\*

Time Concentration, Tc = .25000 hrs (ID: None Selected)  
 Computational Incr, Tm = .03333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)  
 K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))  
 Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.25 cfs  
 Unit peak time Tp = .16667 hrs  
 Unit receding limb, Tr = .66667 hrs  
 Total unit time, Tb = .83333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm  
 Duration = 24.0000 hrs Rain Depth = 5.3000 in  
 Rain Dir = C:\HAESTAD\PPKW\RAINFALL\  
 Rain File -ID = SCSTYPES.RNF - TypeII 24hr  
 Unit Hyd Type = Default Curvilinear  
 HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
 HYG File - ID = SEALPAKX.HYG - EXISTING BASIN Pre.10  
 Tc = .2500 hrs  
 Drainage Area = 1.600 acres Runoff CN= 69

=====  
 Computational Time Increment = .03333 hrs  
 Computed Peak Time = 12.0667 hrs  
 Computed Peak Flow = 4.19 cfs

Time Increment for HYG File = .0200 hrs  
 Peak Time, Interpolated Output = 12.0601 hrs  
 Peak Flow, Interpolated Output = 4.19 cfs  
 =====

DRAINAGE AREA

-----  
 ID:None Selected  
 CN = 69  
 Area = 1.600 acres  
 S = 4.4928 in  
 0.2S = .8986 in

Cumulative Runoff

-----  
 2.1781 in  
 .290 ac-ft

HYG Volume... .290 ac-ft (area under HYG curve)

\*\*\*\*\* UNIT HYDROGRAPH PARAMETERS \*\*\*\*\*

Time Concentration, Tc = .25000 hrs (ID: None Selected)  
 Computational Incr, Tm = .03333 hrs = 0.20000 Tp  
 Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)  
 K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))  
 Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)  
 Unit peak, qp = 7.25 cfs  
 Unit peak time, Tp = .16667 hrs  
 Unit receding limb, Tr = .66667 hrs  
 Total unit time, Tb = .83333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm  
 Duration = 24.0000 hrs Rain Depth = 7.9000 in  
 Rain Dir = C:\HAESTAD\PPKW\RAINFALL\  
 Rain File -ID = SCSTYPES.RNF - TypeII 24hr  
 Unit Hyd Type = Default Curvilinear  
 HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
 HYG File - ID = SEALPAKX.HYG - EXISTING BASIN Pre100  
 Tc = .2500 hrs  
 Drainage Area = 1.600 acres Runoff CN= 69

=====  
 Computational Time Increment = .03333 hrs  
 Computed Peak Time = 12.0333 hrs  
 Computed Peak Flow = 8.31 cfs

Time Increment for HYG File = .0200 hrs  
 Peak Time, Interpolated Output = 12.0401 hrs  
 Peak Flow, Interpolated Output = 8.29 cfs  
 =====

DRAINAGE AREA

-----  
 ID:None Selected  
 CN = 69  
 Area = 1.600 acres  
 S = 4.4928 in  
 0.2S = .8986 in

Cumulative Runoff

-----  
 4.2648 in  
 .569 ac-ft

HYG Volume... .569 ac-ft (area under HYG curve)

\*\*\*\*\* UNIT HYDROGRAPH PARAMETERS \*\*\*\*\*

Time Concentration, Tc = .25000 hrs (ID: None Selected)  
 Computational Incr, Tm = .03333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)  
 K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))  
 Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.25 cfs  
 Unit peak time Tp = .16667 hrs  
 Unit receding limb, Tr = .66667 hrs  
 Total unit time, Tb = .83333 hrs

Index of Starting Page Numbers for ID Names

----- E -----  
EXISTING BASIN Pre..2... 3.01, 3.02,  
3.03, 3.04

---

----- S -----  
Sedgwick24... 2.01

----- W -----  
Watershed... 1.01

# Appendix D

Developed Conditions w/o detention PondPak Model

Job File: F:\HYDRO\PROJECTS\SEALPAK\PONDPACK\SEALPAK\_DEVELOPED.PPW  
Rain Dir: C:\HAESTAD\PPKW\RAINFALL\

=====  
JOB TITLE  
=====

---

Developed Conditions Model for the SealPak site on N. Hoover.  
This Model reflects conditions prior to detention

Table of Contents

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

Watershed..... Master Network Summary ..... 1.01

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

Sedgwick24..... Design Storms ..... 2.01

\*\*\*\*\* RUNOFF HYDROGRAPHS \*\*\*\*\*

DEVELOPED..... Dev..2  
SCS Unit Hyd. Summary ..... 3.01

DEVELOPED..... Dev..5  
SCS Unit Hyd. Summary ..... 3.02

DEVELOPED..... Dev.10  
SCS Unit Hyd. Summary ..... 3.03

DEVELOPED..... Dev100  
SCS Unit Hyd. Summary ..... 3.04

MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID SEDGWICK.RNQ Sedgwick24

| Return Event | Total Depth in | Rainfall Type   | RNF File | RNF ID |      |
|--------------|----------------|-----------------|----------|--------|------|
| Dev..5       | 4.5000         | Synthetic Curve | SCSTYPES | TypeII | 24hr |
| Dev100       | 7.9000         | Synthetic Curve | SCSTYPES | TypeII | 24hr |
| Dev.10       | 5.3000         | Synthetic Curve | SCSTYPES | TypeII | 24hr |
| Dev..2       | 3.5000         | Synthetic Curve | SCSTYPES | TypeII | 24hr |

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 |
|-----------------|-------------|-------|---------------|------|-----------|-----------|-------------|----------------|
| DEVELOPED       | AREA        | 5     | .328          |      | 12.0400   | 4.79      |             |                |
| DEVELOPED       | AREA        | 100   | .737          |      | 12.0400   | 10.55     |             |                |
| DEVELOPED       | AREA        | 10    | .421          |      | 12.0400   | 6.12      |             |                |
| DEVELOPED       | AREA        | 2     | .218          |      | 12.0400   | 3.17      |             |                |
| *OUTLET         | JCT         | 5     | .328          |      | 12.0400   | 4.79      |             |                |
| *OUTLET         | JCT         | 100   | .737          |      | 12.0400   | 10.55     |             |                |
| *OUTLET         | JCT         | 10    | .421          |      | 12.0400   | 6.12      |             |                |
| *OUTLET         | JCT         | 2     | .218          |      | 12.0400   | 3.17      |             |                |

Type.... Design Storms  
Name.... Sedgwick24

File.... C:\HAESTAD\PPKW\RAINFALL\SEDGWICK.RNQ  
Title... Developed Conditions Model for the SealPak site on N.  
Hoover.

This Model reflects conditions prior to detention

DESIGN STORMS SUMMARY

Design Storm File, ID = SEDGWICK.RNQ Sedgwick24

Storm Tag Name = Dev..5  
Description: Sedgwick County 5-yr 24 hour Duration

-----  
Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr  
Storm Frequency = 5 yr  
Total Rainfall Depth= 4.5000 in  
Duration Multiplier = 1  
Resulting Duration = 24.0000 hrs  
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = Dev100  
Description: Sedgwick County 100-yr 24 hour Duration

-----  
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

Storm Tag Name = Dev.10  
Description: Sedgwick County 10-yr 24 hour Duration

-----  
Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr  
Storm Frequency = 10 yr  
Total Rainfall Depth= 5.3000 in  
Duration Multiplier = 1  
Resulting Duration = 24.0000 hrs  
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = Dev..2  
Description: Sedgwick County 2-yr 24 hour Duration

-----  
Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr  
Storm Frequency = 2 yr  
Total Rainfall Depth= 3.5000 in  
Duration Multiplier = 1  
Resulting Duration = 24.0000 hrs  
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Type.... SCS Unit Hyd. Summary Page 3.01  
Name.... DEVELOPED Tag: Dev..2 Event: 2 yr  
File.... F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\SEALPAK\_DEVELOPED.PPW  
Storm... TypeII 24hr Tag: Dev..2

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm  
Duration = 24.0000 hrs Rain Depth = 3.5000 in  
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\  
Rain File -ID = SCSTYPES.RNF - TypeII 24hr  
Unit Hyd Type = Default Curvilinear  
HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
HYG File - ID = SEALPAKD.HYG - DEVELOPED Dev..2  
Tc = .2500 hrs  
Drainage Area = 1.600 acres Runoff CN= 80

=====  
Computational Time Increment = .03333 hrs  
Computed Peak Time = 12.0333 hrs  
Computed Peak Flow = 3.17 cfs

Time Increment for HYG File = .0200 hrs  
Peak Time, Interpolated Output = 12.0401 hrs  
Peak Flow, Interpolated Output = 3.17 cfs  
=====

DRAINAGE AREA

-----  
ID:None Selected  
CN = 80  
Area = 1.600 acres  
S = 2.5000 in  
0.2S = .5000 in

Cumulative Runoff

-----  
1.6364 in  
.218 ac-ft

HYG Volume... .218 ac-ft (area under HYG curve)

\*\*\*\*\* UNIT HYDROGRAPH PARAMETERS \*\*\*\*\*

Time Concentration, Tc = .25000 hrs (ID: None Selected)  
Computational Incr, Tm = .03333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)  
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))  
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.25 cfs  
Unit peak time Tp = .16667 hrs  
Unit receding limb, Tr = .66667 hrs  
Total unit time, Tb = .83333 hrs

SCS UNIT HYDROGRAPH METHOD

---

STORM EVENT: 5 year storm  
 Duration = 24.0000 hrs Rain Depth = 4.5000 in  
 Rain Dir = C:\HAESTAD\PPKW\RAINFALL\  
 Rain File -ID = SCSTYPES.RNF - TypeII 24hr  
 Unit Hyd Type = Default Curvilinear  
 HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
 HYG File - ID = SEALPAKD.HYG - DEVELOPED Dev..5  
 Tc = .2500 hrs  
 Drainage Area = 1.600 acres Runoff CN= 80

=====  
 Computational Time Increment = .03333 hrs  
 Computed Peak Time = 12.0333 hrs  
 Computed Peak Flow = 4.80 cfs

Time Increment for HYG File = .0200 hrs  
 Peak Time, Interpolated Output = 12.0401 hrs  
 Peak Flow, Interpolated Output = 4.79 cfs  
 =====

DRAINAGE AREA

-----  
 ID:None Selected  
 CN = 80  
 Area = 1.600 acres  
 S = 2.5000 in  
 0.2S = .5000 in

Cumulative Runoff

-----  
 2.4615 in  
 .328 ac-ft

HYG Volume... .328 ac-ft (area under HYG curve)

\*\*\*\*\* UNIT HYDROGRAPH PARAMETERS \*\*\*\*\*

Time Concentration, Tc = .25000 hrs (ID: None Selected)  
 Computational Incr, Tm = .03333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)  
 K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))  
 Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.25 cfs  
 Unit peak time Tp = .16667 hrs  
 Unit receding limb, Tr = .66667 hrs  
 Total unit time, Tb = .83333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm  
 Duration = 24.0000 hrs Rain Depth = 5.3000 in  
 Rain Dir = C:\HAESTAD\PPKW\RAINFALL\  
 Rain File -ID = SCSTYPES.RNF - TypeII 24hr  
 Unit Hyd Type = Default Curvilinear  
 HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
 HYG File - ID = SEALPAKD.HYG - DEVELOPED Dev.10  
 Tc = .2500 hrs  
 Drainage Area = 1.600 acres Runoff CN= 80

=====  
 Computational Time Increment = .03333 hrs  
 Computed Peak Time = 12.0333 hrs  
 Computed Peak Flow = 6.14 cfs

Time Increment for HYG File = .0200 hrs  
 Peak Time, Interpolated Output = 12.0401 hrs  
 Peak Flow, Interpolated Output = 6.12 cfs  
 =====

DRAINAGE AREA

-----  
 ID:None Selected  
 CN = 80  
 Area = 1.600 acres  
 S = 2.5000 in  
 0.25 = .5000 in

Cumulative Runoff

-----  
 3.1562 in  
 .421 ac-ft

HYG Volume... .421 ac-ft (area under HYG curve)

\*\*\*\*\* UNIT HYDROGRAPH PARAMETERS \*\*\*\*\*

Time Concentration, Tc = .25000 hrs (ID: None Selected)  
 Computational Incr, Tm = .03333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)  
 K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))  
 Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.25 cfs  
 Unit peak time Tp = .16667 hrs  
 Unit receding limb, Tr = .66667 hrs  
 Total unit time, Tb = .83333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm  
 Duration = 24.0000 hrs Rain Depth = 7.9000 in  
 Rain Dir = C:\HAESTAD\PPKW\RAINFALL\  
 Rain File -ID = SCSTYPES.RNF - TypeII 24hr  
 Unit Hyd Type = Default Curvilinear  
 HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
 HYG File - ID = SEALPAKD.HYG - DEVELOPED Dev100  
 Tc = .2500 hrs  
 Drainage Area = 1.600 acres Runoff CN= 80

=====  
 Computational Time Increment = .03333 hrs  
 Computed Peak Time = 12.0333 hrs  
 Computed Peak Flow = 10.60 cfs

Time Increment for HYG File = .0200 hrs  
 Peak Time, Interpolated Output = 12.0401 hrs  
 Peak Flow, Interpolated Output = 10.55 cfs  
 =====

DRAINAGE AREA

-----  
 ID:None Selected  
 CN = 80  
 Area = 1.600 acres  
 S = 2.5000 in  
 0.2S = .5000 in

Cumulative Runoff

-----  
 5.5313 in  
 .738 ac-ft

HYG Volume... .737 ac-ft (area under HYG curve)

\*\*\*\*\* UNIT HYDROGRAPH PARAMETERS \*\*\*\*\*

Time Concentration, Tc = .25000 hrs (ID: None Selected)  
 Computational Incr, Tm = .03333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)  
 K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))  
 Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.25 cfs  
 Unit peak time, Tp = .16667 hrs  
 Unit receding limb, Tr = .66667 hrs  
 Total unit time, Tb = .83333 hrs

Index of Starting Page Numbers for ID Names

----- D -----  
DEVELOPED Dev..2... 3.01, 3.02,  
3.03, 3.04

----- S -----  
Sedgwick24... 2.01

----- W -----  
Watershed... 1.01

# Appendix E

Proposed Conditions w/ detention PondPak Model

Job File: F:\HYDRO\PROJECTS\SEALPAK\PONDPACK\SEALPAK\_DETAINED.PPW  
Rain Dir: C:\HAESTAD\PPKW\RAINFALL\

=====  
JOB TITLE  
=====

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Proposed Conditions Model for SealPak site on N. Hoover.  
Model reflects proposed discharges after detention

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

Watershed..... Master Network Summary ..... 1.01

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

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\*\*\*\*\* RUNOFF HYDROGRAPHS \*\*\*\*\*

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SCS Unit Hyd. Summary ..... 3.02

DEVELOPED..... 100y24  
SCS Unit Hyd. Summary ..... 3.03

DEVELOPED..... 10y24h  
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---

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|      |                                          |      |
|------|------------------------------------------|------|
| POND | OUT 2y24h<br>Pond Routing Summary .....  | 6.01 |
| POND | OUT 5y24h<br>Pond Routing Summary .....  | 6.02 |
| POND | OUT 100y24<br>Pond Routing Summary ..... | 6.03 |
| POND | OUT 10y24h<br>Pond Routing Summary ..... | 6.04 |

MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID SEDGWICK.RNQ Sedgwick24

| Return Event | Total Depth in | Rainfall Type   | RNF File | RNF ID |      |
|--------------|----------------|-----------------|----------|--------|------|
| 5y24h        | 4.5000         | Synthetic Curve | SCSTYPES | TypeII | 24hr |
| 100y24       | 7.9000         | Synthetic Curve | SCSTYPES | TypeII | 24hr |
| 10y24h       | 5.3000         | Synthetic Curve | SCSTYPES | TypeII | 24hr |
| 2y24h        | 3.5000         | Synthetic Curve | SCSTYPES | TypeII | 24hr |

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 |
|-----------------|-------------------|---------------|------|-----------|-----------|-------------|----------------|
| DEVELOPED       | AREA 5            | .328          |      | 12.0400   | 4.79      |             |                |
| DEVELOPED       | AREA 100          | .737          |      | 12.0400   | 10.55     |             |                |
| DEVELOPED       | AREA 10           | .421          |      | 12.0400   | 6.12      |             |                |
| DEVELOPED       | AREA 2            | .218          |      | 12.0400   | 3.17      |             |                |
| *OUTLET         | JCT 5             | .328          |      | 12.2200   | 2.35      |             |                |
| *OUTLET         | JCT 100           | .737          |      | 12.1800   | 6.40      |             |                |
| *OUTLET         | JCT 10            | .421          |      | 12.2000   | 3.17      |             |                |
| *OUTLET         | JCT 2             | .218          |      | 12.2400   | 1.31      |             |                |
| POND            | IN POND 5         | .328          |      | 12.0400   | 4.79      |             |                |
| POND            | IN POND 100       | .737          |      | 12.0400   | 10.55     |             |                |
| POND            | IN POND 10        | .421          |      | 12.0400   | 6.12      |             |                |
| POND            | IN POND 2         | .218          |      | 12.0400   | 3.17      |             |                |
| POND            | OUT POND 5        | .328          |      | 12.2200   | 2.35      | 135.31      | .092           |
| POND            | OUT POND 100      | .737          |      | 12.1800   | 6.40      | 135.62      | .18            |
| POND            | OUT POND 10       | .421          |      | 12.2000   | 3.17      | 135.39      | .117           |
| POND            | OUT POND 2        | .218          |      | 12.2400   | 1.31      | 135.21      | .064           |

Type.... Design Storms  
Name.... Sedgwick24

Page 2.01

File.... C:\HAESTAD\PPKW\RAINFALL\SEDGWICK.RNQ  
Title... Proposed Conditions Model for SealPak site on N.  
Hoover.

Model reflects proposed discharges after detention

#### DESIGN STORMS SUMMARY

Design Storm File, ID = SEDGWICK.RNQ Sedgwick24

Storm Tag Name = 5y24h  
Description: Sedgwick County 5-yr 24 hour Duration

-----  
Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr  
Storm Frequency = 5 yr  
Total Rainfall Depth= 4.5000 in  
Duration Multiplier = 1  
Resulting Duration = 24.0000 hrs  
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100y24  
Description: Sedgwick County 100-yr 24 hour Duration

-----  
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

Storm Tag Name = 10y24h  
Description: Sedgwick County 10-yr 24 hour Duration

-----  
Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr  
Storm Frequency = 10 yr  
Total Rainfall Depth= 5.3000 in  
Duration Multiplier = 1  
Resulting Duration = 24.0000 hrs  
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 2y24h  
Description: Sedgwick County 2-yr 24 hour Duration

-----  
Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr  
Storm Frequency = 2 yr  
Total Rainfall Depth= 3.5000 in  
Duration Multiplier = 1  
Resulting Duration = 24.0000 hrs  
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm  
 Duration = 24.0000 hrs Rain Depth = 3.5000 in  
 Rain Dir = C:\HAESTAD\PPKW\RAINFALL\  
 Rain File -ID = SCSTYPES.RNF - TypeII 24hr  
 Unit Hyd Type = Default Curvilinear  
 HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
 HYG File - ID = SEALPAK.HYG - DEVELOPED 2y24h  
 Tc = .2500 hrs  
 Drainage Area = 1.600 acres Runoff CN= 80

=====  
 Computational Time Increment = .03333 hrs  
 Computed Peak Time = 12.0333 hrs  
 Computed Peak Flow = 3.17 cfs

Time Increment for HYG File = .0200 hrs  
 Peak Time, Interpolated Output = 12.0401 hrs  
 Peak Flow, Interpolated Output = 3.17 cfs  
 =====

DRAINAGE AREA

-----  
 ID:None Selected  
 CN = 80  
 Area = 1.600 acres  
 S = 2.5000 in  
 0.2S = .5000 in

Cumulative Runoff

-----  
 1.6364 in  
 .218 ac-ft

HYG Volume... .218 ac-ft (area under HYG curve)

\*\*\*\*\* UNIT HYDROGRAPH PARAMETERS \*\*\*\*\*

Time Concentration, Tc = .25000 hrs (ID: None Selected)  
 Computational Incr, Tm = .03333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)  
 K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))  
 Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.25 cfs  
 Unit peak time Tp = .16667 hrs  
 Unit receding limb, Tr = .66667 hrs  
 Total unit time, Tb = .83333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm  
 Duration = 24.0000 hrs Rain Depth = 4.5000 in  
 Rain Dir = C:\HAESTAD\PPKW\RAINFALL\  
 Rain File -ID = SCSTYPES.RNF - TypeII 24hr  
 Unit Hyd Type = Default Curvilinear  
 HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
 HYG File - ID = SEALPAK.HYG - DEVELOPED 5y24h  
 Tc = .2500 hrs  
 Drainage Area = 1.600 acres Runoff CN= 80

=====  
 Computational Time Increment = .03333 hrs  
 Computed Peak Time = 12.0333 hrs  
 Computed Peak Flow = 4.80 cfs

Time Increment for HYG File = .0200 hrs  
 Peak Time, Interpolated Output = 12.0401 hrs  
 Peak Flow, Interpolated Output = 4.79 cfs  
 =====

DRAINAGE AREA

-----  
 ID:None Selected  
 CN = 80  
 Area = 1.600 acres  
 S = 2.5000 in  
 0.2S = .5000 in

Cumulative Runoff

-----  
 2.4615 in  
 .328 ac-ft

HYG Volume... .328 ac-ft (area under HYG curve)

\*\*\*\*\* UNIT HYDROGRAPH PARAMETERS \*\*\*\*\*

Time Concentration, Tc = .25000 hrs (ID: None Selected)  
 Computational Incr, Tm = .03333 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)  
 K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))  
 Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.25 cfs  
 Unit peak time Tp = .16667 hrs  
 Unit receding limb, Tr = .66667 hrs  
 Total unit time, Tb = .83333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm  
 Duration = 24.0000 hrs Rain Depth = 7.9000 in  
 Rain Dir = C:\HAESTAD\PPKW\RAINFALL\  
 Rain File -ID = SCSTYPES.RNF - TypeII 24hr  
 Unit Hyd Type = Default Curvilinear  
 HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
 HYG File - ID = SEALPAK.HYG - DEVELOPED 100y24  
 Tc = .2500 hrs  
 Drainage Area = 1.600 acres Runoff CN= 80

=====  
 Computational Time Increment = .03333 hrs  
 Computed Peak Time = 12.0333 hrs  
 Computed Peak Flow = 10.60 cfs

Time Increment for HYG File = .0200 hrs  
 Peak Time, Interpolated Output = 12.0401 hrs  
 Peak Flow, Interpolated Output = 10.55 cfs  
 =====

DRAINAGE AREA

-----  
 ID:None Selected  
 CN = 80  
 Area = 1.600 acres  
 S = 2.5000 in  
 0.2S = .5000 in

Cumulative Runoff

-----  
 5.5313 in  
 .738 ac-ft

HYG Volume... .737 ac-ft (area under HYG curve)

\*\*\*\*\* UNIT HYDROGRAPH PARAMETERS \*\*\*\*\*

Time Concentration, Tc = .25000 hrs (ID: None Selected)  
 Computational Incr, Tm = .03333 hrs = 0.20000 Tp  
 Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)  
 K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))  
 Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)  
 Unit peak, qp = 7.25 cfs  
 Unit peak time Tp = .16667 hrs  
 Unit receding limb, Tr = .66667 hrs  
 Total unit time, Tb = .83333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm  
 Duration = 24.0000 hrs Rain Depth = 5.3000 in  
 Rain Dir = C:\HAESTAD\PPKW\RAINFALL\  
 Rain File -ID = SCSTYPES.RNF - TypeII 24hr  
 Unit Hyd Type = Default Curvilinear  
 HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
 HYG File - ID = SEALPAK.HYG - DEVELOPED 10y24h  
 Tc = .2500 hrs  
 Drainage Area = 1.600 acres Runoff CN= 80

=====  
 Computational Time Increment = .03333 hrs  
 Computed Peak Time = 12.0333 hrs  
 Computed Peak Flow = 6.14 cfs

Time Increment for HYG File = .0200 hrs  
 Peak Time, Interpolated Output = 12.0401 hrs  
 Peak Flow, Interpolated Output = 6.12 cfs  
 =====

DRAINAGE AREA

-----  
 ID:None Selected  
 CN = 80  
 Area = 1.600 acres  
 S = 2.5000 in  
 0.2S = .5000 in

Cumulative Runoff

-----  
 3.1562 in  
 .421 ac-ft

HYG Volume... .421 ac-ft (area under HYG curve)

\*\*\*\*\* UNIT HYDROGRAPH PARAMETERS \*\*\*\*\*

Time Concentration, Tc = .25000 hrs (ID: None Selected)  
 Computational Incr, Tm = .03333 hrs = 0.20000 Tp  
 Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)  
 K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))  
 Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)  
 Unit peak, qp = 7.25 cfs  
 Unit peak time Tp = .16667 hrs  
 Unit receding limb, Tr = .66667 hrs  
 Total unit time, Tb = .83333 hrs

File.... F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\SEALPAK\_DETAINED.PPW

| Elevation<br>(ft) | Planimeter<br>(sq.in) | Area<br>(acres) | A1+A2+sqr(A1*A2)<br>(acres) | Volume<br>(ac-ft) | Volume Sum<br>(ac-ft) |
|-------------------|-----------------------|-----------------|-----------------------------|-------------------|-----------------------|
| 135.00            | -----                 | .3000           | .0000                       | .000              | .000                  |
| 137.00            | -----                 | .3000           | .9000                       | .600              | .600                  |

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

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 135.00 ft  
Increment = .20 ft  
Max. Elev.= 137.00 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  |
|------------------------------------------|-----|---------|---------|---------|
| Weir-Rectangular<br>TW SETUP, DS Channel | WR  | ---> TW | 135.000 | 137.000 |

OUTLET STRUCTURE INPUT DATA

Structure ID = WR  
Structure Type = Weir-Rectangular  
-----  
# of Openings = 1  
Crest Elev. = 135.00 ft  
Weir Length = 5.00 ft  
Weir Coeff. = 2.600000  
  
Weir TW effects (Use adjustment equation)

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

File.... F:\HYDRO\PROJECTS\SEALPAK\PONDPACK\SEALPAK\_DETAINED.PPW

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = WR (Weir-Rectangular)

Upstream ID = (Pond Water Surface)

DNstream ID = TW (Pond Outfall)

| WS Elev, Device Q |          | Tail Water    |                   | Notes                         |
|-------------------|----------|---------------|-------------------|-------------------------------|
| WS Elev.<br>ft    | Q<br>cfs | TW Elev<br>ft | Converge<br>+/-ft | Computation Messages          |
| 135.00            | .00      | Free Outfall  |                   | H=.00; Htw=.00; Qfree=.00;    |
| 135.20            | 1.16     | Free Outfall  |                   | H=.20; Htw=.00; Qfree=1.16;   |
| 135.40            | 3.29     | Free Outfall  |                   | H=.40; Htw=.00; Qfree=3.29;   |
| 135.60            | 6.04     | Free Outfall  |                   | H=.60; Htw=.00; Qfree=6.04;   |
| 135.80            | 9.30     | Free Outfall  |                   | H=.80; Htw=.00; Qfree=9.30;   |
| 136.00            | 13.00    | Free Outfall  |                   | H=1.00; Htw=.00; Qfree=13.00; |
| 136.20            | 17.09    | Free Outfall  |                   | H=1.20; Htw=.00; Qfree=17.09; |
| 136.40            | 21.53    | Free Outfall  |                   | H=1.40; Htw=.00; Qfree=21.53; |
| 136.60            | 26.31    | Free Outfall  |                   | H=1.60; Htw=.00; Qfree=26.31; |
| 136.80            | 31.39    | Free Outfall  |                   | H=1.80; Htw=.00; Qfree=31.39; |
| 137.00            | 36.77    | Free Outfall  |                   | H=2.00; Htw=.00; Qfree=36.77; |

Type.... Composite Rating Curve  
Name.... WEIR

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File.... F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\SEALPAK\_DETAINED.PPW

\*\*\*\*\* COMPOSITE OUTFLOW SUMMARY \*\*\*\*\*

| WS Elev, Total Q |          | Converge      |                | Notes                   |
|------------------|----------|---------------|----------------|-------------------------|
| Elev.<br>ft      | Q<br>cfs | TW Elev<br>ft | Error<br>+/-ft | Contributing Structures |
| 135.00           | .00      | Free Outfall  |                | WR                      |
| 135.20           | 1.16     | Free Outfall  |                | WR                      |
| 135.40           | 3.29     | Free Outfall  |                | WR                      |
| 135.60           | 6.04     | Free Outfall  |                | WR                      |
| 135.80           | 9.30     | Free Outfall  |                | WR                      |
| 136.00           | 13.00    | Free Outfall  |                | WR                      |
| 136.20           | 17.09    | Free Outfall  |                | WR                      |
| 136.40           | 21.53    | Free Outfall  |                | WR                      |
| 136.60           | 26.31    | Free Outfall  |                | WR                      |
| 136.80           | 31.39    | Free Outfall  |                | WR                      |
| 137.00           | 36.77    | Free Outfall  |                | WR                      |

Type.... Pond Routing Summary

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Name.... POND OUT Tag: 2y24h

Event: 2 yr

File.... F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\SEALPAK\_DETAINED.PPW

Storm... TypeII 24hr Tag: 2y24h

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
Inflow HYG file = SEALPAKP.HYG - POND IN 2y24h  
Outflow HYG file = SEALPAKP.HYG - POND OUT 2y24h

Pond Node Data = POND  
Pond Volume Data = POND  
Pond Outlet Data = WEIR

No Infiltration

INITIAL CONDITIONS

-----  
Starting WS Elev = 135.00 ft  
Starting Volume = .000 ac-ft  
Starting Outflow = .00 cfs  
Starting Infiltr. = .00 cfs  
Starting Total Qout = .00 cfs  
Time Increment = .0200 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

=====  
Peak Inflow = 3.17 cfs at 12.0400 hrs  
Peak Outflow = 1.32 cfs at 12.2400 hrs  
-----  
Peak Elevation = 135.21 ft  
Peak Storage = .064 ac-ft  
=====

MASS BALANCE (ac-ft)

-----  
+ Initial Vol = .000  
+ HYG Vol IN = .218  
- Infiltration = .000  
- HYG Vol OUT = .218  
- Retained Vol = .000  
-----  
Unrouted Vol = -.000 ac-ft (.001% of Inflow Volume)

Type... Pond Routing Summary  
 Name... POND OUT Tag: 5y24h  
 File... F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\SEALPAK\_DETAINED.PPW  
 Storm... TypeII 24hr Tag: 5y24h

Page 6.02  
 Event: 5 yr

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
 Inflow HYG file = SEALPAK.HYG - POND IN 5y24h  
 Outflow HYG file = SEALPAK.HYG - POND OUT 5y24h

Pond Node Data = POND  
 Pond Volume Data = POND  
 Pond Outlet Data = WEIR

No Infiltration

INITIAL CONDITIONS

-----  
 Starting WS Elev = 135.00 ft  
 Starting Volume = .000 ac-ft  
 Starting Outflow = .00 cfs  
 Starting Infiltr. = .00 cfs  
 Starting Total Qout = .00 cfs  
 Time Increment = .0200 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

=====  
 Peak Inflow = 4.79 cfs at 12.0400 hrs  
 Peak Outflow = 2.35 cfs at 12.2200 hrs  
 -----  
 Peak Elevation = 135.31 ft  
 Peak Storage = .093 ac-ft  
 =====

MASS BALANCE (ac-ft)

-----  
 + Initial Vol = .000  
 + HYG Vol IN = .328  
 - Infiltration = .000  
 - HYG Vol OUT = .328  
 - Retained Vol = .000  
 -----  
 Unrouted Vol = -.000 ac-ft (.001% of Inflow Volume)

Type.... Pond Routing Summary  
Name.... POND           OUT   Tag: 100y24  
File.... F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\SEALPAK\_DETAINED.PPW  
Storm... TypeII 24hr   Tag: 100y24

LEVEL POOL ROUTING SUMMARY

HYG Dir           = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
Inflow HYG file = SEALPAKP.HYG - POND           IN 100y24  
Outflow HYG file = SEALPAKP.HYG - POND           OUT 100y24

Pond Node   Data = POND  
Pond Volume Data = POND  
Pond Outlet Data = WEIR

No Infiltration

INITIAL CONDITIONS

-----  
Starting WS Elev   =   135.00 ft  
Starting Volume    =   .000 ac-ft  
Starting Outflow   =   .00 cfs  
Starting Infiltr.  =   .00 cfs  
Starting Total Qout=   .00 cfs  
Time Increment    =   .0200 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

=====  
Peak Inflow       =   10.55 cfs    at   12.0400 hrs  
Peak Outflow      =   6.40 cfs     at   12.1800 hrs  
-----  
Peak Elevation    =   135.62 ft  
Peak Storage      =   .187 ac-ft  
=====

MASS BALANCE (ac-ft)

-----  
+ Initial Vol    =   .000  
+ HYG Vol IN     =   .737  
- Infiltration   =   .000  
- HYG Vol OUT    =   .737  
- Retained Vol   =   .000  
-----  
Unrouted Vol    =   .000 ac-ft   (.000% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\HYDRO\PROJECTS\SEALPAK\PONDPAK\  
Inflow HYG file = SEALPAK.HYG - POND IN 10y24h  
Outflow HYG file = SEALPAK.HYG - POND OUT 10y24h

Pond Node Data = POND  
Pond Volume Data = POND  
Pond Outlet Data = WEIR

No Infiltration

INITIAL CONDITIONS

-----  
Starting WS Elev = 135.00 ft  
Starting Volume = .000 ac-ft  
Starting Outflow = .00 cfs  
Starting Infiltr. = .00 cfs  
Starting Total Qout= .00 cfs  
Time Increment = .0200 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

=====  
Peak Inflow = 6.12 cfs at 12.0400 hrs  
Peak Outflow = 3.17 cfs at 12.2000 hrs  
-----

Peak Elevation = 135.39 ft  
Peak Storage = .117 ac-ft  
=====

MASS BALANCE (ac-ft)

-----  
+ Initial Vol = .000  
+ HYG Vol IN = .421  
- Infiltration = .000  
- HYG Vol OUT = .421  
- Retained Vol = .000  
-----

Unrouted Vol = .000 ac-ft (.000% of Inflow Volume)

Index of Starting Page Numbers for ID Names

----- D -----  
DEVELOPED 2y24h... 3.01, 3.02, 3.03,  
3.04

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----- P -----  
POND... 4.01, 6.01, 6.02, 6.03,  
6.04

----- S -----  
Sedgwick24... 2.01

----- W -----  
Watershed... 1.01  
WEIR... 5.01, 5.03, 5.04