VOLUME VIII
VAN VLISSINGEN PRAIRIE HYDROLOGIC ANALYSIS

CALUMET AREA HYDROLOGIC MASTER PLAN (HMP)

PROJECT SITE:

VAN VLISSINGEN PRAIRIE
CITY OF CHICAGO, COOK COUNTY, ILLINOIS

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1.0 INTRODUCTION

V3 Companies of Illinois, Ltd. (V3) was retained by the City of Chicago Department of Environment (CDOE) to provide professional engineering and scientific services to further evaluate hydrologic conditions at Van Vlissingen Prairie / Marian R. Byrnes Natural Area (Van Vlissingen Prairie, the "Site"). The objective of the expanded hydrologic evaluation was to develop a better understanding of the Site's hydrology in support of on-going natural area site planning at Van Vlissingen Prairie. In particular, the evaluation sought to answer two basic questions:

1) what are the driving influences on site hydrology, and
2) what is the nature of typical hydroperiods that may be expected within specific management sub-units at the Site?

This report presents the findings of this evaluation, and includes surface water and groundwater monitoring and estimates for typical hydroperiods within three management sub-units. The report also discusses an assessment of the Jewel Pond's influence on site hydrology and a discussion of the surface and groundwater interactions (*Jewel Pond is a constructed naturalized detention basin that was built to mitigate for impacted wetlands resulting from the construction of the Jewel grocery store located North of the Site*) Lastly, the report provides options that might be explored to optimize hydrologic conditions in support of the biologic and ecological goals for Site. The study is divided into three zones, which represent ecological sub-management units. These units include the North Reservoir (North Marsh), the Central Zone (Central Wet Marsh) and the South Reservoir (South Marsh).

The basic activities performed as part of this hydrologic evaluation include the following:

- A preliminary groundwater and surface water evaluation of site conditions was conducted following the installation of three monitoring wells and two auto-recording staff gages on February 10, 2005. The monitoring locations are provided on Figure 1.

- Groundwater levels were recorded monthly; this report includes 12 sampling events. The monitoring wells and staff gages, plus four existing PVC stickups, were surveyed into the project datum (NAVD 88; NAD 83) (Figure 1, Table 1). The automatic staff gages were equipped with In-Situ Mini-troll (30 psi) pressure transducers that record water levels every fifteen minutes for one year.

- Groundwater mapping was prepared using Surfer software. A depiction of the Site's water table for May 2005 is provided in Figure 2.

- Percussion sediment and soil cores were advanced at the Site to assist understanding groundwater/surface water interactions, and to determine the influence the Jewel Pond basin has on site hydrology. The cores were collected on February 7, 2005 in the Jewel Pond (2 cores), the northern reservoir (2 cores) and the southern reservoir (1 core). Additionally, soil probing was conducted at two (2) locations on the slopes of Jewel Pond. The locations are identified in Figure 2; boring logs are located in Appendix 1.

- Continuous simulation surface water modeling was completed using XP-SWMM. The XP-SWMM model was calibrated and developed using actual site observations, and included the consideration of groundwater influences. The reference hydroperiods developed from the SWMM model are provided in Appendix 2.

The results of this study conclude that groundwater has significant influence on hydroperiods throughout the site. Surface water is also a significant component of the water budget, which is driven by on-site precipitation, evapotranspiration and infiltration. Extreme dry conditions plagued the monitoring period (February 2005-February 2006) of this study, which created approximately four months of drought within the marsh water bodies. Modeled hydroperiods during an average precipitation year indicated that both the North and South marshes undergo seasonal drought conditions during the summer months. These drought conditions are due to low precipitation conditions which lower the water table and cease surface water input to the site. It was also determined that the Jewel Pond detention basin construction significantly lowered the water table east of the North Marsh. V3 believes that this expedites water loss from the North Reservoir.

2.0 STUDY AREA

Van Vlissingen Prairie is a 138 acre site located north of the Lake Calumet watershed; it contains a 59 acre wetland unit that drains approximately 83 acres. Its location is bounded by 96^{th} street to the north, and Van Vlissingen Road alleyway to the east (Figures 1 and 2). Topography is relatively flat with depressional areas located along the west portion of the site.

3.0 SURFICIAL GEOLOGY AND GROUNDWATER

3.1 Site Geology

The following paragraphs briefly discuss surficial geology and groundwater behavior at the Site.

Field Data

The surficial geology and groundwater characteristics of the Site are derived from soil boring data collected during well installations and percussion coring (V3 February 2005), soil boring data compiled from the Phase II report completed by Versar (2004), and the respective water levels of three V3 installed wells and four PVC stickups installed by Versar. Relative to the nature of the data, it must be noted that PVC stickups #2, #3, and #4 (Figure 1) do not accurately portray groundwater levels on most occasions. This is suggested because PVC stickups located within the central zone interact with perched surface water during inundation periods, while MW-02 (also located within the central zone) recorded deeper water levels separate from the surface water. These spurious readings reflect an influence from surface water levels and improper well construction for the purpose of this investigation.

The three monitoring wells installed by V3 were installed to a depth between 10 and 10.5 feet, with a five feet screened interval, surrounded by #5 sand. Above the sand, a thick seal of bentonite was placed within the well annulus to minimize surface water influence during saturated conditions. The potential for surface water influence is of greatest concern at well MW-02. See Appendix 1 for well boring data.

Site Strata

Site stratigraphy is impacted by human activity (fills and excavations) that significantly influence the behavior of shallow groundwater at the Site. The lowermost stratigraphic unit encountered during site investigations is a layer of sand that is generally continuous, and thickens towards the south. This sand unit, a native glacio-lacustrine and aoelian (lake deposited and wind deposited) sequence of the Equality Formation, can be initially encountered between 5 and 8' below ground surface.

Overlying the Equality Formation sand, sandy loam and sandy clay loam sequence, is a unit of organic sandy loam or silt loam that represents a period of soil development following the retreat of the high energy environment (moving/flowing water). This unit is discontinuous throughout the site due to human modifications, but has been found as thick as five feet at locations in the northern portion of the Site.

Above this unit and/or in place of its removal lies fill composed of green and white coarse sand sized slag, brick/concrete fill and compacted sands from construction activities. The fill ranges from 2 feet to 5 feet in thickness throughout the Site. The location of the green/white slag is typically limited to the western portions of the Site. Overlying these fills are the silt and clay products from recent soil development.

Figure 4, which illustrates a vertically exaggerated cross section of the North Reservoir and Jewel Pond area, provides a representative depiction of site strata. This cross-section utilizes surface topography from the V3 survey, geologic data from six soil borings, two soil probes and four percussion cores (V3; Versar). Water level data is interpreted from site conditions on May 11, 2005.

3.2 Groundwater Monitoring and Results

The shallow sand aquifer was monitored at the Site monthly for a one year period. Three monitoring wells were installed (Figure 1) and one existing PVC stickup well provided additional groundwater information. The remaining PVC stickups provided groundwater information during drier periods, however, the well construction was poor which promoted significant surface water influence and therefore provide a poor indication of groundwater conditions. Groundwater flow contour modeling was conducted using Surfer software. Utilizing the monitoring data, contour results and site stratigraphy/topography V3 hydrogeologists were able to decipher and portray subsurface conditions. Table 1 provides the groundwater data collected and Table 3 shows groundwater elevation statistics. Figure 5 plots groundwater elevations alongside local precipitation data in addition to ground surface elevations at each well location. Lastly, Figure 6 represents average groundwater conditions at both the North and South portions of the Site.

3.3 Groundwater Behavior and Fluctuations

SITE SUMMARY

The shallow water bearing unit of interest at the Site is located within the Equality Formation sand layer. This is the water bearing unit that produces a water table within the overlying materials and influences Site hydrology. Under the conditions observed during this evaluation, groundwater flow throughout the site is transitional in nature (Figure 2 maps the water table from early May 2005 data). VVP functions as a groundwater recharge and discharge area with low horizontal groundwater gradients, as a result, different patterns of groundwater flow occur throughout the year. A single groundwater flow map (Figure 2) does not interpret consistent conditions. Fills and excavations (including Jewel Pond) influence the localized groundwater flow patterns and water table elevations. Table A provides correlation between monitoring locations to illustrate the relationship between monitoring locations. The lack of correlations indicates an aquifer that is not uniformly behaving, and has many local processes that affect the water elevations. The most significant horizontal groundwater flow gradients occur around Jewel pond (Figure 2) and south of the South Reservoir (Figure 2). On-Site groundwater flow trends generally occur towards the north, and at the South Reservoir groundwater flows towards the south. During saturated periods, the reservoirs and the central zone recharge the groundwater creating an elevated groundwater table mound.

The groundwater levels on-site have been measured as shallow as the ground surface to as deep as 7.13 feet below the ground surface during the one year monitoring period (Table 3). Groundwater beneath the site is generally very shallow and fluctuated up to 7 feet (MW-03) , and averaged around 3 feet of fluctuation. The extreme fluctuations in groundwater may be partly attributed to fractured and porous subsurface slag conditions. The minimum elevation reached was 577 feet at MW-03 during September of 2005, although it is likely that on-site groundwater elevations rarely dipped below 580 feet msl. This observation is provided because MW-03 is located significantly south of the water bodies (Figure 1). The highest groundwater elevation recorded during the one year monitoring period was 584.91 feet at MW-02, this elevation was 0.1 feet above the ground surface (Table 1 & 3), this condition occurred within the central zone under recharging conditions. Figure 5 graphically portrays groundwater elevations throughout the year and Figure 6 shows average groundwater elevations at the North and South portions of the site.

The behavior of groundwater as it relates to site surface water, and the influence of the Jewel Pond is discussed further in subsequent sections.

North Reservoir (Northern Marsh)

The North Reservoir groundwater is best represented by MW-01 and PVC-1. PVC-2 provides additional groundwater information during drier periods. During wet periods, PVC-2 is influenced by surface water and provides inaccurate interpretation of groundwater conditions. Figure 5 illustrates the groundwater ranges from each well in relation to the surface topography. Figure 2 and Figure 4 show that the groundwater gradient increases significantly and unnaturally between the North Reservoir and Jewel Pond, section 6 details the process that occurs. The North Marsh is likely fed by groundwater from the northwest, influenced by the higher topography and point of inflection from the slope. During wet conditions, the Central Zone acts as a groundwater recharge area and this zone likely contributes to localized subsurface flow into the North Reservoir. During wet periods and higher water tables, the groundwater table inhibits infiltration/seepage from the North Reservoir into the aquifer; this allows the Reservoir to withhold more of the surface water that it collects. However, the sustained lowered water table at MW-01 due to the Jewel Pond drawdown effect encourages infiltration/seepage through the east side of the reservoir and into the Jewel Pond basin and deeper groundwater (Figure 4).

During drier periods the groundwater table is lowered which encourages a significant amount of infiltration and seepage from the reservoir into the groundwater, which then flows east towards the Jewel Pond basin.

Central Zone (Central Wet Prairie)

The central zone groundwater is generally represented by MW-02 and PVC-03 (Table 1, Figure 1). These units fluctuated up to 3 feet, and MW-02 was as deep as 2.8 feet below ground surface to as shallow as 0.1 feet below the ground surface (Tables 1 and 3). During wet periods, surface water collects in depressional areas of the central zone and recharges the groundwater which creates a local scale elevated groundwater mound that flows in the shallow subsurface towards the North and South Reservoirs. Figure 5 illustrates the groundwater ranges beneath the Central Zone. The groundwater flow in the northern area of the central zone is drawn towards the Jewel Pond due to its drawdown effect (Figure 2). High water tables in the central zone also inhibit the infiltration/seepage rate from surface water into the groundwater (Figure 5). Low infiltration rates combined with the cemented basin bottom material encourages the sustained hydroperiods that occur in this zone.

During drier periods, the groundwater table lowers substantially (Figure 5). This is because the recharge volume is lower or absent and the seasonal groundwater fluctuations are naturally lower. To a certain extent, the northern central zone water elevations may be slightly lower due to the Jewel Pond influence described in Section 6.

South Reservoir (South Marsh)

The South Reservoir groundwater is best represented by MW-02, PVC 3, PVC 4 and MW-03. PVC-3 and PVC-4 provide reasonable groundwater information during drier periods. Figure 5 illustrates the groundwater ranges from each well in relation to the surface topography. Figure 2 shows that the groundwater flow radiates away from the South Reservoir and is likely fed by groundwater flow from the west during high water table conditions. During wet conditions, the Central Zone acts as a groundwater recharge area and this zone likely contributes to localized subsurface flow towards towards the north, east and south (Figure 2). During wet periods and higher water tables, the groundwater table inhibits infiltration/seepage from the North Reservoir into the aquifer; this allows the Reservoir to withhold more of the surface water that it collects.
During drier periods the groundwater table is lowered which encourages a significant amount of infiltration and seepage from the reservoir into the groundwater, which then flows east towards the Jewel Pond basin.

Table A: Van Vlissingen Prairie Groundwater and Surface Water Correlation Table (February 2005 thru February 2006)

	MW-01	*MW-02*	*MW-03*	*PVC-1*	*ASG 11*	*ASG 12*	*PVC-2*	*PVC-3*	*PVC-4*
MW-01	1								
MW-02	0.46	1.00							
MW-03	**0.90**	0.24	1.00						
PVC-1	0.80	0.32	**0.87**	1.00					
ASG 11	**0.80**	0.28	**0.92**	**0.97**	1.00				
ASG 12	0.69	0.26	**0.86**	**0.89**	**0.94**	1.00			
PVC-2	0.63	0.57	0.57	**0.80**	**0.81**	**0.83**	1.00		
PVC-3	0.28	0.46	0.31	0.65	0.60	0.39	**0.89**	1.00	
PVC-4	0.74	0.63	0.70	**0.84**	**0.87**	**0.96**	**0.95**	**0.86**	1.00

Note: PVC 2, PVC 3 and PVC 4 portray a groundwater representation; however surface water influence to these wells is significant during wet periods, and likely results in poor indication of groundwater conditions.

4.0 SURFACE WATER

4.1 Site Hydrology

The primary surface water features of interest relative to the Van Vlissingen Prairie study area include:

- Central Wet Prairie (Central Zone). This is a management sub-unit and area of periodically stored water within depressional areas of the west central portion of the Site.

- Southern Marsh (South Reservoir). This is a management sub-unit and depressional area within the southwest quadrant of the Site.

- Northern Marsh (North Reservoir). This is a management sub-unit and depressional area within the northwest quadrant of the Site.

- Jewel Pond (sub-area of Northern Prairie Buffer Unit). This is a constructed stormwater basin associated with commercial development to the north, and is located at the northeast corner of the Site. This feature's significance includes the influence it exerts on site hydrology.

SURFACE WATER BEHAVIOR

From the standpoint of surface water and storm runoff, the Site can be divided into two distinct hydrologic areas, as shown on Figure 3 and briefly described below.

- The east half of the Site drains overland to an alleyway adjoining the Site's eastern boundary, and ultimately to the City of Chicago sewer system. This eastern half of the Site collects approximately 40% of the Site's storm runoff. This runoff is lost from the Site and unavailable to feed on-site wetlands.

- The west half of the property drains to a series of on-site depressional areas (Northern and Southern Marshes, and Central Wet Prairie) separated by shallow ridges. A field investigation determined there are no surface water outlets present within the depressional areas; therefore, stormwater release from these areas of the Site is governed by evapo-transpiration, overflow into adjacent land (Jewel Pond), and infiltration and groundwater flow.

During periods of inundation within the western portions of the Site, surface water that is stored within depressional areas tends to drain from south to north through successive basins until discharging (subsurface) into the Jewel Pond. Flow between the depressional areas occurs within the subsurface under hydraulic gradients driven by the head difference (surface water gradient) between basins. Under extreme inundation, the southern basins overtop and flow overland to the north. Overflow of surface water into the Jewel Pond will occur only under high inudation conditions, when water elevations exceed 585.25 feet in the North Reservoir. Monitoring data introduced in section 4.2 suggest that this elevation was nearly reached during the one-year monitoring period, indicating that excessive precipitation periods may result in overland discharge into the Jewel pond basin (Figure 6).

Under desirable hydrology conditions at Van Vlissingen Prairie, the North Reservoir would have water elevations of 584.7' or higher. The South Reservoir would have water elevations of 585.5 feet or higher. Hydrologic modeling and a one year of water level monitoring was conducted to assess the feasibility of these conditions. Section 4.2 details these elevations further.

The surface water analysis and hydrologic modeling presented in this report generally focuses on the west half of the Site (Western Wetland Unit and Northern Prairie Buffer Unit, V3 2004), and specifically attempts to develop annual hydroperiods for three management sub-units (depressional areas, or basins): Northern and Southern Marshes, and Central Wet Prairie. The hydrologic modeling, which takes into consideration the effects of infiltration and groundwater interaction and includes developed hydroperiods, is discussed in the following paragraphs.

HYDROLOGIC MODELING

V3 utilized XP-SWMM to model and evaluate hydrology at the Site. XP-SWMM is an implementation of the Environmental Protection Agency's Stormwater Management Model, which was chosen for this study based on the model's ability to perform a continuous event simulation, and its ability to account for groundwater influences. Estimated hydrologic parameters, such as basin areas and infiltration rates, were input in the model for each of the study basins (North Reservoir, Central Zone, and South Reservoir). The model was then calibrated using a 2004 rainfall data set and surface water measurements recorded by V3 during early 2005. After calibration, the model was run with an average year rainfall data set to estimate seasonal surface water fluctuations.[1] The resulting "reference" hydroperiods for the North Reservoir, Central Zone, and South Reservoir are included in Appendix 2.

It is important to note the modeled hydroperiods most accurately display the anticipated range of water levels throughout an average precipitation year. The hydroperiods should be used only as a reference to derive average annual water elevations, maximums, minimums and average seasonal water levels. Developing water elevation predictions for any period of greater detail than a season is not within the confidence level of the model.

North Reservoir (Northern Marsh)

An infiltration curve was utilized to model the effects of the hydrogeologic/hydraulic processes that were identified in this study. This curve approached the seasonal fluctuations of infiltration rates as a function of seasonal groundwater table fluctuations. Evapotranspiration was incorporated into the model as the secondary driver of reservoir discharge. Calibration was approached using field observations from V3 surveyors, scientists and engineers involved with the site. Additionally, the staff gage upload data from 2005 was utilized in the calibration.

The modeled average annual hydroperiod (Appendix 2) provides an accurate range of water levels expected during an average precipitation year. The relative normal water level during an average year fluctuates around 585 feet (NAVD 88).

Central Zone (Central Wet Prairie)

This hydrologic study identified the central zone water levels as driven by surface water processes and low infiltration. As a result, evapotranspiration was incorporated into the model as the primary driver of central zone discharge (water loss). Evapotranspiration

[1] Rainfall data was obtained from NOAA for this purpose. V3 performed a statistical analysis on the available rainfall data sets and determined that the 1973 data set was the closest match to the average annual and quarterly rainfall depths for the City of Chicago.

rates were adjusted to represent seasonal fluctuations. An infiltration curve based on seasonal water table fluctuations was also incorporated into this modeling but with less weight than evapotranspiration. Calibration was approached using field observations from V3 staff and 2005 hydrologic monitoring data interpreted from this study.

Appendix 2 shows the modeled average annual hydroperiod to be flashy, indicating the shallow nature of the zone and its high evapotranspiration rates. The model shows that the water level is only consistent throughout the winter and spring months, then transitions between being inundated and completely dry throughout the rest of the year (as a function of precipitation events).

South Reservoir (Southern Marsh)

Both infiltration and evapotranspiration were identified as drivers relative to surface water discharge. The model incorporated an infiltration curve based on seasonal groundwater table fluctuations. Evapotranspiration rates were also utilized and accounted for seasonal fluctuations. Calibration was approached using field observations from V3 staff and 2005 hydrologic monitoring data interpreted from this study.

Appendix 2 shows the modeled average annual hydroperiod, its behavior illustrating characteristics of both the Central Zone and the North Reservoir. The relative normal water level of an average year fluctuates around 586 feet (NAVD) or 7.1 feet (Chicago City Datum). Importantly, this reservoir also experiences summer drought during an average annual precipitation year.

Extreme hydrologic scenarios were not modeled. However, it is anticipated that extreme drought years will completely dry out all zones on the Site, including the North Reservoir, for periods extending four months. This condition was experienced from late June through October 2005. During extreme wet periods, the North Reservoir will be inundated to a maximum elevation of 6.3 +/- Chicago City Datum (585.25 +/- NAVD 88), where the surface water would drain directly into the Jewel Pond basin and into the city sewer system. Under these conditions, the surface water gradient would flow to the north.

4.2 Surface Water Level Monitoring and Results

In order to supplement the initial hydrology investigation and modeling, two automatic recording staff gages were installed at the Site in February 2005. ASG -11, located in the North Marsh, provides the water elevations that are most important for the largest water body on the site. ASG-12 provides water levels of the South Marsh (Figure 1); the idea of these gages is to provide seasonal inundation periods for these marsh systems. Water elevations were recorded every 15 minutes for a one year period starting in February 2005 and ending February 2006. The data that resulted from this monitoring was an “extreme” drought year and is useful in understanding site behavior during extreme low conditions. Figure 6 graphically illustrates the water elevations from each gage and table 2 shows statistics regarding each gage for the period of record. The two staff gages produced data that is correlative (Table A). This suggests that similar hydrologic processes influence the water levels of both systems.

Figure 6 shows that both reservoirs (marshes) behaved very similarly throughout the monitoring period, ASG 12 (South Reservoir) is always approximately 1 foot higher in elevation than the North Reservoir. Precipitation data from the ISWS Calumet area rain gage network (Gage 18) is provided in Figure 6. It is evident that the South Reservoir is more responsive to precipitation events due to its smaller size. It takes more volume and cumulative rainfall frequency to create this effect in the North Reservoir. Following precipitation events it can take anywhere from one to three weeks for the water bodies to rebound to pre-storm elevations. The overall seasonal trend of the water elevations is attributed to the groundwater table and its seasonal variations.

ASG 11 (North Reservoir) fluctuated 1.17 feet during the one year monitoring period and reached a maximum elevation of 585.25 (just reaching the overflow elevation into the Jewel pond basin) (Table 2). The mean elevation at ASG 11 over the monitoring period was 584.59 feet and the mode was 584.22 feet (nearly dry conditions). ASG 12 (South Reservoir) fluctuated 1.26 feet during the monitoring period and reached a maximum elevation of 586.11 feet (Table 2), under these conditions there was likely a hydraulic connection between the central zone and the South Reservoir, which flowed towards the north. The mean water elevation at ASG 12 was 585.35 feet and its mode was 584.95 feet.

Desired Hydrologic Conditions

As discussed in section 4.1, desired surface water elevations in the North Marsh would be above 584.7 feet. During the one year, 365 day record of surface water elevations at the North Marsh, the water elevation was above 584.7 feet for 5.5 months. These conditions occurred from December through the end of May. This statistic is discouraging, however, the drought conditions of 2005 created extremely prolonged periods of low water levels at the Prairie during the monitoring period.

The South Marsh's desired water elevation is 585.5 feet. During the one year, 365 day record of surface water elevations, the water was above 585.5 feet for approximately 5 months. These conditions occurred from December to May. Due to the drought conditions, prolonged periods of absolute drought plagued the South Marsh.

Desired water elevations in the central zone occur at elevations slightly higher than desirable in the North Marsh. Optimal conditions in the central zone can be expected to occur for similar time frames as the North and South Marshes.

Ideal Hydrologic Conditions of North Reservoir (looking North) May 2005, 584.9 feet water elevation.

Ideal Hydrologic Conditions of South Reservoir (looking South) May 2005, 585.8 feet water elevation.

5.0 SURFACE WATER AND GROUNDWATER INTERACTION

Figures 5 and 6 illustrate observed trends in groundwater and surface water elevations across the Site over the one year monitoring period. The hydrologic modeling results and available site data provide some general insights into the interaction between groundwater and surface water at the Site. These insights are the subject of the following discussion.

The XP-SWMM output and plotted hydroperiods (Appendix 2) and the surface water data collected from the two reservoirs (Figure 6, Table 1) indicate, when inundated, the South Reservoir surface water elevation remains approximately one foot higher than the North Reservoir water surface. The head gradient between these systems drives shallow subsurface flow towards the north. As will be discussed later, it seems reasonable to assume that this gradient was less significant prior to Jewel Pond construction. The Jewel pond basin construction (Section 6) has created a groundwater sink in the north which encourages groundwater, and by extension Site surface waters, to migrate towards the North Reservoir and ultimately the Jewel pond. The following paragraphs discuss the three management sub-units of interest for this study.

North Reservoir (Northern Marsh)

The hydraulic connection between the North Reservoir (Northern Marsh) and local groundwater appears significant. While the native Equality Formation sands do not directly intersect the reservoir basin itself, the unconsolidated fill (sandy slag etc.) provides a medium that allows a connection between the water table and reservoir. During wet periods (winter-spring) local groundwater feeds the reservoir and a concurrent loss of water to seepage occurs into the Jewel Pond basin (Figure 4). When the groundwater table reaches a certain elevation height around the marsh (Figure 6) it can be expected for the water table to significantly impede the volume of water lost from the surface to the groundwater. However, during drier periods when the groundwater table falls below a certain elevation (Figure 6), the reservoir can expect a significant volume loss of water to infiltration/seepage.

The North Reservoir does capture surface water runoff from precipitation and snow-melt events and this factor is a very important part of maintaining water levels in the reservoir. However, during drier periods the lowering water levels of the North Reservoir are a reflection of a lowering water table and a lack of surface water recharge. Under extended dry periods the water table likely falls below the basin bottom and the North Reservoir dries out. These processes are evident in the one year monitoring period and modeling simulation (Figure 6, Appendix 2).

The results of percussion coring conducted by V3 indicate the North Reservoir bottom consists of organic muck and areas containing heavily cemented materials. These cemented materials decrease infiltration rates from the pond, attenuate the overall connection between surface water and groundwater. As a result, some storage exists in this reservoir, maintaining periods where surface water levels are higher than the groundwater (semi-perched).

Central Zone (Central Wet Prairie)

Depressional areas within the Central Zone of the Site (Central Wet Prairie) are "semi-perched" systems that become inundated when they capture runoff from storm water or snow melt. This central zone is consistently matted with impermeable cemented material which slows and prolongs groundwater recharge and allows for inundation periods in excess of a month following precipitation or snow-melt events. It appears the water within these depressional areas is lost primarily to evapotranspiration and infiltration. During annual periods of heavy inundation, surface waters from the Central Zone can be fed by the South Reservoir and overtop and connect to the North Reservoir through small corridors (localized topographic lows). Appendix 2 and Figure 6 illustrate modeled and actual hydroperiods which graphically depicts the processes described above. Groundwater elevations are shallowest and highest within this zone, indicating the recharge processes. Groundwater monitored below the Central Zone rose above the elevations of some low-lying areas of this zone indicating that groundwater does contribute to water elevations in this zone.

Much like the groundwater influence in the North and South Reservoirs, when the groundwater table reaches a certain elevation height in the Central Zone (Figure 6) it can be expected for the water table to significantly impede the volume of water lost from the surface to the groundwater. However, during drier periods when the groundwater table falls below a certain elevation (Figure 6), the central zone can expect a significant water volume loss to infiltration/seepage.

South Reservoir (South Marsh)

The South Reservoir water levels were always slightly higher than adjacent groundwater elevations throughout the monitoring period. Additionally, the South Reservoir basin bottom material is similar to the Central Zone consisting of semi-permeable cemented material (Appendix 1). Figures 5 and 6 shows the similarity of trends in water elevations between the North and South Reservoirs indicating that the South Reservoir behaves very similarly to the North Reservoir. The South Reservoir is characteristic to both the Central Zone and the North Reservoir as a "semi-perched" system that stores surface water runoff and slowly loses water by infiltration and evapotranspiration. When water tables are high the groundwater can feed the reservoir and infiltration rates are lowered, increasing the length of the hydroperiods in this reservoir. When water tables are low the infiltration rates are higher and hydroperiods become shorter. During periods of inundation, surface water hydraulic head promotes shallow subsurface and surface flow towards the north. Figure 6 illustrates the monitored groundwater and surface water elevations of the South Reservoir area, and it is evident of the groundwater and surface water influence on hydroperiods.

6.0 INFLUENCE OF JEWEL POND

Figure 4 depicts the influence that the Jewel Pond has on the water table within its vicinity. Approximately five years ago, the Jewel Pond was constructed at the northeast edge of the Site to collect stormwater from commercial development to the north. The pond's outlet and normal water levels were set well below the Site's water table (approx. 5 feet using May 2005 elevations). Additionally, the Jewel Pond outlet elevation is approximately 6.5 feet below the water level of the North Reservoir (May 2005 elevations).

Two 4 foot, percussion cores and three soil probe borings (Appendix 1) were advanced in and around the Jewel Pond to help investigate the pond's influence on site hydrology. While the results of this coring indicate that the Jewel Pond bottom is lined with clay, data from soil borings and the groundwater monitoring at MW-01 (located southwest of the pond) indicate the southwest and western slopes of the basin contain only a very thin silty clay loam layer (up to 10 inches) that has been structured by *phragmites australis* roots. This root penetration through the thin clay liner has increased its permeability and decreased its function as an impermeable hydraulic barrier.

V3's evaluation indicates the sandy slag found in the subsurface has a relatively high hydraulic conductivity, surrounds the southwest and western borders of the Jewel Pond, and extends to the western Site boundary. It is likely the sandy slag and nominal clay liner around the Jewel Pond provides a reasonably strong hydraulic connection with the North Reservoir and the local groundwater table. The lowering surface water levels within the reservoir would be further attributed to the longer term lowering of the water table in that area due to the Jewel Pond's presence as a sink for groundwater.

During site visits in March and April of 2005, V3 observed groundwater seeping through these slopes. MW-01, adjacent to the Jewel Pond, consistently has a groundwater level that intersects the slopes of the basin. Sampling events indicate that MW-01 has the lowest groundwater elevations on the Site (Table 1). Further, soil mottles and reduction characteristics observed while advancing the soil boring at MW-01 indicate the recorded groundwater levels at this location appear abnormally lower than historic water levels. From the available data and site observations, it's clear the Jewel Pond plays a role in lowering the local water table in and around the North Reservoir. These effects can be seen in Figures 2, 4 and 5.

In summary, the North Reservoir water levels are lowered as a result of loss to groundwater and the Jewel Pond. Further, the resulting gradient (head difference) encourages shallow subsurface flow towards the north which promotes a drawing of surface water from the central perched zones and ultimately the South Reservoir during saturated conditions. Thus, the Jewel Pond exerts an influence on all three primary areas of surface water storage at the Site.

7.0 OPTIONS FOR IMPROVING SITE HYDROLOGY

It has been determined that the Site's water budget is limited and inundation elevations on the Site cannot be controlled with an outlet control structure. The Site's seasonal surface water levels are a function of groundwater and on-site hydrology. Therefore, the options for increasing and maintaining water levels are outlined below.

1) Excavate and deepen desired zones to optimal groundwater elevations. We provide a one year record of "extreme" drought conditions, this is valuable in that extreme lows are already known and excavation grades can be planned to optimize hydrologic conditions. Groundwater fluctuates a maximum of 3 feet around the marsh areas. This option would also benefit from the creation of an outlet control structure to further control the surface water elevations. This option will increase the connection between reservoir water and groundwater and will likely maintain hydrology on-site year round. Excavation activity should coordinate with environmental "hotspots" that need to be excavated. This option should also incorporate option 2.

2) Re-claim former groundwater levels in the northern portion of the Site. This may be accomplished by re-lining the southwest and west slopes of the Jewel Pond with a very thick and low hydraulic conductivity soil, geo-synthetic clay liner or grouting. It is believed that groundwater levels around the North Reservoir will be increased, but never to the pre-Jewel Pond water table elevations. This solution will decrease groundwater drawdown on-site and increase the duration of hydroperiods in and around the North Reservoir. This solution will assist in maintaining water levels in the North Reservoir during drought periods.

3) Increase drainage area (increase surface water entering the Site). This would increase the amount of water entering the reservoirs. The supplemental water would provide increased inundation and storage, and decrease the duration of drying periods on-site. Options include:

    - Collect stormwater runoff that currently drains to the east, accomplished by constructing a water quality basin that stores the stormwater and makes it available for pumping back to the western portions of the Site. Water quality would have to be assessed, but this source of runoff would likely be of better quality than storm water diverted from impervious sources.

    - Divert stormwater from off-site. This would require an additional feasibility study to assess sources and water quality.

4) Site planning option: Reduce evaporative potential when developing restoration plans for the Site. Field observations indicate the reservoirs are susceptible to notable wind fetch. Wind drastically increases evaporation, and any additional wetland enhancement or creation should consider reducing this effect by developing corridor type reservoirs rather than open water.

5) Consider the addition of organic or mineral soil as substrate in the Central Zone and South Reservoir. Currently these perched zones on the Site are bottomed with cemented slag and concrete, materials that store heat collected during the day which increases evaporation and increases water temperature (this has biotic influences as well).

GLOSSARY

Automatic Staff Gage (ASG) : Apparatus installed to collect sufrace water elevations of water bodies at 15 minute intervals.

Anoxic : Water that contains little to no dissolved oxygen.

Conveyance Capacity : The maximum amount of water that can be transported downstream by a pipe or channel.

Discharge : The rate of water flowing out of a site.

Dredging : Process of removing sediment accumulation from lake and river bottoms.

Equality Formation : Tongues of glacial lake deposits that consist of silts, clays and sands.

Evapotranspiration : Proportion of waterbudget that is returned to the air through evaporation and transpiration (plant uptake).

Glacio-fluvial : Sediment or lithified sequence deposited from meltwater streams flowing from or within glaciers.

Glacio-lacustrine : Sediment or lithified sequence deposited within a glacial lake.

Gradient : Slope of a surface, generally pertaining to groundwater surfaces in these texts.

Headwater : The depth of water at the upstream end of a control structure or pipe.

HEC-RAS : Hydraulic Engineering Center – River Analysis System. A computation program widely used for developing water surface profiles for streams and ditches.

Hummock : Micro-topographic mounds that usually form from soil consolidation and poor surface water drainage.

Hydraulics : The determination of water surface elevations through relationships of flow and physical geography.

Hydrology : The determination of stormwater runoff rates and volumes for a study area based on rainfall data and physical geography.

Hydroperiod : A simulated or measured time duration of water elevations.

Infiltration : The downward movement of water through pores or small openings in soil or rock.

Inudation : Standing surface water.

Manual Staff Gage (MSG) : Apparatus installed within surface water body to visually observe surface water elevations (observations conducted once per month).

*All words are not necessarily referred to in text.

Mottles : Soil discolorations usually caused by chemical interactions between water and chemicals/minerals within the soil.

Orifice : A control structure ; a small opening, usually in a metal plate or wall, used to restrict the amount of water discharging from a site.

Permeability : The capacity of rock or sediment for transmitting fluid flow under unequal pressure.

Piezometer : A well installed into the ground that penetrates an underground water bearing unit – in which the groundwater elevation can be monitored along with its associated head.

Reduction : The removal of oxygen from soil or water.

Slag : Iron and steel manufacturing by-product. Waste material resulting from the impurities of mineral ore and ash from coke.

Stage-Discharge Rating Curve : A curve illustrating discharge rates for water leaving a site at given stages or elevations.

Seep : A location where groundwater discharges to the surface.

Stop Logs : Removable planks used to block water from leaving a site. The top stop log will set the normal pool level for a basin.

Stormwater Control Structure : A device, usually an orifice or a weir, used to regulate water discharge from a site.

Stratigraphy : The arrangement of rock and or soil types in chronologic order of sequence.

Submerged : Located entirely underwater.

Tailwater : The depth of water at the downstream end of a control structure or pipe.

Watershed : The area the drains to a similar point location or water body.

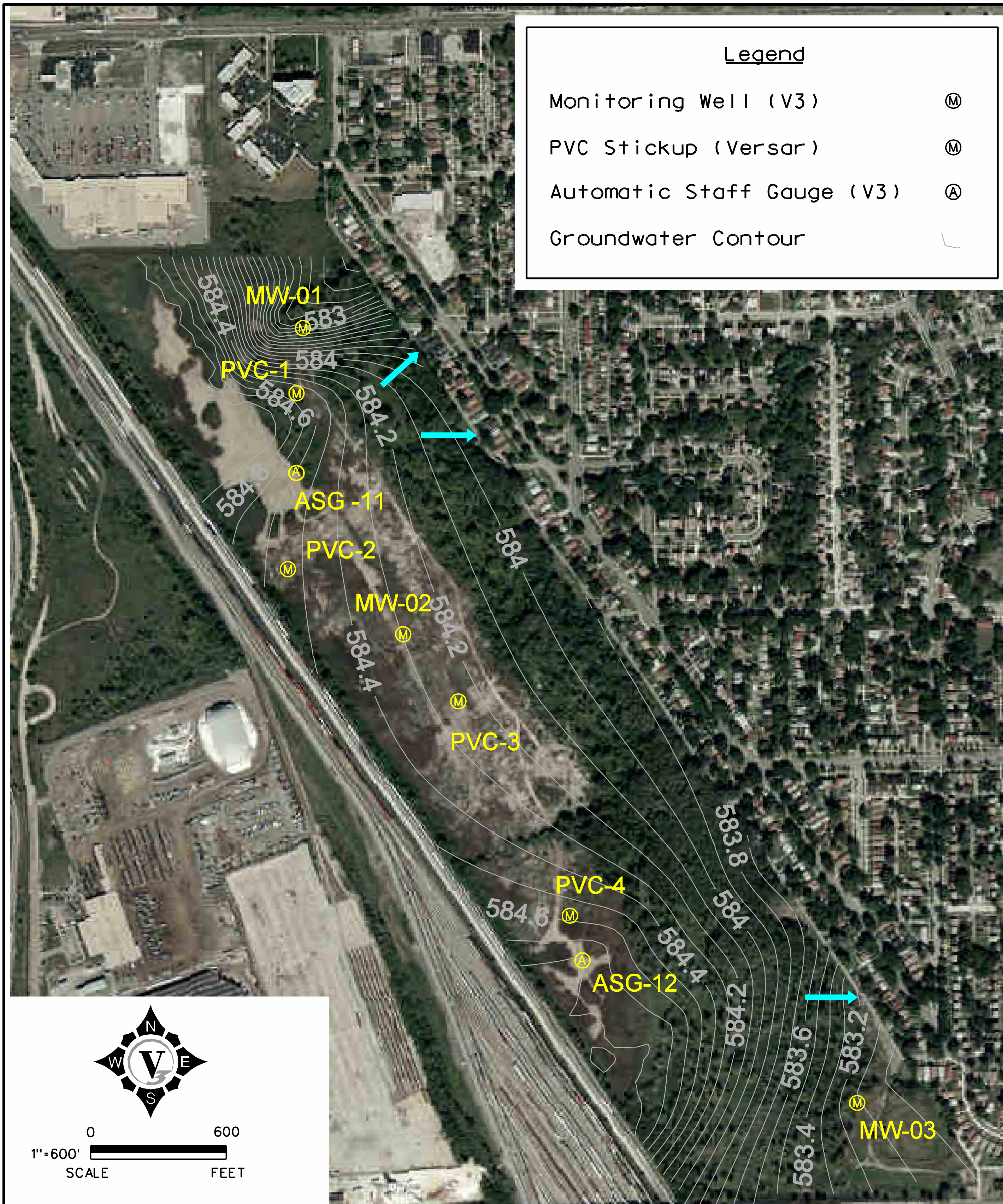
Weir : A control structure that prevents discharge from a site until the headwater exceeds the overflow elevation.

*All words are not necessarily referred to in text.

FIGURES

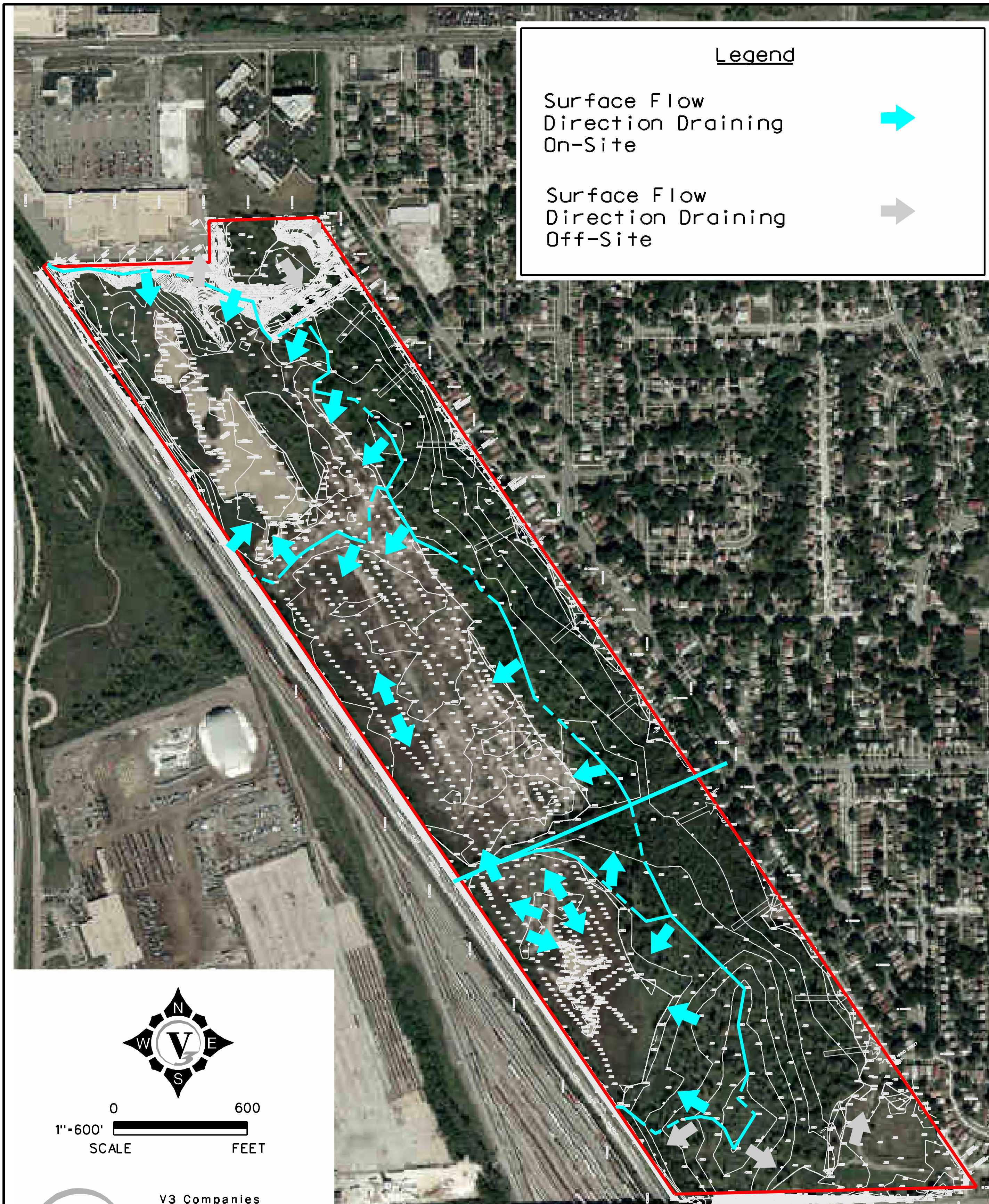
V3 Companies
7325 Janes Avenue
Woodridge, IL 60517
630.724.9200 phone
630.724.9202 fax
www.v3co.com

TITLE: **Site Data Collection Locations**	PROJECT: **Van Vlissingen Prairie Hydrologic Analysis**		
BASE LAYER: 2002 Aerial	PROJECT NO. 98216HMP.VVP	EXHIBIT: 1	SHEET 1 OF 1
CLIENT: City of Chicago Department of Environment 30 North LaSalle Street, 25th Floor Chicago, IL 60602	CREATED BY: JKA	DATE: September 2005	SCALE: 1" = 600'



V3 Companies
7325 Janes Avenue
Woodridge, IL 60517
630.724.9200 phone
630.724.9202 fax
www.v3co.com

Figure 2: Groundwater Contour (05-11-05) and Well / ASG Location Map

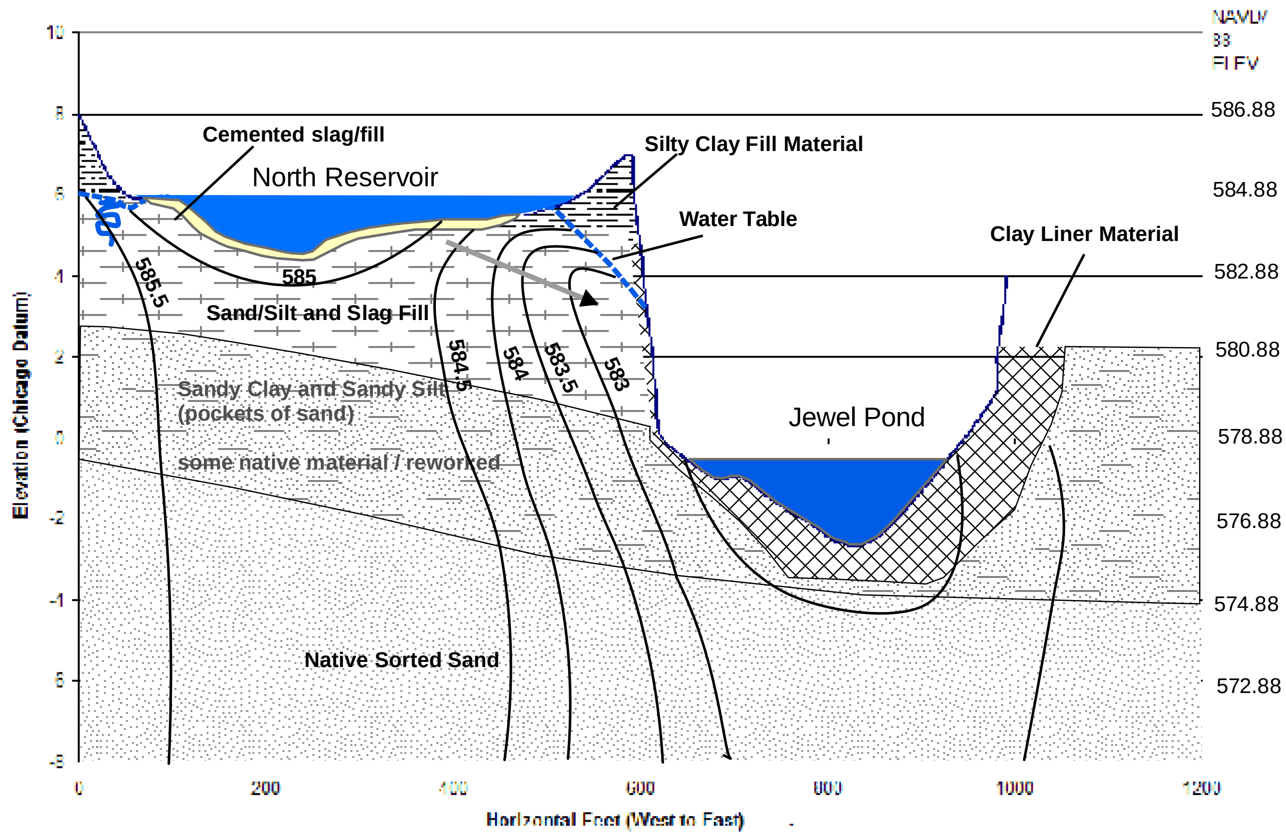


V3 Companies
7325 Janes Avenue
Woodridge, IL 60517
630.724.9200 phone
630.724.9202 fax
www.v3co.com

Figure 3: Existing Drainage Boundaries

E:\1998\98216\98216HMP.VVP\Drawings\Mstn\wshdbndyexh04057.dgn 3/30/2006 3:57:03 PM

...\Mstn\wshdbndyexh04057.dgn 3/30/2006 3:57:00 PM



NOTES

Geologic and subsurface interpretations are generalized and based upon boring logs (V3; Versar). Water elevation data is from May 11, 2005.

Subsurface groundwater flow conditions are based on interpretations from the monitoring well data and professional interpretation from V3 Hydrogeologists.

Line of equal hydraulic potential (ft)

V3 Companies
120 N. LaSalle St,
Suite 1550
Chicago, IL 60602
312.419.1985 phone
312.419.1986 fax
www.v3co.com

TITLE: **West to East Cross Section with Hydrogeologic Conditions**
North Reservoir and Jewel Pond
May 11, 2005

PROJECT AND SITE LOCATION: **Van Vlissingen Prairie Hydrologic Analysis**

BASE LAYER: NA	PROJECT NO.: 98216hmp.vvp	FIGURE: **4**	SHEET: 1 OF: 1
CLIENT: **Chicago Department of Environment, 30 N. LaSalle, 25th Floor, Chicago, Illinois 60602**	QUADRANGLE: NA	DATE: August 2005	SCALE: Vert. Exag

Figure 5: Van Vlissingen Prairie Groundwater Elevations 02/05 - 02/06

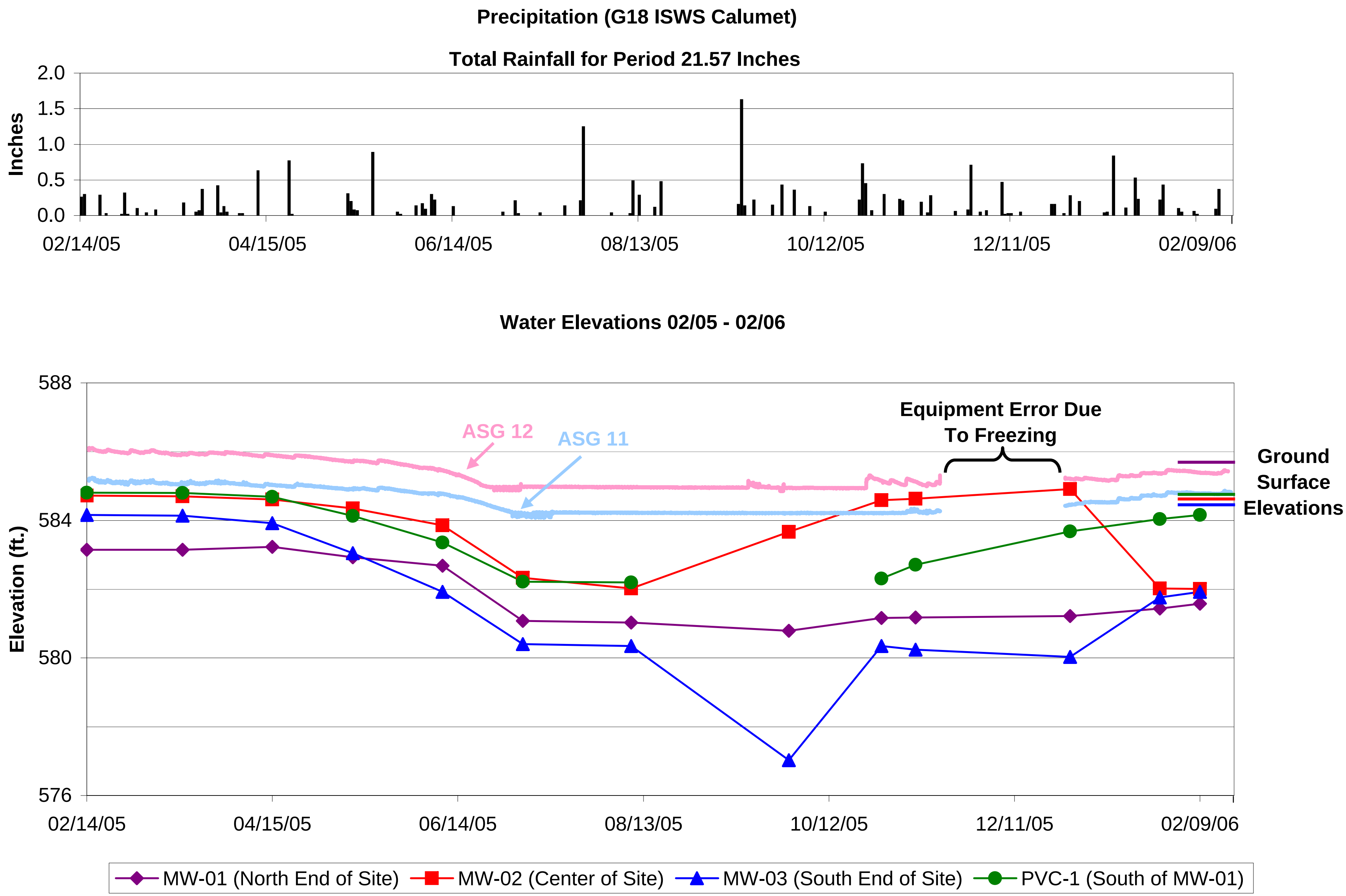
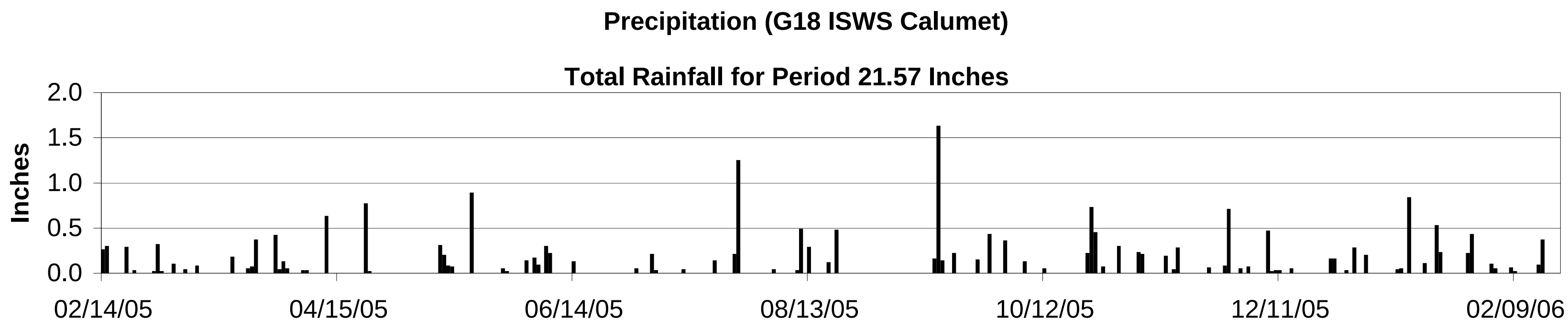
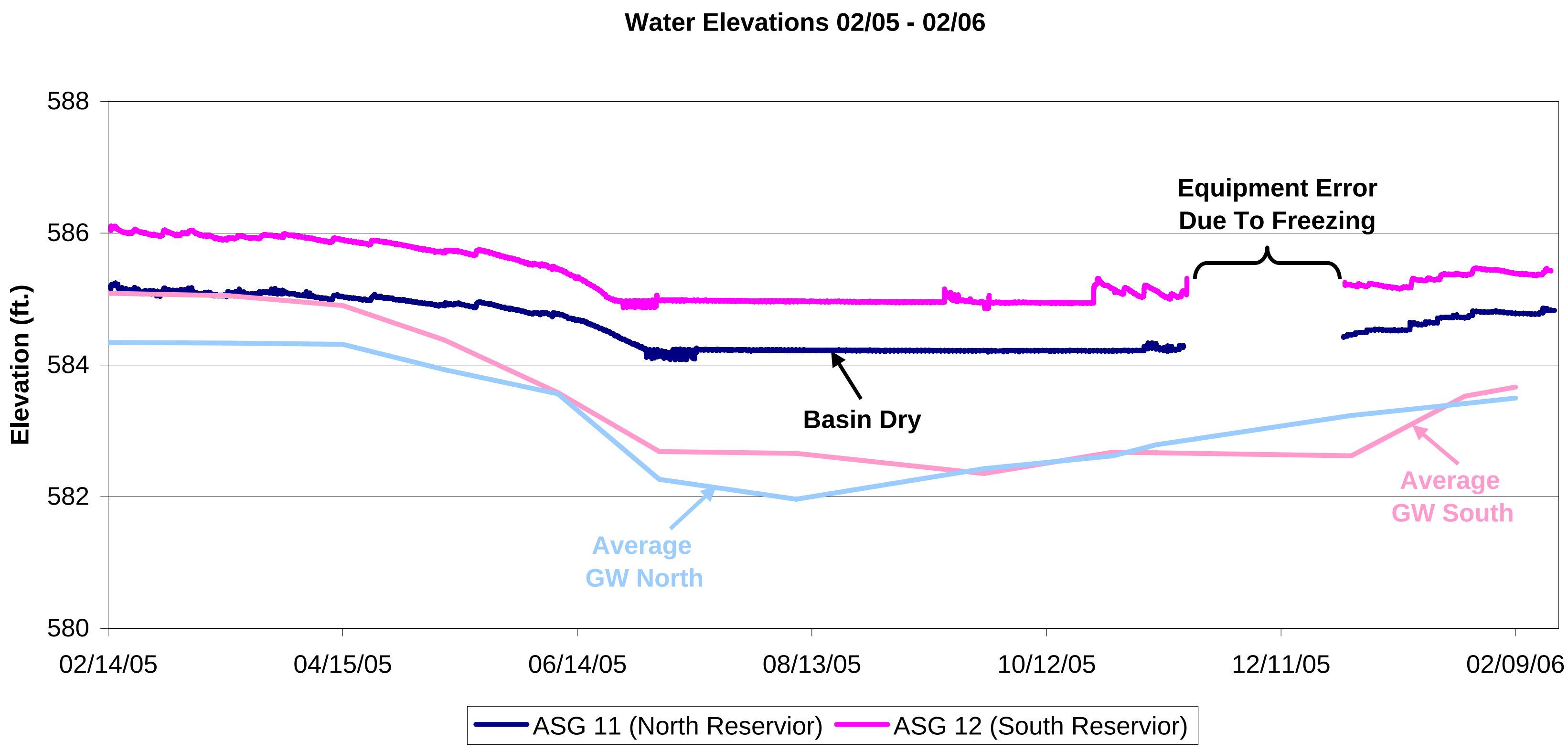


Figure 6: Van Vlissingen Prairie Surface Water Elevations 02/05 - 02/06





TABLES

Table 1
Van Vlissingen Prairie
Surface Water and Groundwater Levels
February 2005-February 2006

					14-Feb-05		17-Mar-05		15-Apr-05		11-May-05		9-Jun-05		5-Jul-05	
	Well	Location	Ground Elevation at Well (ft. msl)	TOC Elevation (ft. msl)	Depth to Water (ft.)	Water Elevation (ft. msl)	Depth to Water (ft.)	Water Elevation (ft. msl)	Depth to Water (ft.)	Water Elevation (ft. msl)	Depth to Water (ft.)	Water Elevation (ft. msl)	Depth to Water (ft.)	Water Elevation (ft. msl)	Depth to Water (ft.)	Water Elevation (ft. msl)
Shallow Groundwater System	MW-01	North End of Site	585.81	588.88	5.73	583.15	5.73	583.15	5.65	583.23	5.95	582.93	6.2	582.68	7.8	581.08
	MW-02	Center of Site	584.81	588.01	3.29	584.72	3.31	584.70	3.40	584.61	3.66	584.35	4.15	583.86	5.68	582.33
	MW-03	South End of Site	584.61	586.77	2.61	584.16	2.63	584.14	2.85	583.92	3.72	583.05	4.85	581.92	6.37	580.40
	PVC 1	Just south of MW-01	584.83	589.61	4.8	584.81	4.81	584.80	4.92	584.69	5.48	584.13	6.25	583.36	7.39	582.22
Surface Water System	ASG11	North Reservoir	583.66	589.85	4.7	585.15	4.83	585.02	4.83	585.02	4.92	584.93	5.44	584.41	5.82	584.03
	ASG 12	South Reservoir	584.60	590.16	4.125	586.04	4.24	585.92	4.27	585.89	4.42	585.74	5.23	584.93	DRY	<584
PVC Stickups	PVC 2	South of North Reservoir	584.61	589.27	4.21	585.06	4.23	585.04	4.25	585.02	4.55	584.72	4.62	584.65	5.78	583.49
	PVC 3	South of MW-02	584.90	589.13	NA	NA	4.21	584.92	4.71	584.42	4.87	584.26	5.5	583.63	6.49	582.64
	PVC 4	North of South Reservoir	585.28	589.58	3.77	585.81	3.79	585.79	3.80	585.78	3.86	585.72	4.80	584.78	6.42	583.16

	9-Aug-05		29-Sep-05		29-Oct-05		9-Nov-05		29-Dec-05		27-Jan-06		9-Feb-06		20-Mar-06	
Well	Depth to Water (ft.)	Water Elevation (ft. msl)	Depth to Water (ft.)	Water Elevation (ft. msl)	Depth to Water (ft.)	Water Elevation (ft. msl)	Depth to Water (ft.)	Water Elevation (ft. msl)	Depth to Water (ft.)	Water Elevation (ft. msl)	Depth to Water (ft.)	Water Elevation (ft. msl)	Depth to Water (ft.)	Water Elevation (ft. msl)	Depth to Water (ft.)	Water Elevation (ft. msl)
MW-01	7.85	581.03	8.09	580.79	7.72	581.16	7.7	581.18	7.66	581.22	7.44	581.44	7.3	581.58	7.24	581.64
MW-02	5.99	582.02	4.34	583.67	3.42	584.59	3.38	584.63	3.1	584.91	5.99	582.02	6	582.01	NA	NA
MW-03	6.42	580.35	9.74	577.03	6.42	580.35	6.53	580.24	6.74	580.03	5.01	581.76	4.85	581.92	3.98	582.79
PVC 1	7.41	582.20	NA	NA	7.3	582.31	6.9	582.71	5.93	583.68	5.57	584.04	5.45	584.16	5.15	584.46
ASG11	DRY	<584	DRY	<584	DRY	<584	5.65	584.20	5.45	584.40	5.12	584.73	5.1	584.75	4.92	584.93
ASG 12	DRY	<584.5	DRY	<584.5	DRY	<584.5	5.00	585.16	4.95	585.21	4.79	585.37	4.70	585.46	4.56	585.60
PVC 2	6.62	582.65	5.21	584.06	4.88	584.39	4.8	584.47	4.47	584.80	4.51	584.76	4.52	584.75		
PVC 3	6.85	582.28	5.19	583.94	4.54	584.59	4.52	584.61	4.4	584.73	4.25	584.88	4.28	584.85	4.24	584.89
PVC 4	6.79	582.79	5.75	583.83	4.77	584.81	4.68	584.90	4.46	585.12	4.56	585.02	4.50	585.08		

Chicago Datum Conversion 578.884 = 0 C.C.D.

Note: PVC 2, PVC 3 and PVC 4 portray a groundwater representation; however surface water influence to these wells is significant during wet periods, and likely results in poor indication of groundwater conditions.

Quick Water Elevation Reference

	2/14/2005	3/17/2005	4/15/2005	5/15/2005	6/9/2005	7/5/2005	8/9/2005	9/29/2005	10/29/2005	11/9/2005	12/29/2005	1/27/2006	2/9/2006	3/20/2006
MW-01	583.15	583.15	583.23	582.93	582.68	581.08	581.03	580.79	581.16	581.18	581.22	581.44	581.58	581.64
MW-02	584.72	584.7	584.61	584.35	583.86	582.33	582.02	583.67	584.59	584.63	584.91	582.02	582.01	NA
MW-03	584.16	584.14	583.92	583.05	581.92	580.4	580.35	577.03	580.35	580.24	580.03	581.76	581.92	582.79
PVC-1	584.81	584.8	584.69	584.13	583.36	582.22	582.2	NA	582.31	582.71	583.68	584.04	584.16	584.46
ASG 11	585.15	585.02	585.02	584.93	584.41	584.03	<584	<584	<584	584.2	584.40	584.73	584.75	584.93
ASG 12	586.035	585.92	585.89	585.74	584.93	<584.5	<584.5	<584.5	<584.5	585.16	585.21	585.37	585.46	585.6
PVC-2	585.06	585.04	585.02	584.72	584.65	583.49	582.65	584.06	584.39	584.47	584.80	584.76	584.75	NA
PVC-3	NA	584.92	584.42	584.26	583.63	582.64	582.28	583.94	584.59	584.61	584.73	584.88	584.85	584.89
PVC-4	585.81	585.79	585.78	585.72	584.78	583.16	582.79	583.83	584.81	584.9	585.12	585.02	585.08	NA

Table 2
Van Vlissingen Prairie - Surface Water Statistics
(02/05 - 02/06)

	ASG 11	ASG 12
	Surface Water Elevation	Surface Water Elevation
Mean	584.59	585.35
Median	584.53	585.22
Mode	584.22	584.95
Standard Deviation	0.36	0.40
Range	1.17	1.26
Minimum	584.08	584.85
Maximum	585.25	586.11
Count	31574.00	31480.00

Statistics for the period 02/05 - 02/06:
Elevation Datum: NAVD 88; NAD 83 (feet)

Table 3
Van Vlissingen Prairie - Groundwater Statistics
(02/05/ - 02/06)

	MW-01		*MW-02*		*MW-03*		*PVC-1*	
	Depth Below Ground	Groundwater Elevation	Depth Below Ground	Groundwater Elevation	Depth Below Ground	Groundwater Elevation	Depth Below Ground	Groundwater Elevation
Mean	3.92	581.89	1.09	583.72	3.13	581.48	1.24	583.59
Median	4.37	581.44	0.46	584.35	2.85	581.76	0.97	583.86
Mode	2.66	583.15	2.79	582.02	2.69	581.92	#N/A	#N/A
Standard Deviation	0.96	0.96	1.18	1.18	2.05	2.05	1.01	1.01
Range	2.44	2.44	2.90	2.90	7.13	7.13	2.61	2.61
Minimum	2.58	580.79	-0.10	582.01	0.45	577.03	0.02	582.20
Maximum	5.02	583.23	2.80	584.91	7.58	584.16	2.63	584.81
Count	13.00	13.00	13.00	13.00	13.00	13.00	12.00	12.00

Statistics for the period 02/05/ - 02/06: Hard Data Shown in Table 1
All values in feet

APPENDIX I:

BORING AND CORING LOGS

PERCUSSION CORE LOG

Van Vlissingen Prairie, Chicago, IL

Core: Core -01
Sheet No: 1 of 1
Project No: 98216HMP.VVP

Date Started:	02/07/05	End:	02/07/05	Logged by:	James Adamson
Total Depth (ft)	3.1	Water Depth (ft)	3.0	Location: East Portion of Jewel Pond Bottom	
		Ice Thickness (ft)	0.3		
		Corer:	JKA		
Core Type:	Percussion 4" PVC	Backfilled with Bentonite		Ground Elev.: NA ft (Approx Elev. from USGS Quad Map)	

Depth (ft)	Elevation (ft)	Sample No	Sampler Type	Sample Interval	Penetrometer	Soil Descriptions	Lithology	Notes and Observations
0.5						Very soft, organic, 10YR 2/1 (black), muck. Common, small to medium rootlets. Very thin (1 mm) sand sequences.		
1	-1.0				1.20	Medium-hard, compact , (dark grayish brown) **Silty clay loam.** High Plasticity/high cohesion		Clay Bottom
1.5								
2	-2.0							
2.5		1	Core					
3	-3.0				NA	Medium, grayish brown sandy clay loam. Abundant gray reduction, wet EOB 3.1'		Residual material from excavation
3.5								
4	-4.0							

PERCUSSION CORE LOG

Van Vlissingen Prairie, Chicago, IL

Core: Core -02
Sheet No: 1 of 1
Project No: 98216HMP.VVP

Date Started: 02/07/05	End: 02/07/05	Logged by: James Adamson	
Total Depth (ft) 2.7	Water Depth (ft) 3.0	Location: West Portion of Jewel Pond Bottom	
	Ice Thickness (ft) 0.3		
	Corer: JKA		
Core Type: Percussion 4" PVC	Backfilled with Bentonite	Ground Elev.: NA ft (Approx Elev. from USGS Quad Map)	

Depth (ft)	Elevation (ft)	Sample No	Sampler Type	Sample Interval	Penetrometer	Soil Descriptions	Lithology	Notes and Observations
0.5					0.25	Very soft, organic, 10YR 2/1 (black), muck. Common, small to medium rootlets. Very thin (1 mm) sand sequences.		
	-1.0							
1								
1.5						Medium-hard, compact , (dark grayish brown) **Silty clay loam.** High cohesion		Clay Bottom
	-2.0							
2		1	Core		3.25			
2.5								
	-3.0							
3						EOB 2.7'		
3.5								
	-4.0							
4								

V3 Companies: Pond Sediment/PERCUSSION CORING DOCUMENTATION: CORE-03 and 04

DATA POINT: Core -03 & 04

PROJECT/SITE Van Vlissingen Prairie

DATE ______02/07/05

Water Depth__2.5 Feet

LOCATION__Core 03- Central Portion of North Reservoir
Core 04- South Central Portion of North Reservoir

Ice Thickness__4”

CORE PROFILE DESCRIPTION:

HORIZON	DEPTH	MATRIX COLOR	TEXTURE	OTHER
O	0-3”	10YR 2/1	Sandy Organic Muck	very sandy
Fill	3-8”	NA	Concrete/Fill--Impenetrable	

ADDITIONAL OBSERVATIONS/OTHER INFORMATION: Wind fetch produces wave action and sandy muck sediment

---

FIELDWORK AND SOIL LOG BY: ______James K. Adamson__________________

V3 Companies: Pond Sediment/PERCUSSION CORING DOCUMENTATION: CORE-05

DATA POINT: Core -05

PROJECT/SITE Van Vlissingen Prairie

DATE ______02/07/05

Water Depth__1.8 Feet

LOCATION__Core 05- Central Portion of South Reservoir

Ice Thickness__3"

CORE PROFILE DESCRIPTION:

HORIZON	DEPTH	MATRIX COLOR	TEXTURE	OTHER
O	0-5"	10YR 2/1	Organic Muck	little to no sand, common rootlets
Fill	5-7"	NA	Coarse Concrete/gravel	
Fill	7"	NA	Impenetrable Concrete/Fill	

ADDITIONAL OBSERVATIONS/OTHER INFORMATION: Dries out during summer months

---

FIELDWORK AND SOIL LOG BY: _______James K. Adamson__________________

SOIL BORING LOG

Van Vlissingen Prairie, Chicago IL

Boring: MW-01	Sheet No: 1 of 1	Project No: 98216HMP.VVP	
Date Started: 02/10/05	Completed: 02/10/05	Logged by: James Adamson	
Total Depth (ft) 11.0	Water Table Depth (ft) -5.73	Location: Northeast of property (sw corner of Jewel Pond)	
Drilling Contr.: R.W. Collins	Driller: Ted S.		
Drill Rig: Diedrich Tractor Mount	Hammer: Direct Push	Ground Elev.: 585.81 ft (Elevation from V3 Survey)	

Depth (ft)	Elevation (ft)	Sample No	Sampler Type	Blows / 6 in.	Penetrometer	Soil Descriptions	Notes and Observations (USCS Classification)
0.5					1.8		Soil Development SC
1	584.8	1	SS	NA			
1.5					NA	Loose, soft, 10YR 5/3 (brown), **sandy clay loam**, moist, 25% sand content.	
2	583.8					Common, small rootlets, few, common, distinct orange mottles--reduction conditions evident.	
2.5					1.5		
3	582.8	2	SS	NA			Groundwater table location
3.5					NA		
4	581.8						
4.5			SS		0.5	Single grain, green (olive, dark green), sand texture; medium to coarse particle sizes. <5% fine grained materials SLAG/FILL DEPOSIT	SW
5	580.8	3		NA			
5.5					NA		
6	579.8						
6.5					NA	Soft, 10YR 2/1 (black) **silt loam**, organic, wet, medium cohesion, non-plastic. Common, faint orange mottles, oxidized root channels	
7	578.8	4	SS	NA			ML
7.5					0.8		
8	577.8					Soft, 10YR 5/2 (grayish brown) **sandy loam**, wet. 15% sand. Non plastic, low cohesion	SM
8.5					NA		
9	576.8	5	SS	NA			
9.5					2.2	Medium, 10YR 5/2 (grayish brown) **sandy clay loam**, wet. 5-10% sand. Medium plasticity, medium cohesion. Common prominent orange mottles and gray reduction. Gets grayer with depth	SC
10	575.8						
10.5		NA	SS	NA	2.5	EOB	
11	574.8						

SOIL BORING LOG

Van Vlissingen Prairie, Chicago IL

Boring: MW-02			
Sheet No: 1 of 1			
Project No: 98216HMP.VVP			
Date Started: 02/10/05	Completed: 02/10/05	Logged by: James Adamson	
Total Depth (ft) 11.0	Water Table Depth (ft) -3.55	Location: Central Portion of Property	
Drilling Contr.: R.W. Collins	Driller: Ted S.		
Drill Rig: Diedrich Tractor Mount	Hammer: Direct Push	Ground Elev.: 584.81 ft (Elevation from V3 Survey)	

Depth (ft)	Elevation (ft)	Sample No	Sampler Type	Sample Interval Recovery	Blows / 6 in.	Penetrometer	Soil Descriptions	Lithology	Well	Notes and Observations (USCS Classification)
							1 " layer of sandy clay loam overlying 4" layer of concrete			
0.5						2.0				
1	583.8	1	SS		NA					
1.5						0.5	Single grain,10YR 3/4 (dark yellowish brown) medium to coarse grained **sand**. Wet and Saturated			SM
2	582.8						<10% fine grained Traces of white slag sand			Sand Fill
2.5						NA				
3	581.8	2	SS		NA					
3.5						NA				
4	580.8									
4.5			SS			0.5	Single grain, white, **sand texture**; medium to coarse particle sizes.			SW
5	579.8	3			NA		SLAG/FILL DEPOSIT			
5.5						NA				
6	578.8						Single grain, green (olive, dark green), sand texture; medium to coarse particle sizes.			
6.5						0.5	<5% fine grained materials SLAG/FILL DEPOSIT			SW
7	577.8	4	SS		NA					
7.5						NA				
8	576.8						Well sorted, single grain 10YR 5/3 (brown) medium **sand**, wet/saturated. 5-10% fines.			SP
8.5						0.5				
9	575.8	5	SS		NA					
9.5						NA				
10	574.8									
10.5		NA	SS		NA	NA				
11	573.8						EOB			

SOIL BORING LOG

Van Vlissingen Prairie, Chicago IL

Boring: MW-03	
Sheet No:	1 of 1
Project No: 98216HMP.VVP	

Date Started: 02/10/05		Completed: 02/10/05		Logged by: James Adamson
Total Depth (ft) 11.0		Water Table Depth (ft) -2.70		Location: South East Corner of Property
Drilling Contr.: R.W. Collins		Driller: Ted S.		
Drill Rig: Diedrich Tractor Mount		Hammer: Direct Push		Ground Elev.: 584.61 ft (Elevation from V3 Survey)

Depth (ft)	Elevation (ft)	Sample No	Sampler Type	Sample Interval Recovery	Blows / 6 in.	Penetrometer	Soil Descriptions	Lithology	Well	Notes and Observations (USCS Classification)
							4 " layer of silty clay loam overlying 8" layer of bricks/gravel			
0.5						1.8	moist			
1	583.6	1	SS		NA					
1.5						NA				ML/SW
2	582.6						Loose, fine to coarse grained sand mixed with gravel.			
							Saturated			
							<15% fine grained			
2.5						0.5	Common brick fragments			
3	581.6	2	SS		NA					
3.5						NA				
4	580.6									
4.5			SS			NA				
5	579.6	3			NA		Soft, 10YR 2/2 (very dark brown) **silt loam**, wet, organic, small rootlets			ML
5.5						1.0	common, prominent orange mottles			
6	578.6						SLAG/FILL DEPOSIT			
6.5						0.8	Soft, 10YR 5/2 (grayish brown) sandy clay loam, wet.			
7	577.6	4	SS		NA		Medium plasticity, medium cohesion. Many, prominent orange mottles and gray reduction.			SC
7.5						0.8				
8	576.6									
8.5						NA				
9	575.6	5	SS		NA					
9.5						0.5	Well sorted, single grain 10YR 4/2 (brown) medium **sand**, wet/saturated. 15% fines.			SM/SP
10	574.6									
10.5		NA	SS		NA	NA				
11	573.6									

SOIL LOG

DATA POINT: Soil Probe -01

PROJECT/SITE Van Vlissingen Prairie

DATE ______02/07/05

LOCATION__SW Slope of Jewel Pond; Mid-Slope

DEPTH TO SATURATED SOIL: 16”

SAMPLING METHOD: Hand Probe

SOIL PROFILE DESCRIPTION:

HORIZON	DEPTH	MATRIX COLOR	TEXTURE	OTHER
Ao/h	0-6”	10YR 2/1	SIL	few, prominent orange mottles, abundant roots, structured soil
Fill	6-9”	10YR 5/3	SiCL	compact; abundant, distinct orange mottles
Fill	9-17”	10YR 5/2	SL	sandy, well disturbed, mixed, saturated, some white/green slag present

ADDITIONAL HYDROLOGIC OBSERVATIONS/OTHER INFORMATION: Seeping evident on slope/phragmites is dominant species

---

FIELDWORK AND SOIL LOG BY: _______James K. Adamson___________________

SOIL LOG

DATA POINT: Soil Probe -02 PROJECT/SITE Van Vlissingen Prairie

DATE ______02/07/05

LOCATION__W Slope of Jewel Pond; Mid-Slope

DEPTH TO SATURATED SOIL: 14”

SAMPLING METHOD: Hand probe

SOIL PROFILE DESCRIPTION:

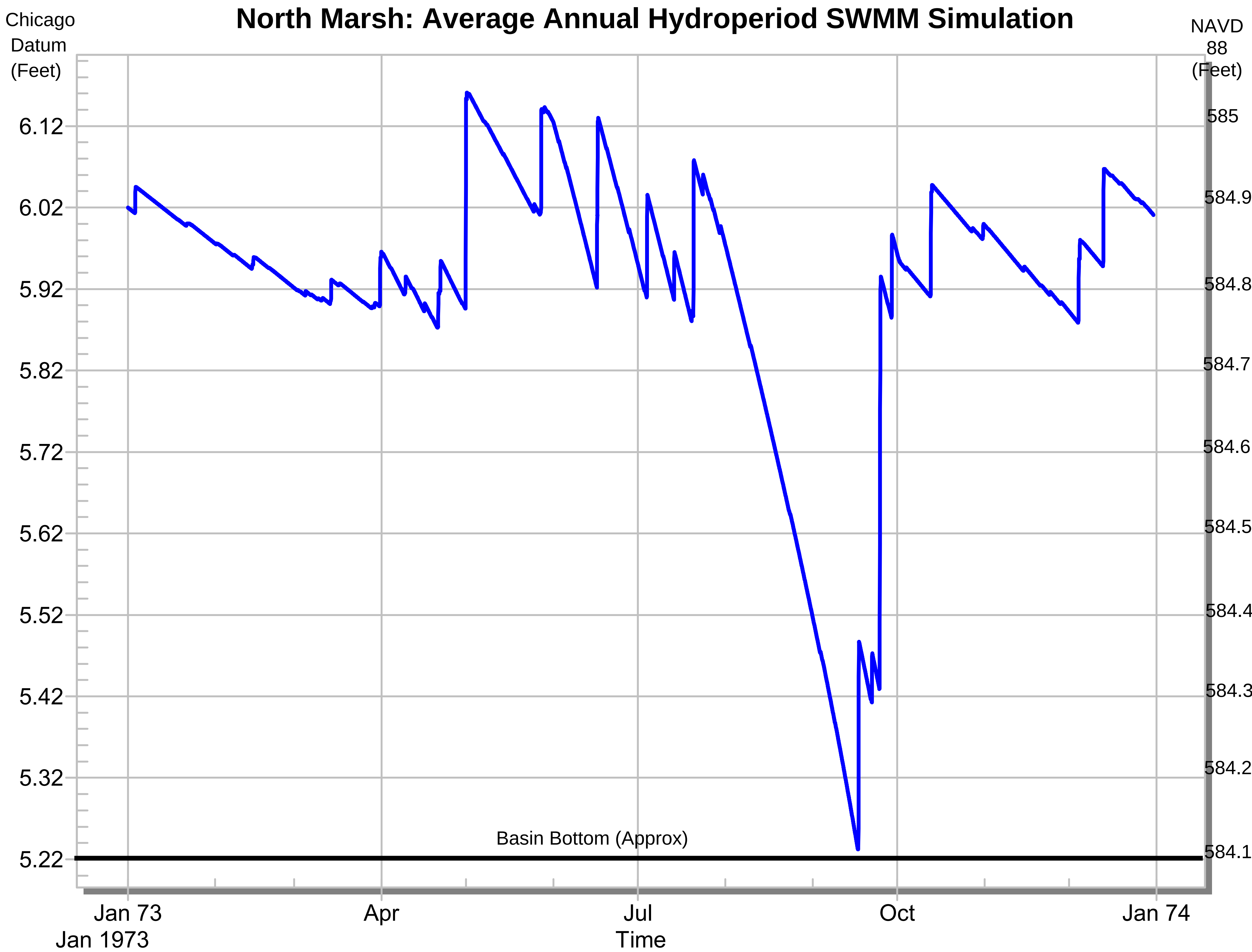
HORIZON	DEPTH	MATRIX COLOR	TEXTURE	OTHER
Ao/h	0-8”	10YR 2/1	SIL	few, prominent orange mottles, abundant roots, organic, structured soil
Fill	8-15”	10YR 5/3	SiCL	compact; abundant, distinct orange mottles, very structured/friable from plant roots
Fill	15-22”	10YR 5/2	SL	sandy, well disturbed, mixed, saturated, some white/green slag present

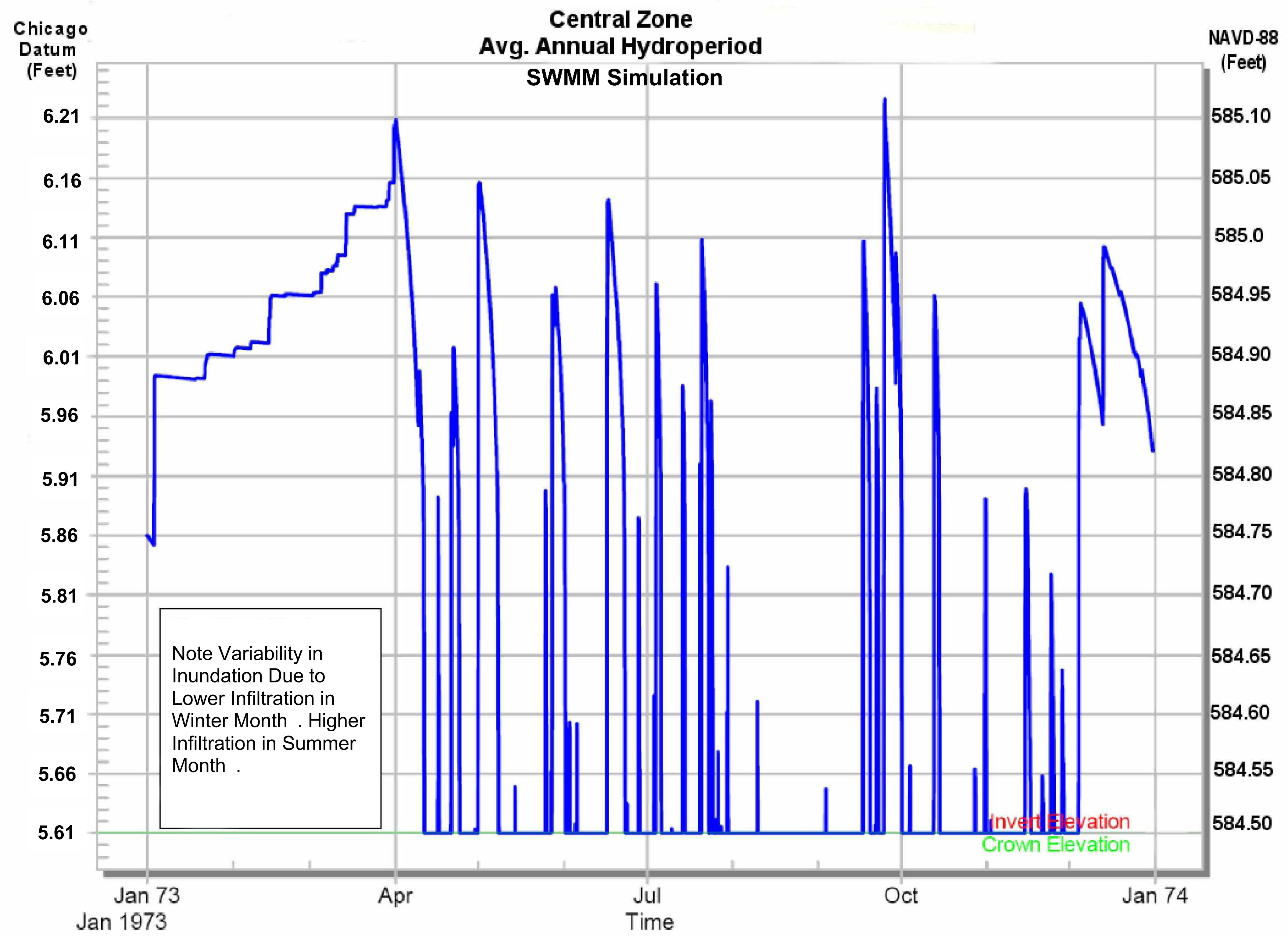
ADDITIONAL HYDROLOGIC OBSERVATIONS/OTHER INFORMATION: Seeping evident on slope/phragmites is dominant species/overland flow is evident from the West

FIELDWORK AND SOIL LOG BY: _______James K. Adamson___________________

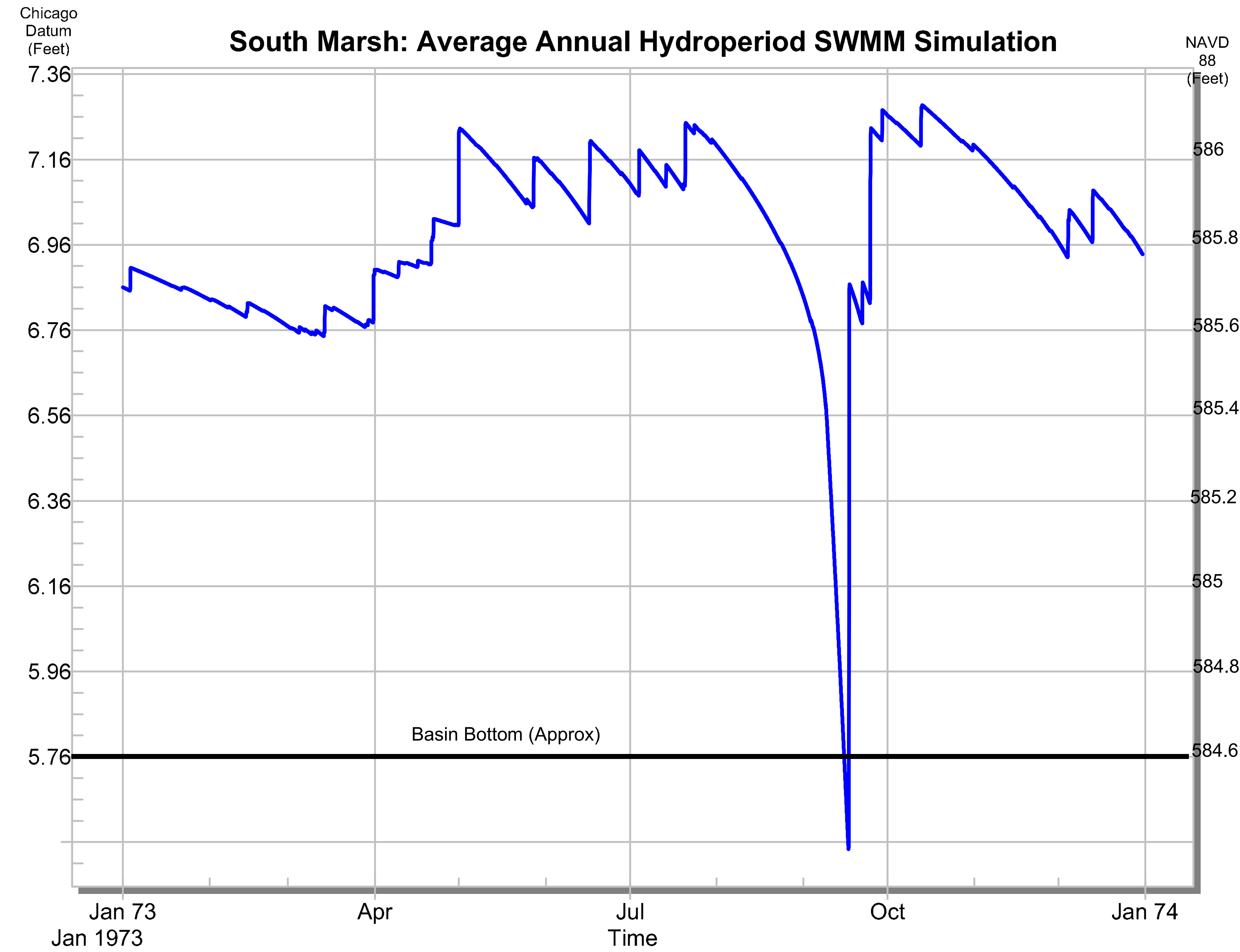
APPENDIX II:

SWMM MODEL HYDROGRAPHS


North Marsh: Average Annual Hydroperiod SWMM Simulation
Chicago Datum (Feet)
NAVD 88 (Feet)
6.12
6.02
5.92
5.82
5.72
5.62
5.52
5.42
5.32
5.22
585
584.9
584.8
584.7
584.6
584.5
584.4
584.3
584.2
584.1
Basin Bottom (Approx)
Jan 73
Apr
Jul
Oct
Jan 74
Jan 1973
Time



Central Zone
Avg. Annual Hydroperiod
SWMM Simulation
Chicago Datum (Feet)
6.21
6.16
6.11
6.06
6.01
5.96
5.91
5.86
5.81
5.76
5.71
5.66
5.61
NAVD-88 (Feet)
585.10
585.05
585.0
584.95
584.90
584.85
584.80
584.75
584.70
584.65
584.60
584.55
584.50
Note Variability in Inundation Due to Lower Infiltration in Winter Month . Higher Infiltration in Summer Month .
Invert Elevation
Crown Elevation
Jan 73
Jan 1973
Apr
Jul
Oct
Jan 74
Time


South Marsh: Average Annual Hydroperiod SWMM Simulation
Chicago Datum (Feet)
NAVD 88 (Feet)
7.36
7.16
6.96
6.76
6.56
6.36
6.16
5.96
5.76
586
585.8
585.6
585.4
585.2
585
584.8
584.6
Basin Bottom (Approx)
Jan 73
Jan 1973
Apr
Jul
Oct
Jan 74
Time

```
 Input File : 998\98216\98216HMP.VVP\Calculations & Data\Watershed\XP\Avg\vv.XP
 Current Directory:   E:\
 Engine Name: C:\PROGRA~1\XPS\XP-SWMM\swmmengw.exe
 Read      0 line(s) and found    0 items(s) from your cfg file.
          *================================================*
          |                      XP-SWMM                   |
          |     Storm and Wastewater Management Model      |
          |                  Version 9.08                  |
          |================================================|
          |                Developed by                    |
          |================================================|
          |                                                |
          |                  XP Software                   |
          |                                                |
          |               Based on the U.S. EPA            |
          |   Storm Water Management Model Version 4.30    |
          |                                                |
          |             Originally Developed by            |
          |              Metcalf & Eddy, Inc.              |
          |             University of Florida              |
          |           Camp Dresser & McKee Inc.            |
          |               September 1970                   |
          |                                                |
          |             EPA-SWMM is maintained by          |
          |             Oregon State University            |
          |             Camp Dresser & McKee Inc.          |
          |================================================|
          |     XP Software      October, 2003             |
          |       Data File Version --->    11.7           |
          *================================================*


*==========================================================*
|       Input and Output file names by SWMM Layer          |
*==========================================================*

 Input File  to Layer #     1 E:\1998\98216\98216HMP.VVP\Calculations & Data\Watershed\XP\Avg\vv.rin

 Output File to Layer #     1 E:\1998\98216\98216HMP.VVP\Calculations & Data\Watershed\XP\Avg\vv.int


*============================================================*
|   Special command line arguments in XP-SWMM2000. This     |
|   now includes program defaults. $Keywords are the program|
|   defaults.  Other Keywords are from the SWMMCOM.CFG file.|
|   or the command line or any cfg file on the command line.|
|   Examples include these in the file xpswm.bat under the  |
|   section :solve or in the windows version XPSWMM32 in the|
```

```
|   file solve.bat                                          |
|                                                           |
|   Note: the cfg file should be in the subdirectory swmxp  |
|         or defined by the set variable in the xpswm.bat   |
|         file.  Some examples of the command lines possible|
|         are shown below:                                  |
|                                                           |
|   swmmd swmmcom.cfg                                       |
|   swmmd my.cfg                                            |
|   swmmd nokeys nconv5 perv extranwq                       |
*===========================================================*

 $powerstation                         0.0000         1         2
 $perv                                 0.0000         0         4
 $oldegg                               0.0000         0         7
 $as                                   0.0000         0        11
 $noflat                               0.0000         0        21
 $oldomega                             0.0000         0        24
 $oldvol                               0.0000         1        28
 $implicit                             0.0000         1        29
 $oldhot                               0.0000         1        31
 $oldscs                               0.0000         0        33
 $flood                                0.0000         1        40
 $nokeys                               0.0000         0        42
 $pzero                                0.0000         0        55
 $oldvol2                              0.0000         2        59
 $storage2                             0.0000         3        62
 $oldhot1                              0.0000         1        63
 $pumpwt                               0.0000         1        70
 $ecloss                               0.0000         1        77
 $exout                                0.0000         0        97
 $spatial = 0.90                       0.9000         5       124
 $djref = -1.0                        -0.1000         3       143
 $weirlen = 50                        50.0000         1       153
 $oldbnd                               0.0000         1       154
 $nogrelev                             0.0000         1       161
 $ncmid                                0.0000         0       164
 $new_nl_97                            0.0000         2       290
 $best97                               0.0000         1       294
 $newbound                             0.0000         1       295
 $q_tol = 0.1                          0.0010         1       316
 $new_storage                          0.0000         1       322
 $old_iteration                        0.0000         1       333
 $minlen=30.0                         30.0000         1       346
 $review_elevation                     0.0000         1       383
 $use_half_volume                      0.0000         1       385
 $min_ts = 0.5                         0.5000         1       407
 $design_restart = on                  0.0000         1       412
```

```
$zero_value=1.e-05                   0.0000        1      414

*=============================================================*
| Parameter Values on the Tapes Common Block.These are the |
| values read from the data file and dynamically allocated |
| by the model for this simulation.                         |
*=============================================================*

 Number of Subcatchments in the Runoff Block (NW)....     5
 Number of Channel/Pipes in the Runoff Block (NG)....     0
 Runoff Water quality constituents (NRQ).............     0
 Runoff Land Uses per Subcatchment (NLU).............     0
 Number of Elements in the Transport Block (NET).....     0
 Number of Storage Junctions in Transport (NTSE).....     0
 Number of Input Hydrographs in Transport (NTH)......     0
 Number of Elements in the Extran Block (NEE)........     0
 Number of Groundwater Subcatchments in Runoff (NGW).     0
 Number of Interface locations for all Blocks (NIE)..     5
 Number of Pumps in Extran (NEP).....................     0
 Number of Orifices in Extran (NEO)..................     0
 Number of Tide Gates/Free Outfalls in Extran (NTG)..     0
 Number of Extran Weirs (NEW)........................     0
 Number of scs hydrograph points.....................  2881
 Number of Extran printout locations (NPO)...........     0
 Number of Tide elements in Extran (NTE).............     0
 Number of Natural channels (NNC)....................     0
 Number of Storage junctions in Extran (NVSE)........     0
 Number of Time history data points in Extran(NTVAL).     0
 Number of Variable storage elements in Extran (NVST)     0
 Number of Input Hydrographs in Extran (NEH).........     0
 Number of Particle sizes in Transport Block (NPS)...     0
 Number of User defined conduits (NHW)...............     5
 Number of Connecting conduits in Extran (NECC)......    20
 Number of Upstream elements in Transport (NTCC).....    10
 Number of Storage/treatment plants (NSTU)...........     0
 Number of Values for R1 lines in Transport (NR1)....     0
 Number of Nodes to be allowed for (NNOD)............     5
 Number of Plugs in a Storage Treatment Unit.........     1


#######################################################
#    Entry made to the Runoff Layer(Block) of SWMM    #
#    Last Updated October, 2000 by XP Software        #
#    and is CURRENTLY under development.              #

*=============================================================*
|         RUNOFF TABLES IN THE OUTPUT FILE.                   |
|  These are the more important tables in the output file. |
```

```
 |  You can use your editor to find the table numbers,      |
 |  for example: search for Table R3 to check continuity.   |
 |  This output file can be imported into a Word Processor  |
 |  and printed on US letter or A4 paper using portrait     |
 |  mode, courier font, a size of 8 pt. and margins of 0.75 |
 |                                                          |
 | Table R1  - Physical Hydrology Data                      |
 | Table R2  - Infiltration data                            |
 | Table R3  - Raingage and Infiltration Database Names     |
 | Table R4  - Groundwater Data                             |
 | Table R5  - Continuity Check for Surface Water           |
 | Table R6  - Continuity Check for Channels/Pipes          |
 | Table R7  - Continuity Check for Subsurface Water        |
 | Table R8  - Infiltration/Inflow Continuity Check         |
 | Table R9  - Summary Statistics for Subcatchments         |
 | Table R10 - Sensitivity anlysis for Subcatchments        |
 *==========================================================*

                   Van Vlissengen Prarire - Chicago, Illnois
                   Average Year - Hydroperiod
###########################################
#             RUNOFF JOB CONTROL          #
###########################################

 Snowmelt parameter - ISNOW......................           0
 Number of rain gages - NRGAG....................           0
 Quality is not simulated - KWALTY...............           0
 Read evaporation data on line(s) F1 (F2) - IVAP..          1
 Hour of day at start of storm - NHR.............           0
 Minute of hour at start of storm - NMN..........           0
 Time TZERO at start of storm (hours)............       0.000
 Use U.S. Customary units for most I/O - METRIC...          0
 Runoff input print control...                              0
 Runoff graph plot control....                              1
 Runoff output print control..                              2
 Limit number of groundwater convergence messages to    10000

 Print headers every 50 lines - NOHEAD (0=yes, 1=no)        0

 Print land use load percentages -LANDUPR (0=no, 1=yes)     0
 Month, day, year of start of storm is:                1/ 1/1973
 Wet time step length (seconds).......                  300.0
 Dry time step length (seconds).......                86400.0
 Wet/Dry time step length (seconds)...                  600.0
 Simulation length is......                            8736.0 Hours

 If Horton infiltration model is being used
 A mixture of infiltration options may be used in
```

```
XP-SWMM2000 as a watershed specific option.
Rate for regeneration of infiltration = REGEN * DECAY
Decay is read in for each subcatchment
REGEN = .........................................  0.01000

########################################################
#   Processed Precipitation will be read on JIN(1)     #
########################################################

Use Partial Area Effects: OFF

Year to be Analyzed:     0.0

  #############################
  #        Data Group F1      #
  # Evaporation Rate (in/day) #
  #############################

 JAN.  FEB.  MAR.  APR.  MAY   JUN.  JUL.  AUG.  SEP.  OCT.  NOV  DEC.
 ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ---- ----
0.100 0.100 0.100 0.100 0.140 0.179 0.195 0.172 0.125 0.100 0.100 0.100


*************************************************
*          No Channel or Pipe Network           *
*  This is a good idea, the hydraulic routing   *
*  in your network should be done in either     *
*  the Transport Layer or Extran Layer of SWMM. *
*************************************************



 ###################################################
 #  Table R1.  S U B C A T C H M E N T  D A T A    #
 #             Physical Hydrology Data             #
 ###################################################
```

Subcatchment Number	Subcatchment Name	Channel or inlet	Width ft	Area ac	Per-cent Imperv	Slope ft/ft	"n" Imprv	"n" Perv	Deprs-sion Storge Imprv	Deprs-sion Strge Perv	Prcnt Zero Deten-tion
1	A5#1	A5	800.00	17.470	5.00	0.010	0.014	0.030	0.000	0.000	0.00
2	A4#1	A4	800.00	3.1400	50.00	0.010	0.014	0.030	0.000	0.000	0.00
3	A3#1	A3	800.00	20.480	10.00	0.010	0.014	0.030	0.000	0.000	0.00
4	A2#1	A2	800.00	12.290	40.00	0.010	0.014	0.030	0.000	0.000	0.00
5	A1#1	A1	800.00	25.410	5.00	0.010	0.014	0.030	0.000	0.000	0.00

Table R2. SUBCATCHMENT DATA

Infiltration or Time of Concentration Data

Infiltration Type		Infl #1(#5)	Infl #2(#6)	Infl #3(#7)	Infl #4(#8)
SCS	->	Comp CN	Time Conc	Shape Factor	Depth or Fraction
SBUH	->	Comp CN	Time Conc	N/A	N/A
Green Ampt	->	Suction	Hydr Cond	Initial MD	N/A
Horton	->	Max Rate	Min Rate	Decay Rate (1/sec)	Max. Infilt. Volume
Proportional	->	Constant	N/A	N/A	N/A
Initial/Cont Loss	->	Initial	Continuing	N/A	N/A
Initial/Proportional	->	Initial	Constant	N/A	N/A
Laurenson Parameters	->	B Value	Pervious "n"	Impervious Cont	Exponent
Rational Formula	->	Tc Method	Flow Path Length	Flow Path Slope	Roughness or Retardance

(#1 - #4 is Impervious Data / #5 - #8 is Pervious Data)

Rational Formula Tc Method:
1 = Constant
2 = Friend's Equation
3 = Kinematic Wave
4 = Alameda Method
5 = Izzard's Formula
6 = Kerby's Equation
7 = Kirpich's Equation
8 = Bransby Williams Equation
9 = Federal Aviation Authority Equation

Subcatchment Number	Subcatchment Name	Infl # 1	Infl # 2	Infl # 3	Infl # 4	Infl # 5	Infl # 6	Infl # 7	Infl # 8
1	A5#1	1.0000	0.0500	0.0010	0.0000				
2	A4#1	1.0000	0.0500	0.0010	0.0000				
3	A3#1	1.0000	0.0500	0.0010	0.0000				
4	A2#1	1.0000	0.0500	0.0010	0.0000				
5	A1#1	1.0000	0.0500	0.0010	0.0000				

Table R3. SUBCATCHMENT DATA

Rainfall and Infiltration Database Names

Subcatchment	Gage	Infltrn	Routing	Rainfall Database	Infiltration Database

```
 Number     Name      No    Type    Type                 Name                 Name
 ===============    ====  ======    ===========          =================    ================
   1 A5#1             1 Horton      Non-linear reservoir Average Year         Horton
   2 A4#1             1 Horton      Non-linear reservoir Average Year         Horton
   3 A3#1             1 Horton      Non-linear reservoir Average Year         Horton
   4 A2#1             1 Horton      Non-linear reservoir Average Year         Horton
   5 A1#1             1 Horton      Non-linear reservoir Average Year         Horton

 Total Number of Subcatchments...             5
 Total Tributary Area (acres)....         78.79
 Impervious Area (acres).........         10.68
 Pervious Area (acres)...........         68.11
 Total Width (feet)..............       4000.00
 Percent Imperviousness..........         13.55


  ###################################################
  #          S U B C A T C H M E N T   D A T A      #
  #   Default, Ratio values for subcatchment data   #
  #   Used with the calibrate node in the runoff.   #
  # 1 - width     2 - area       3 - impervious %   #
  # 4 - slope     5 - imp "n"    6 - perv "n"       #
  # 7 - imp ds    8 - perv ds    9 - 1st infil      #
  #10 - 2nd infil              11 - 3rd infil      #
  ###################################################

 Column           1         2         3         4         5         6         7         8         9        10
11
 Default     0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000
 Ratio       1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
1.0000

 *********************************************************
 *     Arrangement of Subcatchments and Channel/Pipes    *
 *********************************************************


     Inlet
 A5             No Tributary Channel/Pipes
                Tributary Subareas........ A5#1
 A4             No Tributary Channel/Pipes
                Tributary Subareas........ A4#1
 A3             No Tributary Channel/Pipes
                Tributary Subareas........ A3#1
 A2             No Tributary Channel/Pipes
                Tributary Subareas........ A2#1
 A1             No Tributary Channel/Pipes
```

Tributary Subareas........ A1#1

```
*********************************************************
* Hydrographs will be stored for the following   5 INLETS *
*********************************************************
A5        A4        A3        A2        A1
```

```
************************************************
*  Quality Simulation not included in this run *
************************************************
```

```
***************************************************
*  Precipitation Interface File Summary           *
*  Number of precipitation station....        1   *
***************************************************
```

Location	Station Number
1.	111549

```
***********************************************
* Summary of Quantity and Quality results for *
*           January    1973                   *
***********************************************
```

Date	Inlet	Area acres	Rain Inch	Flow Inch
3/ 1/1973	A5	17.47	0.62000	0.12607
3/ 1/1973	A4	3.140	0.62000	0.36048
3/ 1/1973	A3	20.48	0.62000	0.14707
3/ 1/1973	A2	12.29	0.62000	0.30458
3/ 1/1973	A1	25.41	0.62000	0.11497
18/ 1/1973	A5	17.47	0.05000	0.00134
18/ 1/1973	A4	3.140	0.05000	0.01219
18/ 1/1973	A3	20.48	0.05000	0.00231
18/ 1/1973	A2	12.29	0.05000	0.00726
18/ 1/1973	A1	25.41	0.05000	0.00127
19/ 1/1973	A5	17.47	0.02000	0.00050
19/ 1/1973	A4	3.140	0.02000	0.00472
19/ 1/1973	A3	20.48	0.02000	0.00091

19/ 1/1973	A2	12.29	0.02000	0.00303
19/ 1/1973	A1	25.41	0.02000	0.00048
21/ 1/1973	A5	17.47	0.29000	0.01267
21/ 1/1973	A4	3.140	0.29000	0.12578
21/ 1/1973	A3	20.48	0.29000	0.02505
21/ 1/1973	A2	12.29	0.29000	0.09807
21/ 1/1973	A1	25.41	0.29000	0.01261
22/ 1/1973	A5	17.47	0.20000	0.00780
22/ 1/1973	A4	3.140	0.20000	0.07696
22/ 1/1973	A3	20.48	0.20000	0.01528
22/ 1/1973	A2	12.29	0.20000	0.05944
22/ 1/1973	A1	25.41	0.20000	0.00774
23/ 1/1973	A5	17.47	0.05000	0.00162
23/ 1/1973	A4	3.140	0.05000	0.01532
23/ 1/1973	A3	20.48	0.05000	0.00297
23/ 1/1973	A2	12.29	0.05000	0.01035
23/ 1/1973	A1	25.41	0.05000	0.00157
Total	A5	17.47	1.23000	0.15001
Total	A4	3.140	1.23000	0.59546
Total	A3	20.48	1.23000	0.19359
Total	A2	12.29	1.23000	0.48274
Total	A1	25.41	1.23000	0.13864

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***********************************************
* Summary of Quantity and Quality results for *
*           February   1973                   *
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Date	Inlet	Area acres	Rain Inch	Flow Inch
1/ 2/1973	A5	17.47	0.21000	0.00837
1/ 2/1973	A4	3.140	0.21000	0.08162
1/ 2/1973	A3	20.48	0.21000	0.01610
1/ 2/1973	A2	12.29	0.21000	0.06066
1/ 2/1973	A1	25.41	0.21000	0.00824
2/ 2/1973	A5	17.47	0.06000	0.00157
2/ 2/1973	A4	3.140	0.06000	0.01432
2/ 2/1973	A3	20.48	0.06000	0.00272
2/ 2/1973	A2	12.29	0.06000	0.00878
2/ 2/1973	A1	25.41	0.06000	0.00149
7/ 2/1973	A5	17.47	0.19000	0.00733
7/ 2/1973	A4	3.140	0.19000	0.07294
7/ 2/1973	A3	20.48	0.19000	0.01455
7/ 2/1973	A2	12.29	0.19000	0.05739
7/ 2/1973	A1	25.41	0.19000	0.00731
14/ 2/1973	A5	17.47	0.74000	0.06128

14/ 2/1973	A4	3.140	0.74000	0.36562
14/ 2/1973	A3	20.48	0.74000	0.09160
14/ 2/1973	A2	12.29	0.74000	0.28900
14/ 2/1973	A1	25.41	0.74000	0.05594
15/ 2/1973	A5	17.47	0.09000	0.00326
15/ 2/1973	A4	3.140	0.09000	0.03272
15/ 2/1973	A3	20.48	0.09000	0.00656
15/ 2/1973	A2	12.29	0.09000	0.02641
15/ 2/1973	A1	25.41	0.09000	0.00327
19/ 2/1973	A5	17.47	0.02000	0.00048
19/ 2/1973	A4	3.140	0.02000	0.00437
19/ 2/1973	A3	20.48	0.02000	0.00082
19/ 2/1973	A2	12.29	0.02000	0.00241
19/ 2/1973	A1	25.41	0.02000	0.00046
20/ 2/1973	A5	17.47	0.09000	0.00308
20/ 2/1973	A4	3.140	0.09000	0.03001
20/ 2/1973	A3	20.48	0.09000	0.00591
20/ 2/1973	A2	12.29	0.09000	0.02212
20/ 2/1973	A1	25.41	0.09000	0.00303
21/ 2/1973	A5	17.47	0.00000	0.00001
21/ 2/1973	A4	3.140	0.00000	0.00021
21/ 2/1973	A3	20.48	0.00000	0.00005
21/ 2/1973	A2	12.29	0.00000	0.00043
21/ 2/1973	A1	25.41	0.00000	0.00002
Total	A5	17.47	1.40000	0.08538
Total	A4	3.140	1.40000	0.60180
Total	A3	20.48	1.40000	0.13831
Total	A2	12.29	1.40000	0.46719
Total	A1	25.41	1.40000	0.07975

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***********************************************
* Summary of Quantity and Quality results for *
*          March      1973                    *
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Date	Inlet	Area acres	Rain Inch	Flow Inch
1/ 3/1973	A5	17.47	0.01000	0.00020
1/ 3/1973	A4	3.140	0.01000	0.00173
1/ 3/1973	A3	20.48	0.01000	0.00032
1/ 3/1973	A2	12.29	0.01000	0.00085
1/ 3/1973	A1	25.41	0.01000	0.00018
2/ 3/1973	A5	17.47	0.12000	0.00428
2/ 3/1973	A4	3.140	0.12000	0.04169
2/ 3/1973	A3	20.48	0.12000	0.00821
2/ 3/1973	A2	12.29	0.12000	0.03053

2/ 3/1973	A1	25.41	0.12000	0.00421
3/ 3/1973	A5	17.47	0.04000	0.00116
3/ 3/1973	A4	3.140	0.04000	0.01068
3/ 3/1973	A3	20.48	0.04000	0.00204
3/ 3/1973	A2	12.29	0.04000	0.00669
3/ 3/1973	A1	25.41	0.04000	0.00110
4/ 3/1973	A5	17.47	0.01000	0.00019
4/ 3/1973	A4	3.140	0.01000	0.00155
4/ 3/1973	A3	20.48	0.01000	0.00027
4/ 3/1973	A2	12.29	0.01000	0.00063
4/ 3/1973	A1	25.41	0.01000	0.00017
5/ 3/1973	A5	17.47	0.38000	0.01992
5/ 3/1973	A4	3.140	0.38000	0.18581
5/ 3/1973	A3	20.48	0.38000	0.03786
5/ 3/1973	A2	12.29	0.38000	0.14682
5/ 3/1973	A1	25.41	0.38000	0.01944
6/ 3/1973	A5	17.47	0.02000	0.00040
6/ 3/1973	A4	3.140	0.02000	0.00328
6/ 3/1973	A3	20.48	0.02000	0.00059
6/ 3/1973	A2	12.29	0.02000	0.00148
6/ 3/1973	A1	25.41	0.02000	0.00035
7/ 3/1973	A5	17.47	0.11000	0.00485
7/ 3/1973	A4	3.140	0.11000	0.04765
7/ 3/1973	A3	20.48	0.11000	0.00944
7/ 3/1973	A2	12.29	0.11000	0.03616
7/ 3/1973	A1	25.41	0.11000	0.00480
9/ 3/1973	A5	17.47	0.18000	0.00771
9/ 3/1973	A4	3.140	0.18000	0.07601
9/ 3/1973	A3	20.48	0.18000	0.01508
9/ 3/1973	A2	12.29	0.18000	0.05833
9/ 3/1973	A1	25.41	0.18000	0.00764
10/ 3/1973	A5	17.47	0.13000	0.00592
10/ 3/1973	A4	3.140	0.13000	0.05844
10/ 3/1973	A3	20.48	0.13000	0.01161
10/ 3/1973	A2	12.29	0.13000	0.04503
10/ 3/1973	A1	25.41	0.13000	0.00587
11/ 3/1973	A5	17.47	0.21000	0.00974
11/ 3/1973	A4	3.140	0.21000	0.09668
11/ 3/1973	A3	20.48	0.21000	0.01926
11/ 3/1973	A2	12.29	0.21000	0.07573
11/ 3/1973	A1	25.41	0.21000	0.00969
13/ 3/1973	A5	17.47	0.31000	0.01411
13/ 3/1973	A4	3.140	0.31000	0.14020
13/ 3/1973	A3	20.48	0.31000	0.02794
13/ 3/1973	A2	12.29	0.31000	0.10999
13/ 3/1973	A1	25.41	0.31000	0.01406
14/ 3/1973	A5	17.47	0.32000	0.09776
14/ 3/1973	A4	3.140	0.32000	0.20793

14/ 3/1973	A3	20.48	0.32000	0.10582
14/ 3/1973	A2	12.29	0.32000	0.18151
14/ 3/1973	A1	25.41	0.32000	0.08814
16/ 3/1973	A5	17.47	0.14000	0.00537
16/ 3/1973	A4	3.140	0.14000	0.05286
16/ 3/1973	A3	20.48	0.14000	0.01047
16/ 3/1973	A2	12.29	0.14000	0.03991
16/ 3/1973	A1	25.41	0.14000	0.00532
17/ 3/1973	A5	17.47	0.20000	0.00855
17/ 3/1973	A4	3.140	0.20000	0.08577
17/ 3/1973	A3	20.48	0.20000	0.01719
17/ 3/1973	A2	12.29	0.20000	0.06957
17/ 3/1973	A1	25.41	0.20000	0.00857
25/ 3/1973	A5	17.47	0.07000	0.00228
25/ 3/1973	A4	3.140	0.07000	0.02212
25/ 3/1973	A3	20.48	0.07000	0.00435
25/ 3/1973	A2	12.29	0.07000	0.01609
25/ 3/1973	A1	25.41	0.07000	0.00224
28/ 3/1973	A5	17.47	0.27000	0.01171
28/ 3/1973	A4	3.140	0.27000	0.11618
28/ 3/1973	A3	20.48	0.27000	0.02314
28/ 3/1973	A2	12.29	0.27000	0.09096
28/ 3/1973	A1	25.41	0.27000	0.01165
29/ 3/1973	A5	17.47	0.53000	0.02362
29/ 3/1973	A4	3.140	0.53000	0.23357
29/ 3/1973	A3	20.48	0.53000	0.04656
29/ 3/1973	A2	12.29	0.53000	0.18419
29/ 3/1973	A1	25.41	0.53000	0.02347
31/ 3/1973	A5	17.47	0.86000	0.23632
31/ 3/1973	A4	3.140	0.86000	0.53770
31/ 3/1973	A3	20.48	0.86000	0.26168
31/ 3/1973	A2	12.29	0.86000	0.45106
31/ 3/1973	A1	25.41	0.86000	0.21673
Total	A5	17.47	3.91000	0.45410
Total	A4	3.140	3.91000	1.91985
Total	A3	20.48	3.91000	0.60183
Total	A2	12.29	3.91000	1.54551
Total	A1	25.41	3.91000	0.42365

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* Summary of Quantity and Quality results for *
*          April      1973                    *
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Date	Inlet	Area acres	Rain Inch	Flow Inch

1/ 4/1973	A5	17.47	0.17000	0.00666
1/ 4/1973	A4	3.140	0.17000	0.06590
1/ 4/1973	A3	20.48	0.17000	0.01310
1/ 4/1973	A2	12.29	0.17000	0.05112
1/ 4/1973	A1	25.41	0.17000	0.00662
4/ 4/1973	A5	17.47	0.19000	0.00649
4/ 4/1973	A4	3.140	0.19000	0.06296
4/ 4/1973	A3	20.48	0.19000	0.01239
4/ 4/1973	A2	12.29	0.19000	0.04729
4/ 4/1973	A1	25.41	0.19000	0.00637
9/ 4/1973	A5	17.47	0.71000	0.09378
9/ 4/1973	A4	3.140	0.71000	0.37231
9/ 4/1973	A3	20.48	0.71000	0.12040
9/ 4/1973	A2	12.29	0.71000	0.30505
9/ 4/1973	A1	25.41	0.71000	0.08517
10/ 4/1973	A5	17.47	0.04000	0.00099
10/ 4/1973	A4	3.140	0.04000	0.00917
10/ 4/1973	A3	20.48	0.04000	0.00175
10/ 4/1973	A2	12.29	0.04000	0.00571
10/ 4/1973	A1	25.41	0.04000	0.00095
11/ 4/1973	A5	17.47	0.16000	0.00628
11/ 4/1973	A4	3.140	0.16000	0.06143
11/ 4/1973	A3	20.48	0.16000	0.01212
11/ 4/1973	A2	12.29	0.16000	0.04551
11/ 4/1973	A1	25.41	0.16000	0.00620
12/ 4/1973	A5	17.47	0.09000	0.00350
12/ 4/1973	A4	3.140	0.09000	0.03547
12/ 4/1973	A3	20.48	0.09000	0.00716
12/ 4/1973	A2	12.29	0.09000	0.02986
12/ 4/1973	A1	25.41	0.09000	0.00353
16/ 4/1973	A5	17.47	0.48000	0.04238
16/ 4/1973	A4	3.140	0.48000	0.24360
16/ 4/1973	A3	20.48	0.48000	0.06209
16/ 4/1973	A2	12.29	0.48000	0.19336
16/ 4/1973	A1	25.41	0.48000	0.03819
18/ 4/1973	A5	17.47	0.11000	0.00450
18/ 4/1973	A4	3.140	0.11000	0.04354
18/ 4/1973	A3	20.48	0.11000	0.00855
18/ 4/1973	A2	12.29	0.11000	0.03150
18/ 4/1973	A1	25.41	0.11000	0.00441
19/ 4/1973	A2	12.29	0.00000	0.00021
20/ 4/1973	A5	17.47	0.21000	0.00911
20/ 4/1973	A4	3.140	0.21000	0.08911
20/ 4/1973	A3	20.48	0.21000	0.01759
20/ 4/1973	A2	12.29	0.21000	0.06599
20/ 4/1973	A1	25.41	0.21000	0.00899
21/ 4/1973	A5	17.47	1.20000	0.31230
21/ 4/1973	A4	3.140	1.20000	0.76906

21/ 4/1973	A3	20.48	1.20000	0.34691
21/ 4/1973	A2	12.29	1.20000	0.63890
21/ 4/1973	A1	25.41	1.20000	0.28265
22/ 4/1973	A5	17.47	0.05000	0.00626
22/ 4/1973	A4	3.140	0.05000	0.02307
22/ 4/1973	A3	20.48	0.05000	0.00889
22/ 4/1973	A2	12.29	0.05000	0.02166
22/ 4/1973	A1	25.41	0.05000	0.00796
29/ 4/1973	A5	17.47	0.17000	0.00701
29/ 4/1973	A4	3.140	0.17000	0.06910
29/ 4/1973	A3	20.48	0.17000	0.01371
29/ 4/1973	A2	12.29	0.17000	0.05287
29/ 4/1973	A1	25.41	0.17000	0.00695
30/ 4/1973	A5	17.47	1.41000	0.90089
30/ 4/1973	A4	3.140	1.41000	1.16702
30/ 4/1973	A3	20.48	1.41000	0.91591
30/ 4/1973	A2	12.29	1.41000	1.10123
30/ 4/1973	A1	25.41	1.41000	0.86059
Total	A5	17.47	4.99000	1.40014
Total	A4	3.140	4.99000	3.01174
Total	A3	20.48	4.99000	1.54057
Total	A2	12.29	4.99000	2.59025
Total	A1	25.41	4.99000	1.31857

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* Summary of Quantity and Quality results for *
*   May   1973   *
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Date	Inlet	Area acres	Rain Inch	Flow Inch
1/ 5/1973	A5	17.47	0.40000	0.06103
1/ 5/1973	A4	3.140	0.40000	0.21054
1/ 5/1973	A3	20.48	0.40000	0.07942
1/ 5/1973	A2	12.29	0.40000	0.16588
1/ 5/1973	A1	25.41	0.40000	0.07402
2/ 5/1973	A5	17.47	0.05000	0.00202
2/ 5/1973	A4	3.140	0.05000	0.01926
2/ 5/1973	A3	20.48	0.05000	0.00375
2/ 5/1973	A2	12.29	0.05000	0.01416
2/ 5/1973	A1	25.41	0.05000	0.00196
7/ 5/1973	A5	17.47	0.26000	0.00988
7/ 5/1973	A4	3.140	0.26000	0.09645
7/ 5/1973	A3	20.48	0.26000	0.01903
7/ 5/1973	A2	12.29	0.26000	0.07144
7/ 5/1973	A1	25.41	0.26000	0.00974

8/ 5/1973	A5	17.47	0.14000	0.00577
8/ 5/1973	A4	3.140	0.14000	0.05724
8/ 5/1973	A3	20.48	0.14000	0.01140
8/ 5/1973	A2	12.29	0.14000	0.04452
8/ 5/1973	A1	25.41	0.14000	0.00574
10/ 5/1973	A5	17.47	0.01000	0.00013
10/ 5/1973	A4	3.140	0.01000	0.00105
10/ 5/1973	A3	20.48	0.01000	0.00019
10/ 5/1973	A2	12.29	0.01000	0.00045
10/ 5/1973	A1	25.41	0.01000	0.00011
11/ 5/1973	A5	17.47	0.03000	0.00084
11/ 5/1973	A4	3.140	0.03000	0.00800
11/ 5/1973	A3	20.48	0.03000	0.00155
11/ 5/1973	A2	12.29	0.03000	0.00536
11/ 5/1973	A1	25.41	0.03000	0.00082
13/ 5/1973	A5	17.47	0.04000	0.00126
13/ 5/1973	A4	3.140	0.04000	0.01176
13/ 5/1973	A3	20.48	0.04000	0.00226
13/ 5/1973	A2	12.29	0.04000	0.00736
13/ 5/1973	A1	25.41	0.04000	0.00121
14/ 5/1973	A5	17.47	0.14000	0.00640
14/ 5/1973	A4	3.140	0.14000	0.06368
14/ 5/1973	A3	20.48	0.14000	0.01270
14/ 5/1973	A2	12.29	0.14000	0.04995
14/ 5/1973	A1	25.41	0.14000	0.00638
18/ 5/1973	A5	17.47	0.03000	0.00070
18/ 5/1973	A4	3.140	0.03000	0.00622
18/ 5/1973	A3	20.48	0.03000	0.00116
18/ 5/1973	A2	12.29	0.03000	0.00350
18/ 5/1973	A1	25.41	0.03000	0.00065
19/ 5/1973	A5	17.47	0.02000	0.00057
19/ 5/1973	A4	3.140	0.02000	0.00517
19/ 5/1973	A3	20.48	0.02000	0.00098
19/ 5/1973	A2	12.29	0.02000	0.00305
19/ 5/1973	A1	25.41	0.02000	0.00054
21/ 5/1973	A5	17.47	0.01000	0.00013
21/ 5/1973	A4	3.140	0.01000	0.00105
21/ 5/1973	A3	20.48	0.01000	0.00019
21/ 5/1973	A2	12.29	0.01000	0.00045
21/ 5/1973	A1	25.41	0.01000	0.00011
22/ 5/1973	A5	17.47	0.09000	0.00246
22/ 5/1973	A4	3.140	0.09000	0.02349
22/ 5/1973	A3	20.48	0.09000	0.00459
22/ 5/1973	A2	12.29	0.09000	0.01657
22/ 5/1973	A1	25.41	0.09000	0.00239
23/ 5/1973	A5	17.47	0.01000	0.00013
23/ 5/1973	A4	3.140	0.01000	0.00105
23/ 5/1973	A3	20.48	0.01000	0.00019

23/ 5/1973	A2	12.29	0.01000	0.00045
23/ 5/1973	A1	25.41	0.01000	0.00011
25/ 5/1973	A5	17.47	0.44000	0.03918
25/ 5/1973	A4	3.140	0.44000	0.23177
25/ 5/1973	A3	20.48	0.44000	0.05753
25/ 5/1973	A2	12.29	0.44000	0.18089
25/ 5/1973	A1	25.41	0.44000	0.03507
26/ 5/1973	A5	17.47	0.04000	0.00128
26/ 5/1973	A4	3.140	0.04000	0.01223
26/ 5/1973	A3	20.48	0.04000	0.00238
26/ 5/1973	A2	12.29	0.04000	0.00844
26/ 5/1973	A1	25.41	0.04000	0.00124
27/ 5/1973	A5	17.47	1.15000	0.48305
27/ 5/1973	A4	3.140	1.15000	0.79703
27/ 5/1973	A3	20.48	1.15000	0.50753
27/ 5/1973	A2	12.29	1.15000	0.71630
27/ 5/1973	A1	25.41	1.15000	0.46104
28/ 5/1973	A5	17.47	0.61000	0.03144
28/ 5/1973	A4	3.140	0.61000	0.29629
28/ 5/1973	A3	20.48	0.61000	0.05899
28/ 5/1973	A2	12.29	0.61000	0.22427
28/ 5/1973	A1	25.41	0.61000	0.03050
29/ 5/1973	A5	17.47	0.15000	0.00605
29/ 5/1973	A4	3.140	0.15000	0.05889
29/ 5/1973	A3	20.48	0.15000	0.01159
29/ 5/1973	A2	12.29	0.15000	0.04287
29/ 5/1973	A1	25.41	0.15000	0.00595
30/ 5/1973	A5	17.47	0.07000	0.00238
30/ 5/1973	A4	3.140	0.07000	0.02430
30/ 5/1973	A3	20.48	0.07000	0.00493
30/ 5/1973	A2	12.29	0.07000	0.02193
30/ 5/1973	A1	25.41	0.07000	0.00241
Total	A5	17.47	3.69000	0.65469
Total	A4	3.140	3.69000	1.92547
Total	A3	20.48	3.69000	0.78036
Total	A2	12.29	3.69000	1.57782
Total	A1	25.41	3.69000	0.64001

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***********************************************
* Summary of Quantity and Quality results for *
*          June       1973                    *
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Date	Inlet	Area acres	Rain Inch	Flow Inch
2/ 6/1973	A5	17.47	0.20000	0.00890

2/ 6/1973	A4	3.140	0.20000	0.08740
2/ 6/1973	A3	20.48	0.20000	0.01731
2/ 6/1973	A2	12.29	0.20000	0.06637
2/ 6/1973	A1	25.41	0.20000	0.00880
3/ 6/1973	A5	17.47	0.02000	0.00049
3/ 6/1973	A4	3.140	0.02000	0.00437
3/ 6/1973	A3	20.48	0.02000	0.00082
3/ 6/1973	A2	12.29	0.02000	0.00256
3/ 6/1973	A1	25.41	0.02000	0.00046
4/ 6/1973	A5	17.47	0.10000	0.00341
4/ 6/1973	A4	3.140	0.10000	0.03160
4/ 6/1973	A3	20.48	0.10000	0.00604
4/ 6/1973	A2	12.29	0.10000	0.01940
4/ 6/1973	A1	25.41	0.10000	0.00326
5/ 6/1973	A5	17.47	0.18000	0.00796
5/ 6/1973	A4	3.140	0.18000	0.07873
5/ 6/1973	A3	20.48	0.18000	0.01568
5/ 6/1973	A2	12.29	0.18000	0.06225
5/ 6/1973	A1	25.41	0.18000	0.00790
15/ 6/1973	A5	17.47	0.03000	0.00095
15/ 6/1973	A4	3.140	0.03000	0.00882
15/ 6/1973	A3	20.48	0.03000	0.00169
15/ 6/1973	A2	12.29	0.03000	0.00556
15/ 6/1973	A1	25.41	0.03000	0.00091
16/ 6/1973	A5	17.47	1.58000	0.75622
16/ 6/1973	A4	3.140	1.58000	1.18522
16/ 6/1973	A3	20.48	1.58000	0.78148
16/ 6/1973	A2	12.29	1.58000	1.05796
16/ 6/1973	A1	25.41	1.58000	0.71638
17/ 6/1973	A5	17.47	0.01000	0.00013
17/ 6/1973	A4	3.140	0.01000	0.00131
17/ 6/1973	A3	20.48	0.01000	0.00027
17/ 6/1973	A2	12.29	0.01000	0.00141
17/ 6/1973	A1	25.41	0.01000	0.00013
19/ 6/1973	A5	17.47	0.17000	0.00731
19/ 6/1973	A4	3.140	0.17000	0.07231
19/ 6/1973	A3	20.48	0.17000	0.01437
19/ 6/1973	A2	12.29	0.17000	0.05574
19/ 6/1973	A1	25.41	0.17000	0.00726
23/ 6/1973	A5	17.47	0.25000	0.01047
23/ 6/1973	A4	3.140	0.25000	0.10189
23/ 6/1973	A3	20.48	0.25000	0.02008
23/ 6/1973	A2	12.29	0.25000	0.07590
23/ 6/1973	A1	25.41	0.25000	0.01030
27/ 6/1973	A5	17.47	0.33000	0.01750
27/ 6/1973	A4	3.140	0.33000	0.15765
27/ 6/1973	A3	20.48	0.33000	0.03174
27/ 6/1973	A2	12.29	0.33000	0.11827

27/ 6/1973	A1	25.41	0.33000	0.01670
Total	A5	17.47	2.87000	0.81334
Total	A4	3.140	2.87000	1.72931
Total	A3	20.48	2.87000	0.88948
Total	A2	12.29	2.87000	1.46541
Total	A1	25.41	2.87000	0.77210

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* Summary of Quantity and Quality results for *

*   July   1973   *

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Date	Inlet	Area acres	Rain Inch	Flow Inch
3/ 7/1973	A5	17.47	0.25000	0.01131
3/ 7/1973	A4	3.140	0.25000	0.11128
3/ 7/1973	A3	20.48	0.25000	0.02207
3/ 7/1973	A2	12.29	0.25000	0.08524
3/ 7/1973	A1	25.41	0.25000	0.01120
4/ 7/1973	A5	17.47	0.92000	0.45175
4/ 7/1973	A4	3.140	0.92000	0.69340
4/ 7/1973	A3	20.48	0.92000	0.46876
4/ 7/1973	A2	12.29	0.92000	0.63224
4/ 7/1973	A1	25.41	0.92000	0.42860
9/ 7/1973	A5	17.47	0.13000	0.00578
9/ 7/1973	A4	3.140	0.13000	0.05632
9/ 7/1973	A3	20.48	0.13000	0.01111
9/ 7/1973	A2	12.29	0.13000	0.04184
9/ 7/1973	A1	25.41	0.13000	0.00569
10/ 7/1973	A2	12.29	0.00000	0.00006
13/ 7/1973	A5	17.47	0.66000	0.21939
13/ 7/1973	A4	3.140	0.66000	0.43742
13/ 7/1973	A3	20.48	0.66000	0.23657
13/ 7/1973	A2	12.29	0.66000	0.38342
13/ 7/1973	A1	25.41	0.66000	0.20310
14/ 7/1973	A5	17.47	0.04000	0.00096
14/ 7/1973	A4	3.140	0.04000	0.00880
14/ 7/1973	A3	20.48	0.04000	0.00167
14/ 7/1973	A2	12.29	0.04000	0.00538
14/ 7/1973	A1	25.41	0.04000	0.00091
20/ 7/1973	A5	17.47	1.63000	0.73295
20/ 7/1973	A4	3.140	1.63000	1.17442
20/ 7/1973	A3	20.48	1.63000	0.76811
20/ 7/1973	A2	12.29	1.63000	1.05607
20/ 7/1973	A1	25.41	1.63000	0.70368
24/ 7/1973	A5	17.47	0.55000	0.10223

24/ 7/1973	A4	3.140	0.55000	0.31242
24/ 7/1973	A3	20.48	0.55000	0.12045
24/ 7/1973	A2	12.29	0.55000	0.25872
24/ 7/1973	A1	25.41	0.55000	0.09186
25/ 7/1973	A5	17.47	0.05000	0.00187
25/ 7/1973	A4	3.140	0.05000	0.01777
25/ 7/1973	A3	20.48	0.05000	0.00345
25/ 7/1973	A2	12.29	0.05000	0.01217
25/ 7/1973	A1	25.41	0.05000	0.00181
26/ 7/1973	A5	17.47	0.34000	0.01534
26/ 7/1973	A4	3.140	0.34000	0.15089
26/ 7/1973	A3	20.48	0.34000	0.02990
26/ 7/1973	A2	12.29	0.34000	0.11502
26/ 7/1973	A1	25.41	0.34000	0.01519
27/ 7/1973	A5	17.47	0.20000	0.00893
27/ 7/1973	A4	3.140	0.20000	0.08813
27/ 7/1973	A3	20.48	0.20000	0.01750
27/ 7/1973	A2	12.29	0.20000	0.06783
27/ 7/1973	A1	25.41	0.20000	0.00886
30/ 7/1973	A5	17.47	0.50000	0.04978
30/ 7/1973	A4	3.140	0.50000	0.25756
30/ 7/1973	A3	20.48	0.50000	0.06947
30/ 7/1973	A2	12.29	0.50000	0.20318
30/ 7/1973	A1	25.41	0.50000	0.04438
Total	A5	17.47	5.27000	1.60030
Total	A4	3.140	5.27000	3.30842
Total	A3	20.48	5.27000	1.74907
Total	A2	12.29	5.27000	2.86117
Total	A1	25.41	5.27000	1.51528

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* Summary of Quantity and Quality results for *
*          August     1973                    *
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Date	Inlet	Area acres	Rain Inch	Flow Inch
9/ 8/1973	A5	17.47	0.30000	0.01323
9/ 8/1973	A4	3.140	0.30000	0.12763
9/ 8/1973	A3	20.48	0.30000	0.02499
9/ 8/1973	A2	12.29	0.30000	0.09004
9/ 8/1973	A1	25.41	0.30000	0.01295
10/ 8/1973	A5	17.47	0.00000	0.00020
10/ 8/1973	A4	3.140	0.00000	0.00410
10/ 8/1973	A3	20.48	0.00000	0.00110
10/ 8/1973	A2	12.29	0.00000	0.01029

10/ 8/1973	A1	25.41	0.00000	0.00032
14/ 8/1973	A5	17.47	0.02000	0.00022
14/ 8/1973	A4	3.140	0.02000	0.00190
14/ 8/1973	A3	20.48	0.02000	0.00035
14/ 8/1973	A2	12.29	0.02000	0.00097
14/ 8/1973	A1	25.41	0.02000	0.00020
23/ 8/1973	A5	17.47	0.22000	0.00722
23/ 8/1973	A4	3.140	0.22000	0.06807
23/ 8/1973	A3	20.48	0.22000	0.01316
23/ 8/1973	A2	12.29	0.22000	0.04489
23/ 8/1973	A1	25.41	0.22000	0.00697
24/ 8/1973	A5	17.47	0.12000	0.00458
24/ 8/1973	A4	3.140	0.12000	0.04623
24/ 8/1973	A3	20.48	0.12000	0.00930
24/ 8/1973	A2	12.29	0.12000	0.03855
24/ 8/1973	A1	25.41	0.12000	0.00461
30/ 8/1973	A5	17.47	0.01000	0.00008
30/ 8/1973	A4	3.140	0.01000	0.00060
30/ 8/1973	A3	20.48	0.01000	0.00010
30/ 8/1973	A2	12.29	0.01000	0.00023
30/ 8/1973	A1	25.41	0.01000	0.00007
Total	A5	17.47	0.67000	0.02553
Total	A4	3.140	0.67000	0.24854
Total	A3	20.48	0.67000	0.04900
Total	A2	12.29	0.67000	0.18497
Total	A1	25.41	0.67000	0.02511

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* Summary of Quantity and Quality results for *
*          September  1973                    *
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Date	Inlet	Area acres	Rain Inch	Flow Inch
3/ 9/1973	A5	17.47	0.25000	0.01102
3/ 9/1973	A4	3.140	0.25000	0.10814
3/ 9/1973	A3	20.48	0.25000	0.02145
3/ 9/1973	A2	12.29	0.25000	0.08406
3/ 9/1973	A1	25.41	0.25000	0.01089
4/ 9/1973	A5	17.47	0.14000	0.00586
4/ 9/1973	A4	3.140	0.14000	0.05692
4/ 9/1973	A3	20.48	0.14000	0.01121
4/ 9/1973	A2	12.29	0.14000	0.04332
4/ 9/1973	A1	25.41	0.14000	0.00576
8/ 9/1973	A5	17.47	0.09000	0.00346
8/ 9/1973	A4	3.140	0.09000	0.03326

8/ 9/1973	A3	20.48	0.09000	0.00649
8/ 9/1973	A2	12.29	0.09000	0.02304
8/ 9/1973	A1	25.41	0.09000	0.00338
9/ 9/1973	A5	17.47	0.02000	0.00067
9/ 9/1973	A4	3.140	0.02000	0.00677
9/ 9/1973	A3	20.48	0.02000	0.00137
9/ 9/1973	A2	12.29	0.02000	0.00618
9/ 9/1973	A1	25.41	0.02000	0.00067
15/ 9/1973	A5	17.47	0.01000	0.00016
15/ 9/1973	A4	3.140	0.01000	0.00129
15/ 9/1973	A3	20.48	0.01000	0.00023
15/ 9/1973	A2	12.29	0.01000	0.00058
15/ 9/1973	A1	25.41	0.01000	0.00014
16/ 9/1973	A5	17.47	0.04000	0.00079
16/ 9/1973	A4	3.140	0.04000	0.00729
16/ 9/1973	A3	20.48	0.04000	0.00139
16/ 9/1973	A2	12.29	0.04000	0.00451
16/ 9/1973	A1	25.41	0.04000	0.00075
17/ 9/1973	A5	17.47	1.32000	0.68355
17/ 9/1973	A4	3.140	1.32000	0.98018
17/ 9/1973	A3	20.48	1.32000	0.70866
17/ 9/1973	A2	12.29	1.32000	0.90780
17/ 9/1973	A1	25.41	1.32000	0.66445
20/ 9/1973	A5	17.47	0.02000	0.00060
20/ 9/1973	A4	3.140	0.02000	0.00550
20/ 9/1973	A3	20.48	0.02000	0.00104
20/ 9/1973	A2	12.29	0.02000	0.00332
20/ 9/1973	A1	25.41	0.02000	0.00057
21/ 9/1973	A5	17.47	0.16000	0.00732
21/ 9/1973	A4	3.140	0.16000	0.07236
21/ 9/1973	A3	20.48	0.16000	0.01438
21/ 9/1973	A2	12.29	0.16000	0.05598
21/ 9/1973	A1	25.41	0.16000	0.00727
22/ 9/1973	A5	17.47	0.61000	0.17747
22/ 9/1973	A4	3.140	0.61000	0.40557
22/ 9/1973	A3	20.48	0.61000	0.19493
22/ 9/1973	A2	12.29	0.61000	0.34376
22/ 9/1973	A1	25.41	0.61000	0.16210
24/ 9/1973	A5	17.47	2.03000	1.23592
24/ 9/1973	A4	3.140	2.03000	1.66562
24/ 9/1973	A3	20.48	2.03000	1.26274
24/ 9/1973	A2	12.29	2.03000	1.53702
24/ 9/1973	A1	25.41	2.03000	1.19318
25/ 9/1973	A5	17.47	0.18000	0.19604
25/ 9/1973	A4	3.140	0.18000	0.14129
25/ 9/1973	A3	20.48	0.18000	0.20120
25/ 9/1973	A2	12.29	0.18000	0.17637
25/ 9/1973	A1	25.41	0.18000	0.21642

27/ 9/1973	A5	17.47	0.14000	0.00546
27/ 9/1973	A4	3.140	0.14000	0.05264
27/ 9/1973	A3	20.48	0.14000	0.01032
27/ 9/1973	A2	12.29	0.14000	0.03795
27/ 9/1973	A1	25.41	0.14000	0.00534
28/ 9/1973	A5	17.47	0.03000	0.00085
28/ 9/1973	A4	3.140	0.03000	0.00791
28/ 9/1973	A3	20.48	0.03000	0.00152
28/ 9/1973	A2	12.29	0.03000	0.00496
28/ 9/1973	A1	25.41	0.03000	0.00081
29/ 9/1973	A5	17.47	0.93000	0.36714
29/ 9/1973	A4	3.140	0.93000	0.63616
29/ 9/1973	A3	20.48	0.93000	0.38741
29/ 9/1973	A2	12.29	0.93000	0.56516
29/ 9/1973	A1	25.41	0.93000	0.34597
30/ 9/1973	A5	17.47	0.04000	0.00113
30/ 9/1973	A4	3.140	0.04000	0.01096
30/ 9/1973	A3	20.48	0.04000	0.00215
30/ 9/1973	A2	12.29	0.04000	0.00770
30/ 9/1973	A1	25.41	0.04000	0.00111
Total	A5	17.47	6.01000	2.69744
Total	A4	3.140	6.01000	4.19184
Total	A3	20.48	6.01000	2.82650
Total	A2	12.29	6.01000	3.80171
Total	A1	25.41	6.01000	2.61882

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***********************************************
* Summary of Quantity and Quality results for *
*          October    1973                    *
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Date	Inlet	Area acres	Rain Inch	Flow Inch
1/10/1973	A5	17.47	0.27000	0.01092
1/10/1973	A4	3.140	0.27000	0.10646
1/10/1973	A3	20.48	0.27000	0.02100
1/10/1973	A2	12.29	0.27000	0.07940
1/10/1973	A1	25.41	0.27000	0.01075
3/10/1973	A5	17.47	0.01000	0.00019
3/10/1973	A4	3.140	0.01000	0.00155
3/10/1973	A3	20.48	0.01000	0.00027
3/10/1973	A2	12.29	0.01000	0.00063
3/10/1973	A1	25.41	0.01000	0.00017
4/10/1973	A5	17.47	0.23000	0.01050
4/10/1973	A4	3.140	0.23000	0.10409
4/10/1973	A3	20.48	0.23000	0.02072

4/10/1973	A2	12.29	0.23000	0.08187
4/10/1973	A1	25.41	0.23000	0.01044
6/10/1973	A5	17.47	0.02000	0.00041
6/10/1973	A4	3.140	0.02000	0.00346
6/10/1973	A3	20.48	0.02000	0.00063
6/10/1973	A2	12.29	0.02000	0.00170
6/10/1973	A1	25.41	0.02000	0.00037
12/10/1973	A5	17.47	0.94000	0.39014
12/10/1973	A4	3.140	0.94000	0.68120
12/10/1973	A3	20.48	0.94000	0.40816
12/10/1973	A2	12.29	0.94000	0.59707
12/10/1973	A1	25.41	0.94000	0.35806
13/10/1973	A5	17.47	0.30000	0.10482
13/10/1973	A4	3.140	0.30000	0.17981
13/10/1973	A3	20.48	0.30000	0.11626
13/10/1973	A2	12.29	0.30000	0.16618
13/10/1973	A1	25.41	0.30000	0.11422
27/10/1973	A5	17.47	0.43000	0.01986
27/10/1973	A4	3.140	0.43000	0.19451
27/10/1973	A3	20.48	0.43000	0.03891
27/10/1973	A2	12.29	0.43000	0.15332
27/10/1973	A1	25.41	0.43000	0.01966
29/10/1973	A5	17.47	0.05000	0.00179
29/10/1973	A4	3.140	0.05000	0.01747
29/10/1973	A3	20.48	0.05000	0.00345
29/10/1973	A2	12.29	0.05000	0.01283
29/10/1973	A1	25.41	0.05000	0.00176
31/10/1973	A5	17.47	0.61000	0.07682
31/10/1973	A4	3.140	0.61000	0.32182
31/10/1973	A3	20.48	0.61000	0.10100
31/10/1973	A2	12.29	0.61000	0.26451
31/10/1973	A1	25.41	0.61000	0.07020
Total	A5	17.47	2.86000	0.61545
Total	A4	3.140	2.86000	1.61036
Total	A3	20.48	2.86000	0.71040
Total	A2	12.29	2.86000	1.35750
Total	A1	25.41	2.86000	0.58563

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* Summary of Quantity and Quality results for *
*   November   1973   *
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Date	Inlet	Area acres	Rain Inch	Flow Inch
1/11/1973	A5	17.47	0.02000	0.00066

1/11/1973	A4	3.140	0.02000	0.00607
1/11/1973	A3	20.48	0.02000	0.00116
1/11/1973	A2	12.29	0.02000	0.00380
1/11/1973	A1	25.41	0.02000	0.00063
2/11/1973	A5	17.47	0.05000	0.00200
2/11/1973	A4	3.140	0.05000	0.01958
2/11/1973	A3	20.48	0.05000	0.00386
2/11/1973	A2	12.29	0.05000	0.01446
2/11/1973	A1	25.41	0.05000	0.00198
14/11/1973	A5	17.47	0.38000	0.01747
14/11/1973	A4	3.140	0.38000	0.17030
14/11/1973	A3	20.48	0.38000	0.03373
14/11/1973	A2	12.29	0.38000	0.12873
14/11/1973	A1	25.41	0.38000	0.01721
15/11/1973	A5	17.47	0.15000	0.00665
15/11/1973	A4	3.140	0.15000	0.06597
15/11/1973	A3	20.48	0.15000	0.01338
15/11/1973	A2	12.29	0.15000	0.05570
15/11/1973	A1	25.41	0.15000	0.00665
17/11/1973	A5	17.47	0.01000	0.00020
17/11/1973	A4	3.140	0.01000	0.00173
17/11/1973	A3	20.48	0.01000	0.00032
17/11/1973	A2	12.29	0.01000	0.00085
17/11/1973	A1	25.41	0.01000	0.00018
20/11/1973	A5	17.47	0.09000	0.00341
20/11/1973	A4	3.140	0.09000	0.03268
20/11/1973	A3	20.48	0.09000	0.00638
20/11/1973	A2	12.29	0.09000	0.02258
20/11/1973	A1	25.41	0.09000	0.00332
21/11/1973	A5	17.47	0.12000	0.00479
21/11/1973	A4	3.140	0.12000	0.04757
21/11/1973	A3	20.48	0.12000	0.00949
21/11/1973	A2	12.29	0.12000	0.03788
21/11/1973	A1	25.41	0.12000	0.00477
24/11/1973	A5	17.47	0.36000	0.01647
24/11/1973	A4	3.140	0.36000	0.16350
24/11/1973	A3	20.48	0.36000	0.03257
24/11/1973	A2	12.29	0.36000	0.12805
24/11/1973	A1	25.41	0.36000	0.01640
25/11/1973	A5	17.47	0.01000	0.00020
25/11/1973	A4	3.140	0.01000	0.00173
25/11/1973	A3	20.48	0.01000	0.00032
25/11/1973	A2	12.29	0.01000	0.00085
25/11/1973	A1	25.41	0.01000	0.00018
27/11/1973	A5	17.47	0.04000	0.00141
27/11/1973	A4	3.140	0.04000	0.01328
27/11/1973	A3	20.48	0.04000	0.00256
27/11/1973	A2	12.29	0.04000	0.00842

27/11/1973	A1	25.41	0.04000	0.00136
28/11/1973	A5	17.47	0.27000	0.01209
28/11/1973	A4	3.140	0.27000	0.12117
28/11/1973	A3	20.48	0.27000	0.02427
28/11/1973	A2	12.29	0.27000	0.09776
28/11/1973	A1	25.41	0.27000	0.01210
Total	A5	17.47	1.50000	0.06534
Total	A4	3.140	1.50000	0.64357
Total	A3	20.48	1.50000	0.12803
Total	A2	12.29	1.50000	0.49906
Total	A1	25.41	1.50000	0.06478

****
* Summary of Quantity and Quality results for *
*   December   1973   *
****

Date	Inlet	Area acres	Rain Inch	Flow Inch
4/12/1973	A5	17.47	1.12000	0.36643
4/12/1973	A4	3.140	1.12000	0.73791
4/12/1973	A3	20.48	1.12000	0.39647
4/12/1973	A2	12.29	1.12000	0.64201
4/12/1973	A1	25.41	1.12000	0.34370
5/12/1973	A5	17.47	0.16000	0.00494
5/12/1973	A4	3.140	0.16000	0.04805
5/12/1973	A3	20.48	0.16000	0.00947
5/12/1973	A2	12.29	0.16000	0.03575
5/12/1973	A1	25.41	0.16000	0.00486
6/12/1973	A5	17.47	0.02000	0.00049
6/12/1973	A4	3.140	0.02000	0.00458
6/12/1973	A3	20.48	0.02000	0.00088
6/12/1973	A2	12.29	0.02000	0.00284
6/12/1973	A1	25.41	0.02000	0.00047
9/12/1973	A5	17.47	0.01000	0.00020
9/12/1973	A4	3.140	0.01000	0.00173
9/12/1973	A3	20.48	0.01000	0.00032
9/12/1973	A2	12.29	0.01000	0.00085
9/12/1973	A1	25.41	0.01000	0.00018
13/12/1973	A5	17.47	1.10000	0.43185
13/12/1973	A4	3.140	1.10000	0.73696
13/12/1973	A3	20.48	1.10000	0.46011
13/12/1973	A2	12.29	1.10000	0.66585
13/12/1973	A1	25.41	1.10000	0.41762
14/12/1973	A5	17.47	0.01000	0.00019
14/12/1973	A4	3.140	0.01000	0.00155

14/12/1973	A3	20.48	0.01000	0.00027
14/12/1973	A2	12.29	0.01000	0.00063
14/12/1973	A1	25.41	0.01000	0.00017
15/12/1973	A5	17.47	0.14000	0.00419
15/12/1973	A4	3.140	0.14000	0.03981
15/12/1973	A3	20.48	0.14000	0.00773
15/12/1973	A2	12.29	0.14000	0.02688
15/12/1973	A1	25.41	0.14000	0.00407
16/12/1973	A5	17.47	0.14000	0.00506
16/12/1973	A4	3.140	0.14000	0.04973
16/12/1973	A3	20.48	0.14000	0.00985
16/12/1973	A2	12.29	0.14000	0.03951
16/12/1973	A1	25.41	0.14000	0.00501
17/12/1973	A5	17.47	0.04000	0.00098
17/12/1973	A4	3.140	0.04000	0.00896
17/12/1973	A3	20.48	0.04000	0.00170
17/12/1973	A2	12.29	0.04000	0.00525
17/12/1973	A1	25.41	0.04000	0.00093
18/12/1973	A5	17.47	0.05000	0.00142
18/12/1973	A4	3.140	0.05000	0.01317
18/12/1973	A3	20.48	0.05000	0.00253
18/12/1973	A2	12.29	0.05000	0.00857
18/12/1973	A1	25.41	0.05000	0.00136
19/12/1973	A5	17.47	0.28000	0.01141
19/12/1973	A4	3.140	0.28000	0.11385
19/12/1973	A3	20.48	0.28000	0.02274
19/12/1973	A2	12.29	0.28000	0.09036
19/12/1973	A1	25.41	0.28000	0.01139
20/12/1973	A5	17.47	0.01000	0.00020
20/12/1973	A4	3.140	0.01000	0.00173
20/12/1973	A3	20.48	0.01000	0.00032
20/12/1973	A2	12.29	0.01000	0.00085
20/12/1973	A1	25.41	0.01000	0.00018
24/12/1973	A5	17.47	0.23000	0.00849
24/12/1973	A4	3.140	0.23000	0.08254
24/12/1973	A3	20.48	0.23000	0.01625
24/12/1973	A2	12.29	0.23000	0.06029
24/12/1973	A1	25.41	0.23000	0.00835
25/12/1973	A5	17.47	0.17000	0.00670
25/12/1973	A4	3.140	0.17000	0.06567
25/12/1973	A3	20.48	0.17000	0.01303
25/12/1973	A2	12.29	0.17000	0.05107
25/12/1973	A1	25.41	0.17000	0.00662
26/12/1973	A5	17.47	0.18000	0.00787
26/12/1973	A4	3.140	0.18000	0.07816
26/12/1973	A3	20.48	0.18000	0.01557
26/12/1973	A2	12.29	0.18000	0.06091
26/12/1973	A1	25.41	0.18000	0.00784

```
27/12/1973  A5          17.47      0.01000      0.00030
27/12/1973  A4          3.140      0.01000      0.00317
27/12/1973  A3          20.48      0.01000      0.00065
27/12/1973  A2          12.29      0.01000      0.00316
27/12/1973  A1          25.41      0.01000      0.00031
28/12/1973  A5          17.47      0.04000      0.00142
28/12/1973  A4          3.140      0.04000      0.01359
28/12/1973  A3          20.48      0.04000      0.00265
28/12/1973  A2          12.29      0.04000      0.00950
28/12/1973  A1          25.41      0.04000      0.00138
Total       A5          17.47      3.71000      0.85216
Total       A4          3.140      3.71000      2.00116
Total       A3          20.48      3.71000      0.96052
Total       A2          12.29      3.71000      1.70428
Total       A1          25.41      3.71000      0.81444
Year        A5          17.47     38.11000      9.41388
Year        A4          3.140     38.11000     21.78752
Year        A3          20.48     38.11000     10.56765
Year        A2          12.29     38.11000     18.53760
Year        A1          25.41     38.11000      8.99678

************************************************
*      End of time step DO-loop in Runoff      *
************************************************

Final Date (Mo/Day/Year)   =           12/31/1973
Total number of time steps =                10277
Final Julian Date          =              1973365
Final time of day          =                   0. seconds.
Final time of day          =                 0.00   hours.
Final running time         =            8736.0000   hours.
Final running time         =             364.0000    days.

****************************************************
*     Extrapolation Summary for Watersheds         *
* Explains the number of time steps and iterations *
* used in the solution of the subcatchments.       *
* # Steps ==> Total Number of Extrapolated Steps   *
* # Calls ==> Total Number of OVERLND Calls        *
****************************************************

Subcatchment   # Steps   # Calls Subcatchment   # Steps   # Calls
-------------  -------  -------- -------------  -------  --------
A5#1             70057     10763 A4#1             71663     10769 A3#1             70837     11171
A2#1             68891     11621 A1#1             68501     10891


#########################################################
```

```
# Rainfall input summary from Runoff Continuity Check   #
#########################################################

 Total rainfall read for gage #     1 is      38.1100 in
 Total rainfall read for gage #     1 is     40740.00 minutes

 ************************************************************
 * Table R5. CONTINUITY CHECK FOR SURFACE WATER             *
 *       Any continuity error can be fixed by lowering the  *
 *       wet and transition time step. The transition time  *
 *       should not be much greater than the wet time step. *
 ************************************************************
                                                                    Inches over
                                                      cubic feet    Total Basin
 Total Precipitation (Rain plus Snow)                1.089975E+07     38.110
 Total Infiltration                                  6.564594E+06     22.953
 Total Evaporation                                   1.015310E+06      3.550
 Surface Runoff from Watersheds                      3.287814E+06     11.496
 Total Water remaining in Surface Storage            0.000000E+00      0.000
 Infiltration over the Pervious Area...              6.564594E+06     26.551
                                    --------
 Infiltration + Evaporation +
 Surface Runoff + Snow removal +
 Water remaining in Surface Storage +
 Water remaining in Snow Cover.........              1.086772E+07     37.998
 Total Precipitation + Initial Storage.              1.089975E+07     38.110


 The error in continuity is calculated as
 ***************************************
 * Precipitation + Initial Snow Cover  *
 *      - Infiltration -               *
 *Evaporation - Snow removal -         *
 *Surface Runoff from Watersheds -     *
 *Water in Surface Storage -           *
 *Water remaining in Snow Cover        *
 *-------------------------------------*
 * Precipitation + Initial Snow Cover  *
 ***************************************
 Percent Continuity Error..............                                0.2939


 ****************************************************
 * Table R6. Continuity Check for Channel/Pipes     *
 *           You should have zero continuity error  *
 *           if you are not using runoff hydraulics *
 ****************************************************
                                                                    Inches over
```

	cubic feet	Total Basin
Initial Channel/Pipe Storage................	0.000000E+00	0.000
Final Channel/Pipe Storage..................	0.000000E+00	0.000
Surface Runoff from Watersheds..............	3.287814E+06	11.496
Groundwater Subsurface Inflow or Diversion..	0.000000E+00	0.000
Evaporation Loss from Channels..............	0.000000E+00	0.000
Groundwater Flow Diverted Out of Network....	0.000000E+00	0.000
Channel/Pipe/Inlet Outflow..................	3.287814E+06	11.496
Initial Storage + Inflow....................	3.287814E+06	11.496
Final Storage + Outflow + Diverted GW.......	3.287814E+06	11.496

```
********************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     --------------------------------     *
*  Final Storage + Outflow  + Evaporation  *
********************************************
```

Percent Continuity Error................... 0.000

```
##################################################
# Table R9. Summary Statistics for Subcatchments #
##################################################
```

Note: Total Runoff Depth includes pervious & impervious area
Pervious and Impervious Runoff Depth is only the runoff from those two areas.

Subcatchment...........	A5#1	A4#1	A3#1	A2#1	A1#1
Area (acres)...........	17.47000	3.14000	20.48000	12.29000	25.41000
Percent Impervious.....	5.00000	50.00000	10.00000	40.00000	5.00000
Total Rainfall (in)....	38.11000	38.11000	38.11000	38.11000	38.11000
Max Intensity (in/hr)..	0.80000	0.80000	0.80000	0.80000	0.80000
Pervious Area					
Total Runoff Depth (in)	8.10706	9.64589	7.99036	8.81132	7.67813
Total Losses (in)......	30.00294	28.46411	30.11964	29.29868	30.43187
Remaining Depth (in)...	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	9.36963	1.13575	10.02148	4.99489	12.17725
Total Impervious Area					
Total Runoff Depth (in)	34.24344	33.92915	33.76325	33.12702	34.05111
Peak Runoff Rate (cfs).	0.70095	1.25987	1.64345	3.94479	1.01953
Impervious Area with depression storage					
Total Runoff Depth (in)	34.24344	33.92915	33.76325	33.12702	34.05111
Peak Runoff Rate (cfs).	0.70095	1.25987	1.64345	3.94479	1.01953
Impervious Area without depression storage					

```
Total Runoff Depth (in)          0.00000          0.00000          0.00000          0.00000          0.00000
Peak Runoff Rate (cfs).          0.00000          0.00000          0.00000          0.00000          0.00000
Total Area
----------
Total Runoff Depth (in)          9.41388         21.78752         10.56765         18.53760          8.99678
Peak Runoff Rate (cfs).         10.07058          2.39562         11.66493          8.93967         13.19678
Unit Runoff (in/hr)....          0.57645          0.76294          0.56958          0.72739          0.51935
Rational Formula
----------------
Pervious Tc. (mins)....          0.00000          0.00000          0.00000          0.00000          0.00000
Perv. Intensity (in/hr)          0.00000          0.00000          0.00000          0.00000          0.00000
Pervious C ............          0.00000          0.00000          0.00000          0.00000          0.00000
Impervious Tc. (mins)..          0.00000          0.00000          0.00000          0.00000          0.00000
Imp. Intensity (in/hr).          0.00000          0.00000          0.00000          0.00000          0.00000
Impervious C ..........          0.00000          0.00000          0.00000          0.00000          0.00000
Partial Area (Ha)......          0.00000          0.00000          0.00000          0.00000          0.00000
Partial Area Tc........          0.00000          0.00000          0.00000          0.00000          0.00000
Partial Area Intensity.          0.00000          0.00000          0.00000          0.00000          0.00000


RANGE AND SCALE ARE ZERO ON PLOT ATTEMPT FOR LOCATION: FLOW SUM


RANGE AND SCALE ARE ZERO ON PLOT ATTEMPT FOR LOCATION: INFILTRA

===> Runoff simulation ended normally.
===> XP-SWMM Simulation ended normally.
===> Your input file was named  : E:\1998\98216\98216HMP.VVP\Calculations & Data\Watershed\XP\Avg\vv.DAT

===> Your output file was named : E:\1998\98216\98216HMP.VVP\Calculations & Data\Watershed\XP\Avg\vv.out


*===============================================================*
|             SWMM Simulation Date and Time Summary             |
*===============================================================*
| Starting Date... April      19, 2005  Time...   13:33:46: 5  |
|   Ending Date... April      19, 2005  Time...   13:34:10:16  |
|  Elapsed Time...    0.40183 minutes or     24.11000 seconds  |
*===============================================================*
```