Lincoln Complex

Drainage Master Plan

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City of Albuquerque

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ALBUQUERQUE PUBLIC SCHOOLS
LINCOLN COMPLEX
DRAINAGE MASTER PLAN

OCTOBER 2011

REVISED DECEMBER 2011

I, Vancel S. Fossinger, P.E., do hereby certify that this report was prepared under my direction and review and that I am a duly registered Professional Engineer under the laws of the State of New Mexico.

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Table of Contents

List of Figures

List of Tables

Appendix

1 Introduction

The Albuquerque Public Schools (APS) Lincoln Complex is located in the City of Albuquerque. The complex primarily functions as the day-to-day food preparation and distribution center and the maintenance and operations hub for the school system. The complex provides construction, design, and environmental planning services, has a data center, and also provides salvage and excess materials storage. The Lincoln complex also includes Milne Stadium and Milne Soccer Field.

The master plan for a significant portion of the Lincoln Complex is currently being revised. The revised master plan will propose removing and replacing obsolete buildings and create better campus circulation by consolidating work and parking areas, increasing both pedestrian and vehicular safety.

1.1 Purpose

The purpose of this report is to evaluate existing on-site drainage conditions and recommend drainage patterns and concepts for drainage system infrastructure improvements required for the proposed redevelopment of the campus. At the time of this analysis specific details regarding the phasing of the various elements of the proposed redevelopment are not known. Thus, this document provides drainage planning required for the ultimate or full build-out condition.

It is anticipated that future independent drainage studies detailing the individual or phased site improvements will be provided to expand on the site recommendations provided with this report and address conditions that will exist in a partial redeveloped condition.

1.2 Existing Reports and Plans

The following previous reports and plans were used to help aid in hydrologic and hydraulic analyses.

“Albuquerque Public Schools, Lincoln Complex Draft Master Plan, dated August 12, 2011, by Design Plus.

City of Albuquerque Maps and Records, Storm Sewer Inventory Sheet K-15, not dated, provided by the City of Albuquerque, June 2011.

“Draft - APS Lincoln Complex Master Plan”, dated May 2011, by ARC Larkin Group NM, Inc.

“Grading and Drainage Plan - Milne Stadium Locker Room Addition,” by Wilson & Company, stamped 2-19-07.

"Albuquerque Public Schools - Milne Stadium Field House - Additions and Improvements – Milne and Wilson Stadiums – Site Survey", by Wilson & Company, dated Nov. 15, 2006.

"Albuquerque Public Schools - Milne Stadium - 30" ADS SD Relocation, by Wilson & Company, dated August 2004.

"Grading and Drainage Plan - Milne Stadium", by Wilson & Company, stamped 8-23-04.

"Paving and Drainage Modifications, APS M&O Control Center, by Jeff Mortenson & Associates Inc., stamped 07-18-2001.

"Composite Topographic Survey, Portion of Tract C-1, Central Office Addition", by Jeff Mortenson & Associates Inc. dated 03-2000.

"Plat of Tracts A through D, A.P.S. Central Office Addition", by Jeff Mortenson & Associates Inc., dated February 1989, recorded April 20, 1990.

"Aerial Based Topographic Survey, Tracts B and C, A.P.S. Central Office Addition", by Jeff Mortenson & Associates Inc. dated 01-1999.

"APS Warehouse Milne Stadium & Data Processing Additions, dated Dec. 1981, by Sample/McMurray Architects.

Milne Field Construction plan, author and date not available, provided by Albuquerque Public Schools.

The above plans and reports provided information regarding existing infrastructure, grading and drainage assumptions, and boundary information that served as guidelines for the development of the proposed Drainage Master Plan. The surveyed topographic information provided in the above plans was utilized to supplement LIDAR generated on-site contour data, to more closely reflect current grading conditions. It should be noted that only the LIDAR contour data is illustrated on the drainage maps included in this report.

1.3 Site Location

The Albuquerque Public Schools (APS) Lincoln Complex is sited on approximately 53 acres of land located to the southeast of downtown Albuquerque (see Figure 1, Vicinity Map, on the following page). The physical address of the Albuquerque Public Schools Lincoln Complex is 915 Locust Street. The site is bounded on the north by Halzendine Road and a 3.5± acre privately owned tract and to the west by Locust Street and Interstate 25 (I-25). The site is bounded on the south by Basehart Road S.E., the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) South Diversion Channel, and undeveloped lands owned by University of New Mexico. To the east, the site is bounded by Spruce Street S.E., Roosevelt Park, and portions of the Central New

Mexico Community College campus. As an additional reference, this site can also be located within the southeast corner of K-14 and southwest corner of K-15 on the Albuquerque Zone Atlas Map.

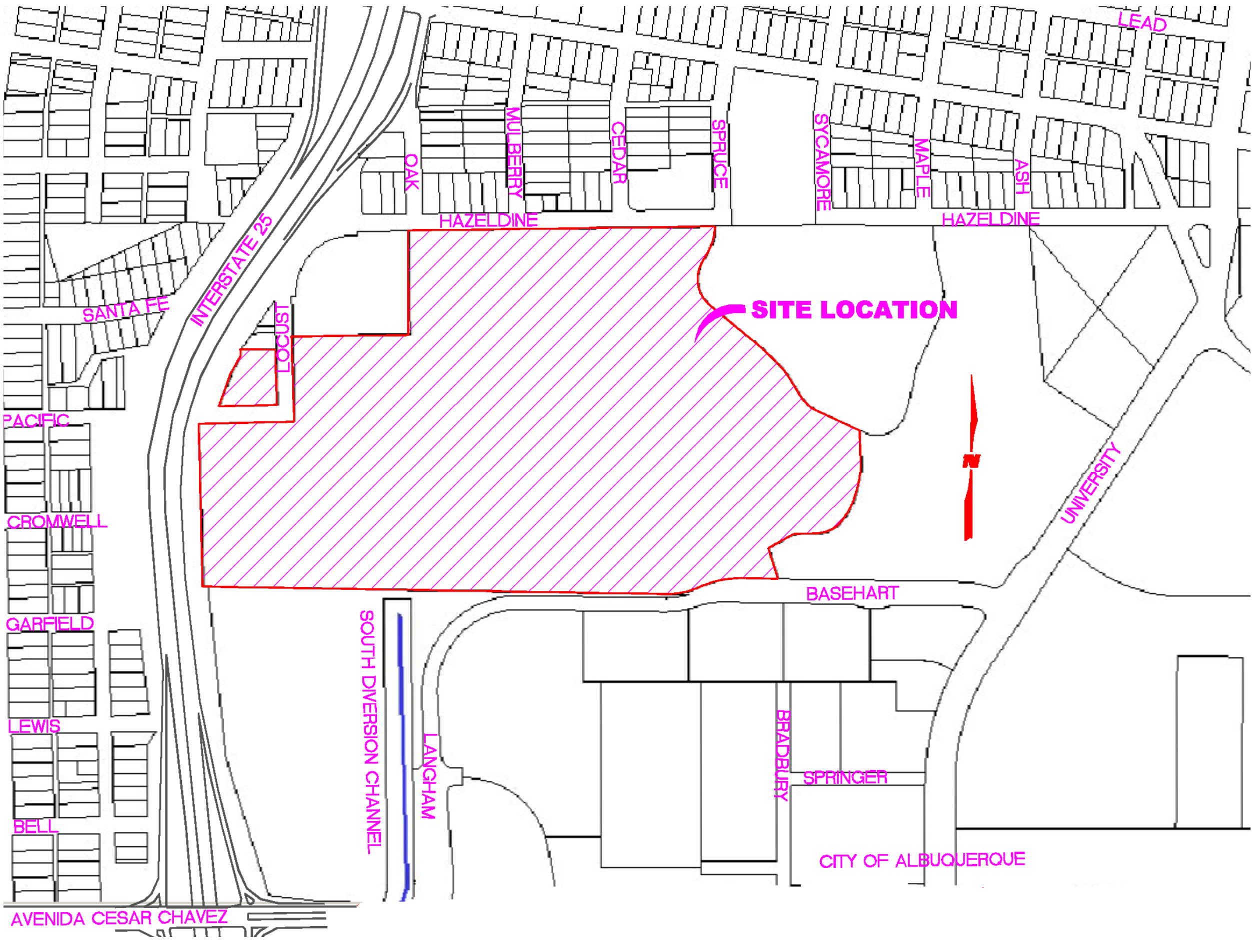


Figure 1: Vicinity Map

No portion of the existing site is located within a FEMA designated flood hazard zone as illustrated on FEMA Flood Insurance Rate Map (F.I.R.M.) Map Number 35001C0334G, revised September 26, 2008. The map does indicate the presence of a Zone A floodplain located directly south of the site. This floodplain is associated with the South Diversion Channel. A copy of the F.I.R.M. map is included within Appendix A of this report.

1.4 Planning History

Design and construction plans that were obtained from the APS facilities planning and construction office (see Section 1.2) where utilized as historical planning information for the site.

2 Hydrology

The majority of the APS Lincoln Complex is located within the South Diversion Channel watershed which ultimately discharges to Rio Grande. This area lies within Precipitation Zone 2 as defined in Section 22.2 of the DPM. However, due to the size of the analyzed watershed, precipitation was determined using NOAA Atlas 14. Basin peak flows and volumes for the studied area were computed using AHYMO.

2.1 Methodology

The AHYMO Computer Program follows the procedures outlined in Chapter 22 of the City of Albuquerque Development Process Manual (DPM), July 1997. The program's input parameters were created by Albuquerque Metropolitan Arroyo and Flood Control Authority (AMAFCA), in conjunction with the City of Albuquerque. The storm events analyzed were the 100-Year 6-hour and 24-hour events.

2.2 Design Storm Precipitation

Two design storm events were considered for the analysis of the existing and proposed drainage systems. The 100-Year, 6-hour event storm was utilized in calculating peak runoff and the 100-Year, 24-hour event storm was utilized in determining runoff volumes. NOAA Atlas 14, indicates that precipitation depths for the APS campus are P_{60}=1.80", P_{360}=2.27", and P_{1440}=2.62" for 100-Year Average Recurrence Interval (AVI) respectively.

2.3 Land Treatments

Four land treatments are defined by the DPM. Table A-4 of Section 22.2 of the DPM describes land conditions for each treatment. The following sections describe how the percentages of land treatments were determined for use in the current analysis.

2.3.1 Existing Land Treatment

Existing offsite and on-site land treatments were delineated using 2008 aerial photography acquired from the Bernalillo County Website, 2004 LIDAR contour data, and historical construction and survey drawings. Soil information for the site was obtained from the NRCS Web Soil Survey. A copy of the soils map is included in Appendix B.

2.3.2 Proposed Land Treatment

The revised campus Master Plan (see Figure 7, page 34) illustrates the proposed location and approximate sizes of future buildings, parking lots, roadway systems and landscaping areas. At the time of this report, specific site planning regarding final grading and landscaping have not been thoroughly developed. Thus, some assumptions regarding the land use percentages for specific areas were made. With the exception of new landscaped areas and the anticipated sporadic involvement of landscaping within the plaza areas, a large percentage of the site will remain impervious. Land use assumptions for the areas designated for landscaping have been divided into two categories, as described below.

- Where steep hillsides have been shown to receive landscaping, land use treatments were considered to be treatment ‘C’. The use of this treatment anticipates that the steep sloped areas will likely receive desert landscaping or gravel.

- Where proposed landscaping correlates with relatively flat slopes, such as those in landscaped medians and large areas adjacent to buildings, a land use ratio of 50% ‘B’ and 50% ‘C’ was used to account for the probability of a combination of irrigated areas and desert landscaping mixed with some areas compacted by human activity.

- The large plaza area between the Central Kitchen and the Lincoln Building is anticipated to have sporadic irrigated and desert type landscaping with the remainder of the area impervious. Percentages of treatments in this area were assumed to be 2% ‘B’, 2% ‘C’ and 96% ‘D’.

- Where on-site water quality treatment ponds are proposed, a 70% ‘B’ and 30% ‘D’ land treatments were utilized.

2.4 Time of Concentration

In accordance with the DPM Chapter 22, equation B-9, the time to peak (t_p) is equal to 2/3 of the time of concentration (t_c). Times of concentration for the existing and proposed sub-basins utilized in the on-site hydrologic analysis have been estimated to be 12 minutes or less. Thus, in accordance with the DPM, minimum time to peak values of 0.1333 hours where utilized in the AHYMO model.

A non-detailed hydrologic analysis of a large offsite basin was also conducted in the preparation of this drainage master plan. This analysis looked at estimating runoff that could potentially reach the large storm drain system which passes through the subject site. Times of concentration for this portion of the analysis were computed within AHYMO using the “Compute LT TP” command, which is based on the SCS Upland Method. Flow paths, routing lengths, and slopes utilized as input for the Upland Method were determined for the offsite areas using and 2010 USGS topography.

2.5 Peak Discharge Rates

Peak discharge rates for existing and proposed conditions were calculated using AHYMO computer program as outlined in DPM, Chapter 22. Soils report data obtained from the NRCS Web Soil Survey indicated that the primary soils in and around the subject site are classified as Hydraulic Soil Group A and as Cut and Fill Lands. These soils are typically well-drained and have low runoff potential. For the purposes of the analysis, bulking factors between 1.03 and 1.10 (3-10% sediment by volume) were utilized in determining peak discharge rates from contributing watersheds containing undeveloped and unpaved areas. Peak discharge rates for the existing and proposed conditions are presented in Tables 1 through 4 in Section 4 of this report.

3 Hydraulics

Basic hydraulic capacity calculations were performed on the proposed storm sewer system using Flowmaster by Bentley. An approximate hydraulic grade line evaluation was performed using the adjusted loss coefficients 'K' calculation per procedures present in FHWA HEC-22. Friction losses were based upon full pipe flow. Refer to Appendix D for calculations.

4 Hydrologic and Hydraulic Analysis

4.1 Existing Site Description

As illustrated in Figure 2, Site Map (see below), and Figures 4 and 5 (pages 18 and 19) the existing complex is developed. With the exception of the Milne Track and Soccer Fields and a few exposed steep slopes, the complex is mostly impervious. The existing complex includes several buildings, parking lots, and storage areas which are occasionally interrupted by both formal and informal streets.

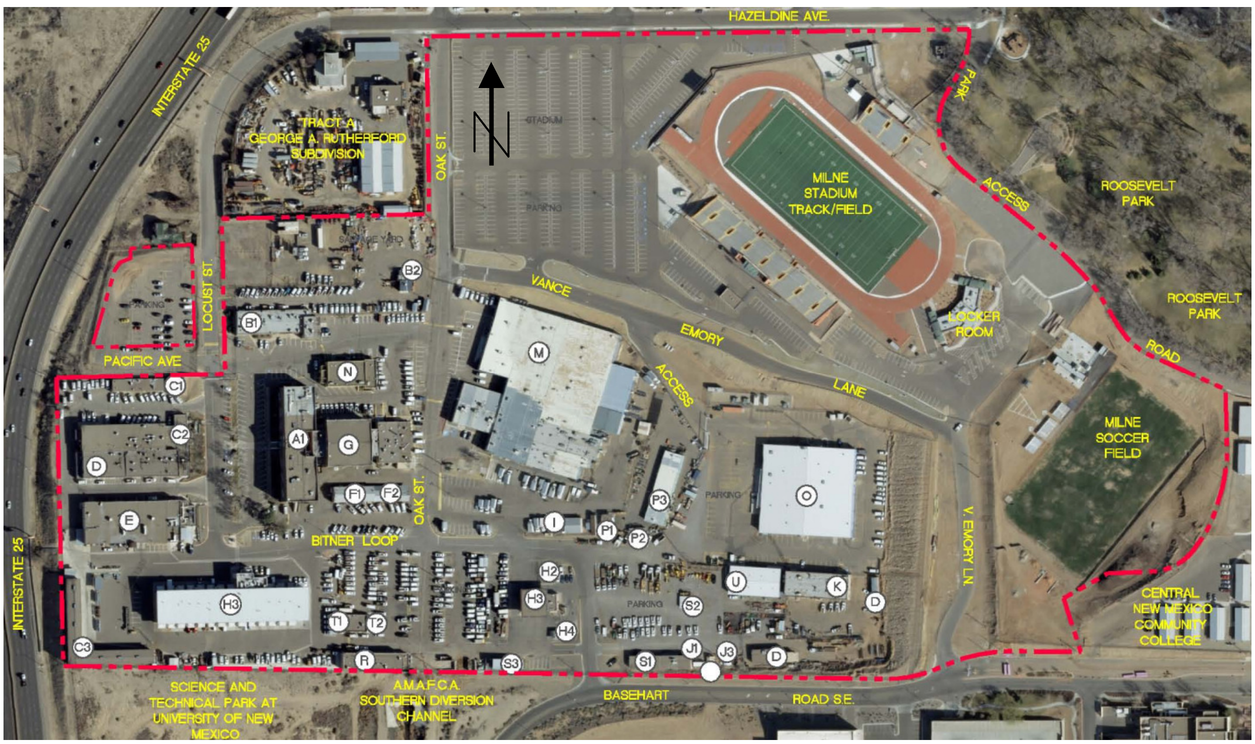


Figure 2: Site Map

Vegetation across the site is minimal, with some landscape plantings around portions of Milne Stadium and between the Maintenance & Operation and Administrative Office (Building A1) and Repair Shop (Building C2), where a few trees and irrigated lawn area are present. With the exception of the southeast corner of the site, impacts from offsite surface drainage are limited. A slight ridgeline largely coincides with the north boundary. Existing on-site topography slopes generally from the northeast to the southwest with generally mild slopes. The presence of large buildings, roadway corridors and a high point located near the northwest corner of the site causes some deviation from the general pattern.

The site relies primarily upon surface conveyance to direct runoff to one of six primary surface discharge locations. These locations include; Locust Street, three other points along the western boundary that discharge to the I-25 Right-of-Way, and two points located along the southern boundary which include the South Diversion Channel and Basehart Drive at Vance Emory Lane.

The use of storm sewer systems for the collection of on-site runoff is primarily limited to the northeast corner of the site where underground systems with inlets collect and convey runoff from Milne Stadium, stadium parking lots and from a portion of Vance Emory Drive. Another small underground system runs east from Oak Street towards the Data Center (Building O) and collects runoff from two existing low points. Both of the collection systems discharge to a large 108" reinforced concrete pipe which runs north-south under Oak Street and the southern parking area and discharges to AMAFCA's South Diversion Channel.

Currently the site is accessible by two entrances along the north side at Oak and Locust Streets and also by two entrances located off of Basehart Road along the southern boundary (Bitner Loop and Vance Emory Lane).

4.2 Existing Conditions Analysis

The following sections discuss existing site drainage patterns and define drainage issues that have been identified through analysis and an on-site inspection. Figure 5 on page 19 depicts the existing drainage patterns, analysis basins, design points, flow rates and volumes associated with the existing condition. Peak flow rates, volumes, and basin areas are also provided in Table 1 on Page 15. A map which summarizes drainage concerns associated with the existing site condition is included as Figure 4 on Page 18.

For the purposes of discussion, the site has been sub-divided into five geographic regions which include; the southeast, northeast, south central, southwest and northwest areas. The exterior boundaries of the regions, which also serve as boundaries for the individual watershed basins, are shown in light orange on Figure 10 and are further identified on the map as S.E, N.E., S.C., S.W. and N.W.

4.2.1 Southeast Region (S.E.)

The Southeast Region includes Milne Soccer Fields, portion of Vance Emory Drive, portions of Basehart Road and Central New Mexico Community College and University of New Mexico campuses. The area has been subdivided into on-site basins 101, 102, and 103 and offsite basins OS-A, OS-B and OS-C. The total analyzed watershed for this region encompasses approximately 32.7 acres. Currently runoff from this area is primarily discharged to Basehart Street.

In the existing condition, runoff produced within Basins OS-C and Basin 101 is conveyed towards Basehart Road via a berm/swale to a small informal ponding area located at **Design Point 1 (DP-1)** (refer to Figure 5, page 19). Based on supplemental topography, the existing ponding area is insufficient to retain the contributing runoff in large event storms. Thus, the berm is likely to be overtopped and breached. Runoff breaching the berm is anticipated to erode the adjacent steep slope area and combine with runoff in Basin 102.

Runoff produced within Basin 102 is conveyed via a berm/swale located along the west edge of the basin towards Basehart Road and **Design Point 2 (DP-2).** As existing grades within Basin 102 are relatively flat, ponding within the corridor adjacent to the existing berm likely occurs. Large rills are evident on the steep slope below Basin 102, where past efforts to stabilize the slope have included placing concrete riprap on the hillside. It is likely that a large percentage of the erosion along the hillside may have occurred prior to construction or improvement of the existing berm and thus may not be representative of current drainage deficiencies. However if the berm is not maintained, overtopping and breaching is possible.

Near **DP-2,** at the northwest corner of the intersection, a small circular 10-12" grated area drain is present. In its current condition the existing area drain does not provide significant collection of runoff conveyed by the berm/swale due to both the small size of the drain and limited achievable headwater. Runoff bypassing the inlet is discharged into Basehart Road to **Design Point 3 (DP-3)**, or is diverted into Basin 121 over a steep erodible slope.

Similar rilling of the steep slopes along the southern property line were also noted during the site inspection. Analysis of the conveyance capacity of north half of Basehart Road at and below **DP-3** indicates that the roadway is sufficient to convey the 100-Year storm event produced within Basins OS-C, 101, 102 and 103, if approximately 70% of the runoff from upstream watershed (Basins OS-A and OS-B) can be collected by the existing offsite drainage systems. This interception rate seems practical given the existing systems sizes and pipe grades. Thus, it does not appear that the erosion is caused by insufficient adjacent street conveyance capacity in Basehart Road.

It is anticipated that erosion along the southern property line may be the result of a combination of factors. Inspection of the area indicated that the existing berm which conveys runoff to **DP-2**, the small area drain, and then toward Basehart Road stops short of the north Basehart curb line. Although the area generally slopes towards the roadway and **DP-3,** it is plausible that small portion of the runoff is retained behind the curb at this location. Additionally, the geometry and topography associated with the Basehart/Vance Emory Lane intersection, likely result in runoff in Basehart being concentrated at and directed to the southwest curb return where it likely jumps the curb. Calculations provided in the appendix indicate that a hydraulic jump of approximately 0.8' may occur at the return in the 100-Year event. A hydraulic jump will divert a portion of the roadway flows behind the curb return and towards the adjacent slope area on the south edge of the site.

4.2.2 Northeast Region (N.E.) and 108" Main

The Northeast Region consists of the Milne Stadium facilities, parking lots, portions of Vance Emory Drive, an area north and east of the Central Kitchen, as well as a small portion of Spruce Avenue. This area has been subdivided into ten on-site basins (Basins 104-113) and one offsite basin (OS-D) with a total contributing watershed area of approximately 18.6 acres. Currently, runoff from this area is primarily collected in a storm sewer and discharged to existing 108" storm sewer.

Runoff produced within Basins 104 is collected and conveyed by a series of inlets and an existing 18" storm drain and discharged thru a concrete headwall outlet structure to Vance Emory Lane. Hydraulic Grade line calculations provided in Appendix D indicate that the existing facility appears to be sufficient to convey the developed runoff. The runoff from Basins 104, 105 and 106 is conveyed within the street section of Vance Emory Lane to a pair of at-grade inlets located behind the Central Kitchen at **Design Points 4** and **5 (DP-4 and 5).** Runoff in excess of the inlet capacity continues southeast in an unnamed roadway located near the northeast corner of the Central Kitchen.

Erosion was noted on the steep slope adjacent to the south curb of Vance Emory Drive approximately halfway between southeast entrance to the stadium and the access roadway behind the Central Kitchen. It is likely that the erosion in this area is due to flow jumping behind the curb at a transition in curb alignment and shape.

Runoff produced within Basin 107 combines with bypass flow from **DP-4** and **5** at **Design Point 6 (DP-6)**. Currently insufficient drainage exists around the north and east sides of the Central Kitchen due to lack of vertical relief, resulting in occasional flooding of the structure. Evidence of sandbagging and soil piled against the existing structure to mitigate the flooding was noted during the site inspection. Based on elevations provided by construction drawings and limited hydraulic capacity, the existing storm sewer in Vance Emory Lane does not appear to be a feasible outfall for the problematic areas adjacent to the Central Kitchen.

Runoff developed with Basins OS-D, 108, and 109 is conveyed through the southern stadium parking areas and a portion of Vance Emory Lane to **Design Point 7 (DP-7).** Prior to reaching **DP-7**, runoff conveyed within the superelevated street section of Vance Emory Lane is forced to overtop a speed bump. Erosion of the earthen slope directly adjacent to the speed bump was noted during the site inspection. The erosion is likely the result of a hydraulic jump that occurs at the speed bump. A simplistic hydraulic jump calculation performed at this location indicated 100-Year sequent depths of 1.3' at this location at the speed bump.

Runoff continuing within the street section is intercepted by an at-grade inlet located at **DP-7.** Intercepted runoff at **DP-7** combines with flows from **DP 4 & 5** in a 24" storm drain at storm sewer **Design Point 8 (DP-8)**. Runoff in excess of inlet capacity continues south as surface runoff in Oak Street. Runoff from Basin 113 as well as minor bypass flow from an inlet located within Basin 112 is collected in a single sump inlet located at the southwest corner of the stadium lot. Runoff collected at the inlet combines with flows from **DP-8** within a 30” storm sewer at storm sewer **Design Point 9 (DP-9)**. The 30” storm sewer continues north under stadium parking lot.

Runoff produced within the stadium (Basin 111) is collected by several area drains located around the perimeter of the track. Cursory analysis of the existing stadium drainage system (based upon construction drawing acquired from APS), suggests that limited headwater and flat slopes associated with the small, 8-12” storm mains limit the ability of the system to collect and convey local runoff which likely results in minor ponding around the track and field area during larger storms events. Flows discharged from the stadium at storm sewer **Design Point 10 (DP-10)** are conveyed toward Oak Street in a 24” Steel and downstream 30” corrugated metal pipe (CMP). Runoff collected by the 30” CMP combines with flows from **DP-9** at storm sewer **Design Point 11 (DP-11)** (Calculations detailing the conveyance limitations of the stadium system are included in Appendix D). The combined runoff at **DP-11** is then discharged to the 108” storm main located under Oak Drive (storm sewer **Design Points12/12A**).

It should be noted that construction drawings indicate the presence of an 18” storm sewer which extends from the storm drain system under Vance Emory Lane to the south side of the stadium. However, no physical surface evidence of this storm sewer was located.

As previously mentioned, a large **108” Reinforced Concrete Pipe (RCP) storm sewer main** passes through the central portion of the site and conveys runoff to the South Diversion Channel. The primary function of this storm sewer main is to convey runoff from a large offsite watershed located north and east of the subject site. The 108” main also conveys runoff intercepted from on-site areas (storm sewer **Design Points 12 &16**). Given this, a non-detailed analysis of the offsite runoff contributed to and the upstream conveyance capacity of the 108” storm sewer main was performed to estimate the potential hydraulic capacity of the main as it crosses through the Lincoln Complex.

Review of both the offsite topography and storm sewer inventory map, provided by the City of Albuquerque, indicate that the existing 108” RCP is the largest leg of a storm sewer system with multiple outfalls which has been estimated to collect runoff from as much as approximately 660 acres. A map illustrating the offsite watershed and the Lincoln Complex is shown as Figure 3 on the following page. The configuration of the system appears to be such that runoff in excess of the system inlet or pipe capacity is diverted down streets or to separate storm sewer outfalls. This diverted flow does not impact the Lincoln Complex.

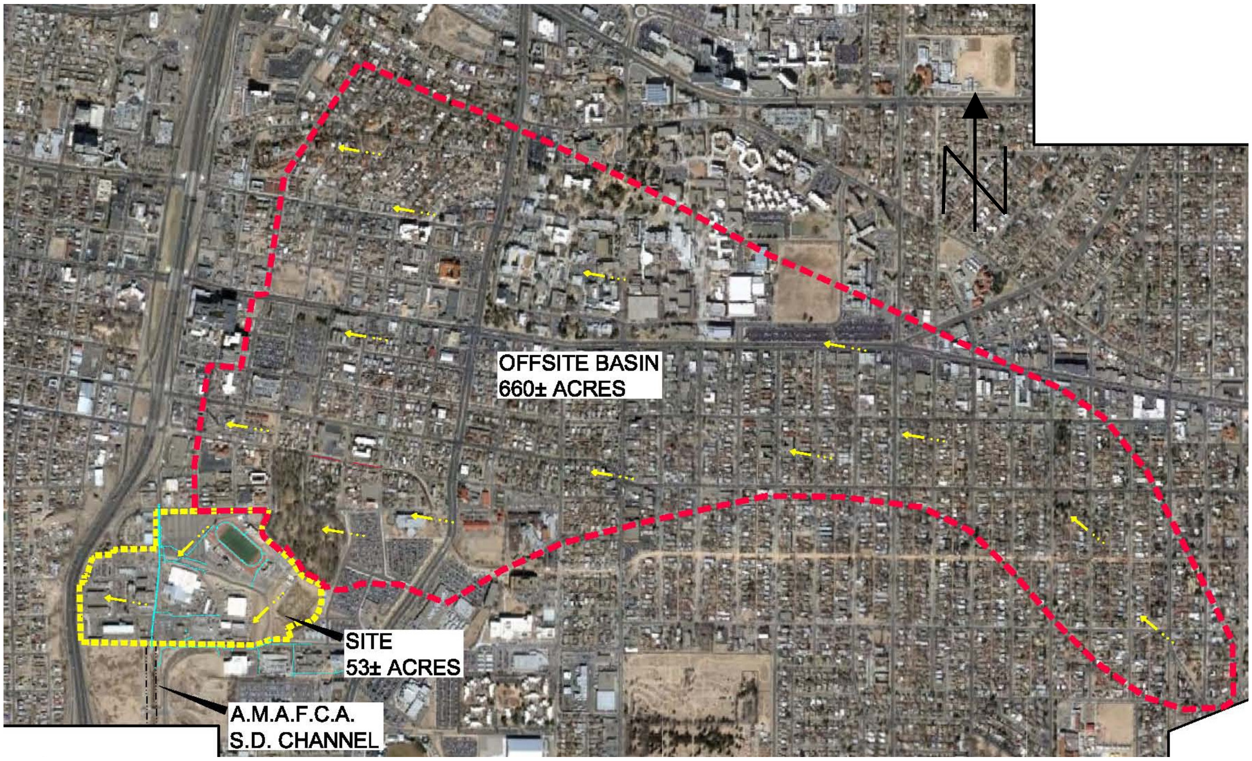


Figure 3: Offsite Watershed of the 108" Storm Sewer Main Map

An AHYMO model was developed based on the general land use and topographic characteristics of the apparent watershed that has potential to contribute to the 108" main (refer to Existing Hydrology section in Appendix D). The model calculated that runoff produced within the 660 acre watershed will reach a peak flow rate of 1573 cfs in the 100-Year 6-hour storm event.

This flow was judged to be well in excess of the capacity of the main and thus a simplistic analysis was performed to estimate how much of this flow might reach the portion of the main through the Lincoln Complex. Offsite topographic mapping indicates the presence of a low lying area located north of the Lincoln Complex (between Coal and Hazeldine Avenues). Based upon the inventory map, the 108" storm drain has manholes in this low lying area as well as connections to another system which possess inlets. These manholes and inlets will allow for runoff to be discharged to the surface and will limit the headwater that can be achieved between low lying area and the Lincoln Complex.

For the purpose of this analysis the maximum 108" main line capacity between the low area and the Lincoln Complex was estimated as full pipe capacity based on the slope between the street grade at the low point and the top the 108" pipe at the north end of the complex (**DP-12**) divided by the approximate length of pipe between the two points. This slope was calculated to be 0.46%. Full pipe capacity at this slope, and assuming a manning's roughness "n" of 0.013 was calculated with a manning's equation to be 845 cfs. The calculation is included in Appendix D. This estimate of capacity is thought to be conservatively high as minor losses related to bends and manholes were ignored in the calculation.

Hydraulic grade line calculations performed on the existing systems within the Northeast Region (excluding the system inside the stadium) indicate that sufficient capacity exists within the minor systems to collect and convey runoff from the 100-Year event storm and that the 108” main has capacity to convey the runoff to the South Diversion Channel.

4.2.3 South Central Region (S.C.)

The South Central Region consists of several buildings, roadways corridors, and parking and storage areas located to the south and west of Vance Emory Lane and adjacent to the Oak Street corridor. This area has been subdivided into eleven basins (Basins 114-125) with a total watershed area of approximately 16.2 acres. Currently runoff from this area is primarily discharged as surface flow to the South Diversion Channel and to I-25 Right-of-Way at the southwest corner of the site.

Runoff produced within Basins 114-116 and bypass flows from **DP-7** are conveyed within the informal street section of Oak Street to **Design Point 13 (DP-13).** Grading within this portion of the site is relatively flat with the Oak Street corridor possessing slopes of 0.4% to 0.8%. During the site inspection asphalt spalling, which is indicative of poor drainage, was noted along the north and east of Building N and near the southeast corner the procurement building. A normal depth analysis indicated that the street has the availability to convey the 100-Year runoff through the corridor without flooding the adjacent structures. On-site topographic mapping however, does not provide enough detail to define the flooding potential of the sheet metal shop (building F2), which has its entrance is at ground level. Runoff may enter the structure in large event storms. During site inspection it was also noted that the existing roof drains along the north and south sides of the Lincoln Building discharged near unprotected stairwells. Roof drainage discharge could be problematic if flows are not properly directed away from the building.

To the east of the Central Kitchen, runoff produced within Basin 117 is directed to an area inlet located at the **Design Point 14 (DP-14)**. At **DP-14** ponding above the existing sump inlet has been estimated to reach a depth of 15” before runoff can escape the parking area toward the west. Based on the site inspection and review of the topographic mapping, ponding at this location is not anticipated to flood the adjacent structures. Runoff intercepted by the existing inlet is conveyed westward to **Design Point 15 (DP-15)** via a 12” storm drain. As conveyance of the 12” is limited, minor runoff in excess of the pipe capacity and ponding volume discharges westward on the surface to Basin 119. Insufficient grading adjacent to the east entrance of Building K was noted during the site inspection of Basin 117. The general topographic mapping indicates similar conditions may occur along the south side of Building K as well as adjacent to the Excess and Surplus Material Management Building (P3) located in Basin 119.

Runoff from **DP-6**, **DP-13**, bypass flows from **DP-14** and runoff from Basins 118 and 119 combine at a low point near the southeast corner of the Central Kitchen at **DP-15**. Despite the presence of a large 4' x 4' area drain, runoff intercepted at **DP-15** is minimal due to the limited available pipe capacity associated with the 12" outlet pipe that connect this inlet to the adjacent 108" storm sewer main.

Intercepted runoff combines with flows from **DP-14** and discharges into the 108" RCP in Oak Street (storm sewer **Design Points 16/16A**). Runoff in excess of the inlet capacity sheet flows across intersection at Bitner Loop and Oak Drive and is discharged to Basins 124, 129 and 130.

Runoff produced within Basins 120 and 121 is conveyed to a low point located to the east of the southern entrance. A 12" RCP culvert (**Design Point 17 (DP-17)**) conveys runoff westerly under the roadway. As the culvert has limited capacity, ponding depths at the upstream end of the culvert this location are anticipated to reach 18" in the 100-Year event runoff. Although ponding is likely to make accessing the Grounds Building (S1) difficult in storm events, the elevated finished floor of the building likely mitigates flood damage. Flow discharged from the culvert continues west, just north of the southern property line, to low point located east of Building R.

Runoff produced in Basin 123 is collected by an area drain and routed through a water quality treatment device. At this time the specific details regarding the outfall of the facility is unknown.

Based upon the current topographic mapping, our analysis indicates that very limited surface conveyance capacity above **Design Point 18 (DP-18)** forces a portion of the bypass flows from **DP-16** and runoff developed within Basin 124 to split in front of the Shop/Storage Building (R). This results in a portion of the runoff west to Basin 129 and the remaining portion to the south property line. The finished floor elevation of Building R does not appear to be considerably higher than the surrounding topography. Thus, it is likely that the building could be impacted by surface runoff flooding in large storm events.

Flows conveyed to the east side of the Building R combine with runoff from **DP-17** and Basin 125 at a low point at **DP-18.** It is estimated that in the 100-Year event approximately 21.6 cfs is discharged as surface runoff toward the South Diversion Channel.

The total 100-Year discharge to the South Diversion Channel from the Lincoln Complex including surface flow and flow discharged to the 108" storm sewer main is estimated at 72.7 cfs in the existing condition. Adding this flow rate to the estimated upstream 108" storm sewer conveyance capacity, results in an estimated 100-Year discharge to the head of the South Diversion Channel of 919 cfs. These flow rates are shown on Figure 5 as **DP-19** and **DP-19A**.

During site inspection no significant erosion was noted between the South Diversion Channel and the low point (**DP-18**). However the erosion potential is likely high based on the observed grading and current lack of armoring.

4.2.4 Southwest Region (S.W.)

The Southwest Region consists of several buildings, roadways corridors, and parking and storage areas. This area has been subdivided into eight on-site basins (Basins 126-133) with a total watershed area of approximately 9.1 acres. In the existing condition runoff from this region is primarily discharged to three points along the western boundary to I-25 Right-of-Way.

Runoff produced within Basins 126, 127 and 130 and bypass flows from **DP-16** are conveyed as surface flow to the south and west where they combine at **Design Point 20 (DP-20)**. A small courtyard located at the southeast corner of Building E appears to possess insufficient grading to ensure that runoff produced within and reaching the area will be directed away from the building. It is anticipated that some minor ponding and localized flooding occurs at this location. Runoff reaching **DP-20** continues west, where it combines with split flow from Basin 124 and runoff from Basins 129 and 131 at a low point located near the southwest corner of the site. The low point in the southwest corner is identified as **Design Point 21 (DP-21)**.

At **DP-21**, a 1.5' high concrete trapezoidal chase/rundown (with a 2' wide bottom and 5' wide top width) discharges runoff through and down an earthen embankment located within the adjacent I-25 Right-of-Way. The AHYMO model indicates that runoff discharged from the low point is approximately 70 cfs in the 100-Year event. The capacity of the existing chase is estimated to be approximately 19 cfs at its full 18" depth. Thus, runoff ponds to a depth of approximately 2' in large storm events, then overtops the embankment and flows into the I-25 Right-of-Way. Based on the current generalized topographic mapping, ponding adjacent the south side of Building E and flooding of the Material Storage Building (C3) appears to be likely. Erosion adjacent to the chase section and near the Material Storage Building (C3) was noted during the site inspection.

When ponding at **DP-21** is near its peak a small amount of runoff overtops a high point in the roadway behind Building E and combines with runoff produced within Basin 132 at a low point, identified as **Design Point 22 (DP-22)**. At **DP-22**, the combined runoff is discharged from the site to the I-25 Right-of-Way in a similarly sized and configured chase and rundown section. The analysis indicates that approximately 8.6 cfs will reach the low point. Ponding at **DP-22** may reach a depth of 1.2' above the low point adjacent to the Building D, in the 100-Year event, but based upon the available topography it does not appear to result in flooding of the Building D.

Runoff from Basin 133 (which includes only a small portion of the Lincoln site, the remainder is existing City Right-of-Way) is conveyed westward to a low point at the northeast corner of the property defined as **Design Point 23 (DP-23)**. At **DP-23**, runoff is discharged to the steep unarmored slope in the I-25 Right-of-Way. Although the runoff is from a small area, erosion of the embankment and sedimentation in the existing swale adjacent to the interstate was noted during site inspection.

4.2.5 Northwest Region (N.W.)

The Northwest Region consists of an employee parking area, Buildings B1 and B2 and a salvage yard as well as a portion of Locust Street. This area has been subdivided into two on-site basins (Basins 134-135) and a single offsite Basin (OSE) with a total watershed area of approximately 3.7 acres.

Runoff produced within Basins 134 and 135 is conveyed as sheet flow through the existing salvage yard and gravel parking towards Locust Street (Basin OS-E). Runoff reaching the site boundary at **Design Point 24 (DP-24)** has been estimated to reach 14 cfs in the 100-Year event.

4.2.6 Existing Conditions Hydrologic Analysis Summaries

The following table summarizes the assumptions for land use, watershed areas, peak flow rates, and runoff volumes associated with the 40 analyzed sub-basins.

Table 1: Existing Sub-basin Peak Discharge and Volumes

Sub-Basin	Area (Ac)	Land Treatment Percentage (%)				Q_{100} 6-HR (cfs)	V_{100} 24-HR (ac-ft)
		A	B	C	D		
OS-A	18.01	0	18	4	78	69.9	3.10
OS-B	7.90	0	0	8	92	33.4	1.53
OS-C	0.90	0	0	44	56	3.8	0.16
OS-D	0.54	0	0	0	100	2.3	0.11
OS-E	0.33	0	0	0	100	1.5	0.07
101	4.40	0	44	53	3	12.2	0.35
102	1.33	0	0	77	23	4.7	0.16
103	0.18	0	0	79	21	0.6	0.02
104	0.85	0	0	20	80	3.5	0.15
105	0.70	0	0	0	100	3.1	0.14
106	0.37	0	0	0	100	1.6	0.08
107	1.73	0	0	38	62	6.6	0.27
108	1.92	0	0	16	84	9.4	0.42
109	1.65	0	0	0	100	7.2	0.34
110	0.60	0	0	72	28	2.0	0.07
111	2.42	0	0	0	100	23.5	1.07
112	5.58	0	0	10	90	14.2	0.66
113	2.27	0	0	0	100	6.2	0.29
114	0.71	0	0	0	100	3.1	0.14
115	1.62	0	0	4	96	7.2	0.33

116	1.57	0	0	0	100	6.8	0.32
117	3.72	0	0	27	73	15.2	0.66
118	1.25	0	0	85	15	4.1	0.13
119	3.45	0	0	16	84	14.2	0.64
120	1.61	0	0	82	18	0.6	0.02
121	0.21	0	0	100	0	5.3	0.18
122	0.00	0	0	0	100	0.0	0.00
123	0.08	0	0	0	100	0.4	0.02
124	0.97	0	0	0	100	4.2	0.20
125	0.97	0	0	0	100	4.2	0.20
126	0.94	0	11	0	89	3.9	0.18
127	0.70	0	9	0	91	2.9	0.13
128	0.17	0	0	0	100	0.8	0.04
129	2.50	0	0	0	100	10.9	0.51
130	1.60	0	0	0	100	7.0	0.33
131	0.75	0	0	0	100	3.3	0.15
132	1.98	0	0	0	100	8.6	0.40
133	0.41	0	0	0	100	1.8	0.08
134	0.86	0	0	6	94	3.8	0.17
135	2.52	0	0	69	31	8.7	0.31

The following table summarizes the contributing peak flow rates and runoff volumes at 27 Design Points.

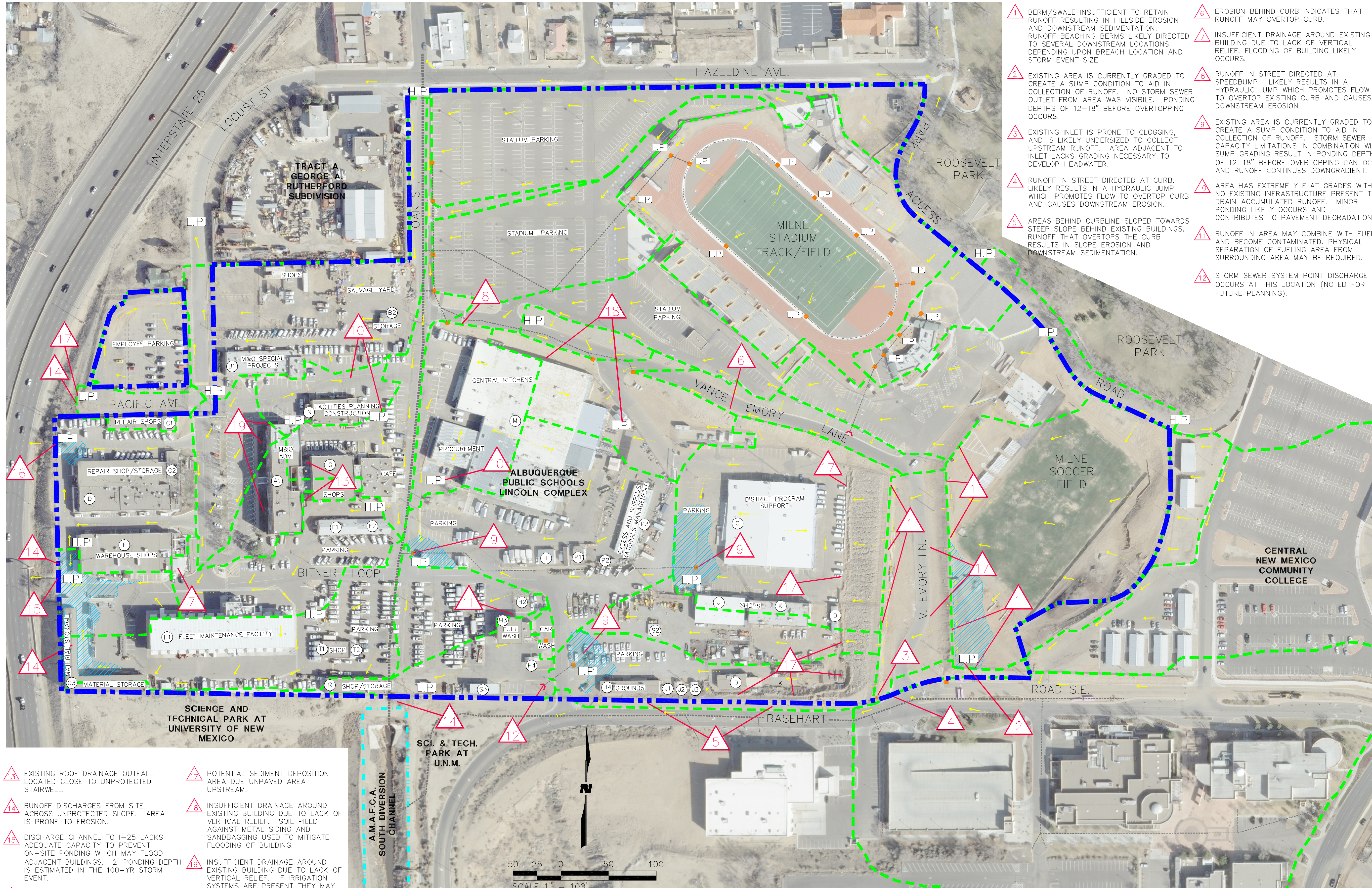
Table 2: Existing Design Point Peak Discharge and Volumes

Design Point	Q_{100} 6-HR (cfs)	V_{100} 24-HR (ac-ft)
DP-1	16.0	0.51
DP-2	4.7	0.16
DP-3	52.3 *	2.07 *
DP-4	6.5	0.30
DP-5	1.6	0.08
DP-6	10.5	0.38
DP-7	18.9	0.87
DP-8	9.6	0.70
DP-9	15.9	0.99
DP-10	13.0	0.95
DP-11	28.9	1.94
DP-12	43.0	2.61
DP-12A	888 **	N/A

DP-13	30.7	1.23
DP-14	15.2	0.66
DP-15	59.4	2.38
DP-16	51.1	4.08
DP-16A	897 **	N/A
DP-17	6.0	0.19
DP-18	21.6	0.96
DP-19	72.7	5.04
DP-19A	919 **	N/A
DP-20	34.8	1.22
DP-21	73.2	2.48
DP-22	8.6	0.40
DP-23	1.8	0.08
DP-24	14.0	0.56

* Flow rates estimated at DP-3 assume a 70% interception from existing infrastructure located with Basins OS-A and OS-B and also Assume the Construction of the Proposed Retention Pond at Design Point 1.

** Flow Rates Reported at these Design Points are Based upon an Estimated Maximum Pipe Conveyance of 845 cfs upstream of Design Point 12A. Refer to Section 4.2.2 (page 10).



1. BERM/SWALE INSUFFICIENT TO RETAIN RUNOFF RESULTING IN HILLSIDE EROSION AND DOWNSTREAM SEDIMENTATION. RUNOFF BEACHING BERMS LIKELY DIRECTED TO SEVERAL DOWNSTREAM LOCATIONS DEPENDING UPON BREACH LOCATION AND STORM EVENT SIZE.
2. EXISTING AREA IS CURRENTLY GRADED TO CREATE A SUMP CONDITION TO AID IN COLLECTION OF RUNOFF. NO STORM SEWER OUTLET FROM AREA WAS VISIBLE. PONDING DEPTHS OF 12–18" BEFORE OVERTOPPING OCCURS.
3. EXISTING INLET IS PRONE TO CLOGGING, AND IS LIKELY UNDERSIZED TO COLLECT UPSTREAM RUNOFF. AREA ADJACENT TO INLET LACKS GRADING NECESSARY TO DEVELOP HEADWATER.
4. RUNOFF IN STREET DIRECTED AT CURB. LIKELY RESULTS IN A HYDRAULIC JUMP WHICH PROMOTES FLOW TO OVERTOP CURB AND CAUSES DOWNSTREAM EROSION.
5. AREAS BEHIND CURBLINE SLOPED TOWARDS STEEP SLOPE BEHIND EXISTING BUILDINGS. RUNOFF THAT OVERTOPS THE CURB RESULTS IN SLOPE EROSION AND DOWNSTREAM SEDIMENTATION.
6. EROSION BEHIND CURB INDICATES THAT RUNOFF MAY OVERTOP CURB.
7. INSUFFICIENT DRAINAGE AROUND EXISTING BUILDING DUE TO LACK OF VERTICAL RELIEF. FLOODING OF BUILDING LIKELY OCCURS.
8. RUNOFF IN STREET DIRECTED AT SPEEDBUMP. LIKELY RESULTS IN A HYDRAULIC JUMP WHICH PROMOTES FLOW TO OVERTOP EXISTING CURB AND CAUSES DOWNSTREAM EROSION.
9. EXISTING AREA IS CURRENTLY GRADED TO CREATE A SUMP CONDITION TO AID IN COLLECTION OF RUNOFF. STORM SEWER CAPACITY LIMITATIONS IN COMBINATION WITH SUMP GRADING RESULT IN PONDING DEPTHS OF 12–18" BEFORE OVERTOPPING CAN OCCUR AND RUNOFF CONTINUES DOWNGRADIENT.
10. AREA HAS EXTREMELY FLAT GRADES WITH NO EXISTING INFRASTRUCTURE PRESENT TO DRAIN ACCUMULATED RUNOFF. MINOR PONDING LIKELY OCCURS AND CONTRIBUTES TO PAVEMENT DEGRADATION.
11. RUNOFF IN AREA MAY COMBINE WITH FUEL AND BECOME CONTAMINATED. PHYSICAL SEPARATION OF FUELING AREA FROM SURROUNDING AREA MAY BE REQUIRED.
12. STORM SEWER SYSTEM POINT DISCHARGE OCCURS AT THIS LOCATION (NOTED FOR FUTURE PLANNING).
13. EXISTING ROOF DRAINAGE OUTFALL LOCATED CLOSE TO UNPROTECTED STAIRWELL.
14. RUNOFF DISCHARGES FROM SITE ACROSS UNPROTECTED SLOPE. AREA IS PRONE TO EROSION.
15. DISCHARGE CHANNEL TO I–25 LACKS ADEQUATE CAPACITY TO PREVENT ON–SITE PONDING WHICH MAY FLOOD ADJACENT BUILDINGS. 2' PONDING DEPTH IS ESTIMATED IN THE 100–YR STORM EVENT.
16. DISCHARGE CHANNEL TO I–25 LACKS ADEQUATE CAPACITY TO PREVENT ON–SITE PONDING. 12"–18" PONDING DEPTH IS ESTIMATED IN THE 100–YR STORM EVENT.
17. POTENTIAL SEDIMENT DEPOSITION AREA DUE UNPAVED AREA UPSTREAM.
18. INSUFFICIENT DRAINAGE AROUND EXISTING BUILDING DUE TO LACK OF VERTICAL RELIEF. SOIL PILED AGAINST METAL SIDING AND SANDBAGGING USED TO MITIGATE FLOODING OF BUILDING.
19. INSUFFICIENT DRAINAGE AROUND EXISTING BUILDING DUE TO LACK OF VERTICAL RELIEF. IF IRRIGATION SYSTEMS ARE PRESENT THEY MAY CONTRIBUTE TO PONDING OR FLOODING.
20. OVERALL SITE LACKS FACILITIES TO PROVIDE WATER QUALITY TREATMENT (ID NOT SHOWN ON MAP).

APPROXIMATE SITE BOUNDARY
EXISTING DRAINAGE BASIN BOUNDARY
DIRECTION OF DRAINAGE
EXISTING STORM SEWER
EXISTING INLET
BUILDING ID
DRAINAGE ISSUE ID
HIGH POINT H.P.
LOW POINT L.P.
APPROXIMATE PONDING LIMITS
FEMA 100 YR FLOODPLAIN BOUNDARY

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CLIENT: APS

SEAL: NOT FOR CONSTRUCTION

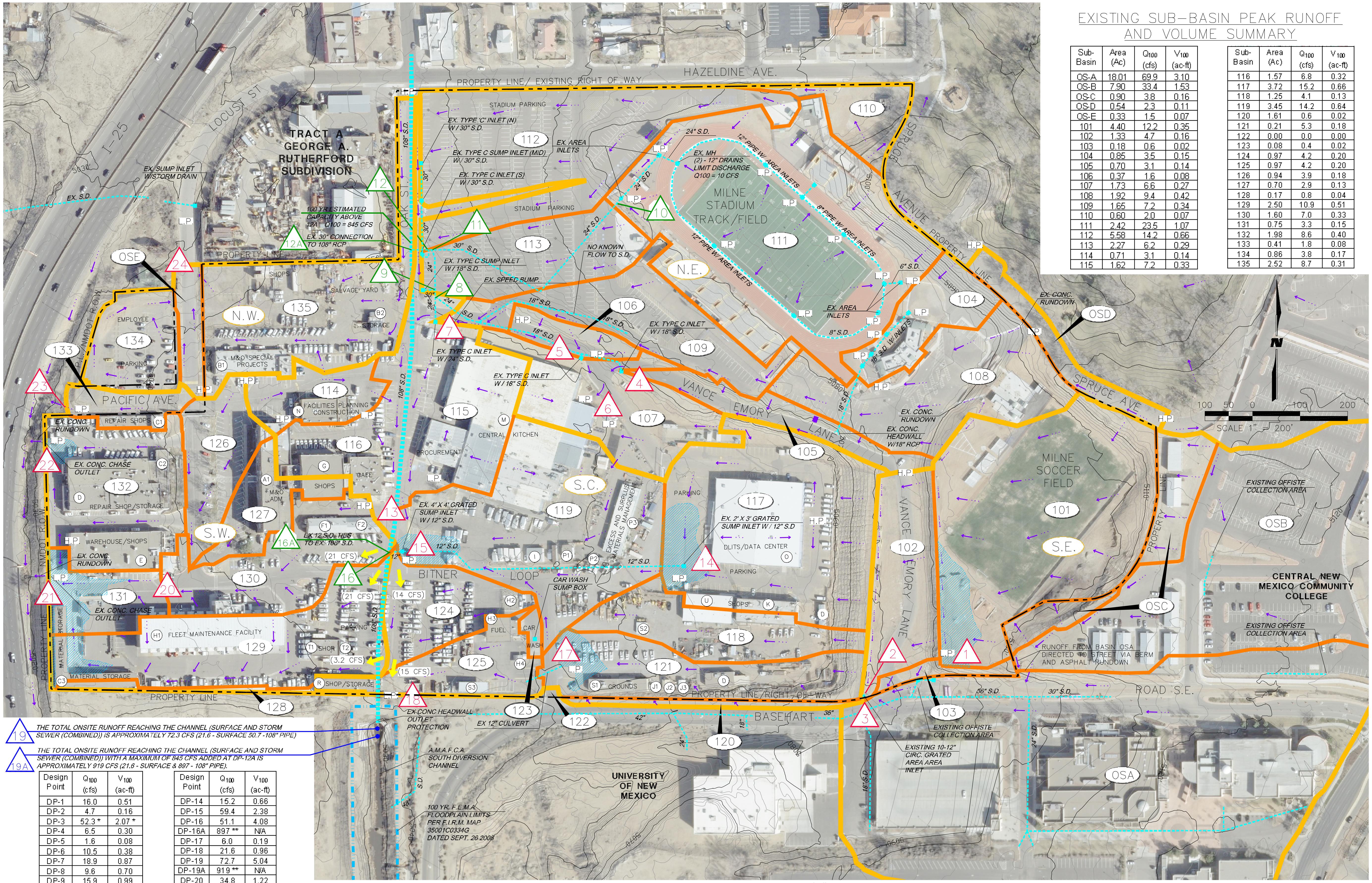
PROJECT NAME: ALBUQUERQUE PUBLIC SCHOOLS LINCOLN COMPLEX BERNALILLO COUNTY, NM

MARK	DATE	DESCRIPTION

PROJECT NO:
DESIGNED BY: DLM
DRAWN BY: DLM
CHECKED BY: VSF
DATE:

SHEET TITLE: DRAINAGE MASTER PLAN EXISTING DRAINAGE ISSUES MAP

SHEET NO: FIGURE 4



EXISTING SUB-BASIN PEAK RUNOFF AND VOLUME SUMMARY

Sub-Basin	Area (Ac)	Q_{100} (cfs)	V_{100} (ac-ft)
OS-A	18.01	69.9	3.10
OS-B	7.90	33.4	1.53
OS-C	0.90	3.8	0.16
OS-D	0.54	2.3	0.11
OS-E	0.33	1.5	0.07
101	4.40	12.2	0.35
102	1.33	4.7	0.16
103	0.18	0.6	0.02
104	0.85	3.5	0.15
105	0.70	3.1	0.14
106	0.37	1.6	0.08
107	1.73	6.6	0.27
108	1.92	9.4	0.42
109	1.65	7.2	0.34
110	0.60	2.0	0.07
111	2.42	23.5	1.07
112	5.58	14.2	0.66
113	2.27	6.2	0.29
114	0.71	3.1	0.14
115	1.62	7.2	0.33

Sub-Basin	Area (Ac)	Q_{100} (cfs)	V_{100} (ac-ft)
116	1.57	6.8	0.32
117	3.72	15.2	0.66
118	1.25	4.1	0.13
119	3.45	14.2	0.64
120	1.61	0.6	0.02
121	0.21	5.3	0.18
122	0.00	0.0	0.00
123	0.08	0.4	0.02
124	0.97	4.2	0.20
125	0.97	4.2	0.20
126	0.94	3.9	0.18
127	0.70	2.9	0.13
128	0.17	0.8	0.04
129	2.50	10.9	0.51
130	1.60	7.0	0.33
131	0.75	3.3	0.15
132	1.98	8.6	0.40
133	0.41	1.8	0.08
134	0.86	3.8	0.17
135	2.52	8.7	0.31

19 THE TOTAL ONSITE RUNOFF REACHING THE CHANNEL (SURFACE AND STORM SEWER (COMBINED)) IS APPROXIMATELY 72.3 CFS (21.6 - SURFACE 50.7 -108" PIPE)

19A THE TOTAL ONSITE RUNOFF REACHING THE CHANNEL (SURFACE AND STORM SEWER (COMBINED)) WITH A MAXIMUM OF 845 CFS ADDED AT DP-12A IS APPROXIMATELY 919 CFS (21.6 - SURFACE & 897 - 108" PIPE).

Design Point	Q_{100} (cfs)	V_{100} (ac-ft)
DP-1	16.0	0.51
DP-2	4.7	0.16
DP-3	52.3 *	2.07 *
DP-4	6.5	0.30
DP-5	1.6	0.08
DP-6	10.5	0.38
DP-7	18.9	0.87
DP-8	9.6	0.70
DP-9	15.9	0.99
DP-10	13.0	0.95
DP-11	28.9	1.94
DP-12	43.0	2.61
DP-12A	888 **	N/A
DP-13	30.7	1.23

Design Point	Q_{100} (cfs)	V_{100} (ac-ft)
DP-14	15.2	0.66
DP-15	59.4	2.38
DP-16	51.1	4.08
DP-16A	897 **	N/A
DP-17	6.0	0.19
DP-18	21.6	0.96
DP-19	72.7	5.04
DP-19A	919 **	N/A
DP-20	34.8	1.22
DP-21	73.2 ***	2.48
DP-22	8.6	0.40
DP-23	1.8	0.08
DP-24	14.0	0.56

EXISTING DESIGN POINT PEAK RUNOFF AND VOLUME SUMMARY

* FLOW RATE ESTIMATED AT DP-3 ASSUMES 70% INTERCEPTION FROM EXISTING INFRASTRUCTURE WITHING BASINS OS-A & OS-B

** FLOW RATES REPORTED AT THESE DESIGNS POINTS ARE BASED UPON A MAXIMUM PIPE CAPACITY OF 845 CFS AT DESIGN POINT 12A. REFER TO SECTION 4.2.2.

*** RUNOFF REACHING THIS LOCATION INCLUDES PORTION OF BYPASS FLOW FROM DP-15 & BASIN 124 AS WELL AS BASINS 129, 130 & 131.

LEGEND

- EXISTING INDEX CONTOUR (10') — 5410
- EXISTING NOMINAL CONTOUR (2')
- EXISTING STORM SEWER W/INLET
- PONDING AREA
- REGIONAL DRAINAGE BASIN BOUNDARY (N.E., S.E., S.C. (S.CENTRAL) S.W. N.W.)
- SUB BASIN DRAINAGE BASIN BOUNDARY
- DIRECTION OF DRAINAGE
- SWALE
- 100 YR. SPLIT FLOW (25 CFS)
- BUILDING IDENTIFIER (M)
- FEMA FLOODPLAIN BOUNDARY
- SITE BOUNDARY
- BASIN IDENTIFIER (110)
- REGIONAL DRAINAGE AREA ID (N.W.)
- DESIGN POINTS (DP) (ON SURFACE/IN STORM/COMBINED) 7 8 19

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APS

SEAL: NOT FOR CONSTRUCTION

PROJECT NAME: ALBUQUERQUE PUBLIC SCHOOLS LINCOLN COMPLEX BERNALILLO COUNTY, NM

MARK	DATE	DESCRIPTION

PROJECT NO:
DESIGNED BY: DLM
DRAWN BY: DLM
CHECKED BY: VSF
DATE:

SHEET TITLE: DRAINAGE MASTER PLAN EXISTING CONDITIONS MAP

SHEET NO: FIGURE 5

4.3 Proposed Site Description

A map illustrating the revised site master plan (without drainage infrastructure) is shown below as Figure 6. As indicated by the map, site redevelopment will not affect the Lincoln Complex in its entirety, but will focus on the day to day operations portion of the campus. The proposed redevelopment will affect approximately 31 of the 53 acres of the site. Minor changes in the proposed site boundary will be necessary to accommodate the revised roadway and building layout.

Figure 6: Proposed Site Map

As previously discussed, the primary goal of the revised master site plan is to provide improved building facilities and to create better campus circulation. Proposed changes include the removal and demolition of approximately twenty-four buildings and portable structures, construction of seven new buildings, creation of a pedestrian friendly central plaza area, redistribution and resurfacing of parking areas, creation of new looping roadway system and improvements to site landscaping.

4.4 Proposed Drainage Improvements

Proposed drainage improvements and drainage patterns to support the re-development of the Lincoln complex are shown on Figures 9 and 10 on pages 36 and 37. The primary components of the proposed plan are listed below.

- Increased collection and diversion of runoff to the 108" diameter storm sewer that crosses through the site and discharges to the South Diversion Channel.

- Decreased flow discharged to the I-25 Right-of-Way.
- Formalization and expansion of a pond south of the soccer fields.
- Addition of 2 water quality enhancement ponds and 2 water quality enhancement/detention ponds in the southern and western portions of the site.
- Utilization of surface flow where practical.
- Addition of inlets and storm sewers where surface flow is not practical.
- Utilization of existing discharge points.
- Addition of concrete drainage swales and retaining walls to facilitate drainage around exiting and proposed structures.
- Enhancement and continued maintenance of existing drainage diversion berms on the site.

4.5 Water Quality Treatment

At the time of this report the City of Albuquerque is in the process of developing new standards for water quality treatment for new and re-development projects. Based on discussions with City Development Services, the new standard will likely include either extended detention or retention of a given volume of storm water from a developed site. Gross pollutant removal, screening flow to remove large floatable debris, will also likely continue to be included in the requirements.

The proposed Drainage Master Plan includes 4 proposed water quality enhancement ponds to treat runoff from the areas of the site where redevelopment is proposed. The proposed ponds and the areas that they will provide water quality treatment for are shown on Figure 8 on Page 35. These ponds have been preliminarily sized to provide Storm Water Quality Treatment Volumes (SWQV) based on the runoff from 0.6 inches of precipitation in a 6-hour period as recommended in the current City Drainage Criteria Manual. The calculated SWQVs were increased by a factor of 1.2 to provide some allowance for sediment storage. It is assumed that the outlets from these ponds will need to incorporate screens for removal of gross pollutants and should release the SWQV over an extended period of approximately 40 hours to allow for settlement of pollutants.

Other types of structural water quality treatment facilities such as underground dynamic separators, storm water filters, and underground extended detention were considered in the development of the plan. The primary benefit of underground treatment is that less land is required for the treatment facility and thus more land is available for development. However, construction and maintenance costs are generally considerably higher and in some cases, treatment is less effective with the underground facilities. These types of facilities can be evaluated in greater detail in final design of the re-development if land area constraints become an issue.

Proposed Ponds 2 and 3 have been demonstrated to provide the additional benefit of mitigation of peak flow rates released to the I-25 Right-of-Way. The outlets for these ponds should be designed in consideration of the proposed 100-Year peak discharge rates provided in the plan. Ponds 1 and 4 will also provide peak rate mitigation inherent with routing of water through storage areas. However, their discharge points are not constrained and thus peak rate reduction through these ponds was not considered as part of this plan.

The current City standards for water quality treatment should be considered at the time of re-development of the site. Adjustments of the plan may be required to conform to the current standards.

4.6 Proposed Drainage Improvements and Analysis Details

The following sections provide detailed discussion of the proposed drainage patterns and proposed drainage improvements. Figure 9 on page 36 shows proposed drainage directions and proposed drainage facilities. Figure 10 on page 37 further depicts the proposed drainage patterns, analysis basins, design points, flow rates and volumes associated with the proposed condition. Peak flow rates, volumes, and basin areas are provided in Table 3 on Page 30.

The site has been sub-divided into five geographic regions for the discussion. The regions include the: southeast (S.E.), northeast (N.E.), south central (S.C.), southwest (S.W.) and northwest (N.W.) areas. The exterior boundaries of the regions, which also serve as boundaries for the individual watershed basins, are shown in light orange on Figure 10.

4.6.1 Southeast Region (S.E.)

The southeast region includes the Milne Soccer Fields, portions of Vance Emory Drive, portions of Basehart Road and portions of the Central New Mexico Community and University of New Mexico Campuses. Proposed site improvements for the area include the realignment of a portion of Vance Emory Lane to create bus parking areas along both sides of the roadway. Drainage improvements to the region include recommendations for the formalization and expansion of an existing pond, improvement to the existing drainage swales and berms, minor hardscaping and replacement of an area inlet as well as a small diameter storm sewer connection to provide an outfall for the existing pond. The area has been subdivided into on-site basins 201, 202, and 203 and offsite basins OS-A, OS-B and OS-C. The total analyzed watershed for this region encompasses approximately 32.7 acres.

It is proposed that the existing berm/swale along the north, west, and southern boundaries of Basin 201 be improved to assure conveyance of runoff developed in Basin 201 and Basin OSC to proposed **Detention Pond 1**. The proposed detention pond is located at the southwestern corner of the basin at **Design Point 1 (DP-1)**. The installation of an outlet structure and 12” diameter storm sewer connection from the proposed pond to the adjacent existing inlets along Basehart Road will allow for draining of the facility over an extended period of time. Limiting discharge from the proposed pond to 0.1 cfs will maximize sedimentation occurring in the proposed pond while minimizing potential impacts to the downstream storm system in Basehart Road. The total ponding area illustrated on the Proposed Conditions Map (Figure 10) will provide a storage volume equal to 2 times the 100-Year event runoff volume.

Runoff from Basin 202 will continue to be directed to **Design Point 2 (DP-2)** as in the existing condition. The existing berm and swale along the western edge of Basin 202 should be enlarged and kept in good condition in order to prevent runoff from discharging down the steep adjacent slopes. A concrete valley gutter lining of the swale is recommended to hold the relatively flat grade and enhance conveyance to the inlet adjacent to Basehart Road at **DP-2.** The existing small grated inlet at DP- 2 should be replaced with a Type 'D' area drain to provide more dependable collection of the runoff from the basin.

The geometry of the intersection of Basehart Road and Vance Emory Lane is not anticipated to change with redevelopment of the Complex. Thus, runoff from the upstream watershed will continue to be concentrated and directed at the northwest curb return with the potential to jump the curb and impact the Complex. It is recommended that the berm along the western edge of Basin 202 be extended along the top of the slope as it turns to parallel Basehart Road. It is also recommended that the top of the berm be at least 1 foot above the adjacent top of curb at the northwest curb return. It is also recommended that the face of the berm adjacent to the northwest return be paved with concrete or asphalt in order to armor it against erosion and assure its perpetuity.

4.6.2 Northeast Region (N.E.)

The northeast region includes Milne Stadium facilities, parking lots, portions of Vance Emory Drive, as well as a small portion of Spruce Avenue. The Northeast region was subdivided into nine on-site basins (Basins 204-206 and 208-213) and one offsite basin (OS-D) with a total watershed area of approximately 16.8 acres. For discussion purposes only, a small area located to the northeast of the central kitchen has been relocated to the South Central Region, and in accordance with these changes Design Point 6 and Basin 107 are not utilized in the proposed analysis to maximize the use of the same design point numbers between the existing and proposed conditions.

Proposed drainage improvements for this region include the replacement of two inlets and the repair and vertical extension of curbs to reduce erosion. Drainage produced within the Northeast Region will continue to utilize the 108" storm sewer system for its primary outfall.

No site improvements are anticipated upstream of **Design Points 4 and 5** (**DP-4 & DP-5**) (within Basins OS-D, 204 and 205). Thus, the combined runoff reaching the two inlets at these points will remain the same in the existing condition. The removal of the existing access roadway and the subsequent creation of a low point within the Vance Emory Drive at **DP-5** will require that slightly more runoff be intercepted by the west inlet and be conveyed by the existing storm sewer system.

As existing storm sewer capacity and available headwater at **DP-4 and 5** are limited, replacement of both inlets and utilization of the two existing 18" outfalls is recommended, in lieu of trying to collect runoff only at the proposed low point. By limiting inlet interception ponding depths at the low point to less than 0.5' and increasing the curb height from 6” to 8” with final design, the likelihood of runoff overtopping and draining towards Central Kitchen will be minimized.

As no site improvements are anticipated for Milne Stadium, stadium parking lots, and the portions of Vance Emory Lane which contribute to **Design Points 7-12** (Basins 207-213), recommendations for this portion of the site are limited. As noted within the existing conditions analysis, a speed bump is promoting erosion of an embankment slope above the inlet at **DP-7**. Removal of the speed bump, raising the curb height to 15” immediately adjacent the speed bump, or providing erosion protection on the slope are possible solutions.

4.6.3 South Central Region (S.C.) Including Increased Discharge to South Diversion Channel.

The proposed site improvements to the South Central region include the removal of several obsolete buildings, construction of three new facilities and the construction of new roadways, resurfacing and reconstruction of parking areas and addition of a plaza and landscaping areas. Proposed drainage improvements include the construction of new storm sewer systems within the center and along the south boundary of the site, the construction of a water quality treatment pond, provision for treatment of the runoff from the fueling area, and the construction of retaining walls and concrete lined swales and minor re-grading. The proposed facilities will increase the rates and volumes of runoff that are collected and discharged to the head of the South Diversion Channel from the site.

The south central region has been subdivided into ten on-site basins (Basins 214-218 and 220-225) and one small offsite basin located (219) with a total watershed area of approximately 19.2 acres (16.2 acres existing).

A meeting was held with AMAFCA prior to the development of the proposed drainage master plan to determine if additional discharge to the South Channel above the existing conditions rates was permittable. The redirection of runoff to the South Diversion Channel is to mitigate the high concentration of runoff along the western boundary of the site that is ultimately discharged to the I-25 Right-of-Way. AMAFCA indicated that re-distribution of runoff from a portion of the site to the channel would likely be permitted but would subject to further review during both the master planning and future site development processes. It should be noted that nearly all of the area that is proposed to drain to the South Diversion Channel is located within the defined watershed of the South Diversion Channel. A map illustrating the site within the Southern Diversion Watershed is included in Appendix E.

Runoff from Basin 214 along with runoff that bypasses the inlet at **DP-7** will be collected within existing and reconstructed portions of Oak Street and conveyed to series of sump inlets located at the south end of the proposed turnaround bulb at **Design Point 13 (DP-13)**. Conveyance charts provided in the appendix of this report indicate that a standard 34’ wide street section with 8” curb can convey the proposed runoff at 0.5%. A proposed 30” storm drain will be required to convey the collected runoff south to storm sewer **Design Point 17 (DP-17)**. Grades within Basin 214 may be less than 1%, and thus additional extensions of the proposed collection and conveyance system may be required in final design to achieve adequate drainage of the basin. An overflow path from **DP-13** should be also be considered to provide for potential failure. Some minor regrading of the Oak Street corridor to provide a more uniform grade between Vance Emory Lane and Bitner Loop will likely be required. Based on the information that was available at the time of this analysis, placement of the proposed 30" storm drain on the west side of the existing 108" storm sewer appears to minimize potential conflicts with existing utilities.

As in the existing condition, runoff reaching **Design Point 14 (DP-14)** will be limited to the runoff produced from the local basin (Basin 215). Proposed site improvements to this portion of the campus will include securing the area and improving the adjacent landscaping around the perimeter of the basin. The existing 12" storm drain is sufficient to convey runoff from the basin with ponding in the parking lot. This ponding does not appear to be a flood hazard to adjacent buildings. Thus, unless elimination of ponding in the parking lot is desired, no changes are proposed for this basin. An overflow path for the parking lot should be maintained.

The construction of a retaining wall system and a concrete lined swale immediately adjacent to the north wall of the Central Kitchen building is proposed in order to provide positive surface drainage around the existing building. The proposed wall and swale will provide an outlet for runoff in the area in normal conditions as well as an emergency flow path for potential system failure in adjacent Vance Emory Lane. Calculations provided in the appendix of the report indicate that construction of a 0.5% 8:1 swale with a 3' wide concrete lined bottom along the north side and east sides of the Central Kitchen building will limit flow depths to less than 0.9' in the 100-Year storm in the event the upstream storm drain system at **DP-4** & **5** become clogged and discharge runoff to the north side of the kitchen. Runoff directed around the building will combine with local runoff produced within Basin 216. The finished floor elevation of the new Building No. 7 and the top of the retaining wall adjacent to the existing building should be placed at least 12" higher than the proposed swale flow line at its highest point adjacent to the building. Runoff from this area will be directed around the east and south side of the Central Kitchen. A similar wall and concrete lined swale will also be needed to convey runoff from the western portion of the area north of the building to the west side of the building.

New sump inlets and a 30" storm drain are proposed to collect runoff reaching **Design Point 16 (DP-16)**. The collected runoff at **DP-16** will combine with runoff intercepted at a **DP-13** at a proposed manhole at storm sewer **DP-17**. Combined flows will be conveyed south underground in a proposed 30" storm drain to proposed **Water Quality Pond # 1** located west of the existing Fleet Maintenance Building. Construction plans indicate that a water line conflict for this storm sewer may occur along the south edge of Binter Loop.

Grading the right-of-way adjacent to Basehart Road and within Basin 219, to drain to the street to mitigate the potential for flow from the right-of-way to impact the site and l limit the potential for erosion of the steep slopes located along the southern boundary line. Coordination with the City of Albuquerque will be required to grade within the City owned right-of-way.

Runoff produced within Basins 217, 220, 222, 223, (storm sewer **Design Points 18-20**) will be collected by a series of inlets and proposed 18-24" storm drain storm sewer which will convey flow to the proposed **Water Quality Pond # 1 (WQ Pond #1)**. In addition to the storm sewer collection system, improvement of the grades adjacent to Building K to provide positive drainage away from the structure is proposed. The installation of a curb to isolate runoff within Basin 222 to allow for the collection and treatment of contaminated runoff from the fueling station is also proposed.

At this time no improvements are proposed for the car wash as runoff appears to be contained and treated within existing facilities.

Runoff produced within Basin 224 will be conveyed through the proposed circulation streets to a low point at storm sewer **Design Point 21 (DP-21).** It is anticipated that the roadway can be designed with a single cross slope to allow for the collection of runoff from a single low point. Runoff reaching the low point may enter the pond via curb chase sections and rundowns or via proposed storm sump inlets and 24" storm drain system. Runoff collected at **DP-21** will combine with flows from **DP-17** and **DP-20** and Basin 225 in the proposed water quality pond for a combined peak flow rate to the pond of 77.2 cfs in the 100-Year event (**Design Point 22**)**.**

Approximately 15.3 acres are proposed to contribute to proposed **WQ Pond #1**. Approximately 89% of the contributing area is anticipated to be impervious. The required volume of the pond has been estimated at 0.56 acre-feet including an additional 20% for sediment storage. The pond was conceptually designed with 4:1 side slopes.

Stormwater will be discharged from the pond via water quality outlet structure and a 48" storm drain which will connect to the existing 108" storm sewer main located east of the proposed pond (calculations regarding the preliminary sizing of the pond facilities are included Appendix D). As the headwater differential is very limited between the 108" storm drain and the anticipated 100-Year water surface elevation of the proposed pond, consideration should be given to provide a connection to the 108" storm drain which minimizes head losses.

Review of construction plans for the Lincoln Complex indicates the presence of gas, sanitary and waterlines which parallel the south edge of the proposed pond. Surface interception of the runoff entering the proposed pond in lieu of storm sewer pipe and inlet systems, pond grading north of the existing lines and placement of the proposed outlet structure and connection to the existing 108" north of the existing systems, may aid in reducing potential conflicts in this area. Additional utility system conflicts with the proposed storm sewer may exist. Surface location and potholing of existing utilities is recommended prior to final design.

The total proposed peak runoff anticipated to the reach the South Diversion Channel from the Lincoln Complex (at storm sewer **Design Point 23 (DP-23)**) is approximately 130 cfs in the 100-Year event. This compares to 72 cfs from the site in the existing condition. When the estimated maximum offsite conveyance contribution is included, approximately 978 cfs is proposed to be discharged to the channel at storm sewer **Design Point 23A (DP-23A)** from the 108" storm drain, as compared to 919 cfs (897 cfs in pipe, 21.6 cfs surface) in the existing condition. This conservatively assumes that the peak in the storm sewer and the peak from the on-site are coincidental. This equates to an approximate 6.4% increase in the developed condition over the existing condition.

The construction of a small retaining wall along portions of the south and east sides of the proposed roadway near the Fleet Maintenance Building may be required to ensure that the potential overflow is routed towards the South Diversion Channel and collection of local area runoff is maximized.

4.6.4 Southwest Region (S.W.)

The proposed site improvements in the Southwest Region include the removal of several obsolete buildings, construction of four new buildings and the construction of new looping roadway, resurfacing and construction of parking areas, and addition of a plaza and new landscaping areas. Proposed drainage improvements to coincide with site improvements include: construction of two new water quality treatment and storm water detention ponds, construction of collection and discharge systems for the ponds, and construction of retaining walls and concrete lined swales to facilitate the collection and conveyance of surface runoff.

The Southwest Region has been subdivided into eight on-site basins (Basins 226-233) with a total contributing watershed area of approximately 8.2 acres as compared to 9.1 acres in the existing condition. In the proposed condition, runoff from this region will utilize two of the three existing outfall points and infrastructure to discharge flows to the I-25 Right-of-Way. Discharge to the third existing and unarmored outfall point will be eliminated.

Runoff produced within Basin 226 will be conveyed south of the existing fleet maintenance building and around the south and west side of proposed Building No. 1. It is anticipated that a 0.5% or better grade can be achieved around the buildings if the proposed low point at **Design Point 24 (DP-24)** is not raised more than 0.5' above the upstream invert of the existing outfall chase. This should permit surface conveyance of the runoff produced within the contributing watershed and limit the need for the extension of additional storm sewer systems. This should be validated with a field survey at the time of final design. A valley gutter is recommended along this flow path.

Runoff produced within Basin 227 will be conveyed within the proposed single cross slope roadway sections to a single sump location where it will combine with runoff from Basin 226 at **Design Point 24**. Runoff will be discharged to **Water Quality Pond # 2 (WQ Pond #2)** through proposed curb chase sections and rundowns or by proposed sump inlets and 24" storm drains where it will combine with flows from Basin 228 at **Design Point 25 (DP-25 & WQ Pond #2)**.

Approximately 5.1 acres are proposed to contribute to this proposed water quality pond. Approximately 94% of the contributing area is anticipated to be impervious. The required volume of the pond has been estimated at 0.22 acre-feet including an additional 20% for sediment storage. This pond was conceptually designed with 4:1 side slopes.

Runoff reaching this area in the existing condition was estimated at 70 cfs in the 100-Year event. This is significantly in excess of the capacity of the existing concrete chase, and likely causes localized flooding and erosion of the existing roadway embankment. In order to reduce discharge to this location, runoff from a significant portion of the historic contributing watershed is proposed to be redirected to the South Diversion channel. Based on the calculations performed in the existing conditions analysis, the existing concrete chase /rundown located at DP-26 has a full conveyance capacity of approximately 18-19 cfs (refer to Existing Conditions analysis calculation for **DP-21**). In the proposed condition, runoff anticipated to reach the proposed water quality pond located adjacent to existing rundown is approximately 21.2 cfs in the 100-Year event. Preliminary modeling based on the concept pond footprint indicates that routing through the pond will reduce the discharge rate to approximately 17 cfs which is consistent with the existing structures conveyance capacity.

Runoff will be discharged from the pond via a water quality outlet structure and 24" storm sewer, which will cross under the proposed street and discharge to the existing concrete rundown located within the I-25 Right-of-Way at storm sewer **Design Point 26 (DP-26)**. It is anticipated that the proposed 24" storm drain can likely be terminated at the west property line with the construction of a concrete headwall/wingwall structure. It is estimated that the proposed headwall will be approximately 20' L x 5' w x 6' tall if grading in the area remains the similar to the existing condition. Coordination with NMDOT for approval of the connection is recommended prior to further design. Provision for a surface overflow at the low point to the I-25 Right-of-Way should also be considered with final design.

The addition of the proposed roadway along the exterior of northwest corner of the property line will likely require the construction of a retaining wall along both the north and west side of the proposed roadway. With the construction of the retaining wall, runoff produced within Basin 229 can efficiently be conveyed within the proposed single cross slope roadway to a single sump location at **Design Point 27 (DP-27)** adjacent to proposed **Water Quality Pond # 3 (WQ Pond #3)**. To limit the pond depth and disturbance within the adjacent I-25 Right-of-Way, runoff reaching **DP-27** may best be collected in proposed curb chase sections and directed to the pond via a riprap or concrete rundown. Runoff collected at **DP-27** will combine with runoff from Basin 230 and 231 at **Design Point 28 (DP-28)** in **WQ Pond #3**.

Approximately 3.1 acres are proposed to contribute to **WQ Pond #3**. Approximately 86% of the contributing area is anticipated to be impervious. The required volume of the pond has been estimated at 0.11 acre feet including an additional 20% for sediment storage. This pond was conceptually designed with 4:1 side slopes.

In the proposed condition, 100-Year peak flow to **WQ Pond #3** at **DP-28** is estimated at 12.7 cfs. This is slightly higher than the historic flow rate of 8.4 cfs. Preliminary modeling based on the concept pond footprint indicates that routing through the pond will reduce the peak 100-Year discharge rate to approximately 6.4 cfs.

Similar to **WQ Pond #2**, it is proposed that runoff discharged from **WQ Pond #3** will occur through a proposed water outlet structure and 24" storm drain. The proposed 24" storm drain will convey runoff under the proposed roadway to the existing concrete rundown located I-25 Right-of-Way. It is anticipated that a headwall / wingwall structure to connect the proposed pipe to the existing rundown section will be required at storm sewer **Design Point 29 (DP-29)**. Coordination with NMDOT for approval of the connection is recommended prior to final design.

4.6.5 Northwest Region (N.W.)

The proposed site plan changes to the Northwest Region include the removal of several obsolete buildings, resurfacing and construction of parking areas, as well as the construction of new plaza and landscaping areas. Proposed drainage improvements to coincide with site improvements include the construction of a new water quality treatment pond, collection and discharge systems for the pond, and the construction of retaining walls to reduce the slope of the existing parking areas and allow for the construction of the water quality pond.

The Northwest Region has been subdivided into four on-site basins (Basins 233-236 with a total contributing watershed area of approximately 3.4 acres as compared to 3.7 acres in the existing condition. In the proposed condition, runoff from this region will continue to discharge to Locust Street.

Runoff produced with Basins 233 and 234 will be directed through parking areas to a proposed water quality treatment pond to be located near the northeast corner of the site at **Design Point 30 (DP-30)**.

Approximately 2.7 acres are proposed to contribute to proposed **Water Quality Pond # 4 (WQ Pond #4).** Approximately 93% of the contributing area is anticipated to be impervious. This results in an estimated water quality treatment volume of approximately 0.11 acre-feet including an additional 20% for sediment storage. Similar to the other ponds a 4:1 slope was utilized to size the conceptual footprint.

The combined proposed discharge from Basin 233, 234, 235 and 236 at **Design Point 31 (DP-31)** is equivalent to the existing conditions discharge to Locust Street of 14 cfs in the 100-Year event.

Based on the existing grading, it is anticipated that the construction of a retention wall along both the north and east side of the proposed parking lot adjacent to the proposed **WQ Pond #4** will be required to reduce the steep slopes across the existing storage lot and facilitate the construction of the proposed pond and its outlet works. Runoff discharged from the **WQ Pond #4** will be discharged through a water quality outlet structure and 24" storm drain through a proposed retaining wall to Locust Street. It is anticipated that a transition from the outlet pipe to a chase section will be required to discharge runoff under the existing sidewalk to the roadway.

It is recommended that the relationship between the pond, adjacent retaining walls and upstream parking lot and connection to Locust Street be designed such that overflow from the pond is routed through the parking lot to Locust Street.

4.6.6 Proposed Conditions Hydrologic Analysis Summaries

The following table summarizes the assumptions for land use, watershed areas, peak flow rates, and runoff volumes associated with the 40 analyzed sub-basins.

Table 3: Proposed Sub-basin Peak Discharge and Volumes

Sub-Basin	Area (Ac)	Land Treatment Percentage (%)				Q_{100} 6-HR (cfs)	V_{100} 24-HR (ac-ft)
		A	B	C	D		
OS-A	18.01	0	18	4	78	69.9	3.10
OS-B	7.90	0	0	8	92	33.4	1.53
OS-C	0.90	0	0	44	56	3.5	0.14
OS-D	0.54	0	0	0	100	2.3	0.11
201	4.40	0	44	53	3	12.2	0.35
202	1.35	0	0	75	25	4.8	0.17
203	0.18	0	0	79	21	0.6	0.02
204	0.85	0	0	20	80	3.5	0.15
205	0.70	0	0	0	100	3.1	0.14
206	0.46	0	0	0	100	2.0	0.10
207	NOT USED IN PROPOSED ANALYSIS						
208	2.28	0	0	16	84	9.4	0.42
209	1.65	0	0	0	100	7.2	0.34
210	0.60	0	0	72	28	2.0	0.07
211	5.58	0	0	10	90	24.2	1.14
212	3.26	0	0	0	100	14.2	0.66
213	1.43	0	0	0	100	6.2	0.29
214	3.08	0	2	2	96	13.1	0.61
215	3.56	0	1	25	74	14.6	0.63
216	4.74	0	3	11	86	19.6	0.88
217	1.97	0	3	30	67	7.8	0.33
218	0.06	0	0	0	100	0.3	0.01

219	0.21	0	0	0	100	0.9	0.04
220	0.77	0	0	0	100	3.4	0.16
221	0.08	0	0	0	100	0.4	0.02
222	0.43	0	0	0	100	1.9	0.09
223	1.55	0	0	0	100	6.7	0.32
224	2.39	0	1	1	98	10.3	0.48
225	0.33	0	70	0	30	0.9	0.03
226	1.86	0	0	0	100	8.1	0.38
227	2.96	0	3	3	94	12.6	0.58
228	0.21	0	70	0	30	0.6	0.02
229	1.58	0	1	1	98	6.8	0.32
230	1.27	0	9	9	82	5.1	0.23
231	0.25	0	70	0	30	0.7	0.03
232	0.10	0	0	100	0	0.3	0.01
233	0.98	0	2	2	96	4.2	0.19
234	1.57	0	1	1	97	6.8	0.32
235	0.17	0	70	0	30	0.5	0.02
236	0.65	0	7	7	86	2.7	0.12

The following table summarizes the contributing peak flow rates and runoff volumes at 34 Design Points.

Table 4: Proposed Analysis Point Peak Discharge and Volumes		
Design Point	Q_{100} 6-HR (cfs)	V_{100} 24-HR (ac-ft)
DP-1	15.7	0.49
DP-2	4.8	0.17
DP-3	36.3 *	1.57 *
DP-4	6.5	0.30
DP-5	4.8	0.15
DP-6	NOT	USED
DP-7	18.9	0.87
DP-8	13.9	0.83
DP-9	20.1	1.12
DP-10	13.0	1.00
DP-11	33.1	2.12
DP-12	47.3	2.78
DP-12A	892 **	N/A
DP-13	26.7	1.04
DP-14	14.6	0.63
DP-15	52.7	3.42
DP-15A	898 **	N/A
DP-16	19.6	0.88

DP-17	46.3	1.92
DP-18	7.8	0.33
DP-19	11.1	0.48
DP-20	13.0	0.57
DP-21	17.0	0.80
DP-22	77.2	3.32
DP-23	129.9	6.74
DP-23A	978 **	N/A
DP-24	20.7	0.96
DP-25	21.2	0.98
DP-26	16.4	0.98
DP-27	6.8	0.32
DP-28	12.7	0.57
DP-29	6.4	0.58
DP-30	11.4	0.53
DP-31	14.1	0.64

* Flow rates estimated at DP-3 assume a 70% interception from existing infrastructure located with Basins OS-A and OS-B and also Assume the Construction of the Proposed Retention Pond at Design Point 1.

** Flow Rates Reported at these Design Points are Based upon an Estimated Maximum Pipe Conveyance of 845 cfs upstream of Design Point 12A. Refer to Section 4.2.2 (page 10).

5 Summary and Conclusions

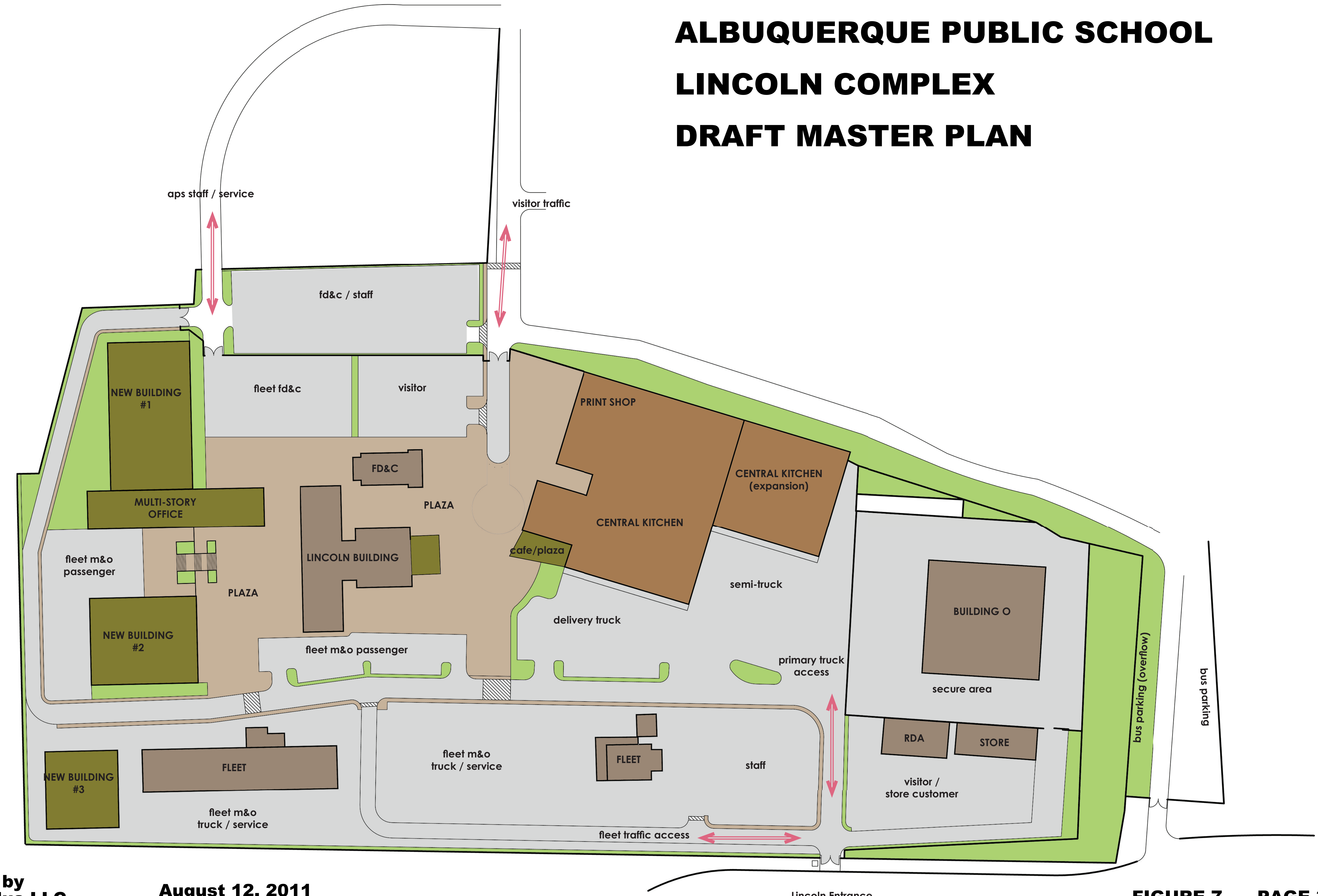
The primary components of the Drainage Master Plan include:

- Increased collection and diversion of runoff to the 108" diameter storm sewer that crosses through the site and discharges to the South Diversion Channel.
- Decreased flow discharged to the I-25 Right-of-Way.
- Expansion of a pond south of the soccer fields.
- Addition of 2 water quality enhancement ponds and 2 water quality enhancement/detention ponds in the southern and western portions of the site.
- Utilization of surface flow where practical.
- Addition of inlets and storm sewers where surface flow is not practical.
- Utilization of existing discharge points.
- Addition of concrete drainage swales and retaining walls to facilitate drainage around structures.
- Enhancement and continued maintenance of existing drainage diversion berms on the site.

The proposed 58 cfs increase in the 100-Year peak flow to the existing 108" diameter storm sewer main that crosses the site and ultimately discharges to the head of the South Diversion Channel, is due to improved collection of runoff from the portion of the site that generally lies in the defined watershed of the South Diversion Channel as shown on AMAFCA GIS maps. This proposed redirection of flow will improve drainage conditions in the western portion of the Lincoln Complex and will reduce runoff discharged to the I-25 corridor and ultimately to the San Jose Drain from the site.

Construction of the improvements proposed in this plan will mitigate drainage issues currently present on the site. Proposed ponds have been incorporated in the plan to provide treatment of stormwater generated in areas of the site proposed for redevelopment.

ALBUQUERQUE PUBLIC SCHOOL
LINCOLN COMPLEX
DRAFT MASTER PLAN



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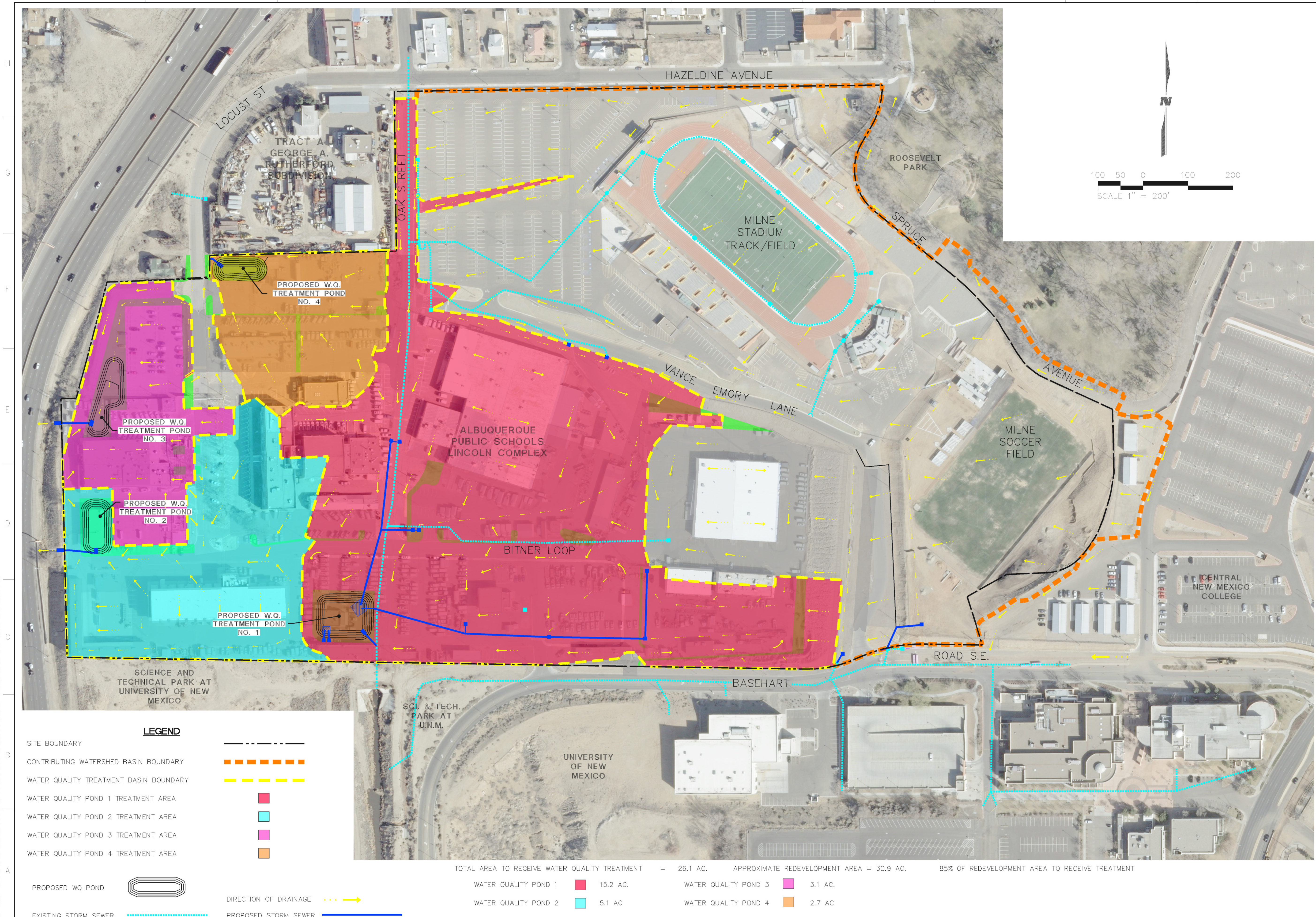
Design Plus LLC

August 12, 2011

FIGURE 7



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APS

SEAL
XX% SUBMITTAL NOT FOR CONSTRUCTION

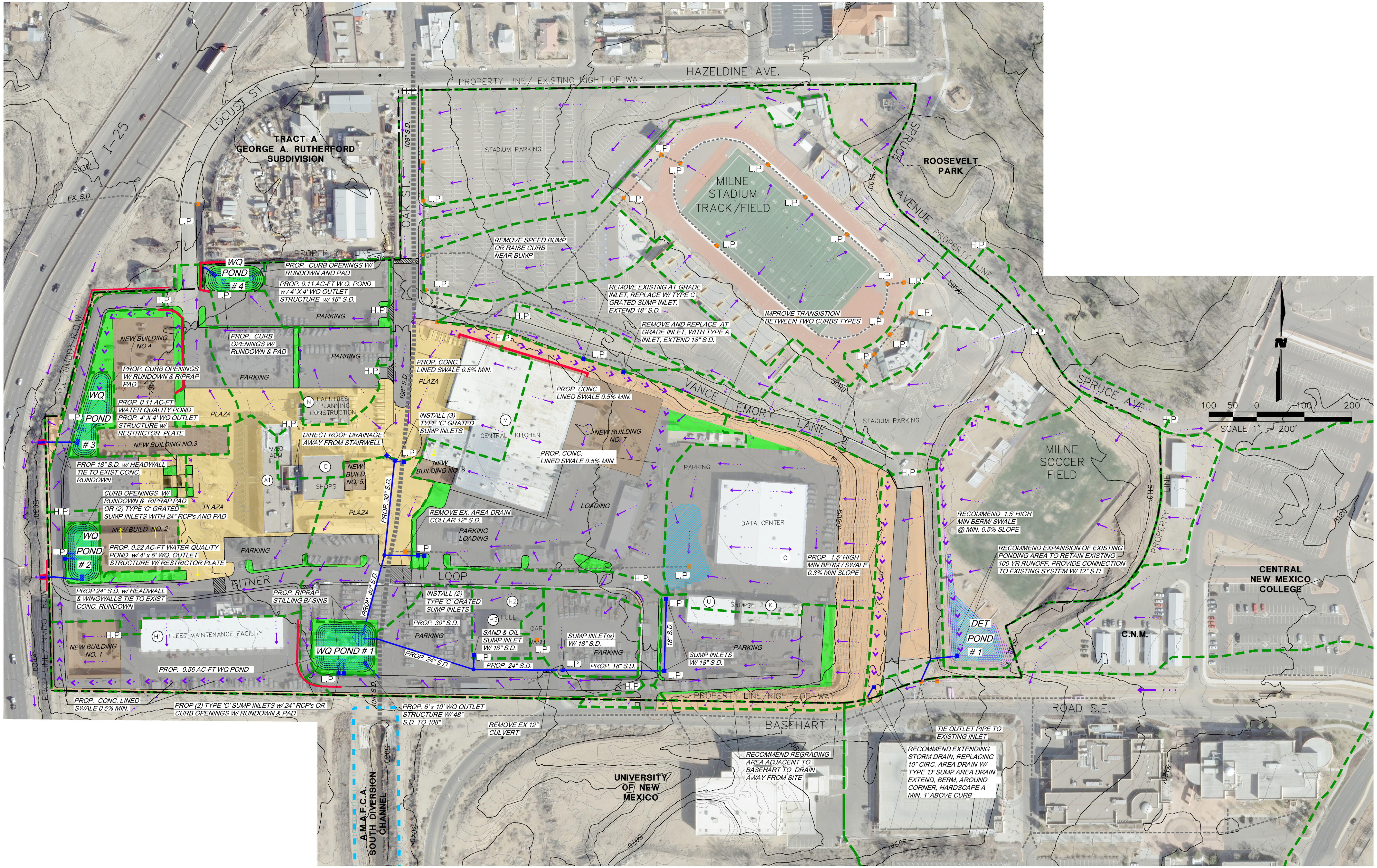
PROJECT NAME
ALBUQUERQUE PUBLIC SCHOOLS
LINCOLN COMPLEX
BERNALILLO COUNTY, NM

MARK	DATE	DESCRIPTION

PROJECT NO:
DESIGNED BY: DLM
DRAWN BY: DLM
CHECKED BY: VSF
DATE:

SHEET TITLE
DRAINAGE MASTER PLAN – WATER QUALITY TREATMENT AREA EXHIBIT

SHEET NO:
FIGURE 8



LEGEND

PONDING AREA
PROPOSED DETENTION POND (OUTSIDE OF MASTER PLAN)
PROPOSED WATER QUALITY POND
EXISTING INDEX CONTOUR (10')
EXISTING NOMINAL CONTOUR (2')
EXISTING STORM SEWER W/INLET
PROPOSED STORM SEWER W/INLET
DRAINAGE BASIN BOUNDARY
DIRECTION OF DRAINAGE
SWALE OR SWALE/BERM
RETAINING WALLS MAYBE NEEDED
FEMA FLOODPLAIN BOUNDARY
SITE BOUNDARY
BUILDING IDENTIFIER (M)
DESIGN POINTS (DP) (ON SURFACE/IN STORM/COMBINED) 7 8 19

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PROJECT NAME
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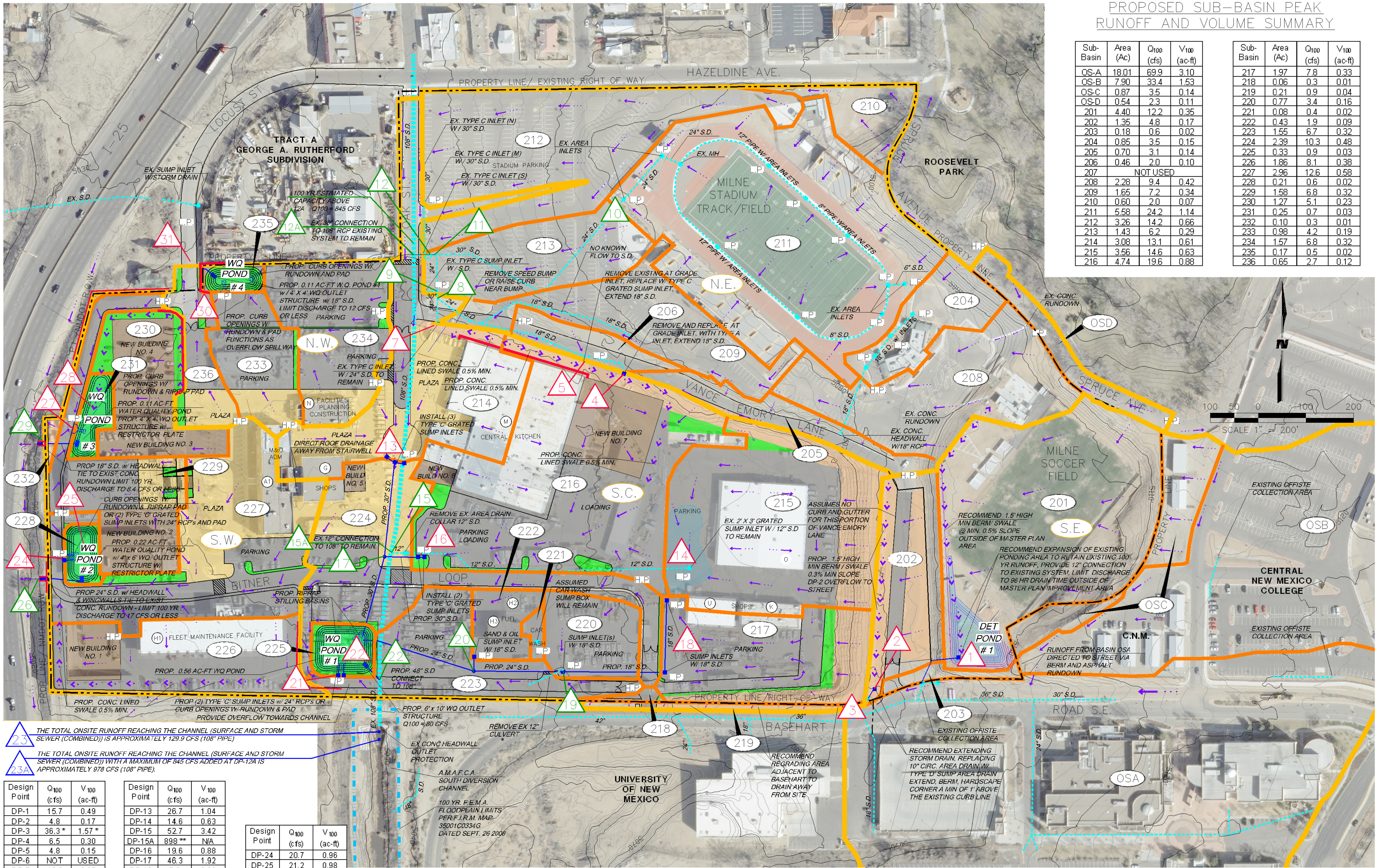
LINCOLN COMPLEX
BERNALILLO COUNTY, NM

MARK | DATE | DESCRIPTION

PROJECT NO:
DESIGNED BY: DLM
DRAWN BY: DLM
CHECKED BY: VSF
DATE:

SHEET TITLE
DRAINAGE MASTER PLAN PROPOSED IMPROVEMENTS MAP

SHEET NO:
FIGURE 9



PROPOSED SUB-BASIN PEAK RUNOFF AND VOLUME SUMMARY

Sub-Basin	Area (Ac)	Q_{100} (cfs)	V_{100} (ac-ft)
OS-A	18.01	69.9	3.10
OS-B	7.90	33.4	1.53
OS-C	0.87	3.5	0.14
OS-D	0.54	2.3	0.11
201	4.40	12.2	0.35
202	1.35	4.8	0.17
203	0.18	0.6	0.02
204	0.85	3.5	0.15
205	0.70	3.1	0.14
206	0.46	2.0	0.10
207	NOT USED		
208	2.28	9.4	0.42
209	1.65	7.2	0.34
210	0.60	2.0	0.07
211	5.58	24.2	1.14
212	3.26	14.2	0.66
213	1.43	6.2	0.29
214	3.08	13.1	0.61
215	3.56	14.6	0.63
216	4.74	19.6	0.88

Sub-Basin	Area (Ac)	Q_{100} (cfs)	V_{100} (ac-ft)
217	1.97	7.8	0.33
218	0.06	0.3	0.01
219	0.21	0.9	0.04
220	0.77	3.4	0.16
221	0.08	0.4	0.02
222	0.43	1.9	0.09
223	1.55	6.7	0.32
224	2.39	10.3	0.48
225	0.33	0.9	0.03
226	1.86	8.1	0.38
227	2.96	12.6	0.58
228	0.21	0.6	0.02
229	1.58	6.8	0.32
230	1.27	5.1	0.23
231	0.25	0.7	0.03
232	0.10	0.3	0.01
233	0.98	4.2	0.19
234	1.57	6.8	0.32
235	0.17	0.5	0.02
236	0.65	2.7	0.12

PROPOSED DESIGN POINT PEAK RUNOFF AND VOLUME SUMMARY

Design Point	Q_{100} (cfs)	V_{100} (ac-ft)
DP-1	15.7	0.49
DP-2	4.8	0.17
DP-3	36.3 *	1.57 *
DP-4	6.5	0.30
DP-5	4.8	0.15
DP-6	NOT	USED
DP-7	18.9	0.87
DP-8	13.9	0.83
DP-9	20.1	1.12
DP-10	13.0	1.00
DP-11	33.1	2.12
DP-12	47.3	2.78
DP-12A	892 **	N/A

Design Point	Q_{100} (cfs)	V_{100} (ac-ft)
DP-13	26.7	1.04
DP-14	14.6	0.63
DP-15	52.7	3.42
DP-15A	898 **	N/A
DP-16	19.6	0.88
DP-17	46.3	1.92
DP-18	7.8	0.33
DP-19	11.1	0.48
DP-20	13.0	0.57
DP-21	17.0	0.80
DP-22	77.2	3.32
DP-23	129.9	6.74
DP-23A	978 **	N/A

Design Point	Q_{100} (cfs)	V_{100} (ac-ft)
DP-24	20.7	0.96
DP-25	21.2	0.98
DP-26	16.4	0.98
DP-27	6.8	0.32
DP-28	12.7	0.57
DP-29	6.4	0.58
DP-30	11.4	0.53
DP-31	14.1	0.64

* FLOW RATE ESTIMATED AT DP-3 ASSUMES 70% INTERCEPTION FROM EXISTING INFRASTRUCTURE LOCATED WITHIN BASINS OS-A & OS-B, CONSTRUCTION OF RETENTION POND AT DESIGN POINT 1.

** FLOW RATES REPORTED AT THESE DESIGN POINTS ARE BASED UPON A MAXIMUM PIPE CONVEYANCE OF 845 CFS UPSTREAM OF DESIGN POINT 12A.

NOTE: AS NO DETENTION IS ANTICIPATED TO BE REQUIRED AT WQ PONDS #1 & 4 STAGE STORAGE DISCHARGE CURVES WERE NOT MODELED IN AHYMO THUS REPORTED FLOW RATES AT THESE LOCATIONS DO NOT REFLECT MINOR EFFECTS OF ATTENUATION. Q IN = Q OUT

LEGEND

PONDING AREA
PROPOSED DETENTION POND (OUTSIDE OF MASTER PLAN)
PROPOSED WATER QUALITY POND
EXISTING INDEX CONTOUR
EXISTING NOMINAL CONTOUR
EXISTING STORM SEWER W/INLET
PROPOSED STORM SEWER W/INLET
REGIONAL DRAINAGE BASIN BOUNDARY (N.E., S.E., S.C. (S.CENTRAL), S.W. N.W.)
DRAINAGE BASIN BOUNDARY
DIRECTION OF DRAINAGE
SWALE OR SWALE/BERM
RETAINING WALLS MAYBE NEEDED
FEMA FLOODPLAIN BOUNDARY
SITE BOUNDARY
BASIN IDENTIFIER 210
BUILDING IDENTIFIER M
REGIONAL DRAINAGE AREA ID N.W.
DESIGN POINTS (DP) (ON SURFACE/IN STORM/COMBINED) 7 8 19

M:\IFS\11-600-022-00\CADD\EXHIBITS\LINCOLN COMPLEX DMP-PROPOSED.DWG 11/28/2011 7:13 PM

WILSON & COMPANY
490 LANG AVE, NE SUITE 200
ALBUQUERQUE, NM 87109
PHONE: 505-348-4000
FAX: 505-348-4072
www.wilsonco.com

SEAL: NOT FOR CONSTRUCTION

PROJECT NAME: ALBUQUERQUE PUBLIC SCHOOLS LINCOLN COMPLEX BERNALILLO COUNTY, NM

MARK	DATE	DESCRIPTION

PROJECT NO:
DESIGNED BY: DLM
DRAWN BY: DLM
CHECKED BY: VSF
DATE:

SHEET TITLE: DRAINAGE MASTER PLAN PROPOSED CONDITIONS MAP

SHEET NO: FIGURE 10

APPENDIX

- **APPENDIX A**
  - FEMA FLOODPLAIN MAP

- **APPENDIX B**
  - NRCS SOILS DATA MAP

- **APPENDIX C**
  - HYDROLOGIC ANALYSIS
    - ATLAS 14 - PRECIPITATION CHART
    - EXISTING CONDITIONS MODELS
    - PROPOSED CONDITIONS MODELS

- **APPENDIX D**
  - HYDRAULIC ANALYSIS
    - EXISTING CONDITIONS
      SOUTHEAST REGION
      NORTHEAST REGION
      SOUTH CENTRAL REGION
      SOUTHWEST REGION
      NORTHWEST REGION
    - PROPOSED CONDITIONS
      SOUTHEAST REGION
      NORTHEAST REGION
      SOUTH CENTRAL REGION
      SOUTHWEST REGION
      NORTHWEST REGION

- **APPENDIX E**
  - SUPPORTING DOCUMENTATION

APPENDIX A

FEMA FLOOD INSURANCE RATE MAP

WILSON
&COMPANY

LEGEND

FEMA FLOODPLAIN – ZONE A

SITE BOUNDARY

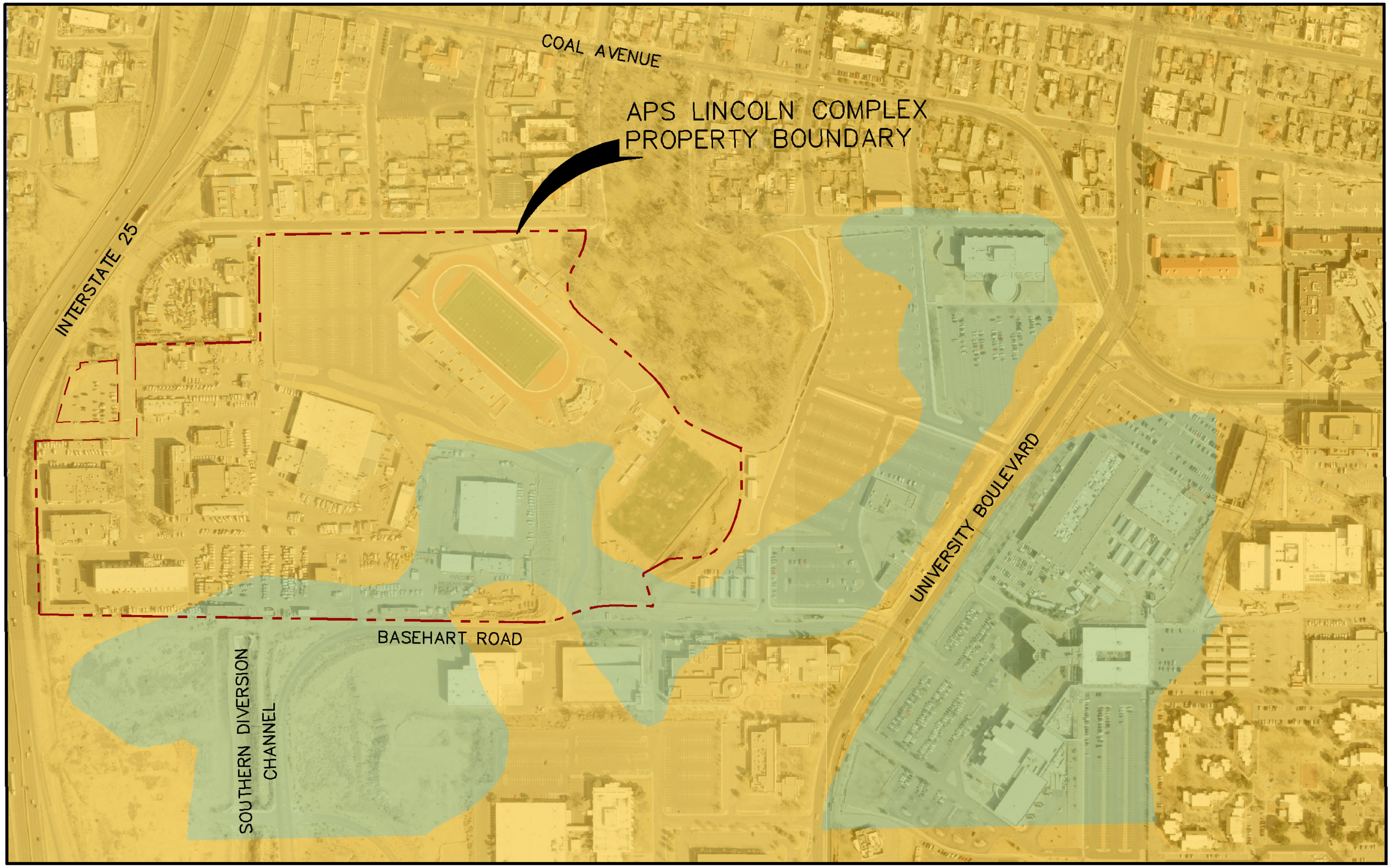
ALBUQUERQUE PUBLIC SCHOOLS
LINCOLN COMPLEX
FEMA FLOODPLAIN MAP

WILSON & COMPANY

NRCS SOILS DATA MAP

APPENDIX B

WILSON
&COMPANY



ALBUQUERQUE PUBLIC SCHOOLS
LINCOLN COMPLEX - SOILS MAP

LEGEND

BKD – BLUEPOINT KOKAN ASSOCIATION, HILLY

CU – CUT AND FILL LAND

SITE BOUNDARY

N

500 250 0 500 1000

SCALE: 1" = 1000'

WILSON & COMPANY

HYDROLOGIC ANALYSIS

APPENDIX C

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

New Mexico 35.0750 N 106.6364 W 5068 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 4
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2006

Extracted: Thu Jun 23 2011

Confidence Limits | Seasonality | Related Info | GIS data | Maps | Docs | Return to State Map

Precipitation Frequency Estimates (inches)

ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.17	0.27	0.33	0.44	0.55	0.63	0.67	0.78	0.85	0.98	1.02	1.19	1.35	1.49	1.85	2.21	2.71	3.11
2	0.23	0.34	0.42	0.57	0.71	0.80	0.85	0.98	1.08	1.23	1.27	1.47	1.67	1.84	2.29	2.74	3.35	3.84
5	0.30	0.46	0.57	0.77	0.95	1.06	1.11	1.26	1.36	1.54	1.59	1.81	2.03	2.26	2.78	3.29	3.99	4.58
10	0.36	0.55	0.68	0.92	1.14	1.27	1.32	1.48	1.59	1.78	1.83	2.07	2.31	2.58	3.15	3.71	4.44	5.10
25	0.44	0.67	0.84	1.13	1.39	1.56	1.61	1.78	1.90	2.11	2.16	2.43	2.69	3.01	3.62	4.22	4.99	5.73
50	0.51	0.77	0.95	1.29	1.59	1.79	1.84	2.02	2.13	2.36	2.42	2.70	2.96	3.33	3.96	4.58	5.37	6.16
100	0.57	0.87	1.08	1.46	1.80	2.03	2.09	2.27	2.38	2.62	2.67	2.97	3.23	3.65	4.29	4.93	5.71	6.56
200	0.64	0.98	1.21	1.63	2.02	2.29	2.35	2.53	2.63	2.89	2.94	3.24	3.50	3.96	4.60	5.25	6.01	6.90
500	0.74	1.12	1.39	1.87	2.32	2.65	2.72	2.89	2.97	3.24	3.29	3.60	3.84	4.37	4.98	5.63	6.34	7.29
1000	0.81	1.24	1.53	2.06	2.55	2.94	3.02	3.18	3.24	3.52	3.55	3.87	4.09	4.67	5.26	5.90	6.54	7.54

* These precipitation frequency estimates are based on a partial duration series. **ARI** is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting forces estimates near zero to appear as zero.

*** Upper bound of the 90% confidence interval**
Precipitation Frequency Estimates (inches)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.20	0.31	0.38	0.52	0.64	0.74	0.79	0.91	0.98	1.12	1.15	1.30	1.47	1.62	2.03	2.40	2.94	3.39
2	0.26	0.40	0.49	0.67	0.82	0.95	1.00	1.14	1.24	1.40	1.44	1.62	1.82	2.01	2.52	2.98	3.64	4.18
5	0.35	0.54	0.66	0.89	1.10	1.26	1.31	1.47	1.56	1.75	1.78	1.98	2.22	2.46	3.04	3.58	4.34	4.98
10	0.42	0.64	0.79	1.06	1.32	1.49	1.54	1.72	1.82	2.02	2.05	2.27	2.52	2.80	3.44	4.02	4.82	5.55
25	0.51	0.78	0.97	1.30	1.61	1.83	1.88	2.07	2.16	2.39	2.42	2.66	2.92	3.26	3.96	4.57	5.42	6.23
50	0.58	0.89	1.10	1.49	1.84	2.10	2.15	2.34	2.42	2.67	2.70	2.96	3.22	3.61	4.33	4.96	5.83	6.70
100	0.66	1.01	1.25	1.68	2.08	2.38	2.44	2.63	2.70	2.97	2.99	3.25	3.53	3.96	4.68	5.34	6.20	7.13
200	0.74	1.13	1.40	1.88	2.33	2.68	2.75	2.93	2.99	3.26	3.29	3.56	3.82	4.30	5.01	5.69	6.52	7.51
500	0.85	1.30	1.61	2.16	2.68	3.10	3.17	3.35	3.39	3.67	3.69	3.96	4.20	4.75	5.44	6.11	6.88	7.95
1000	0.94	1.43	1.77	2.38	2.95	3.44	3.53	3.69	3.71	3.98	3.99	4.26	4.49	5.09	5.74	6.41	7.10	8.21

* The **upper** bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are **greater** than.
** These precipitation frequency estimates are based on a partial duration series. **ARI** is the Average Recurrence Interval.

Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

*** Lower bound of the 90% confidence interval**
Precipitation Frequency Estimates (inches)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.15	0.23	0.28	0.38	0.47	0.54	0.58	0.67	0.75	0.87	0.90	1.08	1.23	1.36	1.68	2.02	2.48	2.85
2	0.19	0.29	0.36	0.49	0.61	0.69	0.73	0.85	0.95	1.08	1.13	1.33	1.52	1.68	2.09	2.50	3.07	3.53
5	0.26	0.39	0.49	0.66	0.81	0.91	0.96	1.09	1.19	1.35	1.41	1.63	1.85	2.06	2.53	3.01	3.65	4.21
10	0.31	0.47	0.58	0.79	0.97	1.08	1.13	1.28	1.39	1.57	1.62	1.87	2.10	2.36	2.87	3.38	4.07	4.69
25	0.38	0.57	0.71	0.96	1.18	1.31	1.37	1.53	1.65	1.85	1.91	2.19	2.44	2.75	3.29	3.84	4.57	5.27

EXISTING CONDITIONS

- **100 YEAR - 6 HOUR –HYDROLOGY MODEL**
- **100 YEAR – 24 HOUR HYDROLOGY MODEL**
- **100 YEAR – 6 HOUR**
  660 ACRE OFFSITE AND 35 ACRE ONSITE MODEL

-

EXISTING CONDITIONS
100 YEAR – 6 HOUR
HYDROLOGY MODEL

```
* ALBUQUERQUE PUBLIC SCHOOLS
* MASTER DRAINAGE PLAN
* EXISTING CONDITIONS MODEL
* 100 YR 6 HR STORM EVENT
* DATE: November 2011
*

*S***************************************************************************
*S
*S      100 YEAR 6 HOUR STORM - EXISTING RUNOFF ANALYSIS
*S      RAINFALL DATA FROM DPM Chapter 22 - ZONE 2
*S
*S***************************************************************************

START           0.0 HOURS
RAINFALL        TYPE=1  RAIN QUARTER=0.0 IN
                RAIN ONE=1.80 IN        RAIN SIX=2.27 IN
                RAIN DAY=2.62 IN        DT=0.03333 HR

**** SEDIMENT BULK FACTOR
SEDIMENT BULK   CODE=1  BULK FACTOR=1.10
****************************************************************************
*
****************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN C (OSC)
****************************************************************************
*

COMPUTE NM HYD  ID=1    HYD NO=B-OSC    DA=0.001499 SQ MI
                PER A=0    PER B=0   PER C=44   PER D=56
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=1    CODE=1

****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 101 (101)
****************************************************************************
*

COMPUTE NM HYD  ID=2    HYD NO=B-101    DA=0.006872 SQ MI
                PER A=0    PER B=44   PER C=53   PER D=3
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=2    CODE=1

**** ADD OSC TO 101 TO GET DP-1
ADD HYD              ID=3 HYD NO=DP-1  INFLOW IDS= 1 AND 2
PRINT HYD            ID=3   CODE=5

****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 102 (102)
****************************************************************************
*

COMPUTE NM HYD  ID=4    HYD NO=B-102-DP-2 DA=0.002085 SQ MI
                PER A=0     PER B=0   PER C=77   PER D=23
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=4    CODE=1


****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 103 (103)
****************************************************************************
*
**** REDUCE SEDIMENT BULK FACTOR FOR DEVELOPED BASINS
SEDIMENT BULK   CODE=1  BULK FACTOR=1.03

COMPUTE NM HYD  ID=1    HYD NO=B-103    DA=0.000275 SQ MI
                PER A=0     PER B=0   PER C=79   PER D=21
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=1    CODE=1

****************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN OSA (OSA)
****************************************************************************
*

COMPUTE NM HYD  ID=2    HYD NO=B-OSA    DA=0.028141 SQ MI
                PER A=0     PER B=18   PER C=4   PER D=78
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=2    CODE=1

****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN OSB (OSB)
****************************************************************************
*

COMPUTE NM HYD  ID=5    HYD NO=B-OSB    DA=0.012342 SQ MI
                PER A=0     PER B=0   PER C=8    PER D=92
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=5    CODE=1

**** ADD B-OSA TO B-OSB
ADD HYD              ID=6 HYD NO=OSA.1  INFLOW IDS= 2 AND 5
PRINT HYD            ID=6   CODE=5

**** DIVIDE ABOVE HYDROGRAPH BY A 70 PERCENT ESTIMATED UPSTREAM INTERCEPTION
DIVIDE HYD           ID=6  PER=-70     ID=7  HYD NO=OSA&B-INT
                                       ID=8  HYD NO=OSA&B-FB
**** ADD OSA&B-FB TO DP-1
ADD HYD              ID=5 HYD NO=OSB.2  INFLOW IDS= 3 AND 8
PRINT HYD            ID=5   CODE=5
```

```
**** ADD 102 TO B-OSB.2 TO GET OSB.3
ADD HYD              ID=7 HYD NO=OSB.3  INFLOW IDS= 4 AND 5
PRINT HYD            ID=7   CODE=5

**** ADD 103 TO B-OSB.3 TO GET DP-3
ADD HYD              ID=8 HYD NO=DP-3  INFLOW IDS= 1 AND 7
PRINT HYD            ID=8   CODE=5


*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 104 (104)
*************************************************************************
*

COMPUTE NM HYD  ID=10   HYD NO=B-104    DA=0.00132 SQ MI
                PER A=0     PER B=0   PER C=20   PER D=80
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=10   CODE=1

*************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN 105 (105)
*************************************************************************
*

COMPUTE NM HYD  ID=11   HYD NO=B-105    DA=0.0011 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=11   CODE=1

**** ADD B-104 TO B-105 TO GET DP-4
ADD HYD              ID=12 HYD NO=DP-4  INFLOW IDS= 10 AND 11
PRINT HYD            ID=12   CODE=5

**** DIVIDE HYDROGRAPH BY A RATING CURVE FOR INLET AT DP-4
DIVIDE HYD           ID=12 CODE=999    ID=13  HYD NO=DP-4INT
                                       ID=14  HYD NO=DP-4FB

                     TOTAL FLOW    DIVIDED FLOW
                       0.0             0.0
                       1.0             0.8
                       2.0             1.5
                       3.0             1.9
                       4.0             2.3
                       5.0             2.5
                       6.0             2.8
                       7.0             3.0

PRINT HYD            ID=13   CODE=5
PRINT HYD            ID=14   CODE=5

*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 106 (106)
*************************************************************************
*

COMPUTE NM HYD  ID=15   HYD NO=B-106-DP-5     DA=0.000581 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=15   CODE=1

**** DIVIDE HYDROGRAPH BY A RATING CURVE FOR INLET AT DP-5
DIVIDE HYD           ID=15 CODE=999    ID=16  HYD NO=DP-5INT
                                       ID=17  HYD NO=DP-5FB

                     TOTAL FLOW    DIVIDED FLOW
                       0.0             0.0
                       1.0             1.0
                       2.0             1.6
                       3.0             2.1
                       4.0             2.5

PRINT HYD       ID=16   CODE=5
PRINT HYD       ID=17   CODE=5

*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 107 (107)
*************************************************************************
*

COMPUTE NM HYD  ID=18   HYD NO=B-107    DA=0.0027 SQ MI
                PER A=0     PER B=0   PER C=38   PER D=62
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=18   CODE=1

**** ADD FLOW-BY FROM INLETS AT DP-4 AND DP-5 TO GET DP-4&5FB
ADD HYD              ID=19 HYD NO=DP-4&5FB  INFLOW IDS= 14 AND 17
PRINT HYD            ID=19   CODE=5


**** ADD FLOW-BY DP-4&5FB TO 107 TO GET DP-6
ADD HYD              ID=20 HYD NO=DP-6  INFLOW IDS= 18 AND 19
PRINT HYD            ID=20   CODE=5

*************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN OS-D (OSD)
*************************************************************************
*

COMPUTE NM HYD  ID=21   HYD NO=B-OSD    DA=0.000838 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1
```

```
PRINT HYD       ID=21   CODE=1

*******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 108 (108)
*******************************************************************************
*

COMPUTE NM HYD  ID=22   HYD NO=B-108    DA=0.003569 SQ MI
                PER A=0     PER B=0   PER C=16   PER D=84
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=22   CODE=1

**** ADD OSD TO 108 TO GET 108.1
ADD HYD              ID=23 HYD NO=108.1  INFLOW IDS= 21 AND 22
PRINT HYD            ID=23   CODE=5

*******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 109 (109)
*******************************************************************************
*

COMPUTE NM HYD  ID=24   HYD NO=B-109    DA=0.002571 SQ MI
                PER A=0     PER B=0   PER C=0  PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=24   CODE=1

**** ADD 108.1 TO 109 TO GET DP-7
ADD HYD              ID=25 HYD NO=DP-7  INFLOW IDS= 23 AND 24
PRINT HYD            ID=25   CODE=5

**** DIVIDE HYDROGRAPH BY A RATING CURVE FOR INLET AT DP-7
DIVIDE HYD           ID=25 CODE=999    ID=26  HYD NO=DP-7INT
                                       ID=27  HYD NO=DP-7FB

                     TOTAL FLOW    DIVIDED FLOW
                       0.0             0.0
                       3.0             2.1
                       6.0             3.2
                       9.0             4.0
                      12.0             4.5
                      15.0             5.0
                      18.0             5.3
                      21.0             5.5
                      24.0             5.8

**** DIVIDE HYDROGRAPH BY A MAX FLOW RATE TO DIV FLOWS THAT ESCAPE OAK
DIVIDE HYD           ID=27  Q=15.0        ID I=28    HYD NO=DV-DP-7FB.1
                                         ID II=29   HYD NO=DV-DP-7FB.2

PRINT HYD       ID=28   CODE=5
PRINT HYD       ID=29   CODE=5

*******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 110 (110)
*******************************************************************************
*

COMPUTE NM HYD  ID=30   HYD NO=B-110    DA=0.000938 SQ MI
                PER A=0     PER B=0   PER C=72   PER D=28
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=30   CODE=1

*******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 111 (111)
*******************************************************************************
*

COMPUTE NM HYD  ID=31   HYD NO=B-111    DA=0.008711 SQ MI
                PER A=0     PER B=0   PER C=10   PER D=90
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=31   CODE=1

**** DIVIDE HYDROGRAPH BY A MAX FLOW RATE AT DP-10
DIVIDE HYD           ID=31  Q=13.0       ID I=33   HYD NO=DP-10
                                        ID II=34  HYD NO=DP-10PND


*******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 112 (112)
*******************************************************************************
*

COMPUTE NM HYD  ID=35   HYD NO=B-112    DA=0.00509 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=35   CODE=1


*******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 113 (113)
*******************************************************************************
*

COMPUTE NM HYD  ID=36   HYD NO=B-113    DA=0.00223 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=36   CODE=1

**** ADD FLOWS INT AT DP-4 TO DP-5 TO GET FLOW IN PIPE UNDER EMORY LANE
```

```
ADD HYD             ID=24 HYD NO=DP4&5INT  INFLOW IDS= 13 AND 16
PRINT HYD           ID=24   CODE=

**** ADD FLOWS INT AT DP-4 & DP-5 & DP-7 TO GET DP-8
ADD HYD             ID=25 HYD NO=DP-8  INFLOW IDS= 24 AND 26
PRINT HYD           ID=25   CODE=5

**** ADD FLOWS AT DP-8 & BASIN 113 TO GET DP-9
ADD HYD             ID=24 HYD NO=DP-9  INFLOW IDS= 25 AND 36
PRINT HYD           ID=24   CODE=5

**** ADD FLOWS AT DP-9 TO DP-10 TO GET DP-11
ADD HYD             ID=26 HYD NO=DP-11  INFLOW IDS= 24 AND 33
PRINT HYD           ID=26   CODE=5

**** ADD FLOWS FROM BASIN 112 TO DP-11 TO GET DP-12
ADD HYD             ID=36 HYD NO=DP-12  INFLOW IDS= 26 AND 35
PRINT HYD           ID=36   CODE=5


*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 114 (114)
*************************************************************************
*

COMPUTE NM HYD  ID=37   HYD NO=B-114    DA=0.001107 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=37   CODE=1

*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 115 (115)
*************************************************************************
*

COMPUTE NM HYD  ID=38   HYD NO=B-115    DA=0.002619 SQ MI
                PER A=0     PER B=0   PER C=4    PER D=96
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=38   CODE=1

*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 116 (116)
*************************************************************************
*

COMPUTE NM HYD  ID=39   HYD NO=B-116    DA=0.002454 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=39   CODE=1

**** ADD DIV FLOWS BELOW DP-7 TO 116 TO GET 116.1
ADD HYD             ID=40 HYD NO=116.1  INFLOW IDS= 28 AND 39
PRINT HYD           ID=40   CODE=5

**** ADD 104 TO 116.1 TO GET 116.2
ADD HYD             ID=41 HYD NO=116.2  INFLOW IDS= 37 AND 40
PRINT HYD           ID=41   CODE=5

**** ADD 115 TO 116.2 TO GET DP-13
ADD HYD             ID=42 HYD NO=DP-13  INFLOW IDS= 38 AND 41
PRINT HYD           ID=42   CODE=5

*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 117 (117)
*************************************************************************
*
**** INCREASE SEDIMENT BULK FACTOR FOR PARTIALLY DEVELOPED BASINS 117, 118
SEDIMENT BULK   CODE=1  BULK FACTOR=1.06
*

COMPUTE NM HYD  ID=43   HYD NO=B-117-DP-14      DA=0.005809 SQ MI
                PER A=0     PER B=0   PER C=27    PER D=73
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=43   CODE=1

****DETERMINE PONDING DEPTH AT DP-14
*
ROUTE RESERVOIR         ID=44  HYD NO=RR-DP-14 INFLOW ID=43  CODE=1
                        OUTFLOW (CFS)     STORAGE (AC FT)       ELEV
                        0.01                    0.00            5047.20
                        4.60                    0.06            5047.53
                        4.80                    0.11            5047.86
                        4.80                    0.17            5048.19
                        4.80                    0.21            5048.52
                       27.00                    0.30            5048.72

**** DIVIDE HYDROGRAPH BY A MAX FLOW RATE AT INLET
DIVIDE HYD          ID=44  Q=4.8       ID I=45   HYD NO=DP-14INT
                                       ID II=46  HYD NO=DP-14FB

PRINT HYD       ID=45   CODE=5
PRINT HYD       ID=46   CODE=5

*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 118 (118)
*************************************************************************
*

COMPUTE NM HYD  ID=47   HYD NO=B-118    DA=0.001953 SQ MI
                PER A=0     PER B=0   PER C=85    PER D=15
                TP=0.1333  MASS RAIN=-1
```

```
PRINT HYD       ID=47   CODE=1

******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 119 (119)
******************************************************************************
*
**** DECREASE SEDIMENT BULK FACTOR FOR DEVELOPED BASINS
SEDIMENT BULK   CODE=1  BULK FACTOR=1.03
*

COMPUTE NM HYD  ID=50   HYD NO=B-119    DA=0.005388 SQ MI
                PER A=0     PER B=0   PER C=16    PER D=84
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=50   CODE=1

**** ADD DP-6 TO 119 TO GET 119.1
ADD HYD              ID=51 HYD NO=119.1  INFLOW IDS= 20 AND 50
PRINT HYD            ID=51   CODE=5

**** ADD 119.1 TO FLOWBY FROM DP-14 TO GET 119.2
ADD HYD              ID=52 HYD NO=119.2 INFLOW IDS= 46 AND 51
PRINT HYD            ID=52   CODE=5

**** ADD 118 TO 119.2 TO GET 119.3
ADD HYD              ID=53 HYD NO=119.3 INFLOW IDS= 47 AND 52
PRINT HYD            ID=53   CODE=5

**** ADD DP-13 TO 119.3 TO GET DP-15
ADD HYD              ID=54 HYD NO=DP-15 INFLOW IDS= 42 AND 53
PRINT HYD            ID=54   CODE=5

**** DIVIDE HYDROGRAPH BY A MAX FLOW RATE AT INLET
DIVIDE HYD           ID=54 Q=3.3       ID I=55  HYD NO=DP-15INT
                                       ID II=56  HYD NO=DP-15FB
PRINT HYD       ID=55   CODE=5
PRINT HYD       ID=56   CODE=5

**** ADD FLOWS INT AT DP-14 & DP-15 TO GET FLOWS TO 108 RCP AT DP-15.1
ADD HYD              ID=46 HYD NO=DP-15.1 INFLOW IDS= 45 AND 55
PRINT HYD            ID=46   CODE=5


**** ADD FLOWS INT AT DP-12 & DP-15.1 TO GET FLOWS TO 108 RCP AT DP-16
ADD HYD              ID=57 HYD NO=DP-16 INFLOW IDS= 36 AND 46
PRINT HYD            ID=57   CODE=5

**** DIVIDE HYDROGRAPH BY A PERCENTAGE TO DIVERT FLOWS AT OAK & BITNER TO TWO FLOWS
DIVIDE HYD           ID=56  PER=-75     ID=58  HYD NO=DV-DP7FB.1
                                        ID=59  HYD NO=DV-DP7FB.2
PRINT HYD       ID=58   CODE=5
PRINT HYD       ID=59   CODE=5

**** DIVIDE ABOVE HYDROGRAPH BY A PERCENTAGE TO DIVERT OAK & BITNER TO THREE LOCATIONS
DIVIDE HYD           ID=58  PER=-50     ID=60  HYD NO=DVDP7FB.1-1
                                        ID=61  HYD NO=DVDP7FB.1-2
PRINT HYD       ID=60   CODE=5
PRINT HYD       ID=61   CODE=5

******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 120 (120)
******************************************************************************
*
**** INCREASE SEDIMENT BULK FACTOR FOR PARTIALLY UNDEVELOPED BASIN
SEDIMENT BULK   CODE=1  BULK FACTOR=1.06

COMPUTE NM HYD  ID=62   HYD NO=B-120    DA=0.000327 SQ MI
                PER A=0     PER B=0   PER C=100    PER D=0
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=62   CODE=1

******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 121 (121)
******************************************************************************
*

COMPUTE NM HYD  ID=63   HYD NO=B-121    DA=0.00252 SQ MI
                PER A=0     PER B=0   PER C=82   PER D=18
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=63   CODE=1

**** ADD B-120 TO B-121 TO GET DP-17
ADD HYD              ID=64 HYD NO=DP-17  INFLOW IDS= 62 AND 63
PRINT HYD            ID=64   CODE=5

****DETERMINE PONDING DEPTH AT DP-17
*
ROUTE RESERVOIR         ID=65  HYD NO=RR-DP-17  INFLOW ID=64  CODE=1
                        OUTFLOW (CFS)     STORAGE (AC FT)       ELEV
                        0.00                    0.00            5044.40
                        1.00                    0.003           5045.00
                        2.30                    0.030           5045.50
                        4.10                    0.097           5046.00

PRINT HYD       ID=65   CODE=5

******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 122 (122)
******************************************************************************
*
**** DECREASE SEDIMENT BULK FACTOR FOR DEVELOPED BASINS
SEDIMENT BULK   CODE=1  BULK FACTOR=1.03
*
```

```
COMPUTE NM HYD  ID=66   HYD NO=B-122    DA=0.0000038 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=66   CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 123 (123)
***************************************************************************
*

COMPUTE NM HYD  ID=67   HYD NO=B-123    DA=0.000124 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=67   CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 124 (124)
***************************************************************************
*

COMPUTE NM HYD  ID=68   HYD NO=B-124    DA=0.001508 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=68   CODE=1

**** ADD B-124 TO DIV DP-7FB.1 TO GET 124.1
ADD HYD              ID=69 HYD NO=124.1   INFLOW IDS= 59 AND 68
PRINT HYD            ID=69   CODE=5

**** DIVIDE HYDROGRAPH BY A MAX FLOW RATE BASED UPON STREET CAPACITY IN OAK
DIVIDE HYD           ID=69  Q=15        ID I=70   HYD NO=DV-124.1-1
                                        ID II=71   HYD NO=DV-124.1-2

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 125 (125)
***************************************************************************
*

COMPUTE NM HYD  ID=59   HYD NO=B-125    DA=0.001513 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=59   CODE=1

**** ADD RR DP-17 TO B-125 TO GET 125.1
ADD HYD              ID=68 HYD NO=125.1   INFLOW IDS= 59 AND 65
PRINT HYD            ID=68   CODE=5

**** ADD 125.1 TO DIV 124.1-1 TO GET DP-18
ADD HYD              ID=72 HYD NO=DP-18  INFLOW IDS= 68 AND 70
PRINT HYD            ID=72   CODE=5

**** ADD DP-16 TO DP-18 TO GET DP-19
ADD HYD              ID=74 HYD NO=DP-19  INFLOW IDS= 57 AND 72
PRINT HYD            ID=74   CODE=5


***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 126 (126)
***************************************************************************
*

COMPUTE NM HYD  ID=75   HYD NO=B-126    DA=0.001473 SQ MI
                PER A=0     PER B=11   PER C=0   PER D=89
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=75   CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 127 (127)
***************************************************************************
*

COMPUTE NM HYD  ID=76   HYD NO=B-127    DA=0.001087 SQ MI
                PER A=0     PER B=9   PER C=0   PER D=91
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=76   CODE=1

**** ADD B-126 TO B-127 TO GET DP-127.1
ADD HYD              ID=77 HYD NO=DP-127.1  INFLOW IDS= 75 AND 76
PRINT HYD            ID=77   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 128 (128)
***************************************************************************
*

COMPUTE NM HYD  ID=78   HYD NO=B-128    DA=0.000266 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=78   CODE=1

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 129 (129)
***************************************************************************
*

COMPUTE NM HYD  ID=79   HYD NO=B-129    DA=0.003907 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1
```

```
PRINT HYD       ID=79   CODE=1
**** ADD SUBDIV-DP-7FB.2-1 TO B-129 TO GET 129.1
ADD HYD              ID=80 HYD NO=129.1  INFLOW IDS= 60 AND 79
PRINT HYD            ID=80   CODE=5

**** ADD 124.1-2 TO 129.1 TO GET 129.2
ADD HYD              ID=81 HYD NO=129.2  INFLOW IDS= 71 AND 80
PRINT HYD            ID=81   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 130 (130)
***************************************************************************
*

COMPUTE NM HYD  ID=82   HYD NO=B-130    DA=0.002498 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=82   CODE=1

**** ADD SUBDIV-DP-7FB.2-2 TO 130 TO GET 130.1
ADD HYD              ID=83 HYD NO=130.1  INFLOW IDS= 61 AND 82
PRINT HYD            ID=83   CODE=5

**** ADD 127.1 TO 130.1 TO GET DP-20
ADD HYD              ID=84 HYD NO=DP-20  INFLOW IDS= 77 AND 83
PRINT HYD            ID=84   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 131 (131)
***************************************************************************
*

COMPUTE NM HYD  ID=85   HYD NO=131      DA=0.001171 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=85   CODE=1

**** ADD 129.2 TO 131 TO GET 131.1
ADD HYD              ID=86 HYD NO=131.1  INFLOW IDS= 81 AND 85
PRINT HYD            ID=86   CODE=5

**** ADD DP-20 TO 131.1 TO GET DP-21
ADD HYD              ID=87 HYD NO=DP-21  INFLOW IDS= 84 AND 86
PRINT HYD            ID=87   CODE=5

****DETERMINE PONDING DEPTH AT DP-21
*
ROUTE RESERVOIR         ID=88  HYD NO=RR-DP-21  INFLOW ID=87  CODE=1
                        OUTFLOW (CFS)     STORAGE (AC FT)       ELEV
                        0.00                    0.00            5029.50
                        0.90                    0.002           5030.00
                        2.80                    0.019           5030.50
                       18.90                    0.091           5031.00
                       69.80                    0.190           5031.30
                       100.00                   0.240           5031.40

**** DIVIDE HYDROGRAPH BY A RATING CURVE FOR OVERFLOW TO DP-21.1
DIVIDE HYD           ID=88 CODE=999    ID=89  HYD NO=DP-21FB
                                       ID=84  HYD NO=DP-21INT

                     TOTAL FLOW    DIVIDED FLOW
                         0.0           0.0
                        69.9           0.0
                        83.9           1.4
                       100.0           3.9

PRINT HYD       ID=88   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 132 (132)
***************************************************************************
*

COMPUTE NM HYD  ID=90   HYD NO=B-132            DA=0.003091 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=90   CODE=1

**** ADD DP-21FB TO B-13 TO GET DP-22
ADD HYD              ID=91 HYD NO=DP-22  INFLOW IDS= 89 AND 90
PRINT HYD            ID=91   CODE=5


****DETERMINE PONDING DEPTH AT DP-22
*
ROUTE RESERVOIR         ID=92  HYD NO=RR-DP-22  INFLOW ID=91  CODE=1
                        OUTFLOW (CFS)     STORAGE (AC FT)       ELEV
                        0.00                    0.00            5028.50
                        0.90                    0.003           5029.00
                        2.80                    0.030           5029.50
                       18.90                    0.050           5030.00

PRINT HYD       ID=92   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 133 (133)
***************************************************************************
*

COMPUTE NM HYD  ID=93   HYD NO=B-133-DP23       DA=0.000645 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1
```

```
PRINT HYD       ID=93   CODE=1

*******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 134 (134)
*******************************************************************************
*
**** INCREASE SEDIMENT BULK FACTOR FOR PARTIALLY DEVELOPED BASINS 134, 135
SEDIMENT BULK   CODE=1  BULK FACTOR=1.06

COMPUTE NM HYD  ID=94   HYD NO=B-134    DA=0.001341 SQ MI
                PER A=0     PER B=0   PER=6   PER D=94
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=94   CODE=1

*******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 135 (135)
*******************************************************************************
*

COMPUTE NM HYD  ID=95   HYD NO=B-135    DA=0.003929 SQ MI
                PER A=0     PER B=0   PER C=69   PER D=31
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=95   CODE=1

**** ADD DIV DP-7FB.2 TO B-135 TO GET 135.1
ADD HYD              ID=96 HYD NO=135.1  INFLOW ID= 29 AND 95
PRINT HYD            ID=96   CODE=5

*******************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN OSE (OSE)
*******************************************************************************
*
**** DECREASE SEDIMENT BULK FACTOR FOR DEVELOPED BASINS
SEDIMENT BULK   CODE=1  BULK FACTOR=1.03

COMPUTE NM HYD  ID=97   HYD NO=B-OSE    DA=0.0005216 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=97   CODE=1

**** ADD B-134 TO OSE TO GET OSE.1
ADD HYD              ID=98 HYD NO=B-OSE.1  INFLOW IDS= 94 AND 97
PRINT HYD            ID=98   CODE=5

**** ADD B-135 TO OSE.1 TO GET DP-24
ADD HYD              ID=99 HYD NO=DP-24 INFLOW IDS= 96 AND 98
PRINT HYD            ID=99   CODE=5

FINISH
```

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =11/28/2011
INPUT FILE = 100yre6.dat USER NO.= AHYMO-C-9803c01UNMLIB-AH

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 1 NOTATION
*S***										
*S										
*S	100 YEAR 6 HOUR STORM - EXISTING RUNOFF ANALYSIS									
*S	RAINFALL DATA FROM DPM Chapter 22 - ZONE 2									
*S										
*S***										
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.270
SEDIMENT BULK										PK BF = 1.10
COMPUTE NM HYD	B-OSC	-	1	.00150	3.83	.138	1.72065	1.500	3.995	PER IMP= 56.00
COMPUTE NM HYD	B-101	-	2	.00687	12.19	.347	.94623	1.500	2.772	PER IMP= 3.00
ADD HYD	DP-1	1& 2	3	.00837	16.02	.484	1.08484	1.500	2.991	
COMPUTE NM HYD	B-102-DP-2	-	4	.00209	4.66	.149	1.34395	1.500	3.493	PER IMP= 23.00
SEDIMENT BULK										PK BF = 1.03
COMPUTE NM HYD	B-103	-	1	.00028	.59	.018	1.23704	1.500	3.326	PER IMP= 21.00
COMPUTE NM HYD	B-OSA	-	2	.02814	69.89	2.680	1.78564	1.500	3.881	PER IMP= 78.00
COMPUTE NM HYD	B-OSB	-	5	.01234	33.44	1.314	1.99596	1.500	4.233	PER IMP= 92.00
ADD HYD	OSA.1	2& 5	6	.04048	103.33	3.994	1.84975	1.500	3.988	
DIVIDE HYD	OSA&B-INT	6	7	.02834	72.33	2.796	1.84974	1.500	3.988	
	OSA&B-FB	and	8	.01214	31.00	1.198	1.84974	1.500	3.988	
ADD HYD	OSB.2	3& 8	5	.02052	47.02	1.682	1.53764	1.500	3.581	
ADD HYD	OSB.3	4& 5	7	.02260	51.68	1.832	1.51976	1.500	3.573	
ADD HYD	DP-3	1& 7	8	.02288	52.27	1.850	1.51635	1.500	3.570	
COMPUTE NM HYD	B-104	-	10	.00132	3.45	.131	1.86769	1.500	4.082	PER IMP= 80.00
COMPUTE NM HYD	B-105	-	11	.00110	3.07	.122	2.08147	1.500	4.355	PER IMP= 100.00
ADD HYD	DP-4	10&11	12	.00242	6.51	.254	1.96465	1.500	4.206	
DIVIDE HYD	DP-4INT	12	13	.00153	2.90	.160	1.96465	1.500	2.963	
	DP-4FB	and	14	.00089	3.61	.093	1.96465	1.500	6.343	
COMPUTE NM HYD	B-106-DP-5	-	15	.00058	1.62	.064	2.08147	1.500	4.367	PER IMP= 100.00
DIVIDE HYD	DP-5INT	15	16	.00056	1.37	.062	2.08099	1.500	3.848	
	DP-5FB	and	17	.00002	.25	.003	2.08099	1.500	16.930	
COMPUTE NM HYD	B-107	-	18	.00270	6.60	.241	1.67529	1.500	3.818	PER IMP= 62.00
ADD HYD	DP-4&5FB	14&17	19	.00091	3.86	.096	1.96738	1.500	6.610	
ADD HYD	DP-6	18&19	20	.00361	10.46	.337	1.74900	1.500	4.524	
COMPUTE NM HYD	B-OSD	-	21	.00084	2.34	.093	2.08147	1.500	4.358	PER IMP= 100.00
COMPUTE NM HYD	B-108	-	22	.00357	9.42	.364	1.91045	1.500	4.126	PER IMP= 84.00
ADD HYD	108.10	21&22	23	.00441	11.76	.457	1.94285	1.500	4.170	
COMPUTE NM HYD	B-109	-	24	.00257	7.16	.285	2.08147	1.500	4.349	PER IMP= 100.00
ADD HYD	DP-7	23&24	25	.00698	18.92	.742	1.99388	1.500	4.236	
DIVIDE HYD	DP-7INT	25	26	.00328	5.36	.349	1.99388	1.500	2.555	
	DP-7FB	and	27	.00370	13.56	.393	1.99388	1.500	5.726	
DIVIDE HYD	DV-DP-7FB.1	27	28	.00370	13.56	.393	1.99384	1.500	5.726	
	DV-DP-7FB.2	and	29	.00000	.00	.000	.00000	-.033	.000	
COMPUTE NM HYD	B-110	-	30	.00094	2.02	.066	1.31187	1.500	3.358	PER IMP= 28.00
COMPUTE NM HYD	B-111	-	31	.00871	23.45	.917	1.97458	1.500	4.206	PER IMP= 90.00
DIVIDE HYD	DP-10	31	33	.00758	13.00	.798	1.97455	1.400	2.681	
	DP-10PND	and	34	.00113	10.45	.119	1.97455	1.500	14.388	
COMPUTE NM HYD	B-112	-	35	.00509	14.16	.565	2.08147	1.500	4.346	PER IMP= 100.00
COMPUTE NM HYD	B-113	-	36	.00223	6.21	.248	2.08147	1.500	4.350	PER IMP= 100.00

♀

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 2 NOTATION
ADD HYD	DP4&5INT	13&16	24	.00209	4.28	.222	1.99571	1.500	3.200	
ADD HYD	DP-8	24&26	25	.00537	9.64	.571	1.99459	1.500	2.806	
ADD HYD	DP-9	25&36	24	.00760	15.85	.819	2.02005	1.500	3.259	
ADD HYD	DP-11	24&33	26	.01517	28.85	1.616	1.99733	1.500	2.970	
ADD HYD	DP-12	26&35	36	.02026	43.00	2.181	2.01845	1.500	3.316	
COMPUTE NM HYD	B-114	-	37	.00111	3.09	.123	2.08147	1.500	4.355	PER IMP= 100.00
COMPUTE NM HYD	B-115	-	38	.00262	7.20	.285	2.03871	1.500	4.297	PER IMP= 96.00
COMPUTE NM HYD	B-116	-	39	.00245	6.83	.272	2.08147	1.500	4.349	PER IMP= 100.00
ADD HYD	116.10	28&39	40	.00615	20.39	.666	2.02875	1.500	5.177	
ADD HYD	116.20	37&40	41	.00726	23.47	.789	2.03675	1.500	5.051	
ADD HYD	DP-13	38&41	42	.00988	30.67	1.073	2.03725	1.500	4.852	
SEDIMENT BULK										PK BF = 1.06
COMPUTE NM HYD	B-117-DP-14	-	43	.00581	15.18	.572	1.84509	1.500	4.084	PER IMP= 73.00
ROUTE RESERVOIR	RR-DP-14	43	44	.00581	5.46	.583	1.88236	1.766	1.468	AC-FT= .213
DIVIDE HYD	DP-14INT	44	45	.00575	4.80	.578	1.88236	1.533	1.304	
	DP-14FB	and	46	.00006	.66	.006	1.88236	1.766	18.458	
COMPUTE NM HYD	B-118	-	47	.00195	4.06	.126	1.20707	1.500	3.251	PER IMP= 15.00
SEDIMENT BULK										PK BF = 1.03
COMPUTE NM HYD	B-119	-	50	.00539	14.22	.549	1.91045	1.500	4.123	PER IMP= 84.00
ADD HYD	119.10	20&50	51	.00900	24.68	.886	1.84562	1.500	4.284	
ADD HYD	119.20	46&51	52	.00906	24.68	.892	1.84584	1.500	4.257	
ADD HYD	119.30	47&52	53	.01101	28.74	1.017	1.73251	1.500	4.079	
ADD HYD	DP-15	42&53	54	.02089	59.41	2.091	1.87663	1.500	4.444	
DIVIDE HYD	DP-15INT	54	55	.00528	3.30	.528	1.87663	1.233	.977	
	DP-15FB	and	56	.01561	56.11	1.563	1.87663	1.500	5.616	
ADD HYD	DP-15.1	45&55	46	.01103	8.10	1.106	1.87965	1.533	1.148	
ADD HYD	DP-16	36&46	57	.03129	51.09	3.287	1.96953	1.500	2.551	
DIVIDE HYD	DV-DP7FB.1	56	58	.01171	42.09	1.172	1.87663	1.500	5.616	
	DV-DP7FB.2	and	59	.00390	14.03	.391	1.87663	1.500	5.616	
DIVIDE HYD	DVDP7FB.1-1	58	60	.00585	21.04	.586	1.87663	1.500	5.616	
	DVDP7FB.1-2	and	61	.00585	21.04	.586	1.87663	1.500	5.616	
SEDIMENT BULK										PK BF = 1.06
COMPUTE NM HYD	B-120	-	62	.00033	.64	.018	1.04207	1.500	3.060	PER IMP= .00
COMPUTE NM HYD	B-121	-	63	.00252	5.31	.167	1.24007	1.500	3.292	PER IMP= 18.00
ADD HYD	DP-17	62&63	64	.00285	5.95	.185	1.21719	1.500	3.265	
ROUTE RESERVOIR	RR-DP-17	64	65	.00285	3.02	.185	1.21719	1.667	1.660	AC-FT= .057
SEDIMENT BULK										PK BF = 1.03
COMPUTE NM HYD	B-122	-	66	.00000	.01	.000	2.08147	1.500	4.861	PER IMP= 100.00
COMPUTE NM HYD	B-123	-	67	.00012	.35	.014	2.08147	1.500	4.451	PER IMP= 100.00
COMPUTE NM HYD	B-124	-	68	.00151	4.20	.167	2.08147	1.500	4.352	PER IMP= 100.00
ADD HYD	124.10	59&68	69	.00541	18.23	.558	1.93367	1.500	5.264	
DIVIDE HYD	DV-124.1-1	69	70	.00522	15.00	.539	1.93367	1.467	4.486	
	DV-124.1-2	and	71	.00019	3.23	.019	1.93367	1.500	27.006	
COMPUTE NM HYD	B-125	-	59	.00151	4.21	.168	2.08147	1.500	4.352	PER IMP= 100.00
ADD HYD	125.10	59&65	68	.00436	6.60	.353	1.51704	1.533	2.364	

ADD HYD	DP-18	68&70	72	.00958	21.60	.892	1.74414	1.533	3.521	
ADD HYD	DP-19	57&72	74	.04088	72.65	4.179	1.91669	1.500	2.777	
COMPUTE NM HYD	B-126	-	75	.00147	3.88	.151	1.92811	1.500	4.113	PER IMP= 89.00
COMPUTE NM HYD	B-127	-	76	.00109	2.90	.113	1.95599	1.500	4.164	PER IMP= 91.00
ADD HYD	DP-127.1	75&76	77	.00256	6.77	.265	1.93975	1.500	4.135	
COMPUTE NM HYD	B-128	-	78	.00027	.75	.030	2.08147	1.500	4.394	PER IMP= 100.00
COMPUTE NM HYD	B-129	-	79	.00391	10.87	.434	2.08147	1.500	4.347	PER IMP= 100.00

PAGE = 3

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
ADD HYD	129.10	60&79	80	.00976	31.91	1.020	1.95859	1.500	5.108	
ADD HYD	129.20	71&80	81	.00995	35.14	1.039	1.95812	1.500	5.519	
COMPUTE NM HYD	B-130	-	82	.00250	6.95	.277	2.08147	1.500	4.349	PER IMP= 100.00
ADD HYD	130.10	61&82	83	.00835	28.00	.863	1.93786	1.500	5.237	
ADD HYD	DP-20	77&83	84	.01091	34.77	1.128	1.93830	1.500	4.978	
COMPUTE NM HYD	131.00	-	85	.00117	3.26	.130	2.08147	1.500	4.355	PER IMP= 100.00
ADD HYD	131.10	81&85	86	.01112	38.40	1.169	1.97109	1.500	5.397	
ADD HYD	DP-21	84&86	87	.02203	73.17	2.297	1.95485	1.500	5.189	
ROUTE RESERVOIR	RR-DP-21	87	88	.02203	70.15	2.297	1.95485	1.533	4.975	AC-FT= .191
DIVIDE HYD	DP-21FB	88	89	.00000	.03	.000	1.95485	1.533	59.140	
	DP-21INT	and	84	.02203	70.13	2.297	1.95485	1.533	4.973	
COMPUTE NM HYD	B-132	-	90	.00309	8.60	.343	2.08147	1.500	4.348	PER IMP= 100.00
ADD HYD	DP-22	89&90	91	.00309	8.60	.343	2.08135	1.500	4.347	
ROUTE RESERVOIR	RR-DP-22	91	92	.00309	8.40	.343	2.08135	1.533	4.247	AC-FT= .037
COMPUTE NM HYD	B-133-DP23	-	93	.00065	1.80	.072	2.08147	1.500	4.364	PER IMP= 100.00
SEDIMENT BULK										PK BF = 1.06
COMPUTE NM HYD	B-134	-	94	.00134	3.78	.148	2.07609	1.500	4.405	PER IMP= 94.00
COMPUTE NM HYD	B-135	-	95	.00393	8.74	.290	1.38308	1.500	3.476	PER IMP= 31.00
ADD HYD	135.10	29&95	96	.00393	8.74	.290	1.38301	1.500	3.476	
SEDIMENT BULK										PK BF = 1.03
COMPUTE NM HYD	B-OSE	-	97	.00052	1.46	.058	2.08147	1.500	4.367	PER IMP= 100.00
ADD HYD	B-OSE.1	94&97	98	.00186	5.24	.206	2.07734	1.500	4.394	
ADD HYD	DP-24	96&98	99	.00579	13.98	.496	1.60630	1.500	3.772	
FINISH										

EXISTING CONDITIONS
100 YEAR – 24 HOUR
HYDROLOGY MODEL

WILSON
&COMPANY

```
* ALBUQUERQUE PUBLIC SCHOOLS
* MASTER DRAINAGE PLAN
* EXISTING CONDITIONS MODEL
* 100 YR 24 HR STORM EVENT
* DATE: November 2011
*
*S****************************************************************************
*S
*S      100 YEAR 24 HOUR STORM - EXISTING RUNOFF ANALYSIS
*S      RAINFALL DATA FROM DPM Chapter 22 - ZONE 2
*S
*S****************************************************************************

START           0.0 HOURS
RAINFALL        TYPE=2  RAIN QUARTER=0.0 IN
                RAIN ONE=1.80 IN        RAIN SIX=2.27 IN
                RAIN DAY=2.62 IN        DT=0.05 HR

**** SEDIMENT BULK FACTOR
SEDIMENT BULK   CODE=1  BULK FACTOR=1.10
****************************************************************************
*
****************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN C (OSC)
****************************************************************************
*

COMPUTE NM HYD  ID=1    HYD NO=B-OSC    DA=0.001499 SQ MI
                PER A=0    PER B=0    PER C=44   PER D=56
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=1    CODE=1

****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 101 (101)
****************************************************************************
*

COMPUTE NM HYD  ID=2    HYD NO=B-101    DA=0.006872 SQ MI
                PER A=0    PER B=44   PER C=53   PER D=3
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=2    CODE=1

**** ADD OSC TO 101 TO GET DP-1
ADD HYD              ID=3 HYD NO=DP-1  INFLOW IDS= 1 AND 2
PRINT HYD            ID=3   CODE=5

****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 102 (102)
****************************************************************************
*

COMPUTE NM HYD  ID=4    HYD NO=B-102-DP-2 DA=0.002085 SQ MI
                PER A=0     PER B=0   PER C=77   PER D=23
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=4    CODE=1


****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 103 (103)
****************************************************************************
*
**** REDUCE SEDIMENT BULK FACTOR FOR DEVELOPED BASINS
SEDIMENT BULK   CODE=1  BULK FACTOR=1.03

COMPUTE NM HYD  ID=1    HYD NO=B-103    DA=0.000275 SQ MI
                PER A=0     PER B=0   PER C=79   PER D=21
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=1    CODE=1

****************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN OSA (OSA)
****************************************************************************
*

COMPUTE NM HYD  ID=2    HYD NO=B-OSA    DA=0.028141 SQ MI
                PER A=0     PER B=18   PER C=4   PER D=78
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=2    CODE=1

****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN OSB (OSB)
****************************************************************************
*

COMPUTE NM HYD  ID=5    HYD NO=B-OSB    DA=0.012342 SQ MI
                PER A=0     PER B=0   PER C=8    PER D=92
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=5    CODE=1

**** ADD B-OSA TO B-OSB
ADD HYD              ID=6 HYD NO=OSA.1  INFLOW IDS= 2 AND 5
PRINT HYD            ID=6   CODE=5

**** DIVIDE ABOVE HYDROGRAPH BY A 70 PERCENT ESTIMATED UPSTREAM INTERCEPTION
DIVIDE HYD           ID=6  PER=-70     ID=7  HYD NO=OSA&B-INT
                                       ID=8  HYD NO=OSA&B-FB
**** ADD OSA&B-FB TO DP-1
ADD HYD              ID=5 HYD NO=OSB.2  INFLOW IDS= 3 AND 8
PRINT HYD            ID=5   CODE=5
```

```
**** ADD 102 TO B-OSB.2 TO GET OSB.3
ADD HYD              ID=7 HYD NO=OSB.3  INFLOW IDS= 4 AND 5
PRINT HYD            ID=7   CODE=5

**** ADD 103 TO B-OSB.3 TO GET DP-3
ADD HYD              ID=8 HYD NO=DP-3  INFLOW IDS= 1 AND 7
PRINT HYD            ID=8   CODE=5


******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 104 (104)
******************************************************************************
*

COMPUTE NM HYD  ID=10   HYD NO=B-104    DA=0.00132 SQ MI
                PER A=0     PER B=0   PER C=20   PER D=80
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=10   CODE=1

******************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN 105 (105)
******************************************************************************
*

COMPUTE NM HYD  ID=11   HYD NO=B-105    DA=0.0011 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=11   CODE=1

**** ADD B-104 TO B-105 TO GET DP-4
ADD HYD              ID=12 HYD NO=DP-4  INFLOW IDS= 10 AND 11
PRINT HYD            ID=12   CODE=5

**** DIVIDE HYDROGRAPH BY A RATING CURVE FOR INLET AT DP-4
DIVIDE HYD           ID=12 CODE=999    ID=13  HYD NO=DP-4INT
                                       ID=14  HYD NO=DP-4FB

                     TOTAL FLOW    DIVIDED FLOW
                       0.0            0.0
                       1.0            0.8
                       2.0            1.5
                       3.0            1.9
                       4.0            2.3
                       5.0            2.5
                       6.0            2.8
                       7.0            3.0

PRINT HYD            ID=13   CODE=5
PRINT HYD            ID=14   CODE=5

******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 106 (106)
******************************************************************************
*

COMPUTE NM HYD  ID=15   HYD NO=B-106-DP-5     DA=0.000581 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=15   CODE=1

**** DIVIDE HYDROGRAPH BY A RATING CURVE FOR INLET AT DP-5
DIVIDE HYD           ID=15 CODE=999    ID=16  HYD NO=DP-5INT
                                       ID=17  HYD NO=DP-5FB

                     TOTAL FLOW    DIVIDED FLOW
                       0.0            0.0
                       1.0            1.0
                       2.0            1.6
                       3.0            2.1
                       4.0            2.5

PRINT HYD       ID=16   CODE=5
PRINT HYD       ID=17   CODE=5

******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 107 (107)
******************************************************************************
*

COMPUTE NM HYD  ID=18   HYD NO=B-107    DA=0.0027 SQ MI
                PER A=0     PER B=0   PER C=38   PER D=62
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=18   CODE=1

**** ADD FLOW-BY FROM INLETS AT DP-4 AND DP-5 TO GET DP-4&5FB
ADD HYD              ID=19 HYD NO=DP-4&5FB  INFLOW IDS= 14 AND 17
PRINT HYD            ID=19   CODE=5


**** ADD FLOW-BY DP-4&5FB TO 107 TO GET DP-6
ADD HYD              ID=20 HYD NO=DP-6  INFLOW IDS= 18 AND 19
PRINT HYD            ID=20   CODE=5

******************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN OS-D (OSD)
******************************************************************************
*

COMPUTE NM HYD  ID=21   HYD NO=B-OSD    DA=0.000838 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1
```

```
PRINT HYD       ID=21   CODE=1

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 108 (108)
*****************************************************************************
*

COMPUTE NM HYD  ID=22   HYD NO=B-108    DA=0.003569 SQ MI
                PER A=0     PER B=0   PER C=16   PER D=84
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=22   CODE=1

**** ADD OSD TO 108 TO GET 108.1
ADD HYD              ID=23 HYD NO=108.1  INFLOW IDS= 21 AND 22
PRINT HYD            ID=23   CODE=5

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 109 (109)
*****************************************************************************
*

COMPUTE NM HYD  ID=24   HYD NO=B-109    DA=0.002571 SQ MI
                PER A=0     PER B=0   PER C=0  PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=24   CODE=1

**** ADD 108.1 TO 109 TO GET DP-7
ADD HYD              ID=25 HYD NO=DP-7  INFLOW IDS= 23 AND 24
PRINT HYD            ID=25   CODE=5

**** DIVIDE HYDROGRAPH BY A RATING CURVE FOR INLET AT DP-7
DIVIDE HYD           ID=25 CODE=999    ID=26  HYD NO=DP-7INT
                                       ID=27  HYD NO=DP-7FB

                     TOTAL FLOW    DIVIDED FLOW
                       0.0            0.0
                       3.0            2.1
                       6.0            3.2
                       9.0            4.0
                      12.0            4.5
                      15.0            5.0
                      18.0            5.3
                      21.0            5.5
                      24.0            5.8

**** DIVIDE HYDROGRAPH BY A MAX FLOW RATE TO DIV FLOWS THAT ESCAPE OAK
DIVIDE HYD           ID=27  Q=15.0        ID I=28    HYD NO=DV-DP-7FB.1
                                         ID II=29   HYD NO=DV-DP-7FB.2

PRINT HYD       ID=28   CODE=5
PRINT HYD       ID=29   CODE=5

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 110 (110)
*****************************************************************************
*

COMPUTE NM HYD  ID=30   HYD NO=B-110    DA=0.000938 SQ MI
                PER A=0     PER B=0   PER C=72   PER D=28
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=30   CODE=1

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 111 (111)
*****************************************************************************
*

COMPUTE NM HYD  ID=31   HYD NO=B-111    DA=0.008711 SQ MI
                PER A=0     PER B=0   PER C=10   PER D=90
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=31   CODE=1

**** DIVIDE HYDROGRAPH BY A MAX FLOW RATE AT DP-10
DIVIDE HYD           ID=31  Q=13.0       ID I=33   HYD NO=DP-10
                                        ID II=34  HYD NO=DP-10PND


*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 112 (112)
*****************************************************************************
*

COMPUTE NM HYD  ID=35   HYD NO=B-112    DA=0.00509 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=35   CODE=1


*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 113 (113)
*****************************************************************************
*

COMPUTE NM HYD  ID=36   HYD NO=B-113    DA=0.00223 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=36   CODE=1

**** ADD FLOWS INT AT DP-4 TO DP-5 TO GET FLOW IN PIPE UNDER EMORY LANE
```

```
ADD HYD              ID=24 HYD NO=DP4&5INT  INFLOW IDS= 13 AND 16
PRINT HYD            ID=24   CODE=

**** ADD FLOWS INT AT DP-4 & DP-5 & DP-7 TO GET DP-8
ADD HYD              ID=25 HYD NO=DP-8  INFLOW IDS= 24 AND 26
PRINT HYD            ID=25   CODE=5

**** ADD FLOWS AT DP-8 & BASIN 113 TO GET DP-9
ADD HYD              ID=24 HYD NO=DP-9  INFLOW IDS= 25 AND 36
PRINT HYD            ID=24   CODE=5

**** ADD FLOWS AT DP-9 TO DP-10 TO GET DP-11
ADD HYD              ID=26 HYD NO=DP-11  INFLOW IDS= 24 AND 33
PRINT HYD            ID=26   CODE=5

**** ADD FLOWS FROM BASIN 112 TO DP-11 TO GET DP-12
ADD HYD              ID=36 HYD NO=DP-12  INFLOW IDS= 26 AND 35
PRINT HYD            ID=36   CODE=5


***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 114 (114)
***************************************************************************
*

COMPUTE NM HYD  ID=37   HYD NO=B-114    DA=0.001107 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=37   CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 115 (115)
***************************************************************************
*

COMPUTE NM HYD  ID=38   HYD NO=B-115    DA=0.002619 SQ MI
                PER A=0     PER B=0   PER C=4    PER D=96
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=38   CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 116 (116)
***************************************************************************
*

COMPUTE NM HYD  ID=39   HYD NO=B-116    DA=0.002454 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=39   CODE=1

**** ADD DIV FLOWS BELOW DP-7 TO 116 TO GET 116.1
ADD HYD              ID=40 HYD NO=116.1  INFLOW IDS= 28 AND 39
PRINT HYD            ID=40   CODE=5

**** ADD 104 TO 116.1 TO GET 116.2
ADD HYD              ID=41 HYD NO=116.2  INFLOW IDS= 37 AND 40
PRINT HYD            ID=41   CODE=5

**** ADD 115 TO 116.2 TO GET DP-13
ADD HYD              ID=42 HYD NO=DP-13  INFLOW IDS= 38 AND 41
PRINT HYD            ID=42   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 117 (117)
***************************************************************************
*
**** INCREASE SEDIMENT BULK FACTOR FOR PARTIALLY DEVELOPED BASINS 117, 118
SEDIMENT BULK   CODE=1  BULK FACTOR=1.06
*

COMPUTE NM HYD  ID=43   HYD NO=B-117-DP-14      DA=0.005809 SQ MI
                PER A=0     PER B=0   PER C=27    PER D=73
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=43   CODE=1

****DETERMINE PONDING DEPTH AT DP-14
*
ROUTE RESERVOIR         ID=44  HYD NO=RR-DP-14 INFLOW ID=43  CODE=1
                        OUTFLOW (CFS)     STORAGE (AC FT)       ELEV
                        0.01                   0.00           5047.20
                        4.60                   0.06           5047.53
                        4.80                   0.11           5047.86
                        4.80                   0.17           5048.19
                        4.80                   0.21           5048.52
                       27.00                   0.30           5048.72

**** DIVIDE HYDROGRAPH BY A MAX FLOW RATE AT INLET
DIVIDE HYD           ID=44  Q=4.8       ID I=45   HYD NO=DP-14INT
                                        ID II=46  HYD NO=DP-14FB

PRINT HYD       ID=45   CODE=5
PRINT HYD       ID=46   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 118 (118)
***************************************************************************
*

COMPUTE NM HYD  ID=47   HYD NO=B-118    DA=0.001953 SQ MI
                PER A=0     PER B=0   PER C=85    PER D=15
                TP=0.1333  MASS RAIN=-1
```

```
PRINT HYD       ID=47   CODE=1

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 119 (119)
*****************************************************************************
*
**** DECREASE SEDIMENT BULK FACTOR FOR DEVELOPED BASINS
SEDIMENT BULK   CODE=1  BULK FACTOR=1.03
*

COMPUTE NM HYD  ID=50   HYD NO=B-119    DA=0.005388 SQ MI
                PER A=0     PER B=0   PER C=16    PER D=84
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=50   CODE=1

**** ADD DP-6 TO 119 TO GET 119.1
ADD HYD              ID=51 HYD NO=119.1  INFLOW IDS= 20 AND 50
PRINT HYD            ID=51   CODE=5

**** ADD 119.1 TO FLOWBY FROM DP-14 TO GET 119.2
ADD HYD              ID=52 HYD NO=119.2 INFLOW IDS= 46 AND 51
PRINT HYD            ID=52   CODE=5

**** ADD 118 TO 119.2 TO GET 119.3
ADD HYD              ID=53 HYD NO=119.3 INFLOW IDS= 47 AND 52
PRINT HYD            ID=53   CODE=5

**** ADD DP-13 TO 119.3 TO GET DP-15
ADD HYD              ID=54 HYD NO=DP-15 INFLOW IDS= 42 AND 53
PRINT HYD            ID=54   CODE=5

**** DIVIDE HYDROGRAPH BY A MAX FLOW RATE AT INLET
DIVIDE HYD           ID=54 Q=3.3       ID I=55  HYD NO=DP-15INT
                                       ID II=56  HYD NO=DP-15FB
PRINT HYD       ID=55   CODE=5
PRINT HYD       ID=56   CODE=5

**** ADD FLOWS INT AT DP-14 & DP-15 TO GET FLOWS TO 108 RCP AT DP-15.1
ADD HYD              ID=46 HYD NO=DP-15.1 INFLOW IDS= 45 AND 55
PRINT HYD            ID=46   CODE=5


**** ADD FLOWS INT AT DP-12 & DP-15.1 TO GET FLOWS TO 108 RCP AT DP-16
ADD HYD              ID=57 HYD NO=DP-16 INFLOW IDS= 36 AND 46
PRINT HYD            ID=57   CODE=5

**** DIVIDE HYDROGRAPH BY A PERCENTAGE TO DIVERT FLOWS AT OAK & BITNER TO TWO FLOWS
DIVIDE HYD           ID=56  PER=-75     ID=58  HYD NO=DV-DP7FB.1
                                        ID=59  HYD NO=DV-DP7FB.2
PRINT HYD       ID=58   CODE=5
PRINT HYD       ID=59   CODE=5

**** DIVIDE ABOVE HYDROGRAPH BY A PERCENTAGE TO DIVERT OAK & BITNER TO THREE LOCATIONS
DIVIDE HYD           ID=58  PER=-50     ID=60  HYD NO=DVDP7FB.1-1
                                        ID=61  HYD NO=DVDP7FB.1-2
PRINT HYD       ID=60   CODE=5
PRINT HYD       ID=61   CODE=5

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 120 (120)
*****************************************************************************
*
**** INCREASE SEDIMENT BULK FACTOR FOR PARTIALLY UNDEVELOPED BASIN
SEDIMENT BULK   CODE=1  BULK FACTOR=1.06

COMPUTE NM HYD  ID=62   HYD NO=B-120    DA=0.000327 SQ MI
                PER A=0     PER B=0   PER C=100    PER D=0
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=62   CODE=1

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 121 (121)
*****************************************************************************
*

COMPUTE NM HYD  ID=63   HYD NO=B-121    DA=0.00252 SQ MI
                PER A=0     PER B=0   PER C=82   PER D=18
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=63   CODE=1

**** ADD B-120 TO B-121 TO GET DP-17
ADD HYD              ID=64 HYD NO=DP-17  INFLOW IDS= 62 AND 63
PRINT HYD            ID=64   CODE=5

****DETERMINE PONDING DEPTH AT DP-17
*
ROUTE RESERVOIR         ID=65  HYD NO=RR-DP-17  INFLOW ID=64  CODE=1
                        OUTFLOW (CFS)     STORAGE (AC FT)       ELEV
                        0.00                    0.00            5044.40
                        1.00                    0.003           5045.00
                        2.30                    0.030           5045.50
                        4.10                    0.097           5046.00

PRINT HYD       ID=65   CODE=5

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 122 (122)
*****************************************************************************
*
**** DECREASE SEDIMENT BULK FACTOR FOR DEVELOPED BASINS
SEDIMENT BULK   CODE=1  BULK FACTOR=1.03
*
```

```
COMPUTE NM HYD  ID=66   HYD NO=B-122    DA=0.0000038 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=66   CODE=1

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 123 (123)
**************************************************************************
*

COMPUTE NM HYD  ID=67   HYD NO=B-123    DA=0.000124 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=67   CODE=1

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 124 (124)
**************************************************************************
*

COMPUTE NM HYD  ID=68   HYD NO=B-124    DA=0.001508 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=68   CODE=1

**** ADD B-124 TO DIV DP-7FB.1 TO GET 124.1
ADD HYD              ID=69 HYD NO=124.1   INFLOW IDS= 59 AND 68
PRINT HYD            ID=69   CODE=5

**** DIVIDE HYDROGRAPH BY A MAX FLOW RATE BASED UPON STREET CAPACITY IN OAK
DIVIDE HYD           ID=69  Q=15        ID I=70   HYD NO=DV-124.1-1
                                        ID II=71   HYD NO=DV-124.1-2

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 125 (125)
**************************************************************************
*

COMPUTE NM HYD  ID=59   HYD NO=B-125    DA=0.001513 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=59   CODE=1

**** ADD RR DP-17 TO B-125 TO GET 125.1
ADD HYD              ID=68 HYD NO=125.1   INFLOW IDS= 59 AND 65
PRINT HYD            ID=68   CODE=5

**** ADD 125.1 TO DIV 124.1-1 TO GET DP-18
ADD HYD              ID=72 HYD NO=DP-18  INFLOW IDS= 68 AND 70
PRINT HYD            ID=72   CODE=5

**** ADD DP-16 TO DP-18 TO GET DP-19
ADD HYD              ID=74 HYD NO=DP-19  INFLOW IDS= 57 AND 72
PRINT HYD            ID=74   CODE=5


**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 126 (126)
**************************************************************************
*

COMPUTE NM HYD  ID=75   HYD NO=B-126    DA=0.001473 SQ MI
                PER A=0     PER B=11   PER C=0   PER D=89
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=75   CODE=1

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 127 (127)
**************************************************************************
*

COMPUTE NM HYD  ID=76   HYD NO=B-127    DA=0.001087 SQ MI
                PER A=0     PER B=9   PER C=0   PER D=91
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=76   CODE=1

**** ADD B-126 TO B-127 TO GET DP-127.1
ADD HYD              ID=77 HYD NO=DP-127.1  INFLOW IDS= 75 AND 76
PRINT HYD            ID=77   CODE=5

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 128 (128)
**************************************************************************
*

COMPUTE NM HYD  ID=78   HYD NO=B-128    DA=0.000266 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=78   CODE=1

*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 129 (129)
**************************************************************************
*

COMPUTE NM HYD  ID=79   HYD NO=B-129    DA=0.003907 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1
```

```
PRINT HYD       ID=79   CODE=1
**** ADD SUBDIV-DP-7FB.2-1 TO B-129 TO GET 129.1
ADD HYD              ID=80 HYD NO=129.1  INFLOW IDS= 60 AND 79
PRINT HYD            ID=80   CODE=5

**** ADD 124.1-2 TO 129.1 TO GET 129.2
ADD HYD              ID=81 HYD NO=129.2  INFLOW IDS= 71 AND 80
PRINT HYD            ID=81   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 130 (130)
***************************************************************************
*

COMPUTE NM HYD  ID=82   HYD NO=B-130    DA=0.002498 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=82   CODE=1

**** ADD SUBDIV-DP-7FB.2-2 TO 130 TO GET 130.1
ADD HYD              ID=83 HYD NO=130.1  INFLOW IDS= 61 AND 82
PRINT HYD            ID=83   CODE=5

**** ADD 127.1 TO 130.1 TO GET DP-20
ADD HYD              ID=84 HYD NO=DP-20  INFLOW IDS= 77 AND 83
PRINT HYD            ID=84   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 131 (131)
***************************************************************************
*

COMPUTE NM HYD  ID=85   HYD NO=131      DA=0.001171 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=85   CODE=1

**** ADD 129.2 TO 131 TO GET 131.1
ADD HYD              ID=86 HYD NO=131.1  INFLOW IDS= 81 AND 85
PRINT HYD            ID=86   CODE=5

**** ADD DP-20 TO 131.1 TO GET DP-21
ADD HYD              ID=87 HYD NO=DP-21  INFLOW IDS= 84 AND 86
PRINT HYD            ID=87   CODE=5

****DETERMINE PONDING DEPTH AT DP-21
*
ROUTE RESERVOIR         ID=88  HYD NO=RR-DP-21  INFLOW ID=87  CODE=1
                        OUTFLOW (CFS)     STORAGE (AC FT)       ELEV
                        0.00                    0.00           5029.50
                        0.90                    0.002          5030.00
                        2.80                    0.019          5030.50
                       18.90                    0.091          5031.00
                       69.80                    0.190          5031.30
                       100.00                   0.240          5031.40

**** DIVIDE HYDROGRAPH BY A RATING CURVE FOR OVERFLOW TO DP-21.1
DIVIDE HYD           ID=88 CODE=999    ID=89  HYD NO=DP-21FB
                                       ID=84  HYD NO=DP-21INT

                     TOTAL FLOW    DIVIDED FLOW
                         0.0           0.0
                        69.9           0.0
                        83.9           1.4
                       100.0           3.9

PRINT HYD       ID=88   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 132 (132)
***************************************************************************
*

COMPUTE NM HYD  ID=90   HYD NO=B-132            DA=0.003091 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=90   CODE=1

**** ADD DP-21FB TO B-13 TO GET DP-22
ADD HYD              ID=91 HYD NO=DP-22  INFLOW IDS= 89 AND 90
PRINT HYD            ID=91   CODE=5


****DETERMINE PONDING DEPTH AT DP-22
*
ROUTE RESERVOIR         ID=92  HYD NO=RR-DP-22  INFLOW ID=91  CODE=1
                        OUTFLOW (CFS)     STORAGE (AC FT)       ELEV
                        0.00                    0.00           5028.50
                        0.90                    0.003          5029.00
                        2.80                    0.030          5029.50
                       18.90                    0.050          5030.00

PRINT HYD       ID=92   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 133 (133)
***************************************************************************
*

COMPUTE NM HYD  ID=93   HYD NO=B-133-DP23       DA=0.000645 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1
```

```
PRINT HYD       ID=93   CODE=1

********************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 134 (134)
********************************************************************************
*
**** INCREASE SEDIMENT BULK FACTOR FOR PARTIALLY DEVELOPED BASINS 134, 135
SEDIMENT BULK   CODE=1  BULK FACTOR=1.06

COMPUTE NM HYD  ID=94   HYD NO=B-134    DA=0.001341 SQ MI
                PER A=0     PER B=0   PER=6   PER D=94
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=94   CODE=1

********************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 135 (135)
********************************************************************************
*

COMPUTE NM HYD  ID=95   HYD NO=B-135    DA=0.003929 SQ MI
                PER A=0     PER B=0   PER C=69   PER D=31
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=95   CODE=1

**** ADD DIV DP-7FB.2 TO B-135 TO GET 135.1
ADD HYD              ID=96 HYD NO=135.1  INFLOW ID= 29 AND 95
PRINT HYD            ID=96   CODE=5

********************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN OSE (OSE)
********************************************************************************
*
**** DECREASE SEDIMENT BULK FACTOR FOR DEVELOPED BASINS
SEDIMENT BULK   CODE=1  BULK FACTOR=1.03

COMPUTE NM HYD  ID=97   HYD NO=B-OSE    DA=0.0005216 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=97   CODE=1

**** ADD B-134 TO OSE TO GET OSE.1
ADD HYD              ID=98 HYD NO=B-OSE.1  INFLOW IDS= 94 AND 97
PRINT HYD            ID=98   CODE=5

**** ADD B-135 TO OSE.1 TO GET DP-24
ADD HYD              ID=99 HYD NO=DP-24 INFLOW IDS= 96 AND 98
PRINT HYD            ID=99   CODE=5

FINISH
```

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =11/28/2011
INPUT FILE = 100yre24.dat USER NO.= AHYMO-C-9803c01UNMLIB-AH

```
*S*************************************************************************
*S
*S                    100 YEAR 24 HOUR STORM - EXISTING RUNOFF ANALYSIS
*S                    RAINFALL DATA FROM DPM Chapter 22 - ZONE 2
*S
*S*************************************************************************
```

PAGE = 1

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										TIME= .00
RAINFALL TYPE= 2										RAIN24= 2.620
SEDIMENT BULK										PK BF = 1.10
COMPUTE NM HYD	B-OSC	-	1	.00150	3.78	.155	1.93780	1.500	3.940	PER IMP= 56.00
COMPUTE NM HYD	B-101	-	2	.00687	12.07	.350	.95605	1.500	2.744	PER IMP= 3.00
ADD HYD	DP-1	1& 2	3	.00837	15.85	.505	1.13178	1.500	2.958	
COMPUTE NM HYD	B-102-DP-2	-	4	.00209	4.61	.159	1.43359	1.500	3.456	PER IMP= 23.00
SEDIMENT BULK										PK BF = 1.03
COMPUTE NM HYD	B-103	-	1	.00028	.58	.019	1.31374	1.500	3.289	PER IMP= 21.00
COMPUTE NM HYD	B-OSA	-	2	.02814	68.84	3.104	2.06823	1.500	3.822	PER IMP= 78.00
COMPUTE NM HYD	B-OSB	-	5	.01234	32.90	1.533	2.32954	1.500	4.165	PER IMP= 92.00
ADD HYD	OSA.1	2& 5	6	.04048	101.73	4.637	2.14788	1.500	3.926	
DIVIDE HYD	OSA&B-INT	6	7	.02834	71.21	3.246	2.14788	1.500	3.926	
	OSA&B-FB	and	8	.01214	30.52	1.391	2.14788	1.500	3.926	
ADD HYD	OSB.2	3& 8	5	.02052	46.37	1.897	1.73328	1.500	3.531	
ADD HYD	OSB.3	4& 5	7	.02260	50.98	2.056	1.70562	1.500	3.524	
ADD HYD	DP-3	1& 7	8	.02288	51.56	2.074	1.70016	1.500	3.522	
COMPUTE NM HYD	B-104	-	10	.00132	3.39	.152	2.15785	1.500	4.018	PER IMP= 80.00
COMPUTE NM HYD	B-105	-	11	.00110	3.01	.143	2.44399	1.500	4.282	PER IMP= 100.00
ADD HYD	DP-4	10&11	12	.00242	6.41	.295	2.28765	1.500	4.138	
DIVIDE HYD	DP-4INT	12	13	.00159	2.88	.194	2.28765	1.500	2.834	
	DP-4FB	and	14	.00083	3.53	.101	2.28765	1.500	6.633	
COMPUTE NM HYD	B-106-DP-5	-	15	.00058	1.60	.076	2.44399	1.500	4.293	PER IMP= 100.00
DIVIDE HYD	DP-5INT	15	16	.00056	1.36	.073	2.44352	1.500	3.775	
	DP-5FB	and	17	.00002	.24	.002	2.44352	1.500	19.701	
COMPUTE NM HYD	B-107	-	18	.00270	6.50	.274	1.90033	1.500	3.764	PER IMP= 62.00
ADD HYD	DP-4&5FB	14&17	19	.00085	3.77	.104	2.29093	1.500	6.924	
ADD HYD	DP-6	18&19	20	.00355	10.27	.377	1.99375	1.500	4.520	
COMPUTE NM HYD	B-OSD	-	21	.00084	2.30	.109	2.44399	1.500	4.285	PER IMP= 100.00
COMPUTE NM HYD	B-108	-	22	.00357	9.27	.422	2.21508	1.500	4.060	PER IMP= 84.00
ADD HYD	108.10	21&22	23	.00441	11.57	.531	2.25847	1.500	4.103	
COMPUTE NM HYD	B-109	-	24	.00257	7.04	.335	2.44399	1.500	4.276	PER IMP= 100.00
ADD HYD	DP-7	23&24	25	.00698	18.61	.866	2.32678	1.500	4.167	
DIVIDE HYD	DP-7INT	25	26	.00351	5.34	.436	2.32678	1.500	2.377	
	DP-7FB	and	27	.00347	13.27	.430	2.32678	1.500	5.978	
DIVIDE HYD	DV-DP-7FB.1	27	28	.00347	13.27	.430	2.32674	1.500	5.978	
	DV-DP-7FB.2	and	29	.00000	.00	.000	.00000	-.050	.000	
COMPUTE NM HYD	B-110	-	30	.00094	1.99	.071	1.41389	1.500	3.319	PER IMP= 28.00
COMPUTE NM HYD	B-111	-	31	.00871	23.07	1.069	2.30092	1.500	4.138	PER IMP= 90.00
DIVIDE HYD	DP-10	31	33	.00774	13.00	.950	2.30089	1.400	2.623	
	DP-10PND	and	34	.00097	10.07	.119	2.30089	1.500	16.259	
COMPUTE NM HYD	B-112	-	35	.00509	13.92	.663	2.44399	1.500	4.274	PER IMP= 100.00
COMPUTE NM HYD	B-113	-	36	.00223	6.10	.291	2.44399	1.500	4.277	PER IMP= 100.00

♀

PAGE = 2

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
ADD HYD	DP4&5INT	13&16	24	.00215	4.24	.267	2.32838	1.500	3.080	
ADD HYD	DP-8	24&26	25	.00566	9.58	.703	2.32738	1.500	2.644	
ADD HYD	DP-9	25&36	24	.00789	15.68	.993	2.36029	1.500	3.106	
ADD HYD	DP-11	24&33	26	.01563	28.68	1.944	2.33087	1.500	2.867	
ADD HYD	DP-12	26&35	36	.02072	42.61	2.607	2.35864	1.500	3.212	
COMPUTE NM HYD	B-114	-	37	.00111	3.03	.144	2.44399	1.500	4.282	PER IMP= 100.00
COMPUTE NM HYD	B-115	-	38	.00262	7.08	.333	2.38677	1.500	4.226	PER IMP= 96.00
COMPUTE NM HYD	B-116	-	39	.00245	6.72	.320	2.44399	1.500	4.276	PER IMP= 100.00
ADD HYD	116.10	28&39	40	.00592	19.98	.750	2.37527	1.500	5.272	
ADD HYD	116.20	37&40	41	.00703	23.02	.894	2.38605	1.500	5.117	
ADD HYD	DP-13	38&41	42	.00965	30.10	1.228	2.38622	1.500	4.875	
SEDIMENT BULK										PK BF = 1.06
COMPUTE NM HYD	B-117-DP-14	-	43	.00581	14.96	.656	2.11764	1.500	4.023	PER IMP= 73.00
ROUTE RESERVOIR	RR-DP-14	43	44	.00581	5.38	.661	2.13420	1.800	1.448	AC-FT= .212
DIVIDE HYD	DP-14INT	44	45	.00576	4.80	.656	2.13420	1.500	1.302	
	DP-14FB	and	46	.00005	.58	.006	2.13420	1.800	18.771	
COMPUTE NM HYD	B-118	-	47	.00195	4.03	.132	1.26366	1.500	3.220	PER IMP= 15.00
SEDIMENT BULK										PK BF = 1.03
COMPUTE NM HYD	B-119	-	50	.00539	14.00	.637	2.21508	1.500	4.059	PER IMP= 84.00
ADD HYD	119.10	20&50	51	.00894	24.26	1.014	2.12714	1.500	4.242	
ADD HYD	119.20	46&51	52	.00899	24.26	1.020	2.12718	1.500	4.219	
ADD HYD	119.30	47&52	53	.01094	28.29	1.151	1.97300	1.500	4.041	
ADD HYD	DP-15	42&53	54	.02059	58.39	2.379	2.16665	1.500	4.432	
DIVIDE HYD	DP-15INT	54	55	.00707	3.30	.817	2.16665	1.250	.730	
	DP-15FB	and	56	.01352	55.09	1.562	2.16665	1.500	6.367	
ADD HYD	DP-15.1	45&55	46	.01283	8.10	1.472	2.15208	1.500	.987	
ADD HYD	DP-16	36&46	57	.03355	50.71	4.079	2.27967	1.500	2.361	
DIVIDE HYD	DV-DP7FB.1	56	58	.01014	41.32	1.172	2.16665	1.500	6.367	
	DV-DP7FB.2	and	59	.00338	13.77	.391	2.16665	1.500	6.367	
DIVIDE HYD	DVDP7FB.1-1	58	60	.00507	20.66	.586	2.16665	1.500	6.367	
	DVDP7FB.1-2	and	61	.00507	20.66	.586	2.16665	1.500	6.367	
SEDIMENT BULK										PK BF = 1.06
COMPUTE NM HYD	B-120	-	62	.00033	.63	.018	1.04281	1.500	3.034	PER IMP= .00
COMPUTE NM HYD	B-121	-	63	.00252	5.26	.176	1.30783	1.500	3.259	PER IMP= 18.00
ADD HYD	DP-17	62&63	64	.00285	5.89	.194	1.27728	1.500	3.234	
ROUTE RESERVOIR	RR-DP-17	64	65	.00285	3.02	.194	1.27728	1.650	1.655	AC-FT= .057
SEDIMENT BULK										PK BF = 1.03
COMPUTE NM HYD	B-122	-	66	.00000	.01	.000	2.44399	1.500	4.723	PER IMP= 100.00
COMPUTE NM HYD	B-123	-	67	.00012	.35	.016	2.44399	1.500	4.358	PER IMP= 100.00
COMPUTE NM HYD	B-124	-	68	.00151	4.13	.197	2.44399	1.500	4.278	PER IMP= 100.00
ADD HYD	124.10	59&68	69	.00489	17.90	.587	2.25215	1.500	5.723	
DIVIDE HYD	DV-124.1-1	69	70	.00475	15.00	.571	2.25215	1.450	4.929	
	DV-124.1-2	and	71	.00013	2.90	.016	2.25215	1.500	34.023	
COMPUTE NM HYD	B-125	-	59	.00151	4.14	.197	2.44399	1.500	4.278	PER IMP= 100.00
ADD HYD	125.10	59&65	68	.00436	6.54	.391	1.68207	1.500	2.345	

ADD HYD	DP-18	68&70	72	.00911	21.54	.962	1.97945	1.500	3.693	
ADD HYD	DP-19	57&72	74	.04267	72.25	5.042	2.21553	1.500	2.646	
COMPUTE NM HYD	B-126	-	75	.00147	3.82	.177	2.25074	1.500	4.047	PER IMP= 89.00
COMPUTE NM HYD	B-127	-	76	.00109	2.85	.133	2.28588	1.500	4.096	PER IMP= 91.00
ADD HYD	DP-127.1	75&76	77	.00256	6.66	.309	2.26542	1.500	4.068	
COMPUTE NM HYD	B-128	-	78	.00027	.73	.035	2.44399	1.500	4.315	PER IMP= 100.00
COMPUTE NM HYD	B-129	-	79	.00391	10.69	.509	2.44399	1.500	4.274	PER IMP= 100.00

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 3 NOTATION
ADD HYD	129.10	60&79	80	.00898	31.35	1.095	2.28732	1.500	5.456	
ADD HYD	129.20	71&80	81	.00911	34.25	1.111	2.28681	1.500	5.874	
COMPUTE NM HYD	B-130	-	82	.00250	6.84	.326	2.44399	1.500	4.276	PER IMP= 100.00
ADD HYD	130.10	61&82	83	.00757	27.49	.911	2.25815	1.500	5.677	
ADD HYD	DP-20	77&83	84	.01013	34.16	1.221	2.25999	1.500	5.270	
COMPUTE NM HYD	131.00	-	85	.00117	3.21	.153	2.44399	1.500	4.282	PER IMP= 100.00
ADD HYD	131.10	81&85	86	.01028	37.46	1.264	2.30468	1.500	5.693	
ADD HYD	DP-21	84&86	87	.02041	71.62	2.484	2.28250	1.500	5.483	
ROUTE RESERVOIR	RR-DP-21	87	88	.02041	66.64	2.484	2.28250	1.500	5.101	AC-FT= .184
DIVIDE HYD	DP-21FB	88	89	.00000	.00	.000	2.28250	-.050	.000	
	DP-21INT	and	84	.02041	66.64	2.484	2.28250	1.500	5.101	
COMPUTE NM HYD	B-132	-	90	.00309	8.46	.403	2.44399	1.500	4.275	PER IMP= 100.00
ADD HYD	DP-22	89&90	91	.00309	8.46	.403	2.44390	1.500	4.275	
ROUTE RESERVOIR	RR-DP-22	91	92	.00309	8.65	.403	2.44390	1.500	4.373	AC-FT= .037
COMPUTE NM HYD	B-133-DP23	-	93	.00065	1.77	.084	2.44399	1.500	4.289	PER IMP= 100.00
SEDIMENT BULK										PK BF = 1.06
COMPUTE NM HYD	B-134	-	94	.00134	3.72	.174	2.42684	1.500	4.330	PER IMP= 94.00
COMPUTE NM HYD	B-135	-	95	.00393	8.64	.314	1.49924	1.500	3.437	PER IMP= 31.00
ADD HYD	135.10	29&95	96	.00393	8.64	.314	1.49917	1.500	3.437	
SEDIMENT BULK										PK BF = 1.03
COMPUTE NM HYD	B-OSE	-	97	.00052	1.43	.068	2.44399	1.500	4.293	PER IMP= 100.00
ADD HYD	B-OSE.1	94&97	98	.00186	5.15	.242	2.43134	1.500	4.319	
ADD HYD	DP-24	96&98	99	.00579	13.79	.556	1.79896	1.500	3.721	
FINISH										

EXISTING CONDITIONS
100 YEAR – 6 HOUR
660 ACRE OFFSITE AND 35 ACRE ONSITE
HYDROLOGY MODEL

WILSON
&COMPANY

```
* ALBUQUERQUE PUBLIC SCHOOLS
* MASTER DRAINAGE PLAN
* LARGE OFFSITE / ONSITE EXISTING CONDITIONS MODEL
* 100 YR 6 HR STORM EVENT
* DATE: November 2011
*

*S***************************************************************************
*S
*S      100 YEAR 6 HOUR STORM - EXISTING OFFSITE / ONSITE RUNOFF ANALYSIS
*S      RAINFALL DATA FROM DPM Chapter 22 - ZONE 2
*S
*S***************************************************************************

START           0.0 HOURS
RAINFALL        TYPE=1  RAIN QUARTER=0.0 IN
                RAIN ONE=1.80 IN        RAIN SIX=2.27 IN
                RAIN DAY=2.62 IN        DT=0.03333 HR

**** SEDIMENT BULK FACTOR
SEDIMENT BULK   CODE=1  BULK FACTOR=1.02
***************************************************************************
*
***************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN A-1 (A-1)
**************************************************************************
*

COMPUTE LT TP   LCODE=1 NK=3    ISLOPE=0
                LENGTH=100      SLOPE=0.013     K=.7
                LENGTH=461      SLOPE=0.027     K=2.0
                LENGTH=9930     SLOPE=0.014     K=3.0
                KN=0.021        CENTROID RATIO= 0.43

COMPUTE NM HYD  ID=1    HYD NO=A-1      DA=1.02469 SQ MI
                PER A=0     PER B=26   PER C=0   PER D=74
                TP=0.0  MASS RAIN=-1

PRINT HYD       ID=1    CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN B-1 (B-1)
***************************************************************************
*

COMPUTE NM HYD  ID=2    HYD NO=B-1      DA=0.060156 SQ MI
                PER A=0    PER B=1   PER C=7   PER D=92
                TP=0.133  MASS RAIN=-1

PRINT HYD       ID=2    CODE=1

**** ROUTE A-1 TO B-1 GET DP-1
ADD HYD              ID=3 HYD NO=DP-1  INFLOW IDS= 1 AND 2
PRINT HYD            ID=3   CODE=5

FINISH
```

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =11/28/2011
INPUT FILE = 100YRE61.DAT USER NO.= AHYMO-C-9803c01UNMLIB-AH

PAGE = 1

*S***
*S
*S EAR 6 HOUR STORM - EXISTING OFFSITE / ONSITE RUNOFF ANALYSIS
*S RAINFALL DATA FROM DPM Chapter 22 - ZONE 2
*S
*S***

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.270
SEDIMENT BULK										PK BF = 1.02
COMPUTE NM HYD	A-1	-	1	1.02469	1573.02	93.031	1.70229	1.667	2.399	PER IMP= 74.00
COMPUTE NM HYD	B-1	-	2	.06016	161.17	6.329	1.97277	1.500	4.186	PER IMP= 92.00
ADD HYD	DP-1	1& 2	3	1.08485	1654.11	99.360	1.71729	1.667	2.382	
FINISH										

PROPOSED CONDITIONS

- **100 YEAR - 6 HOUR –HYDROLOGY MODEL**
- **100 YEAR – 24 HOUR HYDROLOGY MODEL**

PROPOSED CONDITIONS
100 YEAR – 6 HOUR
HYDROLOGY MODEL

```
 * ALBUQUERQUE PUBLIC SCHOOLS
* MASTER DRAINAGE PLAN
* PROPOSED CONDITIONS MODEL
* 100 YR 6 HR STORM EVENT
* DATE: November 2011
*

*S***************************************************************************
*S
*S      100 YEAR 6 HOUR STORM - PROPOSED RUNOFF ANALYSIS
*S      RAINFALL DATA FROM DPM Chapter 22 - ZONE 2
*S
*S***************************************************************************

START           0.0 HOURS
RAINFALL        TYPE=1  RAIN QUARTER=0.0 IN
                RAIN ONE=1.80 IN        RAIN SIX=2.27 IN
                RAIN DAY=2.62 IN        DT=0.03333 HR

**** SEDIMENT BULK FACTOR
SEDIMENT BULK   CODE=1  BULK FACTOR=1.10
***************************************************************************
*
***************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN C (OSC)
***************************************************************************
*

COMPUTE NM HYD  ID=1    HYD NO=B-OSC    DA=0.001352 SQ MI
                PER A=0    PER B=0    PER C=44   PER D=56
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=1    CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 201 (201)
***************************************************************************
*

COMPUTE NM HYD  ID=2    HYD NO=B-201    DA=0.006872 SQ MI
                PER A=0    PER B=44   PER C=53   PER D=3
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=2    CODE=1

**** ADD OSC TO 101 TO GET DP-1
ADD HYD              ID=3 HYD NO=DP-1  INFLOW IDS= 1 AND 2
PRINT HYD            ID=3   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 202 (202)
***************************************************************************
*

COMPUTE NM HYD  ID=4    HYD NO=B-202-DP-2 DA=0.00211 SQ MI
                PER A=0     PER B=0   PER C=75   PER D=25
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=4    CODE=1


***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 203 (203)
***************************************************************************
*
**** REDUCE SEDIMENT BULK FACTOR FOR DEVELOPED BASINS
SEDIMENT BULK   CODE=1  BULK FACTOR=1.03

COMPUTE NM HYD  ID=1    HYD NO=B-203    DA=0.000275 SQ MI
                PER A=0     PER B=0   PER C=79   PER D=21
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=1    CODE=1

***************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN OSA (OSA)
***************************************************************************
*

COMPUTE NM HYD  ID=2    HYD NO=B-OSA    DA=0.028141 SQ MI
                PER A=0     PER B=18   PER C=4   PER D=78
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=2    CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN OSB (OSB)
***************************************************************************
*

COMPUTE NM HYD  ID=5    HYD NO=B-OSB    DA=0.012342 SQ MI
                PER A=0     PER B=0   PER C=8    PER D=92
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=5    CODE=1

**** ADD B-OSA TO B-OSB
ADD HYD              ID=6 HYD NO=OSA.1  INFLOW IDS= 2 AND 5
PRINT HYD            ID=6   CODE=5

**** DIVIDE ABOVE HYDROGRAPH BY A 70 PERCENT ESTIMATED UPSTREAM INTERCEPTION
DIVIDE HYD           ID=6  PER=-70     ID=7  HYD NO=OSA&B-INT
                                       ID=8  HYD NO=OSA&B-FB
**** ADD OSA&B-FB TO 202 TO GET OSB.1
ADD HYD              ID=5 HYD NO=OSB.2  INFLOW IDS= 4 AND 8
PRINT HYD            ID=5   CODE=5
```

```
**** ADD 203 TO B-OSB.2 TO GET DP-3
ADD HYD              ID=8 HYD NO=DP-3  INFLOW IDS= 1 AND 5
PRINT HYD            ID=8   CODE=5


*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 204 (204)
*****************************************************************************
*P

COMPUTE NM HYD  ID=10   HYD NO=B-204    DA=0.00132 SQ MI
                PER A=0     PER B=0   PER C=20   PER D=80
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=10   CODE=1

*****************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN 205 (205)
*****************************************************************************
*

COMPUTE NM HYD  ID=11   HYD NO=B-205    DA=0.0011 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=11   CODE=1

**** ADD B-204 TO B-205 TO GET DP-4
ADD HYD              ID=12 HYD NO=DP-4  INFLOW IDS= 10 AND 11
PRINT HYD            ID=12   CODE=5

**** DIVIDE HYDROGRAPH BY A RATING CURVE FOR INLET AT DP-4
DIVIDE HYD           ID=12 CODE=999    ID=13  HYD NO=DP-4INT
                                       ID=14  HYD NO=DP-4FB

                     TOTAL FLOW    DIVIDED FLOW
                       0.0             0.0
                       1.0             1.0
                       2.0             1.7
                       3.0             2.3
                       4.0             2.8
                       5.0             3.2
                       6.0             3.6
                       7.0             3.9

PRINT HYD            ID=13   CODE=5
PRINT HYD            ID=14   CODE=5

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 206 (206)
*****************************************************************************
*

COMPUTE NM HYD  ID=15   HYD NO=B-206     DA=0.00073 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=15   CODE=1

**** ADD 206 TO FLOW-BY FROM DP-4 TO GET DP-5
ADD HYD              ID=16 HYD NO=DP-5  INFLOW IDS= 14 AND 15

PRINT HYD       ID=16   CODE=5


*****************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN OS-D (OSD)
*****************************************************************************
*

COMPUTE NM HYD  ID=21   HYD NO=B-OSD    DA=0.000838 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=21   CODE=1

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 208 (208)
*****************************************************************************
*

COMPUTE NM HYD  ID=22   HYD NO=B-208    DA=0.003569 SQ MI
                PER A=0     PER B=0   PER C=16   PER D=84
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=22   CODE=1

**** ADD OSD TO 208 TO GET 208.1
ADD HYD              ID=23 HYD NO=208.1  INFLOW IDS= 21 AND 22
PRINT HYD            ID=23   CODE=5

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 209 (209)
*****************************************************************************
*

COMPUTE NM HYD  ID=24   HYD NO=B-209    DA=0.002571 SQ MI
                PER A=0     PER B=0   PER C=0  PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=24   CODE=1

**** ADD 208.1 TO 209 TO GET DP-7
ADD HYD              ID=25 HYD NO=DP-7  INFLOW IDS= 23 AND 24
PRINT HYD            ID=25   CODE=5
```

```
**** DIVIDE HYDROGRAPH BY A RATING CURVE FOR INLET AT DP-7
DIVIDE HYD           ID=25 CODE=999    ID=26  HYD NO=DP-7INT
                                       ID=27  HYD NO=DP-7FB

                     TOTAL FLOW    DIVIDED FLOW
                       0.0             0.0
                       3.0             2.1
                       6.0             3.2
                       9.0             4.0
                      12.0             4.5
                      15.0             5.0
                      18.0             5.3
                      21.0             5.5
                      24.0             5.8

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 210 (210)
**************************************************************************
*

COMPUTE NM HYD  ID=30   HYD NO=B-210    DA=0.000938 SQ MI
                PER A=0     PER B=0   PER C=72   PER D=28
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=30   CODE=1

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 211 (211)
**************************************************************************
*

COMPUTE NM HYD  ID=31   HYD NO=B-211    DA=0.0087114 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=31   CODE=1

**** DIVIDE HYDROGRAPH BY A MAX FLOW RATE AT DP-10
DIVIDE HYD           ID=31  Q=13.0       ID I=33   HYD NO=DP-10
                                        ID II=34  HYD NO=DP-10PND

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 212 (212)
**************************************************************************
*

COMPUTE NM HYD  ID=32   HYD NO=B-212    DA=0.00509 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=32   CODE=1

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 213 (213)
**************************************************************************
*

COMPUTE NM HYD  ID=31   HYD NO=B-213    DA=0.00223 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=31   CODE=1

**** ADD FLOWS INT AT DP-4 TO DP-5 TO GET FLOW IN PIPE UNDER EMORY LANE
ADD HYD              ID=24 HYD NO=DP4&5INT  INFLOW IDS= 13 AND 16
PRINT HYD            ID=24   CODE=

**** ADD FLOWS INT AT DP-4 & DP-5 & DP-7 TO GET DP-8
ADD HYD              ID=25 HYD NO=DP-8  INFLOW IDS= 24 AND 26
PRINT HYD            ID=25   CODE=5

**** ADD FLOWS AT DP-8 & BASIN 213 TO GET DP-9
ADD HYD              ID=24 HYD NO=DP-9  INFLOW IDS= 25 AND 31
PRINT HYD            ID=24   CODE=5

**** ADD FLOWS AT DP-9 TO DP-10 TO GET DP-11
ADD HYD              ID=26 HYD NO=DP-11  INFLOW IDS= 24 AND 33
PRINT HYD            ID=26   CODE=5

**** ADD FLOWS FROM BASIN 212 TO DP-11 TO GET DP-12
ADD HYD              ID=36 HYD NO=DP-12  INFLOW IDS= 26 AND 32
PRINT HYD            ID=36   CODE=5

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 214 (214)
**************************************************************************
*

COMPUTE NM HYD  ID=34   HYD NO=B-214    DA=0.004804 SQ MI
                PER A=0     PER B=2   PER C=2    PER D=96
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=34   CODE=1

**** ADD FLOWS DP-7FB TO B-214 TO GET DP-13
ADD HYD              ID=35 HYD NO=DP-13  INFLOW IDS= 27 AND 34
PRINT HYD            ID=35   CODE=5


**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 215 (215)
**************************************************************************
*
**** INCREASE SEDIMENT BULK FACTOR FOR PARTIALLY DEVELOPED BASIN 215
SEDIMENT BULK   CODE=1  BULK FACTOR=1.06
```

```
*

COMPUTE NM HYD  ID=43   HYD NO=B-215-DP-14      DA=0.00556 SQ MI
                PER A=0     PER B=1   PER C=25    PER D=74
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=43   CODE=1

****DETERMINE PONDING DEPTH AT DP-13
*
ROUTE RESERVOIR         ID=44  HYD NO=RR-DP-14 INFLOW ID=43  CODE=1
                        OUTFLOW (CFS)     STORAGE (AC FT)       ELEV
                        0.01                    0.00            5047.20
                        4.60                    0.06            5047.53
                        5.60                    0.11            5047.86
                        5.80                    0.17            5048.19
                        5.90                    0.21            5048.52
                       27.00                    0.30            5048.72

**** DIVIDE HYDROGRAPH BY A MAX FLOW RATE AT INLET
DIVIDE HYD           ID=44  Q=5.9       ID I=45   HYD NO=DP-14INT
                                        ID II=46  HYD NO=DP-14FB

PRINT HYD       ID=45   CODE=5
PRINT HYD       ID=46   CODE=5

**** ADD DP-12 TO DP-14INT TO GET DP-15
ADD HYD              ID=43 HYD NO=DP-15  INFLOW IDS= 36 AND 45
PRINT HYD            ID=43   CODE=5


***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 216 (216)
***************************************************************************
*
**** DECREASE SEDIMENT BULK FACTOR FOR DEVELOPED BASINS
SEDIMENT BULK   CODE=1  BULK FACTOR=1.03
*

COMPUTE NM HYD  ID=47   HYD NO=B-216    DA=0.00741 SQ MI
                PER A=0     PER B=3   PER C=11    PER D=86
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=47   CODE=1

**** ADD DP-14FB TO 216 TO GET DP-16
ADD HYD              ID=48 HYD NO=DP-16  INFLOW IDS= 46 AND 47
PRINT HYD            ID=48   CODE=5

**** ADD DP-13 TO DP-16 TO GET DP-17
ADD HYD              ID=49 HYD NO=DP-17  INFLOW IDS= 35 AND 48
PRINT HYD            ID=49   CODE=5


***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 217 (217)
***************************************************************************
*
**** INCREASE SEDIMENT BULK FACTOR FOR PARTIALLY DEVELOPED BASIN 217
SEDIMENT BULK   CODE=1  BULK FACTOR=1.06
*

COMPUTE NM HYD  ID=48   HYD NO=B-217-DP-18      DA=0.003078 SQ MI
                PER A=1     PER B=3   PER C=30    PER D=66
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=48   CODE=1


***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 218 (218)
***************************************************************************
*
**** DECREASE SEDIMENT BULK FACTOR FOR DEVELOPED BASINS
SEDIMENT BULK   CODE=1  BULK FACTOR=1.03

COMPUTE NM HYD  ID=50   HYD NO=B-218    DA=0.000099 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=50   CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 219 (219)
***************************************************************************
*

COMPUTE NM HYD  ID=51   HYD NO=B-219    DA=0.000322 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=51   CODE=1


***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 220 (220)
***************************************************************************
*

COMPUTE NM HYD  ID=52   HYD NO=B-220    DA=0.001204 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=52   CODE=1

**** ADD DP-18 TO 220 TO GET DP-19
```

```
ADD HYD              ID=53 HYD NO=DP-19  INFLOW IDS= 48 AND 52
PRINT HYD            ID=53   CODE=5

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 221 (221)
*****************************************************************************
*

COMPUTE NM HYD  ID=48   HYD NO=B-221    DA=0.000131 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=48   CODE=1

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 222 (222)
*****************************************************************************
*

COMPUTE NM HYD  ID=52   HYD NO=B-222    DA=0.000664 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=52   CODE=1

**** ADD DP-19 TO 222 TO GET DP-20
ADD HYD              ID=54 HYD NO=DP-20  INFLOW IDS= 52 AND 53
PRINT HYD            ID=54   CODE=5

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 223 (223)
*****************************************************************************
*

COMPUTE NM HYD  ID=55   HYD NO=B-223    DA=0.00242 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=55   CODE=1

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 224 (224)
*****************************************************************************
*

COMPUTE NM HYD  ID=56   HYD NO=B-224    DA=0.003727 SQ MI
                PER A=0     PER B=1   PER C=1    PER D=98
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=56   CODE=1

**** ADD 223 TO 224 TO GET DP-19
ADD HYD              ID=57 HYD NO=DP-21  INFLOW IDS= 55 AND 56
PRINT HYD            ID=57   CODE=5

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 225 (225)
*****************************************************************************
*

COMPUTE NM HYD  ID=58   HYD NO=B-225    DA=0.00051 SQ MI
                PER A=0     PER B=70   PER C=0    PER D=30
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=58   CODE=1


**** ADD DP-17 TO DP-20 TO GET 225.1
ADD HYD              ID=59 HYD NO=225.1  INFLOW IDS= 49 AND 54
PRINT HYD            ID=59   CODE=5

**** ADD DP-21 TO DP-225.1 TO GET 225.2
ADD HYD              ID=49 HYD NO=225.1  INFLOW IDS= 57 AND 59
PRINT HYD            ID=49   CODE=5

**** ADD 225 TO 225.2 TO GET DP-22
ADD HYD              ID=54 HYD NO=DP-22  INFLOW IDS= 49 AND 58
PRINT HYD            ID=54   CODE=5

**** ADD FLOW INT AT DP-16 & DP-22 TO GET DP-23
ADD HYD              ID=53 HYD NO=DP-23  INFLOW IDS= 43 AND 54
PRINT HYD            ID=53   CODE=5


*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 226 (226)
*****************************************************************************
*

COMPUTE NM HYD  ID=56   HYD NO=B-226    DA=0.00291 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=56   CODE=1

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 227 (227)
*****************************************************************************
*

COMPUTE NM HYD  ID=57   HYD NO=B-227    DA=0.00463 SQ MI
                PER A=0     PER B=3   PER C=3    PER D=94
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=57   CODE=1
```

```
**** ADD 226 TO 227 TO GET DP-24
ADD HYD             ID=58 HYD NO=DP-24  INFLOW IDS= 56 AND 57
PRINT HYD           ID=58   CODE=5

*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 228 (228)
*************************************************************************
*

COMPUTE NM HYD  ID=59   HYD NO=B-228    DA=0.00032 SQ MI
                PER A=0     PER B=70   PER C=0    PER D=30
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=59   CODE=1

**** ADD DP-24 TO 228 TO GET DP-25
ADD HYD             ID=60 HYD NO=DP-25  INFLOW IDS= 58 AND 59
PRINT HYD           ID=60   CODE=5

****DETERMINE PONDING DEPTH AT DP-25
*
ROUTE RESERVOIR         ID=61  HYD NO=RR-DP-25/26 INFLOW ID=60  CODE=1
                        OUTFLOW (CFS)     STORAGE (AC FT)       ELEV
                        0.01                    0.00            5029.00
                        6.20                    0.03            5029.25
                       15.91                    0.06            5029.50
                       16.48                    0.10            5029.75
                       17.01                    0.13            5030.00

PRINT HYD       ID=61   CODE=5

*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 229 (229)
*************************************************************************

COMPUTE NM HYD  ID=62   HYD NO=B-229-DP-27      DA=0.002477 SQ MI
                PER A=0     PER B=1   PER C=1   PER D=98
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=62   CODE=1


*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 230 (230)
*************************************************************************
*

COMPUTE NM HYD  ID=63   HYD NO=B-230    DA=0.00198 SQ MI
                PER A=0     PER B=9   PER C=9   PER D=82
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=63   CODE=1

*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 231 (231)
*************************************************************************
*

COMPUTE NM HYD  ID=64   HYD NO=B-231    DA=0.00040 SQ MI
                PER A=0     PER B=70   PER C=0   PER D=30
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=64   CODE=1

**** ADD 230 TO 231 TO GET 231.1
ADD HYD             ID=65 HYD NO=231.1   INFLOW IDS= 63 AND 64
PRINT HYD           ID=65   CODE=5

**** ADD 229 TO 231.1 TO GET DP-28
ADD HYD             ID=66 HYD NO=DP-28  INFLOW IDS= 62 AND 65
PRINT HYD           ID=66   CODE=5

****DETERMINE PONDING DEPTH AT DP-28
*
ROUTE RESERVOIR         ID=67  HYD NO=RR-DP-28/29 INFLOW ID=66  CODE=1
                        OUTFLOW (CFS)     STORAGE (AC FT)       ELEV
                        0.01                    0.00            5028.00
                        4.70                    0.04            5028.25
                        6.00                    0.07            5028.50
                        6.30                    0.11            5028.75
                        6.50                    0.15            5029.00

PRINT HYD       ID=67   CODE=5


*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 232 (232)
*************************************************************************
*

COMPUTE NM HYD  ID=68   HYD NO=B-232    DA=0.00016 SQ MI
                PER A=0     PER B=9   PER C=100   PER D=0
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=68   CODE=1

*************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 233 (233)
*************************************************************************
*

COMPUTE NM HYD  ID=69   HYD NO=B-233    DA=0.00152 SQ MI
                PER A=0     PER B=2   PER C=2   PER D=96
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=69   CODE=1
```

```
********************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 234 (234)
********************************************************************************
*

COMPUTE NM HYD  ID=70   HYD NO=B-234    DA=0.00245 SQ MI
                PER A=0     PER B=1   PER C=1   PER D=98
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=70   CODE=1

*******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 235(235)
********************************************************************************
*

COMPUTE NM HYD  ID=71   HYD NO=B-235    DA=0.000266 SQ MI
                PER A=0     PER B=70   PER C=0   PER D=30
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=71   CODE=1

**** ADD 233 TO 235 TO GET 235.1
ADD HYD              ID=72 HYD NO=235.1  INFLOW IDS= 69 AND 71
PRINT HYD            ID=72   CODE=5

**** ADD 234 TO 235.1 TO GET DP-30
ADD HYD              ID=73 HYD NO=DP-30  INFLOW IDS= 70 AND 72
PRINT HYD            ID=73   CODE=5

********************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 236 (236)
********************************************************************************
*

COMPUTE NM HYD  ID=74   HYD NO=B-236    DA=0.00101 SQ MI
                PER A=0     PER B=7   PER C=7   PER D=86
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=74   CODE=1

**** ADD DP-30 TO 236 TO GET DP-31
ADD HYD              ID=75 HYD NO=DP-31  INFLOW IDS= 73 AND 74
PRINT HYD            ID=75   CODE=5

FINISH
```

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =11/28/2011
INPUT FILE = 100YRE6.DAT USER NO.= AHYMO-C-9803c01UNMLIB-AH

PAGE = 1

*S**
*S
*S 100 YEAR 6 HOUR STORM - PROPOSED RUNOFF ANALYSIS
*S RAINFALL DATA FROM DPM Chapter 22 - ZONE 2
*S
*S**

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.270
SEDIMENT BULK										PK BF = 1.10
COMPUTE NM HYD	B-OSC	-	1	.00135	3.46	.124	1.72065	1.500	3.998	PER IMP= 56.00
COMPUTE NM HYD	B-201	-	2	.00687	12.19	.347	.94623	1.500	2.772	PER IMP= 3.00
ADD HYD	DP-1	1& 2	3	.00822	15.65	.471	1.07348	1.500	2.973	
COMPUTE NM HYD	B-202-DP-2	-	4	.00211	4.76	.154	1.36678	1.500	3.523	PER IMP= 25.00
SEDIMENT BULK										PK BF = 1.03
COMPUTE NM HYD	B-203	-	1	.00028	.59	.018	1.23704	1.500	3.326	PER IMP= 21.00
COMPUTE NM HYD	B-OSA	-	2	.02814	69.89	2.680	1.78564	1.500	3.881	PER IMP= 78.00
COMPUTE NM HYD	B-OSB	-	5	.01234	33.44	1.314	1.99596	1.500	4.233	PER IMP= 92.00
ADD HYD	OSA.1	2& 5	6	.04048	103.33	3.994	1.84975	1.500	3.988	
DIVIDE HYD	OSA&B-INT	6	7	.02834	72.33	2.796	1.84974	1.500	3.988	
	OSA&B-FB	and	8	.01214	31.00	1.198	1.84974	1.500	3.988	
ADD HYD	OSB.2	4& 8	5	.01425	35.76	1.352	1.77823	1.500	3.919	
ADD HYD	DP-3	1& 5	8	.01453	36.34	1.370	1.76797	1.500	3.908	
COMPUTE NM HYD	B-204	-	10	.00132	3.45	.131	1.86769	1.500	4.082	PER IMP= 80.00
COMPUTE NM HYD	B-205	-	11	.00110	3.07	.122	2.08147	1.500	4.355	PER IMP= 100.00
ADD HYD	DP-4	10&11	12	.00242	6.51	.254	1.96465	1.500	4.206	
DIVIDE HYD	DP-4INT	12	13	.00187	3.75	.196	1.96465	1.500	3.132	
	DP-4FB	and	14	.00055	2.76	.057	1.96465	1.500	7.881	
COMPUTE NM HYD	B-206	-	15	.00073	2.04	.081	2.08147	1.500	4.361	PER IMP= 100.00
ADD HYD	DP-5	14&15	16	.00128	4.80	.138	2.03122	1.500	5.869	
COMPUTE NM HYD	B-OSD	-	21	.00084	2.34	.093	2.08147	1.500	4.358	PER IMP= 100.00
COMPUTE NM HYD	B-208	-	22	.00357	9.42	.364	1.91045	1.500	4.126	PER IMP= 84.00
ADD HYD	208.10	21&22	23	.00441	11.76	.457	1.94285	1.500	4.170	
COMPUTE NM HYD	B-209	-	24	.00257	7.16	.285	2.08147	1.500	4.349	PER IMP= 100.00
ADD HYD	DP-7	23&24	25	.00698	18.92	.742	1.99388	1.500	4.236	
DIVIDE HYD	DP-7INT	25	26	.00328	5.36	.349	1.99388	1.500	2.555	
	DP-7FB	and	27	.00370	13.56	.393	1.99388	1.500	5.726	
COMPUTE NM HYD	B-210	-	30	.00094	2.02	.066	1.31187	1.500	3.358	PER IMP= 28.00
COMPUTE NM HYD	B-211	-	31	.00871	24.23	.967	2.08147	1.500	4.345	PER IMP= 100.00
DIVIDE HYD	DP-10	31	33	.00751	13.00	.834	2.08144	1.400	2.704	
	DP-10PND	and	34	.00120	11.23	.133	2.08144	1.500	14.633	
COMPUTE NM HYD	B-212	-	32	.00509	14.16	.565	2.08147	1.500	4.346	PER IMP= 100.00
COMPUTE NM HYD	B-213	-	31	.00223	6.21	.248	2.08147	1.500	4.350	PER IMP= 100.00
ADD HYD	DP4&5INT	13&16	24	.00315	8.55	.335	1.99164	1.500	4.242	
ADD HYD	DP-8	24&26	25	.00643	13.91	.683	1.99278	1.500	3.381	
ADD HYD	DP-9	25&31	24	.00866	20.12	.931	2.01559	1.500	3.631	
ADD HYD	DP-11	24&33	26	.01617	33.12	1.765	2.04618	1.500	3.200	
ADD HYD	DP-12	26&32	36	.02126	47.28	2.330	2.05462	1.500	3.474	
COMPUTE NM HYD	B-214	-	34	.00480	13.14	.521	2.03156	1.500	4.275	PER IMP= 96.00
ADD HYD	DP-13	27&34	35	.00850	26.70	.914	2.01512	1.500	4.906	

PAGE = 2

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
SEDIMENT BULK										PK BF = 1.06
COMPUTE NM HYD	B-215-DP-14	-	43	.00556	14.55	.549	1.85202	1.500	4.089	PER IMP= 74.00
ROUTE RESERVOIR	RR-DP-14	43	44	.00556	5.82	.561	1.89098	1.733	1.636	AC-FT= .178
DIVIDE HYD	DP-14INT	44	45	.00556	5.82	.561	1.89098	1.733	1.636	
	DP-14FB	and	46	.00000	.00	.000	.00000	-.033	.000	
ADD HYD	DP-15	36&45	43	.02682	52.68	2.891	2.02071	1.500	3.069	
SEDIMENT BULK										PK BF = 1.03
COMPUTE NM HYD	B-216	-	47	.00741	19.56	.759	1.92054	1.500	4.124	PER IMP= 86.00
ADD HYD	DP-16	46&47	48	.00741	19.56	.759	1.92051	1.500	4.124	
ADD HYD	DP-17	35&48	49	.01591	46.26	1.673	1.97106	1.500	4.542	
SEDIMENT BULK										PK BF = 1.06
COMPUTE NM HYD	B-217-DP-18	-	48	.00308	7.76	.287	1.74837	1.500	3.939	PER IMP= 66.00
SEDIMENT BULK										PK BF = 1.03
COMPUTE NM HYD	B-218	-	50	.00010	.28	.011	2.08147	1.500	4.469	PER IMP= 100.00
COMPUTE NM HYD	B-219	-	51	.00032	.90	.036	2.08147	1.500	4.386	PER IMP= 100.00
COMPUTE NM HYD	B-220	-	52	.00120	3.36	.134	2.08147	1.500	4.355	PER IMP= 100.00
ADD HYD	DP-19	48&52	53	.00428	11.12	.421	1.84190	1.500	4.056	
COMPUTE NM HYD	B-221	-	48	.00013	.37	.015	2.08147	1.500	4.436	PER IMP= 100.00
COMPUTE NM HYD	B-222	-	52	.00066	1.85	.074	2.08147	1.500	4.364	PER IMP= 100.00
ADD HYD	DP-20	52&53	54	.00495	12.97	.494	1.87401	1.500	4.097	
COMPUTE NM HYD	B-223	-	55	.00242	6.74	.269	2.08147	1.500	4.349	PER IMP= 100.00
COMPUTE NM HYD	B-224	-	56	.00373	10.29	.409	2.05651	1.500	4.314	PER IMP= 98.00
ADD HYD	DP-21	55&56	57	.00615	17.03	.677	2.06625	1.500	4.328	
COMPUTE NM HYD	B-225	-	58	.00051	.92	.030	1.10555	1.500	2.817	PER IMP= 30.00
ADD HYD	225.10	49&54	59	.02086	59.23	2.167	1.94805	1.500	4.437	
ADD HYD	225.10	57&59	49	.02701	76.25	2.845	1.97496	1.500	4.412	
ADD HYD	DP-22	49&58	54	.02752	77.17	2.875	1.95883	1.500	4.382	
ADD HYD	DP-23	43&54	53	.05434	129.86	5.765	1.98937	1.500	3.734	
COMPUTE NM HYD	B-226	-	56	.00291	8.10	.323	2.08147	1.500	4.348	PER IMP= 100.00
COMPUTE NM HYD	B-227	-	57	.00463	12.56	.495	2.00660	1.500	4.238	PER IMP= 94.00
ADD HYD	DP-24	56&57	58	.00754	20.66	.819	2.03543	1.500	4.281	
COMPUTE NM HYD	B-228	-	59	.00032	.58	.019	1.10555	1.500	2.847	PER IMP= 30.00
ADD HYD	DP-25	58&59	60	.00786	21.24	.837	1.99755	1.500	4.222	
ROUTE RESERVOIR	RR-DP-25/26	60	61	.00786	16.35	.849	2.02519	1.567	3.250	AC-FT= .091
COMPUTE NM HYD	B-229-DP-27	-	62	.00248	6.84	.272	2.05651	1.500	4.318	PER IMP= 98.00
COMPUTE NM HYD	B-230	-	63	.00198	5.10	.196	1.85686	1.500	4.025	PER IMP= 82.00
COMPUTE NM HYD	B-231	-	64	.00040	.73	.024	1.10555	1.500	2.833	PER IMP= 30.00
ADD HYD	231.10	63&64	65	.00238	5.82	.220	1.73039	1.500	3.824	
ADD HYD	DP-28	62&65	66	.00486	12.67	.491	1.89665	1.500	4.076	
ROUTE RESERVOIR	RR-DP-28/29	66	67	.00486	6.35	.503	1.94165	1.667	2.044	AC-FT= .121
COMPUTE NM HYD	B-232	-	68	.00016	.30	.008	.98058	1.500	2.946	PER IMP= .00
COMPUTE NM HYD	B-233	-	69	.00152	4.17	.165	2.03156	1.500	4.288	PER IMP= 96.00
COMPUTE NM HYD	B-234	-	70	.00245	6.77	.269	2.05651	1.500	4.318	PER IMP= 98.00
COMPUTE NM HYD	B-235	-	71	.00027	.49	.016	1.10555	1.500	2.868	PER IMP= 30.00
ADD HYD	235.10	69&71	72	.00179	4.66	.180	1.89339	1.500	4.077	

ADD HYD	DP-30	70&72	73	.00424	11.43	.449	1.98768	1.500	4.216	
COMPUTE NM HYD	B-236	-	74	.00101	2.66	.103	1.90677	1.500	4.111	PER IMP= 86.00
ADD HYD	DP-31	73&74	75	.00525	14.09	.552	1.97205	1.500	4.196	
FINISH										

PROPOSED CONDITIONS
100 YEAR – 24 HOUR
HYDROLOGY MODEL

WILSON
&COMPANY

```
* ALBUQUERQUE PUBLIC SCHOOLS
* MASTER DRAINAGE PLAN
* PROPOSED CONDITIONS MODEL
* 100 YR 24 HR STORM EVENT
* DATE: November 2011
*

*S****************************************************************************
*S
*S      100 YEAR 24 HOUR STORM - PROPOSED RUNOFF ANALYSIS
*S      RAINFALL DATA FROM DPM Chapter 22 - ZONE 2
*S
*S****************************************************************************

START           0.0 HOURS
RAINFALL        TYPE=2  RAIN QUARTER=0.0 IN
                RAIN ONE=1.80 IN        RAIN SIX=2.27 IN
                RAIN DAY=2.62 IN        DT=0.05 HR

**** SEDIMENT BULK FACTOR
SEDIMENT BULK   CODE=1  BULK FACTOR=1.10
*****************************************************************************
*
*****************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN C (OSC)
*****************************************************************************
*

COMPUTE NM HYD  ID=1    HYD NO=B-OSC    DA=0.001352 SQ MI
                PER A=0    PER B=0    PER C=44   PER D=56
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=1    CODE=1

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 201 (201)
*****************************************************************************
*

COMPUTE NM HYD  ID=2    HYD NO=B-201    DA=0.006872 SQ MI
                PER A=0    PER B=44   PER C=53   PER D=3
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=2    CODE=1

**** ADD OSC TO 101 TO GET DP-1
ADD HYD              ID=3 HYD NO=DP-1  INFLOW IDS= 1 AND 2
PRINT HYD            ID=3   CODE=5

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 202 (202)
*****************************************************************************
*

COMPUTE NM HYD  ID=4    HYD NO=B-202-DP-2 DA=0.00211 SQ MI
                PER A=0     PER B=0   PER C=75   PER D=25
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=4    CODE=1


*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 203 (203)
*****************************************************************************
*
**** REDUCE SEDIMENT BULK FACTOR FOR DEVELOPED BASINS
SEDIMENT BULK   CODE=1  BULK FACTOR=1.03

COMPUTE NM HYD  ID=1    HYD NO=B-203    DA=0.000275 SQ MI
                PER A=0     PER B=0   PER C=79   PER D=21
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=1    CODE=1

*****************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN OSA (OSA)
*****************************************************************************
*

COMPUTE NM HYD  ID=2    HYD NO=B-OSA    DA=0.028141 SQ MI
                PER A=0     PER B=18   PER C=4   PER D=78
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=2    CODE=1

*****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN OSB (OSB)
*****************************************************************************
*

COMPUTE NM HYD  ID=5    HYD NO=B-OSB    DA=0.012342 SQ MI
                PER A=0     PER B=0   PER C=8    PER D=92
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=5    CODE=1

**** ADD B-OSA TO B-OSB
ADD HYD              ID=6 HYD NO=OSA.1  INFLOW IDS= 2 AND 5
PRINT HYD            ID=6   CODE=5

**** DIVIDE ABOVE HYDROGRAPH BY A 70 PERCENT ESTIMATED UPSTREAM INTERCEPTION
DIVIDE HYD           ID=6  PER=-70     ID=7  HYD NO=OSA&B-INT
                                       ID=8  HYD NO=OSA&B-FB
**** ADD OSA&B-FB TO 202 TO GET OSB.1
ADD HYD              ID=5 HYD NO=OSB.2  INFLOW IDS= 4 AND 8
PRINT HYD            ID=5   CODE=5
```

```
**** ADD 203 TO B-OSB.2 TO GET DP-3
ADD HYD             ID=8 HYD NO=DP-3  INFLOW IDS= 1 AND 5
PRINT HYD           ID=8   CODE=5


****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 204 (204)
****************************************************************************
*P

COMPUTE NM HYD  ID=10   HYD NO=B-204    DA=0.00132 SQ MI
                PER A=0     PER B=0   PER C=20   PER D=80
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=10   CODE=1

****************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN 205 (205)
****************************************************************************
*

COMPUTE NM HYD  ID=11   HYD NO=B-205    DA=0.0011 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=11   CODE=1

**** ADD B-204 TO B-205 TO GET DP-4
ADD HYD             ID=12 HYD NO=DP-4  INFLOW IDS= 10 AND 11
PRINT HYD           ID=12   CODE=5

**** DIVIDE HYDROGRAPH BY A RATING CURVE FOR INLET AT DP-4
DIVIDE HYD          ID=12 CODE=999    ID=13  HYD NO=DP-4INT
                                      ID=14  HYD NO=DP-4FB

                    TOTAL FLOW    DIVIDED FLOW
                      0.0             0.0
                      1.0             1.0
                      2.0             1.7
                      3.0             2.3
                      4.0             2.8
                      5.0             3.2
                      6.0             3.6
                      7.0             3.9

PRINT HYD           ID=13   CODE=5
PRINT HYD           ID=14   CODE=5

****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 206 (206)
****************************************************************************
*

COMPUTE NM HYD  ID=15   HYD NO=B-206     DA=0.00073 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=15   CODE=1

**** ADD 206 TO FLOW-BY FROM DP-4 TO GET DP-5
ADD HYD             ID=16 HYD NO=DP-5  INFLOW IDS= 14 AND 15

PRINT HYD       ID=16   CODE=5


****************************************************************************
*       COMPUTE HYD FOR OFFSITE SUB-BASIN OS-D (OSD)
****************************************************************************
*

COMPUTE NM HYD  ID=21   HYD NO=B-OSD    DA=0.000838 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=21   CODE=1

****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 208 (208)
****************************************************************************
*

COMPUTE NM HYD  ID=22   HYD NO=B-208    DA=0.003569 SQ MI
                PER A=0     PER B=0   PER C=16   PER D=84
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=22   CODE=1

**** ADD OSD TO 208 TO GET 208.1
ADD HYD             ID=23 HYD NO=208.1  INFLOW IDS= 21 AND 22
PRINT HYD           ID=23   CODE=5

****************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 209 (209)
****************************************************************************
*

COMPUTE NM HYD  ID=24   HYD NO=B-209    DA=0.002571 SQ MI
                PER A=0     PER B=0   PER C=0  PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=24   CODE=1

**** ADD 208.1 TO 209 TO GET DP-7
ADD HYD             ID=25 HYD NO=DP-7  INFLOW IDS= 23 AND 24
PRINT HYD           ID=25   CODE=5
```

```
**** DIVIDE HYDROGRAPH BY A RATING CURVE FOR INLET AT DP-7
DIVIDE HYD           ID=25 CODE=999    ID=26  HYD NO=DP-7INT
                                       ID=27  HYD NO=DP-7FB

                     TOTAL FLOW    DIVIDED FLOW
                       0.0             0.0
                       3.0             2.1
                       6.0             3.2
                       9.0             4.0
                      12.0             4.5
                      15.0             5.0
                      18.0             5.3
                      21.0             5.5
                      24.0             5.8

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 210 (210)
**************************************************************************
*

COMPUTE NM HYD  ID=30   HYD NO=B-210    DA=0.000938 SQ MI
                PER A=0     PER B=0   PER C=72   PER D=28
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=30   CODE=1

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 211 (211)
**************************************************************************
*

COMPUTE NM HYD  ID=31   HYD NO=B-211    DA=0.0087114 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=31   CODE=1

**** DIVIDE HYDROGRAPH BY A MAX FLOW RATE AT DP-10
DIVIDE HYD           ID=31  Q=13.0       ID I=33   HYD NO=DP-10
                                        ID II=34  HYD NO=DP-10PND

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 212 (212)
**************************************************************************
*

COMPUTE NM HYD  ID=32   HYD NO=B-212    DA=0.00509 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=32   CODE=1

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 213 (213)
**************************************************************************
*

COMPUTE NM HYD  ID=31   HYD NO=B-213    DA=0.00223 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=31   CODE=1

**** ADD FLOWS INT AT DP-4 TO DP-5 TO GET FLOW IN PIPE UNDER EMORY LANE
ADD HYD              ID=24 HYD NO=DP4&5INT  INFLOW IDS= 13 AND 16
PRINT HYD            ID=24   CODE=

**** ADD FLOWS INT AT DP-4 & DP-5 & DP-7 TO GET DP-8
ADD HYD              ID=25 HYD NO=DP-8  INFLOW IDS= 24 AND 26
PRINT HYD            ID=25   CODE=5

**** ADD FLOWS AT DP-8 & BASIN 213 TO GET DP-9
ADD HYD              ID=24 HYD NO=DP-9  INFLOW IDS= 25 AND 31
PRINT HYD            ID=24   CODE=5

**** ADD FLOWS AT DP-9 TO DP-10 TO GET DP-11
ADD HYD              ID=26 HYD NO=DP-11  INFLOW IDS= 24 AND 33
PRINT HYD            ID=26   CODE=5

**** ADD FLOWS FROM BASIN 212 TO DP-11 TO GET DP-12
ADD HYD              ID=36 HYD NO=DP-12  INFLOW IDS= 26 AND 32
PRINT HYD            ID=36   CODE=5

**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 214 (214)
**************************************************************************
*

COMPUTE NM HYD  ID=34   HYD NO=B-214    DA=0.004804 SQ MI
                PER A=0     PER B=2   PER C=2    PER D=96
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=34   CODE=1

**** ADD FLOWS DP-7FB TO B-214 TO GET DP-13
ADD HYD              ID=35 HYD NO=DP-13  INFLOW IDS= 27 AND 34
PRINT HYD            ID=35   CODE=5


**************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 215 (215)
**************************************************************************
*
**** INCREASE SEDIMENT BULK FACTOR FOR PARTIALLY DEVELOPED BASIN 215
SEDIMENT BULK   CODE=1  BULK FACTOR=1.06
```

```
*

COMPUTE NM HYD  ID=43   HYD NO=B-215-DP-14      DA=0.00556 SQ MI
                PER A=0     PER B=1   PER C=25    PER D=74
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=43   CODE=1

****DETERMINE PONDING DEPTH AT DP-13
*
ROUTE RESERVOIR         ID=44  HYD NO=RR-DP-14 INFLOW ID=43  CODE=1
                        OUTFLOW (CFS)     STORAGE (AC FT)       ELEV
                        0.01                    0.00            5047.20
                        4.60                    0.06            5047.53
                        5.60                    0.11            5047.86
                        5.80                    0.17            5048.19
                        5.90                    0.21            5048.52
                       27.00                    0.30            5048.72

**** DIVIDE HYDROGRAPH BY A MAX FLOW RATE AT INLET
DIVIDE HYD           ID=44  Q=5.9       ID I=45   HYD NO=DP-14INT
                                        ID II=46  HYD NO=DP-14FB

PRINT HYD       ID=45   CODE=5
PRINT HYD       ID=46   CODE=5

**** ADD DP-12 TO DP-14INT TO GET DP-15
ADD HYD              ID=43 HYD NO=DP-15  INFLOW IDS= 36 AND 45
PRINT HYD            ID=43   CODE=5


***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 216 (216)
***************************************************************************
*
**** DECREASE SEDIMENT BULK FACTOR FOR DEVELOPED BASINS
SEDIMENT BULK   CODE=1  BULK FACTOR=1.03
*

COMPUTE NM HYD  ID=47   HYD NO=B-216    DA=0.00741 SQ MI
                PER A=0     PER B=3   PER C=11    PER D=86
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=47   CODE=1

**** ADD DP-14FB TO 216 TO GET DP-16
ADD HYD              ID=48 HYD NO=DP-16  INFLOW IDS= 46 AND 47
PRINT HYD            ID=48   CODE=5

**** ADD DP-13 TO DP-16 TO GET DP-17
ADD HYD              ID=49 HYD NO=DP-17  INFLOW IDS= 35 AND 48
PRINT HYD            ID=49   CODE=5


***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 217 (217)
***************************************************************************
*
**** INCREASE SEDIMENT BULK FACTOR FOR PARTIALLY DEVELOPED BASIN 217
SEDIMENT BULK   CODE=1  BULK FACTOR=1.06
*

COMPUTE NM HYD  ID=48   HYD NO=B-217-DP-18      DA=0.003078 SQ MI
                PER A=1     PER B=3   PER C=30    PER D=66
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=48   CODE=1


***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 218 (218)
***************************************************************************
*
**** DECREASE SEDIMENT BULK FACTOR FOR DEVELOPED BASINS
SEDIMENT BULK   CODE=1  BULK FACTOR=1.03

COMPUTE NM HYD  ID=50   HYD NO=B-218    DA=0.000099 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=50   CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 219 (219)
***************************************************************************
*

COMPUTE NM HYD  ID=51   HYD NO=B-219    DA=0.000322 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=51   CODE=1


***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 220 (220)
***************************************************************************
*

COMPUTE NM HYD  ID=52   HYD NO=B-220    DA=0.001204 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=52   CODE=1

**** ADD DP-18 TO 220 TO GET DP-19
```

```
ADD HYD              ID=53 HYD NO=DP-19  INFLOW IDS= 48 AND 52
PRINT HYD            ID=53   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 221 (221)
***************************************************************************
*

COMPUTE NM HYD  ID=48   HYD NO=B-221    DA=0.000131 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=48   CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 222 (222)
***************************************************************************
*

COMPUTE NM HYD  ID=52   HYD NO=B-222    DA=0.000664 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=52   CODE=1

**** ADD DP-19 TO 222 TO GET DP-20
ADD HYD              ID=54 HYD NO=DP-20  INFLOW IDS= 52 AND 53
PRINT HYD            ID=54   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 223 (223)
***************************************************************************
*

COMPUTE NM HYD  ID=55   HYD NO=B-223    DA=0.00242 SQ MI
                PER A=0     PER B=0   PER C=0   PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=55   CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 224 (224)
***************************************************************************
*

COMPUTE NM HYD  ID=56   HYD NO=B-224    DA=0.003727 SQ MI
                PER A=0     PER B=1   PER C=1    PER D=98
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=56   CODE=1

**** ADD 223 TO 224 TO GET DP-19
ADD HYD              ID=57 HYD NO=DP-21  INFLOW IDS= 55 AND 56
PRINT HYD            ID=57   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 225 (225)
***************************************************************************
*

COMPUTE NM HYD  ID=58   HYD NO=B-225    DA=0.00051 SQ MI
                PER A=0     PER B=70   PER C=0    PER D=30
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=58   CODE=1


**** ADD DP-17 TO DP-20 TO GET 225.1
ADD HYD              ID=59 HYD NO=225.1  INFLOW IDS= 49 AND 54
PRINT HYD            ID=59   CODE=5

**** ADD DP-21 TO DP-225.1 TO GET 225.2
ADD HYD              ID=49 HYD NO=225.1  INFLOW IDS= 57 AND 59
PRINT HYD            ID=49   CODE=5

**** ADD 225 TO 225.2 TO GET DP-22
ADD HYD              ID=54 HYD NO=DP-22  INFLOW IDS= 49 AND 58
PRINT HYD            ID=54   CODE=5

**** ADD FLOW INT AT DP-16 & DP-22 TO GET DP-23
ADD HYD              ID=53 HYD NO=DP-23  INFLOW IDS= 43 AND 54
PRINT HYD            ID=53   CODE=5


***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 226 (226)
***************************************************************************
*

COMPUTE NM HYD  ID=56   HYD NO=B-226    DA=0.00291 SQ MI
                PER A=0     PER B=0   PER C=0    PER D=100
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=56   CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 227 (227)
***************************************************************************
*

COMPUTE NM HYD  ID=57   HYD NO=B-227    DA=0.00463 SQ MI
                PER A=0     PER B=3   PER C=3    PER D=94
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=57   CODE=1
```

```
**** ADD 226 TO 227 TO GET DP-24
ADD HYD             ID=58 HYD NO=DP-24  INFLOW IDS= 56 AND 57
PRINT HYD           ID=58   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 228 (228)
***************************************************************************
*

COMPUTE NM HYD  ID=59   HYD NO=B-228    DA=0.00032 SQ MI
                PER A=0     PER B=70   PER C=0    PER D=30
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=59   CODE=1

**** ADD DP-24 TO 228 TO GET DP-25
ADD HYD             ID=60 HYD NO=DP-25  INFLOW IDS= 58 AND 59
PRINT HYD           ID=60   CODE=5

****DETERMINE PONDING DEPTH AT DP-25
*
ROUTE RESERVOIR         ID=61  HYD NO=RR-DP-25/26 INFLOW ID=60  CODE=1
                        OUTFLOW (CFS)     STORAGE (AC FT)       ELEV
                        0.01                   0.00             5029.00
                        6.20                   0.03             5029.25
                       15.91                   0.06             5029.50
                       16.48                   0.10             5029.75
                       17.01                   0.13             5030.00

PRINT HYD       ID=61   CODE=5

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 229 (229)
***************************************************************************

COMPUTE NM HYD  ID=62   HYD NO=B-229-DP-27      DA=0.002477 SQ MI
                PER A=0     PER B=1   PER C=1   PER D=98
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=62   CODE=1


***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 230 (230)
***************************************************************************
*

COMPUTE NM HYD  ID=63   HYD NO=B-230    DA=0.00198 SQ MI
                PER A=0     PER B=9   PER C=9   PER D=82
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=63   CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 231 (231)
***************************************************************************
*

COMPUTE NM HYD  ID=64   HYD NO=B-231    DA=0.00040 SQ MI
                PER A=0     PER B=70   PER C=0   PER D=30
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=64   CODE=1

**** ADD 230 TO 231 TO GET 231.1
ADD HYD             ID=65 HYD NO=231.1   INFLOW IDS= 63 AND 64
PRINT HYD           ID=65   CODE=5

**** ADD 229 TO 231.1 TO GET DP-28
ADD HYD             ID=66 HYD NO=DP-28  INFLOW IDS= 62 AND 65
PRINT HYD           ID=66   CODE=5

****DETERMINE PONDING DEPTH AT DP-28
*
ROUTE RESERVOIR         ID=67  HYD NO=RR-DP-28/29 INFLOW ID=66  CODE=1
                        OUTFLOW (CFS)     STORAGE (AC FT)       ELEV
                        0.01                   0.00             5028.00
                        4.70                   0.04             5028.25
                        6.00                   0.07             5028.50
                        6.30                   0.11             5028.75
                        6.50                   0.15             5029.00

PRINT HYD       ID=67   CODE=5


***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 232 (232)
***************************************************************************
*

COMPUTE NM HYD  ID=68   HYD NO=B-232    DA=0.00016 SQ MI
                PER A=0     PER B=9   PER C=100   PER D=0
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=68   CODE=1

***************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 233 (233)
***************************************************************************
*

COMPUTE NM HYD  ID=69   HYD NO=B-233    DA=0.00152 SQ MI
                PER A=0     PER B=2   PER C=2   PER D=96
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=69   CODE=1
```

```
*******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 234 (234)
*******************************************************************************
*

COMPUTE NM HYD  ID=70   HYD NO=B-234    DA=0.00245 SQ MI
                PER A=0     PER B=1   PER C=1   PER D=98
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=70   CODE=1

******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 235(235)
*******************************************************************************
*

COMPUTE NM HYD  ID=71   HYD NO=B-235    DA=0.000266 SQ MI
                PER A=0     PER B=70   PER C=0   PER D=30
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=71   CODE=1

**** ADD 233 TO 235 TO GET 235.1
ADD HYD              ID=72 HYD NO=235.1  INFLOW IDS= 69 AND 71
PRINT HYD            ID=72   CODE=5

**** ADD 234 TO 235.1 TO GET DP-30
ADD HYD              ID=73 HYD NO=DP-30  INFLOW IDS= 70 AND 72
PRINT HYD            ID=73   CODE=5

*******************************************************************************
*       COMPUTE HYD FOR ONSITE SUB-BASIN 236 (236)
*******************************************************************************
*

COMPUTE NM HYD  ID=74   HYD NO=B-236    DA=0.00101 SQ MI
                PER A=0     PER B=7   PER C=7   PER D=86
                TP=0.1333  MASS RAIN=-1

PRINT HYD       ID=74   CODE=1

**** ADD DP-30 TO 236 TO GET DP-31
ADD HYD              ID=75 HYD NO=DP-31  INFLOW IDS= 73 AND 74
PRINT HYD            ID=75   CODE=5

FINISH
```

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =11/28/2011
INPUT FILE = 100YRE24.DAT USER NO.= AHYMO-C-9803c01UNMLIB-AH

PAGE = 1

```
*S************************************************************************
*S
*S            100 YEAR 24 HOUR STORM - PROPOSED RUNOFF ANALYSIS
*S            RAINFALL DATA FROM DPM Chapter 22 - ZONE 2
*S
*S************************************************************************
```

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										TIME= .00
RAINFALL TYPE= 2										RAIN24= 2.620
SEDIMENT BULK										PK BF = 1.10
COMPUTE NM HYD	B-OSC	-	1	.00135	3.41	.140	1.93780	1.500	3.942	PER IMP= 56.00
COMPUTE NM HYD	B-201	-	2	.00687	12.07	.350	.95605	1.500	2.744	PER IMP= 3.00
ADD HYD	DP-1	1& 2	3	.00822	15.48	.490	1.11738	1.500	2.941	
COMPUTE NM HYD	B-202-DP-2	-	4	.00211	4.71	.165	1.46414	1.500	3.485	PER IMP= 25.00
SEDIMENT BULK										PK BF = 1.03
COMPUTE NM HYD	B-203	-	1	.00028	.58	.019	1.31374	1.500	3.289	PER IMP= 21.00
COMPUTE NM HYD	B-OSA	-	2	.02814	68.84	3.104	2.06823	1.500	3.822	PER IMP= 78.00
COMPUTE NM HYD	B-OSB	-	5	.01234	32.90	1.533	2.32954	1.500	4.165	PER IMP= 92.00
ADD HYD	OSA.1	2& 5	6	.04048	101.73	4.637	2.14788	1.500	3.926	
DIVIDE HYD	OSA&B-INT	6	7	.02834	71.21	3.246	2.14788	1.500	3.926	
	OSA&B-FB	and	8	.01214	30.52	1.391	2.14788	1.500	3.926	
ADD HYD	OSB.2	4& 8	5	.01425	35.23	1.556	2.04664	1.500	3.861	
ADD HYD	DP-3	1& 5	8	.01453	35.80	1.574	2.03158	1.500	3.850	
COMPUTE NM HYD	B-204	-	10	.00132	3.39	.152	2.15785	1.500	4.018	PER IMP= 80.00
COMPUTE NM HYD	B-205	-	11	.00110	3.01	.143	2.44399	1.500	4.282	PER IMP= 100.00
ADD HYD	DP-4	10&11	12	.00242	6.41	.295	2.28765	1.500	4.138	
DIVIDE HYD	DP-4INT	12	13	.00195	3.72	.238	2.28765	1.500	2.981	
	DP-4FB	and	14	.00047	2.69	.057	2.28765	1.500	8.953	
COMPUTE NM HYD	B-206	-	15	.00073	2.00	.095	2.44399	1.500	4.289	PER IMP= 100.00
ADD HYD	DP-5	14&15	16	.00120	4.69	.152	2.38262	1.500	6.113	
COMPUTE NM HYD	B-OSD	-	21	.00084	2.30	.109	2.44399	1.500	4.285	PER IMP= 100.00
COMPUTE NM HYD	B-208	-	22	.00357	9.27	.422	2.21508	1.500	4.060	PER IMP= 84.00
ADD HYD	208.10	21&22	23	.00441	11.57	.531	2.25847	1.500	4.103	
COMPUTE NM HYD	B-209	-	24	.00257	7.04	.335	2.44399	1.500	4.276	PER IMP= 100.00
ADD HYD	DP-7	23&24	25	.00698	18.61	.866	2.32678	1.500	4.167	
DIVIDE HYD	DP-7INT	25	26	.00351	5.34	.436	2.32678	1.500	2.377	
	DP-7FB	and	27	.00347	13.27	.430	2.32678	1.500	5.978	
COMPUTE NM HYD	B-210	-	30	.00094	1.99	.071	1.41389	1.500	3.319	PER IMP= 28.00
COMPUTE NM HYD	B-211	-	31	.00871	23.82	1.135	2.44399	1.500	4.273	PER IMP= 100.00
DIVIDE HYD	DP-10	31	33	.00770	13.00	1.004	2.44395	1.400	2.638	
	DP-10PND	and	34	.00101	10.82	.132	2.44395	1.500	16.734	
COMPUTE NM HYD	B-212	-	32	.00509	13.92	.663	2.44399	1.500	4.274	PER IMP= 100.00
COMPUTE NM HYD	B-213	-	31	.00223	6.10	.291	2.44399	1.500	4.277	PER IMP= 100.00
ADD HYD	DP4&5INT	13&16	24	.00315	8.41	.390	2.32380	1.500	4.173	
ADD HYD	DP-8	24&26	25	.00666	13.75	.826	2.32536	1.500	3.227	
ADD HYD	DP-9	25&31	24	.00889	19.86	1.117	2.35508	1.500	3.490	
ADD HYD	DP-11	24&33	26	.01659	32.86	2.120	2.39633	1.500	3.094	
ADD HYD	DP-12	26&32	36	.02168	46.78	2.784	2.40751	1.500	3.371	
COMPUTE NM HYD	B-214	-	34	.00480	12.93	.610	2.37951	1.500	4.205	PER IMP= 96.00
ADD HYD	DP-13	27&34	35	.00827	26.20	1.040	2.35735	1.500	4.948	

♀

PAGE = 2

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
SEDIMENT BULK										PK BF = 1.06
COMPUTE NM HYD	B-215-DP-14	-	43	.00556	14.33	.631	2.12829	1.500	4.027	PER IMP= 74.00
ROUTE RESERVOIR	RR-DP-14	43	44	.00556	5.82	.636	2.14561	1.750	1.635	AC-FT= .178
DIVIDE HYD	DP-14INT	44	45	.00556	5.82	.636	2.14561	1.750	1.635	
	DP-14FB	and	46	.00000	.00	.000	.00000	-.050	.000	
ADD HYD	DP-15	36&45	43	.02724	52.29	3.420	2.35406	1.500	2.999	
SEDIMENT BULK										PK BF = 1.03
COMPUTE NM HYD	B-216	-	47	.00741	19.24	.882	2.23214	1.500	4.057	PER IMP= 86.00
ADD HYD	DP-16	46&47	48	.00741	19.24	.882	2.23210	1.500	4.057	
ADD HYD	DP-17	35&48	49	.01568	45.44	1.922	2.29817	1.500	4.527	
SEDIMENT BULK										PK BF = 1.06
COMPUTE NM HYD	B-217-DP-18	-	48	.00308	7.64	.327	1.99444	1.500	3.880	PER IMP= 66.00
SEDIMENT BULK										PK BF = 1.03
COMPUTE NM HYD	B-218	-	50	.00010	.28	.013	2.44399	1.500	4.380	PER IMP= 100.00
COMPUTE NM HYD	B-219	-	51	.00032	.89	.042	2.44399	1.500	4.306	PER IMP= 100.00
COMPUTE NM HYD	B-220	-	52	.00120	3.30	.157	2.44399	1.500	4.280	PER IMP= 100.00
ADD HYD	DP-19	48&52	53	.00428	10.94	.484	2.12070	1.500	3.992	
COMPUTE NM HYD	B-221	-	48	.00013	.37	.017	2.44399	1.500	4.358	PER IMP= 100.00
COMPUTE NM HYD	B-222	-	52	.00066	1.82	.087	2.44399	1.500	4.289	PER IMP= 100.00
ADD HYD	DP-20	52&53	54	.00495	12.76	.571	2.16404	1.500	4.032	
COMPUTE NM HYD	B-223	-	55	.00242	6.62	.315	2.44399	1.500	4.276	PER IMP= 100.00
COMPUTE NM HYD	B-224	-	56	.00373	10.12	.479	2.41175	1.500	4.242	PER IMP= 98.00
ADD HYD	DP-21	55&56	57	.00615	16.74	.795	2.42435	1.500	4.255	
COMPUTE NM HYD	B-225	-	58	.00051	.91	.033	1.21422	1.500	2.789	PER IMP= 30.00
ADD HYD	225.10	49&54	59	.02063	58.20	2.493	2.26601	1.500	4.408	
ADD HYD	225.10	57&59	49	.02678	74.94	3.288	2.30236	1.500	4.373	
ADD HYD	DP-22	49&58	54	.02729	75.85	3.321	2.28201	1.500	4.344	
ADD HYD	DP-23	43&54	53	.05453	128.14	6.741	2.31801	1.500	3.672	
COMPUTE NM HYD	B-226	-	56	.00291	7.96	.379	2.44399	1.500	4.276	PER IMP= 100.00
COMPUTE NM HYD	B-227	-	57	.00463	12.35	.580	2.34727	1.500	4.169	PER IMP= 94.00
ADD HYD	DP-24	56&57	58	.00754	20.32	.959	2.38452	1.500	4.210	
COMPUTE NM HYD	B-228	-	59	.00032	.58	.021	1.21422	1.500	2.816	PER IMP= 30.00
ADD HYD	DP-25	58&59	60	.00786	20.89	.979	2.33609	1.500	4.153	
ROUTE RESERVOIR	RR-DP-25/26	60	61	.00786	16.31	.984	2.34836	1.550	3.241	AC-FT= .088
COMPUTE NM HYD	B-229-DP-27	-	62	.00248	6.73	.319	2.41175	1.500	4.245	PER IMP= 98.00
COMPUTE NM HYD	B-230	-	63	.00198	5.02	.227	2.15383	1.500	3.960	PER IMP= 82.00
COMPUTE NM HYD	B-231	-	64	.00040	.72	.026	1.21422	1.500	2.801	PER IMP= 30.00
ADD HYD	231.10	63&64	65	.00238	5.73	.253	1.99572	1.500	3.765	
ADD HYD	DP-28	62&65	66	.00486	12.46	.572	2.20783	1.500	4.010	
ROUTE RESERVOIR	RR-DP-28/29	66	67	.00486	6.35	.577	2.22798	1.650	2.043	AC-FT= .120
COMPUTE NM HYD	B-232	-	68	.00016	.30	.008	.98084	1.500	2.917	PER IMP= .00
COMPUTE NM HYD	B-233	-	69	.00152	4.10	.193	2.37951	1.500	4.217	PER IMP= 96.00
COMPUTE NM HYD	B-234	-	70	.00245	6.66	.315	2.41175	1.500	4.245	PER IMP= 98.00
COMPUTE NM HYD	B-235	-	71	.00027	.48	.017	1.21422	1.500	2.829	PER IMP= 30.00
ADD HYD	235.10	69&71	72	.00179	4.58	.209	2.19895	1.500	4.010	

ADD HYD	DP-30	70&72	73	.00424	11.24	.525	2.32196	1.500	4.146	
COMPUTE NM HYD	B-236	-	74	.00101	2.61	.119	2.21831	1.500	4.045	PER IMP= 86.00
ADD HYD	DP-31	73&74	75	.00525	13.85	.644	2.30194	1.500	4.127	
FINISH										

HYDRAULIC ANALYSIS

APPENDIX D

EXISTING CONDITIONS

- **SOUTHEAST REGION HYDRAULICS**
  - BERM/SWALE CAPACITY WORKSHEETS
  - EXISTING POND VOLUME CALCULATION
  - BASEHART STREET CAPACITY WORKSHEET
  - HYDRAULIC JUMP CALCULATION

- **NORTHEAST REGION HYDRAULICS**
  - EXISTING PIPE / INLET RATING CURVES
  - INLET CAPACITY WORKSHEETS
  - VANCE EMORY LANE STEET CAPACITY WORKSHEET
  - HYDRAULIC JUMP CALCULATIONS
  - 108" STORM SEWER CAPACITY CALCUATIONS
  - HYDRAULIC GRADE LINE CALCULATIONS

- **SOUTH CENTRAL REGION HYDRAULICS**
  - EXISTING PIPE / INLET RATING CURVES
  - HYDRAULIC GRADE LINE CALCULATIONS
  - PONDING VOLUME CALCULATIONS
  - HYDRAULIC GRADE LINE CALCULATIONS

- **SOUTHWEST REGION HYDRAULICS**
  - CONCRETE CHASE RATING CURVES
  - PONDING VOLUME CALCULATIONS

- **NORTHWEST REGION HYDRAULICS**
  - LOCUST STREET CAPACITY WORKSHEET

EXISTING CONDITIONS
SOUTHEAST REGION
HYDRAULIC CALCULATIONS

WILSON
&COMPANY

Existing Swale to DP-1 (upper portion)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.026	
Channel Slope	0.00500	ft/ft
Constructed Depth	0.40	ft
Normal Depth	0.40	ft
Constructed Top Width	25.00	ft

Results

Discharge	11.2	ft^3/s
Flow Area	6.67	ft^2
Wetted Perimeter	25.02	ft
Hydraulic Radius	0.27	ft
Top Width	25.00	ft
Critical Depth	0.30	ft
Critical Slope	0.01532	ft/ft
Velocity	1.67	ft/s
Velocity Head	0.04	ft
Specific Energy	0.44	ft
Froude Number	0.57	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.40	ft
Critical Depth	0.30	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.01532	ft/ft

Existing Berm/Swale to DP-1 (lower portion)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.75	ft
Section Definitions		

Station (ft)	Elevation (ft)
0+00.000	0.750
0+03.000	0.000
0+20.000	0.700

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 0.750)	(0+20.000, 0.700)	0.026

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	17.2	ft^3/s
Elevation Range	0.000 to 0.750 ft	
Flow Area	7.93	ft^2
Wetted Perimeter	20.157	ft
Hydraulic Radius	0.39	ft
Top Width	20.000	ft
Normal Depth	0.75	ft
Critical Depth	0.62	ft
Critical Slope	0.01465	ft/ft
Velocity	2.17	ft/s

Existing Berm/Swale to DP-1 (lower portion)

Results

Velocity Head		0.07	ft
Specific Energy		0.82	ft
Froude Number		0.61	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.75	ft
Critical Depth	0.62	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.01465	ft/ft

Albuquerque Public Schools - Lincoln Complex
DRAINAGE MASTER PLAN
(Pond Volume Calculation)

Existing Max Ponding at DP-1

Elevation	SF	CF	Storage AF	Storage Sum
5991	155.00			0
5992	9,027.00	4,591.00	0.11	0.11
5993	23,087.00	16,057.00	0.37	0.47

Total = 20,648 CF
Total = 0.47 Ac-ft

Exisiting Condition Max. Ponding estimated at 1.5' deep
Existing 100 Yr 24 Hr Req Volume at DP-1 0.53 Ac-ft
At Elevation 5992.5, the Storage is 0.29 Ac-ft.

Calculated by: DLM
Date: 7/5/2011
Checked by:

Existing Berm/Swale to DP-2

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00360	ft/ft
Normal Depth	1.00	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	1.000
0+03.000	0.000
0+20.000	1.000

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 1.000)	(0+20.000, 1.000)	0.025

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	22.3	ft^3/s
Elevation Range	0.000 to 1.000 ft	
Flow Area	10.00	ft^2
Wetted Perimeter	20.192	ft
Hydraulic Radius	0.50	ft
Top Width	20.000	ft
Normal Depth	1.00	ft
Critical Depth	0.79	ft
Critical Slope	0.01257	ft/ft
Velocity	2.23	ft/s

Existing Berm/Swale to DP-2

Results

Velocity Head		0.08	ft
Specific Energy		1.08	ft
Froude Number		0.56	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.00	ft
Critical Depth	0.79	ft
Channel Slope	0.00360	ft/ft
Critical Slope	0.01257	ft/ft

Existing Basehart at Emory - 52 cfs

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.04000	ft/ft
Discharge	52.3	ft³/s
Section Definitions		

Station (ft)	Elevation (ft)
0+00.000	0.667
0+00.000	0.000
0+02.000	0.125
0+38.000	1.025
0+40.000	1.150
0+40.000	1.820

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 0.667)	(0+02.000, 0.125)	0.013
(0+02.000, 0.125)	(0+38.000, 1.025)	0.016
(0+38.000, 1.025)	(0+40.000, 1.820)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.64	ft
Elevation Range	0.000 to 1.820 ft	
Flow Area	6.47	ft²
Wetted Perimeter	23.275	ft
Hydraulic Radius	0.28	ft

Existing Basehart at Emory - 52 cfs

Results

Top Width		22.624	ft
Normal Depth		0.64	ft
Critical Depth		0.92	ft
Critical Slope		0.00496	ft/ft
Velocity		8.08	ft/s
Velocity Head		1.01	ft
Specific Energy		1.66	ft
Froude Number		2.66	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.64	ft
Critical Depth	0.92	ft
Channel Slope	0.04000	ft/ft
Critical Slope	0.00496	ft/ft

WILSON & COMPANY

FROM: Lincoln Complex - APS

TO: Existing Conditions

DATE: 8/23/11

FILE:

SUBJECT: Estimate max height of hydraulic jump @ N.W. Corner of Baseheart and Vance Emory Lane

Assumptions

① No upstream retention

Ⓐ DP-1

② 70% of Basin OSA & OSB Intercepted by existing storm systems

③ No collection of runoff @ DP-2

Existing Flow Rate @ DP-3

52.3 CFS

Hydraulic jump Eqn.
$$d_2 = -\frac{d_1}{2} \sqrt{\frac{d_1^2}{4} + \frac{2V_1^2 d_1}{g}}$$

Velocity of runoff in street @ DP-3 per Flowmaster $V_1 = 8.1$ $D_1 = 0.64'$

$$d_2 = -\frac{0.64}{2} \sqrt{\frac{0.64^2}{4} + \frac{2(8.1)^2 \times 0.64}{32.2}}$$

$d_2 = 1.32$

Approx height above curb line = 1.32 - 0.67 = 0.65'

≈ 0.7'

HIGHER Relationships

EXISTING CONDITIONS
NORTHEAST REGION
HYDRAULIC CALCULATIONS

FROM: APS - Lincoln Complex

WILSON &COMPANY

DATE: 6/28/11

TO: Existing Conditions

FILE:

SUBJECT: Determine Rating Curve @ DP-4

At Grade Type C - Single Grade Inlet w/ Throat

Roadway Longitudinal Slope ≈ 1/12 = 8.33%
Roadway Cross Slope = 1/29 = 3.45%
Roadway Width = 32' ±   8" curb @ Inlet
TOG - INV (2.5') Field Measurement

Approx Q_{100} @ DP-4 = 7 cfs (18" ADS)

Q (cfs)	Int (cfs) (Using Flowmaster)
0	0.0
1	0.8
2	1.5
3	1.9
4	2.3
5	2.5
6	2.8
7	3.0

18" ADS Pipe outlet H = 2.0 ft'
HW/D = 2.0/1.5 = 1.33

Chart #2

Nomograph for conc. pipe ≈ 10 cfs* (based upon conc.)
Flow governed by inlet interception.
(verify w/ spreadsheets)

HIGHER Relationships

WILSON &COMPANY

FROM: APS - Lincoln Complex
TO: Existing Conditions
DATE: 6/28/11
FILE:

SUBJECT: Determine Rating Curve @ DP-5

At-Grade Type C - Single Grate w/ Throat

Roadway Longitudinal Slope ≈ 1/40 = 2.5%

Roadway Cross Slope ≈ .68/32 = 2.1%

Roadway Width = 32'±

TOG - inv (2.0) (Field Measurement)

Approx Q_{100} @ DP-6 = 1.7 cfs (18" ADS)

Q (cfs)	Int (cfs) (Using Flowmaster)	
0	0	
1	1.0	
2	1.6	
3	2.1	
4	2.5	Depth = 0.27 ok

18" Pipe H = 2.0

HW/D = 2.0 / 1.5 = 1.33

Chart #2

Nomograph for conc. pipe ≈ 10 cfs (based upon conc. pipe)

Flow from DP 4 & 6 ≈ 5-6 cfs ok

Check HGL w/ spreadsheet

HIGHER Relationships

Exist Single Grate-Single Throat On Grade DP-4

Project Description

Solve For	Efficiency

Input Data

Discharge	7.00	ft³/s
Slope	0.0833	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.0625	ft/ft
Road Cross Slope	0.0345	ft/ft
Roughness Coefficient	0.015	
Local Depression	2.00	in
Local Depression Width	2.50	ft
Grate Width	2.00	ft
Grate Length	3.20	ft
Grate Type	Reticuline	
Clogging	65.00	%
Curb Opening Length	3.95	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	44.01	%
Intercepted Flow	3.1	ft³/s
Bypass Flow	3.92	ft³/s
Spread	6.60	ft
Depth	0.28	ft
Flow Area	0.81	ft²
Gutter Depression	0.06	ft
Total Depression	0.22	ft
Velocity	8.66	ft/s
Splash Over Velocity	2.62	ft/s
Frontal Flow Factor	0.46	
Side Flow Factor	0.01	
Grate Flow Ratio	0.67	
Equivalent Cross Slope	0.09431	ft/ft
Active Grate Length	1.12	ft
Length Factor	0.09	
Total Interception Length	33.03	ft

Exist Single Grate-Single Throat-On Grade DP-5

Project Description

Solve For	Efficiency

Input Data

Discharge	4.00	ft³/s
Slope	0.0250	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.0625	ft/ft
Road Cross Slope	0.0210	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.50	ft
Grate Width	2.00	ft
Grate Length	3.20	ft
Grate Type	Reticuline	
Clogging	65.00	%
Curb Opening Length	3.95	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	67.18	%
Intercepted Flow	2.7	ft³/s
Bypass Flow	1.31	ft³/s
Spread	9.22	ft
Depth	0.28	ft
Flow Area	0.98	ft²
Gutter Depression	0.08	ft
Total Depression	0.25	ft
Velocity	4.10	ft/s
Splash Over Velocity	2.62	ft/s
Frontal Flow Factor	0.87	
Side Flow Factor	0.01	
Grate Flow Ratio	0.57	
Equivalent Cross Slope	0.07808	ft/ft
Active Grate Length	1.12	ft
Length Factor	0.14	
Total Interception Length	19.61	ft

Existing Vance Emory Lane above DP-7 - 19.8 cfs

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.05000	ft/ft
Discharge	19.8	ft^3/s
Section Definitions		

Station (ft)	Elevation (ft)
0+00.000	0.500
0+00.000	0.000
0+01.000	0.043
0+30.000	1.247

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 0.500)	(0+01.000, 0.043)	0.013
(0+01.000, 0.043)	(0+30.000, 1.247)	0.017

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.47	ft
Elevation Range	0.000 to 1.247 ft	
Flow Area	2.66	ft^2
Wetted Perimeter	11.800	ft
Hydraulic Radius	0.23	ft
Top Width	11.319	ft
Normal Depth	0.47	ft
Critical Depth	0.70	ft

Existing Vance Emory Lane above DP-7 - 19.8 cfs

Results

Critical Slope		0.00599	ft/ft
Velocity		7.44	ft/s
Velocity Head		0.86	ft
Specific Energy		1.33	ft
Froude Number		2.71	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.47	ft
Critical Depth	0.70	ft
Channel Slope	0.05000	ft/ft
Critical Slope	0.00599	ft/ft

WILSON & COMPANY

FROM: Lincoln Complex - APS

TO: EXISTING CONDITION

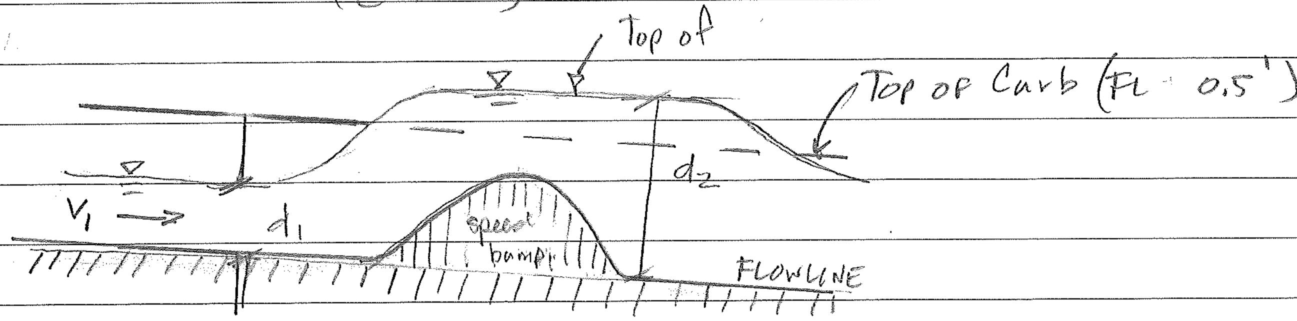
DATE: 6/28/11

FILE:

SUBJECT:

Estimate hydraulic jump at speed bump in Vance Emory Lane above DP-7.

Q_{100} = 19.8 cfs (@ DP-7)



Formula = $d_2 = -\frac{d_1}{2} + \sqrt{\frac{d_1^2}{4} + \frac{2(V_1)^2 d_1}{g}}$

Flowmaster

$d_1 = 0.47$ $V_1 = 7.44$

$d_2 = -\frac{0.47}{2} + \sqrt{\frac{0.47^2}{4} + \frac{2(7.44)^2 * 0.47}{32.2}}$

$d_2 = 1.28'$

flow above curb = 1.28' - 0.5 = 0.78'

additional 0.75' curb may be required at above & below speed bump to retain runoff in street section.

Exist Single Grate-Single Throat-On Grade DP-7

Project Description

Solve For	Efficiency	

Input Data

Discharge	37.00	ft³/s
Slope	0.0500	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.0625	ft/ft
Road Cross Slope	0.0434	ft/ft
Roughness Coefficient	0.015	
Local Depression	2.00	in
Local Depression Width	2.50	ft
Grate Width	2.00	ft
Grate Length	3.20	ft
Grate Type	Reticuline	
Clogging	50.00	%
Curb Opening Length	3.95	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	19.46	%
Intercepted Flow	7.2	ft³/s
Bypass Flow	29.80	ft³/s
Spread	12.31	ft
Depth	0.57	ft
Flow Area	3.33	ft²
Gutter Depression	0.04	ft
Total Depression	0.20	ft
Velocity	11.12	ft/s
Splash Over Velocity	3.51	ft/s
Frontal Flow Factor	0.31	
Side Flow Factor	0.01	
Grate Flow Ratio	0.39	
Equivalent Cross Slope	0.07553	ft/ft
Active Grate Length	1.60	ft
Length Factor	0.04	
Total Interception Length	65.16	ft

WILSON & COMPANY

FROM: Lincoln Complex - APS

TO: EXISTING Conditions

DATE: 8/7/11

FILE:

SUBJECT: ESTIMATE Approx. MAX. Discharge From Stadium

Stadium Area = 5.6 ac.

Existing Conditions

Approx 100yr Developed = Basin 111 = 23.5 cfs (Ahymo)

Outlet pipe = 24 CMC @ 4.5%

Plans provid by APS show

Grate @ Inlet @ NW Corner of Track (Single "D" Inlet)

Invert S.W. = 73.72

Grate = 77.0 w/ 24" CMC outlet pipe

Check 24" Capacity @ Grate

Head = 77.0 - 73.7 = 3.3

HW/D = 3.3/2 = 1.65 HW/D Chart #5

Q MAX = 22 cfs < 23.5

Capacity of 24 CMC @ 4.50% ≈ 28 cfs > 23.5

Majority of runoff Collected by (2) 12" drains @ 0.3%

Check Capacity of (2) 12" Slotted Drains to MH @ NW Corner

Plans indicate runoff from both 12" S.D's are collected in a MH across from grated inlet above assume FG elev ≈ same = 77.2±

Drains = 75.02 inv HW = 77.2 - 75.0 = 2.2

HW/D = 2.2 assume n ≈ 0.013

Qmax = 5.5 cfs / pipe HW/D Chart #2

FROM: Lincoln Complex - ARS
TO: Existing Conditions

WILSON & COMPANY

DATE: 8/7/11
FILE:

SUBJECT: Determine approximate Maximum Flow Rate Discharged from Stadium (cont) @ DP-10

Total Pipe capacity = 11 cfs (Based on HW/D)

Check Capacity of 12" Drains Using Mannings Eqn.

12" drain @ 0.3% (Flowmaster) assume n = 0.013 (slotted) conservative
Q ≈ 2.5' cfs

Assume 4.0 cfs could be carried per side conservative (Avg of 5.5 & 2.5 rounded up)

Add Flows intercepted by Two grated inlets at NW Corner of Site

Conservative assumption: Assume inlets can intercept all of contributing watershed reaching them.

Area = 1.1 Acs   cfs/Ac Basin 111 = 4.2 cfs/Ac (Ahymo)

Qinlets = 4.6 ≈ 5 cfs (both area drains)

TOTAL FLOW ESTIMATED TO EXIT STADIUM VIA 24" CMC

12" drains (2) + area inlet @ N.W Corner
4 cfs × 2 + 5 cfs
8 cfs + 5 cfs ≈ 13 cfs

Approx 1/2 developed 100 yr Flow Rate (PONDING LIKELY OCCURS)

FROM: Lincoln Complex - Alps
TO: EXISTING CONDITION
DATE:
FILE:

SUBJECT: Verify Inlet Capacities - West of Stadium Parking

Basins 112 & Basin 113

Three inlets intercept flow from Basin 112
One inlet intercepts flow from Basin 113

IF INLETS CAN INTERCEPT 100-YR FLOW
INDIVIDUAL RATING CURVES WON'T BE DEVELOPED

Determine Q to inlets in Basin 112

Basin 112 - Area = 3.257 ac Q_{100} = 14.16 CFS (Per Ahymo)
Area to North Inlet = 1.421 ac

% OF AREA = 1.421/3.257 = 0.436
% OF RUNOFF = 0.436 x 14.16 CFS = 6.1 = 6.1 CFS

Inlet 112 (N) - Type 'C' At-Grade (No Grate)
Approx Long. Slope @ Inlet = 0.8%
Approx Cross Slope @ Inlet = 4%
Intercepted Flows (Flow Master) Q_{100} = 2.4

Depth = 0.43' Curb Ht = 0.5' OK 30" STORM

Flowby = 6.1 - 2.4 = 3.7 CFS to Inlet 112 (Mid)

WILSON &COMPANY

FROM: Lincoln Complex - APS
TO: EXISTING Condition
DATE:
FILE:

SUBJECT: Verify Inlet Capacities - West of Stadium Parking

Determine Q to Inlet 112 (mid), Determine Int. 5. Depth @ Curb

Area to 112 (mid) = 1.0 AC
CFS/AC Basin 112 (Per AHYMO) = 4.34 ≈ 4.3 CFS

Total Flow = 3.7 CFS (Flow-By) + 4.3 CFS = 8 CFS

Inlet 112 (mid) - Type 'C' sump (No Grate)
Approx Long Slope @ Inlet = 0.
Approx Cross Slope = 4%
Intercepted Flow (Flowmaster) = Q = 8.0 CFS

@ Depth = 0.67' Curb Ht = 0.67 OK

Determine Q to Inlet 112 (S), Determine Int 5 Depth @ Curb

Area to 112 (S) = 0.84 AC
CFS/AC Basin 112 (Per Ahymo) = 4.3 CFS

TOTAL Flow to Inlet = 0.84 A x 4.3 CFS = 3.6 CFS

Inlet 112 (S) - Type 'C' At-grade Inlet
Approx Long Slope @ Inlet = 1.67%
Approx Cross Slope @ Inlet = 5%
Intercepted Flow (Flowmaster) = 1.6 CFS

HIGHER Relationships

WILSON & COMPANY

FROM: Lincoln Complex - ARS
TO: EXISTING CONDITIONS

DATE:
FILE:

SUBJECT: Verify Inlet Capacities - West of Stadium.

Inlet 112 (s) continued

Depth of Flow @ Inlet = 0.31 Curb Ht = 0.5' OK

Flowby = 3.6 - 1.6 = 2.0 cfs

Determine Q to Inlet 113, Determine Int. & Depth @ Curb

BASIN: 113 Q_{100} = 6.2 cfs (Rev Alhymo)

Total Flow to Inlet = 2.0 cfs (Flow-by) + 6.2 cfs = 8.2 cfs

Inlet 113 - Type 'C' Sump (No Grate)
Approx Long. Slope @ Inlet = 0
Approx Cross Slope @ Inlet = 4%
Intercepted Flow (Flowmaster) = 8.2 cfs

Depth = 0.68' < Curb Ht = 0.67' = OK

Analyze Flows in HGL spreadsheet to determine that F.B. exists to allow proper inlet function.

HIGHER Relationships

Exist Single Throat On Grade - 112 (N)

Project Description

Solve For	Efficiency

Input Data

Discharge	6.10	ft³/s
Slope	0.0080	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.0625	ft/ft
Road Cross Slope	0.0400	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	3.95	ft
Local Depression	2.00	in
Local Depression Width	2.50	ft

Results

Efficiency	38.57	%
Intercepted Flow	2.4	ft³/s
Bypass Flow	3.75	ft³/s
Spread	9.19	ft
Depth	0.41	ft
Flow Area	1.73	ft²
Gutter Depression	0.05	ft
Total Depression	0.21	ft
Velocity	3.52	ft/s
Equivalent Cross Slope	0.08308	ft/ft
Length Factor	0.24	
Total Interception Length	16.66	ft

Exist Single Throat In Sump - 112 (MID)

Project Description

Solve For	Spread

Input Data

Discharge		8.00	ft^3/s
Gutter Width		2.00	ft
Gutter Cross Slope		0.0625	ft/ft
Road Cross Slope		0.0400	ft/ft
Curb Opening Length		3.95	ft
Opening Height		0.50	ft
Curb Throat Type	Horizontal		
Local Depression		2.00	in
Local Depression Width		2.50	ft
Throat Incline Angle		90.00	degrees

Results

Spread	15.16	ft
Depth	0.65	ft
Gutter Depression	0.05	ft
Total Depression	0.21	ft

Exist Single Throat On Grade - 112 (S)

Project Description

Solve For	Efficiency

Input Data

Discharge	3.60	ft³/s
Slope	0.0167	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.0625	ft/ft
Road Cross Slope	0.0500	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	3.95	ft
Local Depression	2.00	in
Local Depression Width	2.50	ft

Results

Efficiency	43.44	%
Intercepted Flow	1.6	ft³/s
Bypass Flow	2.04	ft³/s
Spread	5.70	ft
Depth	0.31	ft
Flow Area	0.84	ft²
Gutter Depression	0.03	ft
Total Depression	0.19	ft
Velocity	4.30	ft/s
Equivalent Cross Slope	0.10390	ft/ft
Length Factor	0.27	
Total Interception Length	14.55	ft

Exist Single Throat In Sump - 113

Project Description

Solve For	Spread

Input Data

Discharge		8.20	ft³/s
Gutter Width		2.00	ft
Gutter Cross Slope		0.0625	ft/ft
Road Cross Slope		0.0400	ft/ft
Curb Opening Length		3.95	ft
Opening Height		0.50	ft
Curb Throat Type	Horizontal		
Local Depression		2.00	in
Local Depression Width		2.50	ft
Throat Incline Angle		90.00	degrees

Results

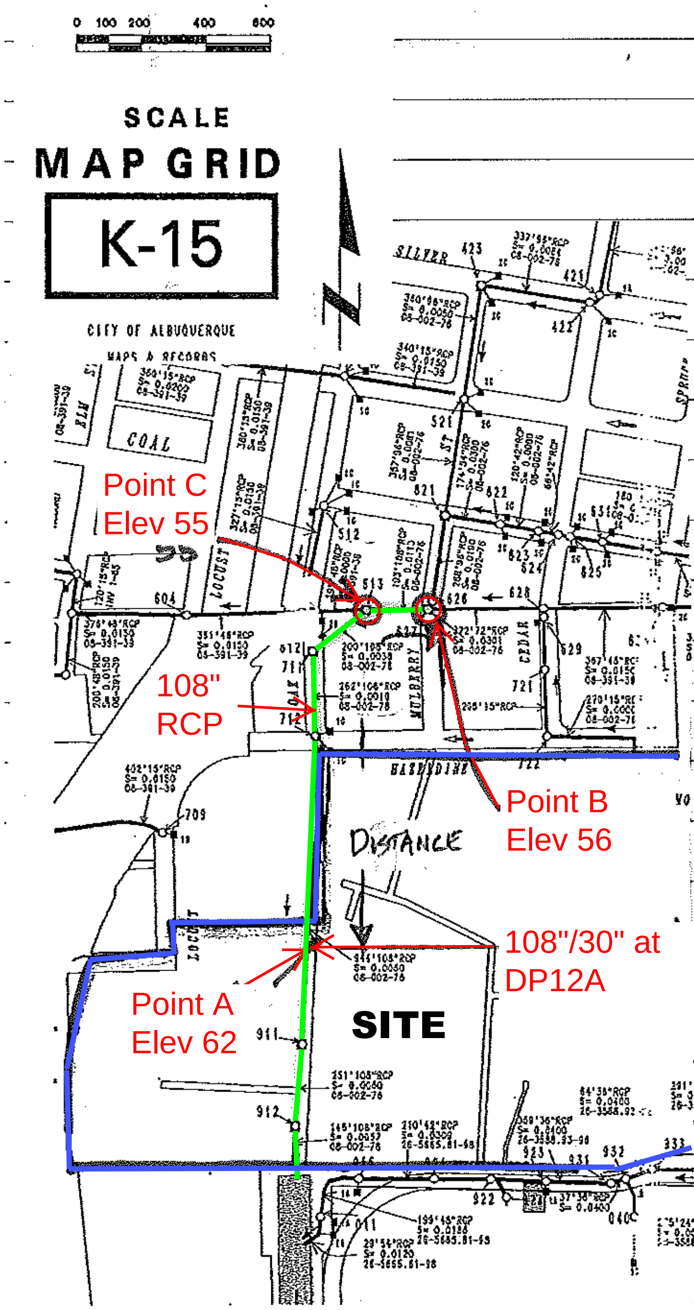
Spread	15.88	ft
Depth	0.68	ft
Gutter Depression	0.05	ft
Total Depression	0.21	ft

WILSON & COMPANY

FROM: Lincoln Complex - APS
TO: EXISTING CONDITION ANALYSIS

DATE: 9/6/11
FILE:

SUBJECT: ESTIMATION OF Pipe Capacity OF 108" RCP (Q_c)



Elev @ Pt A ≈ 62 (google)
Elev @ Pt B = 56

DISTANCE BETWEEN PTS
A & B = 1996 - 990 = 1006'

Approx Depth of Pipe Below ground at Pt A (based upon on site topo)
49.5 - 38.9 = 10.6' below ground

Slope between top of pipe @ Pt A and FG @ Pt B = available friction slope (ignoring headlosses)

62 - 10.6 = 51.4
56 - 51.4 = 4.6'
Slope = 4.6/1006' = 0.00457

Determine Q @ S_f of 0.00457
K_{108} @ n = 0.013 = 12486

$Q_c = (K)(s)^{1/2} = 12486(0.00457)^{1/2}$

Approximate Max. Pipe Capacity reaching Point A (DP-12A)

Q_c ≈ 845 CFS likely less capacity due to headlosses.

Note:
Point C - another location where head atop 108" is limited, Point B was utilized to be slightly conservative.

Elevations on Map above from Google Earth

HIGHER Relationships

MANNINGS n = 0.013
FLOW RATE (OUT) = 897 CFS
FLOW RATE (IN) = 845 CFS

Lincoln Complex - Existing Conditions Analysis
Existing 108" RCP to 30" connection near Stadium (DP-12)
HGL CALCULATION
9/30/2011 12:38

HGL RAISED TO MATCH PIPE CROWN

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	PROPOSED PIPE FL ** (elevation)	PROPOSED CROWN (elevation)
OUTLET TO CHANNEL	100.0	108	897																32.50			23.50	32.50
	100.0	108	897	63.585	14.11	12510	0.00514	0.00				0.00	0.00	0.00		0.00	35.59	3.09	32.50	36.00	3.50		
MH	258.0	108	897	63.585	14.11	12510	0.00514	158.00				0.81	0.00	0.00		0.81	36.49	3.09	33.40			24.40	33.40
	258.0	108	897	63.585	14.11	12510	0.00514	0.00			0.2	0.00	0.62	0.00		0.62	37.11	3.09	34.02	39.50	5.48		
12" CONNECTION	455.0	108	897	63.585	14.11	12510	0.00514	197.00				1.01	0.00	0.00		1.01	38.12	3.09	35.03			25.60	34.60
	455.0	108	888	63.585	13.97	12510	0.00504	0.00	12	90		0.00	0.00	0.06		0.06	38.18	3.03	35.15	42.00	6.85		
MH	514.0	108	888	63.585	13.97	12510	0.00504	59.00				0.30	0.00	0.00		0.30	38.48	3.03	35.45			25.95	34.95
	514.0	108	888	63.585	13.97	12510	0.00504	0.00			0.2	0.00	0.61	0.00		0.61	39.09	3.03	36.06	44.00	7.94		
108" X 30" (DP-12A)	1100.0	108	888	63.585	13.97	12510	0.00504	586.00				2.95	0.00	0.00		2.95	42.04	3.03	39.01			28.90	37.90
	1100.0	108	845	63.585	13.29	12510	0.00456	0.00	30	90		0.00	0.00	0.29		0.29	42.32	2.74	39.58	47.00	7.42		

MANNINGS n = 0.022

Lincoln Complex - Existing Conditions Analysis
Existing 30" CMP Line into Stadium Parking Lot
HGL CALCULATION
9/30/2011 12:38

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	APPROX PIPE FL ** (elevation)	APPROX CROWN (elevation)
108" X 30" (DP-12)	100.0	30	43.0																39.58				
	100.0	30	43.0	4.906	8.76	242	0.03163	0.00				0.00				0.00	40.78	1.19	39.58	52.00	12.42		
30" TEE	135.0	30	43.0	4.906	8.76	242	0.03163	35.00				1.11	0.00	0.00		1.11	44.29	1.19	43.10			40.60	43.10
	135.0	30	28.9	4.906	5.89	242	0.01429	0.00	30	90		0.00	0.00	0.65		0.65	44.95	0.54	44.41	53.00	8.59		
30"X24" WYE (DP-11)	142.5	30	28.9	4.906	5.89	242	0.01429	7.50				0.11	0.00	0.00		0.11	45.05	0.54	44.52			41.00	43.50
	142.5	30	15.9	4.906	3.24	242	0.00432	0.00	30	45		0.00	0.00	0.22		0.22	45.28	0.16	45.11	54.00	8.89		

MANNINGS n = 0.009

Lincoln Complex - Existing Conditions Analysis
Existing 30" ADS collects Basin 113
HGL CALCULATION
9/30/2011 12:38

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	APPROX PIPE FL ** (elevation)	APPROX CROWN (elevation)
30" TEE	100.0	30	14.1																44.41			40.60	43.10
	100.0	30	14.1	4.906	2.87	591	0.00057	0.00				0.00				0.00	44.54	0.13	44.41	52.50	8.09		
BEND	107.3	30	14.1	4.906	2.87	591	0.00057	7.30			1	0.00	0.13	0.00		0.13	47.31	0.13	47.18			44.68	47.18
	107.3	30	14.1	4.906	2.87	591	0.00057	0.00				0.00	0.00	0.00		0.00	47.31	0.13	47.18	51.50	4.32		
BEND	120.3	30	14.1	4.906	2.87	591	0.00057	13.00			1	0.01	0.13	0.00		0.14	47.44	0.13	47.32			44.80	47.30
	120.3	30	14.1	4.906	2.87	591	0.00057	0.00				0.00	0.00	0.00		0.00	47.44	0.13	47.32	51.80	4.48		
INLET @112 (S)	125.3	30	10.5	4.906	2.13	591	0.00031	5.00				0.00	0.00	0.00	0.092	0.09	47.54	0.07	47.47			44.85	47.35
	125.3	30	10.5	4.906	2.13	591	0.00031	0.00				0.00	0.00	0.00		0.00	47.54	0.07	47.47	53.50	6.03		
INLET @ 112 (MID)*	233.3	30	10.5	4.906	2.13	591	0.00031	108.00				0.03	0.00	0.00	0.092	0.13	48.57	0.07	48.50			46.00	48.50
	233.3	30	6.1	4.906	1.25	591	0.00011	0.00				0.00	0.00	0.00		0.00	51.52	0.02	51.50	53.50	2.00	49.00	51.50
INLET @ 112 (N)	318.8	30	6.1	4.906	1.25	591	0.00011	85.50				0.01	0.00	0.00	0.036	0.05	52.37	0.02	52.35			49.85	52.35
	318.8	30	6.1	4.906	1.25	591	0.00011	0.00				0.00	0.00	0.00		0.00	52.37	0.02	52.35	54.35	2.00		

* ELEV. ON FOR INLET ESTIMATED NOT INDICATED ON CONSTRUCTION PLANS

MANNINGS n = 0.009

Lincoln Complex - Existing Conditions Analysis
Existing 24" ADS to DP-7
HGL CALCULATION
9/30/2011 12:38

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	PROPOSED PIPE FL** (elevation)	PROPOSED CROWN (elevation)
30 X 24 WYE (DP-11)	100.0	24	15.9																45.11			41.00	43.00
	100.0	24	15.9	3.140	5.06	326	0.00238	0.00				0.00	0.00	0.00		0.00	45.51	0.40	45.11	54.00	8.89		
BEND	105.0	24	15.9	3.140	5.06	326	0.00238	5.00				0.01	0.00	0.00		0.01	45.52	0.40	45.12			41.20	43.20
	105.0	24	15.9	3.140	5.06	326	0.00238	0.00			0.35	0.00	0.14	0.00		0.14	45.66	0.40	45.26	54.00	8.74		
BEND	110.0	24	15.9	3.140	5.06	326	0.00238	5.00				0.01	0.00	0.00		0.01	45.67	0.40	45.28			41.40	43.40
	110.0	24	15.9	3.140	5.06	326	0.00238	0.00			0.35	0.00	0.14	0.00		0.14	45.81	0.40	45.41	54.00	8.59		
30" TEE (DP-9)	178.0	24	15.9	3.140	5.06	326	0.00238	68.00				0.16	0.00	0.00		0.16	46.38	0.40	45.98			43.98	45.98
	178.0	24	9.6	3.140	3.06	326	0.00087	0.00	30	90		0.00	0.00	0.25		0.25	46.63	0.15	46.49	51.70	5.21		
24 X24 WYE (DP-8)	192.5	24	9.6	3.140	3.06	326	0.00087	14.50				0.01	0.00	0.00		0.01	46.65	0.15	46.50			44.50	46.50
	192.5	24	3.1	3.140	0.98	326	0.00009	0.00	24	45		0.00	0.00	0.04		0.04	46.68	0.02	46.67	50.20	3.53		
INLET @ DP-7	242.5	24	3.1	3.140	0.98	326	0.00009	50.00				0.00	0.00	0.00		0.00	47.02	0.02	47.00			45.00	47.00
	242.5	24	3.1	3.140	0.98	326	0.00009	0.00				0.00	0.00	0.00	0.02	0.02	47.04	0.02	47.02	48.50	1.48		

REFER TO SEPARATE HAND CALCULATION FOR EXISTING 12" LINE @ DP-14/ DP-15
ALL ELEVATIONS PROVIDED IN PLAN HAVE BEEN ESTIMATED FROM CONSTRUCTION DRAWING / AS REQUIRED FIELD VERIFY PRIOR TO PRELIM/FINAL DESIGN OF PROPOSED IMPROVMENTS

MANNINGS n = 0.009

Lincoln Complex - Existing Conditions Analysis

Existing 30" ADS to DP-9

HGL CALCULATION

9/30/2011 12:38

HGL RAISED TO MATCH PIPE CROWN

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	APPROX PIPE FL ** (elevation)	APPROX CROWN (elevation)
TEE *	100.0	30	6.2																46.49			43.98	46.48
	100.0	30	6.2	4.906	1.26	591	0.00011	0.00				0.00				0.00	46.51	0.02	46.49	52.50	6.01		
INLET @ 113	125.0	30	6.2	4.906	1.26	591	0.00011	25.00				0.00	0.00	0.00		0.00	47.02	0.02	47.00			44.50	47.00
	125.0	30	6.2	4.906	1.26	591	0.00011	0.00				0.00	0.00	0.00	0.037	0.04	47.06	0.02	47.04	50.50	3.46		

* PIPE FROM TEE SIZE UNKNOWN (18" USED)

MANNINGS n = 0.009

Lincoln Complex - Existing Conditions Analysis

Existing 18-24" ADS to DP-4

HGL CALCULATION

9/30/2011 12:38

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	PROPOSED PIPE FL ** (elevation)	PROPOSED CROWN (elevation)
24x24 WYE	100.0	24	4.3																46.67			44.50	46.50
	100.0	24	4.3	3.140	1.37	326	0.00017	0.00				0.00	0.00	0.00		0.00	46.70	0.03	46.67	50.20	3.53		
BEND	180.0	24	4.3	3.140	1.37	326	0.00017	80.00				0.01	0.00	0.00		0.01	48.03	0.03	48.00			46.00	48.00
	180.0	24	4.3	3.140	1.37	326	0.00017	0.00			0.2	0.00	0.01	0.00		0.01	48.03	0.03	48.01	50.70	2.69		
24 x 18" WYE	206.0	24	4.3	3.140	1.37	326	0.00017	26.00				0.00	0.00	0.00		0.00	48.24	0.03	48.21			46.21	48.21
	206.0	18	4.3	1.766	2.43	151	0.00081	0.00	18	45		0.00	0.00	0.00		0.00	48.24	0.09	48.15	50.70	2.55		
BEND	316.0	18	4.3	1.766	2.43	151	0.00081	110.00				0.09	0.00	0.00		0.09	48.87	0.09	48.78			47.28	48.78
	316.0	18	4.3	1.766	2.43	151	0.00081	0.00	30	90	0.2	0.00	0.02	0.00		0.02	48.89	0.09	48.80	51.70	2.90		
BEND	416.0	18	4.3	1.766	2.43	151	0.00081	100.00				0.08	0.00	0.00		0.08	49.39	0.09	49.30			47.80	49.30
	416.0	18	4.3	1.766	2.43	151	0.00081	0.00			0.2	0.00	0.02	0.00		0.02	49.41	0.09	49.32	51.00	1.68		
18"X18"WYE	431.5	18	4.3	1.766	2.43	151	0.00081	15.50				0.01	0.00	0.00		0.01	49.61	0.09	49.52			48.02	49.52
	431.5	18	2.9	1.766	1.64	151	0.00037	0.00	18	45		0.00	0.00	0.04		0.04	49.65	0.04	49.61	51.30	1.69		
BEND	514.1	18	2.9	1.766	1.64	151	0.00037	82.60				0.03	0.00	0.00		0.03	50.75	0.04	50.71			49.21	50.71
	514.1	18	2.9	1.766	1.64	151	0.00037	0.00			0.35	0.00	0.01	0.00		0.01	50.77	0.04	50.72	51.50	0.78		
INLET @ DP-4	534.1	18	2.9	1.766	1.64	151	0.00037	20.00				0.01	0.00	0.00		0.01	51.04	0.04	51.00			49.50	51.00
	534.1	18	2.9	1.766	1.64	151	0.00037	0.00				0.00	0.00	0.00	0.06	0.06	51.10	0.04	51.06	51.60	0.54		

MANNINGS n = 0.009

Lincoln Complex - Existing Conditions Analysis

Existing 18" ADS to DP-5

HGL CALCULATION

9/30/2011 12:38

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	APPROX PIPE FL (elevation)	APPROX CROWN (elevation)
18"X18"WYE	100.0	18	1.4																49.61			48.02	49.52
	100.0	18	1.4	1.766	0.79	151	0.00009	0.00				0.00	0.00			0.00	49.62	0.01	49.61	52.50	2.89		
BEND	105.0	18	1.4	1.766	0.79	151	0.00009	5.00				0.00	0.00	0.00		0.00	49.76	0.01	49.75			48.25	49.75
	105.0	18	1.4	1.766	0.79	151	0.00009	0.00			0.35	0.00	0.00	0.00		0.00	49.76	0.01	49.75	51.50	1.85		
INLET @ DP-5	110.0	18	1.4	1.766	0.79	151	0.00009	5.00				0.00	0.00	0.00		0.00	50.01	0.01	50.00			48.50	50.00
	110.0	18	1.4	1.766	0.79	151	0.00009	0.00				0.00	0.00	0.00	0.06	0.06	50.01	0.01	50.00	51.00	1.24		

MANNINGS n = 0.009

Lincoln Complex - Existing Conditions Analysis

Exisitng 18" ADS in Basin 104 to Vance Emory Lane

HGL CALCULATION

9/30/2011 12:38

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	PROPOSED PIPE FL ** (elevation)	PROPOSED CROWN (elevation)
HEADWALL	100.0	18	5.8																66.50			65.00	66.50
	100.0	18	5.8	1.766	3.28	151	0.00147	0.00				0.00	0.00	0.00		0.00	66.67	0.17	66.50	66.50	0.00		
SUMP INLET D	246.0	18	5.8	1.766	3.28	151	0.00147	146.00				0.22	0.00	0.00		0.22	73.33	0.17	73.16			71.66	73.16
	246.0	18	5.4	1.766	3.06	151	0.00128	0.00				0.00	0.00	0.00	0.05	0.05	73.38	0.15	73.24	78.00	4.76		
SUMP INLET C	272.0	18	5.4	1.766	3.06	151	0.00128	26.00				0.03	0.00	0.00		0.03	74.11	0.15	73.96			72.46	73.96
	272.0	18	5.1	1.766	2.89	151	0.00114	0.00				0.00	0.00	0.00	0.05	0.05	74.16	0.13	74.03	78.00	3.97		
SUMP INLET B	324.0	18	5.1	1.766	2.89	151	0.00114	52.00				0.06	0.00	0.00		0.06	76.11	0.13	75.98			74.48	75.98
	324.0	18	4.8	1.766	2.72	151	0.00101	0.00				0.00	0.00	0.00	0.05	0.05	76.17	0.11	76.05	79.00	2.95		
SUMP INLET A	389.0	18	4.8	1.766	2.72	151	0.00101	65.00				0.07	0.00	0.00		0.07	76.61	0.11	76.50			75.00	76.50
	389.0	18	4.8	1.766	2.72	151	0.00101	0.00				0.00	0.00	0.00	0.06	0.06	76.68	0.11	76.56	78.55	1.99		

FLOW RATES REACHING THE 1ST SUMP INLET WERE ANTIIPATED TO INCLUDE BASIN OS-D AND 60% OF RUNOFF OF BASIN 104 REMAINING RUNOFF PRODUCED WITHIN BASIN 104 WERE EQUALITY DIVIDED AMONGST THE REMAINING INLETS
ALL ELEVATIONS PROVIDED IN PLAN HAVE BEEN ESTIMATED FROM CONSTRUCTION DRAWING / AS REQUIRED FIELD VERIFY PRIOR TO PRELIM/FINAL DESIGN OF PROPOSED IMPROVMENTS

EXISTING CONDITIONS
SOUTHCENTRAL REGION
HYDRAULIC CALCULATIONS

WILSON
&COMPANY

WILSON & COMPANY

FROM: APS Lincoln Complex
TO:
DATE: 6/28/11
FILE:

SUBJECT: Approx Outlet Rating Curve, DP-14

15" max ponding

2x3' Mesh grate

Basis upon 50% clogging

Grate open Area = 2.40 ft^2

Active weir length = 8.0 ft

(From Flowmaster)

H = 3' (field measurement)

12" pvc

nomograph (Chart 2)

(slightly cons. as its for concrete)

Assume grate elev. = 47.2

Max ponding = 48.5

12" inv = 44.2

El.	H (ft)	Q (cfs)	HW/D	Q (cfs)	Gov. Q (cfs)
47.2	0	0	0	0	0
47.45	0.25	4.6	3.25/1	7	4.6
47.7	0.5	9.8	3.5/1	7.5	7.5
47.95	0.75	11.8	3.75/1	7.8	7.8
48.2	1.0	13.5	4.0/1	8.1	8.1
48.45	1.25	14.9	4.25/1	8.3	8.3

FROM: Aps Lincoln Complex

WILSON &COMPANY

DATE: 6/28/11

TO:

FILE:

SUBJECT: Approx Outlet Rating Curve @ DP-15

Est. 18" ponding
4'x4' Mesh grate
Based upon 50% clogging
Grate open area = 6.40 ft^2
Active Weir length = 12.0 Ft

(From Flowmaster)

H = 45" = 3.75'
12" pvc
nomograph (Chart 2)
(slightly cons. as chart for concrete)

Assume grate elev = 41.25
Max Ponding = 42.75
12" inv = 37.45

El.	H (ft)	Q (cfs)	HW/D	Q (cfs)	Gove Q (cfs)
41.25	0	0	0	0	0
41.50	0.25	7	4.05/1	7.0	7
41.75	0.5	16	4.3/1	7.1	7.1
42.0	0.75	27	4.55/1	7.4	7.4
42.25	1.00	36	4.8/1	7.7	7.7
42.5	1.25	40	5.05/1	7.9	7.9
42.7	1.5	44	5.3/1	8.1	8.1

Maximum Comb. Flow rates from DP-14 / DP-15 = 8.1 cfs
Maximum Flow from DP-14 = 4.8 cfs
Maximum Flow from DP-15 = 8.1 - 4.8 cfs = 3.3 cfs

WILSON &COMPANY

FROM: Lincoln Complex - APS
TO: Proposed Conditions

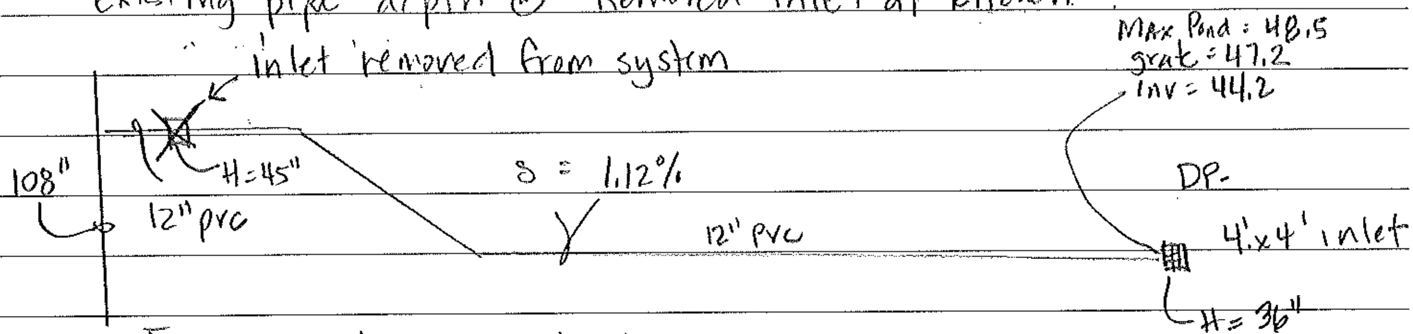
DATE: 8/31/11
FILE:

SUBJECT: Rating Curve @ DP - 14/15 (Revised with removal of downstream inlet)

In the existing condition runoff intercepted at this point was limited by pipe capacity and downstream hydraulic impacts.

The removal of the inlet located in front of the central kitchen from the existing system improves the allowable discharge from this location and reduced ponding depth.

Existing pipe depth @ Removed inlet at kitchen



From existing analysis

Pipe slope = 6.75/602 = 1.12% 12" pvc. n = 0.009

cons. use conc. n = 0.013.

For simplicity of analysis assume head loss @ area drain is minimal and inlet grate does not govern interception based upon previous analysis

Q = 5.9 cfs V = 7.52 Vh = 0.88 f_s = 0.01329

HGL = 38.75 + .35 x 2 (0.88) + 602 (0.01329) + 1.5 (0.88)

= 46.43 ≈ 48.5 max ponding depth MAX ≈ 5.9 cfs

HIGHER *Relationships*

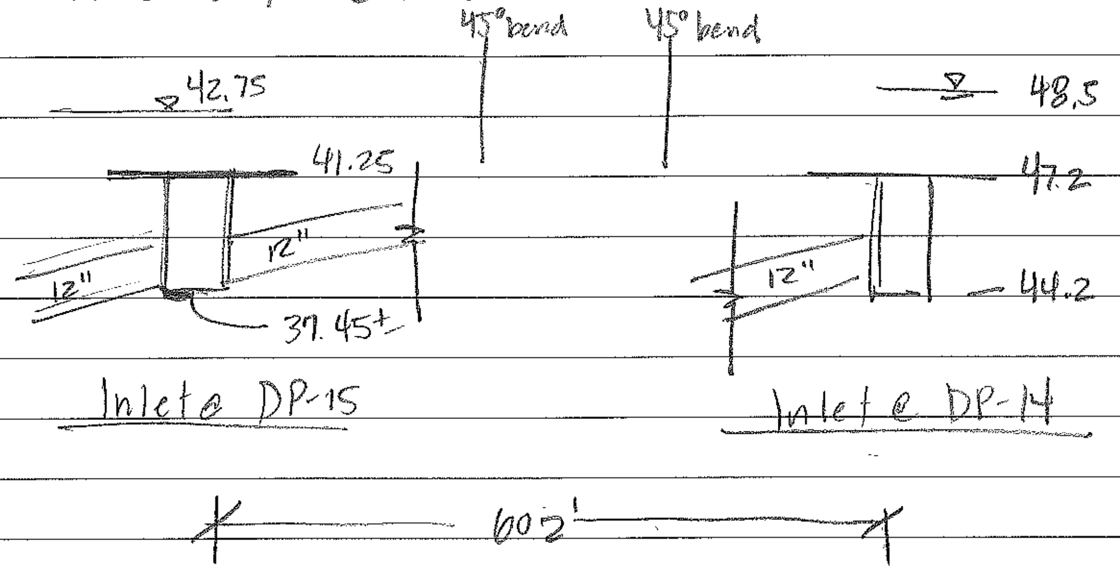
FROM: Lincoln Complex - APS

TO: EXISTING CONDITIONS

DATE: 6/23/11

FILE:

SUBJECT: MAX CAPACITY = 8.1 CFS



Slope = 6.75/602 = 1.12%

Q @ f_s = 112 using n: 0.009

Q = 5.6 cfs

V = 7.18 V_n = 0.80

45° bend = 0.35 x V_n = 0.28'

Assume 4.0 cfs f_s = 0.00605 V_n = 0.40 x 0.35 = 0.14'

4.5 cfs f_s = 0.00765 V_n = 0.51 x 0.35 = 0.18'

4.8 cfs f_s = 0.00870 V_n = 0.

+ To get to 42.75'

4 cfs 41.25 + 602 x 0.00604 = 44.88 + .28 = 45.16 + 1.5 = 46.66

4.5 cfs 41.25 + 602 x 0.00 0 = 45.85 + .36 = 46.21 + 1.5 = 47.71

4.8 cfs 41.25 + 602 x 0.0870 = 46.5 + 0.4 = 46.88 + 1.5 = 48.38 ≈ 48.5

5.0 41.25 + 602 x 0.00944 = 46.93 + 0.44 = 47.37 + 1.5 = 48.87

~~MAX inflow @ pipes = 4.8 cfs @ DP-14~~

MAX inflow @ DP-15 = 8.1 - 4.8 = 3.3 cfs

FROM: APS - Lincoln Complex

WILSON &COMPANY

DATE: 6/28/11

TO:

FILE:

SUBJECT:

Revised Outlet Rating Curve DP-14 when DP-15 is included

		Q gov	
El	47.2	0	bottom of pond
	47.45	4.6	
	47.7	4.8	
	47.95	4.8	
	48.2	4.8	
	48.45	4.8	

Revised outlet rating Curve DP-15 when DP-14 in included

		Q gov.	
El	41.25	0	bottom of pond
	41.50	3.3	
	41.75	3.3	(divide hyd was
	42.0	3.3	utilized at
	42.25	3.3	this flow rate)
	42.5	3.3	
	42.7	3.3	

Albuquerque Public Schools - Lincoln Complex
DRAINAGE MASTER PLAN
(Pond Volume Calculation)

Existing Ponding at DP-14

			Storage	
Elevation	SF	CF	AF	Sum
5047.2	0.00			0
5048.52	14,551.00	9,603.66	0.22	0.22
5048.72	17,980.00	3,253.10	0.07	0.30

Total = 12,857 CF

Total = 0.30 Ac-ft

Exisiting Condition Max. Ponding depth estimated at 15" deep

At Elevation 5048.52, the Storage is 0.22 Ac-ft.

Calculated by: DLM

Date: 5/5/2011

Checked by: ____________

NOTE: PONDING AREA NOT PROVDED FOR DP-15 AS VOLUME LIMITED PRIMARILY TO IMMEDIATE SUMP AREA.

FROM: APS & Lincoln Complex

TO: EXISTING CONDITIONS

WILSON & COMPANY

DATE: 6/28/11

FILE:

SUBJECT:

Determine Rating Curve @ DP-17

12" RCP (from Chart 2 Nomograph)

H (ft)	Q (cfs)
0	0
0.6	1.0
1.0	2.3
1.6	4.1

* assume h_L negligible thru culvert.

Albuquerque Public Schools - Lincoln Complex
DRAINAGE MASTER PLAN
(Pond Volume Calculation)

Existing Ponding at DP-17

			Storage	
Elevation	SF	CF	AF	Sum
5044.4	0.00			0.000
5045	425.00	127.50	0.003	0.003
5045.5	4,230.00	1,163.75	0.027	0.030
5046	7,475.00	2,926.25	0.067	0.097

Total = 4,218 CF

Total = 0.10 Ac-ft

Exisiting Condition Max. Ponding depth estimated at 18" deep

At Elevation 5045.9, the Storage is 0.08 Ac-ft.

Calculated by: DLM

Date: 5/5/2011

Checked by: ____________

EXISTING CONDITIONS
SOUTHWEST REGION
HYDRAULIC CALCULATIONS

WILSON
&COMPANY

APS - Lincoln Complex
Existing Conditions Analysis

Rating Curve for DP-21
Weir in Concrete Headwall

Bottom Width	2	ft
Top Width	5	ft
Side Slopes	45	degrees
Height	1.5	ft

Combination of V notch and Rectangular Weirs

V notch Weir
Q = 2.52 H ^ 2.47

Rect. Weir
Q=3.33(L-0.2H) H^1.5

H	V Notch Weir Q	Rect Weir Q	Comb. Conc. Struct.
	(1)	(2)	(3)
(ft)	(cfs)	(cfs)	(cfs)
0.25	0.1	0.8	0.9
0.5	0.5	2.3	2.8
0.75	1.2	4.3	5.5
1	2.5	6.6	9.1
1.25	4.4	9.2	13.6
1.5	6.9	12.1	18.9
1.8	10.8	15.8	26.6
1.85	11.5	16.4	28.0
1.9	12.3	17.1	29.4

Broad Crested Weir directed towards I-25
Q = 3.1*L* H ^ 1.5 approx length = 85 ft

H	Overtops to I-25	Conc. Structure	Conc. Struct & I-25
	(4)	(3)	(5)
(ft)	(cfs)	(cfs)	(cfs)
0.3	43.3	26.6	69.9
0.35	54.6	28.0	82.5
0.4	66.7	29.4	96.1

Broad Crested Weir directed towards DP-22
Q = 3.1*L* H ^ 1.5 approx length = 40 ft

H	Overtops to DP-22	Conc. Struct & I-25	Combined Q
	(6)	(5)	(7)
(ft)	(cfs)	(cfs)	(cfs)
0.05	1.4	82.5	83.9
0.1	3.9	96.1	100.0

Albuquerque Public Schools - Lincoln Complex
DRAINAGE MASTER PLAN
(Pond Volume Calculation)

Existing Ponding at DP-21

			Storage	
Elevation	SF	CF	AF	Sum
5029.5	0.00			0.000
5030	315.00	78.75	0.002	0.002
5030.5	2,600.00	728.75	0.017	0.019
5031	9,950.00	3,137.50	0.072	0.091
5031.3	17,532.00	4,122.30	0.095	0.185
5032	28,157.90	15,991.46	0.367	0.552

Total = 24,059 CF

Total = 0.55 Ac-ft

At Elevation 5031.4, the Storage is 0.24 Ac-ft.

Calculated by: DLM

Date: 7/5/2011

Checked by: ____________

APS - Lincoln Complex

Existing Conditions Analysis

Rating Curve for DP-22

Weir in Concrete Headwall

Bottom Width		2	ft
Top Width		5	ft
Side Slopes	1 to 1		45 degrees
Height		1.5	ft

Combination of V notch and Rectangular Weirs

V notch Weir: Q = 2.52 H ^ 2.47

Rect. Weir: Q=3.33(L-0.2H) H^1.5

H	Q	Q	Combined Q
(ft)	(cfs)	(cfs)	(cfs)
0.25	0.1	0.8	0.9
0.5	0.5	2.3	2.8
0.75	1.2	4.3	5.5
1	2.5	6.6	9.1
1.25	4.4	9.2	13.6
1.5	6.9	12.1	18.9

Albuquerque Public Schools - Lincoln Complex
DRAINAGE MASTER PLAN
(Pond Volume Calculation)

Exist. Ponding above DP-22

		Storage		
Elevation	SF	CF	AF	Sum
5028.5	0.00			0.000
5029	450.00	112.50	0.003	0.003
5030	3,720.00	2,085.00	0.048	0.050
5031	12,430.00	8,075.00	0.185	0.236

Total = 10,273 CF

Total = 0.24 Ac-ft

At Elevation 5029.5, the Storage is 0.03 Ac-ft.

Calculated by: DLM

Date: 7/5/2011

Checked by: ____________

EXISTING CONDITIONS
NORTHWEST REGION
HYDRAULIC CALCULATIONS

Locust St. at DP-24

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.05000	ft/ft
Discharge	14.0	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	0.670
0+00.000	0.000
0+02.000	0.125
0+14.000	0.500
0+28.000	0.400
0+30.000	0.275
0+30.000	0.945

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 0.670)	(0+02.000, 0.125)	0.013
(0+02.000, 0.125)	(0+28.000, 0.400)	0.016
(0+28.000, 0.400)	(0+30.000, 0.945)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.43	ft
Elevation Range	0.000 to 0.945 ft	
Flow Area	2.48	ft²
Wetted Perimeter	18.595	ft

Locust St. at DP-24

Results

Hydraulic Radius		0.13	ft
Top Width		17.997	ft
Normal Depth		0.43	ft
Critical Depth		0.55	ft
Critical Slope		0.00617	ft/ft
Velocity		5.66	ft/s
Velocity Head		0.50	ft
Specific Energy		0.93	ft
Froude Number		2.69	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.43	ft
Critical Depth	0.55	ft
Channel Slope	0.05000	ft/ft
Critical Slope	0.00617	ft/ft

PROPOSED CONDITIONS

- **PIPE AND STREET CAPACITY CHARTS**

- **SOUTHEAST REGION HYDRAULICS**
  - BERM/SWALE CAPACITY WORKSHEETS
  - DETENTION POND #1 VOLUME CALCULATION
  - PROP. POND #1 DISCHARGE CALCULATION
  - BASEHART STREET CAPACITY WORKSHEET
  - HYDRAULIC JUMP CALCULATION

- **NORTHEAST REGION HYDRAULICS**
  - REVISED PIPE / INLET RATING CURVES
  - INLET CAPACITY WORKSHEETS
  - HYDRAULIC GRADE LINE CALCULATIONS

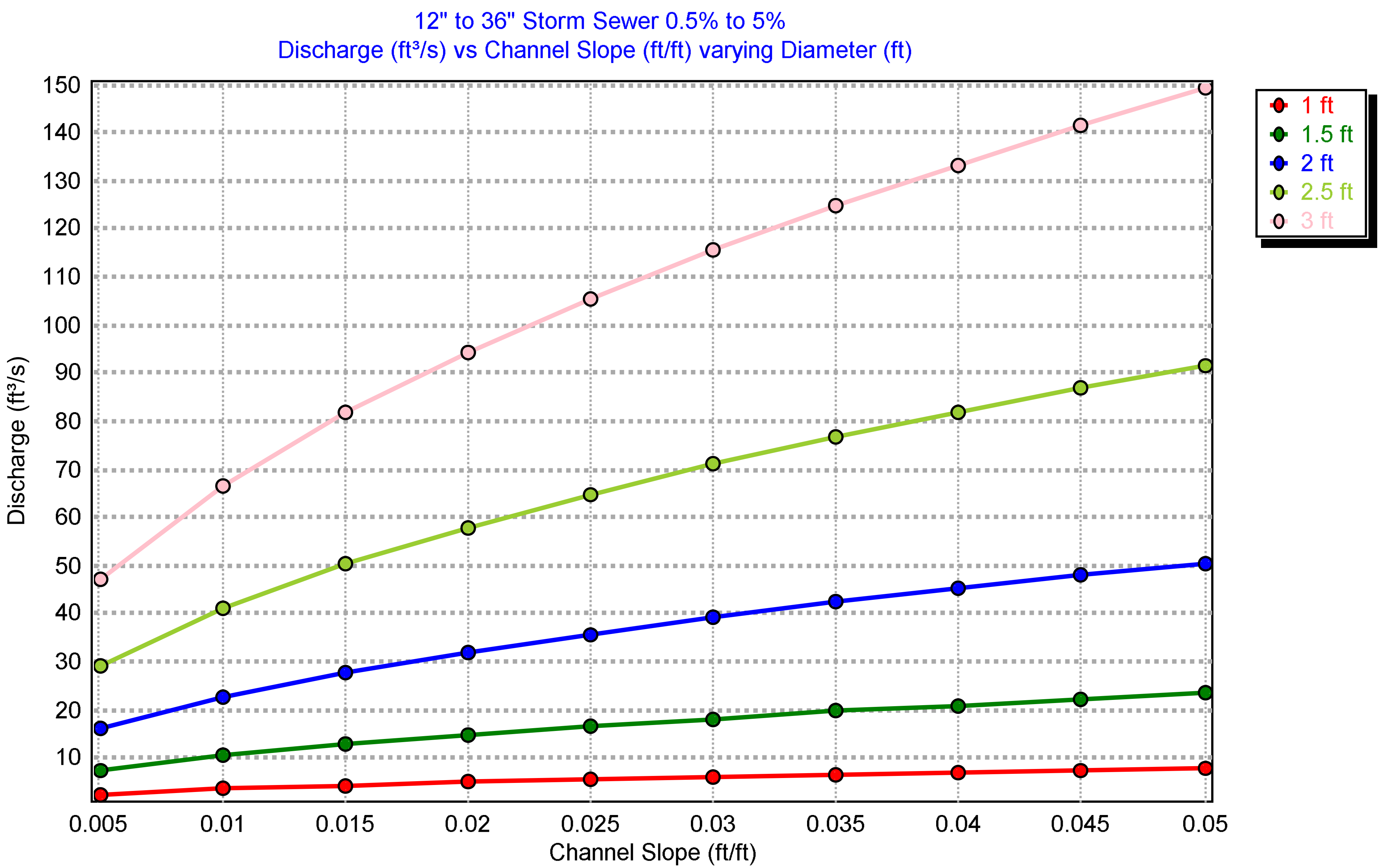
- **SOUTH CENTRAL REGION HYDRAULICS**
  - CONCRETE SWALE CALCULATIONS
  - EXISTING PIPE / INLET RATING CURVES
  - HYDRAULIC GRADE LINE CALCULATIONS
  - WATER QUALITY POND 1 VOLUME CALCULATIONS
  - PROP. POND #1 INLET/OUTLET CONCEPTS

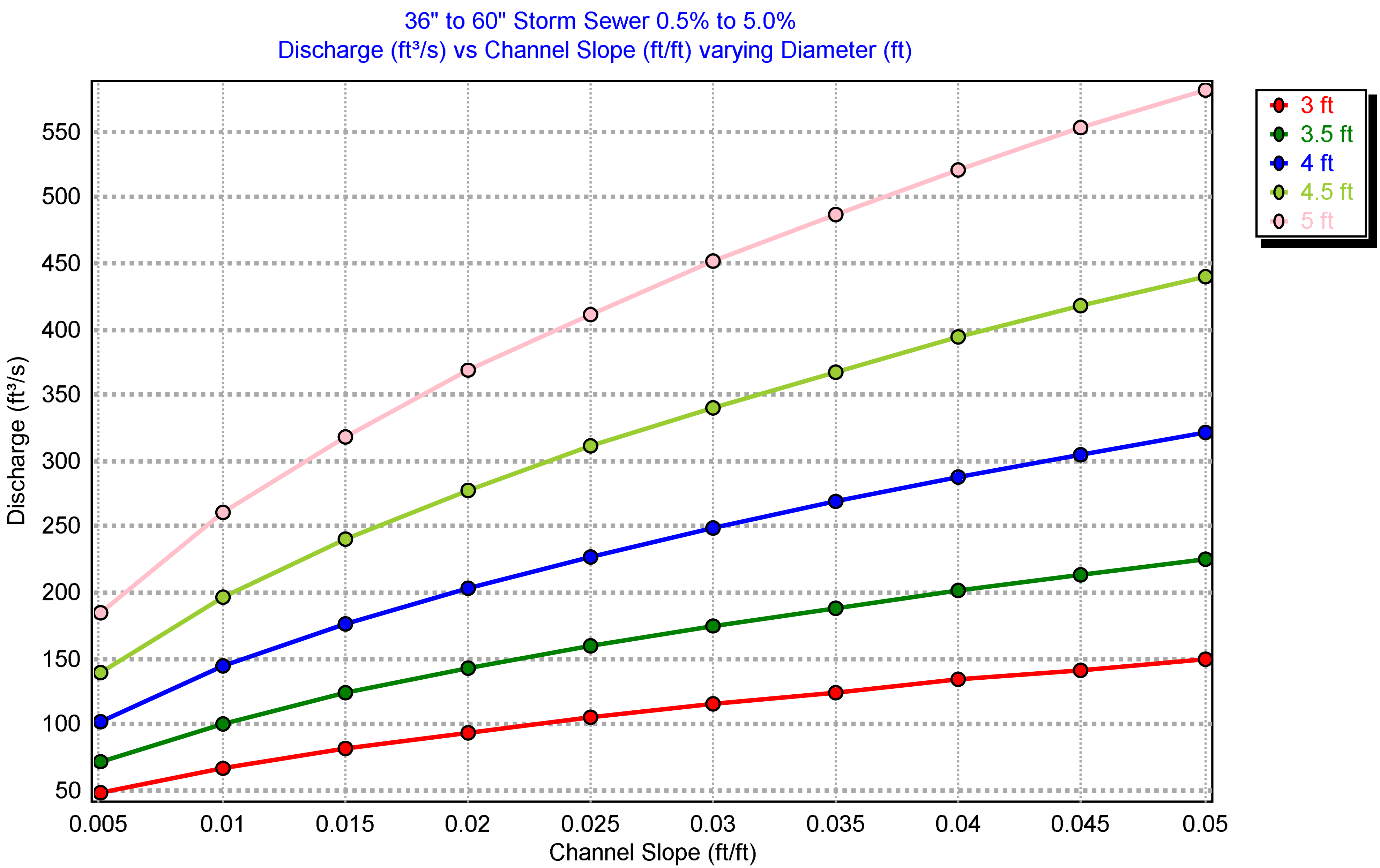
- **SOUTHWEST REGION HYDRAULICS**
  - WATER QUALITY/DET. POND #2 & 3 VOLUMES CALCULATIONS
  - PROP. POND 2 &3 INLET/OUTLET CONCEPTS

- **NORTHWEST REGION HYDRAULICS**
  - WATER QUALITY POND #4 VOLUMES CALCULATIONS
  - PROP. POND #4 INLET/OUTLET CONCEPTS

PROPOSED CONDITIONS
PIPE AND STREET CAPACITY CHARTS

WILSON
&COMPANY


12" to 36" Storm Sewer 0.5% to 5%
Discharge (ft³/s) vs Channel Slope (ft/ft) varying Diameter (ft)
Discharge (ft³/s)
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0.005
0.01
0.015
0.02
0.025
0.03
0.035
0.04
0.045
0.05
Channel Slope (ft/ft)
1 ft
1.5 ft
2 ft
2.5 ft
3 ft


36" to 60" Storm Sewer 0.5% to 5.0%
Discharge (ft³/s) vs Channel Slope (ft/ft) varying Diameter (ft)
Discharge (ft³/s)
550
500
450
400
350
300
250
200
150
100
50
0.005
0.01
0.015
0.02
0.025
0.03
0.035
0.04
0.045
0.05
Channel Slope (ft/ft)
3 ft
3.5 ft
4 ft
4.5 ft
5 ft

PIPE CAPACITY & ENTRANCE LOSS

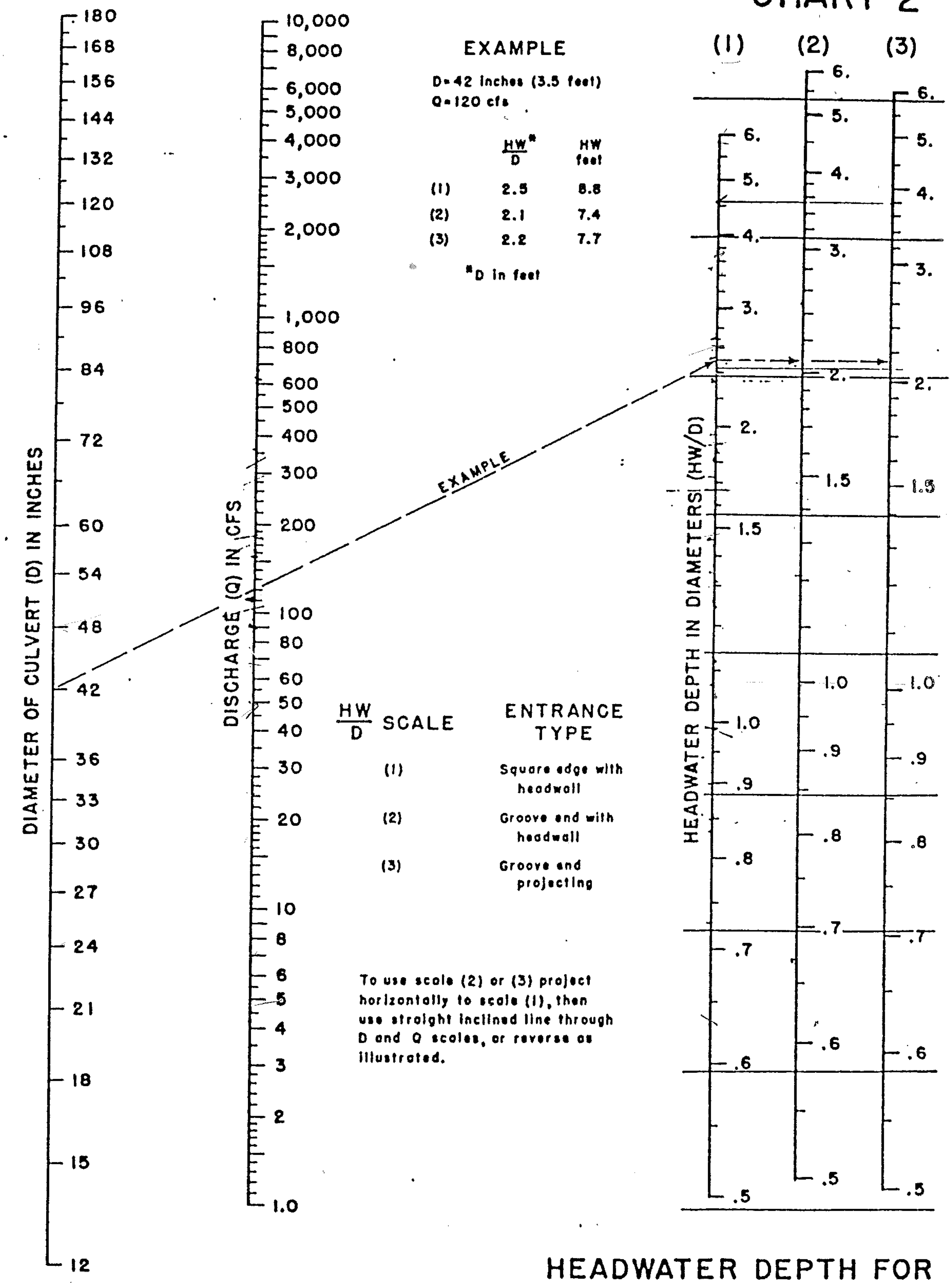
PIPE DIA.	AREA S.F.	Q C.F.S	VEL. F.PS.	ENTRANCE LOSS	n	FRICTION SLOPE
18	1.77	12	6.79	1.07	0.013	0.013066
18	1.77	15	8.49	1.68	0.013	0.020415
18	1.77	18	10.19	2.42	0.013	0.029398
18	1.77	21	11.88	3.29	0.013	0.040013
18	1.77	24	13.58	4.30	0.013	0.052262
18	1.77	27	15.28	5.44	0.013	0.066145
18	1.77	30	16.98	6.71	0.013	0.081660
24	3.14	20	6.37	0.94	0.013	0.007810
24	3.14	25	7.96	1.47	0.013	0.012203
24	3.14	30	9.55	2.12	0.013	0.017573
24	3.14	35	11.14	2.89	0.013	0.023918
24	3.14	40	12.73	3.78	0.013	0.031240
24	3.14	45	14.32	4.78	0.013	0.039538
24	3.14	50	15.92	5.90	0.013	0.048813
24	3.14	55	17.51	7.14	0.013	0.059064
24	3.14	60	19.10	8.50	0.013	0.070291
30	4.91	30	6.11	0.87	0.013	0.005337
30	4.91	40	8.15	1.55	0.013	0.009489
30	4.91	50	10.19	2.42	0.013	0.014826
30	4.91	60	12.22	3.48	0.013	0.021350
30	4.91	70	14.26	4.74	0.013	0.029060
30	4.91	80	16.30	6.19	0.013	0.037956
30	4.91	90	18.33	7.83	0.013	0.048037
36	7.07	40	5.66	0.75	0.013	0.003584
36	7.07	50	7.07	1.17	0.013	0.005600
36	7.07	60	8.49	1.68	0.013	0.008064
36	7.07	70	9.90	2.28	0.013	0.010976
36	7.07	80	11.32	2.98	0.013	0.014337
36	7.07	90	12.73	3.78	0.013	0.018145
36	7.07	100	14.15	4.66	0.013	0.022401
36	7.07	110	15.56	5.64	0.013	0.027105
36	7.07	120	16.98	6.71	0.013	0.032257
36	7.07	140	19.81	9.14	0.013	0.043906
42	9.62	60	6.24	0.91	0.013	0.003541
42	9.62	70	7.28	1.23	0.013	0.004819
42	9.62	80	8.32	1.61	0.013	0.006294
42	9.62	90	9.35	2.04	0.013	0.007966
42	9.62	100	10.39	2.52	0.013	0.009835
42	9.62	110	11.43	3.04	0.013	0.011900
42	9.62	120	12.47	3.62	0.013	0.014162
42	9.62	130	13.51	4.25	0.013	0.016621
42	9.62	140	14.55	4.93	0.013	0.019276
42	9.62	150	15.59	5.66	0.013	0.022129
42	9.62	160	16.63	6.44	0.013	0.025177
42	9.62	170	17.67	7.27	0.013	0.028423
42	9.62	180	18.71	8.15	0.013	0.031865

PIPE CAPACITY & ENTRANCE LOSS

PIPE DIA.	AREA S.F.	Q C.F.S	VEL. F.PS.	ENTRANCE LOSS	n	FRICTION SLOPE
48	12.57	120	9.55	2.12	0.013	0.006942
48	12.57	140	11.14	2.89	0.013	0.009448
48	12.57	160	12.73	3.78	0.013	0.012341
48	12.57	150	11.94	3.32	0.013	0.010846
48	12.57	160	12.73	3.78	0.013	0.012341
48	12.57	170	13.53	4.26	0.013	0.013931
48	12.57	180	14.32	4.78	0.013	0.015619
48	12.57	190	15.12	5.32	0.013	0.017402
48	12.57	200	15.92	5.90	0.013	0.019282
48	12.57	210	16.71	6.50	0.013	0.021259
48	12.57	220	17.51	7.14	0.013	0.023331
48	12.57	230	18.30	7.80	0.013	0.025501
48	12.57	240	19.10	8.50	0.013	0.027766
48	12.57	250	19.89	9.22	0.013	0.030128
48	12.57	260	20.69	9.97	0.013	0.032587
48	12.57	270	21.49	10.75	0.013	0.035142
48	12.57	280	22.28	11.56	0.013	0.037793
54	15.90	180	11.32	2.98	0.013	0.008327
54	15.90	200	12.58	3.68	0.013	0.010280
54	15.90	220	13.83	4.46	0.013	0.012439
54	15.90	240	15.09	5.30	0.013	0.014803
54	15.90	260	16.35	6.22	0.013	0.017373
54	15.90	280	17.61	7.22	0.013	0.020149
54	15.90	300	18.86	8.29	0.013	0.023130
54	15.90	320	20.12	9.43	0.013	0.026317
54	15.90	340	21.38	10.64	0.013	0.029710
60	19.63	220	11.20	2.92	0.013	0.007087
60	19.63	240	12.22	3.48	0.013	0.008434
60	19.63	260	13.24	4.08	0.013	0.009898
60	19.63	280	14.26	4.74	0.013	0.011479
60	19.63	300	15.28	5.44	0.013	0.013178
60	19.63	320	16.30	6.19	0.013	0.014993
60	19.63	340	17.32	6.98	0.013	0.016926
60	19.63	360	18.33	7.83	0.013	0.018976
60	19.63	380	19.35	8.72	0.013	0.021143
60	19.63	400	20.37	9.67	0.013	0.023427
72	28.27	280	9.90	2.28	0.013	0.004336
72	28.27	300	10.61	2.62	0.013	0.004977
72	28.27	320	11.32	2.98	0.013	0.005663
72	28.27	340	12.03	3.37	0.013	0.006393
72	28.27	360	12.73	3.78	0.013	0.007168
72	28.27	380	13.44	4.21	0.013	0.007986
72	28.27	400	14.15	4.66	0.013	0.008849
72	28.27	420	14.85	5.14	0.013	0.009756
72	28.27	440	15.56	5.64	0.013	0.010707
72	28.27	460	16.27	6.17	0.013	0.011703
72	28.27	480	16.98	6.71	0.013	0.012742
72	28.27	500	17.68	7.28	0.013	0.013826
72	28.27	520	18.39	7.88	0.013	0.014955
72	28.27	540	19.10	8.50	0.013	0.016127
72	28.27	560	19.81	9.14	0.013	0.017344

Q_{full} V_{full} $\frac{1.5V^2}{2g}$ S_{full}

CHART 2

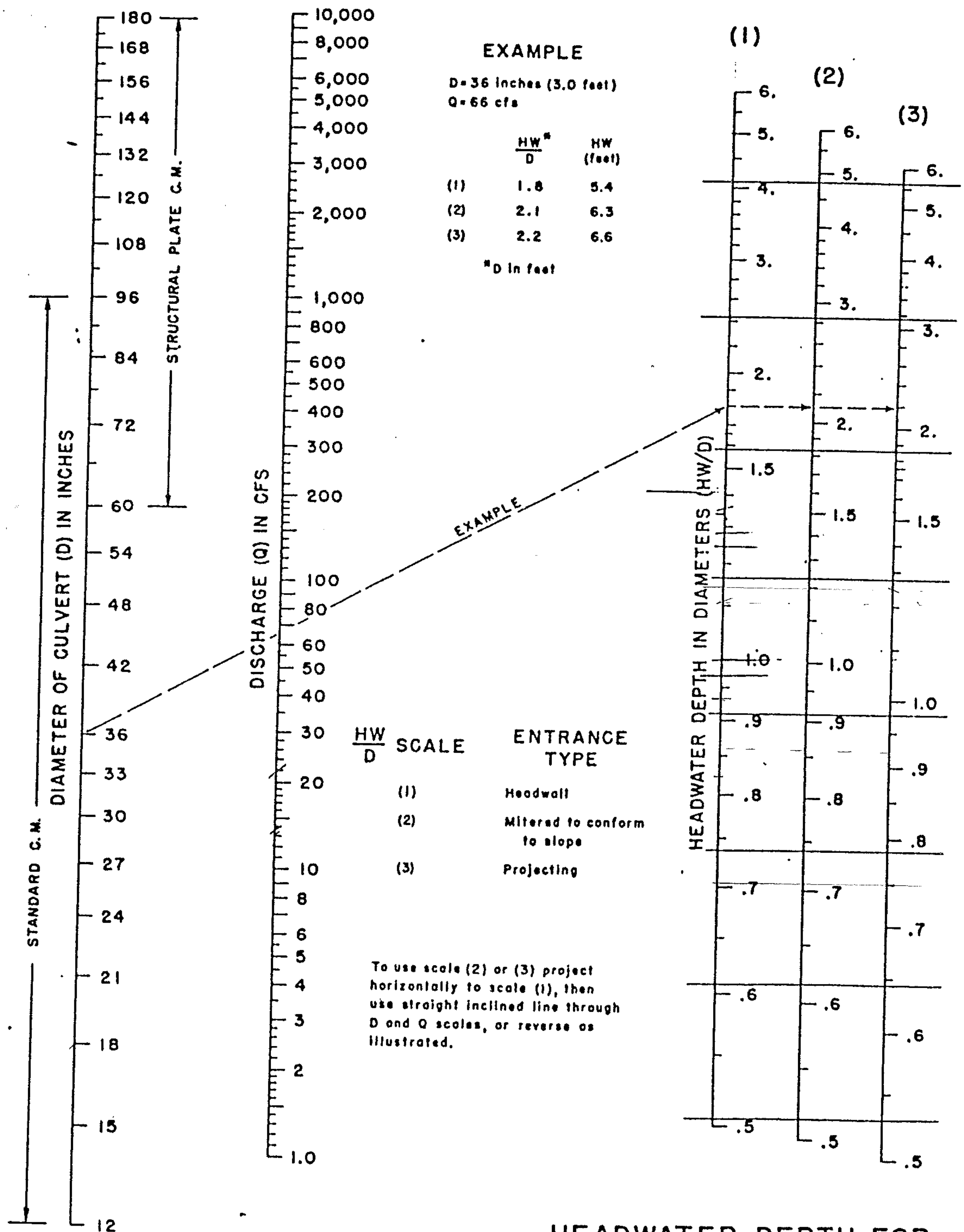


BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER SCALES 2&3
REVISED MAY 1964

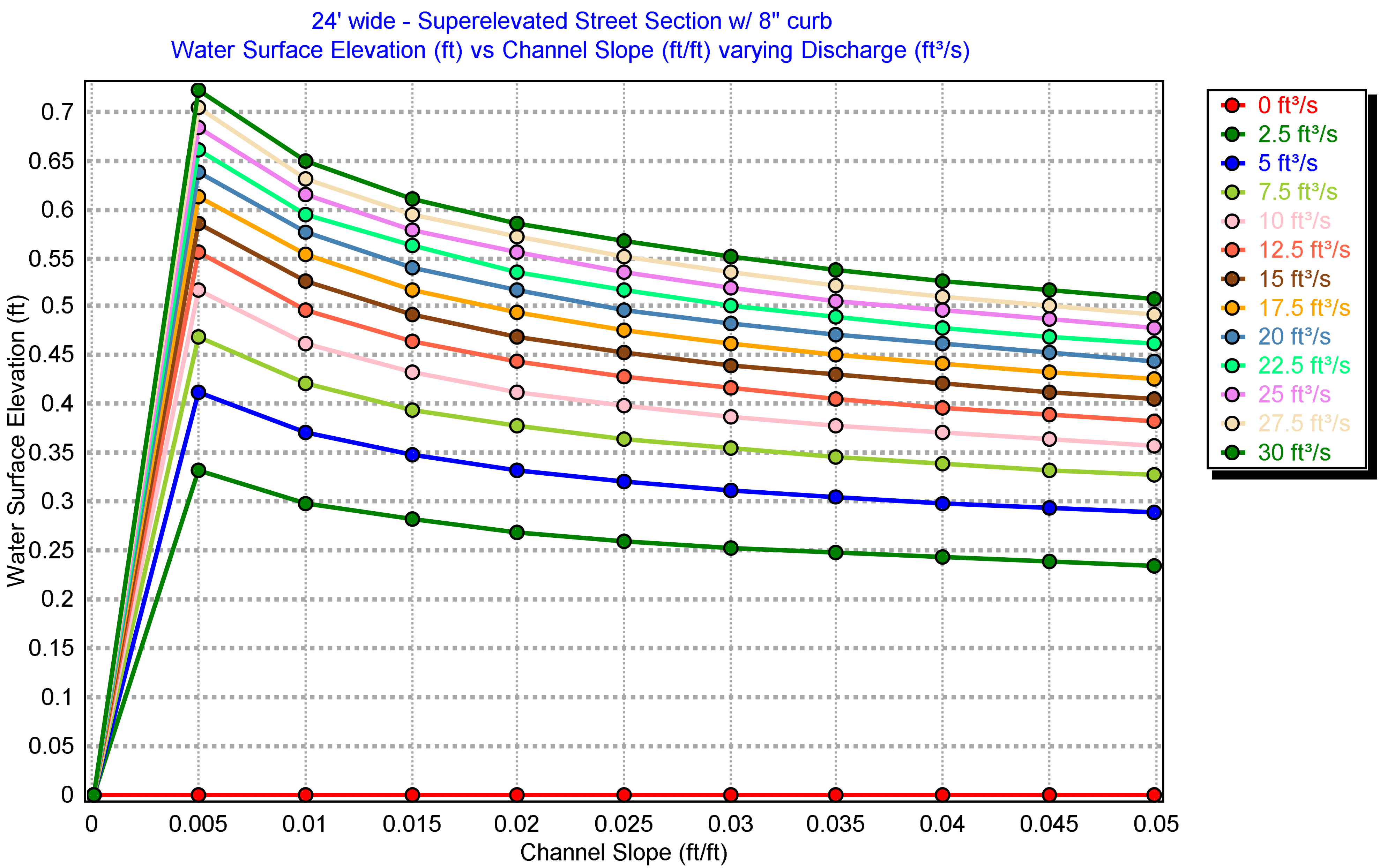
HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

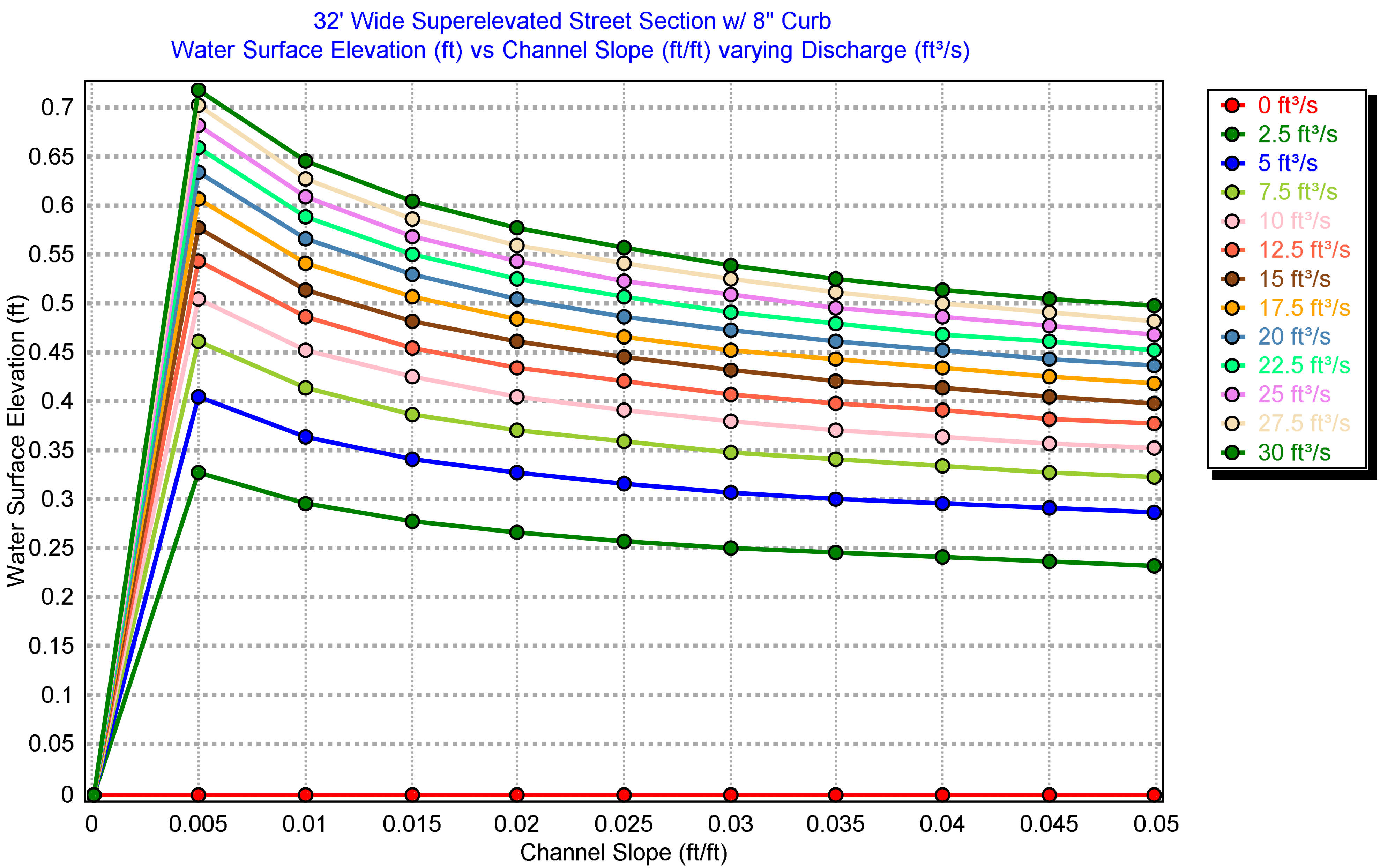
CHART 5



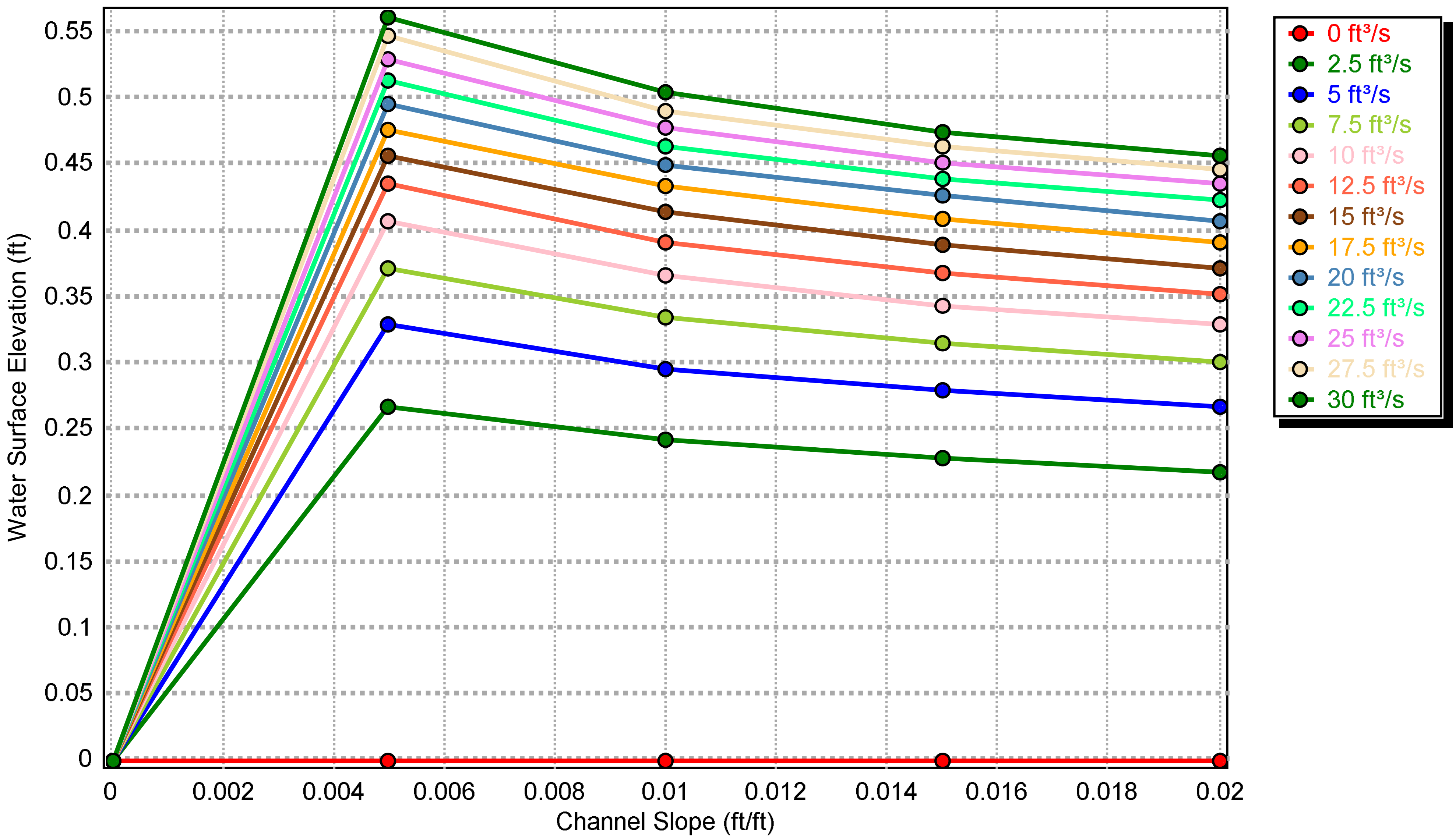
BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL


24' wide - Superelevated Street Section w/ 8" curb
Water Surface Elevation (ft) vs Channel Slope (ft/ft) varying Discharge (ft³/s)
Water Surface Elevation (ft)
Channel Slope (ft/ft)
0 ft³/s
2.5 ft³/s
5 ft³/s
7.5 ft³/s
10 ft³/s
12.5 ft³/s
15 ft³/s
17.5 ft³/s
20 ft³/s
22.5 ft³/s
25 ft³/s
27.5 ft³/s
30 ft³/s


32' Wide Superelevated Street Section w/ 8" Curb
Water Surface Elevation (ft) vs Channel Slope (ft/ft) varying Discharge (ft³/s)
Water Surface Elevation (ft)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
0.65
0.7
Channel Slope (ft/ft)
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035
0.04
0.045
0.05
0 ft³/s
2.5 ft³/s
5 ft³/s
7.5 ft³/s
10 ft³/s
12.5 ft³/s
15 ft³/s
17.5 ft³/s
20 ft³/s
22.5 ft³/s
25 ft³/s
27.5 ft³/s
30 ft³/s

34' Wide - Standard Street Section w/ 8" curb
Water Surface Elevation (ft) vs Channel Slope (ft/ft) varying Discharge (ft³/s)



PROPOSED CONDITIONS
SOUTHEAST REGION
HYDRAULIC CALCULATIONS

WILSON
&COMPANY

Proposed Berm-Swale to DP-1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.00500	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	6.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	15.40	ft³/s

Results

Normal Depth	0.99	ft
Flow Area	6.38	ft²
Wetted Perimeter	11.14	ft
Hydraulic Radius	0.57	ft
Top Width	10.90	ft
Critical Depth	0.75	ft
Critical Slope	0.01748	ft/ft
Velocity	2.41	ft/s
Velocity Head	0.09	ft
Specific Energy	1.08	ft
Froude Number	0.56	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.99	ft
Critical Depth	0.75	ft
Channel Slope	0.00500	ft/ft

Albuquerque Public Schools - Lincoln Complex
DRAINAGE MASTER PLAN
(Pond Volume Calculation)

Proposed Detention Pond @ DP-1

			Storage	
Elevation	SF	CF	AF	Sum
5986	0.00			0
5987	7,000.00	3,500.00	0.08	0.08
5988	8,550.00	7,775.00	0.18	0.26
5989	10,270.00	9,410.00	0.22	0.47
5990	12,890.00	11,580.00	0.27	0.74
5991	20,065.00	16,477.50	0.38	1.12

Total = 48,743 CF

Total = 1.12 Ac-ft

At Elevation 5989.3, the Storage is 0.55 Ac-ft.

Provide a Min. of 1' freeboard above emergency overflow

Calculated by: DLM

Date: 9/5/2011

Checked by: ____________

FROM: Lincoln Complex - APS
TO: Proposed Conditions

WILSON & COMPANY

DATE: 8/31/11
FILE:

SUBJECT:

Req'd Flow Rate to drain Retention Pond @ DP-1 in 96 hours. Based up Existing Development.

Approx total volume = 0.449 AC-FT (Based upon 24 hr. Storm)

Convert to cubic ft = 0.449 AC-FT x 43560 ft^3 = 19558 cf

Discharge Flow over 96 hrs = 19558 cf / 96 hrs
= 204 cf / hr

Convert to cubic ft / sec = $\frac{204 cf}{hr} \times \frac{1 hr}{3600 s}$

= 0.06 cfs

Discharge @ greater than 0.06 cfs

Proposed Berm-Swale to DP-2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.00300	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	10.00	ft/ft (H:V)
Bottom Width	0.00	ft
Discharge	20.00	ft³/s

Results

Normal Depth	1.25	ft
Flow Area	10.18	ft²
Wetted Perimeter	16.54	ft
Hydraulic Radius	0.62	ft
Top Width	16.27	ft
Critical Depth	0.90	ft
Critical Slope	0.01749	ft/ft
Velocity	1.96	ft/s
Velocity Head	0.06	ft
Specific Energy	1.31	ft
Froude Number	0.44	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.25	ft
Critical Depth	0.90	ft
Channel Slope	0.00300	ft/ft

Note: Berm has been oversized to accept runoff from Design Point 1 in the case berm fails or Det. Pond 1 is not constructed.

Berm may be reduced to 1' min. to convey flow from Basin 202 only.

Existing Basehart at Vance Emory Lane - 37 cfs

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.04000	ft/ft
Discharge	37.0	ft³/s
Section Definitions		

Station (ft)	Elevation (ft)
0+00.000	0.667
0+00.000	0.000
0+02.000	0.125
0+38.000	1.025
0+40.000	1.150
0+40.000	1.820

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 0.667)	(0+02.000, 0.125)	0.013
(0+02.000, 0.125)	(0+38.000, 1.025)	0.016
(0+38.000, 1.025)	(0+40.000, 1.820)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.57	ft
Elevation Range	0.000 to 1.820 ft	
Flow Area	4.99	ft²
Wetted Perimeter	20.399	ft
Hydraulic Radius	0.24	ft

Existing Basehart at Vance Emory Lane - 37 cfs

Results

Top Width		19.819	ft
Normal Depth		0.57	ft
Critical Depth		0.81	ft
Critical Slope		0.00517	ft/ft
Velocity		7.42	ft/s
Velocity Head		0.86	ft
Specific Energy		1.43	ft
Froude Number		2.61	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.57	ft
Critical Depth	0.81	ft
Channel Slope	0.04000	ft/ft
Critical Slope	0.00517	ft/ft

WILSON & COMPANY

FROM: Lincoln Complex - APS MDP
TO: Proposed Conditions

DATE: 8/23/11
FILE:

SUBJECT: Estimate max. ht of hydraulic jump at N.W. corner of Basehart and Vance Emory Lane

Assumptions ① 70% of Basin OS-A & OS-B intercepted by existing storm sewer systems.

② Retention pond @ DP-1 in place

③ No collection by area drain @ DP-2

Revised Flow Rate @ DP-3

$Q_{100} = 37$ cfs

Hydraulic jump Eqn $d_2 = \frac{-d_1}{2} + \sqrt{\frac{d_1^2}{4} + \frac{2v_1^2 d_1}{g}}$

Velocity @ roadway
Per Flowmaster $V_1 = 7.42$ $D_1 = 0.57'$

$d_2 = \frac{-0.57}{2} + \sqrt{\frac{0.57^2}{4} + \frac{2(7.4)^2 \times 0.57}{32.2}}$

$d_2 = 1.13'$

Approx ht above curbline = 1.13 - 0.67 = 0.46' ≈ 0.5'

Provide a min of 1' of hardscaping above top back of curb to ensure no erosion occurs

PROPOSED CONDITIONS
NORTHEAST REGION
HYDRAULIC CALCULATIONS

WILSON
&COMPANY

Single Grate-Single Throat Type A Inlet - At Grade DP-4

Project Description

Solve For	Efficiency

Input Data

Discharge	6.50	ft³/s
Slope	0.0600	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.0625	ft/ft
Road Cross Slope	0.0260	ft/ft
Roughness Coefficient	0.015	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.20	ft
Grate Type	Reticuline	
Clogging	50.00	%
Curb Opening Length	6.94	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	66.11	%
Intercepted Flow	4.3	ft³/s
Bypass Flow	2.20	ft³/s
Spread	8.07	ft
Depth	0.28	ft
Flow Area	0.92	ft²
Gutter Depression	0.07	ft
Total Depression	0.24	ft
Velocity	7.07	ft/s
Splash Over Velocity	3.51	ft/s
Frontal Flow Factor	0.68	
Side Flow Factor	0.01	
Grate Flow Ratio	0.61	
Equivalent Cross Slope	0.09896	ft/ft
Active Grate Length	1.60	ft
Length Factor	0.19	
Total Interception Length	28.19	ft

WILSON & COMPANY

FROM: Lincoln Complex - APS
TO: proposed conditions

DATE: 8/31/11
FILE:

SUBJECT: Replace Inlet @ DP-4, Revise Rating Curve

Approx Flow to DP-4 in 100 YR Event = 6.5 cfs

Replace existing Type "C" single inlet w type "A" combination inlet

Significant grade change occurs upstream of inlet. Slope estimated @ 1/15 ≈ 6.6%
(Assume new inlet can be constructed at slightly lesser grade, Assume 6% for master planning.

Longitudinal Slope = 6% (cons. est)
Roadway Cross Slope = 12.2/14 = 0.84 x 1' = 0.84/32
= 2.6% OK

Revised Curve for A type

Flow Reaching Inlet	Interception (Flowmaster)
0	0
1	1.0
2	1.9
3	2.6
4	3.2
5	3.7
6	4.1
7	4.5

Approx 100 YR Bypass = 6.5 - 4.3 = 2.2 cfs

HIGHER Relationships

Double Grate C in Sump - DP-5

Project Description

Solve For	Spread		

Input Data

Discharge		8.10	ft³/s
Gutter Width		2.50	ft
Gutter Cross Slope		0.0625	ft/ft
Road Cross Slope		0.0200	ft/ft
Local Depression		2.00	in
Local Depression Width		2.50	ft
Grate Width		2.50	ft
Grate Length		6.45	ft
Grate Type	Reticuline		
Clogging		50.00	%
Curb Opening Length		6.50	ft
Opening Height		0.50	ft
Curb Throat Type	Horizontal		
Throat Incline Angle		90.00	degrees

Options

Calculation Option	Use Both		

Results

Spread		16.04	ft
Depth		0.43	ft
Gutter Depression		0.11	ft
Total Depression		0.27	ft
Open Grate Area		6.45	ft²
Active Grate Weir Length		8.95	ft

MANNINGS n = 0.013
FLOW RATE (OUT) 978 CFS
FLOW RATE (IN) 845 CFS

Lincoln Complex - Proposed Conditions Analysis

Existing 108" RCP to 30" connection near Stadium (WQ Pond #1 functions)

HGL CALCULATION

9/18/2011 12:59

HGL RAISED TO MATCH PIPE CROWN

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND LOSS K	FRICTION LOSS (ft)	BEND LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	PROPOSED PIPE FL (elevation)	PROPOSED CROWN (elevation)
OUTLET TO CHANNEL	100.0	108	978																32.50			23.50	32.50
	100.0	108	978	63.585	15.39	12510	0.00612	0.00				0.00	0.00	0.00		0.00	36.18	3.68	32.50	36.00	3.50		
108" X 48" WYE COLLAR	190.0	108	978	63.585	15.39	12510	0.00612	90.00				0.55	0.00	0.00		0.55	36.73	3.68	33.05			24.00	33.00
	190.0	108	898	63.585	14.13	12510	0.00516	0.00	48	75		0.00	0.00	0.51		0.51	37.24	3.10	34.14	39.50	5.36		
MH	258.0	108	898	63.585	14.13	12510	0.00516	68.00				0.35	0.00	0.00		0.35	37.59	3.10	34.49			24.40	33.40
	258.0	108	898	63.585	14.13	12510	0.00516	0.00			0.2	0.00	0.62	0.00		0.62	38.21	3.10	35.11	42.00	6.89		
12" CONNECTION	455.0	108	892	63.585	14.03	12510	0.00509	197.00				1.00	0.00	0.00		1.00	39.21	3.06	36.15			25.60	34.60
	455.0	108	892	63.585	14.03	12510	0.00509	0.00	12	90		0.00	0.00	0.00		0.00	39.21	3.06	36.15	44.00	7.85		
MH	514.0	108	892	63.585	14.03	12510	0.00509	59.00				0.30	0.00	0.00		0.30	39.51	3.06	36.45			25.95	34.95
	514.0	108	892	63.585	14.03	12510	0.00509	0.00			0.2	0.00	0.61	0.00		0.61	40.12	3.06	37.06	47.00	9.94		
108" X 30" (DP-12A)	1100.0	108	892	63.585	14.03	12510	0.00509	586.00				2.98	0.00	0.00		2.98	43.10	3.06	40.05			28.90	37.90
	1100.0	108	845	63.585	13.29	12510	0.00456	0.00	30	90		0.00	0.00	0.32		0.32	43.42	2.74	40.68	47.00	6.32		

REFER TO SEPARATE HAND CALCULATION FOR EXISTING 12" LINE @ DP-14/ DP-15

MANNINGS n = 0.022

Lincoln Complex - Proposed Conditions Analysis

Existing 30" CMP Line into Parking Lot

HGL CALCULATION

9/18/2011 12:59

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	APPROX PIPE FL (elevation)	APPROX CROWN (elevation)
108" X 30" (DP-12)	100.0	30	47.3																40.68				
	100.0	30	47.3	4.906	9.64	242	0.03827	0.00				0.00				0.00	42.12	1.44	40.68	52.00	11.32		
30" TEE	135.0	30	47.3	4.906	9.64	242	0.03827	35.00				1.34	0.00	0.00		1.34	44.54	1.44	43.10			40.60	43.10
	135.0	30	33.2	4.906	6.77	242	0.01885	0.00	30	90		0.00	0.00	0.73		0.73	45.28	0.71	44.56	53.00	8.44		
30"X24" WYE (DP-11)	142.5	30	33.2	4.906	6.77	242	0.01885	7.50				0.14	0.00	0.00		0.14	45.42	0.71	44.71			41.00	43.50
	142.5	30	20.2	4.906	4.12	242	0.00698	0.00	30	45		0.00	0.00	0.29		0.29	45.71	0.26	45.45	54.00	8.55		

MANNINGS n = 0.009

Lincoln Complex - Proposed Conditions Analysis

Existing 30" ADS to DP-12

HGL CALCULATION

9/18/2011 12:59

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	APPROX PIPE FL (elevation)	APPROX CROWN (elevation)
30" TEE	100.0	30	14.1																44.56			40.60	43.10
	100.0	30	14.1	4.906	2.88	591	0.00057	0.00				0.00				0.00	44.69	0.13	44.56	52.50	7.94		
BEND	107.3	30	14.1	4.906	2.88	591	0.00057	7.30				0.00	0.00	0.00		0.00	47.31	0.13	47.18			44.68	47.18
	107.3	30	14.1	4.906	2.88	591	0.00057	0.00			1	0.00	0.13	0.00		0.13	47.44	0.13	47.31	51.50	4.19		
BEND	120.3	30	14.1	4.906	2.88	591	0.00057	13.00				0.01	0.00	0.00		0.01	47.45	0.13	47.32			44.80	47.30
	120.3	30	14.1	4.906	2.88	591	0.00057	0.00			1	0.00	0.13	0.00		0.13	47.57	0.13	47.45	51.80	4.35		
INLET @ 212 (S)	125.3	30	10.5	4.906	2.14	591	0.00032	5.00				0.00	0.00	0.00	0.092	0.09	47.67	0.07	47.60			44.85	47.35
	125.3	30	10.5	4.906	2.14	591	0.00032	0.00				0.00	0.00	0.00		0.00	47.67	0.07	47.60	53.50	5.90		
INLET @ 212 (MID)*	233.3	30	10.5	4.906	2.14	591	0.00032	108.00				0.03	0.00	0.00	0.092	0.13	48.57	0.07	48.50			46.00	48.50
	233.3	30	6.2	4.906	1.26	591	0.00011	0.00				0.00	0.00	0.00		0.00	51.52	0.02	51.50	53.50	2.00	49.00	51.50
INLET @ 212 (N)	318.8	30	6.2	4.906	1.26	591	0.00011	85.50				0.01	0.00	0.00	0.037	0.05	52.37	0.02	52.35			49.85	52.35
	318.8	30	6.2	4.906	1.26	591	0.00011	0.00				0.00	0.00	0.00		0.00	52.37	0.02	52.35	54.35	2.00		

* ELEV. ON FOR INLET ESTIMATED NOT INDICATED ON CONSTRUCTION PLANS

MANNINGS n = 0.009

Lincoln Complex - Proposed Conditions Analysis

Existing 24" ADS to DP-7

HGL CALCULATION

9/18/2011 12:59

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	PROPOSED PIPE FL (elevation)	PROPOSED CROWN (elevation)
30 X 24 WYE	100.0	24	20.2																45.45			41.00	43.00
	100.0	24	20.2	3.140	6.43	326	0.00385	0.00				0.00	0.00	0.00		0.00	46.09	0.64	45.45	54.00	8.55		
BEND	105.0	24	20.2	3.140	6.43	326	0.00385	5.00				0.02	0.00	0.00		0.02	46.11	0.64	45.47			41.20	43.20
	105.0	24	20.2	3.140	6.43	326	0.00385	0.00			0.35	0.00	0.22	0.00		0.22	46.33	0.64	45.69	54.00	8.31		
BEND	110.0	24	20.2	3.140	6.43	326	0.00385	5.00				0.02	0.00	0.00		0.02	46.35	0.64	45.71			41.40	43.40
	110.0	24	20.2	3.140	6.43	326	0.00385	0.00			0.35	0.00	0.22	0.00		0.22	46.58	0.64	45.94	54.00	8.06		
30" TEE (DP-9)	178.0	24	20.2	3.140	6.43	326	0.00385	68.00				0.26	0.00	0.00		0.26	46.84	0.64	46.20			43.98	45.98
	178.0	24	14.0	3.140	4.46	326	0.00185	0.00	30	90		0.00	0.00	0.33		0.33	47.17	0.31	46.86	51.70	4.84		
24 X24 WYE (DP-8)	192.5	24	14.0	3.140	4.46	326	0.00185	14.50				0.03	0.00	0.00		0.03	47.20	0.31	46.89			44.50	46.50
	192.5	24	5.4	3.140	1.72	326	0.00027	0.00	24	45		0.00	0.00	0.10		0.10	47.30	0.05	47.25	50.20	2.95		
INLET @ DP-7	242.5	24	5.4	3.140	1.72	326	0.00027	50.00				0.01	0.00	0.00		0.01	47.31	0.05	47.27			45.00	47.00
	242.5	24	5.4	3.140	1.72	326	0.00027	0.00				0.00	0.00	0.00	0.07	0.07	47.38	0.05	47.34	48.50	1.16		

ALL ELEVATIONS PROVIDED IN PLAN HAVE BEEN ESTIMATED FROM CONSTRUCTION DRAWING / FIELD VERIFY PRIOR TO PRELIM/FINAL DESIGN

MANNINGS n = 0.009

Lincoln Complex - Proposed Conditions Analysis

Existing 30" ADS to DP-9

HGL CALCULATION

9/18/2011 12:59

HGL RAISED TO MATCH PIPE CROWN

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	APPROX PIPE FL (elevation)	APPROX CROWN (elevation)
TEE *	100.0	30	6.2																46.86			43.98	46.48
	100.0	30	6.2	4.906	1.26	591	0.00011	0.00				0.00				0.00	46.89	0.02	46.86	52.50	5.64		
INLET @ 213	125.0	30	6.2	4.906	1.26	591	0.00011	25.00				0.00	0.00	0.00		0.00	47.02	0.02	47.00			44.50	47.00
	125.0	30	6.2	4.906	1.26	591	0.00011	0.00				0.00	0.00	0.00	0.037	0.04	47.06	0.02	47.04	50.50	3.46		

ALL ELEVATIONS PROVIDED IN PLAN HAVE BEEN ESTIMATED FROM CONSTRUCTION DRAWING / FIELD VERIFY PRIOR TO PRELIM/FINAL DESIGN

MANNINGS n = 0.009

Lincoln Complex - Proposed Conditions Analysis

Existing 18-24" ADS to DP-4

HGL CALCULATION

9/18/2011 12:59

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	PROPOSED PIPE FL (elevation)	PROPOSED CROWN (elevation)
24x24 WYE	100.0	24	8.5																47.25			44.50	46.50
	100.0	24	8.5	3.140	2.71	326	0.00068	0.00				0.00	0.00	0.00		0.00	47.37	0.11	47.25	50.20	2.95		
BEND	180.0	24	8.5	3.140	2.71	326	0.00068	80.00				0.05	0.00	0.00		0.05	48.11	0.11	48.00			46.00	48.00
	180.0	24	8.5	3.140	2.71	326	0.00068	0.00			0.2	0.00	0.02	0.00		0.02	48.14	0.11	48.02	50.70	2.68		
24 x 18" WYE	206.0	24	8.5	3.140	2.71	326	0.00068	26.00				0.02	0.00	0.00		0.02	48.32	0.11	48.21			46.21	48.21
	206.0	18	8.5	1.766	4.81	151	0.00316	0.00	18	45		0.00	0.00	0.02		0.02	48.34	0.36	47.98	50.70	2.72		
BEND	316.0	18	8.5	1.766	4.81	151	0.00316	110.00				0.35	0.00	0.00		0.35	49.14	0.36	48.78			47.28	48.78
	316.0	18	8.5	1.766	4.81	151	0.00316	0.00	30	90	0.2	0.00	0.07	0.00		0.07	49.21	0.36	48.85	51.70	2.85		
BEND	416.0	18	8.5	1.766	4.81	151	0.00316	100.00				0.32	0.00	0.00		0.32	49.66	0.36	49.30			47.80	49.30
	416.0	18	8.5	1.766	4.81	151	0.00316	0.00			0.2	0.00	0.07	0.00		0.07	49.73	0.36	49.37	51.00	1.63		
18"X18"WYE	431.5	18	8.5	1.766	4.81	151	0.00316	15.50				0.05	0.00	0.00		0.05	49.88	0.36	49.52			48.02	49.52
	431.5	18	3.8	1.766	2.15	151	0.00063	0.00	18	45		0.00	0.00	0.13		0.13	50.01	0.07	49.94	51.30	1.36		
BEND	514.1	18	3.8	1.766	2.15	151	0.00063	82.60				0.05	0.00	0.00		0.05	50.78	0.07	50.71			49.21	50.71
	514.1	18	3.8	1.766	2.15	151	0.00063	0.00			0.35	0.00	0.03	0.00		0.03	50.81	0.07	50.74	51.50	0.76		
REPLACED INLET @ DP-4	534.1	18	3.8	1.766	2.15	151	0.00063	20.00				0.01	0.00	0.00		0.01	51.07	0.07	51.00			49.50	51.00
	534.1	18	3.8	1.766	2.15	151	0.00063	0.00				0.00	0.00	0.00	0.11	0.11	51.18	0.07	51.11	51.60	0.49		

MANNINGS n = 0.009

Lincoln Complex - Proposed Conditions Analysis

Existing 18" ADS to DP-5

HGL CALCULATION

9/18/2011 12:59

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	JUNCTION DATA LATERAL SIZE (inches)	JUNCTION DATA LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	APPROX PIPE FL (elevation)	APPROX CROWN (elevation)
18"X18"WYE	100.0	18	4.8																49.94			48.02	49.52
	100.0	18	4.8	1.766	2.72	151	0.00101	0.00				0.00				0.00	50.05	0.11	49.94	52.50	2.56		
BEND	105.0	18	4.8	1.766	2.72	151	0.00101	5.00				0.01	0.00	0.00		0.01	50.06	0.11	49.95			48.25	49.75
	105.0	18	4.8	1.766	2.72	151	0.00101	0.00			0.35	0.00	0.04	0.00		0.04	50.10	0.11	49.99	51.50	1.51		
REPLACED INLET @ DP-5	110.0	18	4.8	1.766	2.72	151	0.00101	5.00				0.01	0.00	0.00		0.01	50.11	0.11	50.00			48.50	50.00
	110.0	18	4.8	1.766	2.72	151	0.00101	0.00				0.00	0.00	0.00	0.17	0.17	50.29	0.11	50.17	51.00	0.83		

ALL ELEVATIONS PROVIDED IN PLAN HAVE BEEN ESTIMATED FROM CONSTRUCTION DRAWING / FIELD VERIFY PRIOR TO PRELIM/FINAL DESIGN

PROPOSED CONDITIONS
SOUTHCENTRAL REGION
HYDRAULIC CALCULATIONS

WILSON
&COMPANY

WILSON &COMPANY

FROM: Lincoln Complex - ARS
TO: Proposed Condition

DATE: 8/31/11
FILE:

SUBJECT:

Determined Q_{100} for Swale North of Central Kitchen draining west.

Includes local drainage adjacent to building

Area = 0.12 ac.
Assume land use of type 'D'
Approx 4.4 cfs/ac

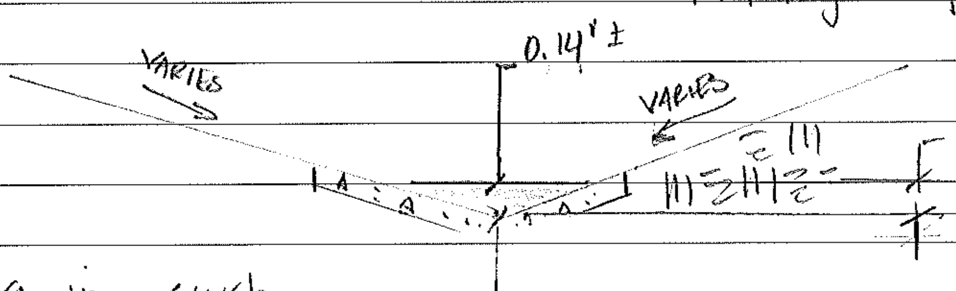
Q_{100} = 0.12 × 4.4 = 0.5± cfs

Total Flow = 0.5 cfs

Refer to Flowmaster Output

Q_{100} = 0.5

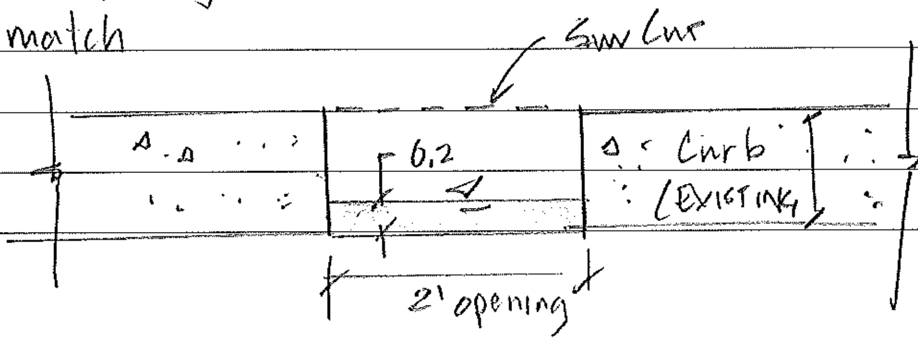
Min longitudinal slope = 0.5%



Create
Chase opening in curb
to match

$0.5 = 3.1 \times 2 \times W^{1.5}$

W = 0.2'



NOTE.
Direct flow
to street

HIGHER Relationships

SUBJECT:

Determine Q_{100} for Swale North of Central Kitchen & Expansion. (draining east)

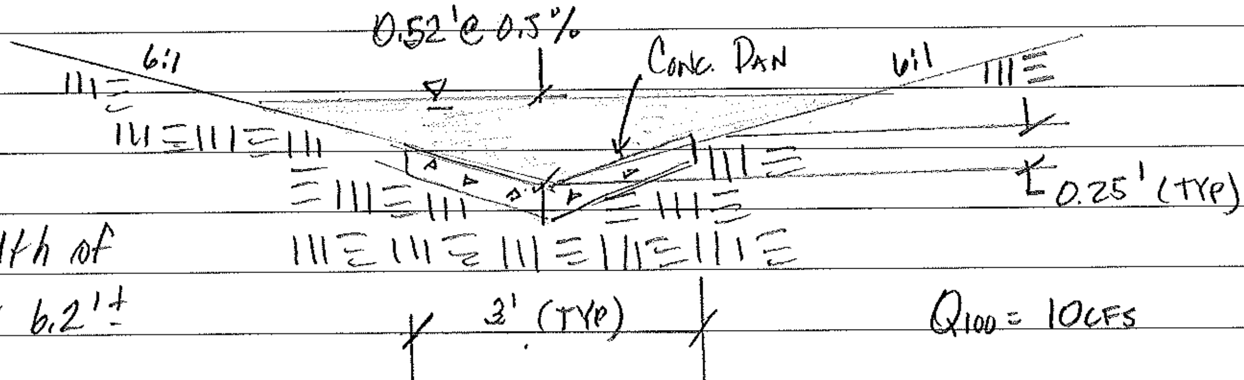
Should include local Drainage from behind building
Area = 0.4 acres ±
Assume land usage type 'D'
Approx. 4.4 cfs/ac
Q_{100} = 0.4 x 4.4 = 1.8 cfs

Include Q_{100} reaching Inlets behind kitchen @ DP-4 & 5, in event of clogged inlets

Q_{100} @ DP-4 = 6.5 cfs
Q_{100} @ DP-6 = 1.6 cfs

Total = 1.8 cfs + 6.5 cfs + 1.6 cfs = 9.9 cfs
≈ 10 cfs

REFER TO FLOWMASTER OUTPUT. Min. Longitudinal slope = 0.5%



Top Width of Water ≈ 6.2' ±

Q_{100} = 10 cfs

* NOTE: Assumes no contributing roof drainage reaches north side of building

FROM: Lincoln Complex - APS
TO: Proposed Condition

WILSON & COMPANY

DATE: 8/31/11
FILE:

SUBJECT:

Determine Q100 For Swale East of Central Kitchen Expansion

Q100 = behind Kitchen estimated @ 10cfs

add contributing area adjacent to building and portion of roof anticipated to reach swale.

Assume type 'D' land use Q/A = 4.4cfs/ac

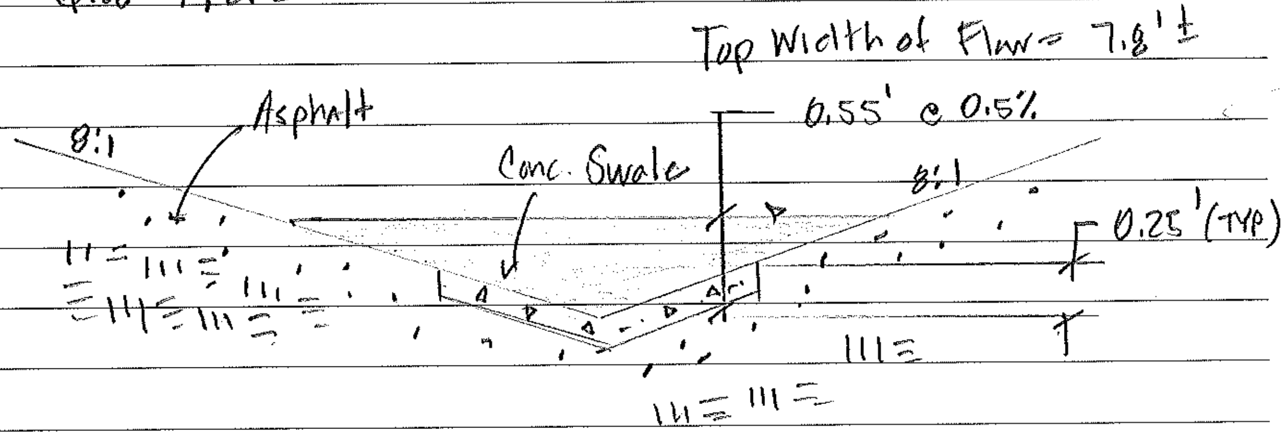
Area = 1.5 ac. @ 4.4cfs/ac = 6.6 cfs ≈ 7.0cfs

Total Flow = 10cfs + 7.0cfs = 17cfs

(if possible roof drainage would be better directed to south side of expansion.)

Refer to Flowmaster Output. Min Longitudinal Slope = 0.5%

Q100 = 17cfs



Note: Assume roof drainage from 1.1Ac. of Roof Top, + Flow from behind Central Kitchen Including Inlet Failure.

HIGHER Relationships

WILSON &COMPANY

FROM: Lincoln Complex - APS
TO: proposed conditions

DATE: 8/31/11
FILE:

SUBJECT: Rating Curve @ DP-14 (Revised)

Q = 5.5 cfs V = 7.01 V_h = 0.76 F_3 = 0.01155

HGL = 38.75 + .35 x 2 (0.76) + 602 (0.01155) + 1.5 (0.76)
= 47.13 ≈ top of grate

El	H (ft)	Q (cfs)	(From Existing Condition Analysis)
47.2	0	0	2' x 3' mesh grate inlet
47.45	0.25	4.6	
47.7	0.5	9.8	thus pipe system governs

Utilize following Rating Curve for Ahymo

El.	Q (cfs)
47.2	4.6
47.45	5.6
47.7	5.7
47.95	5.6
48.2	5.8
48.45	5.9

HIGHER Relationships

MANNINGS n = 0.013

Lincoln Complex - Proposed Conditions Analysis
Concept Storm 1 - WQ Pond 2 to DP-16
HGL CALCULATION

9/18/2011 14:55

HGL RAISED TO MATCH PIPE CROWN

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	LATERAL SIZE (inches)	LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	PROPOSED PIPE FL (elevation)	PROPOSED CROWN (elevation)
WQ POND 1	100.00	24	14																36.20			31.75	33.75
	100.00	24	14	3.140	4.46	226	0.00385	0.00				0.00	0.00	0.00		0.00	36.51	0.31	36.20	36.00	-0.20		
MH OR BEND	130.00	24	14	3.140	4.46	226	0.00385	30.00				0.12	0.00	0.00		0.12	37.81	0.31	37.50			35.50	37.50
	130.00	24	14	3.140	4.46	226	0.00385	0.00			0.3	0.00	0.09	0.00		0.09	37.90	0.31	37.59	39.70	2.11		
SND&OIL INT @ DP-20	340.00	24	14	3.140	4.46	226	0.00385	210.00				0.81	0.00	0.00		0.81	39.81	0.31	39.50			37.50	39.50
	340.00	24	12	3.140	3.82	226	0.00283	0.00			1.05	0.00	0.24	0.00		0.24	40.05	0.23	39.82	42.00	2.18		
MH/INLET @ DP-19	525.00	24	12	3.140	3.82	226	0.00283	185.00				0.52	0.00	0.00		0.52	41.73	0.23	41.50			39.50	41.50
	525.00	24	8	3.140	2.55	226	0.00126	0.00			1.3	0.00	0.13	0.00		0.13	41.86	0.10	41.76	45.00	3.24		
MH/INLET @ DP-18 (S)	730.00	24	8	3.140	2.55	226	0.00126	205.00				0.26	0.00	0.00		0.26	46.10	0.10	46.00			44.00	46.00
	730.00	18	4	1.766	2.26	105	0.00146	0.00			1.5	0.00	0.12	0.00		0.12	46.22	0.08	46.14	48.00	1.86		
INLET @ DP-18 (N)	880.00	18	4	1.766	2.26	105	0.00146	150.00				0.22	0.00	0.00		0.22	46.44	0.08	46.36			44.70	46.20
	880.00	18	4	1.766	2.26	105	0.00146	0.00				0.00	0.00	0.00	0.12	0.12	46.56	0.08	46.48	48.00	1.52		

MANNINGS n = 0.013

Lincoln Complex - Proposed Conditions Analysis
Concept Storm 2 - WQ Pond 2 to DP-12
HGL CALCULATION

9/18/2011 14:55

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	LATERAL SIZE (inches)	LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	PROPOSED PIPE FL (elevation)	PROPOSED CROWN (elevation)
WQ POND 1	100.00	30	47																36.20			31.75	34.25
	100.00	30	47	4.906	9.58	409	0.01319	0.00				0.00	0.00	0.00		0.00	37.62	1.42	36.20	36.00	-0.20		
MH @ DP-17	275.00	30	47	4.906	9.58	409	0.01319	175.00				2.31	0.00	0.00		2.31	39.93	1.42	38.51			36.60	39.10
	275.00	30	28	4.906	5.71	409	0.00468	0.00			1.3	0.00	0.66	0.00		0.66	40.59	0.51	40.09	42.00	1.91		
INLET @ DP-13 (MID)	475.00	30	28	4.906	5.71	409	0.00468	200.00				0.94	0.00	0.00		0.94	41.53	0.51	41.02			37.50	40.00
	475.00	30	9	4.906	1.83	409	0.00048	0.00				0.00	0.00	0.00	0.76	0.76	42.29	0.05	42.23	43.30	1.07		
INLET @ DP-13 (E)	500.00	30	9	4.906	1.83	409	0.00048	25.00				0.01	0.00	0.00		0.01	42.30	0.05	42.25			39.50	42.00
	500.00	30	9	4.906	1.83	409	0.00048	0.00				0.00	0.00	0.00	0.08	0.08	42.38	0.05	42.32	43.30	0.98		

MANNINGS n = 0.013

Lincoln Complex - Proposed Conditions Analysis
Concept Storm 3 - WQ Pond 2 to DP-14
HGL CALCULATION

9/18/2011 14:55

Storm Drain Design Point	STATION	PIPE SIZE (inches)	PEAK RATE (cfs)	AREA (sf)	VELOCITY (fps)	CONV. K	FRICTION SLOPE (ft/ft)	JUNCTION DATA LENGTH (ft)	LATERAL SIZE (inches)	LATERAL ANGLE (degrees)	BEND/MH LOSS K	FRICTION LOSS (ft)	BEND/MH LOSS (ft)	JUNCTION LOSS (ft)	INLET LOSS (ft)	TOTAL LOSS (ft)	ENERGY GRADE LINE (elevation)	VELOCITY HEAD (ft)	HYDRAULIC GRADE LINE (elevation)	MANHOLE RIM, FG, OR INLET FL** (elevation)	FREEBOARD (ft)	PROPOSED PIPE FL (elevation)	PROPOSED CROWN (elevation)
MH @ DP-17	100.00	30	20																40.09			37.00	39.50
	100.00	30	20	4.906	4.08	409	0.00239	0.00				0.00	0.00	0.00		0.00	40.34	0.26	40.09	42.00	1.91		
INLET @ DP-16 (W)	165.00	30	20	4.906	4.08	409	0.00239	65.00				0.16	0.00	0.00		0.16	40.50	0.26	40.24			37.65	40.15
	165.00	30	20	4.906	4.08	409	0.00239	0.00				0.00	0.00	0.00	0.34	0.34	40.83	0.26	40.58	42.00	1.42		
INLET @ DP-16 (E)	180.00	30	20	4.906	4.08	409	0.00239	15.00				0.04	0.00	0.00		0.04	40.87	0.26	40.61			37.80	40.30
	180.00	30	20	4.906	4.08	409	0.00239	0.00				0.00	0.00	0.00	0.39	0.39	41.26	0.26	41.00	42.00	1.00		

REFER TO HAND CALCS FOR WQ POND 1 FOR STARTING HGL ELEVATION

ALL ELEVATIONS PROVIDED IN PLAN HAVE BEEN ESTIMATED FROM CONSTRUCTION DRAWING / FIELD VERIFY PRIOR TO PRELIM/FINAL DESIGN

Albuquerque Public Schools - Lincoln Complex
DRAINAGE MASTER PLAN
(Pond Volume Calculation)

Proposed WQ Pond 1

			Storage	
Elevation	SF	CF	AF	Sum
5031	0.00			0
5032	5,342.00	2,671.00	0.06	0.06
5033	6,551.00	5,946.50	0.14	0.20
5034	7,861.00	7,206.00	0.17	0.36
5035	9,272.00	8,566.50	0.20	0.56
5036	10,783.00	10,027.50	0.23	0.79

Total = 34,418 CF

Total = 0.79 Ac-ft

At Elevation 5035, the Storage is 0.56 Ac-ft.

Calculated by: DLM

Date: 9/5/2011

Checked by: ____________

Albuquerque Public Schools - Lincoln Complex Drainage Master Plan

Concept Water Quality Storage Volume Worksheet

8/29/2011

Watershed Area Reaching Proposed Water Quality Pond No. 1

Basin ID	Basin Area (ac)	Percent Impervious	Basin Impervious Area (ac)
214	3.08	96.00	2.95
216	4.74	86.00	4.08
217	1.97	66.00	1.30
220	0.77	100.00	0.77
222	0.43	100.00	0.43
223	1.55	100.00	1.55
224	2.40	100.00	2.40
225	0.31	30.00	0.09
Sub-total	15.24	89	13.57

Water Quality Storm Even Runoff Rate and Volume**

% Imp.	Runoff Depth (inches)	Runoff Rate (cfs/ac)	Runoff Volume (cubic feet / acre)
0.00	0.00	0.00	0
20	0.09	0.5	327
40	0.18	0.8	653
60	0.27	1.20	980
80	0.36	1.35	1037
100	0.46	1.50	1670

Interpolation of 89% yields Runoff Volume of	1322
SWQV (cf)	20149
SWQV (ac-ft)	0.46
20% Increase for Sediment Storage	
SWQV Plus 20% Sediment Storage (cf)	24179
SWQV Plus 20% Sediment Storage (ac-ft)	0.56

** Table taken from Alb. DC Chapter 22, page 109 Table 2

FROM: Lincoln Complex – APS DMP
TO: Proposed Conditions

DATE: 9/7/11
FILE:

SUBJECT: Determine length of Weir Openings in Curb to convey 100 yr Flow to WQ Pond #1 w/ sidewalk @ DP-19

Q_{100} = 18 cfs Assuming max ponding depth = 0.4'
to allow for slope away from low point (0.1)
and thickness of grate (0.167')

Weir formula = $Q = C_w L H^{1.5}$

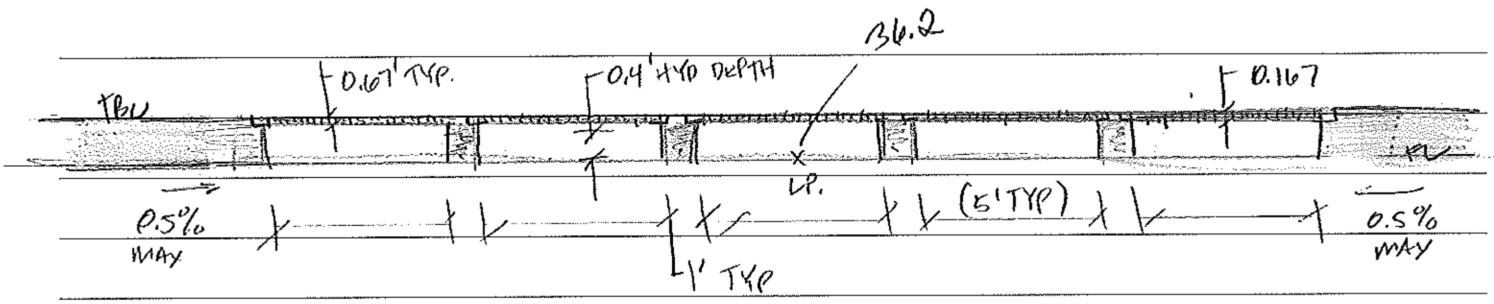
$18 = 3.1 (L) 0.4^{1.5}$

$L = 22.95'$

Provide 25' total opening

$18 = 3.1 (25) H^{1.5}$

$H = 0.38' \leq 0.4$ ok



(5) – 5' openings w/ (4) – 1' supports = 29'

SECTION VIEW

WILSON & COMPANY

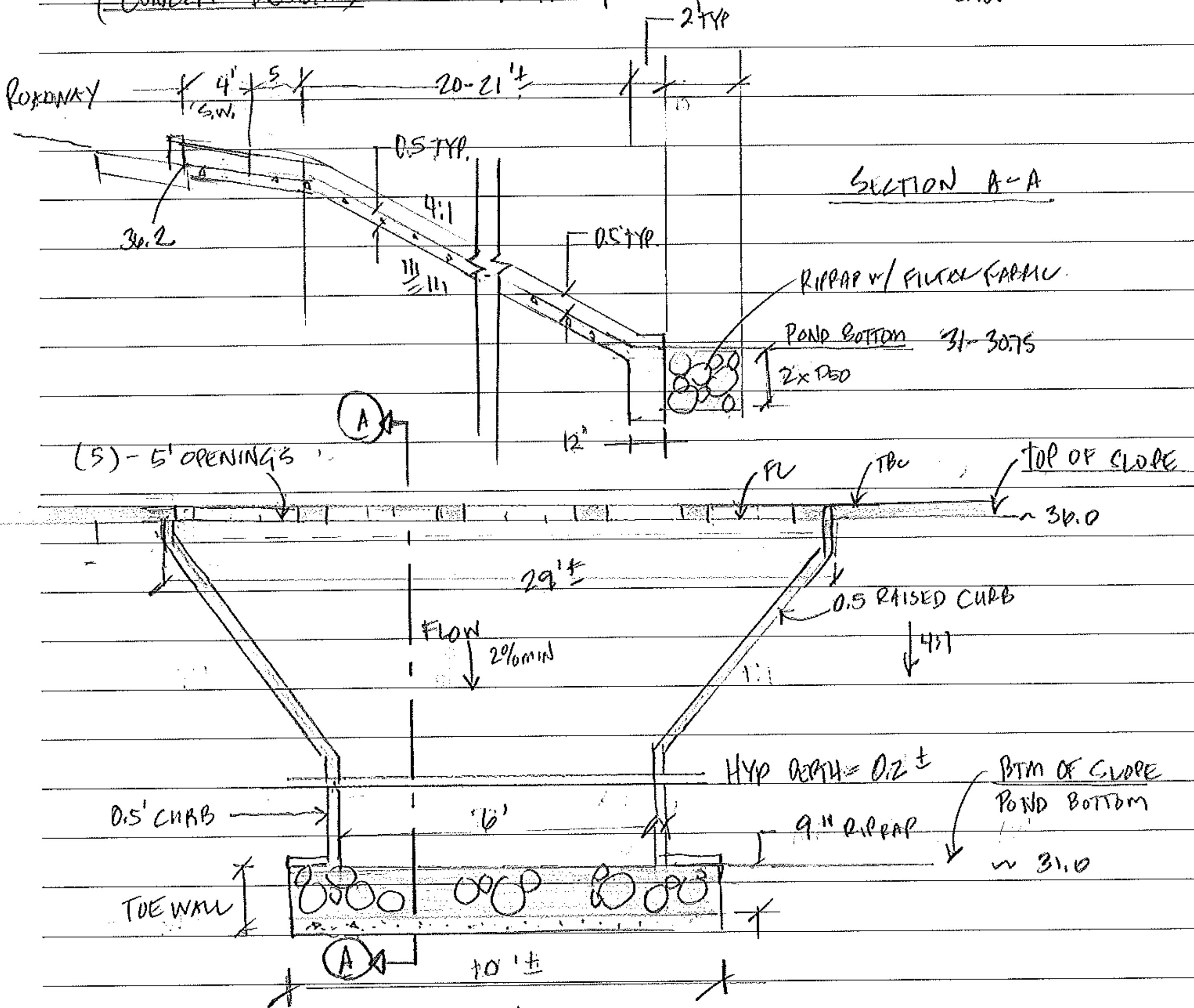
FROM: Lincoln Complex - APS DMP

TO: Proposed conditions

DATE: 9/6/11

FILE:

SUBJECT: Conc. Rundown below curb openings @DP-19 (WQ Pond #1)
(Concept Design) no sidewalk option. $Q_{100} = 18$ cfs ±



OF RUNDOWN

* NOTE: SLOPE COULD BE STEEPENED IN FINAL DESIGN TO REDUCE CONCRETE QUANTITY

NOTE: RIPRAP COULD BE SUBSTITUTED FOR CONC. IF PREFERRED.

FROM: Lincoln Complex - APS DMP

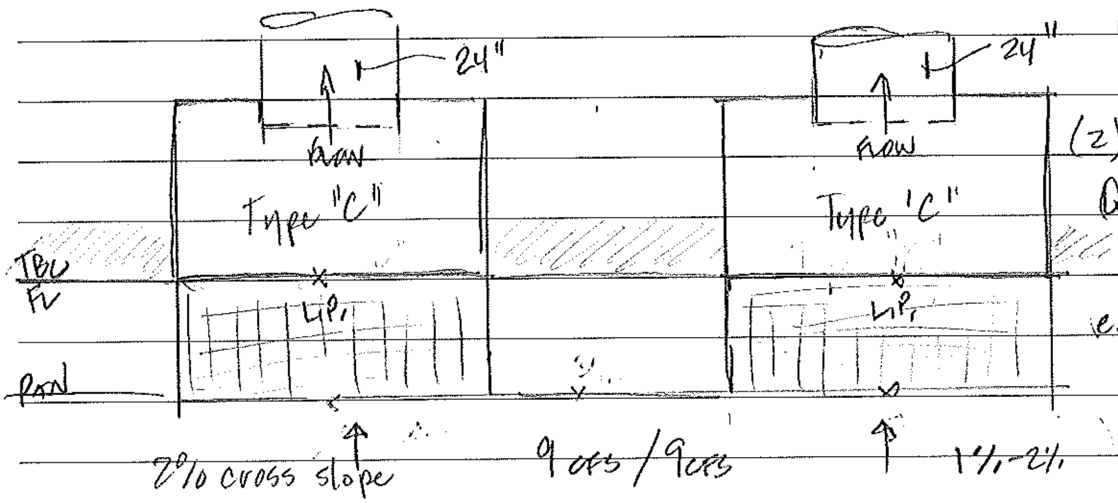
WILSON & COMPANY

DATE: 9/7/11

TO: proposed conditions

FILE:

SUBJECT: HGL Calculation for Outlets to WQ Pond # 1 (set curb el) (Inlet Option)



(2) Type C Inlets
Q_{100} = 17.2 CFS ≈ 18.0 CFS
each inlet 9 cfs

Dual Type 'C' inlets (Flowmaster Calc) Ht flow = 0.46' @ Fl. w/ 65% clogging

Head from 108" = 35.2 = top of box
req's approx 1' head to drive water into box = 35.2 + 1 = 36.2

Retaining wall will likely be needed around corner of roadway limit ht by oversizing outlet pipes.

Calc HGL back to Inlets using 24" pipe.

$V = Q/A = 9/3.14 = 2.8'/s$

$V_h = 2.8^2/64.4 = 0.12$

$f_s = (9/226.2)^2 = 0.0015 \approx 0.15\%$ length of pipes = 20' ±

$H.G.L. = 36.2 + 20(0.0015) + 1.5 \times (0.12)$

$= 36.25$ set opening @ 36.3 (FL) TBC = 37.0

limit curb to 4" on high side to limit ponding depth to 1' before overflow can occur.

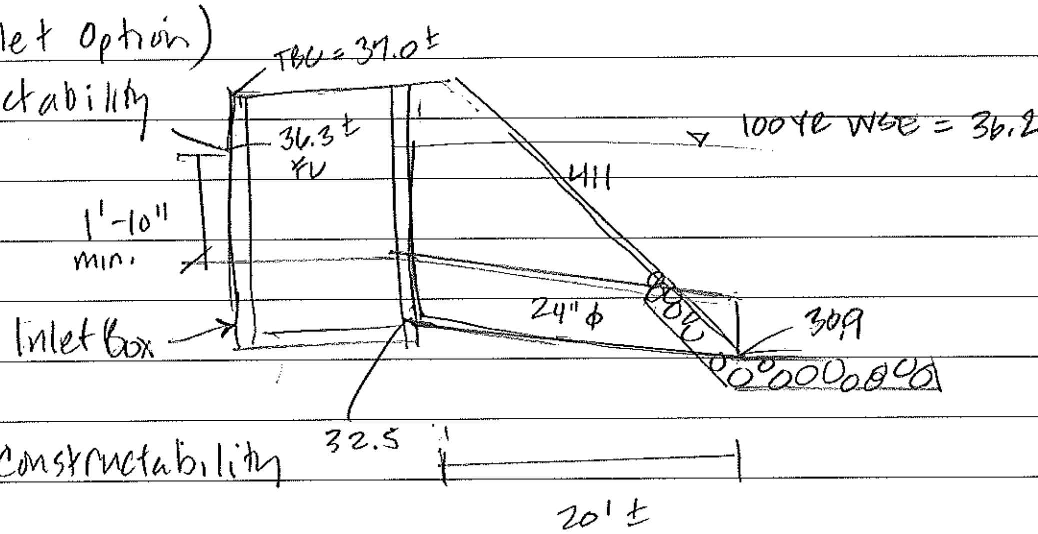
TBC on opposite side = 36.3 + 1 = 37.3

HIGHER Relationships

WILSON & COMPANY

FROM: Lincoln Complex - APS DMP
TO: proposed conditions
DATE: 9/7/11
FILE:

SUBJECT: POND # 1 - (Inlet Option)
Check Constructability



Verify inlet constructability

Pond Bottom = 30.0 +
Flow Path to L.P. = 90'±
assume pond bottom = 1%

Elev @ Pipe Outlet = 30 + 90 x 0.01 ≈ 30.9

Elev @ FV = 36.3±
Subtract min depth to pipe of 1'-10"
Min top of pipe = 34.3 - 1'-10" = 34.46
Subtract pipe dia 34.46 - 2.0 = 0.25 (WALL THICKNESS)
INVERT of 24" ϕ OUTLET = 32.21

Pipe slope max = (32.2 - 30.9) / 20' = 0.065 ≈ 6.5%

Constructable. Inlet and Curb openings approximately requ same curb ht. ≈ 0.1 either constructable

WILSON & COMPANY

FROM: Lincoln Complex - APS DMP
TO: Proposed Conditions
DATE: 9/6/11
FILE:

SUBJECT: Outlet Structure Design WQ Pond #1

Approximate Flow reaching WQ Pond #1

100 yr inflow = 78 cfs ≈ 80 cfs

Size box to accomodate 2'/s = 80 cfs / 2'/s = 40 ft^2

Box = 6' x 10' = 60 ft^2 (total gross open area)

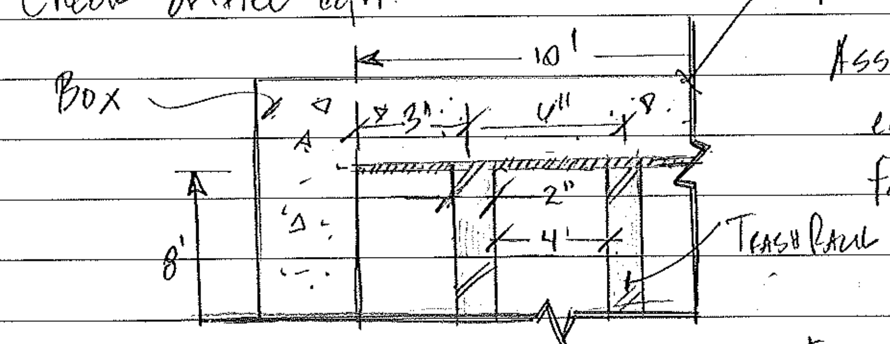
Weir eqn = $Cd \times L \times H^{3/2}$ $Cd = 3.1$

(assume 1' for each corner doesn't contribute to weir)

Length   5x2 + 9x2 = 28'

= $3.1 \times 28 \times 1^{1.5} = 86.8$ cfs ≥ 80 cfs [ok]

Check orifice eqn.



Assume 4" openspace for each 6" long dist. for trash rack opening

Eqn = $Q = Cd A \sqrt{2gh}$

10.0 ft ÷ 6" = 20 openings

each area = 0.333 x 8' = 2.66 ft^2 x 20 = 53.3 ft^2

(assume 50% clogging) = 53.3/2 = 26.7 ft^2

$0.6 \times 26.7 \sqrt{2 \cdot 32.2 \times 1.0}$ = 128 cfs ≥ 80 ok

HIGHER Relationships

WILSON & COMPANY

FROM: Lincoln Complex - APS DMP
TO: proposed conditions

DATE: 9/6/11
FILE:

SUBJECT: Determine Outlet Pipe Size from WQ Pond 1 to Exist 108" RCP & HGL Calc

Assume HGL @ crown of 108" pipe @ connection.

Pipe Inv @ Channel ≈ 23.5'±
approximate distance to pond no. 2 outlet pipe
≈ 90' ± @ 0.57 ≈ 0.51

Inv. of 108 @ connection = 23.5 + 90 x 0.57% = 24.1±
top of pipe = 100-YR HGL = 24.1 + 108"/12 = 33.1.

Assume loss @ connection based upon 108 x 48 lateral @ 75°
based upon excel spread sheet HGL @ 914 - 994 cfs
∴ HGL = 34.2
Velocity = 80 cfs/12.566 = 6.37'/s
Velocity head = $V^2/2g$ = 6.37^2/(64.4) = 0.63

S_f in 48" RCP = $(Q/k)^2$ = $(80/1436)^2$ = 0.0031 lay @ 0.5%

HGL = STARTING HGL @ crown + loss @ connection + slope pipe x length of pipe to pond + entrance loss @ structure

34.2 + (50 x 0.0031) + 1.3 (0.63) = 35.2 = top of box
= top of structure. OK (bevel entr.)

Inv of 48" @ box = 33.0 - 108.0/12/2 - 48/12/2 - 50 (0.005)
= 30.75 < 31.0 (bottom pond) OK

Min Box Dimensions = 6'W x 10'L x 6'H (4.45 pipe to top)

HIGHER Relationships

PROPOSED CONDITIONS
SOUTHWEST REGION
HYDRAULIC CALCULATIONS

WILSON
&COMPANY

Albuquerque Public Schools - Lincoln Complex Drainage Master Plan

Concept Water Quality Storage Volume Worksheet

8/29/2011

Watershed Area Reaching Proposed Water Quality Pond No. 2

Basin ID	Basin Area (ac)	Percent Impervious	Basin Impervious Area (ac)
226	1.96	100.00	1.96
227	2.96	94.00	2.78
228	0.21	30.00	0.06
Sub-total	5.13	94	4.81

Water Quality Storm Even Runoff Rate and Volume**

% Imp.	Runoff Depth (inches)	Runoff Rate (cfs/ac)	Runoff Volume (cubic feet / acre)
0.00	0.00	0.00	0
20	0.09	0.5	327
40	0.18	0.8	653
60	0.27	1.20	980
80	0.36	1.35	1037
100	0.46	1.50	1670

Interpolation of 94% yields Runoff Volume of	1480
SWQV (cf)	7593
SWQV (ac-ft)	0.17
20% Increase for Sediment Storage	
SWQV Plus 20% Sediment Storage (cf)	9491
SWQV Plus 20% Sediment Storage (ac-ft)	0.22

** Table taken from Alb. DC Chapter 22, page 109 Table 2

Albuquerque Public Schools - Lincoln Complex
DRAINAGE MASTER PLAN
(Pond Volume Calculation)

Proposed WQ Pond 2

			Storage	
Elevation	SF	CF	AF	Sum
5026.5	0.00			0
5027	3,261.00	815.25	0.02	0.02
5028	4,269.00	3,765.00	0.09	0.11
5029	5,378.00	4,823.50	0.11	0.22
5030	6,587.00	5,982.50	0.14	0.35

Total = 15,386 CF

Total = 0.35 Ac-ft

At Elevation 5029, the Storage is 0.22 Ac-ft.

Note: Pond bottom and outlet works would need lowered by 1' (25.5.)
if inlets are constructed in lieu of curb openings

Calculated by: DLM
Date: 9/5/2011
Checked by: ______

FROM: Lincoln Complex - APS DMP
TO: proposed Conditions

WILSON &COMPANY

DATE: 9/7/11

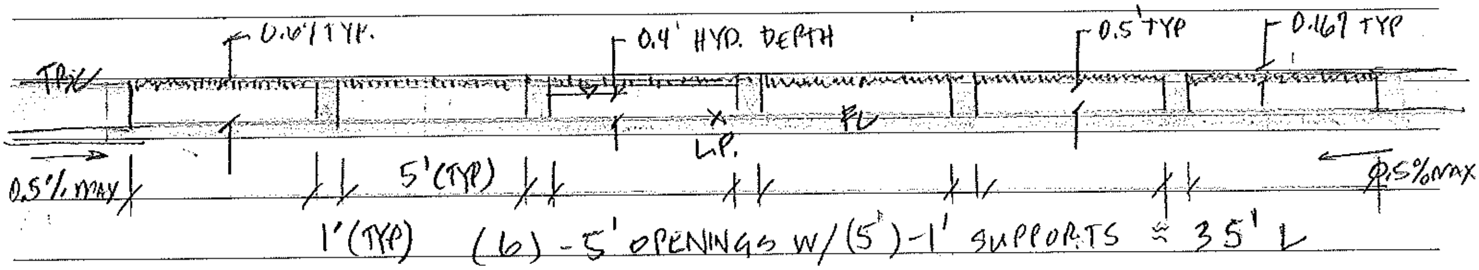
FILE:

SUBJECT: Determine length of Weir Openings in Curb to Convey 100-YR flow to WQ Pond #2 w/ Sidewalk @ DP-21

Q_{100} = 22 cfs Assume max ponding depth = 0.4'
to allow for slope away from low-point (0.1')
thickness of grate (0.167)

Weir formula = $Q = C_H L H^{1.5}$
$22 = 3.1 (L) 0.4^{1.5}$
$L = 28.05'$

Provide 30' total opening
$22 = 3.1 (30)(H)^{1.5}$ $H = 0.38' \le 0.4$ OK



SECTION VIEW

Place curb opening = 100 yr WSE ≈ 36.0
limit curb on opposite side of street to 4"
to limit max ponding depth to 1' before over top.
TBC on opposite side ≈ 37.0

WILSON & COMPANY

FROM: Lincoln Complex - APS DMP

TO:

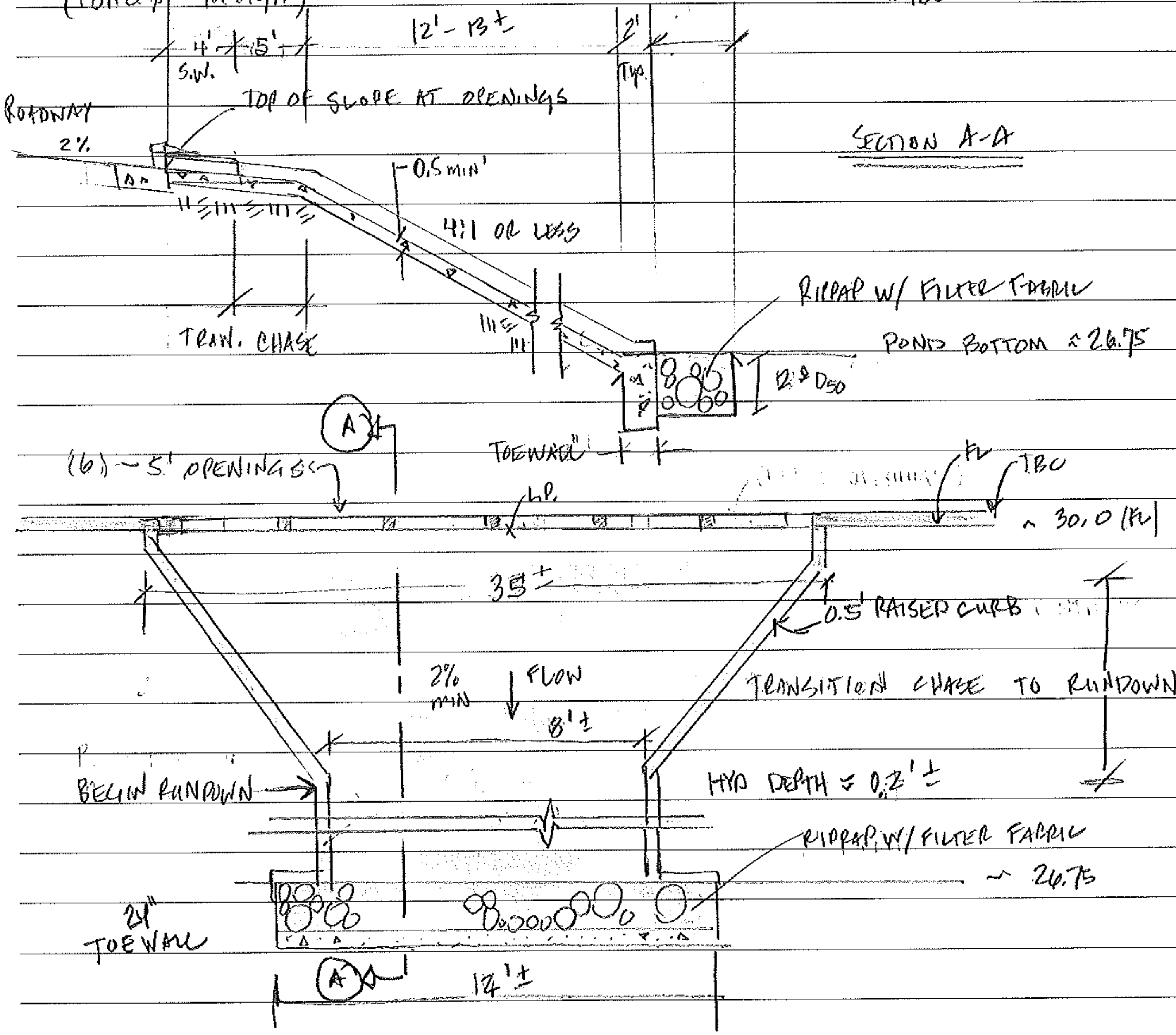
DATE: 9/6/11

FILE:

SUBJECT: Conc. Rundown below curb openings @ DP-21

(Concept Design)

Q_{100} = 22 cfs ±



NOTE: SLOPE COULD BE STEEPENED IN FINAL DESIGN TO REDUCE CONCRETE QUANTITY.

NOTE: RIPRAP COULD ALSO BE UTILIZE FOR RUNDOWN IN LIEU OF CONCRETE.

NOTE: FINAL DESIGN DIMENSIONS LIKELY TO VARY.

WILSON & COMPANY

FROM: Lincoln Complex - APS DMP

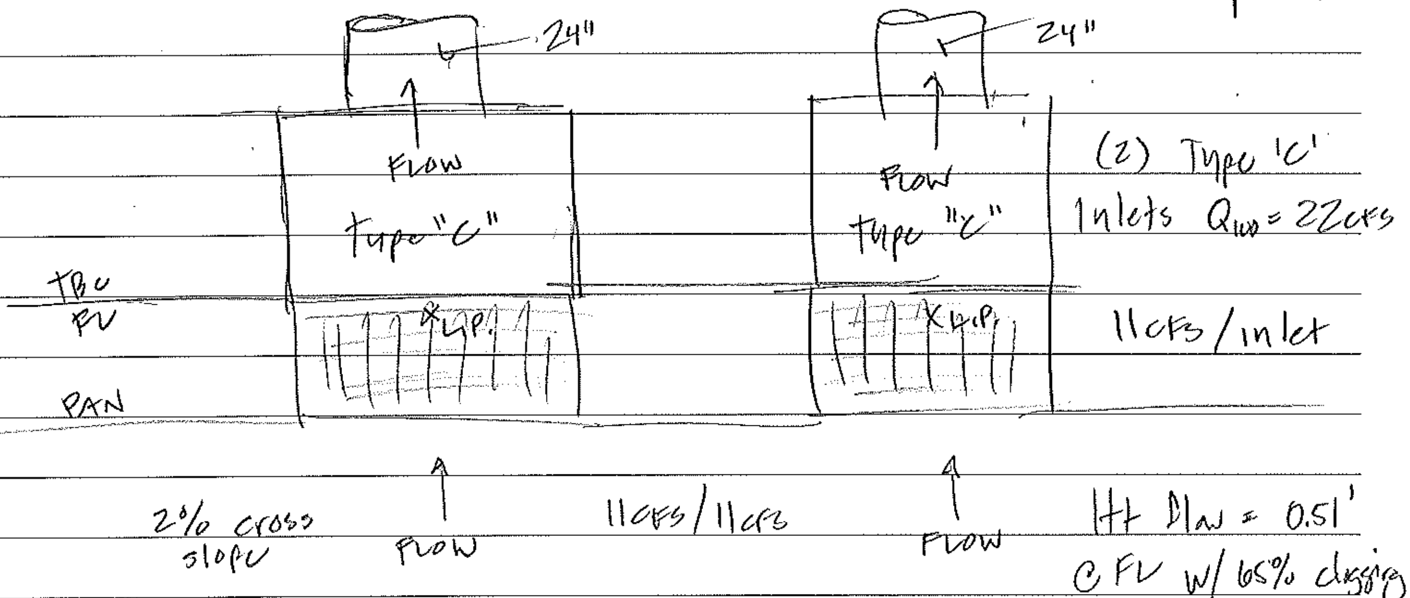
TO: proposed conditions

DATE: 9/7/11

FILE:

SUBJECT: HGL Calculation for Outlet @ WQ Pond #2

(inlet option)



Determine FL elev. based upon using inlets

Calc HGL back to Inlets using 24" pipe

$V = Q/A = 11/3.14 = 3.5$ ft/s

$V_h = 3.5^2/64.4 = 0.19$

$S_f = (11/226.2)^2 = 0.0024$ ∴ length of pipe = 20'±

H.G.L per Ahymo calcs = 29.7

HGL = 29.7 + 20(0.0024) + 1.5(.19) = 30.03 ≈ FL

OK

FROM: Lincoln Complex - APS DMP

TO: proposed conditions

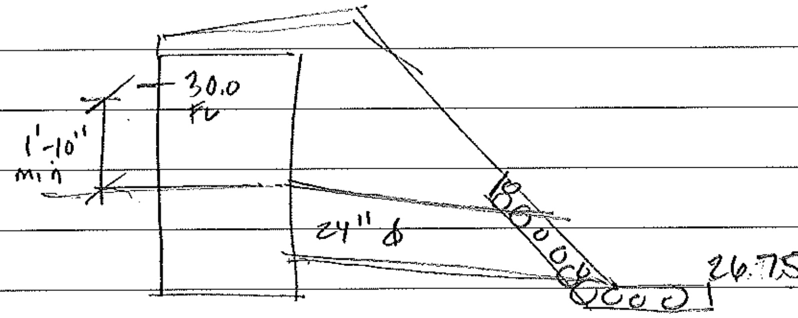
WILSON &COMPANY

DATE: 9/7/11

FILE:

SUBJECT: Pond #2 - (Inlet Option)

Check constructability



Verify Inlet constructability

Pond bottom = 26.5

Flow path to L.P. = 50'

assume pond bottom = 0.5%

Elev @ Pipe Outlet = 26.5 + 50 × 0.005 = 26.75

El @ FL = 30.0 ±

Subtract min depth to pipe of 1'-10"

Min top of pipe = 30.0 - 1.83 = 28.17

subtract pipe dia + wt = 28.17 - 2 - 0.25 = 25.92 = inv.

lay pipe @ 0.5% = 20' × 0.005 = 0.1

Outlet el = 25.92 - 0.1 = 25.82 · Outlet end of 24"

IF inlets are used pond needs to be lowered

lower pond = 26.75 - 25.82 ≈ 0.93 approx 1'

∴ iontfall

FROM: Lincoln Complex - APS DMP
TO: proposed conditions

WILSON & COMPANY

DATE: 9/7/11
FILE:

SUBJECT: Outlet Structure Design - WQ Pond #2

Approx 100 yr Flow to reach pond #2
100yr INFLOW = 21.2 CFS ≈ 22 CFS

Size box to accomidate 2'/s = 22 cfs / 2'/s = 11 ft^2

Box = 4' x 6' = 24 ft^2

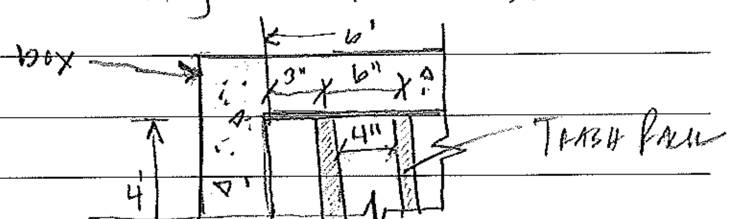
Weir eqn = $Cd \times L \times H^{3/2}$ Cd = 3.1
(assume 1' for each corner doesn't contribute to weir flow)

Length = 3×2 + 5×2 = 16'

$3.1(16) \times 1.0^{1.5} = 49.4$ CFS ≥ 22 CFS OK

Check orifice eqn using 50% clogging

Assume 4" open space for each 6" long dist for trash rack opening



6' ft ÷ 6" = 12 openings

each area = 0.33 x 4' = 1.33 ft^2 x 12 = 15.98 ft^2
(50% clogging) = 15.98 / 2 = 8 ft^2

$0.6 \times 8 \sqrt{2 \cdot 32.2 \cdot 1.0} = 38.5$ CFS ≥ 22 CFS OK

HIGHER Relationships

WILSON & COMPANY

FROM: Lincoln Complex APS DMP

TO: proposed condition

DATE: 9/7/11

FILE:

SUBJECT: Outlet Structure Design - WQ Pond #3 (Cont)

Pond Req's Detention

Orifice Eqn. - 18" φ openings $Q = C_d A \sqrt{2gh}$

Area = 1.767 sf $C_d = 0.6$

	H (ft)	Qout (cfs)	fs of 18" (%)	
(26.0)	Centroid of Area	0	0.0	
	1.0	8.5	0.65	
	2.0	12.0	1.31	
	3.0	14.7	1.96	
(30.0)	4.0	17.0	2.62	← TOP OF POND
	5.0	19.0	3.27	
	6.0	20.84	3.92	

18" pipe would be an excellent choice for discharge pipe from proposed WQ pond, or at least that approximate equivalent area, in form of plate

use larger pipe to reduce friction slope & HGL.

24" pipe @ 20 cfs = fs = 0.78%

22cfs = fs = 0.95%

→ Use 24" pipe or equivalent elliptical pipe w/ 18" circular orifice opening.

HIGHER *Relationships*

FROM: Lincoln Complex - APS DMP
TO: proposed conditions

WILSON &COMPANY

DATE: 9/7/11
FILE:

SUBJECT: Outlet Structure Design - WQ Pond #2 (cont)

Calculate HGL to determine free release from outlet structure.

Elev @ Outlet = 24.7 @ Headwall above existing RUNDOWN

HGL = starting HGL @ crown + minor bend loss + slope pipe x length (assuming > f_3) + entrance loss. (orifice eqn)
(may be needed.)

Q_{100} = 22 CFS (INLET RATE)
Using 24" pipe
Q_{100} = 17 CFS (OUTLET RATE)

$V = 17/3.142 = 5.41$ $V_h = 5.41^2/64.4 = 0.45'$
$f_3 = [17/(226.2)]^2 = 0.0056$
$V_{h,18} = [17/1.767]^2/64.4 = 1.43$

Use 1% for pipe slope. Approx length to outlet structure = 75' ±

Crown @ Outlet = 24.7 + 2 = 26.7

HGL = 26.7 + 0.35(0.45) + 75'(0.056) = 26.76.
= Elev of Top of 18" open if 18"/24 inv = 25.25
set pipe slope @ 0.75%

Orifice should function as previously developed

Restrict flow using orifice plate to 17 CFS using 18" equivalent area. with centroid @ 26.0

HIGHER Relationships

FROM: Lincoln Complex - ADS DMP
TO: Proposed Conditions

WILSON & COMPANY

DATE: 9/7/11
FILE:

SUBJECT: WQ Pond # 2 - Discharge/Storage Curve for Ahymo

Outlet = 25.25 Fl of Curb 30.5
Centroid of Area = 26.0 Top of Curb 31.0
Top of Box = 29.0 (Assumed Flat)
Top of Pond = 30.0 (30.5 if inlets are used)

L = 28'

Elev	Storage (ac-ft)	Ht above orifice centroid / box (ft)	Q orifice	Q weir	Gov
29.0	0.22 - 0.22 = 0.0	0 / 0	0	0	0
29.25	0.25 - 0.22 = 0.03	3.25/0.25	15.34	6.2	6.2
29.5	0.28 - 0.22 = 0.06	3.50/0.5	15.91	17.5	15.9
29.75	0.32 - 0.22 = 0.1	3.75/0.75	16.48	32.2	16.5
30.0	0.35 - 0.22 = 0.13	4.0/1.0	17.0	49.	17.0

RAN AHYMO MODEL PEAK DISCHARGE = 16.35 CFS
AT ELEV 29.7 ±

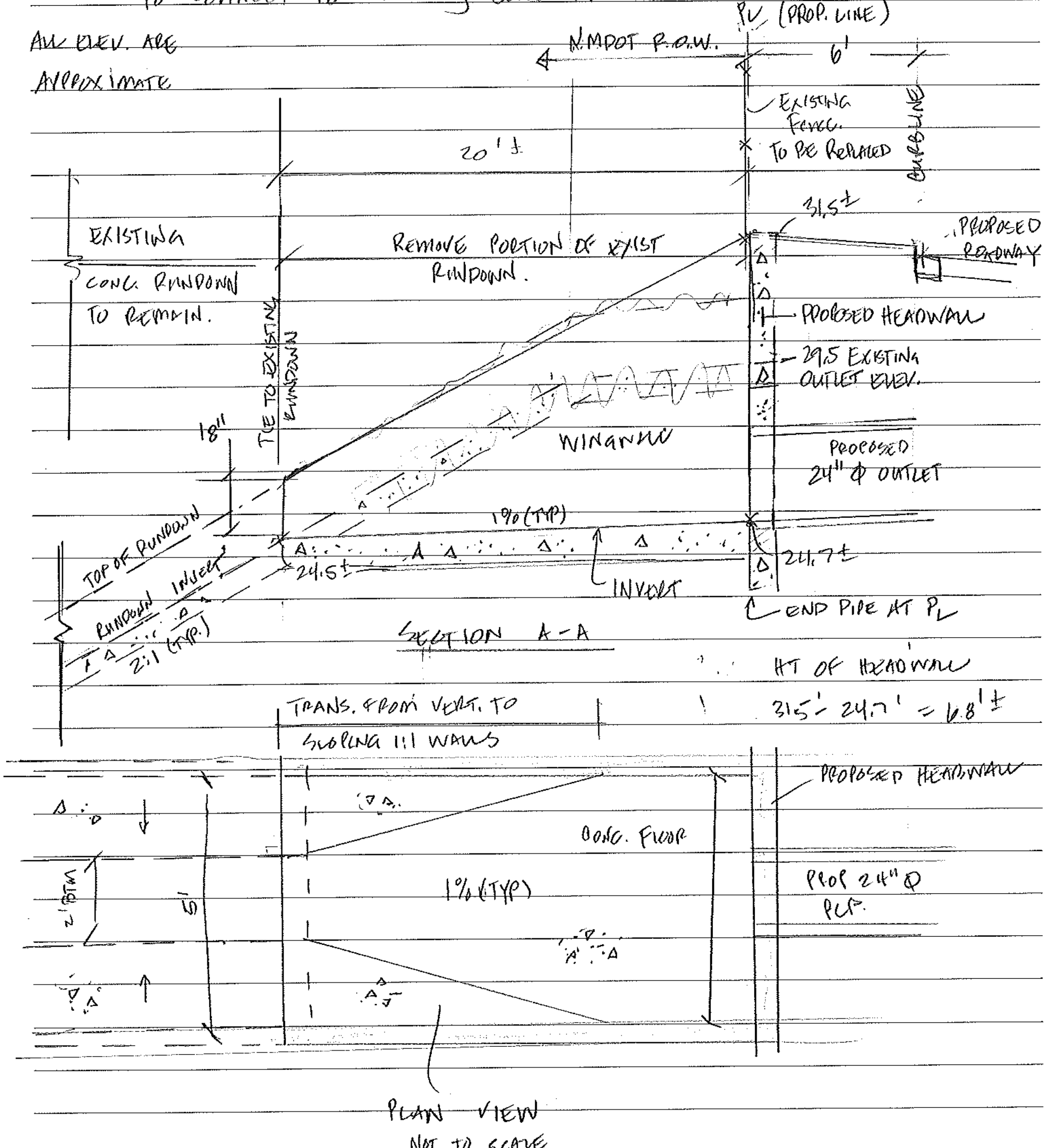
PROVIDES 0.5' BETWEEN CURB OPENINGS AND 100 YR WSE.
OK

AT FLOW RATE LESS THAN ORIGINAL MAX. WEIR CAPACITY OF 18.9 CFS OK

WILSON & COMPANY

FROM: Lincoln Complex - APS DMP
TO: proposed conditions
DATE: 9/17/11
FILE:

SUBJECT: Headwall / Outlet Structure adjacent to WQ Pond #2 @ DP-23 to connect to existing conc. rundown



Note: Elevations shown on page would need to be decreased by 1.0' if Inlet Option utilized.

Albuquerque Public Schools - Lincoln Complex Drainage Master Plan

Concept Water Quality Storage Volume Worksheet

8/29/2011

Watershed Area Reaching Proposed Water Quality Pond No. 3

Basin ID	Basin Area (ac)	Percent Impervious	Basin Impervious Area (ac)
229	1.58	98.00	1.55
230	1.27	82.00	1.04
231	0.25	30.00	0.08
Sub-total	3.10	86	2.66

Water Quality Storm Even Runoff Rate and Volume**

% Imp.	Runoff Depth (inches)	Runoff Rate (cfs/ac)	Runoff Volume (cubic feet / acre)
0.00	0.00	0.00	0
20	0.09	0.5	327
40	0.18	0.8	653
60	0.27	1.20	980
80	0.36	1.35	1037
100	0.46	1.50	1670

Interpolation of 86% yields Runoff Volume of	1226
SWQV (cf)	3801
SWQV (ac-ft)	0.09
20% Increase for Sediment Storage	
SWQV Plus 20% Sediment Storage (cf)	4751
SWQV Plus 20% Sediment Storage (ac-ft)	0.11

** Table taken from Alb. DC Chapter 22, page 109 Table 2

Albuquerque Public Schools - Lincoln Complex
DRAINAGE MASTER PLAN
(Pond Volume Calculation)

Proposed WQ Pond 3

			Storage	
Elevation	SF	CF	AF	Sum
5026	0.00			0
5027	3,174.00	1,587.00	0.04	0.04
5028	5,680.00	4,427.00	0.10	0.14
5029	7,282.00	6,481.00	0.15	0.29

Total = 12,495 CF

Total = 0.29 Ac-ft

At Elevation 5027.7, the Storage is 0.11 Ac-ft.

Calculated by: DLM

Date: 9/5/2011

Checked by: ____________

WILSON & COMPANY

FROM: Lincoln Complex - APS DMP
TO: proposed conditions
DATE: 9/7/11
FILE:

SUBJECT: Determine length of Weir Opening in curb to convey 100-yr Flow to WQ Pond #3 w/ sidewalk @ DP-24

Q_{100} = 12cfs Assume maximum ponding depth = 0.5'

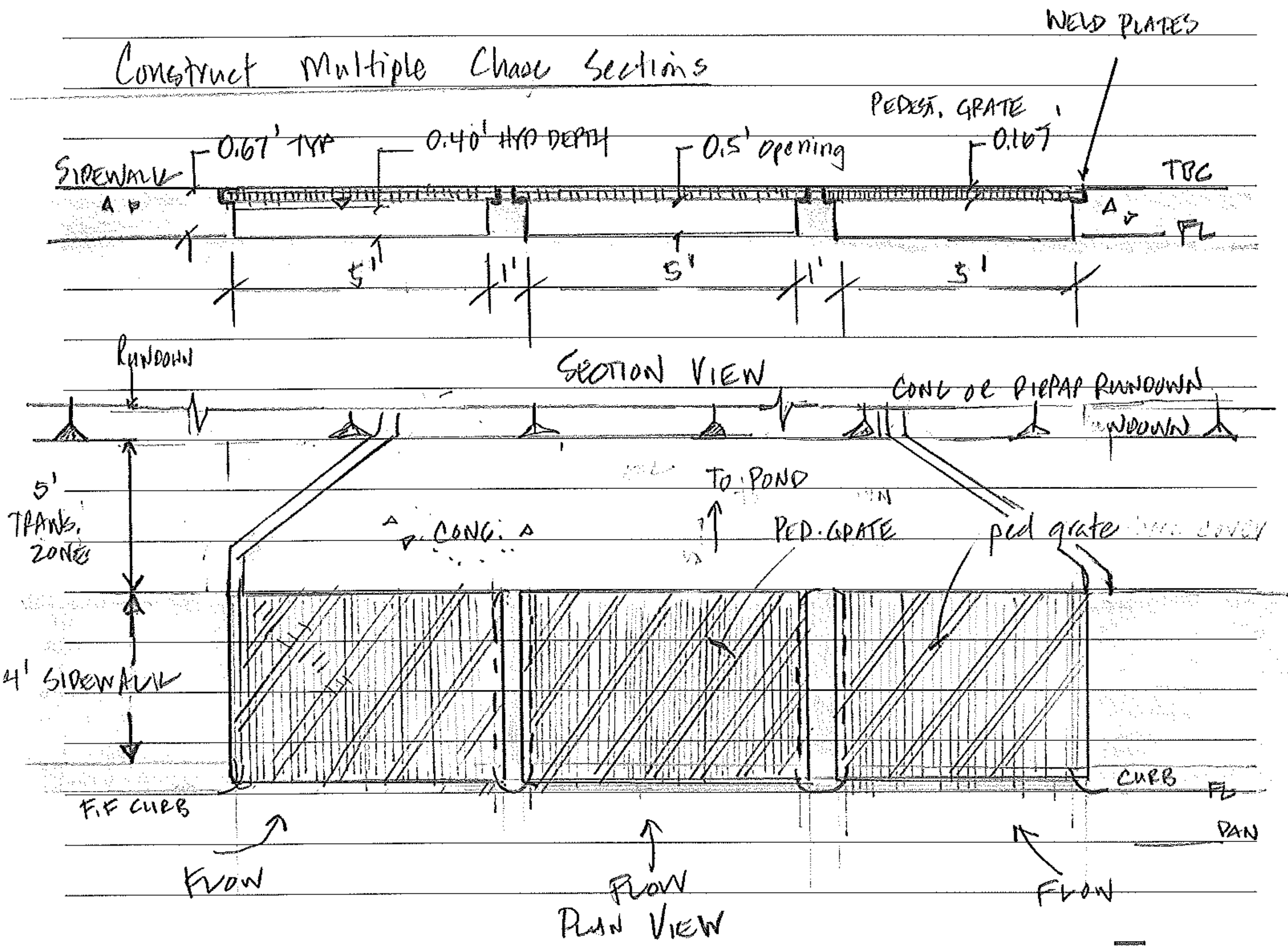
Weir Formula = $Q = C_W L D^{1.5}$

$12 = 3.1 (L)(0.5')^{1.5}$

$L = 10.9'$ FL = 100 WSE + 0.2'

Use 15' $12 = 3.1(15)(H)^{1.5}$ $H = 0.4'$

Construct Multiple Chase Sections



HIGHER Relationships

WILSON & COMPANY

FROM: Lincoln Complex - APS DMP

TO: proposed conditions

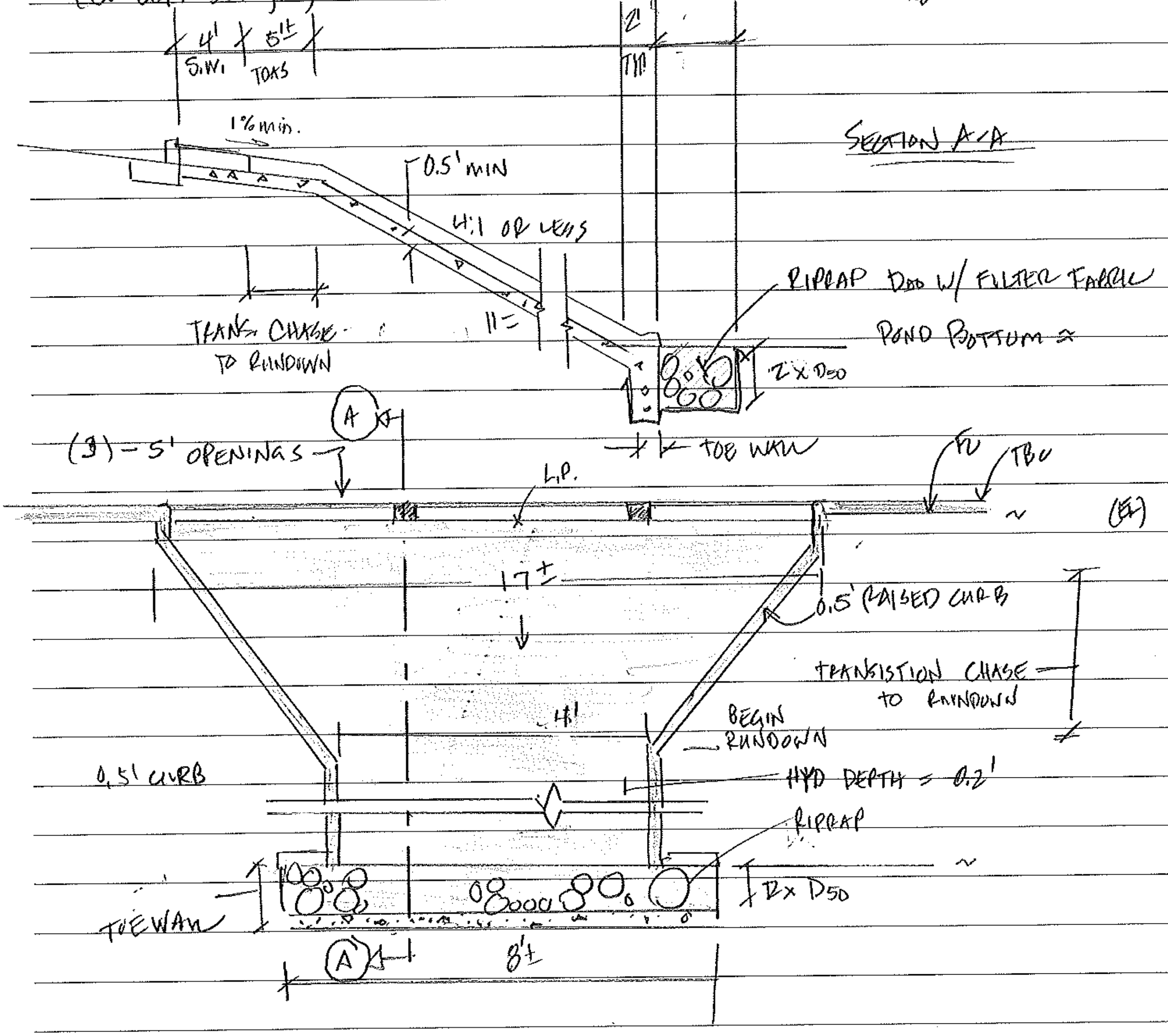
DATE: 9/6/11

FILE:

SUBJECT: HGL Calculation for Outlets to WQ Pond #3 @ DP-24

(Concept Design)

$Q_{100} = 12$ cfs ±



NOTE: SLOPE COULD BE STEEPENED IN FINAL DESIGN TO REDUCE CONCRETE QUANTITY

NOTE: RIPRAP COULD BE USED IN LIEU OF CONCRETE IN FOR RUNDOWN.

NOTE: ACTUAL FINAL DESIGN DIMENSIONS LIKELY TO VARY.

FROM: Lincoln Complex - APS DMP
TO: proposed conditions

WILSON &COMPANY

DATE: 9/7/11
FILE:

SUBJECT: Outlet Structure Design - WQ Pond #3

Approximate Flow Reaching Pond #3
100YR INFLOW = 12 cfs

Size box to accomidate 2'/s = 12cfs / 2'/s = 6 ft²

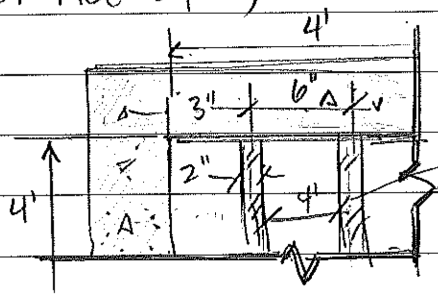
Box = 4' x 4' = 16 ft² (total gross open area)

Weir eqn = Cd x L x H^3/2 = Cd = 3.1
(assume 1' for each corner doesn't contribute to weir)

Length (L) = 3x2 + 3x2 = 12'

= 3.1 x 12 x 0.5^1.5 = 13.15 cfs ≥ 12 cfs
= 3.1 x 12 x 1.0^1.5 = 37.2 cfs ≥ 12 cfs

(Check orifice eqn)



Assume 4" openspace for each 6" long dist. for trash rack openings

Eqn - Q Cd A √2gh

4' ft ÷ 6" = 8 opening

each area = 0.333 x 4' = 1.32 ft² x 8 = 10.56 ft²
(assume 50% clogging) 10.56/2 = 5.3 ft

Q = 0.6 (5.3) √(2·32.2·0.5) = 18.1 cfs > 12cfs OK

HIGHER Relationships

FROM: Lincoln Complex - APS DMP
TO: proposed Conditions

WILSON &COMPANY

DATE: 9/7/11
FILE:

SUBJECT: Outlet Structure Design - WQ Pond #4 (cont)

Determine elev of discharge to allow for free release from structure

Orifice opening = 26.0 - 0.5 = 25.5 inv @ box
=

Using 18" pipe Q = 6.5 cfs ± $V_{18} = 6.5/1.767 = 3.67$
$V_h = (3.67)^2/64.4 = 0.21'$
$f_s = (6.5/1051)^2 = 0.53\%$

$V_{12} = 6.5/0.785 = 4.34$

Assume bend may be req'd for pipe system, verify
Expansion loss from 12" opening to 18" opening is minor

$$\Delta h = \frac{1}{g}\frac{A_1}{A_2}\left(1-\frac{A_1}{A_2}\right)V_1^2 \qquad \frac{1}{32.2}\left(\frac{1}{1.5}\right)\left(1-\frac{1}{1.5}\right)4.34 = \underline{0.03'}$$

bend loss = 0.35 (0.21) = 0.07 ≈ .10'
pipe slope ≥ f_s ≈ 0.75% length = 70' = 0.53'

Total Losses = 0.03 + 0.1 + 0.53 = 0.66 ≈ 0.7'

inv @ Outlet = 25.5 - 0.7 = 24.8'

Orifice should function as previously discribed

Restrict 18" using 12" ϕ orifice plate w/ centroid @ 26.0, inv. pipes = 25.5

HIGHER Relationships

FROM: Lincoln Complex - APS DMP

WILSON & COMPANY

DATE: 9/7/11

TO: Proposed Condition

FILE:

SUBJECT: Outlet Structure Design - WQ Pond #3 (Cont)

Limit discharge to historic ≈ 8.6 cfs or less

Orifice Eqn - 12" ⌀ opening $Q = C_d A \sqrt{2gh}$

Area = 0.785 sf $C_d = 0.6$

$(Q/K)^2 = f_3$

K = 35.7

H (ft)	Q_{ORF} (cfs)	f_3 of 12" (%)	
(26.0) centroid of Area		0.0	
1.0	3.8 cfs	1.13	
2.0	5.4 cfs	2.28	
3.0	6.5 cfs	3.3%	← TOP OF POND
4.0	7.6	4.5%	

12" would be excellent area to meet discharge req'ments however 18" pipe would be better for conveyence by reducing req'd pipe slope to meet friction slope

18" K = 105.1

18" pipe @ 6.5 cfs = f_3 = 0.53%

→ Use 18" pipe w/ 12" equivalent opening.

HIGHER Relationships

FROM: Lincoln Complex - APS DMP
TO: proposed conditions

WILSON & COMPANY

DATE: 9/7/11
FILE:

SUBJECT: WQ Pond #3 Discharge / Storage Curve for Ahymo

Outlet = 25.5
Centroid of plate = 26.0
Top of Box = 5028
Top of Pond = 5029

Fl of Curb = 29.0
Top of Curb = 29.5
Curb Ht @ Outlet = 30.0'
Fl Ht @ Outlet = 29.7'

L=12'

Elev.	Storage (ac-ft)	Ht above orifice Centroid (ft) / weir	Q orifice cfs	Qweir cfs	Qgov. cfs
28.0	0.14 - 0.14	0 / 0	0	0	0
28.25	0.18 - 0.14 = 0.04	2.25 / 0.25	5.7	4.7	4.7
28.50	0.21 - 0.14 = 0.07	2.50 / 0.5	6.0	13.2	6.0
28.75	0.25 - 0.14 = 0.11	2.75 / 0.75	6.3	24.2	6.3
29.0	0.29 - 0.14 = 0.15	3.0 / 1.0	6.5	37.2	6.5

RAW AHYMO MODEL → PEAK DISCHARGE = 6.35 cfs
AT ELEV = 28.8

PROVIDES 0.2' FREEBOARD BETWEEN FL CURB & 100 WSE
OK

AT FLOW RATE LESS THAN HISTORIC
OK

WILSON & COMPANY

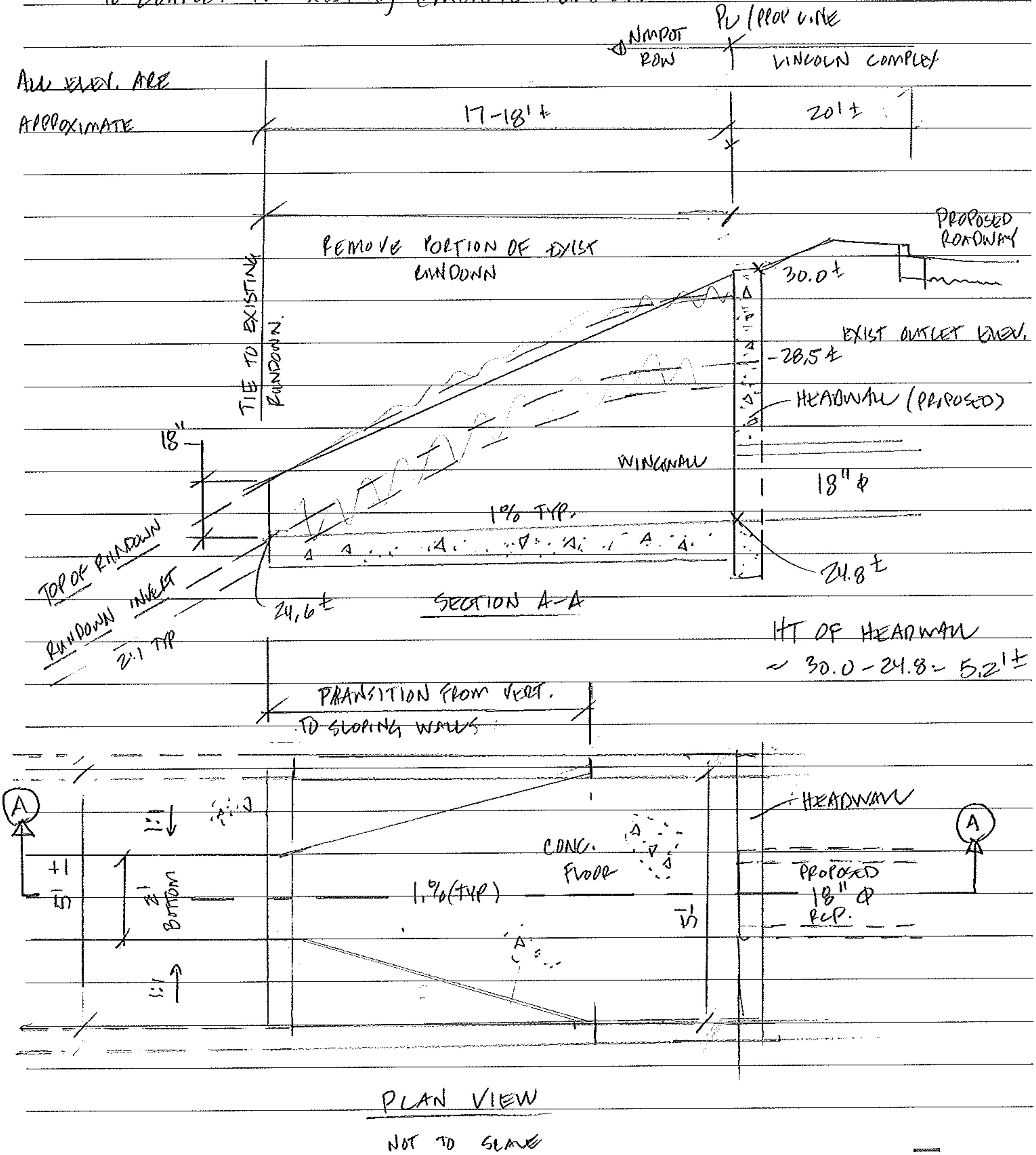
FROM: Lincoln Complex - APS DMP

TO: proposed conditions

DATE: 9/7/11

FILE:

SUBJECT: Headwall / Outlet Structure adjacent to WQ Pond #3 @ DP-26 to connect to existing concrete rundown



PROPOSED CONDITIONS
NORTHWEST REGION
HYDRAULIC CALCULATIONS

WILSON
&COMPANY

Albuquerque Public Schools - Lincoln Complex Drainage Master Plan

Concept Water Quality Storage Volume Worksheet

8/29/2011

Watershed Area Reaching Proposed Water Quality Pond No. 4

Basin ID	Basin Area (ac)	Percent Impervious	Basin Impervious Area (ac)	% Imp.
233	0.98	96.00	0.94	
234	1.57	98.00	1.54	
235	0.17	30.00	0.05	
Sub-total	2.72	93	2.53	

Water Quality Storm Even Runoff Rate and Volume**

% Imp.	Runoff Depth (inches)	Runoff Rate (cfs/ac)	Runoff Volume (cubic feet / acre)
0.00	0.00	0.00	0
20	0.09	0.5	327
40	0.18	0.8	653
60	0.27	1.20	980
80	0.36	1.35	1037
100	0.46	1.50	1670

Interpolation of 93% yields Runoff Volume of	1448
SWQV (cf)	3941
SWQV (ac-ft)	0.09
20% Increase for Sediment Storage	
SWQV Plus 20% Sediment Storage (cf)	4729
SWQV Plus 20% Sediment Storage (ac-ft)	0.11

** Table taken from Alb. DC Chapter 22, page 109 Table 2

Albuquerque Public Schools - Lincoln Complex
DRAINAGE MASTER PLAN
(Pond Volume Calculation)

Proposed WQ Pond 4

			Storage	
Elevation	SF	CF	AF	Sum
5031	0.00			0
5032	1,208.00	604.00	0.01	0.01
5033	1,972.00	1,590.00	0.04	0.05
5034	2,838.00	2,405.00	0.06	0.11
5035	3,787.00	3,312.50	0.08	0.18

Total = 7,912 CF

Total = 0.18 Ac-ft

At Elevation 5034, the Storage is 0.11 Ac-ft.

Calculated by: DLM

Date: 9/5/2011

Checked by: ____________

WILSON & COMPANY

FROM: Lincoln Complex - APS
TO: proposed conditions
DATE: 9/7/11
FILE:

SUBJECT: Outlet Structure Design WQ Pond #4

Approx Flow Reaching Pond #4
100 YR INFLOW = 11.4 cfs ≈ 12 cfs

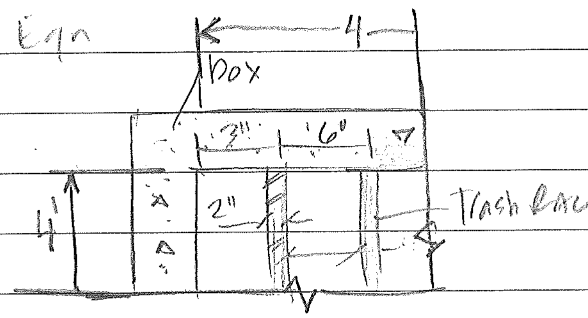
Size box to accomodate 2'/s = 12 cfs / 2'/s = 6 ft

Box = 4'x4' = 16 ft² (total gross open area)

Weir Eqn = Cd x L x $H^{3/2}$ = Cd = 3.1
(assume 1' for each corner doesn't contribute to weir)

Length = (L) = 3x2 + 3x2 = 12'
Q = 3.1 x 12 x 0.5 = 13.2 ≥ 12 cfs
= 3.1 x 12 x 1.0 = 37.2 cfs ≥ 12 cfs

Check Orifice Eqn



Assume 4" open space for every 6" long dist. for trash rack opening

Eqn = Q = Cd A $\sqrt{2gh}$

4 ft ÷ 6" = 8 opening

each area = 0.333 x 4' = 1.32 ft² x 8 = 10.56 ft²
(assume 50% clogging 10.56/2 = 5.3 ft²

Q = 0.6 (5.3) $\sqrt{2 \cdot 32.2 \cdot 0.5}$ = 18.1 cfs ≥ 12 cfs OK

HIGHER Relationships

WILSON & COMPANY

FROM: Lincoln Complex - APS DMP

TO: Proposed conditions

DATE: 9/7/11

FILE:

SUBJECT: WQ Pond #4 (Spillway / Concept Surface Interception)

Per Ahymo Analysis (DP-24) Existing Downstream Discharge = 14.0 cfs

(DP-28) Proposed Downstream Dischage = 14.0 cfs

no detention req'd at this location based upon master plan development assumptions.

Top of Box = 5034.0 = WQCV = 0.11 AC FT (Assumed Flat)

100' YR. WSE = 5034.5

provide spillway. (drain flows back out thru) parking lot and into street.

Oversize interception chases along south side of structure to allow for over flow back to street and away from retaining wall. which will be placed along west, and north sides of pond. and likely around portion of entrance. Provide adequate F.B.

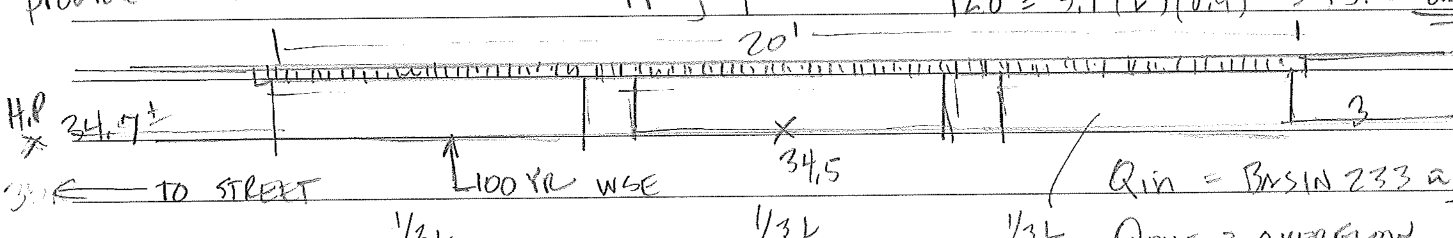
Q_{100} = 14.0   Assume ponding depth = 0.4' above 100 YR WSE

elev. = 5034.9

Weir opening @ South

provide 1' of F.B. above Overtopping pt.

$12.0 = 3.1 (L)(0.4)^{1.5} = 15.'3$ Use 18'



Qin = BASIN 233 ≈ 4.5 cfs

Qout = OVERFLOW SPILLWAY = 14.0 cfs

Set top of pond @ 36.0

NOTE ADDITIONAL RUNDOWN / CURB OPENING WILL BE NEEDED @ N.E CORNER OF POND FOR BASIN 234.

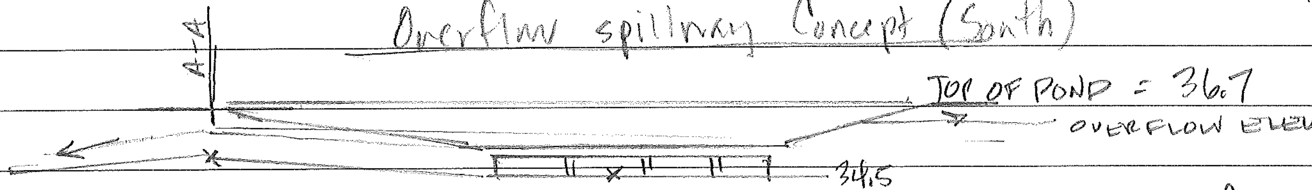
HIGHER Relationships

WILSON & COMPANY

FROM: Lincoln Complex APS DMP
TO: proposed conditions
DATE: 9/7/11
FILE:

SUBJECT: WQ Pond #4

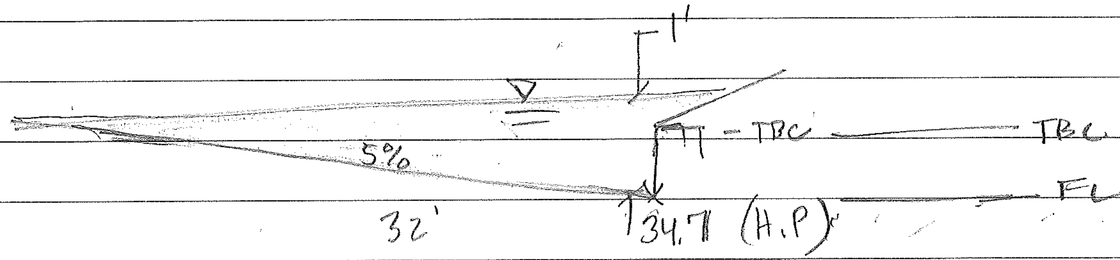
Overflow spillway Concept (South)



H.P. = 34.7 (needs to only be high enough to direct flow from basin

Create weir @ H.P. to pass

MAX Retaining wall ht around pond sidewalk



Assume Parking Lot Grade @ H.P. ← Road ≈ 5% 0.67 / 0.05 = 13.4

SECTION A-A

ASSUME 0.8' HT / AVG. WEIR HT = 0.4'

0.8'/0.05 = 16' = L $Q = 3.1(16)(0.4)^{1.5}$

$= 12.5$ CFS > 12 CFS

SET 2' HIGHER THAN FL ELEV ∴ 34.7 + 2 = 36.7 TOP OF POND.

Maximum Retaining Wall Ht = 30.5 - 36.7 = 6.2'

HIGHER Relationships

WILSON & COMPANY

FROM: Lincoln Complex - APS DMP

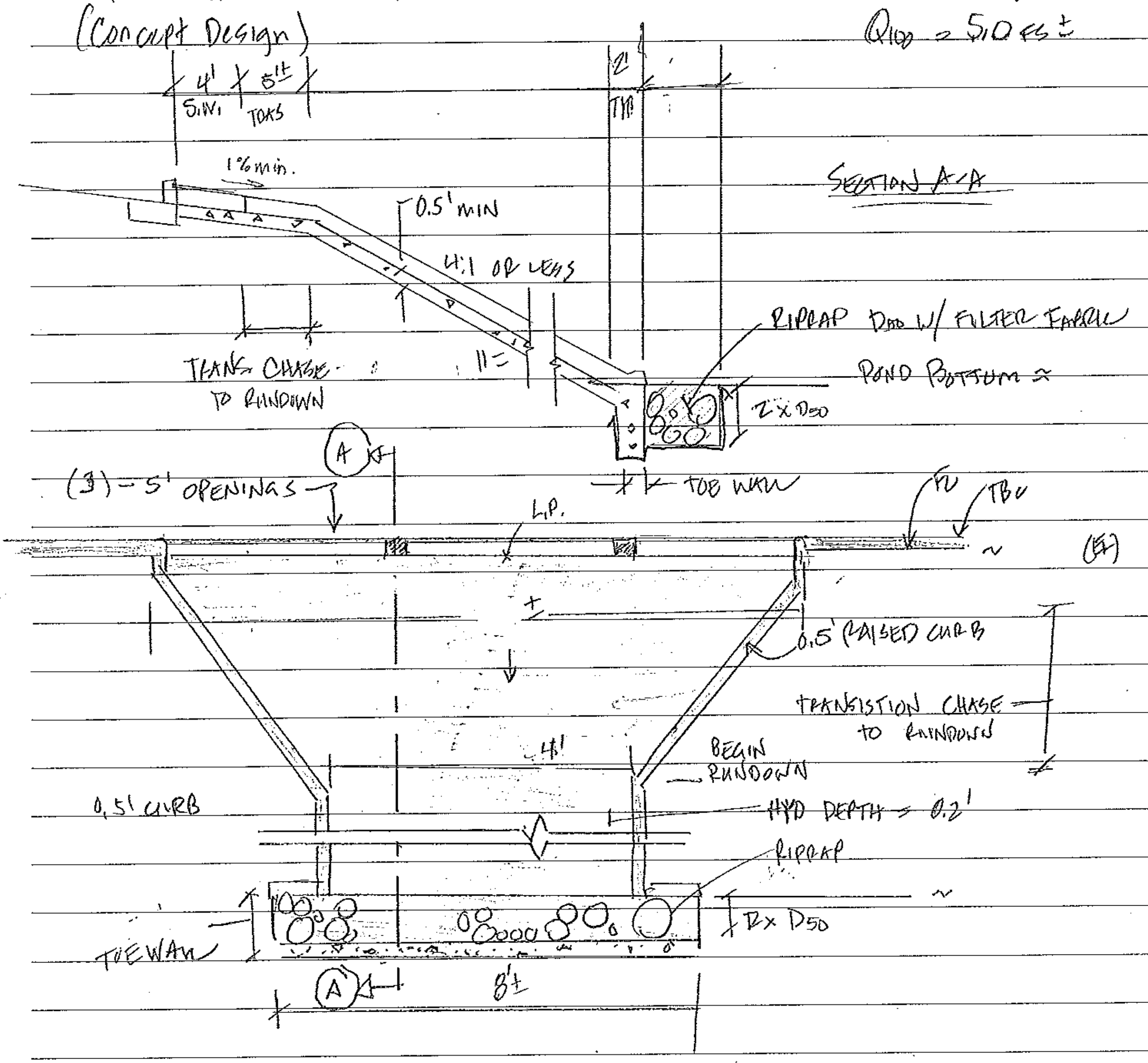
TO: proposed conditions

DATE: 9/6/11

FILE:

SUBJECT: HGL Calculation for Outlets to WQ Pond #4 (South) (Concept Design)

$Q_{100} = 5.0$ cfs ±



NOTE: SLOPE COULD BE STEEPENED IN FINAL DESIGN TO REDUCE CONCRETE QUANTITY

NOTE: RIPRAP COULD BE USED IN LIEU OF CONCRETE IN FOR RUNDOWN.

NOTE: ACTUAL FINAL DESIGN DIMENSIONS LIKELY TO VARY.

WILSON & COMPANY

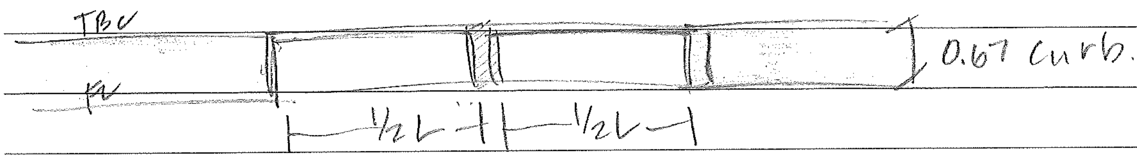
FROM: Lincoln Complex - APS DMP
TO: proposed calculations

DATE: 9/7/11
FILE:

SUBJECT: WQ Pond #4 -

Weir opening @ East side

Q_{100} = Basin 234 = 6.77 ≈ 7.0 cfs



Weir length = $C_d L H^{1.5}$

$7.0 = 3.1 (L) 0.4^{1.5}$ → $L = 8.9 \approx 9.0$

Use L = 10 ft ⇒ (2') - 5' openings w/ 1' transition to 3'-4' rundown w/ riprap pad at bottom.

WILSON & COMPANY

FROM: Lincoln Complex - APS DMP

TO: proposed conditions

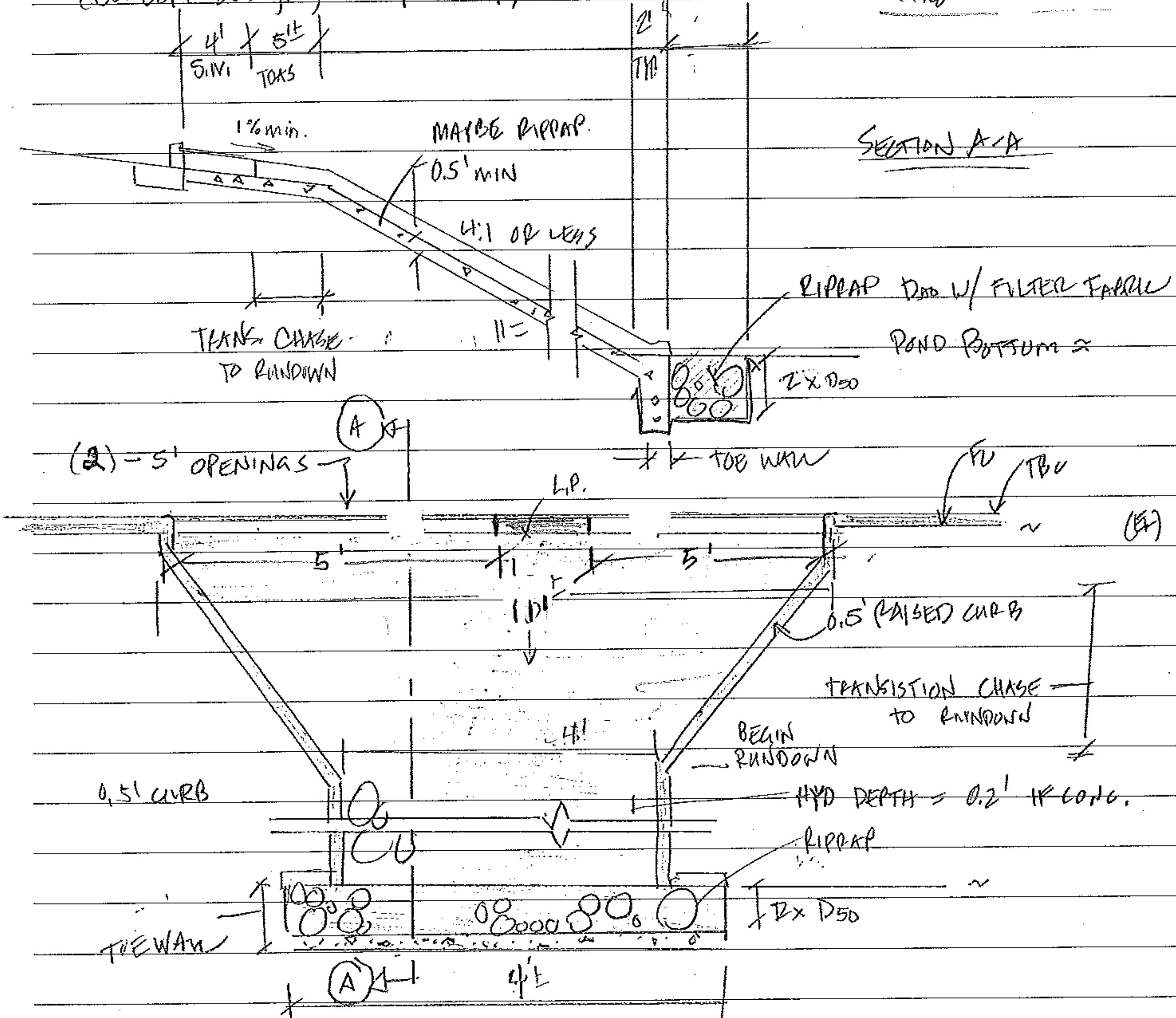
DATE: 9/6/11

FILE:

SUBJECT: HGL Calculation for Outlets to WQ Pond #4 (East)

(Concept Design) Spillway / Rundown

Q_{100} = 7.0 cfs ±



NOTE: SLOPE COULD BE STEEPENED IN FINAL DESIGN TO REDUCE CONCRETE QUANTITY

→ NOTE: RIPRAP COULD BE USED IN LIEU OF CONCRETE IN FOR RUNDOWN.

NOTE: ACTUAL FINAL DESIGN DIMENSIONS LIKELY TO VARY.

WILSON & COMPANY

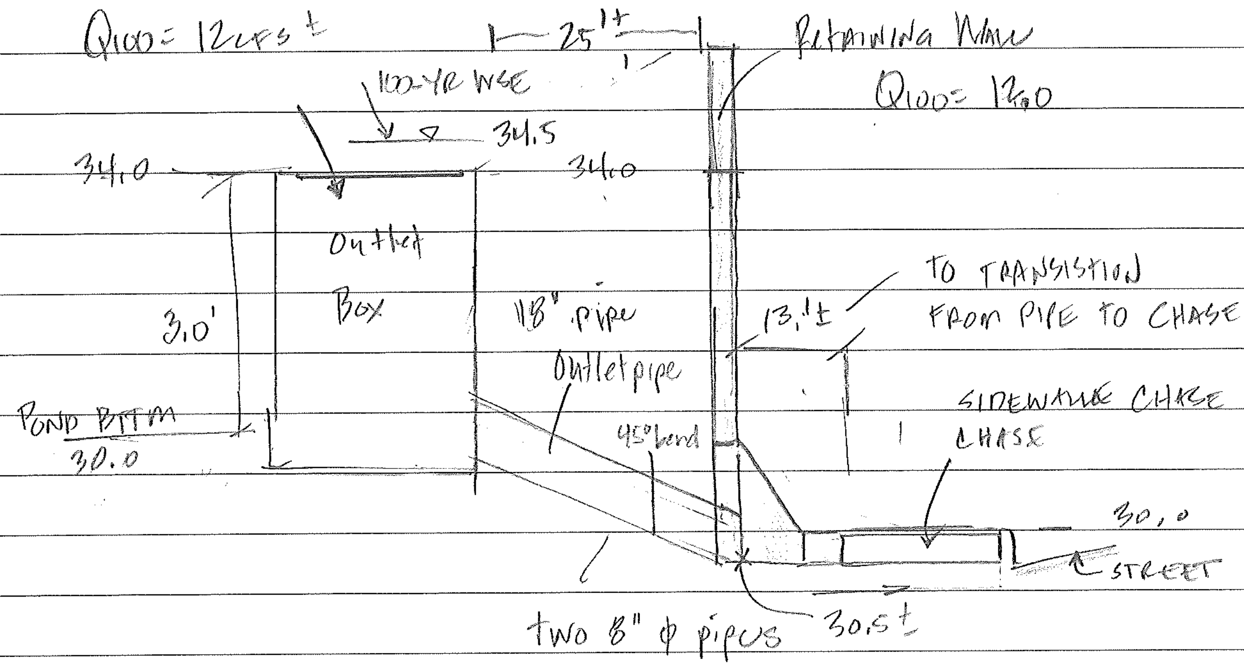
FROM: Lincoln Complex - APS

TO: proposed conditions

DATE: 9/7/11

FILE:

SUBJECT: WQ Pond #4 HGL Calc Verification



chase @ 7% match roadway

HGL. ASSUME FREE RELEASE AT RETAINING WALL

Inv = 30.5 + 1.5 = crown of pipe = Begin H.G.L.

V = 12 / (1.767 = 6.7'/s V_h = 0.72'

$f_s = (12/105.1)^2 = 0.013 = 1.3\%$

lay pipe @ 0.015 (1.5%)

Total Loss = head loss friction + bend loss + entrance loss
(slope × length)

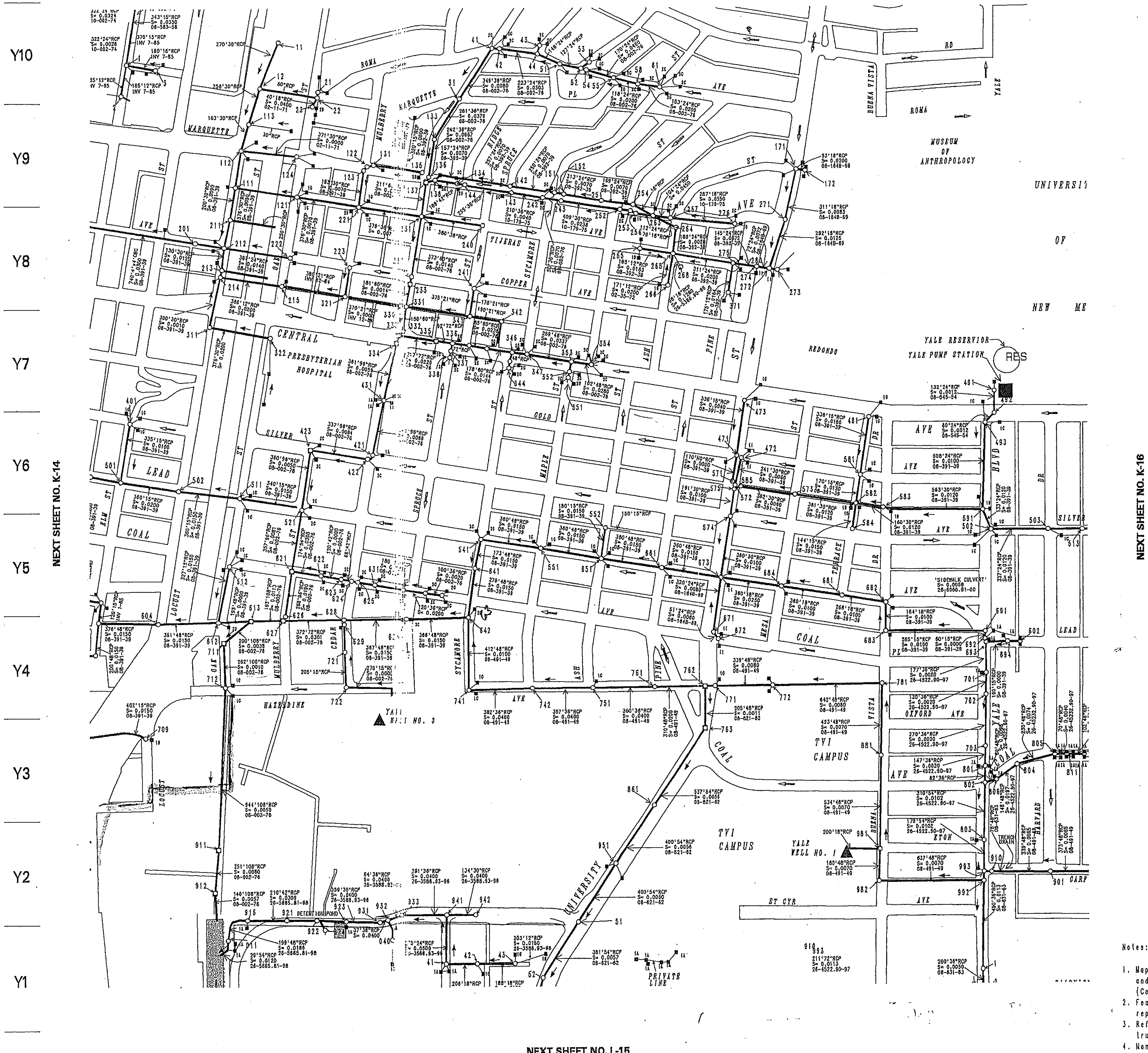
H.G.L. = 30.5 + 25 (0.015) + 0.35 (0.72) + 1.5 (0.72) = 32.2 below top of box OK
@ box

HIGHER Relationships

APPENDIX E

SUPPORTING DOCUMENTATION

WILSON & COMPANY



Legend

- Lateral Stubout Inlet Connector
- Collector
- Reservor Drain Siphon
- Double Pipe
- Force Main
- Abandon Lines
- Manhole
- Inlet Catch Basin
- Junction Box
- Vault
- Standpipe/Riser
- Surface Flow
- Pipe Flow
- Water Course Holding Ponds Dams
- Well
- Reservoir
- Pump Station

0 100 200 400 600

SCALE

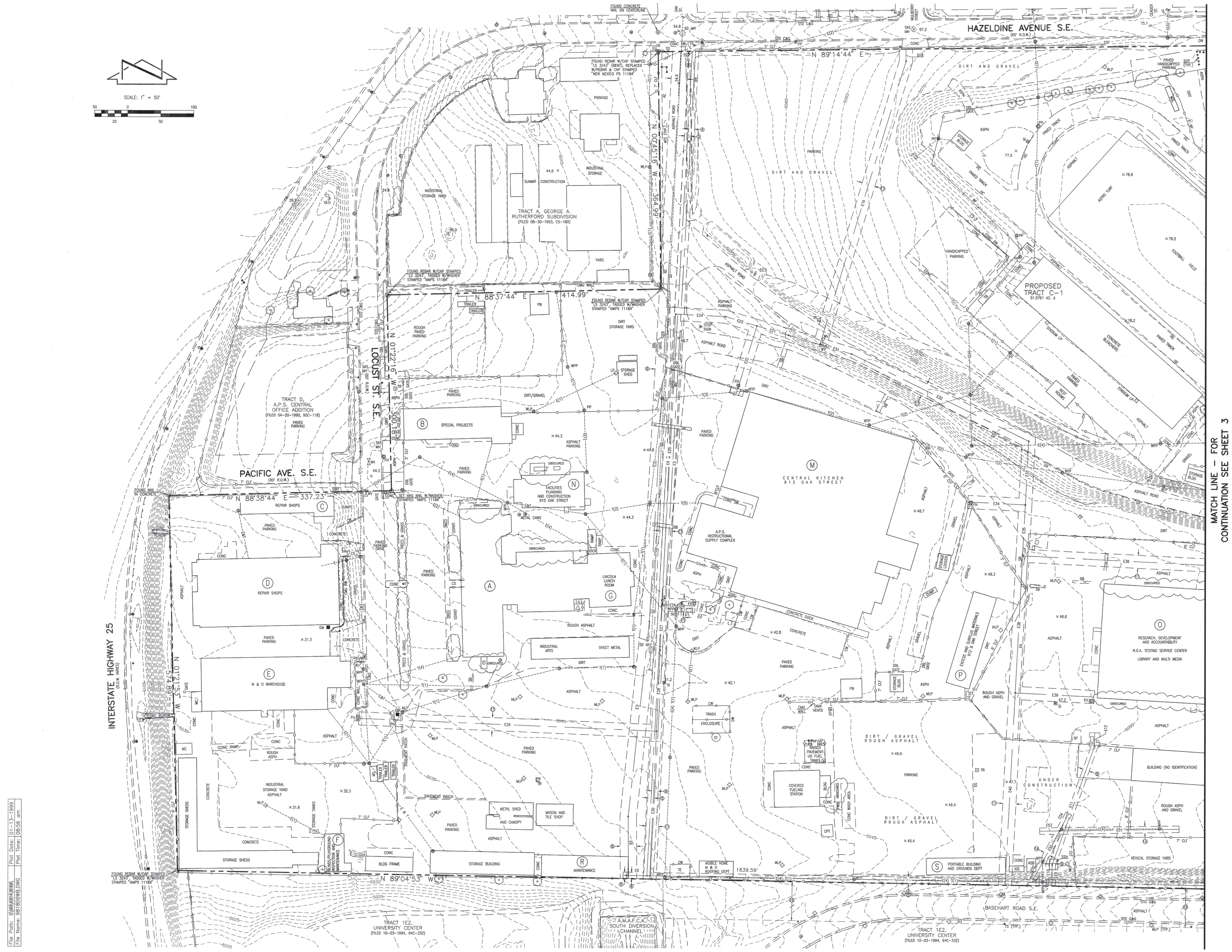
Notes:

1. Map is for information only and is subject to corrections. (Corrections call 768-3606.)
2. Features are drawn for general representation of facilities.
3. Refer to as-built drawing for true representation.
4. Manhole identification requires both the Map Grid & Manhole No.

MAP GRID

K-15

CITY OF ALBUQUERQUE



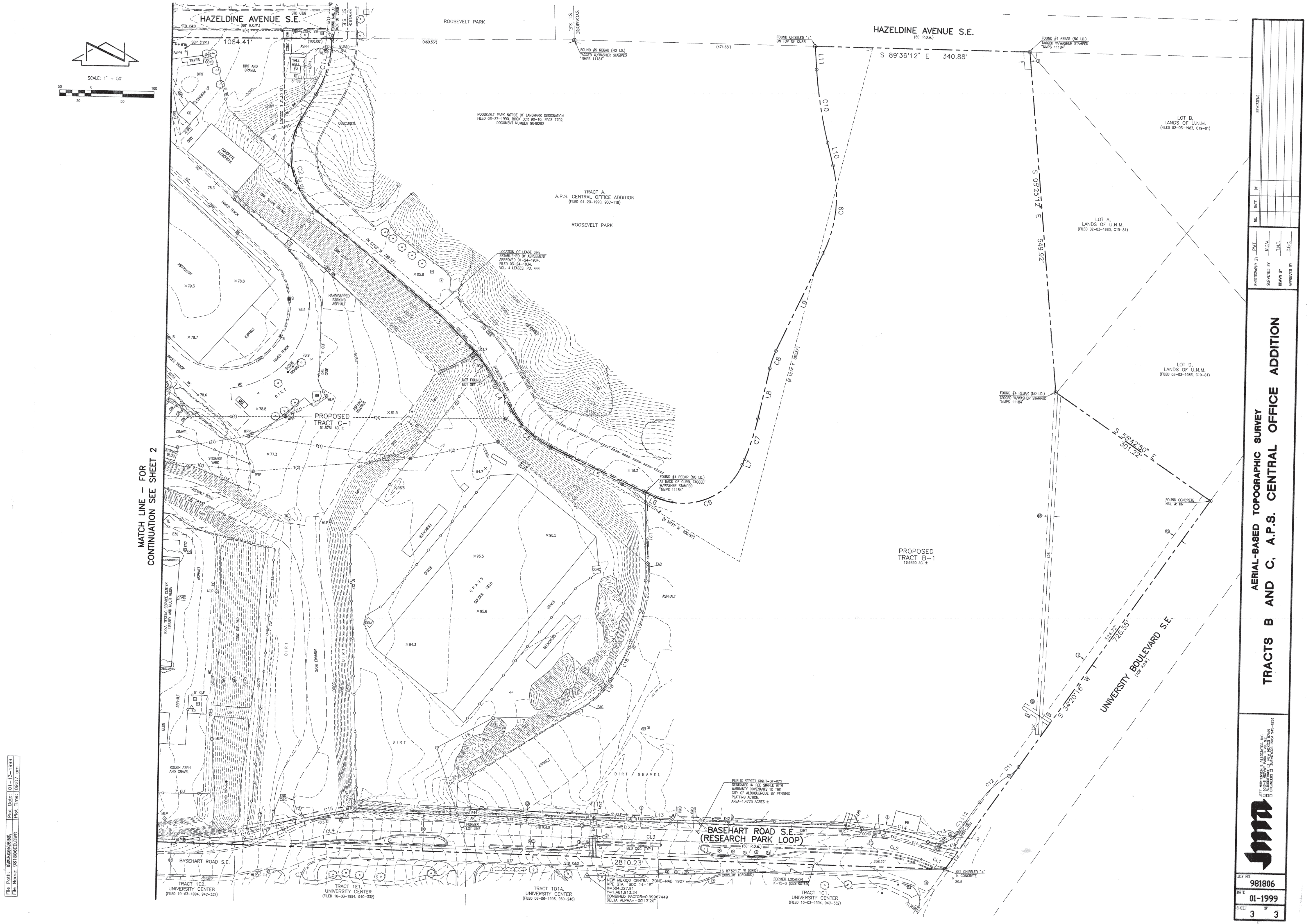
AERIAL-BASED TOPOGRAPHIC SURVEY

TRACTS B AND C, A.P.S. CENTRAL OFFICE ADDITION

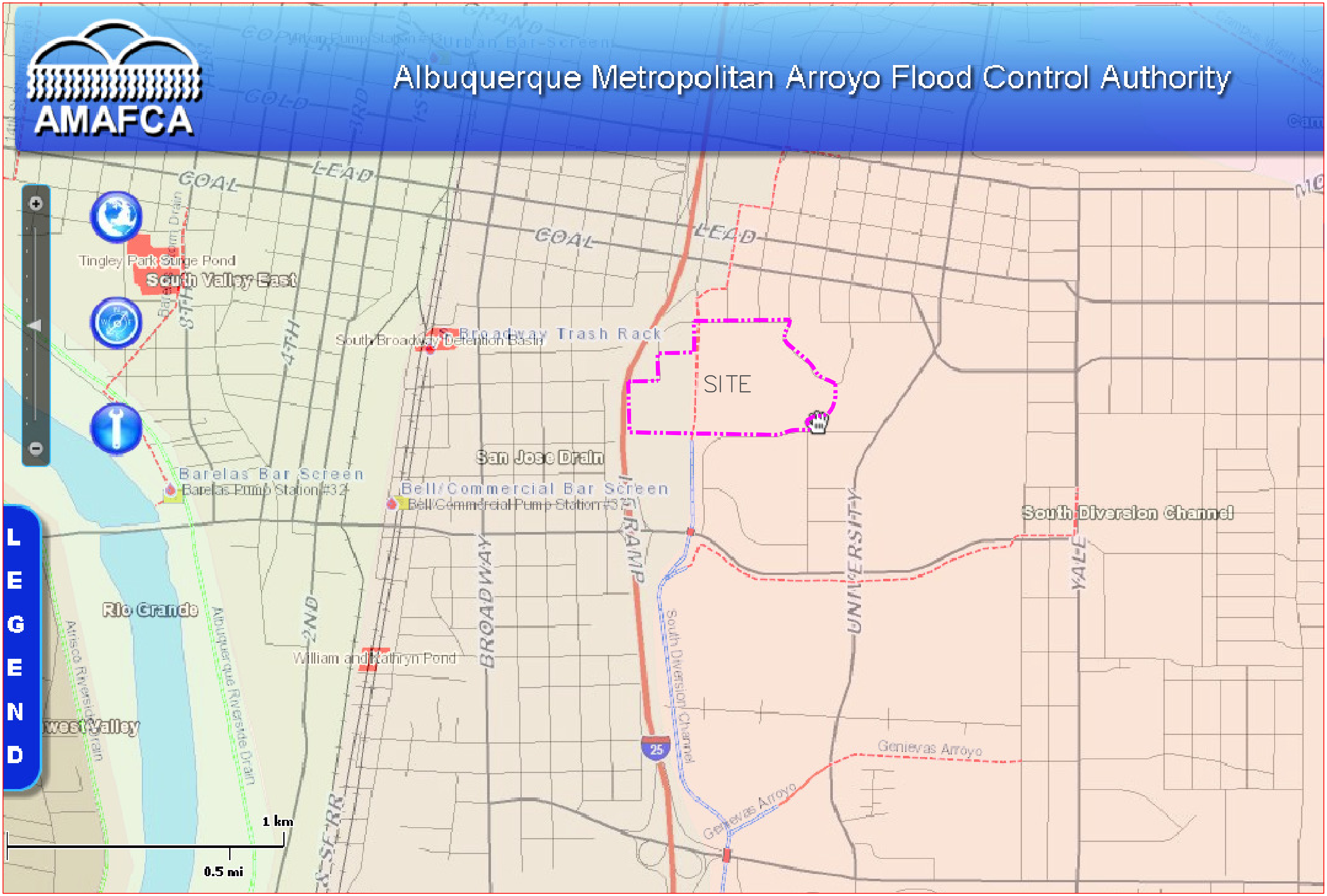
JOB NO. 981806

DATE 01-1999

SHEET 2 OF 3



HAZELDINE AVENUE S.E.
ROOSEVELT PARK
SCALE: 1" = 50'
TRACT A, A.P.S. CENTRAL OFFICE ADDITION
PROPOSED TRACT C-1
PROPOSED TRACT B-1
LOT B, LANDS OF U.N.M.
LOT A, LANDS OF U.N.M.
LOT D, LANDS OF U.N.M.
S 89°36'12" E 340.88'
S 05°25'12" E 549.92'
S 55°42'50" E 301.22'
S 34°20'18" W 726.55'
UNIVERSITY BOULEVARD S.E.
BASEHART ROAD S.E. (RESEARCH PARK LOOP)
BASEHART ROAD S.E.
2810.23'
1084.41'
MATCH LINE – FOR CONTINUATION SEE SHEET 2
TRACT 1E2, UNIVERSITY CENTER
TRACT 1E1, UNIVERSITY CENTER
TRACT 1D1A, UNIVERSITY CENTER
TRACT 1C1, UNIVERSITY CENTER
AERIAL-BASED TOPOGRAPHIC SURVEY
TRACTS B AND C, A.P.S. CENTRAL OFFICE ADDITION
JOB NO. 981806
DATE 01-1999
SHEET 3 OF 3
Plot Date: 01-13-1999
Plot Time: 09:07 am



Albuquerque Metropolitan Arroyo Flood Control Authority
AMAFCA
SITE
LEGEND
COAL
LEAD
Tingley Park Surge Pond
South Valley East
Broadway Trash Rack
South Broadway Detention Basin
San Jose Drain
Barelas Bar Screen
Barelas Pump Station #32
Bell/Commercial Bar Screen
Bell/Commercial Pump Station #37
South Diversion Channel
4TH
2ND
BROADWAY
I-25 RAMP
UNIVERSITY
YALE
Rio Grande
Albuquerque Riverside Drain
Atrisco Riverside Drain
William and Kathryn Pond
South Diversion Channel
Genievas Arroyo
Genievas Arroyo
25
1 km
0.5 mi