City of Livingston
Storm Drainage Master Plan

July, 2007
Revised Final Version

Prepared by:

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and

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TRANSMITTAL

To: **Ms. Donna Kenney, Community Development Dir.**
City of Livingston
1416 C Street
Livingston, CA 95334

From: **Jim Nelson**

Date: **July 11, 2007**

File: **2004-15B**

Re: Storm Drainage Master Plan – Revised Final Version

Remarks: Enclosed are fifteen (15) copies of the revised final version (labeled Revised Final Version – July, 2007) of the Storm Drainage Master Plan for the City, incorporating your comments regarding the draft version that we submitted to the City a couple of weeks ago.

If you have any questions, please let me know.

Thanks

Jim

Enclosures

Cc: Steve Roberts, Harris & Associates

City of Livingston

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1.0 Introduction

This report is a Storm Drainage Master Plan (SDMP) that describes and presents a recommended master plan for storm drainage facilities that will serve new development areas that are currently located within the City of Livingston's sphere of influence or are likely to be incorporated into the sphere of influence at some point in the foreseeable future. This SDMP also provides recommendations for mitigating nuisance flooding in several problem areas of the existing City urbanized area and for eliminating some of the City's current detention/retention ponds that are considered undesirable due to issues related to aesthetics, environment, and/or maintenance. This SDMP document addresses and provides information with respect to the following:

- Watershed hydrology and peak runoff
- Infrastructure plan for new and retrofitted storm drainage facilities
- Joint-use opportunities and design guidelines for detention basins
- Funding alternatives
- Impact fees pertinent to new development areas
- Priority projects

A previous master plan for storm drainage facilities was prepared by the consulting firm of Lew-Garcia-Davis in December 1992 and was entitled City of Livingston Storm Drain Collection System Study and Master Plan. The new SDMP is a stand alone document that will supercede the prior master plan. This is a revised version of the Final SDMP dated September, 2006 that was previously approved by the City, and incorporates additional land areas to the east of the previously adopted study area limits.

This SDMP is intended to be utilized as a guideline document for the identification of storm drainage facilities needed to serve future land development projects and for the identification of future storm drainage capital improvement projects. In general, new development projects will be required to provide site-specific or project-specific storm drainage solutions that are consistent with the overall infrastructure approach presented in this Storm Drainage Master Plan. The City may allow for a reasonable degree of flexibility to be incorporated into specific design approaches as a part of achieving effective solutions. Any significant modifications to the elements of this Storm Drainage Master Plan must be approved by the City and will require that a formal "Supplement" be adopted by the City Council.

2.0 Study Area Setting and Description

The City of Livingston extends along both sides of Highway 99 in the San Joaquin Valley in the northeast quadrant of Merced County, California. According to the 2000 Census by the U.S. Census Bureau, the City of Livingston has a population of 10,743 people. Based on several factors, the U.S. Census Bureau indicates that this may be an underestimated value. The average annual precipitation for the Livingston area is about 12.1 inches, with the substantial majority of this precipitation generally occurring during the rainy season that extends from November through March. Average annual high temperature ranges from 54 degrees to 94 degrees, and average annual low temperature ranges from 37 degrees to 61 degrees, depending upon the time of year.

This SDMP covers the City's Sphere of Influence area, plus additional future development areas to the west, south and east. The SDMP boundaries are generally defined by the Merced River and Olive Avenue on the north; Washington Boulevard on the west; Westside Boulevard on the south; and Cressey Way on the east. The study area for this SDMP is the same as the study area for the City's current General Plan update. The study area is slightly more than 12 square miles in area and includes a combination of residential, commercial, industrial, institutional, and recreational development, as well as currently undeveloped agricultural land and open space. The SDMP has been prepared under the assumption that the areas within the SDMP boundaries are built out (developed) to the land uses shown on the City's current General Plan update.

The SDMP study area is topographically very flat for the most part, with the majority of elevations ranging from about 105 feet to 140 feet above sea level. Localized higher elevations exist near the northeast boundary of the study area and lower elevations exist in the flood terrace areas adjacent to the Merced River. Much of the topography and drainage descends gradually in a southwesterly direction towards one of many topographic depressions.

The Merced River, which borders the north boundary of the western half of the SDMP study area, retains a floodplain area that was delineated by the Federal Emergency Management Agency (FEMA) per Flood Insurance Rate Map (FIRM) Panels 175 and 200 for Merced County, California and Incorporated Areas (Effective Date: 1995). The floodplain area is represented as Zone A on these maps, indicating that the designation is "approximate" (See Appendix), and is shown as being confined to the river channel and adjacent low lying terrace areas. City representatives have indicated that some areas within the northwest quadrant of the SDMP study area may have previously experienced flooding induced by high stages in the Merced River. Prior to development occurring in

2.0 Study Area Setting and Description (continued)

lower lying portions of the northwest quadrant of the SDMP study area, it is recommended that a detailed hydraulic study be performed to more accurately determine the 100-year floodplain limits for the Merced River. This SDMP addresses local storm drainage needs and issues, and analyses pertinent to the Merced River are outside of the scope of the SDMP.

The SDMP study area is also traversed or bordered by several canals and laterals owned and operated by the Merced Irrigation District (MID). The largest of these MID facilities are the Arena Canal (which traverses through the entire south portion of the SDMP study area) and the Livingston Canal (which extends across areas to the north of the SDMP study area). The Arena Canal eventually drains to Bear Creek, located several miles to the south, and the Livingston Canal drains to the Merced River to the north. Though the primary intended function of the MID canals and laterals has historically been to provide supply water for agricultural users, the MID canals also offer a terminal point of discharge for storm drainage originating from portions of the City's existing development area.

3.0 Existing Drainage Facilities

Storm drainage generated within the City's existing development areas is collected and discharged by a combination of the following facilities and methods:

- Underground storm drains
- Detention and percolation basins
- Limited discharge into City sanitary sewer system facilities
- Discharge into MID canals and laterals, via pump stations

Existing underground storm drains, to the extent known, are represented on Exhibit A. However, information and records identifying the location of existing storm drains serving the City are limited, and the relevant information regarding these facilities depicted on Exhibit A is undoubtedly incomplete.

A commonly applied practice that the City has historically utilized for accommodating storm runoff generated by new development areas has included the construction of local detention basins that intercept and store runoff and discharge it at a reduced rate via pumping into MID canals and laterals. Some of these local detention basins do not discharge into MID facilities, and instead, function as percolation basins (or retention basins). The above practice has resulted in the installation of a large number of local detention basins, many of which the City now considers to be undesirable for a variety of aesthetic, environmental and maintenance reasons. These existing detention basins are depicted on Exhibit A. As a goal in developing this SDMP, the City has expressed a desire to provide for the phasing out of several of these detention basins and to provide for the consolidation of storm drainage from new development areas into a limited number of larger detention basins that will also have an opportunity to be utilized, at least in part, for recreation.

Many properties within the City are governed by Subdivision Drainage Agreements that have been executed with MID. These agreements authorize the discharge of storm runoff into specified MID facilities as long as several special provisions are met. The agreements establish a "per lot" one time connection fee and an annual maintenance fee that is levied via the Merced County property tax bill. Current one time connection fees are $205 per subdivision lot and $2,113 per impermeable acre of commercial/commercial office/industrial development. Current annual maintenance fees are $12.30 per subdivision lot and $126.76 per impermeable acre of commercial/commercial

3.0 Existing Drainage Facilities (continued)

office/industrial development. These fees are subject to change in the future. Properties currently governed by such agreements with MID are highlighted on Exhibit A and a current prototype Subdivision Drainage Agreement is included in the Appendix.

The City does not currently collect a fee for the maintenance and operation of City-owned storm drainage facilities.

4.0 Hydrology and Drainage Zones

Drainage Zones

In order to develop an effective and manageable master plan for storm drainage facilities within the SDMP study area, it was first necessary to sub-divide the overall SDMP study area into local watersheds, or Drainage Zones. The establishment of these Drainage Zones facilitated the calculation of peak runoff rates and detention storage requirements, determination of storm drainage infrastructure needs and costs, and identification of responsible constituents for the funding of much of the storm drainage infrastructure. In this SDMP, the subdivision of the SDMP study area resulted in the establishment of thirteen (13) Drainage Zones (Drainage Zones A through L and Drainage Zone CC). These Drainage Zones were initially delineated and subsequently refined based on the following factors and considerations:

- Topography
- Land Use Boundaries
- Current land development proposals
- Street alignments and other physical boundaries (such as Highway 99 and the Union Pacific Transportation Company railroad)
- City stated goals of limiting the number of future detention basins and consolidating terminal drainage needs into larger detention facilities that may have a future potential to include recreational elements
- City stated goal of eliminating existing local detention basins and percolations basins (that do not include any joint-use elements), where possible
- Proximity to suitable outfalls for storm drainage, such as MID canals and laterals and the Merced River.

4.0 Hydrology and Drainage Zones (continued)

Exhibit A depicts the Drainage Zones that have been established per this SDMP and their sub-basin boundaries, where applicable. The following is a brief description of each Drainage Zone:

Drainage Zone A

Drainage Zone A is the largest proposed Drainage Zone and has its boundaries defined by Robin Avenue on the west, Peach Avenue on the north, Cressey Way (south of Highway 99) on the east, and Westside Boulevard on the south. Drainage Zone A also includes twelve (12) sub-basins. The entire Drainage Zone area is approximately 3.7 square miles and currently consists predominantly of agricultural land. The proposed Ranchwood, Yagi (Del Valle Homes), Somerset 1 and 2, and Peach/Arena developments, plus an unnamed Medium Density Residential development, are located within this Drainage Zone. There is no existing positive storm drainage system serving this Drainage Zone. The Arena Canal runs east-west along the northern boundary of Drainage Zone A, and then extends southerly through the western portion of Drainage Zone A.

Drainage Zone B

Drainage Zone B is approximately 1.47 square miles in area and has its boundaries defined by Washington Boulevard on the west, Flint Avenue (F Street) on the north, Robin Avenue on the east and Westside Boulevard on the south. Similar to Drainage Zone A, the current land use within Drainage Zone B is predominantly agricultural. There is a proposed elementary school site located within this Drainage Zone at the intersection of Peach Avenue and Robin Avenue. There is no positive storm drainage system serving this Drainage Zone. However, the Garibaldi and McCoy Laterals of MID traverse through Drainage Zone B.

Drainage Zone C

Drainage Zone C is approximately 0.39 square miles in area and has its boundaries defined by Robin Avenue on the west, Vinewood Avenue (B Street) on the north, MID's Hammett Lateral and Arena Canal on the east, and Peach Avenue on the south. The Drainage Zone contains several new residential developments, including the following existing subdivisions and subdivisions currently under construction: Monte Cristo subdivisions, Bridgeport Village, Country Glen subdivision, Parkside subdivision, La Tierra, Marabella subdivision and Hhad property development. The existing middle school at the northeast corner of Flint Avenue and Robin Avenue as well as the B Street commercial and

4.0 Hydrology and Drainage Zones (continued)

residential project are also a part of this Drainage Zone. There is a centrally located existing joint-use detention basin serving local development within this Drainage Zone.

Drainage Zone D

Drainage Zone D is approximately 0.694 square miles in area and has its boundaries defined by Washington Boulevard on the west, the Merced River and the City's Wastewater Treatment Plant on the north, the alignment of Robin Avenue on the east, and Flint Avenue (F Street) on the south. Under current conditions the land use is predominantly agricultural. Much of this Drainage Zone is overlain by the proposed River Ranch project. There is no positive storm drainage system serving this Drainage Zone.

Drainage Zone E

Drainage Zone E is approximately 0.74 square miles in area and is located northeast of Highway 99; south of the Merced River; and west of Livingston/Cressey Road and Stefani Avenue. This Drainage Zone is primarily occupied by Foster Farms industrial facilities and properties. Existing Foster Farms developments are served by detention/percolation basins. MID's Hammett Lateral extends through this Drainage Zone.

Drainage Zone F

Drainage Zone F is approximately 0.65 square miles in area and has its boundaries defined by Livingston/Cressey Road and Stefani Avenue on the west, Olive Avenue on the north, the alignment of Hunter Road on the east, and Walnut Avenue on the south. This Drainage Zone currently consists of a mix of residential and agricultural land uses, and also includes a degree of institutional and commercial uses. The Drainage Zone includes existing detention or percolation basins within the Harvest Manor and Country Roads subdivisions. The proposed Country Lane 1 and Country Lane 2 developments and a proposed senior housing development are located within this Drainage Zone. There are also local storm drains serving the southwest portion of this Drainage Zone within a local, older section of the City that discharge into the City's sanitary sewer system. MID's Wakefield Lateral extends through this Drainage Zone.

4.0 Hydrology and Drainage Zones (continued)

Drainage Zone G

Drainage Zone G is approximately 0.32 square miles in area and is located northeast of Highway 99, west of the alignment of Hunter Road, south of Walnut Avenue and east of Hammett Avenue. The city has a proposal for Blueberry Crossing, a truck stop, retail pads, restaurant pads, a hotel pad, and a banquet facility to be developed within this Drainage Zone. There is no positive storm drain system serving this Drainage Zone, and existing land use is predominantly agricultural.

Drainage Zone H

Drainage Zone H is approximately 0.70 square miles in area and has its boundaries defined by the Hunter Road alignment on the west, Olive Avenue on the north, Sultana Drive on the east, and Highway 99 on the south. The Drainage Zone currently consists of predominantly agricultural land uses. MID's Arena Canal extends along a portion of the south boundary of this Drainage Zone. There is no positive storm drain system serving this Drainage Zone.

Drainage Zone I

Drainage Zone I is approximately 0.31 square miles in area and is located north of the Arena Canal, south of Highway 99, and east of the Hammett Avenue. This Drainage Zone currently consists of a mix of residential and agricultural land uses, and includes the Vintage West Nos. 4 and 5 subdivisions and their detention/percolation basin.

Drainage Zone J

Drainage Zone J is approximately 0.15 square miles in area, is located south of Walnut Avenue, and is generally bisected by Dwight Way. Drainage Zone J includes the existing Country Villas subdivisions, the Country Villas 4 subdivision under construction to the south of the existing Country Villas subdivisions, and the City's park site at the southwest corner of Walnut Avenue and Dwight Way. There is an existing detention basin located within the City's park site that currently serves as a drainage outfall for the Country Villas subdivisions. The City intends to retrofit this detention basin to more favorably accommodate the desired recreational elements associated with the City's park site. MID's Wakefield Lateral extends through this Drainage Zone.

4.0 Hydrology and Drainage Zones (continued)

Drainage Zone K

Drainage Zone K is approximately 1.50 square miles in area and is located in the northeast quadrant of the SDMP study area. It is bounded by Olive Avenue on the north, Sultana Drive on the west, Peach Avenue/Liberty Avenue on the south, and Cressey Way on the east. Existing land use within this Drainage Zone is almost exclusively agricultural. MID's Arena Canal extends along the south boundary of this Drainage Zone. There is presently no positive storm drain system serving this Drainage Zone.

Drainage Zone L

Drainage Zone L is composed of approximately 0.25 square miles located in the easternmost portion of the SDMP study area. It is triangular in shape and is bounded by Peach Avenue/Liberty Avenue on the north, Cressey Way on the east, and Highway 99 on the southwest. Existing land use within this Drainage Zone is almost exclusively agricultural. MID's Arena Canal extends along the north boundary of this Drainage Zone. There is presently no positive storm drain system serving this Drainage Zone.

Drainage Zone CC

Drainage Zone CC is the "City Core" Drainage Zone that is bounded by all of the other Drainage Zones and is approximately 1.69 square miles in area. It includes the majority of existing developed areas of the City and contains a wide variety of land uses. There are several existing detention/percolation basins within this Drainage Zone including Arakelian Park (a joint-use detention basin), a detention basin serving an existing subdivision on the north side of Flint Avenue (F Street) north of Arakelian Park, a detention/percolation basin serving areas contiguous to the north of Highway 99 east of Livingston/Cressey Road and a detention/percolation basin serving earlier phases of the Vintage West subdivision in the southeast portion of the Drainage Zone. There are several local storm drains that serve this Drainage Zone; however, information regarding their size and alignments is very limited based on a review of available records. MID's Arena Canal extends along the south and southwest boundaries of this Drainage Zone.

Hydrology

The U.S. Army Corps of Engineers' (COE) HEC-1 computer program was used to develop a rainfall/runoff computer simulation for the Drainage Zones and sub-

4.0 Hydrology and Drainage Zones (continued)

basins in the study area. The HEC-1 computer model develops a runoff hydrograph for individual sub-basins through the input of numerical representations of their physical and hydrological characteristics. The computed hydrographs are then routed and/or combined with hydrographs from other sub-basins to yield a dynamic numerical analysis of peak discharges that may be expected to occur at a number of key concentration points along a given flow path. The HEC-1 model was used to estimate flow discharges that would be expected at major detention basins that are proposed to serve Drainage Zones A through L and at key locations within the study area during the 10-year and 100-year storm events.

Rainfall Loss

Rainfall loss is that portion of the precipitation depth that is lost due to evaporation, interception by vegetation, infiltration into soil, and surface depression storage. Rainfall excess is that portion of the precipitation depth that appears as surface or collected storm runoff during and after a storm event. Rainfall losses in the hydrologic analysis were determined using the NRCS Curve Number (CN) Method that uses a soil cover complex for estimating such losses. The CN is related to the underlying hydrologic soil group (A, B, C, or D), land use, cover density, and antecedent soil moisture conditions. The four hydrologic soil groups are described in greater detail in the listing below:

Group A: *Low runoff potential* soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well-drained sands or gravels. These soils have a high rate of water transmission.

Group B: Soils having *moderate infiltration* rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well-drained sandy-loam with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

Group C: Soils having a *low infiltration* rate when thoroughly wetted and consisting chiefly of silt-loam soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. These soils have a slow rate of water transmission.

4.0 Hydrology and Drainage Zones (continued)

Group D: *High runoff potential* soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a clay pan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have slow rate of water transmission.

The soil groups that are present within each Drainage Zone are listed in Table 2.

Assumed Land Uses

Future land uses were incorporated into the hydrologic modeling effort by assigning impervious cover percentages to all of the future land uses defined by the City for the entire SDMP study area. The land uses are defined the City's ongoing General Plan update. For the purposes of hydrologic modeling, discharge determination, and the master planning of storm drainage facilities in this SDMP, future buildout of the SDMP study area was assumed. Assumed land uses are depicted for Drainage Zones and sub-basins on Table 2.

The percent impervious area assigned to the relevant land uses represents an important input parameter in the HEC-1 computer model. The computer model relates the amount of impervious area to the total area of a given sub-basin to estimate the amount of runoff losses attributed to pervious areas. The following impervious cover percentages were utilized to reflect different land uses and are also provided on Table 1:

Land Use Designation	Percent Impervious Cover
Low-Density Residential	40%
Medium-Density Residential	55%
High-Density Residential	65%
All Commercial Designations	85%
Mixed Use	65%
Limited or Light Industrial	85%
General Industrial	90%
Schools	30%
Parks/Open Space/Conservation Reserve	15%
Urban Reserve	55%

4.0 Hydrology and Drainage Zones (continued)

Curve Numbers

The CN values for pervious areas and impervious areas were established for Drainage Zones and Sub-basins using the NRCS publication entitled Urban Hydrology for Small Watersheds and were subsequently weighted for each Drainage Zone and Sub-basin as shown on Table 2.

Rainfall

A 24-hour rainfall depth of 2.06 inches for the 10-year storm and 2.88 inches for the 100-year storm events were utilized in the hydrologic analysis. These values were taken from the City of Merced's Storm Drain Master Plan, which has comparable rainfall characteristics.

Unit Hydrograph

For runoff computations from each sub-basin, the NRCS Dimensionless Unit Hydrograph option was utilized in the HEC-1 computer model.

Lag Time

Input data for NRCS Dimensionless Unit Hydrograph includes the parameter, TLAG, which is equal to the lag time (in hours) between the center of mass of rainfall excess and the peak of the unit hydrograph. Lag time was estimated utilizing the NRCS method of computing the Drainage Zone lag value from the time of concentration. The equation is as follows:

$$\text{TLAG} = 0.6t_c$$

t_c = time of concentration

The time required for storm water to flow in the form of runoff from the most hydraulically remote point in the drainage sub-basin or Drainage Zone to a collection point is called the time of concentration. Time of concentration is the sum of the minimum overland travel time (initial time of concentration) and the gutter flow time. The gutter flow time was calculated by dividing the maximum length of travel by the velocity of the gutter flow. For gutter flow, an average velocity of two (2) feet per second was assumed based on the relatively flat street gradients that exist or will exist throughout most of the City. Values for TLAG are computed and summarized on the worksheets provided in Table 3.

4.0 Hydrology and Drainage Zones (continued)

HEC-1 Results

The HEC-1 computer model input and output are provided in the Appendix. Table 4 provides a listing of 100-year composite discharges generated by Drainage Zones A through L that would constitute a peak inflow rate into proposed major detention basins.

Rational Method

The Rational Method was also utilized to estimate runoff rates that would be generated by a generic 100-acre local watershed under different land use assumptions. This assessment was utilized as a tool for deriving estimates of 10-year peak discharges generated from local areas within Drainage Zones and Sub-basins that could be used to size local storm drains as a part of the development of SDMP storm drainage infrastructure. The Rational Method assessment is summarized on Table 5.

5.0 Storm Drainage Infrastructure Plan

General

This SDMP presents a storm drainage infrastructure plan that will serve the buildout of the SDMP study area and mitigate flooding and nuisance associated with selected existing development areas and facilities.

Design Standards

The following design capacities are recommended as the standards to apply to the sizing of new and replacement storm drainage infrastructure:

- Underground Storm Drains – 10-year, 24-hour storm

- Detention Basins – 100-year, 24-hour storm peak volume considering pump outflow rate. All permanent detention basins shall have outlets (gravity or pump). Detention basin pumping shall conform to the requirements set forth by MID and/or per applicable drainage agreements with MID, when MID facilities are utilized as outfall facilities.

Additional recommended standards to apply to detention basins and temporary percolation basins include the following:

- Maximum allowable drain time for a 10-year, 24-hour storm is 72 hours

- Geotechnical investigations and soil borings are required prior to design to determine sub-surface strata, percolation rates and allowable or recommended depths

- Maximum allowable side slopes are 3:1 in non-joint-use basins and 4:1 for facilities that incorporate park elements, except for structural or aesthetic components

- Integrate recreation elements to facilitate joint-use in conjunction with design and construction of major permanent detention basins, where desired and feasible.

5.0 Storm Drainage Infrastructure Plan (continued)

Outfalls

It is recommended that MID facilities be utilized as an outfall for metered discharges from the major detention basins serving most Drainage Zones. MID has indicated a willingness to continue to accept City storm runoff in their facilities, subject to meeting several physical, legal and financial requirements. To more effectively facilitate a long term program, MID staff have expressed a desire to formulate and execute a Memorandum of Understanding (MOU) between the City and MID. This MOU would set guidelines and standards for future discharge agreements and set forth a strategy for how fee collections will be made and how funds will be dispensed to MID. All new development projects that will utilize MID facilities as the point of drainage outfall will be required to execute a drainage agreement. These items were discussed in meetings held with MID staff on May 26, 2004 and on August 4, 2005, and the minutes of these meetings are included in the Appendix.

Given the flatness of topography, the abundance of MID canals and laterals traversing through the SDMP study area, and the limited practical availability of other outfalls, it is logical for the City to lay the groundwork for continuing to utilize MID facilities as a part of their storm drainage solution. Discharges into MID facilities contemplated by this SDMP are all recommended to be at low rates ranging from 0.5 to 2 cfs. These are lower rates than are currently being applied per existing drainage agreements when measured on a per acre area to be served basis of comparison.

Drainage Zone D is located contiguous to the Merced River. The utilization of a terminal detention basin to be located within the terrace area of the floodplain adjacent to the Merced River or in an upland area for discharge to the Merced River should be considered as a preferred alternative to utilizing MID facilities for terminal discharge within this Drainage Zone, subject to meeting applicable environmental and regulatory requirements. The location of the terminal detention basin will be determined as a part of planning and design associated with the proposed River Ranch project.

Terminal Detention Basins

In all instances, it is proposed that storm runoff from new development and/or retrofitted facilities will enter terminal detention basins prior to discharge to MID facilities or the Merced River. The terminal detention basins are the larger, consolidated detention facilities that are proposed to serve each Drainage Zone.

5.0 Storm Drainage Infrastructure Plan (continued)

These terminal detention basins are a critical component of the storm drainage infrastructure plan and offer the following key benefits:

- Storage and attenuation capabilities that will serve to limit the magnitude of downstream discharge rates. This is important from a capacity standpoint for downstream MID facilities and from a regulatory permitting standpoint for both MID facilities and the Merced River.

- Storage capabilities that will serve to provide discharge control in an emergency. This is important should there be a spill of hazardous material within the City, as such a spill may be collected and remediated within the basin to avoid release into downstream waters. Discharge control will also be of benefit if downstream capacity is temporarily unavailable due to high flows in outfall facilities. Further, should pumping facilities fail due to a power outage or mechanical problems, the storage capabilities of the terminal detention basins will reduce the potential for surrounding areas to be flooded while repairs are completed.

- Creation of low lying areas for upstream storm drain facilities to discharge to. The flatness of topography in the City creates a need for down-gradient areas to be created to allow storm drainage facilities to gravity drain to desired locations.

With the possible exception of the terminal detention basin that will serve Drainage Zone D, the lowest lying portions of the detention basins will be several feet below the discharge elevation for their outfalls; and thus, <u>the terminal detention basins will need to be drained by pumping facilities</u>.

Many Cities utilize terminal detention basins as an integral part of their storm drainage facility and storm water management programs. Nearby Cities utilizing similar approaches include: Merced, Modesto, Tracy, Manteca, Lodi, Turlock, and Fresno.

Storm Water Management Program

The City of Livingston has participated in the development of a Storm Water Management Program (SWMP) for the purpose of limiting to the Maximum Extent Practicable (MEP) the discharge of pollutants from the Merced Storm Water Group (MSWG) storm sewer system. The MSWG is a coalition of municipalities acting as co-permittees consisting of the Cities of Atwater, Livingston, and Merced, Merced County and MID. The development and

5.0 Storm Drainage Infrastructure Plan (continued)

implementation of the SWMP is intended to fulfill requirements for improving the quality of storm water discharges from Small Municipal Separate Storm Sewer System (MS4) operators in accordance with Section 402(p) of the Federal Clean Water Act (CWA). The SWMP was developed as a requirement of and to achieve compliance with General Permit Number CAS000004, Water Quality Order No. 2003-0005-DWQ. The latest version of the SWMP is dated March 1, 2004. The City of Livingston is listed as a municipality that is governed by Water Quality Order No. 2003-0005-DWQ, and the SWMP has been approved by the California State Regional Water Quality Control Board (SRWQCB) Central Valley Region (5F).

The SWMP includes Best Management Practices (BMPs) intended to reduce to the MEP, the quantity of storm water and the discharge of pollutants to the storm water system. The SWMP will be reviewed periodically, as appropriate, and any changes or modifications will need to be described and submitted to and approved by the RWQCB. The review will include the following:

- A review of the status of program implementation and compliance
- A review of any revision or change of BMPs during the year and an assessment of the effectiveness of such revision
- An overall assessment of the goals and direction of the SWMP and effectiveness of BMPs
- A review of monitoring data, any changes in monitoring methods and parameters, and an assessment of the overall monitoring program.

The SWMP was developed to meet the terms of the General Permit and consists of the six minimum control measures established by RWQCB for Phase II storm water discharges. The six minimum control measures are:

- Public education and outreach
- Public involvement/participation
- Illicit discharge detection and elimination
- Construction site storm water runoff control

5.0 Storm Drainage Infrastructure Plan (continued)

- Post-construction storm water management for new development and redevelopment
- Pollution prevention/good housekeeping for municipal operations

This SDMP acknowledges the requirements of the SWMP and is not intended to supercede, contradict, or override any of said requirements.

Storm Drain Sizing and Alignments

Storm drains proposed to serve new development areas and improve storm water conveyance in existing development areas of the SDMP study area were sized based on uniform flow capacities for different concrete pipe sizes at an assumed slope of 0.002 feet/feet. A table depicting uniform flow capacities for a variety of pipe sizes and slope conditions is provided herein as Table 6. Storm drains were extended in a manner such that each property or project to be developed in new development areas would have access to a storm drain outfall. Discharges for the 10-year storm were estimated using the Table 5 discharge per acre rates for applicable land uses as applied to the areas served and the HEC-1 model.

To the extent possible, new storm drains were aligned along existing streets. In some areas, storm drains were aligned along missing segments of existing streets. Some storm drain lines have been aligned adjacent to MID canals and laterals.

In instances where an existing or future street alignment and right-of-way or other contiguous right-of-way were not readily available, storm drain alignments were extended along property lines, and it was assumed that a 20' wide drainage easement would need to be acquired to facilitate construction.

Proposed Storm Drainage Infrastructure Plan

The following paragraphs present a general description of the storm drainage infrastructure that is proposed to serve each Drainage Zone. The elements of the Storm Drainage Infrastructure Plan are represented graphically on Exhibit A. Quantities and costs for the construction of the storm drainage infrastructure elements that will serve each Drainage Zone are tabulated on Tables 7 and 8. The cost estimates have assumed a total right-of-way and easement acquisition cost (where needed) of $50,000/acre for any land located within the Merced River floodplain and $250,000/acre for all other lands. These acquisition costs

5.0 Storm Drainage Infrastructure Plan (continued)

are intended to include the composite of actual land values, staff costs, and legal and administrative costs and fees required to complete the acquisition process. The actual acquisition values to be applied to this SDMP may be subject to change. <u>Land acquisition requirements provided herein for detention basins pertain to storm drainage requirements, only, and do not include additional land that may be needed to incorporate park elements as a joint-use</u>.

Drainage Zone A

Drainage Zone A infrastructure is proposed to consist of storm drains, two (2) large intermediate detention basins (Detention Basins A2A and A2B), and a large terminal detention basin (Detention Basin A1) that will discharge into MID's Arena Canal. The discharges from Detention Basins A2A and A2B and from local downstream sub-basins will be accommodated by a roughly 2 ½ mile long trunk storm drain that will extend primarily along Magnolia Avenue from Detention Basin A2A to Detention Basin A2B to Detention Basin A1. This Drainage Zone is the largest Drainage Zone established in this SDMP and has been subdivided into several sub-basins to allow design discharges to be determined via the HEC-1 model at several key locations, particularly through Detention Basins A2A and A2B and along the route of the Magnolia Avenue trunk storm drain. West of Lincoln Blvd., the Magnolia Avenue trunk storm drain will then extend southwesterly into the proposed Ranchwood development and connect to the proposed terminal detention basin (Detention Basin A1) as shown on Exhibit A. Detention Basin A1 is located adjacent to MID's Arena Canal, and a portion of Detention Basin A1 is proposed to extend to the west side of the Arena Canal and will provide a link for drainage originating from Sub-basin A1-1. Detention Basin A1 is envisioned to include a deep zone, in order for adequate grade to be made available to the upstream contributing system and is envisioned to discharge into the Arena Canal via a pump station and force main.

Drainage Zone B

Drainage Zone B will be drained by new storm drains that will deliver flow to a proposed terminal detention basin to be located in the south central portion of the Drainage Zone. The terminal detention basin location was established based on topographic considerations (it is located in a low lying topographic depression within Drainage Zone B). It is envisioned to include a deep zone, in order for adequate grade to be made available to the upstream contributing system. The terminal detention basin is envisioned to discharge into MID's Arena Canal to the east via a pump station and force main.

5.0 Storm Drainage Infrastructure Plan (continued)

Drainage Zone C

Drainage Zone C will be drained by new storm drains that will deliver flow to an existing joint-use terminal detention basin located on the west side of MID's Arena Canal and on the west side of the Bridgeport Village development. The existing percolation basins serving the Monte Cristo developments have recently been eliminated (filled), and storm drain outfalls extended to connect to the terminal detention basin. The terminal detention basin is proposed to drain to MID's Arena Canal via pumping. A secondary outfall draining to Detention Basin A1 to the south may also be implemented in the future, if desired by the City.

Drainage Zone D

The majority of this Drainage Zone is covered by the proposed River Ranch project area. Storm drains are proposed to serve properties south of and adjacent to Vinewood Avenue. The River Ranch project development will need to accommodate flows from these storm drains in a manner to be determined via the development design process. Combined flows from the Drainage Zone constituents shall be directed northward to a proposed terminal detention basin to be located in the floodplain terrace adjacent to the Merced River or within the development area. Discharge will be to the Merced River via a gravity outlet having a very low discharge rate. Appropriate regulatory permits and environmental clearances will need to be obtained during the design process for this terminal detention basin.

Drainage Zone E

The majority of this Drainage Zone is Foster Farms property, which is a combination of developed and undeveloped land. As a part of continued development within the Drainage Zone, it is assumed that each property will provide onsite (and perhaps offsite) storm drain facilities and detention or retention basins. A formal storm drainage infrastructure plan is not included in this master plan for Drainage Zone E. It is assumed that Foster Farms and contiguous properties will continue to prepare their own drainage facility plans for submittal to the City for review and approval as a part of the development review process.

5.0 Storm Drainage Infrastructure Plan (continued)

Drainage Zone F

Drainage Zone F includes a mixture of developed and undeveloped properties that will be served by storm drains that will deliver flows to a proposed terminal detention facility to be centrally located east of the southeast corner of the Country Lane 2 development. The terminal detention basin is proposed to discharge to MID's Wakefield Lateral to the west via a pump station and force main. Storm drain infrastructure extended to the southwest portion of the Drainage Zone (along Livingston/Cressey Road north of Highway 99) is intended to replace existing storm drain connections to the City's sanitary sewer system in this area. Also, the existing detention/percolation basins currently owned by the City and serving the Harvest Manor and Country Roads subdivisions are proposed to be filled and decommissioned as a part of implementing the infrastructure plan for this Drainage Zone.

Drainage Zone G

Drainage Zone G will be drained by new storm drains that will deliver flow to a proposed terminal detention basin to be located in the southeast corner of the Drainage Zone. The terminal detention basin is envisioned to discharge into the proposed terminal detention basin that will serve Drainage Zone H to the east for eventual delivery to MID's Arena Canal to the east via a pump station/force main.

Drainage Zone H

Drainage Zone H will be drained by new storm drains that will deliver flow to a proposed terminal detention basin to be located in the southwest corner of this Drainage Zone. The terminal detention basin is envisioned to work in conjunction with the terminal detention basin that will serve Drainage Zone G. It is proposed that the terminal detention basin discharge to MID's Arena Canal to the east via a pump station and force main.

Drainage Zone I

Drainage Zone I will be drained by new storm drains that will deliver flow to a proposed terminal detention facility to be located near the northeast corner of Dwight Way and Peach Avenue near the center of the Drainage Zone. The existing detention basin serving Vintage West Nos. 3 and 4 is proposed to be filled and decommissioned as a part of the infrastructure plan for this Drainage Zone. The proposed terminal detention basin is proposed to discharge to MID's Arena Canal to the south via a pump station and force main.

5.0 Storm Drainage Infrastructure Plan (continued)

Drainage Zone J

Existing development within Drainage Zone J is served via a terminal detention basin located in the City's park site at the southwest corner of Walnut Avenue and Dwight Way. Flows collected in the terminal detention basin are discharged into MID's Wakefield Lateral via a pump station and force main. To accommodate new development and to improve the function of the City's park site, it is proposed that the existing terminal detention basin and portions of the park site be retrofitted and regraded to accommodate a joint-use facility. Additional land may be needed to accommodate this retrofit.

Drainage Zone K

Drainage Zone K will be drained by new storm drains that will deliver flow to a proposed terminal detention basin to be located adjacent to the east side of Sultana Drive roughly ½ mile north of Peach Avenue/Liberty Avenue. The terminal detention basin is proposed to discharge to MID's Arena Canal, located roughly ½ mile to the south and at the south boundary of the Drainage Zone, via a pump station and force main.

Drainage Zone L

Drainage Zone L will be drained by new storm drains that will deliver flow to a proposed terminal detention basin to be located at the northwest corner of the Drainage Zone where Highway 99 and Peach Avenue/Liberty Avenue intersect. The terminal detention basin is proposed to discharge to MID's contiguous Arena Canal via a pump station and force main.

Drainage Zone CC

Within this Drainage Zone that includes the existing city core, there are several storm drains proposed to relieve existing nuisance flooding locations. A deep basin has also recently been constructed adjacent to the north of existing Arakelian Park. This deep basin will have the effect of accommodating flows from the existing detention basin and school site to the north (on the north side of F Street), providing for the decommissioning of the detention basin to the north, and relieving Arakelian Park of nuisance low flow flooding. An existing pump station at Peach Avenue and 7th Street is also proposed to be replaced, with drainage being allowed to discharge into a proposed 5-acre joint-use detention basin/park to be located on the south side of Peach Avenue and then being pumped to the Arena Canal via a new pumping facility.

5.0 Storm Drainage Infrastructure Plan (continued)

Considerations and Requirements Applicable to New Development

In general, new development projects will be required to provide site-specific or project-specific storm drainage solutions that are consistent with the overall infrastructure approach presented in this Storm Drainage Master Plan. The City may allow for a reasonable degree of flexibility to be incorporated into specific design approaches as a part of achieving effective solutions. Any significant modifications to the elements of this Storm Drainage Master Plan must be approved by the City and will require that a formal "Supplement" be adopted by the City Council.

New development projects will be required to construct elements of the master plan infrastructure that have alignments that pass through them or extend along their project boundaries. The cost of construction of these master plan elements will be offset against other drainage funding requirements applicable to each project (such as drainage impact fees) in an appropriate manner. In some instances, the City may require or may accept the construction of offsite facilities or interim versions of master planned facilities as appropriate.

When new development projects are not located near existing or proposed terminal detention basins or outfalls leading to such terminal detention basins, the City may consider allowing the use of temporary storm drainage basins as an interim drainage solution, subject to appropriate engineering substantiation regarding feasibility. At the discretion of the City, the project developer may be required to maintain temporary storm drainage basins until the storm drainage system for the development project is connected to the City's permanent storm drainage system and the temporary storm drainage basin is filled and decommissioned. In the event that temporary storm drainage basins are approved by the City for individual or groups of development projects, said approvals will only be provided with the understanding or anticipation that a permanent solution that will allow for the decommissioning of applicable temporary storm drainage basins within a reasonable time frame is imminent. The City may require that the developer deposit enough funds in advance with the City to pay for the future decommissioning of a temporary storm drainage basin.

6.0 Joint-Use Opportunities and Design Guidelines

The City has expressed a desire to avoid, where possible, the construction of new detention basins that serve no other function but to store and discharge storm runoff via pumping facilities or percolation. These single function facilities are eyesores and do not integrate well with adjacent development. Some retain water for long periods of time or indefinitely.

The consolidation of major storm water storage into a limited number of large detention basins provides the City with favorable opportunities for creating innovative grading and designs that incorporate recreation elements into the detention facilities. By adding lands allocated to storm water detention with lands allocated to parks, the City may effectively increase its available park land by utilizing functional joint-use design practices within consolidated facilities.

Many communities in the San Joaquin Valley have been able to effectively convert storm water lands to joint-use facilities that augment the community quality of life and aesthetic appeal as opposed to detracting from it.

An optimized joint-use detention basin will serve to:

- Maximize efficient use of land
- Satisfy detention needs for reducing peak flood flows
- Provide water quality treatment
- Expand community recreational opportunities, with minimal “down time” for recreation elements
- Incur reasonable maintenance requirements and costs
- Serve as a functional open space amenity.

There are several fundamental guidelines that should be followed when incorporating recreation elements into storm water detention facilities. They are:

- Low flow must be accommodated in a manner that confines the frequent inundations to areas that will create minimal nuisance or disruption of recreational uses and will characteristically require only limited maintenance.

6.0 Joint-Use Opportunities and Design Guidelines (continued)

- Contouring within detention facilities is recommended to create internal elevation variations (or tiers) that have differing frequencies and depths of inundation and differing flood risk.

- Internal drainage within detention facilities should provide for positive flow across elevated tiers and to the lowest lying areas of the facilities.

- Internal slopes should be flat enough to allow for mowing of turf areas and to allow other routine recreational-related maintenance activities to occur.

- Hydraulic design components should be included as needed (inflow structures, outflow structures, pump stations, sediment basins, spillways, surcharge structures, etc.).

- Other requirements as dictated by jurisdictional regulations and policies, local site conditions or additional functional uses should be followed.

In general, passive recreational elements should be incorporated in portions of detention facilities having the greatest potential flood risk and frequency. Active recreation elements are more suitable in areas within detention facilities having lesser degrees of flood risk and frequency.

Based on preliminary evaluations performed in conjunction with the preparer of the City's current Parks and Recreation Master Plan, the following is a general assessment of the joint-use potential for the major detention facilities serving each Drainage Zone:

Drainage Zone A – Good joint-use opportunity. Integrate with a community park.

Drainage Zone B – Good joint-use opportunity. Integrate with a neighborhood park.

Drainage Zone C – Integrate open fields (soccer fields) as joint-use elements.

Drainage Zones D and E – Could be integrated into a river corridor (along the Merced River), passive parkway or greenway with a trail system.

Drainage Zone F – integrate open fields, similar to Drainage Zone C.

Drainage Zone G and H – Reasonable joint-use opportunity to integrate with park lands.

6.0 Joint-Use Opportunities and Design Guidelines (continued)

Drainage Zone I – There are limited recreational needs to be satisfied at this location, perhaps some neighborhood park uses may be added.

Drainage Zone J – Additional land area is needed to effectively integrate detention with community park facilities.

Drainage Zone K – This will be a large detention basin to be constructed in the future and is located in an area currently designated as an Urban Reserve land use. At such time as further detail is applied to land use planning for this area, the large size of the facility and location along Sultana Drive will provide for joint-use opportunities.

Drainage Zone L – The proposed terminal detention basin is located in a pie-shaped corner formed by the intersection of Highway 99 and Peach Avenue/Liberty Avenue within an area currently designated for a Highway Commercial future land use. The terminal detention basin could be landscaped, including signage, to provide an entry statement for future land development projects in the area.

Also, existing Arakelian Park is a joint-use facility that, until recently, did not function as effectively as desired as low flow frequently entered the active recreation areas and interfered with recreational uses. This condition has been ameliorated by creating and diverting low flow to a new, deep area constructed within an expansion of the park area within the contiguous property to the north.

7.0 Funding Alternatives

General

This SDMP identifies needs, priorities and costs for new and upgraded storm drainage facilities that are required to accommodate new development areas and relieve nuisance conditions in selected existing development areas. New and upgraded storm drainage facilities may consist of:

1. Facilities that serve existing development and are needed to correct existing deficiencies.
2. Facilities that are needed to serve new development.
3. Facilities that serve a combination of existing development and new development, with varying percentages of costs being attributable to accommodating new development and correcting existing deficiencies.

Given the above general scenarios, several approaches are available to the City for consideration regarding funding the desired capital improvements. Funding approaches may potentially consist of one or a combination of the following elements:

- *Development Impact Fees (subject to Mitigation Fee Act known as AB 1600)*
- *Assessment District (1913/15 Act)*
- *Special Tax Districts (Mello Roos Community Facilities District Act of 1982)*
- *Storm Drain Utility Fee (subject to Proposition 218)*

Existing developed areas in the City could fund storm drainage facility improvements through adoption of a storm drain utility fee. This would be subject to the provisions of Proposition 218, the “Right to Vote on Taxes Act” of 1996. New development can fund storm drainage improvements through a combination of development impact fees, assessment districts and special taxes. New development funds new and upgraded facilities, but they are not allowed to fund projects that fix existing deficiencies.

7.0 Funding Alternatives (continued)

Development Impact Fees

To the extent that new development creates a need for new and upgraded storm drainage facilities to accommodate the resultant increase in storm runoff caused by urbanization, the new development that utilizes these facilities will need to pay a fair share towards funding the required upgrades. See Section 8.0, "Impact Fees" for details.

Assessment Districts (1913/15 Act)

The potential exists for the establishment of one or more assessment districts to fund required storm drainage facilities and upgrades, where a common interest is shared by a large, but clearly defined group of constituents. The establishment of an assessment district requires a finding of direct and special benefit to the parcels being assessed, which shall be set forth in an Engineer's Report. Two public hearings and a mailed ballot are also required to establish an assessment district. If an assessment district is selected as a preferred financing mechanism, the SDMP may be utilized as a resource to assist in making the benefit findings required pursuant to Proposition 218 and preparing an Engineer's Report as part of formation of the district.

Special Tax – Mello Roos Community Facilities District (Act of 1982)

If the City determines that more flexibility is needed in the allocation of costs and funding burdens, a Mello-Roos Community Facilities District (CFD) may be used instead of an assessment district. The Mello-Roos law does not require a finding of benefit for allocating costs among properties within the CFD, and the special tax can be spread in any "reasonable manner" according to the law. If a CFD is determined to be a more feasible funding tool, it will be necessary to prepare a Rate and Method of Apportionment of Special Tax for the CFD as a part of CFD formation and bond issuance. It does require a 2/3 approval of registered voters. However, if less than 12 registered voters reside in the area, which is typical of undeveloped land, the special tax can be implemented with a property owner vote.

7.0 Funding Alternatives (continued)

Storm Drainage Utility Fee Program

The City may initiate the steps that are required to implement a City-wide “storm drainage utility fee” program for the purpose of funding street sweeping, leaf collection, system maintenance, storm drain repairs, vegetation removal, and capital improvements to improve the existing storm drainage deficiencies. Many of these services are needed to meet the requirements of the Federal Clean Water Act. The proposed fees may include an operating component and a capital component. The process of establishing a storm drainage utility fee program will be subject to Proposition 218 which includes public hearings and a public election.

8.0 Impact Fees

General

To the extent that new development creates a need for new and upgraded storm drainage facilities to accommodate the resultant increase in storm runoff caused by urbanization, the new development that utilizes these facilities will need to pay a fair share towards funding the required upgrades. This can be accomplished by requiring new development to pay development impact fees in conformance with AB 1600 (Mitigation Fee Act).

Impact Fee Calculation Procedure

Storm drainage impact fees have been calculated for new development within the SDMP study area using data and calculations represented on Tables 9A and 9B. The storm drainage impact fees proposed to be applied to various land use designations are listed on Table 9B.

The approach to determining appropriate impact fees as presented herein utilized representative land use and infrastructure cost data pertinent to Drainage Zones A, B, C, D, F, G, H, I, K, and L. These Drainage Zones were considered to have prevailing conditions with regard to levels of existing development and extent of properties served by proposed storm drainage infrastructure to be representative of impact fee requirements for the overall SDMP study area. Given that the majority of the proposed River Ranch project development in Drainage Zone D will develop its own storm drainage infrastructure plan, only the areas south of Vinewood Avenue and their proportional storm drainage infrastructure needs were incorporated into the contributing data for this Drainage Zone. It is the intent that the City will adopt a single storm drainage impact fee structure that may be applied to the overall SDMP study area, based on the calculations performed for these representative drainage zones.

Drainage Zones E, J and CC were not included in the representative drainage zones utilized to calculate storm drainage impact fees for the following reasons:

- Drainage Zone E is substantially Foster Farms property, and it is assumed that Foster Farms and contiguous properties will continue to prepare their own drainage facility plans for submittal to the City for review and approval as a part of the development review process.

- Drainage Zones J and CC are already substantially developed.

8.0 Impact Fees (continued)

Storm drainage impact fees have been calculated by allocating the fair share of the total storm drainage infrastructure costs applicable to the evaluated drainage zones to their various proposed (and existing) land uses and areas of coverage, based on the proportional runoff production characteristics for the different land use categories. This has been accomplished using a "percent impervious" approach that applies the percent impervious weighting value shown on Table 1 to each land use. The percent impervious approach will assign a lesser funding requirement on a per acre basis to a lower runoff producing land use (such as Low-Density Residential) than the requirement that will be applied to a greater runoff producing land use (such as Neighborhood Commercial). The funding responsibility for the total areas of each proposed land use was determined by weighting its proportional overall area by its applicable percent impervious value. This total funding responsibility for the land use category was then divided by the total acreage for the land use category to yield a funding responsibility value (or impact fee value) for the land use category on a per acre basis.

The per acre fair-share funding responsibility for the residential development land uses was subsequently divided by the following average development densities, provided by the City, to determine an appropriate impact fee on a "per dwelling unit" basis:

Residential Land Use Type	Average Density
Low-Density Residential	4.5 dwelling units/acre
Medium-Density Residential	9 dwelling units/acre
High-Density Residential	20 dwelling units/acre

Calculated storm drainage impact fees are depicted on Table 9B. The storm drainage impact fees that are collected by the City from new development projects may be utilized to fund the storm drainage upgrades represented on the storm drainage infrastructure plan contained in this SDMP. In some Drainage Zones, elements of proposed storm drainage infrastructure plan are intended to solve existing deficiencies that are not attributable to new development, and funding for these facility upgrades will need to come from sources other than impact fees. Also, though existing development was included in the impact fee calculations (to the extent present in some of the representative drainage zones), it will be necessary to fund some of the facility upgrades represented in this SDMP by sources other than impact fees, as existing development will not be required to pay impact fees. The actual timing and responsibility for construction of storm drainage facilities will be determined by the City from time to time and in conjunction with approvals of individual development projects.

9.0 Priority Projects

The following is an initial listing of storm drainage infrastructure improvement projects that the City has considered to be priorities as of the date of completion of this SDMP. The order in which these projects are listed does not represent any order of importance or urgency. This list may not include all of the projects of imminent importance and will be subject to change in the future.

1. Arekelian Park/Detention Basin expansion (recently completed)

2. Bridgeport Joint-Use Detention Basin/Detention Basin C and elimination of Monte Cristo Detention Ponds (under constriction)

3. Initial Phase of Detention Basin A1 and construction of 72" SD trunk line south of Magnolia Avenue (within the proposed Ranchwood Development); Required storage for Initial Phase of Detention Basin A1 to be determined based on near term projection of development for which storage provision will be needed

4. Storm drainage infrastructure needed to serve initial phases of River Ranch project development. Infrastructure requirements will be established by the City based on near term projection of development for which infrastructure, including detention storage, will be needed

5. 5-Acre Joint-Use Park/Detention Basin and pump station upgrade at Peach Avenue and 7th Street

6. Detention Basin F, elimination of existing detention pond in Harvest Manor development, and 42" SD trunk line connection to Detention Basin F

7. New storm drains in southwest quadrant of Drainage Zone F to facilitate elimination of storm drain cross-connections to the City's sanitary sewer facilities

8. Pump station and force main to Garibaldi Lateral from existing detention pond at Vinewood Avenue and Robin Avenue

9. Expansion of Detention Basin J and improvement of joint-use function

10. Conversion of drainage pond serving Vintage West Nos. 4 and 5 to a joint-use recreational facility

10.0 References

1. City of Livingston Storm Drain Collection System Study and Master Plan; Lew-Garcia-Davis; December 1992.

2. City of Livingston Improvement Standards; City of Livingston; August 1994.

3. General Plan, Livingston, California; Quad Knoph; December 1999 and General Plan Update; Pacific Municipal Consultants; May 2006.

4. City of Livingston Design Guide; City of Livingston; March 16, 2004.

5. Urban Hydrology for Small Watersheds, TR-55; Natural Resources Conservation Service; June 1986.

6. Soil Survey Merced Area, California; U.S. Department of Agriculture Soil Conservation Service, March 1991.

7. Storm Water Management Program, Merced Storm Water Group; Stantec Consulting Inc.; March 1, 2004.

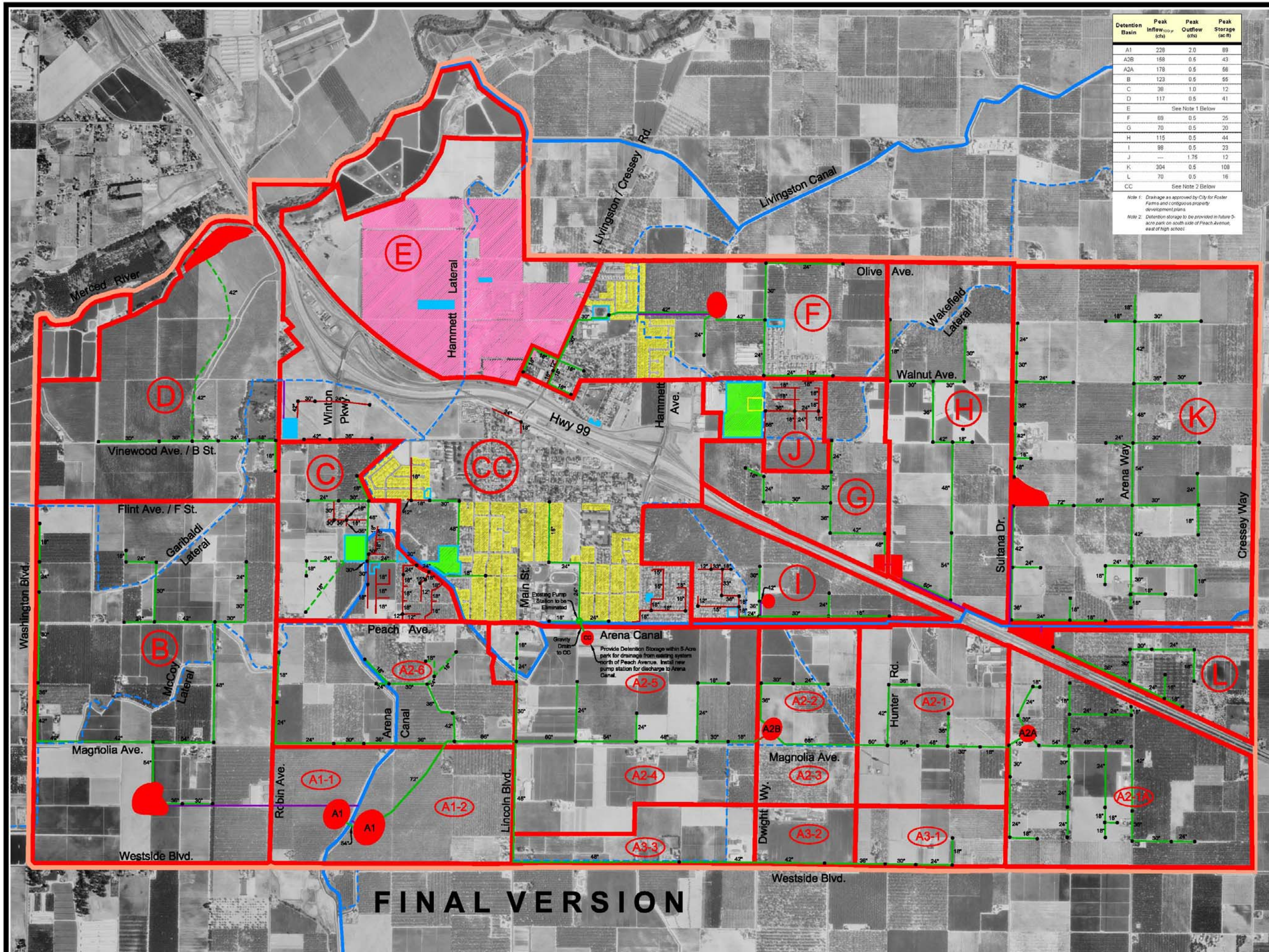
8. Manual of Standards for Design of Joint-Use Stormwater Detention Facilities, Volume 4, City/County Drainage Manual; Cella Barr Associates; January 1994.

List of
Exhibits

Storm Water
Consulting Inc.

Exhibit A

Map Depicting Hydrologic Features, Drainage Zones and Proposed Infrastructure Plan



Detention Basin	Peak Inflow 100-yr (cfs)	Peak Outflow (cfs)	Peak Storage (ac ft)
A1	228	2.0	89
A2B	158	0.5	43
A2A	178	0.5	56
B	123	0.5	55
C	38	1.0	12
D	117	0.5	41
E	See Note 1 Below		
F	69	0.5	25
G	70	0.5	20
H	115	0.5	44
I	98	0.5	23
J	---	1.75	12
K	304	0.5	108
L	70	0.5	16
CC	See Note 2 Below		

Note 1: Drainage as approved by City for Foster Farms and contiguous property development plans.

Note 2: Detention storage to be provided in future 5-acre park on south side of Peach Avenue, east of high school.

Legend

- Master Plan Study Boundary
- Drainage Zone Boundary
- Proposed Detention Basin (surface area & location to be determined)
- Existing Detention Basin
- Existing Detention Basin to be Eliminated
- Existing Detention Basin to be Retrofitted for Joint-Use
- Existing Areas Covered by MID Agreements (Merced Irrigation District)
- Foster Farms' Property
- MID Canal
- MID Lateral
- Proposed Storm Drain
- Proposed Storm Drain thru Planned Dev. Area (alignment to be determined)
- Proposed Force Main from Pump Station
- Existing Storm Drain (all existing facilities not shown due to limited available records)

Note: Existing Facilities Depicted Hereon Are Applicable to 2004.

Prepared by

Storm Water Consulting Inc.

and

Harris & Associates

0.5" 0" 0.5" 1"

1,000' 0' 1,000' 2,000'

SCALE: 1" = 2,000'

W:\Livingston, City of\AutoCAD Dwgs\Master Plan AutoCAD-rev.dwg
Last Modified: 6/21/07

Exhibit A1

Enlargement of Drainage Zone A

Scale: 1" = 1,500'

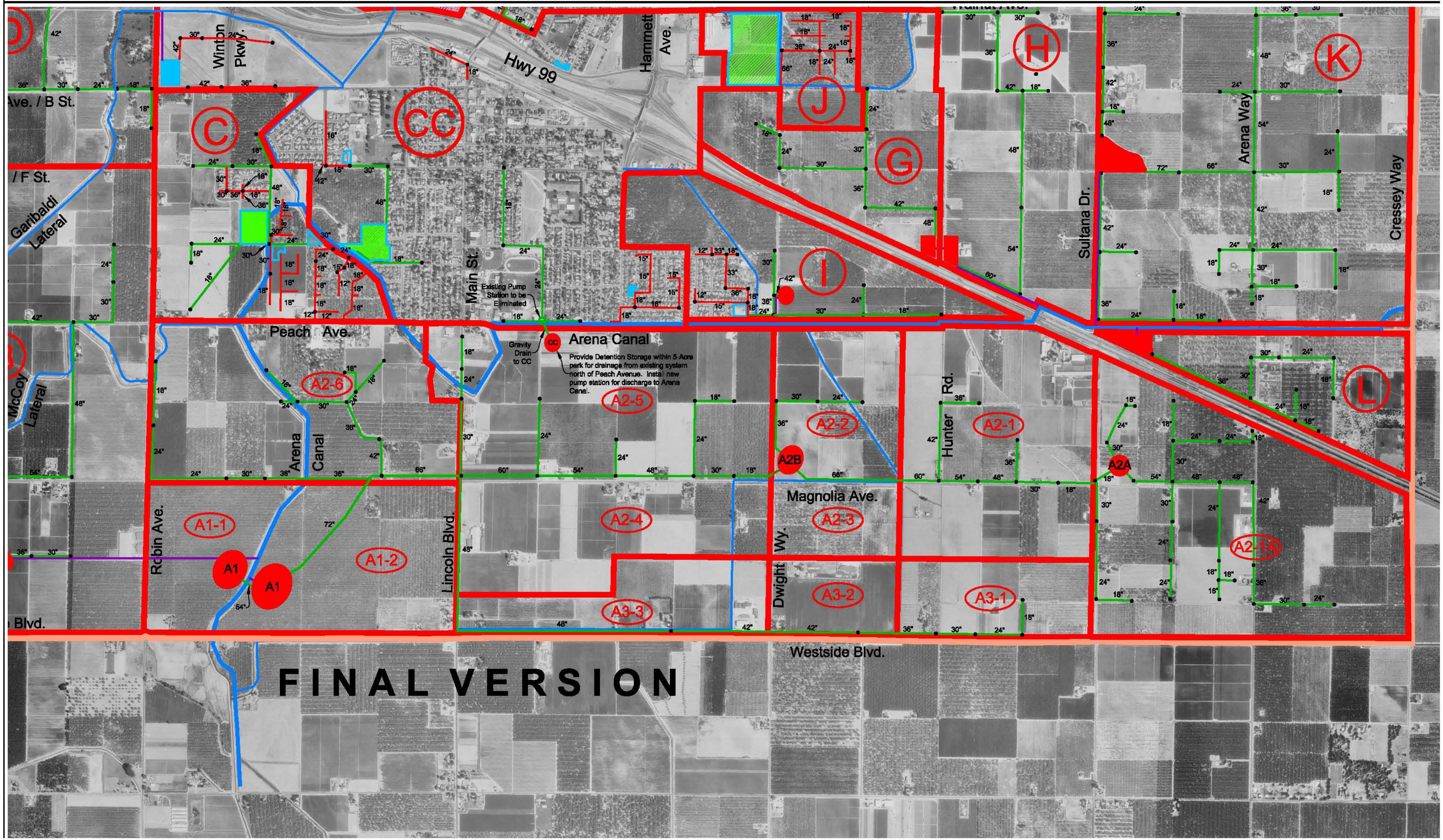


Exhibit A2

Enlargement of Drainage Zone B

Scale: 1" = 1,000'

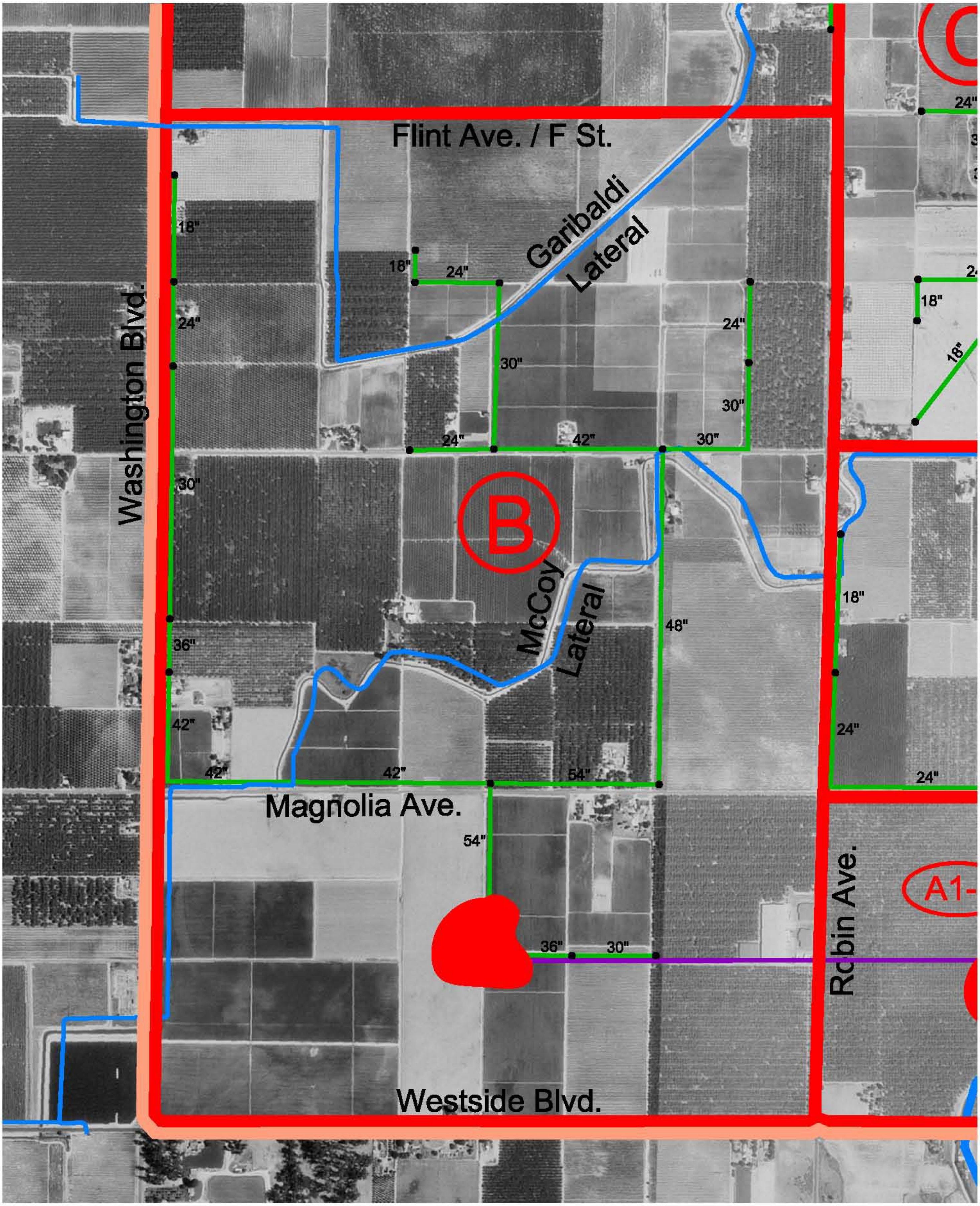


Exhibit A3
Enlargement of Drainage Zone C
Scale: 1" = 1,000'

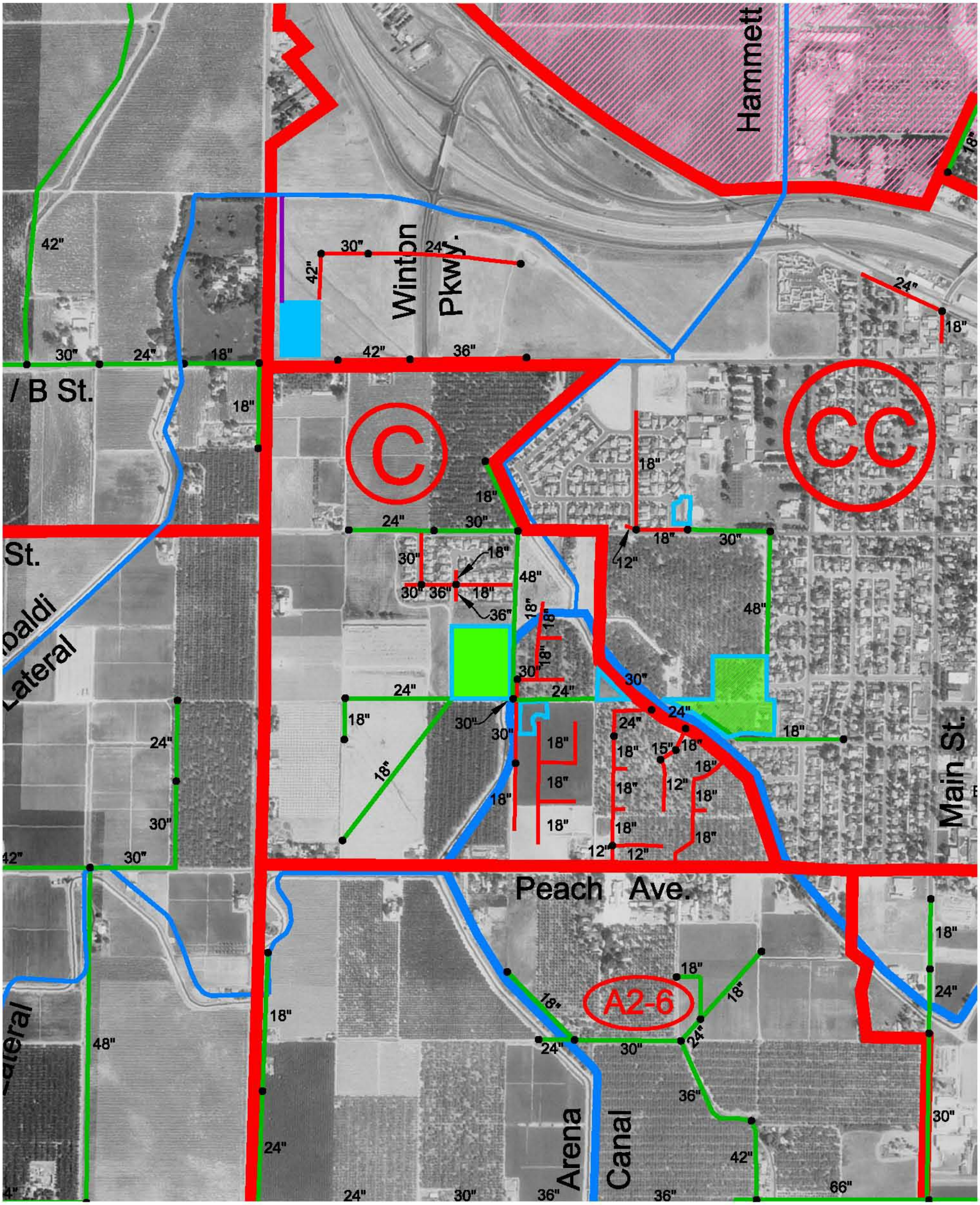


Exhibit A4

Enlargement of Drainage Zone D

Scale: 1" = 1,000'

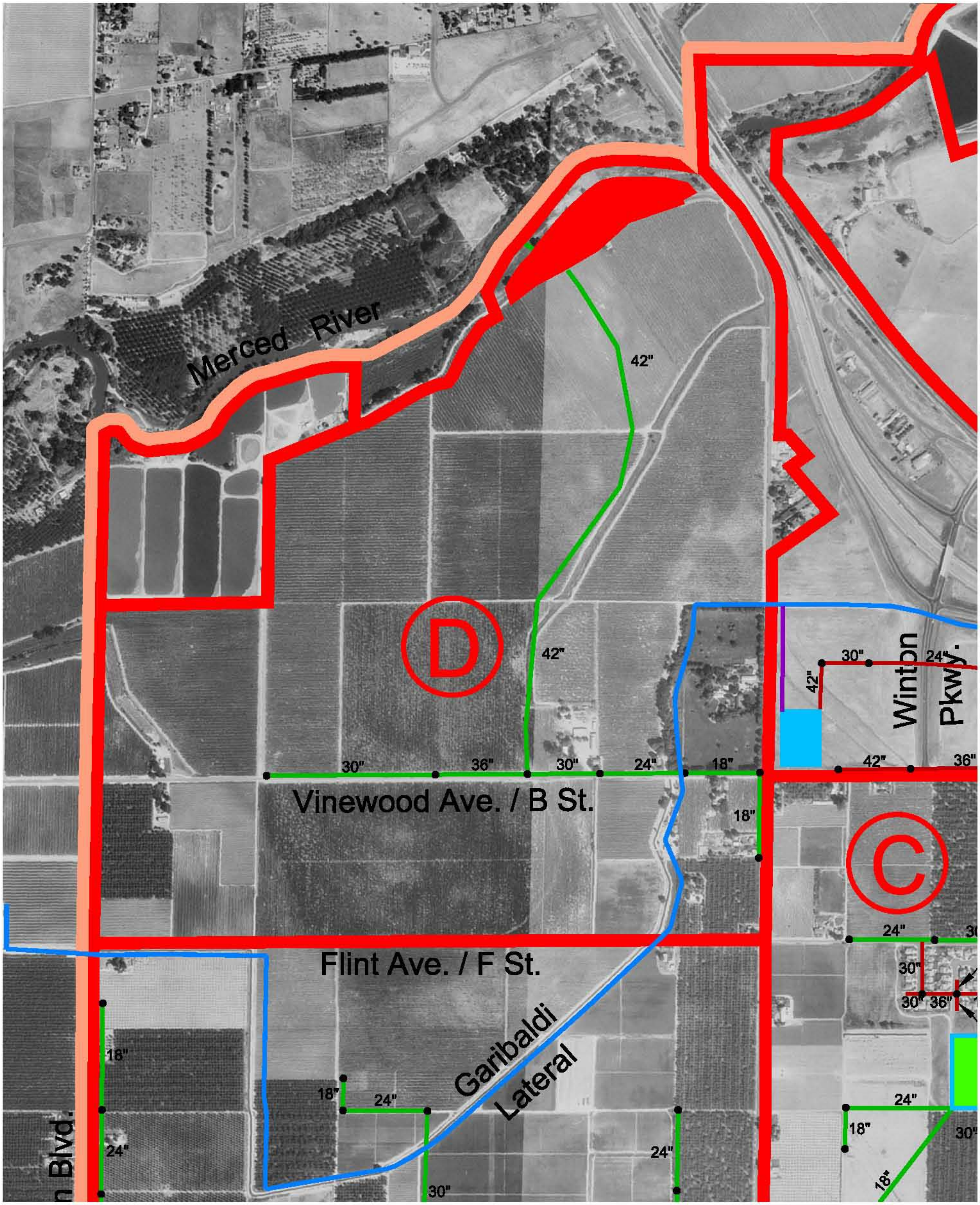


Exhibit A5

Enlargement of Drainage Zone E

Scale: 1" = 1,000'

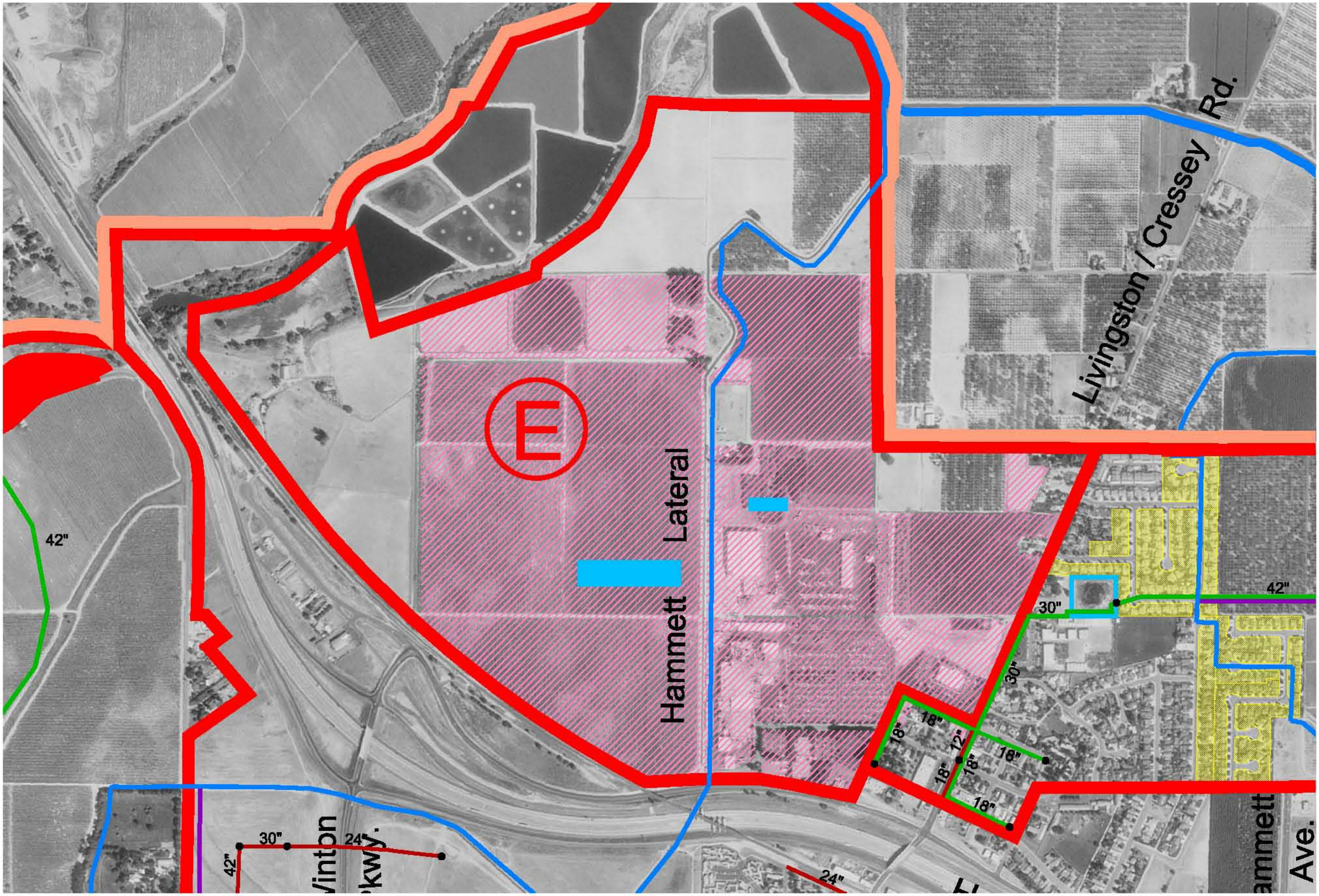


Exhibit A6

Enlargement of Drainage Zone F

Scale: 1" = 1,000'

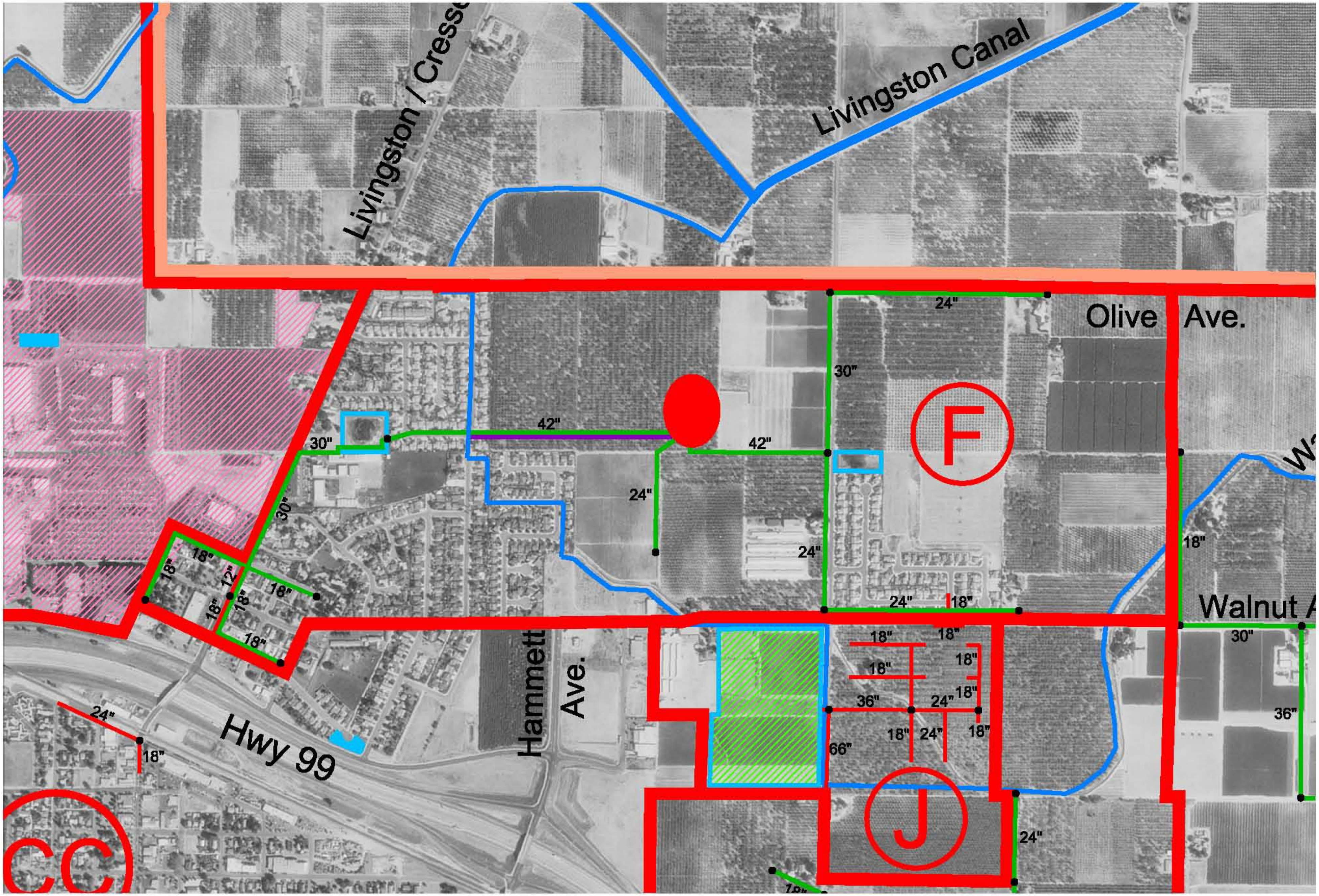


Exhibit A7
Enlargement of Drainage Zone G
Scale: 1" = 1,000'

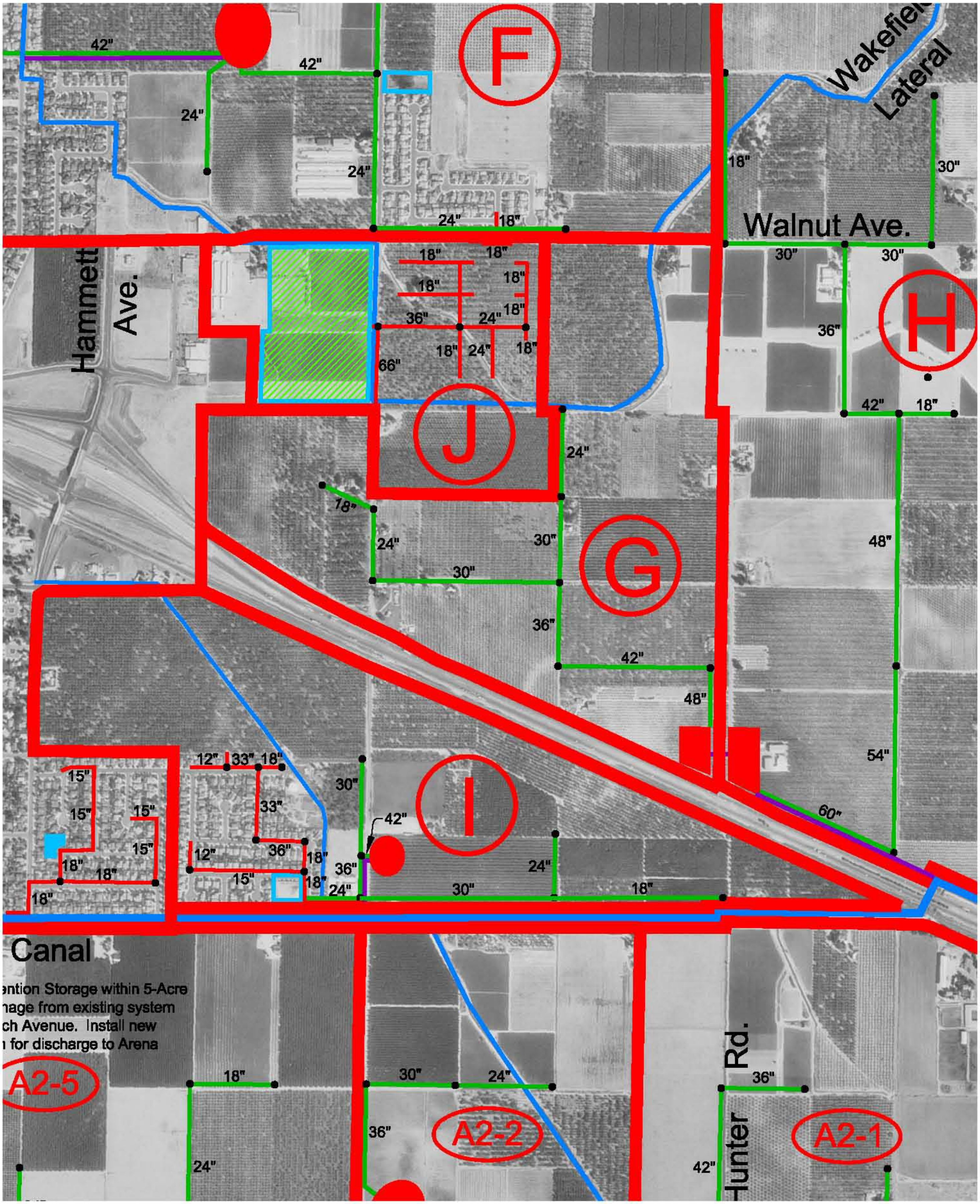


Exhibit A8

Enlargement of Drainage Zone H

Scale: 1" = 1,200'

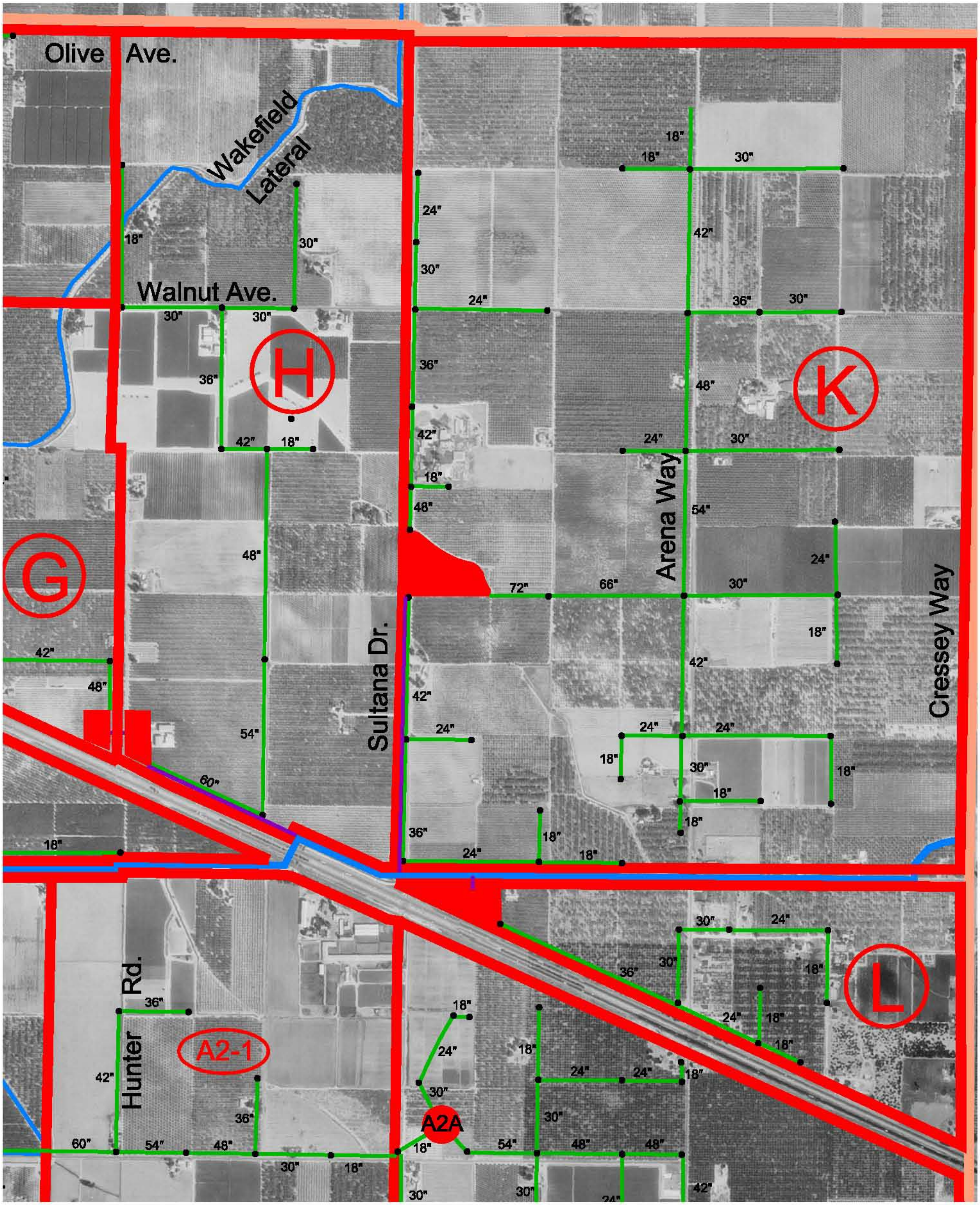


Exhibit A9

Enlargement of Drainage Zone I

Scale: 1" = 1,000'

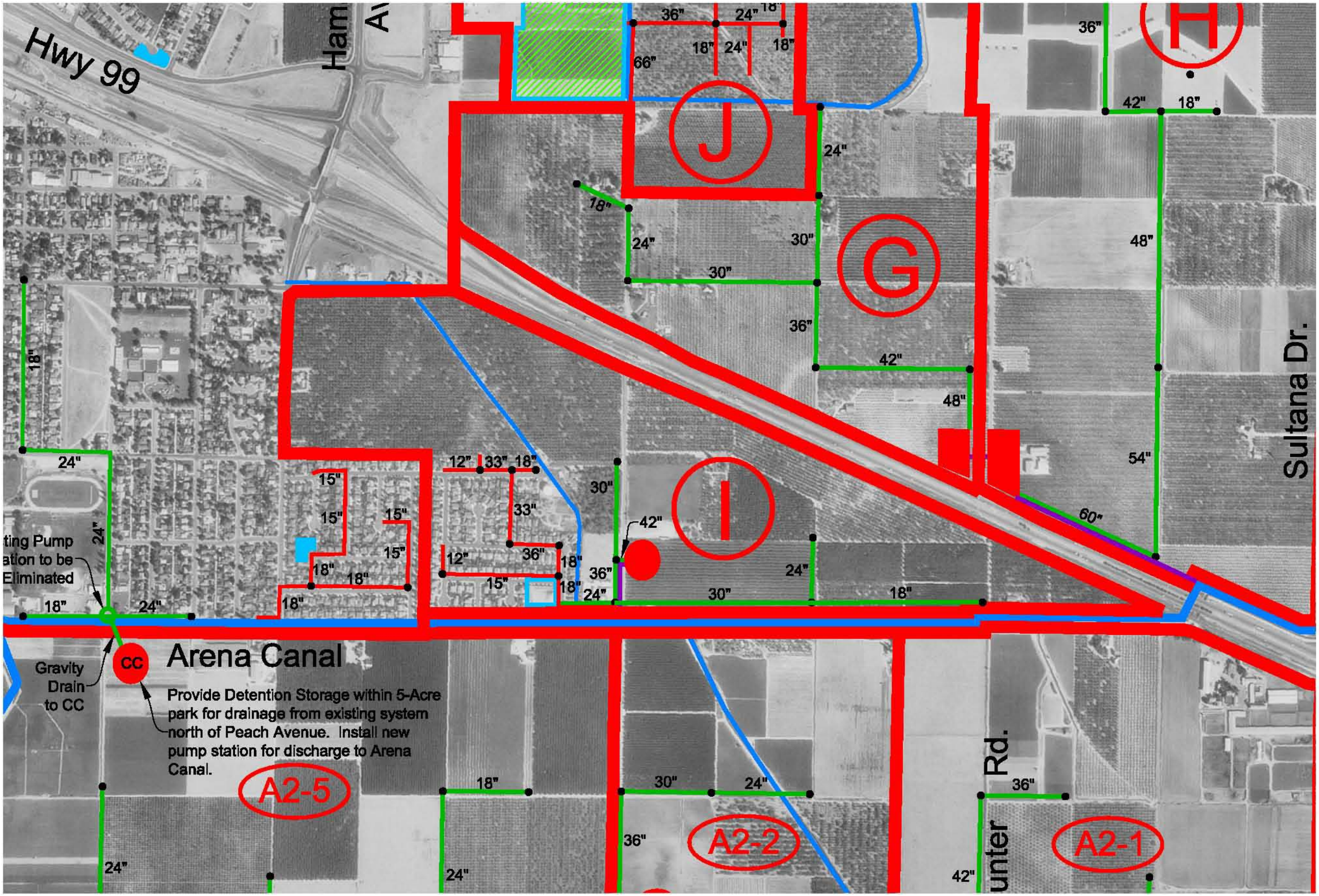


Exhibit A10
Enlargement of Drainage Zone J
Scale: 1" = 1,000'

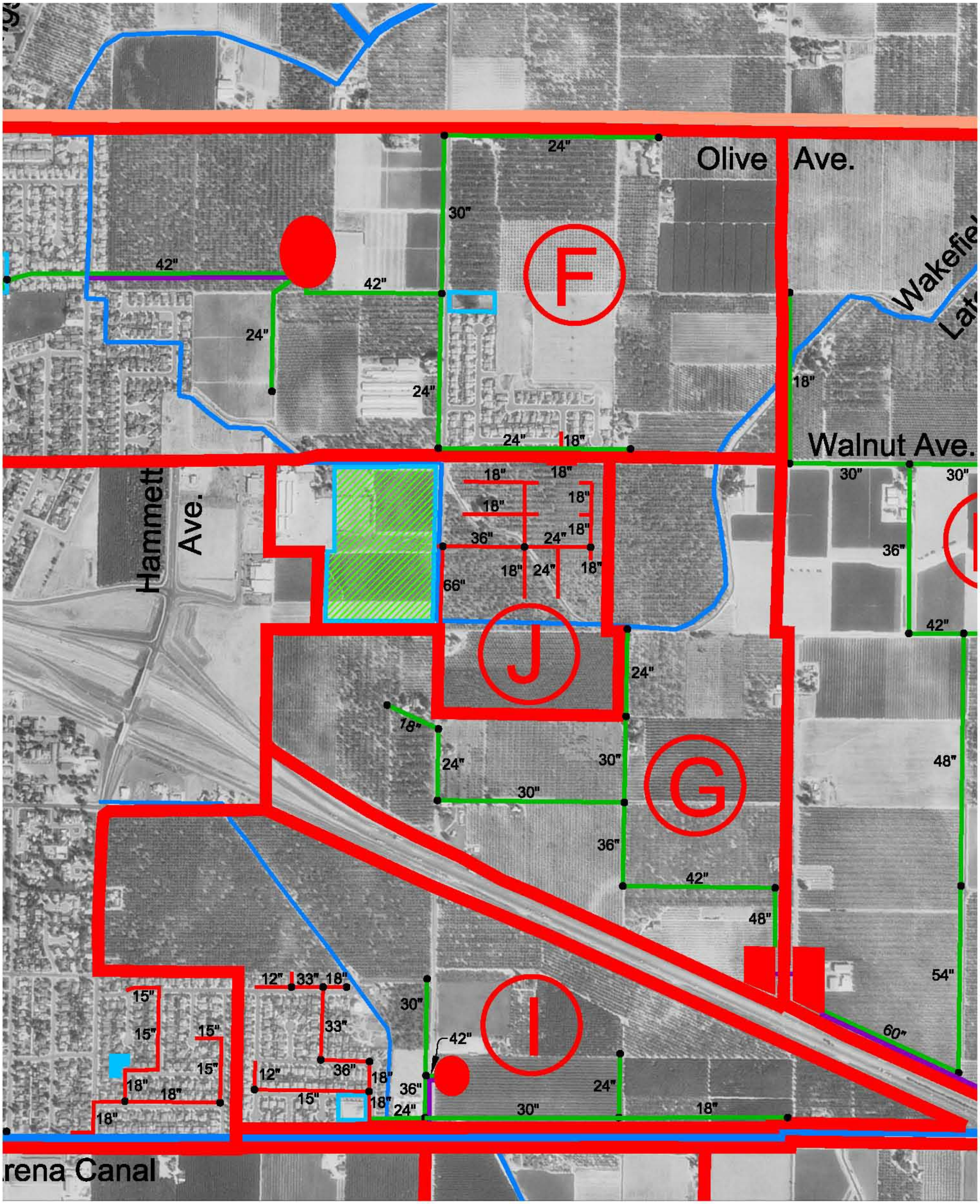


Exhibit A11
Enlargement of Drainage Zone K
Scale: 1" = 1,000'

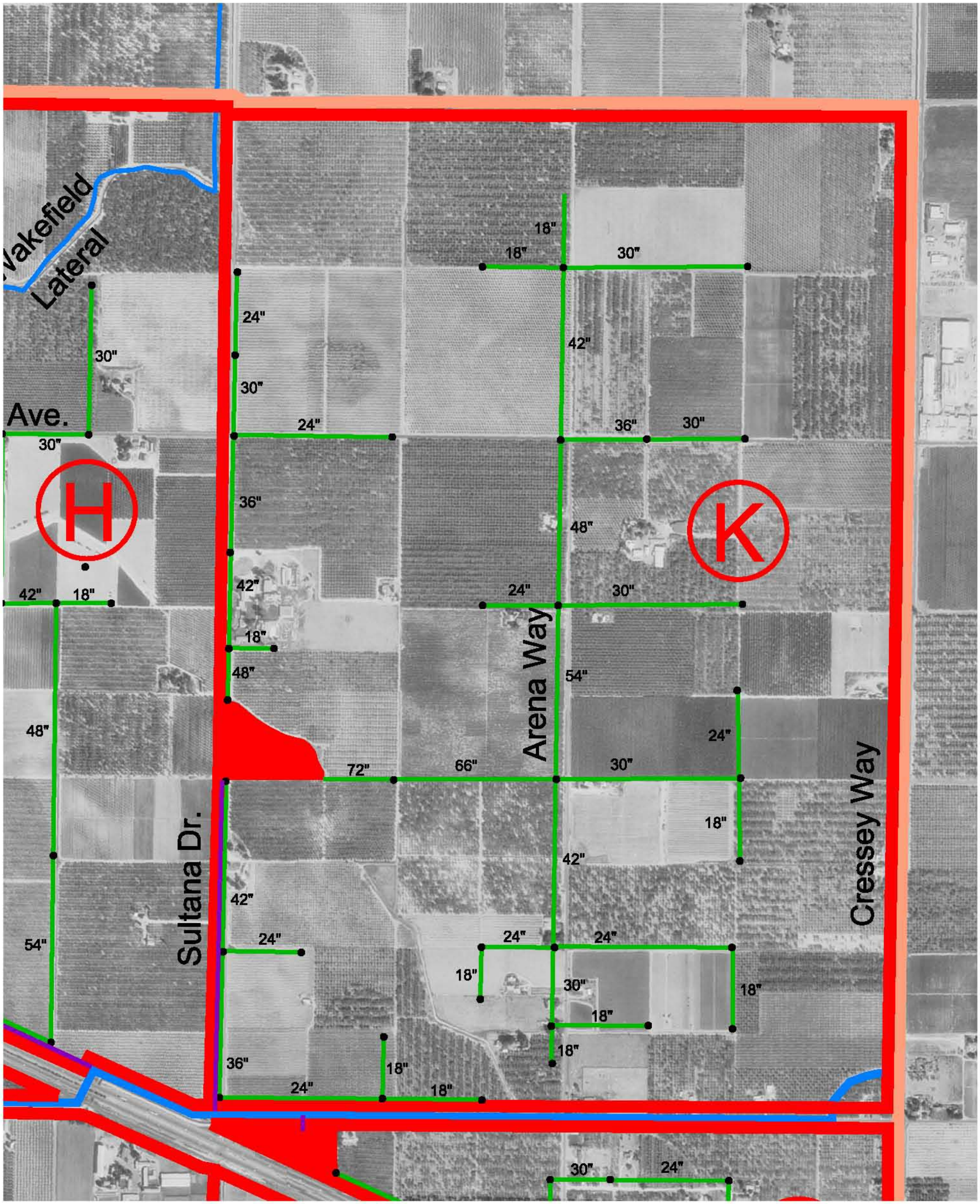


Exhibit A12

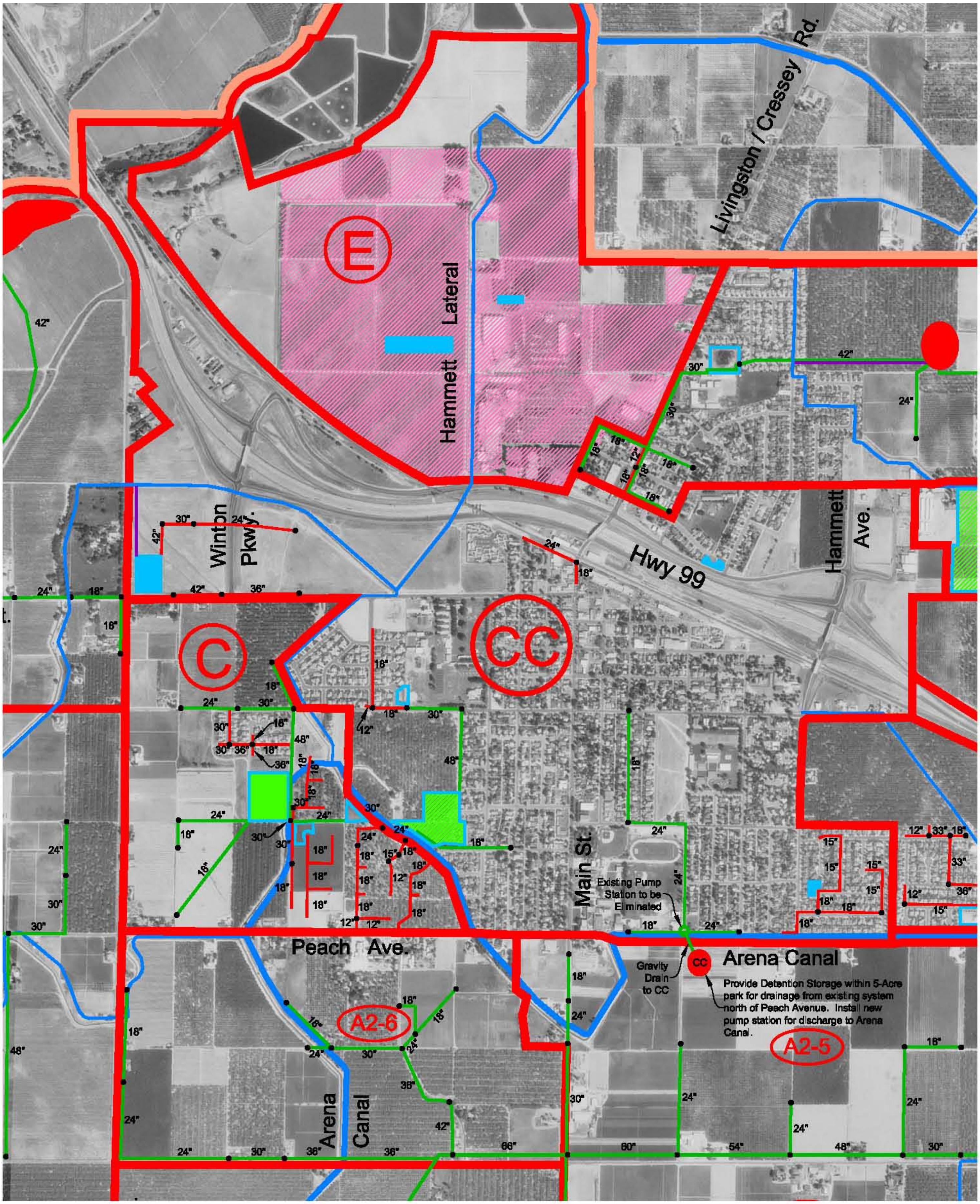
Enlargement of Drainage Zone L

Scale: 1" = 1,000'

Exhibit A13

Enlargement of Drainage Zone CC

Scale: 1" = 1,500'



List of Tables

Table 1

Impervious Cover Values for Different Land Uses

Land Use Type	Percent Impervious Cover
Low-Density Residential	40%
Medium-Density Residential	55%
High-Density Residential	65%
All Commercial Designations*	85%
Mixed Use	65%
Limited Industrial/Light Industrial	85%
General Industrial	90%
Schools	30%
Parks/Open Space	15%
Conservation Reserve	15%
Urban Reserve	55%

*Includes Neighborhood Commercial, Office, Service Commercial, Highway Commercial, and Community Commercial

Table 2
Table of Curve Numbers by Drainage Zone

Drainage Zone	Drainage Zone Area (ac)	Drainage Zone Area (sq mi)	Land Use Description	Percentage of Land Use Type for Drainage Zone	Soil Type	% Pervious	Associated Curve No.	% Impervious	Associated Curve No.	Weighted Curve No. for Land Use Type	Weighted Curve No. for Drainage Zone
A1-1	113.4	0.177	Low-Density Residential	95.59%	A	60.0%	49	40.0%	98	68.6	69.6
			Neighborhood Commercial	4.41%	A	15.0%	49	85.0%	98	90.7	
A1-2	203.1	0.317	Low-Density Residential	76.82%	A	60.0%	49	40.0%	98	68.6	69.7
			Community Commercial	9.29%	A	15.0%	49	85.0%	98	90.7	
			Parks/Open Space	5.66%	A	85.0%	49	15.0%	98	56.4	
			Public Facilities (school site)	7.58%	A	70.0%	49	30.0%	98	63.7	
			Low-Density Residential	0.65%	C	60.0%	79	40.0%	98	86.6	
A2-1A	470.0	0.734	Urban Reserve	21.30%	A	45.0%	49	55.0%	98	76.0	84.8
			Service Commercial	4.25%	B	15.0%	69	85.0%	98	93.7	
			Highway Commercial	29.79%	B	15.0%	69	85.0%	98	93.7	
			Conservation Reserve	10.64%	B	85.0%	69	15.0%	98	73.4	
			Urban Reserve	34.02%	B	45.0%	69	55.0%	98	85.0	
A2-1	287.8	0.450	Low-Density Residential	13.08%	A	60.0%	49	40.0%	98	68.6	82.3
			Medium-Density Residential	11.21%	A	45.0%	49	55.0%	98	76.0	
			Service Commercial	3.47%	A	15.0%	49	85.0%	98	90.7	
			Limited Industrial	13.08%	A	15.0%	49	85.0%	98	90.7	
			Highway Commercial	13.37%	A	15.0%	49	85.0%	98	90.7	
			Urban Reserve	22.57%	A	45.0%	49	55.0%	98	76.0	
			Medium-Density Residential	1.87%	B	45.0%	69	55.0%	98	85.0	
			Service Commercial	3.47%	B	15.0%	69	85.0%	98	93.7	
			Highway Commercial	5.73%	B	15.0%	69	85.0%	98	93.7	
			Urban Reserve	12.15%	B	45.0%	69	55.0%	98	85.0	
A2-2	128.5	0.201	Low-Density Residential	80.10%	A	60.0%	49	40.0%	98	68.6	71.2
			Medium-Density Residential	11.67%	A	45.0%	49	55.0%	98	76.0	
			Neighborhood Commercial	3.12%	A	15.0%	49	85.0%	98	90.7	
			Low-Density Residential	2.00%	B	60.0%	69	40.0%	98	80.6	
			Neighborhood Commercial	3.11%	B	15.0%	69	85.0%	98	93.7	

Table 2
Table of Curve Numbers by Drainage Zone

Drainage Zone	Drainage Zone Area (ac)	Drainage Zone Area (sq mi)	Land Use Description	Percentage of Land Use Type for Drainage Zone	Soil Type	% Pervious	Associated Curve No.	% Impervious	Associated Curve No.	Weighted Curve No. for Land Use Type	Weighted Curve No. for Drainage Zone
A2-3	64.8	0.101	Urban Reserve	99.41%	A	45.0%	49	55.0%	98	76.0	76.1
			Urban Reserve	0.59%	B	45.0%	69	55.0%	98	85.0	
A2-4	206.0	0.322	Low-Density Residential	27.23%	A	60.0%	49	40.0%	98	68.6	76.5
			Medium-Density Residential	19.81%	A	45.0%	49	55.0%	98	76.0	
			Neighborhood Commercial	4.95%	A	15.0%	49	85.0%	98	90.7	
			Low-Density Residential	4.81%	C	60.0%	79	40.0%	98	86.6	
			Medium-Density Residential	3.49%	C	45.0%	79	55.0%	98	89.5	
			Neighborhood Commercial	0.87%	C	15.0%	79	85.0%	98	95.2	
			Urban Reserve	33.01%	A	45.0%	49	55.0%	98	76.0	
			Urban Reserve	2.43%	B	45.0%	69	55.0%	98	85.0	
			Urban Reserve	3.40%	C	45.0%	79	55.0%	98	89.5	
A2-5	316.6	0.495	Low-Density Residential	75.77%	A	60.0%	49	40.0%	98	68.6	71.2
			Medium-Density Residential	2.17%	A	45.0%	49	55.0%	98	76.0	
			High-Density Residential	6.11%	A	35.0%	49	65.0%	98	80.9	
			Neighborhood Commercial	3.22%	A	15.0%	49	85.0%	98	90.7	
			Parks/Open Space	2.27%	A	85.0%	49	15.0%	98	56.4	
			Public Facilities (school site)	2.17%	A	70.0%	49	30.0%	98	63.7	
			Low-Density Residential	3.61%	B	60.0%	69	40.0%	98	80.6	
			Low-Density Residential	2.34%	C	60.0%	79	40.0%	98	86.6	
			High-Density Residential	2.34%	C	35.0%	79	65.0%	98	91.4	
A2-6	299.5	0.468	Low-Density Residential	77.99%	A	60.0%	49	40.0%	98	68.6	72.0
			Medium-Density Residential	8.71%	A	45.0%	49	55.0%	98	76.0	
			High-Density Residential	3.39%	A	35.0%	49	65.0%	98	80.9	
			Neighborhood Commercial	3.57%	A	15.0%	49	85.0%	98	90.7	
			Medium-Density Residential	2.34%	C	45.0%	79	55.0%	98	89.5	
			Neighborhood Commercial	4.00%	C	15.0%	79	85.0%	98	95.2	
A3-1	97.5	0.152	Urban Reserve	68.62%	A	45.0%	49	55.0%	98	76.0	78.8
			Urban Reserve	31.38%	B	45.0%	69	55.0%	98	85.0	
A3-2	64.3	0.100	Urban Reserve	100.00%	A	45.0%	49	55.0%	98	76.0	76.0

Table 2
Table of Curve Numbers by Drainage Zone

Drainage Zone	Drainage Zone Area (ac)	Drainage Zone Area (sq mi)	Land Use Description	Percentage of Land Use Type for Drainage Zone	Soil Type	% Pervious	Associated Curve No.	% Impervious	Associated Curve No.	Weighted Curve No. for Land Use Type	Weighted Curve No. for Drainage Zone
A3-3	116.1	0.181	Low-Density Residential	25.84%	A	60.0%	49	40.0%	98	68.6	75.7
			Urban Reserve	62.45%	A	45.0%	49	55.0%	98	76.0	
			Urban Reserve	11.71%	C	45.0%	79	55.0%	98	89.5	
B	938.8	1.467	Low-Density Residential	59.54%	A	60.0%	49	40.0%	98	68.6	71.8
			Medium-Density Residential	4.73%	A	45.0%	49	55.0%	98	76.0	
			Community Commercial	0.99%	A	15.0%	49	85.0%	98	90.7	
			Public Facilities (school site)	2.03%	A	70.0%	49	30.0%	98	63.7	
			Urban Reserve	30.15%	A	45.0%	49	55.0%	98	76.0	
			Low-Density Residential	1.15%	C	60.0%	79	40.0%	98	86.6	
			Medium-Density Residential	0.43%	C	45.0%	79	55.0%	98	89.5	
			Urban Reserve	0.98%	C	45.0%	79	55.0%	98	89.5	
C	250.1	0.391	Parks/Open Space	1.76%	A	85.0%	49	15.0%	98	56.4	70.4
			Public Facility	13.76%	A	70.0%	49	30.0%	98	63.7	
			Low-Density Residential	67.61%	A	60.0%	49	40.0%	98	68.6	
			Medium-Density Residential	6.16%	A	45.0%	49	55.0%	98	76.0	
			Highway Commercial	7.70%	A	15.0%	49	85.0%	98	90.7	
			Low-Density Residential	3.01%	C	60.0%	79	40.0%	98	86.6	
D	443.9	0.694	Low-Density Residential	14.24%	A	60.0%	49	40.0%	98	68.6	79.7
			Medium-Density Residential	10.59%	A	45.0%	49	55.0%	98	76.0	
			High-Density Residential	1.58%	A	35.0%	49	65.0%	98	80.9	
			Community Commercial	4.39%	A	15.0%	49	85.0%	98	90.7	
			Service Commercial	6.31%	A	15.0%	49	85.0%	98	90.7	
			Public Facility	1.35%	A	70.0%	49	30.0%	98	63.7	
			Parks/Open Space	6.10%	A	85.0%	49	15.0%	98	56.4	
			Low-Density Residential	10.28%	B	60.0%	69	40.0%	98	80.6	
			Parks/Open Space	6.10%	B	85.0%	69	15.0%	98	73.4	
			Low-Density Residential	37.48%	C	60.0%	79	40.0%	98	86.6	
			Medium-Density Residential	0.68%	C	45.0%	79	55.0%	98	89.5	
			Public Facility	0.90%	C	70.0%	79	30.0%	98	84.7	

Table 2
Table of Curve Numbers by Drainage Zone

Drainage Zone	Drainage Zone Area (ac)	Drainage Zone Area (sq mi)	Land Use Description	Percentage of Land Use Type for Drainage Zone	Soil Type	% Pervious	Associated Curve No.	% Impervious	Associated Curve No.	Weighted Curve No. for Land Use Type	Weighted Curve No. for Drainage Zone
E	473.8	0.740	Industrial	98.48%	A	10.0%	49	90.0%	98	93.1	92.8
			Medium-Density Residential	1.52%	A	45.0%	49	55.0%	98	76.0	
F	414.2	0.647	Low-Density Residential	65.11%	A	60.0%	49	40.0%	98	68.6	72.5
			Medium-Density Residential	2.36%	A	45.0%	49	55.0%	98	76.0	
			High-Density Residential	5.10%	A	35.0%	49	65.0%	98	80.9	
			Highway Commercial	7.43%	A	15.0%	49	85.0%	98	90.7	
			Community Commercial	1.44%	A	15.0%	49	85.0%	98	90.7	
			Urban Reserve	14.44%	A	45.0%	49	55.0%	98	76.0	
			Parks/Open Space	2.10%	A	85.0%	49	15.0%	98	56.4	
			Urban Reserve	2.02%	B	45.0%	69	55.0%	98	85.0	
G	205.8	0.322	Low-Density Residential	19.44%	A	60.0%	49	40.0%	98	68.6	81.0
			High-Density Residential	7.78%	A	35.0%	49	65.0%	98	80.9	
			Service Commercial	53.34%	A	15.0%	49	85.0%	98	90.7	
			Public Facilities	14.89%	A	70.0%	49	30.0%	98	63.7	
			Public Facilities	4.55%	B	70.0%	69	30.0%	98	77.7	
H	447.6	0.699	Low-Density Residential	1.34%	A	60.0%	49	40.0%	98	68.6	81.1
			Highway Commercial	5.75%	A	15.0%	49	85.0%	98	90.7	
			Urban Reserve	60.21%	A	45.0%	49	55.0%	98	76.0	
			Low-Density Residential	3.13%	B	60.0%	69	40.0%	98	80.6	
			Highway Commercial	17.26%	B	15.0%	69	85.0%	98	93.7	
			Urban Reserve	12.31%	B	45.0%	69	55.0%	98	85.0	
I	200.8	0.314	Low-Density Residential	27.71%	A	60.0%	49	40.0%	98	68.6	84.5
			Service Commercial	34.26%	A	15.0%	49	85.0%	98	90.7	
			Limited Industrial	31.87%	A	15.0%	49	85.0%	98	90.7	
			Low-Density Residential	1.91%	B	60.0%	69	40.0%	98	80.6	
			Service Commercial	2.00%	B	15.0%	69	85.0%	98	93.7	
			Service Commercial	2.25%	C	15.0%	79	85.0%	98	95.2	

Table 2
Table of Curve Numbers by Drainage Zone

Drainage Zone	Drainage Zone Area (ac)	Drainage Zone Area (sq mi)	Land Use Description	Percentage of Land Use Type for Drainage Zone	Soil Type	% Pervious	Associated Curve No.	% Impervious	Associated Curve No.	Weighted Curve No. for Land Use Type	Weighted Curve No. for Drainage Zone
J	98.2	0.153	Low-Density Residential	62.37%	A	60.0%	49	40.0%	98	68.6	69.0
			Parks/Open Space	23.00%	A	85.0%	49	15.0%	98	56.4	
			Limited Industrial	14.63%	A	15.0%	49	85.0%	98	90.7	
K	960.0	1.500	Medium-Density Residential	1.35%	A	45.0%	49	55.0%	98	76.0	83.5
			Highway Commercial	6.25%	A	15.0%	49	85.0%	98	90.7	
			Urban Reserve	20.31%	A	45.0%	49	55.0%	98	76.0	
			Medium-Density Residential	0.73%	B	45.0%	69	55.0%	98	85.0	
			Highway Commercial	6.25%	B	15.0%	69	85.0%	98	93.7	
			Conservation Resource	4.17%	B	85.0%	69	15.0%	98	73.4	
			Urban Reserve	60.94%	B	45.0%	69	55.0%	98	85.0	
L	160.0	0.250	Highway Commercial	2.81%	A	15.0%	49	85.0%	98	90.7	81.8
			Conservation Resource	17.50%	A	85.0%	49	15.0%	98	56.4	
			Highway Commercial	53.44%	B	15.0%	69	85.0%	98	93.7	
			Conservation Resource	26.25%	B	85.0%	69	15.0%	98	73.4	

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	Corresponding Exhibits/Descriptions:	Date:
Zone A1-1, Southwest Portion of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
1.	Surface Description (TR-55, Table 3-1)	*Concrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)	*0.011*			
3.	Flow Length, L (total L ≤ 300 feet) ... ft	*300*			
4.	10-yr, 24-hr Rainfall, P_{10} ... in	*2.06*			
5.	Land Slope, s ... ft/ft	*0.005*			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5}s^{0.4}]$ ... hr	*0.11*			*0.11*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
7.	Surface Description (TR-55, Table 3-1)	*Concrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)	*0.011*			
9.	Flow Length, L (total L ≤ 300 feet) ... ft	*300*			
10.	100-yr, 24-hr Rainfall, P_{100} ... in	*2.86*			
11.	Land Slope, s ... ft/ft	*0.005*			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5}s^{0.4}]$ ... hr	*0.09*			*0.09*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved)				
14.	Flow Length, L ... ft				
15.	Watercourse Slope, s ... ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1) ... ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$ ... hr				*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	*B to C*	*C to D*		
18.	Average Velocity, V ... ft/s	*2.00*	*2.00*		
19.	Flow Length, L ... ft	*1,200*	*900*		Subtotal of T_t
20.	Compute $T_t = L / (3600V)$ ... hr	*0.17*	*0.13*		*0.29*

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\ 10}$ (add T_t in steps 6, 17, & 25) ... hr	*0.11*	*0.00*	*0.29*	*0.40*
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 10}$**
22.	Watershed or Subarea $T_{c\ 100}$ (add T_t in steps 12, 17, & 25) ... hr	*0.09*	*0.00*	*0.29*	*0.38*
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 100}$**
23.	TLAG (=0.6*Tc) ... hr				*0.24*

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	***Corresponding Exhibits/Descriptions:***	***Date:***
Zone A1-2, Southwest Portion of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
1.	Surface Description (TR-55, Table 3-1)...........................	*Concrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
3.	Flow Length, L (total L ≤ 300 feet)................................ft	*300*			
4.	10-yr, 24-hr Rainfall, P_{10}.....................................in	*2.06*			
5.	Land Slope, s...ft/ft	*0.005*			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}{}^{0.5}s^{0.4}]$ .... hr	*0.11*			*0.11*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
7.	Surface Description (TR-55, Table 3-1)...........................	*Concrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
9.	Flow Length, L (total L ≤ 300 feet)................................ft	*300*			
10.	100-yr, 24-hr Rainfall, P_{100}.................................... in	*2.86*			
11.	Land Slope, s...ft/ft	*0.005*			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}{}^{0.5}s^{0.4}]$ .... hr	*0.09*			*0.09*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved).........................				
14.	Flow Length, L... ft				
15.	Watercourse Slope, s... ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)......................... ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$ .... hr				*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	*B to C*	*C to "Basin A-1"*		
18.	Average Velocity, V ....ft/s	*2.00*	*2.00*		
19.	Flow Length, L .... ft	*1,200*	*750*		Subtotal of T_t
20.	Compute $T_t = L / (3600V)$ .... hr	*0.17*	*0.10*		*0.27*

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\ 10}$ (add T_t in steps 6, 17, & 25)........hr	*0.11*	*0.00*	*0.27*	*0.38*
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 10}$**
22.	Watershed or Subarea $T_{c\ 100}$ (add T_t in steps 12, 17, & 25)......hr	*0.09*	*0.00*	*0.27*	*0.36*
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 100}$**
23.	TLAG (=0.6*Tc)... hr				*0.23*

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	Corresponding Exhibits/Descriptions:	Date:
Zone A2-1, Southeast Portion of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	A to B			
1.	Surface Description (TR-55, Table 3-1)	Concrete/Asphalt			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)	0.011			
3.	Flow Length, L (total L $\leq$ 300 feet) ... ft	300			
4.	10-yr, 24-hr Rainfall, P_{10} ... in	2.06			
5.	Land Slope, s ... ft/ft	0.008			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5} s^{0.4}]$ ... hr	0.09			0.09

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	A to B			
7.	Surface Description (TR-55, Table 3-1)	Concrete/Asphalt			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)	0.011			
9.	Flow Length, L (total L $\leq$ 300 feet) ... ft	300			
10.	100-yr, 24-hr Rainfall, P_{100} ... in	2.86			
11.	Land Slope, s ... ft/ft	0.008			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5} s^{0.4}]$ ... hr	0.08			0.08

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved)				
14.	Flow Length, L ... ft				
15.	Watercourse Slope, s ... ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1) ... ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$ ... hr				0.00

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	B to D	D to F	F to G	
18.	Average Velocity, V ... ft/s	2.00	2.00	2.00	
19.	Flow Length, L ... ft	1,600	2,000	700	Subtotal of T_t
20.	Compute $T_t = L / (3600V)$ ... hr	0.22	0.28	0.10	0.60

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\ 10}$ (add T_t in steps 6, 17, & 25) ... hr	0.09	0.00	0.60	0.69
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 10}$**
22.	Watershed or Subarea $T_{c\ 100}$ (add T_t in steps 12, 17, & 25) ... hr	0.08	0.00	0.60	0.68
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 100}$**
23.	TLAG (=0.6*Tc) ... hr				0.41

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	***Corresponding Exhibits/Descriptions:***	***Date:***
Zone A2-1A, Southeast Corner of Study Area	*Exhibit A*	*June 5, 2007*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
1.	Surface Description (TR-55, Table 3-1)........................	*Concrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)......	*0.011*			
3.	Flow Length, L (total L ≤ 300 feet)................................ ft	*300*			
4.	10-yr, 24-hr Rainfall, P_{10}.................................... in	*2.06*			
5.	Land Slope, s.. ft/ft	*0.003*			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5}s^{0.4}]$ .... hr	*0.13*			*0.13*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
7.	Surface Description (TR-55, Table 3-1)........................	*Concrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)......	*0.011*			
9.	Flow Length, L (total L ≤ 300 feet)................................ ft	*300*			
10.	100-yr, 24-hr Rainfall, P_{100}.................................. in	*2.86*			
11.	Land Slope, s.. ft/ft	*0.003*			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5}s^{0.4}]$ .... hr	*0.11*			*0.11*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved)........................				
14.	Flow Length, L.. ft				
15.	Watercourse Slope, s.. ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)........................ ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$ .... hr				*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	*B to C*	*C to D*		
18.	Average Velocity, V .... ft/s	*2.00*	*2.00*		
19.	Flow Length, L .... ft	*2,600*	*5,000*		Subtotal of T_t
20.	Compute $T_t = L / (3600V)$ .... hr	*0.36*	*0.69*		*1.06*

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\ 10}$ (add T_t in steps 6, 17, & 25)....... hr	*0.13*	*0.00*	*1.06*	*1.19*
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 10}$**
22.	Watershed or Subarea $T_{c\ 100}$ (add T_t in steps 12, 17, & 25)...... hr	*0.11*	*0.00*	*1.06*	*1.17*
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 100}$**
23.	TLAG (=0.6*Tc).. hr				*0.71*

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	***Corresponding Exhibits/Descriptions:***	***Date:***
Zone A2-2, Southeast Portion of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
1.	Surface Description (TR-55, Table 3-1).........................	*Concrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
3.	Flow Length, L (total L ≤ 300 feet)............................... ft	*300*			
4.	10-yr, 24-hr Rainfall, P_{10}.................................... in	*2.06*			
5.	Land Slope, s... ft/ft	*0.003*			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5}s^{0.4}]$ .... hr	*0.12*			*0.12*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
7.	Surface Description (TR-55, Table 3-1).........................	*Concrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
9.	Flow Length, L (total L ≤ 300 feet)............................... ft	*300*			
10.	100-yr, 24-hr Rainfall, P_{100}.................................. in	*2.86*			
11.	Land Slope, s... ft/ft	*0.003*			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5}s^{0.4}]$ .... hr	*0.11*			*0.11*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved).........................				
14.	Flow Length, L... ft				
15.	Watercourse Slope, s...................................... ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)........................ ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$ .... hr				*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	*B to C*	*C to D*	*D to E*	
18.	Average Velocity, V .... ft/s	*2.00*	*2.00*	*2.00*	
19.	Flow Length, L .... ft	*1,000*	*1,800*	*1,300*	Subtotal of T_t
20.	Compute $T_t = L / (3600V)$ .... hr	*0.14*	*0.25*	*0.18*	*0.57*

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\,10}$ (add T_t in steps 6, 17, & 25)....... hr	*0.12*	*0.00*	*0.57*	*0.69*
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,10}$**
22.	Watershed or Subarea $T_{c\,100}$ (add T_t in steps 12, 17, & 25)..... hr	*0.11*	*0.00*	*0.57*	*0.68*
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,100}$**
23.	TLAG (=0.6*Tc)... hr				*0.41*

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	***Corresponding Exhibits/Descriptions:***	***Date:***
Zone A2-3, Southeast Portion of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

		Segment ID	*A to B*			
1.	Surface Description (TR-55, Table 3-1)........................		*Concrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....		*0.011*			
3.	Flow Length, L (total L ≤ 300 feet)................................	ft	*300*			
4.	10-yr, 24-hr Rainfall, P_{10}.....................................	in	*2.06*			
5.	Land Slope, s..	ft/ft	*0.003*			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5}s^{0.4}]$	hr	*0.13*			*0.13*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

		Segment ID	*A to B*			
7.	Surface Description (TR-55, Table 3-1)........................		*Concrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....		*0.011*			
9.	Flow Length, L (total L ≤ 300 feet)................................	ft	*300*			
10.	100-yr, 24-hr Rainfall, P_{100}..................................	in	*2.86*			
11.	Land Slope, s..	ft/ft	*0.003*			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5}s^{0.4}]$	hr	*0.11*			*0.11*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

		Segment ID				
13.	Surface Description (paved or unpaved)........................					
14.	Flow Length, L...	ft				
15.	Watercourse Slope, s.......................................	ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)........................	ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$	hr				*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

		Segment ID	*B to C*	*C to D*	*D to E*	
18.	Average Velocity, V	ft/s	*2.00*	*2.00*	*2.00*	
19.	Flow Length, L	ft	*1,100*	*1,000*	*700*	Subtotal of T_t
20.	Compute $T_t = L / (3600V)$	hr	*0.15*	*0.14*	*0.10*	*0.39*

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\ 10}$ (add T_t in steps 6, 17, & 25).......	hr	*0.13*	*0.00*	*0.39*	*0.52*
			Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 10}$**
22.	Watershed or Subarea $T_{c\ 100}$ (add T_t in steps 12, 17, & 25).....	hr	*0.11*	*0.00*	*0.39*	*0.50*
			Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 100}$**
23.	TLAG (=0.6*Tc)..	hr				*0.31*

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	**Corresponding Exhibits/Descriptions:**	**Date:**
Zone A2-4, South Central Portion of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	A to B			
1.	Surface Description (TR-55, Table 3-1)	Concrete/Asphalt			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)	0.011			
3.	Flow Length, L (total L ≤ 300 feet) ... ft	300			
4.	10-yr, 24-hr Rainfall, P_{10} ... in	2.06			
5.	Land Slope, s ... ft/ft	0.010			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5} s^{0.4}]$ ... hr	0.08			0.08

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	A to B			
7.	Surface Description (TR-55, Table 3-1)	Concrete/Asphalt			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)	0.011			
9.	Flow Length, L (total L ≤ 300 feet) ... ft	300			
10.	100-yr, 24-hr Rainfall, P_{100} ... in	2.86			
11.	Land Slope, s ... ft/ft	0.010			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5} s^{0.4}]$ ... hr	0.07			0.07

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved)				
14.	Flow Length, L ... ft				
15.	Watercourse Slope, s ... ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1) ... ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$ ... hr				0.00

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	B to C	C to D	D to E	
18.	Average Velocity, V ... ft/s	2.00	2.00	2.00	
19.	Flow Length, L ... ft	1,200	1,000	3,900	Subtotal of T_t
20.	Compute $T_t = L / (3600V)$ ... hr	0.17	0.14	0.54	0.85

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\,10}$ (add T_t in steps 6, 17, & 25) ... hr	0.08	0.00	0.85	0.93
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,10}$**
22.	Watershed or Subarea $T_{c\,100}$ (add T_t in steps 12, 17, & 25) ... hr	0.07	0.00	0.85	0.92
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,100}$**
23.	TLAG (=0.6*Tc) ... hr				0.56

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	***Corresponding Exhibits/Descriptions:***	***Date:***
Zone A2-5, South Central Portion of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
1.	Surface Description (TR-55, Table 3-1)........................	*Concrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
3.	Flow Length, L (total L ≤ 300 feet)............................... ft	*300*			
4.	10-yr, 24-hr Rainfall, P_{10}.................................... in	*2.06*			
5.	Land Slope, s.. ft/ft	*0.010*			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5}s^{0.4}]$ .... hr	*0.08*			*0.08*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
7.	Surface Description (TR-55, Table 3-1)........................	*Concrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
9.	Flow Length, L (total L ≤ 300 feet)............................... ft	*300*			
10.	100-yr, 24-hr Rainfall, P_{100}.................................. in	*2.86*			
11.	Land Slope, s.. ft/ft	*0.010*			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5}s^{0.4}]$ .... hr	*0.07*			*0.07*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved)........................				
14.	Flow Length, L.. ft				
15.	Watercourse Slope, s.. ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)........................ ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$ .... hr				*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	*B to C*	*C to D*	*D to E*	
18.	Average Velocity, V .... ft/s	*2.00*	*2.00*	*2.00*	
19.	Flow Length, L .... ft	*1,000*	*2,100*	*3,900*	Subtotal of T_t
20.	Compute $T_t = L / (3600V)$ .... hr	*0.14*	*0.29*	*0.54*	*0.97*

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\,10}$ (add T_t in steps 6, 17, & 25)....... hr	***0.08***	***0.00***	***0.97***	*1.05*
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,10}$**
22.	Watershed or Subarea $T_{c\,100}$ (add T_t in steps 12, 17, & 25)..... hr	***0.07***	***0.00***	***0.97***	*1.04*
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,100}$**
23.	TLAG (=0.6*Tc).. hr				*0.63*

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	Corresponding Exhibits/Descriptions:	Date:
Zone A2-6, Southwest Portion of Study Area	Exhibit A	October 7, 2004

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	A to B			
1.	Surface Description (TR-55, Table 3-1)	Concrete/Asphalt			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)	0.011			
3.	Flow Length, L (total L ≤ 300 feet) ft	300			
4.	10-yr, 24-hr Rainfall, P_{10} in	2.06			
5.	Land Slope, s ft/ft	0.005			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5}s^{0.4}]$ hr	0.11			0.11

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	A to B			
7.	Surface Description (TR-55, Table 3-1)	Concrete/Asphalt			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)	0.011			
9.	Flow Length, L (total L ≤ 300 feet) ft	300			
10.	100-yr, 24-hr Rainfall, P_{100} in	2.86			
11.	Land Slope, s ft/ft	0.005			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5}s^{0.4}]$ hr	0.09			0.09

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved)				
14.	Flow Length, L ft				
15.	Watercourse Slope, s ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1) ft/s				Subtotal of T_t
17.	Compute T_t = L / (3600V) hr				0.00

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	B to D	D to E	E to F	
18.	Average Velocity, V ft/s	2.00	2.00	2.00	
19.	Flow Length, L ft	1,550	2,700	1,700	Subtotal of T_t
20.	Compute T_t = L / (3600V) hr	0.22	0.38	0.24	0.83

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\ 10}$ (add T_t in steps 6, 17, & 25) hr	0.11	0.00	0.83	0.94
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 10}$**
22.	Watershed or Subarea $T_{c\ 100}$ (add T_t in steps 12, 17, & 25) hr	0.09	0.00	0.83	0.92
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 100}$**
23.	TLAG (=0.6*Tc) hr				0.56

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	***Corresponding Exhibits/Descriptions:***	***Date:***
Zone A3-1, Southeast Portion of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
1.	Surface Description (TR-55, Table 3-1).........................	*Concrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
3.	Flow Length, L (total L ≤ 300 feet)............................... ft	*300*			
4.	10-yr, 24-hr Rainfall, P_{10}..................................... in	*2.06*			
5.	Land Slope, s... ft/ft	*0.003*			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}{}^{0.5}s^{0.4}]$ .... hr	*0.13*			***0.13***

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
7.	Surface Description (TR-55, Table 3-1).........................	*Concrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
9.	Flow Length, L (total L ≤ 300 feet)............................... ft	*300*			
10.	100-yr, 24-hr Rainfall, P_{100}.................................. in	*2.86*			
11.	Land Slope, s... ft/ft	*0.003*			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}{}^{0.5}s^{0.4}]$ .... hr	*0.11*			***0.11***

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved).........................				
14.	Flow Length, L.. ft				
15.	Watercourse Slope, s.. ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)......................... ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$ .... hr				***0.00***

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	*B to D*	*D to E*	*E to F*	
18.	Average Velocity, V .... ft/s	*2.00*	*2.00*	*2.00*	
19.	Flow Length, L .... ft	*1,300*	*500*	*2,100*	Subtotal of T_t
20.	Compute $T_t = L / (3600V)$ .... hr	*0.18*	*0.07*	*0.29*	***0.54***

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\ 10}$ (add T_t in steps 6, 17, & 25)....... hr	***0.13***	***0.00***	***0.54***	***0.67***
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 10}$**
22.	Watershed or Subarea $T_{c\ 100}$ (add T_t in steps 12, 17, & 25)..... hr	***0.11***	***0.00***	***0.54***	***0.65***
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 100}$**
23.	TLAG (=0.6*Tc)... hr				***0.40***

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	**Corresponding Exhibits/Descriptions:**	**Date:**
Zone A3-2, Southeast Portion of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
1.	Surface Description (TR-55, Table 3-1)........................	*Concrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
3.	Flow Length, L (total L ≤ 300 feet)............................... ft	*300*			
4.	10-yr, 24-hr Rainfall, P_{10}..................................... in	*2.06*			
5.	Land Slope, s.. ft/ft	*0.003*			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5}s^{0.4}]$ .... hr	*0.13*			*0.13*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
7.	Surface Description (TR-55, Table 3-1)........................	*Concrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
9.	Flow Length, L (total L ≤ 300 feet)............................... ft	*300*			
10.	100-yr, 24-hr Rainfall, P_{100}.................................. in	*2.86*			
11.	Land Slope, s.. ft/ft	*0.003*			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5}s^{0.4}]$ .... hr	*0.11*			*0.11*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved)........................				
14.	Flow Length, L.. ft				
15.	Watercourse Slope, s.. ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)........................ ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$ .... hr				*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	*B to C*	*C to D*	*D to E*	
18.	Average Velocity, V .... ft/s	*2.00*	*2.00*	*2.00*	
19.	Flow Length, L .... ft	*300*	*1,000*	*1,500*	Subtotal of T_t
20.	Compute $T_t = L / (3600V)$ .... hr	*0.04*	*0.14*	*0.21*	*0.39*

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\,10}$ (add T_t in steps 6, 17, & 25)....... hr	*0.13*	*0.00*	*0.39*	*0.52*
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,10}$**
22.	Watershed or Subarea $T_{c\,100}$ (add T_t in steps 12, 17, & 25)..... hr	*0.11*	*0.00*	*0.39*	*0.50*
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,100}$**
23.	TLAG (=0.6*Tc).. hr				*0.31*

Table 3
Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	Corresponding Exhibits/Descriptions:	Date:
Zone A3-3, South Central Portion of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	A to B			
1.	Surface Description (TR-55, Table 3-1)...........................	Concrete/Asphalt			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	0.011			
3.	Flow Length, L (total L ≤ 300 feet)................................ ft	300			
4.	10-yr, 24-hr Rainfall, P_{10}...................................... in	2.06			
5.	Land Slope, s.. ft/ft	0.003			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5}s^{0.4}]$ .... hr	0.13			0.13

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	A to B			
7.	Surface Description (TR-55, Table 3-1)...........................	Concrete/Asphalt			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	0.011			
9.	Flow Length, L (total L ≤ 300 feet)................................ ft	300			
10.	100-yr, 24-hr Rainfall, P_{100}.................................. in	2.86			
11.	Land Slope, s.. ft/ft	0.003			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5}s^{0.4}]$ ....hr	0.11			0.11

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved).........................				
14.	Flow Length, L...ft				
15.	Watercourse Slope, s..ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)........................ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$ ....hr				0.00

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	B to D	D to E	E to F	
18.	Average Velocity, V .... ft/s	2.00	2.00	2.00	
19.	Flow Length, L ....ft	1,200	500	3,600	Subtotal of T_t
20.	Compute $T_t = L / (3600V)$ .... hr	0.17	0.07	0.50	0.74

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\ 10}$ (add T_t in steps 6, 17, & 25)....... hr	0.13	0.00	0.74	0.87
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 10}$**
22.	Watershed or Subarea $T_{c\ 100}$ (add T_t in steps 12, 17, & 25)..... hr	0.11	0.00	0.74	0.85
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 100}$**
23.	TLAG (=0.6*Tc)...hr				0.52

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	***Corresponding Exhibits/Descriptions:***	***Date:***
Zone B, Southwest Corner of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

Segment ID		*A to B*			
1. Surface Description (TR-55, Table 3-1)........................		*Concrete/Asphalt*			
2. Manning's Roughness Coefficient, n (TR-55, Table 3-1).....		*0.011*			
3. Flow Length, L (total L ≤ 300 feet)...............................	ft	*300*			
4. 10-yr, 24-hr Rainfall, P_{10}....................................	in	*2.06*			
5. Land Slope, s..	ft/ft	*0.013*			Subtotal of T_t
6. Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}{}^{0.5}s^{0.4}]$	hr	*0.07*			*0.07*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

Segment ID		*A to B*			
7. Surface Description (TR-55, Table 3-1)........................		*Concrete/Asphalt*			
8. Manning's Roughness Coefficient, n (TR-55, Table 3-1).....		*0.011*			
9. Flow Length, L (total L ≤ 300 feet)...............................	ft	*300*			
10. 100-yr, 24-hr Rainfall, P_{100}..................................	in	*2.86*			
11. Land Slope, s..	ft/ft	*0.013*			Subtotal of T_t
12. Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}{}^{0.5}s^{0.4}]$	hr	*0.06*			*0.06*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

Segment ID					
13. Surface Description (paved or unpaved)........................					
14. Flow Length, L..	ft				
15. Watercourse Slope, s..	ft/ft				
16. Average Velocity, V (TR-55, Figure 3-1).........................	ft/s				Subtotal of T_t
17. Compute T_t = L / (3600V)	hr				*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

Segment ID		*B to D*	*D to E*	*E to "Basin B"*	
18. Average Velocity, V	ft/s	*2.00*	*2.00*	*2.00*	
19. Flow Length, L	ft	*3,965*	*2,482*	*1,647*	Subtotal of T_t
20. Compute T_t = L / (3600V)	hr	*0.55*	*0.34*	*0.23*	*1.12*

Compute T_c for 10-yr & 100-yr Storm Events

21. Watershed or Subarea $T_{c\ 10}$ (add T_t in steps 6, 17, & 25).......	hr	*0.07*	*0.00*	*1.12*	*1.19*
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 10}$**
22. Watershed or Subarea $T_{c\ 100}$ (add T_t in steps 12, 17, & 25).....	hr	*0.06*	*0.00*	*1.12*	*1.18*
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 100}$**
23. TLAG (=0.6*Tc)..	hr				*0.72*

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	***Corresponding Exhibits/Descriptions:***	***Date:***
Zone C, Western Portion of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
1.	Surface Description (TR-55, Table 3-1)........................	*Concrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
3.	Flow Length, L (total L ≤ 300 feet)............................... ft	*300*			
4.	10-yr, 24-hr Rainfall, P_{10}..................................... in	*2.06*			
5.	Land Slope, s.. ft/ft	*0.005*			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5}s^{0.4}]$ .... hr	*0.11*			*0.11*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
7.	Surface Description (TR-55, Table 3-1)........................	*Concrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
9.	Flow Length, L (total L ≤ 300 feet)............................... ft	*300*			
10.	100-yr, 24-hr Rainfall, P_{100}.................................. in	*2.86*			
11.	Land Slope, s.. ft/ft	*0.005*			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5}s^{0.4}]$ .... hr	*0.09*			*0.09*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved).........................				
14.	Flow Length, L... ft				
15.	Watercourse Slope, s....................................... ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)......................... ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$ .... hr				*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	*B to D*	*D to E*	*E to "Basin C"*	
18.	Average Velocity, V .... ft/s	*2.00*	*2.00*	*2.00*	
19.	Flow Length, L .... ft	*1,350*	*1,300*	*800*	Subtotal of T_t
20.	Compute $T_t = L / (3600V)$ .... hr	*0.19*	*0.18*	*0.11*	*0.48*

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\ 10}$ (add T_t in steps 6, 17, & 25)....... hr	*0.11*	*0.00*	*0.48*	*0.59*
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 10}$**
22.	Watershed or Subarea $T_{c\ 100}$ (add T_t in steps 12, 17, & 25)..... hr	*0.09*	*0.00*	*0.48*	*0.57*
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 100}$**
23.	TLAG (=0.6*Tc).. hr				*0.35*

Table 3
Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	Corresponding Exhibits/Descriptions:	Date:
Zone D, Northwest Corner of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
1.	Surface Description (TR-55, Table 3-1)…………	*Concrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)…..	*0.011*			
3.	Flow Length, L (total L ≤ 300 feet)………… ft	*300*			
4.	10-yr, 24-hr Rainfall, P_{10}………… in	*2.06*			
5.	Land Slope, s………… ft/ft	*0.008*			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}{}^{0.5}s^{0.4}]$ ………… hr	*0.09*			*0.09*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
7.	Surface Description (TR-55, Table 3-1)…………	*Concrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)…..	*0.011*			
9.	Flow Length, L (total L ≤ 300 feet)………… ft	*300*			
10.	100-yr, 24-hr Rainfall, P_{100}………… in	*2.86*			
11.	Land Slope, s………… ft/ft	*0.008*			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}{}^{0.5}s^{0.4}]$ ………… hr	*0.07*			*0.07*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved)…………				
14.	Flow Length, L………… ft				
15.	Watercourse Slope, s………… ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)………… ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$ ………… hr				*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	*B to C*	*C to D*	*D to "Basin D"*	
18.	Average Velocity, V ………… ft/s	*2.00*	*2.00*	*2.00*	
19.	Flow Length, L ………… ft	*3,965*	*2,482*	*1,647*	Subtotal of T_t
20.	Compute $T_t = L / (3600V)$ ………… hr	*0.55*	*0.34*	*0.23*	*1.12*

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\ 10}$ (add T_t in steps 6, 17, & 25)……. hr	*0.09*	*0.00*	*1.12*	*1.21*
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 10}$**
22.	Watershed or Subarea $T_{c\ 100}$ (add T_t in steps 12, 17, & 25)….. hr	*0.07*	*0.00*	*1.12*	*1.19*
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 100}$**
23.	TLAG (=0.6*Tc)………… hr				*0.73*

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	***Corresponding Exhibits/Descriptions:***	***Date:***
Zone E, Northwest Corner of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
1.	Surface Description (TR-55, Table 3-1)........................	*Conrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
3.	Flow Length, L (total L ≤ 300 feet)............................... ft	*100*			
4.	10-yr, 24-hr Rainfall, P_{10}.................................... in	*2.06*			
5.	Land Slope, s... ft/ft	*0.02*			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5}s^{0.4}]$ .... hr	*0.03*			*0.03*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
7.	Surface Description (TR-55, Table 3-1)........................	*Conrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
9.	Flow Length, L (total L ≤ 300 feet)............................... ft	*100*			
10.	100-yr, 24-hr Rainfall, P_{100}.................................. in	*2.86*			
11.	Land Slope, s... ft/ft	*0.02*			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5}s^{0.4}]$ ....hr	*0.02*			*0.02*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved).........................				
14.	Flow Length, L... ft				
15.	Watercourse Slope, s...................................... ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)...................... ft/s				Subtotal of T_t
17.	Compute T_t = L / (3600V) .... hr				*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	*B to D*	*D to E*	*E to "Basin E"*	
18.	Average Velocity, V .... ft/s	*2.00*	*2.00*	*2.00*	
19.	Flow Length, L .... ft	*3,166*	*3,024*	*1,275*	Subtotal of T_t
20.	Compute T_t = L / (3600V) .... hr	*0.44*	*0.42*	*0.18*	*1.04*

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\,10}$ (add T_t in steps 6, 17, & 25)....... hr	*0.03*	*0.00*	*1.04*	*1.07*
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,10}$**
22.	Watershed or Subarea $T_{c\,100}$ (add T_t in steps 12, 17, & 25)..... hr	*0.02*	*0.00*	*1.04*	*1.06*
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,100}$**
23.	TLAG (=0.6*Tc).. hr				*0.64*

Table 3
Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	Corresponding Exhibits/Descriptions:	Date:
Zone F, North Central Portion of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

						Subtotal of T_t
	Segment ID		*A to B*			
1.	Surface Description (TR-55, Table 3-1)		*Conrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)		*0.011*			
3.	Flow Length, L (total L $\leq$ 300 feet)	ft	*100*			
4.	10-yr, 24-hr Rainfall, P_{10}	in	*2.06*			
5.	Land Slope, s	ft/ft	*0.02*			
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5} s^{0.4}]$	hr	*0.03*			*0.03*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

						Subtotal of T_t
	Segment ID		*A to B*			
7.	Surface Description (TR-55, Table 3-1)		*Conrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)		*0.011*			
9.	Flow Length, L (total L $\leq$ 300 feet)	ft	*100*			
10.	100-yr, 24-hr Rainfall, P_{100}	in	*2.06*			
11.	Land Slope, s	ft/ft	*0.02*			
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5} s^{0.4}]$	hr	*0.03*			*0.03*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

						Subtotal of T_t
	Segment ID					
13.	Surface Description (paved or unpaved)					
14.	Flow Length, L	ft				
15.	Watercourse Slope, s	ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)	ft/s				
17.	Compute T_t = L / (3600V)	hr				*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

						Subtotal of T_t
	Segment ID		*B to D*	*D to E*	*E to "Basin F"*	
18.	Average Velocity, V	ft/s	*2.00*	*2.00*	*2.00*	
19.	Flow Length, L	ft	*2,000*	*1,500*	*2,250*	
20.	Compute T_t = L / (3600V)	hr	*0.28*	*0.21*	*0.31*	*0.80*

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\,10}$ (add T_t in steps 6, 17, & 25)	hr	*0.03*	*0.00*	*0.80*	*0.83*
			Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,10}$**
22.	Watershed or Subarea $T_{c\,100}$ (add T_t in steps 12, 17, & 25)	hr	*0.03*	*0.00*	*0.80*	*0.83*
			Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,100}$**
23.	TLAG (=0.6*Tc)	hr				*0.50*

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	***Corresponding Exhibits/Descriptions:***	***Date:***
Zone G, Central Portion of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

		Segment ID	*A to B*			
1.	Surface Description (TR-55, Table 3-1)		*Conrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)		*0.011*			
3.	Flow Length, L (total L ≤ 300 feet)	ft	*300*			
4.	10-yr, 24-hr Rainfall, P_{10}	in	*2.06*			
5.	Land Slope, s	ft/ft	*0.004*			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5}s^{0.4}]$	hr	*0.12*			***0.12***

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

		Segment ID	*A to B*			
7.	Surface Description (TR-55, Table 3-1)		*Conrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)		*0.011*			
9.	Flow Length, L (total L ≤ 300 feet)	ft	*300*			
10.	100-yr, 24-hr Rainfall, P_{100}	in	*2.86*			
11.	Land Slope, s	ft/ft	*0.004*			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5}s^{0.4}]$	hr	*0.10*			***0.10***

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

		Segment ID				
13.	Surface Description (paved or unpaved)					
14.	Flow Length, L	ft				
15.	Watercourse Slope, s	ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)	ft/s				Subtotal of T_t
17.	Compute T_t = L / (3600V)	hr				***0.00***

Pipe Flow for 10-yr & 100-yr Storm Events

		Segment ID	*B to D*	*D to E*	*E to "Basin G"*	
18.	Average Velocity, V	ft/s	*2.00*	*2.00*	*2.00*	
19.	Flow Length, L	ft	*1,900*	*2,000*	*1,650*	Subtotal of T_t
20.	Compute T_t = L / (3600V)	hr	*0.26*	*0.28*	*0.23*	***0.77***

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\ 10}$ (add T_t in steps 6, 17, & 25)	hr	***0.12***	***0.00***	***0.77***	***0.89***
			Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 10}$**
22.	Watershed or Subarea $T_{c\ 100}$ (add T_t in steps 12, 17, & 25)	hr	***0.10***	***0.00***	***0.77***	***0.87***
			Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 100}$**
23.	TLAG (=0.6*Tc)	hr				***0.53***

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	***Corresponding Exhibits/Descriptions:***	***Date:***
Zone H, Northeast Portion of Study Area	*Exhibit A*	*February 13, 2006*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
1.	Surface Description (TR-55, Table 3-1).........................	*Concrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
3.	Flow Length, L (total L ≤ 300 feet)............................... ft	*300*			
4.	10-yr, 24-hr Rainfall, P_{10}.................................... in	*2.06*			
5.	Land Slope, s... ft/ft	*0.008*			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5}s^{0.4}]$ .... hr	*0.09*			*0.09*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
7.	Surface Description (TR-55, Table 3-1).........................	*Concrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
9.	Flow Length, L (total L ≤ 300 feet)............................... ft	*300*			
10.	100-yr, 24-hr Rainfall, P_{100}.................................. in	*2.86*			
11.	Land Slope, s... ft/ft	*0.008*			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5}s^{0.4}]$ .... hr	*0.08*			*0.08*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved).........................				
14.	Flow Length, L... ft				
15.	Watercourse Slope, s....................................... ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)......................... ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$ .... hr				*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	*B to E*	*E to H*	*H to "Basin H"*	
18.	Average Velocity, V .... ft/s	*2.00*	*2.00*	*2.00*	
19.	Flow Length, L .... ft	*3,350*	*2,700*	*4,550*	Subtotal of T_t
20.	Compute $T_t = L / (3600V)$ .... hr	*0.47*	*0.38*	*0.63*	*1.47*

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\,10}$ (add T_t in steps 6, 17, & 25)....... hr	*0.09*	*0.00*	*1.47*	*1.56*
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,10}$**
22.	Watershed or Subarea $T_{c\,100}$ (add T_t in steps 12, 17, & 25)..... hr	*0.08*	*0.00*	*1.47*	*1.55*
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,100}$**
23.	TLAG (=0.6*Tc).. hr				*0.94*

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	***Corresponding Exhibits/Description***	***Date:***
Zone I, Central Portion of Study Area	*Exhibit A*	*October 7, 2004*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
1.	Surface Description (TR-55, Table 3-1)........................	*Concrete/Asphalt*			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
3.	Flow Length, L (total L ≤ 300 feet)............................... ft	*300*			
4.	10-yr, 24-hr Rainfall, P_{10}..................................... in	*2.06*			
5.	Land Slope, s.. ft/ft	*0.008*			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}{}^{0.5}s^{0.4}]$ .... hr	*0.09*			*0.09*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

	Segment ID	*A to B*			
7.	Surface Description (TR-55, Table 3-1)........................	*Concrete/Asphalt*			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1).....	*0.011*			
9.	Flow Length, L (total L ≤ 300 feet)............................... ft	*300*			
10.	100-yr, 24-hr Rainfall, P_{100}.................................. in	*2.86*			
11.	Land Slope, s.. ft/ft	*0.008*			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}{}^{0.5}s^{0.4}]$ .... hr	*0.08*			*0.08*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

	Segment ID				
13.	Surface Description (paved or unpaved)........................				
14.	Flow Length, L.. ft				
15.	Watercourse Slope, s...................................... ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)...................... ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$ .... hr				*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

	Segment ID	*B to C*	*C to "Basin I"*	*E to "Basin I"*	
18.	Average Velocity, V .... ft/s	*2.00*	*2.00*	*2.00*	
19.	Flow Length, L .... ft	*3,500*	*600*		Subtotal of T_t
20.	Compute $T_t = L / (3600V)$ .... hr	*0.49*	*0.08*	*0.00*	*0.57*

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\ 10}$ (add T_t in steps 6, 17, & 25)....... hr	*0.09*	*0.00*	*0.57*	*0.66*
		Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 10}$**
22.	Watershed or Subarea $T_{c\ 100}$ (add T_t in steps 12, 17, & 25)..... hr	*0.08*	*0.00*	*0.57*	*0.65*
		Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 100}$**
23.	TLAG (=0.6*Tc)... hr				*0.40*

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	***Corresponding Exhibits/Descriptions:***	***Date:***
Zone K, Northeast Quadrant of Study Area	*Exhibit A*	*June 5, 2007*

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

Segment ID	*A to B*				
1. Surface Description (TR-55, Table 3-1)	*Concrete/Asphalt*				
2. Manning's Roughness Coefficient, n (TR-55, Table 3-1)	*0.011*				
3. Flow Length, L (total L ≤ 300 feet) ... ft	*300*				
4. 10-yr, 24-hr Rainfall, P_{10} ... in	*2.06*				
5. Land Slope, s ... ft/ft	*0.003*				Subtotal of T_t
6. Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5}s^{0.4}]$ ... hr	*0.13*				*0.13*

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

Segment ID	*A to B*				
7. Surface Description (TR-55, Table 3-1)	*Concrete/Asphalt*				
8. Manning's Roughness Coefficient, n (TR-55, Table 3-1)	*0.011*				
9. Flow Length, L (total L ≤ 300 feet) ... ft	*300*				
10. 100-yr, 24-hr Rainfall, P_{100} ... in	*2.86*				
11. Land Slope, s ... ft/ft	*0.003*				Subtotal of T_t
12. Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5}s^{0.4}]$ ... hr	*0.11*				*0.11*

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

Segment ID					
13. Surface Description (paved or unpaved)					
14. Flow Length, L ... ft					
15. Watercourse Slope, s ... ft/ft					
16. Average Velocity, V (TR-55, Figure 3-1) ... ft/s					Subtotal of T_t
17. Compute $T_t = L / (3600V)$ ... hr					*0.00*

Pipe Flow for 10-yr & 100-yr Storm Events

Segment ID	*B to C*	*C to D*	*D to "Basin K"*		
18. Average Velocity, V ... ft/s	*2.00*	*2.00*	*2.00*		
19. Flow Length, L ... ft	*2,600*	*4,900*	*1,800*		Subtotal of T_t
20. Compute $T_t = L / (3600V)$ ... hr	*0.36*	*0.68*	*0.25*		*1.29*

Compute T_c for 10-yr & 100-yr Storm Events

21. Watershed or Subarea $T_{c\ 10}$ (add T_t in steps 6, 17, & 25) ... hr	*0.13*	*0.00*	*1.29*	*1.42*
	Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 10}$**
22. Watershed or Subarea $T_{c\ 100}$ (add T_t in steps 12, 17, & 25) ... hr	*0.11*	*0.00*	*1.29*	*1.40*
	Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\ 100}$**
23. TLAG (=0.6*Tc) ... hr				*0.85*

Table 3

Time of Concentration & Tlag Calculation Worksheet

Drainage Zone & General Location:	Corresponding Exhibits/Descriptions:	Date:
Zone L, East/Central Portion of Study Area	Exhibit A	June 5, 2007

Sheet Flow for 10-yr 24-hr Storm Event (Applicable to T_c only)

		Segment ID	A to B			
1.	Surface Description (TR-55, Table 3-1)		Concrete/Asphalt			
2.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)		0.011			
3.	Flow Length, L (total L ≤ 300 feet)	ft	300			
4.	10-yr, 24-hr Rainfall, P_{10}	in	2.06			
5.	Land Slope, s	ft/ft	0.003			Subtotal of T_t
6.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{10}^{0.5} s^{0.4}]$	hr	0.13			0.13

Sheet Flow for 100-yr 24-hr Storm Event (Applicable to T_c only)

		Segment ID	A to B			
7.	Surface Description (TR-55, Table 3-1)		Concrete/Asphalt			
8.	Manning's Roughness Coefficient, n (TR-55, Table 3-1)		0.011			
9.	Flow Length, L (total L ≤ 300 feet)	ft	300			
10.	100-yr, 24-hr Rainfall, P_{100}	in	2.86			
11.	Land Slope, s	ft/ft	0.003			Subtotal of T_t
12.	Compute $T_t = [0.007*(nL)^{0.8}] / [P_{100}^{0.5} s^{0.4}]$	hr	0.11			0.11

Shallow Concentrated Flow for 10-yr & 100-yr Storm Events

		Segment ID				
13.	Surface Description (paved or unpaved)					
14.	Flow Length, L	ft				
15.	Watercourse Slope, s	ft/ft				
16.	Average Velocity, V (TR-55, Figure 3-1)	ft/s				Subtotal of T_t
17.	Compute $T_t = L / (3600V)$	hr				0.00

Pipe Flow for 10-yr & 100-yr Storm Events

		Segment ID	B to "Basin L"			
18.	Average Velocity, V	ft/s	2.00			
19.	Flow Length, L	ft	3,000			Subtotal of T_t
20.	Compute $T_t = L / (3600V)$	hr	0.42			0.42

Compute T_c for 10-yr & 100-yr Storm Events

21.	Watershed or Subarea $T_{c\,10}$ (add T_t in steps 6, 17, & 25)	hr	0.13	0.00	0.42	0.55
			Step 6 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,10}$**
22.	Watershed or Subarea $T_{c\,100}$ (add T_t in steps 12, 17, & 25)	hr	0.11	0.00	0.42	0.53
			Step 12 T_t Subtotal	Step 17 T_t Subtotal	Step 20 T_t Subtotal	**Total $T_{c\,100}$**
23.	TLAG (=0.6*Tc)	hr				0.33

Table 4
Detention Basin Summary Listing

Detention Basin	Peak $Inflow_{100-yr}$ (cfs)	Peak Outflow (cfs)	Peak Storage (ac-ft)
A1	228	2.0	89
A2B	158	0.5	43
A2A	178	0.5	56
B	123	0.5	55
C	38	1.0	12
D	117	0.5	41
E	See Note 1 Below		
F	69	0.5	25
G	70	0.5	20
H	115	0.5	44
I	98	0.5	23
J	---	1.75	12
K	304	0.5	108
L	70	0.5	16
CC	See Note 2 Below		

Note 1: *Drainage as approved by City for Foster Farms and contiguous property development plans.*

Note 2: *Detention storage to be provided in future 5-acre park on south side of Peach Avenue, east of high school.*

Table 5

Rational Method Discharges Generated by 100 Acres

Land Use	Initial T_c (min) $T_{c\,I}$	Duration (min) $T_{c\,total}$	Runoff Coefficient C	Intensity (in/hr) I_{10}	Intensity (in/hr) I_{100}	Area (acres) A	Discharge (cfs) Q_{10}	Discharge (cfs) Q_{100}
Low-Density Residential	20	87	0.40	0.54	0.79	100	**21.6**	**31.6**
Medium-Density Residential	20	84	0.45	0.55	0.80	100	**24.8**	**36.0**
High-Density Residential	20	83	0.50	0.56	0.81	100	**28.0**	**40.5**
Commercial	10	71	0.80	0.61	0.89	100	**48.8**	**71.2**
Mixed Used	10	77	0.50	0.57	0.85	100	**28.5**	**42.5**
Limited Industrial	10	77	0.80	0.57	0.85	100	**45.6**	**68.0**
General Industrial	10	77	0.85	0.57	0.85	100	**48.5**	**72.3**
Schools	20	87	0.30	0.54	0.79	100	**16.2**	**23.7**
Parks/Open Space	20	83	0.15	0.56	0.81	100	**8.4**	**12.2**

Table 6

Uniform Flow Capacities for Various Storm Drain Pipe Sizes

Pipe Diameter (in)	d/D Ratio	Pipe Slope	Discharge (cfs)
18	full flow	0.003	6.2
18	full flow	0.002	5.0
18	full flow	0.001	3.6
24	full flow	0.003	14.0
24	full flow	0.002	11.0
24	full flow	0.001	8.0
30	full flow	0.003	23.0
30	full flow	0.002	18.7
30	full flow	0.001	13.4
36	full flow	0.003	37.5
36	full flow	0.002	30.5
36	full flow	0.001	21.5
42	full flow	0.003	60.0
42	full flow	0.002	49.0
42	full flow	0.001	34.0
48	full flow	0.003	84
48	full flow	0.002	67
48	full flow	0.001	49
54	full flow	0.003	117
54	full flow	0.002	95
54	full flow	0.001	67
60	full flow	0.003	155
60	full flow	0.002	125
60	full flow	0.001	89
66	full flow	0.003	195
66	full flow	0.002	160
66	full flow	0.001	115
72	full flow	0.003	245
72	full flow	0.002	200
72	full flow	0.001	145
78	full flow	0.003	310
78	full flow	0.002	250
78	full flow	0.001	180
84	full flow	0.003	370
84	full flow	0.002	305
84	full flow	0.001	215

Table 7

Drainage Infrastructure Cost Estimate Summary

DRAINAGE ZONE	ESTIMATED COST
A	$ 31,001,254
B	$ 9,763,689
C	$ 2,868,415
D**	$ 2,744,619
E*	(see note below)
F	$ 5,301,357
G	$ 3,567,078
H	$ 6,928,790
I	$ 2,806,828
J	$ 1,058,000
K	$ 14,899,180
L	$ 3,190,520
CC	$ 3,108,335
SUBTOTAL	**$ 87,238,065**
Misc. @ 15%	**$ 13,085,710**
TOTAL	**$ 100,323,775**

* *An infrastructure cost estimate is not provided for Drainage Zone E, which substantially consists of property owned by Foster Farms. It is assumed that infrastructure will simply be constructed as approved by the City as incremental future development occurs within this drainage zone.*

** *Costs pertain to properties south of Vinewood Ave/B St, only..*

Table 8
Drainage Infrastructure Cost Estimate by Drainage Zone

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
Drainage Zone A				
Construction of Major Facilities				
Detention Basin A1 (20' Depth, Outflow = 2 cfs)	89	AF	$ 10,000	$ 890,000
Detention Basin A2B (10' Depth, Outflow = 0.5 cfs)	43	AF	$ 10,000	$ 430,000
Detention Basin A2A(10' Depth, Outflow = 0.5 cfs)	56	AF	$ 10,000	$ 560,000
Add'l Excavation Allowance Above Detention Basin WSEs	185	AF	$ 10,000	$ 1,850,000
Pump Station (Detention Basin A1)	1	LS	$ 250,000	$ 250,000
Force Main (@ Detention Basin A1)	150	LF	$ 60	$ 9,000
Construction of Storm Drains				
18" SD	8,723	LF	$ 80	$ 697,840
24" SD	14,500	LF	$ 100	$ 1,450,000
30" SD	8,488	LF	$ 125	$ 1,061,000
36" SD	7,006	LF	$ 150	$ 1,050,900
42" SD	6,407	LF	$ 180	$ 1,153,260
48" SD	9,491	LF	$ 210	$ 1,993,110
54" SD	2,640	LF	$ 250	$ 660,000
60" SD	1,960	LF	$ 300	$ 588,000
66" SD	3,160	LF	$ 350	$ 1,106,000
72" SD	2,500	LF	$ 400	$ 1,000,000
Subtotal of Construction				**$ 14,749,110**
Design & Planning @ 10% of Construction Subtotal				**$ 1,474,911**
Construction Management @ 10% of Construction Subtotal				**$ 1,474,911**
Contingency @ 15% of Construction Subtotal				**$ 2,212,367**
Program Implementation @ 5% of Construction Subtotal				**$ 737,456**
Land Acquisition				
Right-of-Way (Detention Basin A1)	12.00	AC	$ 250,000	$ 3,000,000
Right-of-Way (Detention Basin A2B)	10.00	AC	$ 250,000	$ 2,500,000
Right-of-Way (Detention Basin A2A)	11.00	AC	$ 250,000	$ 2,750,000
18" SD Easement	1.69	AC	$ 250,000	$ 422,500
24" SD Easement	4.12	AC	$ 250,000	$ 1,030,000
30" SD Easement	2.02	AC	$ 250,000	$ 505,000
36" SD Easement	0.30	AC	$ 250,000	$ 75,000
42" SD Easement	0.28	AC	$ 250,000	$ 70,000
Subtotal of Land Acquisition				**$ 10,352,500**
TOTAL ESTIMATED COST				**$ 31,001,254**

Table 8

Drainage Infrastructure Cost Estimate by Drainage Zone

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
Drainage Zone B				
Construction of Major Facilities				
Detention Basin B (20' Depth, Outflow = 0.5 cfs)	55	AF	$ 10,000	$ 550,000
Add'l Excavation Allowance Above Detention Basin WSE	40	AF	$ 10,000	$ 400,000
Pump Station	1	LS	$ 250,000	$ 250,000
Force Main (@ Detention Basin B)	4,200	LF	$ 60	$ 252,000
Construction of Storm Drains				
18" SD	1,082	LF	$ 80	$ 86,560
24" SD	2,603	LF	$ 100	$ 260,300
30" SD	5,261	LF	$ 125	$ 657,625
36" SD	1,023	LF	$ 150	$ 153,450
42" SD	4,685	LF	$ 180	$ 843,300
48" SD	2,615	LF	$ 210	$ 549,150
54" SD	2,651	LF	$ 250	$ 662,750
Subtotal of Construction				**$ 4,665,135**
Design & Planning @ 10% of Construction Subtotal				**$ 466,514**
Construction Management @ 10% of Construction Subtotal				**$ 466,514**
Contingency @ 15% of Construction Subtotal				**$ 699,770**
Program Implementation @ 5% of Construction Subtotal				**$ 233,257**
Land Acquisition				
Right-of-Way (Detention Basin)	7.50	AC	$ 250,000	$ 1,875,000
Force main	1.43	AC	$ 250,000	$ 357,500
18" SD Easement	0.11	AC	$ 250,000	$ 27,500
24" SD Easement	0.59	AC	$ 250,000	$ 147,500
30" SD Easement	1.21	AC	$ 250,000	$ 302,500
36" SD Easement	0.28	AC	$ 250,000	$ 70,000
48" SD Easement	1.20	AC	$ 250,000	$ 300,000
54" SD Easement	0.61	AC	$ 250,000	$ 152,500
Subtotal of Land Acquisition				**$ 3,232,500**
TOTAL ESTIMATED COST				**$ 9,763,689**

Table 8

Drainage Infrastructure Cost Estimate by Drainage Zone

DESCRIPTION	QTY	UNIT	UNIT COST		TOTAL COST	
Drainage Zone C						
Construction of Major Facilities						
Detention Basin C (20' Depth, Outflow = 1 cfs)	12	AF	$	10,000	$	120,000
Add'l Excavation Allowance Above Detention Basin WSE	20	AF	$	10,000	$	200,000
Pump Station	1	LS	$	250,000	$	250,000
Construction of Storm Drains						
18" SD	2,320	LF	$	80	$	185,600
24" SD	2,081	LF	$	100	$	208,100
30" SD	809	LF	$	125	$	101,125
36" SD	748	LF	$	150	$	112,200
48" SD	1,320	LF	$	210	$	277,200
Subtotal of Construction					**$**	**1,454,225**
Design & Planning @ 10% of Construction Subtotal					**$**	**145,423**
Construction Management @ 10% of Construction Subtotal					**$**	**145,423**
Contingency @ 15% of Construction Subtotal					**$**	**218,134**
Program Implementation @ 5% of Construction Subtotal					**$**	**72,711**
Land Acquisition						
Right-of-Way (Detention Basin)	3.00	AC	$	250,000	$	750,000
24" SD Easement	0.33	AC	$	250,000	$	82,500
Subtotal of Land Acquisition					**$**	**832,500**
TOTAL ESTIMATED COST					**$**	**2,868,415**

Last Revised: 06-15-07

Table 8

Drainage Infrastructure Cost Estimate by Drainage Zone

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
Drainage Zone D (Note: Infrastructure Needed to Serve Properties South of Vinewood Avenue/B Street Only; Remaining Storm Drainage Infrastructure Costs to be Borne by Gallo Development)				
Construction of Major Facilities				
Detention Basin D (41 AF Total, 20' Depth, Outflow = 0.5 cfs)	16	AF	$ 10,000	$ 160,000
Construction of Storm Drains				
18" SD	1,251	LF	$ 80	$ 100,080
24" SD	661	LF	$ 100	$ 66,100
30" SD	1,883	LF	$ 125	$ 235,375
36" SD	717	LF	$ 150	$ 107,550
42" SD	4,436	LF	$ 180	$ 798,480
Subtotal of Construction				**$ 1,467,585**
Design & Planning @ 10% of Construction Subtotal				**$ 146,759**
Construction Management @ 10% of Construction Subtotal				**$ 146,759**
Contingency @ 15% of Construction Subtotal				**$ 220,138**
Program Implementation @ 5% of Construction Subtotal				**$ 73,379**
Land Acquisition				
Right-of-Way (Applicable Portion of Detention Basin)	3.60	AC	$ 50,000	$ 180,000
42" SD Easement	2.04	AC	$ 250,000	$ 510,000
Subtotal of Land Acquisition				**$ 690,000**
TOTAL ESTIMATED COST				**$ 2,744,619**

Table 8
Drainage Infrastructure Cost Estimate by Drainage Zone

DESCRIPTION	QTY	UNIT	UNIT COST		TOTAL COST	
Drainage Zone F						
Construction of Major Facilities						
Detention Basin F (20' Depth, Outflow = 0.5 cfs)	25	AF	$	10,000	$	250,000
Add'l Excavation Allowance Above Detention Basin WSE	25	AF	$	10,000	$	250,000
Pump Station	1	LS	$	250,000	$	250,000
Force Main (@ Detention Basin F)	1,559	LF	$	60	$	93,540
Construction of Storm Drains						
18" SD	2,836	LF	$	80	$	226,880
24" SD	5,339	LF	$	100	$	533,900
30" SD	2,975	LF	$	125	$	371,875
42" SD	3,342	LF	$	180	$	601,560
Subtotal of Construction					**$**	**2,577,755**
Design & Planning @ 10% of Construction Subtotal					**$**	**257,776**
Construction Management @ 10% of Construction Subtotal					**$**	**257,776**
Contingency @ 15% of Construction Subtotal					**$**	**386,663**
Program Implementation @ 5% of Construction Subtotal					**$**	**128,888**
Land Acquisition						
Right-of-Way (Detention Basin)	5.00	AC	$	250,000	$	1,250,000
24" SD Easement	0.44	AC	$	250,000	$	110,000
30" SD Easement	0.15	AC	$	250,000	$	37,500
42" SD Easement	1.18	AC	$	250,000	$	295,000
Subtotal of Land Acquisition					**$**	**1,692,500**
TOTAL ESTIMATED COST					**$**	**5,301,357**

Last Revised: 06-15-07

Table 8

Drainage Infrastructure Cost Estimate by Drainage Zone

DESCRIPTION	QTY	UNIT	UNIT COST		TOTAL COST	
Drainage Zone G						
Construction of Major Facilities						
Detention Basin G (20' Depth, Outflow = 0.5 cfs)	20	AF	$	10,000	$	200,000
Add'l Excavation Allowance Above Detention Basin WSE	20	AF	$	10,000	$	200,000
Pump Station	1	LS	$	250,000	$	250,000
Force Main (@ Detention Basin G)	320	LF	$	60	$	19,200
Construction of Storm Drains						
18" SD	442	LF	$	80	$	35,360
24" SD	1,239	LF	$	100	$	123,900
30" SD	2,128	LF	$	125	$	266,000
36" SD	653	LF	$	150	$	97,950
42" SD	1,188	LF	$	180	$	213,840
48" SD	462	LF	$	210	$	97,020
Subtotal of Construction					**$**	**1,503,270**
Design & Planning @ 10% of Construction Subtotal					**$**	**150,327**
Construction Management @ 10% of Construction Subtotal					**$**	**150,327**
Contingency @ 15% of Construction Subtotal					**$**	**225,491**
Program Implementation @ 5% of Construction Subtotal					**$**	**75,164**
Land Acquisition						
Right-of-Way	3.50	AC	$	250,000	$	875,000
24" SD Easement	0.31	AC	$	250,000	$	77,500
30" SD Easement	0.98	AC	$	250,000	$	245,000
36" SD Easement	0.30	AC	$	250,000	$	75,000
42" SD Easement	0.55	AC	$	250,000	$	137,500
48" SD Easement	0.21	AC	$	250,000	$	52,500
Subtotal of Land Acquisition					**$**	**1,462,500**
TOTAL ESTIMATED COST					**$**	**3,567,078**

Table 8

Drainage Infrastructure Cost Estimate by Drainage Zone

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
Drainage Zone H				
Construction of Major Facilities				
Detention Basin H (20' Depth, Outflow = 0.5 cfs)	44	AF	$ 10,000	$ 440,000
Add'l Excavation Allowance Above Detention Basin WSE	35	AF	$ 10,000	$ 350,000
Pump Station	1	LS	$ 250,000	$ 250,000
Force Main (@ Detention Basin H)	1,512	LF	$ 60	$ 90,720
Construction of Storm Drains				
18" SD	1,771	LF	$ 80	$ 141,680
30" SD	2,970	LF	$ 125	$ 371,250
36" SD	1,320	LF	$ 150	$ 198,000
42" SD	450	LF	$ 180	$ 81,000
48" SD	1,970	LF	$ 210	$ 413,700
54" SD	1,450	LF	$ 250	$ 362,500
60" SD	1,120	LF	$ 300	$ 336,000
Subtotal of Construction				**$ 3,034,850**
Design & Planning @ 10% of Construction Subtotal				**$ 303,485**
Construction Management @ 10% of Construction Subtotal				**$ 303,485**
Contingency @ 15% of Construction Subtotal				**$ 455,228**
Program Implementation @ 5% of Construction Subtotal				**$ 151,743**
Land Acquisition				
Right-of-Way (Detention Basin)	7.00	AC	$ 250,000	$ 1,750,000
18" SD Easement	0.21	AC	$ 250,000	$ 52,500
30" SD Easement	0.61	AC	$ 250,000	$ 152,500
36" SD Easement	0.61	AC	$ 250,000	$ 152,500
42" SD Easement	0.21	AC	$ 250,000	$ 52,500
48" SD Easement	0.90	AC	$ 250,000	$ 225,000
54" SD Easement	0.67	AC	$ 250,000	$ 167,500
60" SD Easement	0.51	AC	$ 250,000	$ 127,500
Subtotal of Land Acquisition				**$ 2,680,000**
TOTAL ESTIMATED COST				**$ 6,928,790**

Table 8
Drainage Infrastructure Cost Estimate by Drainage Zone

DESCRIPTION	QTY	UNIT	UNIT COST		TOTAL COST	
Drainage Zone I						
Construction of Major Facilities						
Detention Basin I (20' Depth, Outflow = 0.5 cfs)	23	AF	$	10,000	$	230,000
Add'l Excavation Allowance Above Detention Basin WSE	17	AF	$	10,000	$	170,000
Pump Station	1	LS	$	250,000	$	250,000
Force Main (@ Detention Basin I)	480	LF	$	60	$	28,800
Construction of Storm Drains						
18" SD	1,317	LF	$	80	$	105,360
24" SD	954	LF	$	100	$	95,400
30" SD	2,196	LF	$	125	$	274,500
36" SD	400	LF	$	150	$	60,000
42" SD	197	LF	$	180	$	35,460
Subtotal of Construction					**$**	**1,249,520**
Design & Planning @ 10% of Construction Subtotal					**$**	**124,952**
Construction Management @ 10% of Construction Subtotal					**$**	**124,952**
Contingency @ 15% of Construction Subtotal					**$**	**187,428**
Program Implementation @ 5% of Construction Subtotal					**$**	**62,476**
Land Acquisition						
Right-of-Way (Detention Basin)	4.00	AC	$	250,000	$	1,000,000
24" SD Easement	0.23	AC	$	250,000	$	57,500
Subtotal of Land Acquisition					**$**	**1,057,500**
TOTAL ESTIMATED COST					**$**	**2,806,828**

Table 8
Drainage Infrastructure Cost Estimate by Drainage Zone

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
Drainage Zone J				
Construction of Major Facilities				
Detention Basin J (10' Depth, Outflow = 1.75 cfs)	12	AF	$ 10,000	$ 120,000
Add'l Excavation Allowance Above Detention Basin WSE	10	AF	$ 10,000	$ 100,000
Subtotal of Construction				**$ 220,000**
Design & Planning @ 10% of Construction Subtotal				**$ 22,000**
Construction Management @ 10% of Construction Subtotal				**$ 22,000**
Contingency @ 15% of Construction Subtotal				**$ 33,000**
Program Implementation @ 5% of Construction Subtotal				**$ 11,000**
Land Acquisition				
Right-of-Way (Storm Drainage Component of Detention Basin)	3.00	AC	$ 250,000	$ 750,000
Subtotal of Land Acquisition				**$ 750,000**
TOTAL ESTIMATED COST				**$ 1,058,000**

Last Revised: 06-15-07

Table 8

Drainage Infrastructure Cost Estimate by Drainage Zone

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
Drainage Zone K				
Construction of Major Facilities				
Detention Basin K (15' Depth, Outflow = 0.5 cfs)	108	AF	$ 10,000	$ 1,080,000
Add'l Excavation Allowance Above Detention Basin WSE	75	AF	$ 10,000	$ 750,000
Pump Station	1	LS	$ 250,000	$ 250,000
Force Main (@ Detention Basin K)	2,700	LF	$ 60	$ 162,000
Construction of Storm Drains				
18" SD	5,640	LF	$ 80	$ 451,200
24" SD	7,150	LF	$ 100	$ 715,000
30" SD	5,940	LF	$ 125	$ 742,500
36" SD	2,880	LF	$ 150	$ 432,000
42" SD	4,710	LF	$ 180	$ 847,800
48" SD	1,720	LF	$ 210	$ 361,200
54" SD	1,320	LF	$ 250	$ 330,000
66" SD	1,320	LF	$ 350	$ 462,000
72" SD	700	LF	$ 400	$ 280,000
Subtotal of Construction				**$ 6,863,700**
Design & Planning @ 10% of Construction Subtotal				**$ 686,370**
Construction Management @ 10% of Construction Subtotal				**$ 686,370**
Contingency @ 15% of Construction Subtotal				**$ 1,029,555**
Program Implementation @ 5% of Construction Subtotal				**$ 343,185**
Land Acquisition				
Right-of-Way (Detention Basin K)	15.00	AC	$ 250,000	$ 3,750,000
18" SD Easement	1.64	AC	$ 250,000	$ 410,000
24" SD Easement	1.77	AC	$ 250,000	$ 442,500
30" SD Easement	1.82	AC	$ 250,000	$ 455,000
66" SD Easement	0.61	AC	$ 250,000	$ 152,500
72" SD Easement	0.32	AC	$ 250,000	$ 80,000
Subtotal of Land Acquisition				**$ 5,290,000**
TOTAL ESTIMATED COST				**$ 14,899,180**

Last Revised: 06-15-07

Table 8
Drainage Infrastructure Cost Estimate by Drainage Zone

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
Drainage Zone L				
Construction of Major Facilities				
Detention Basin L (15' Depth, Outflow = 0.5 cfs)	16	AF	$ 10,000	$ 160,000
Add'l Excavation Allowance Above Detention Basin WSE	16	AF	$ 10,000	$ 160,000
Pump Station	1	LS	$ 250,000	$ 250,000
Force Main (@ Detention Basin L)	150	LF	$ 60	$ 9,000
Construction of Storm Drains				
18" SD	1,160	LF	$ 80	$ 92,800
24" SD	1,850	LF	$ 100	$ 185,000
30" SD	1,200	LF	$ 125	$ 150,000
36" SD	1,850	LF	$ 150	$ 277,500
Subtotal of Construction				**$ 1,284,300**
Design & Planning @ 10% of Construction Subtotal				**$ 128,430**
Construction Management @ 10% of Construction Subtotal				**$ 128,430**
Contingency @ 15% of Construction Subtotal				**$ 192,645**
Program Implementation @ 5% of Construction Subtotal				**$ 64,215**
Land Acquisition				
Right-of-Way (Detention Basin L)	3.50	AC	$ 250,000	$ 875,000
18" SD Easement	0.53	AC	$ 250,000	$ 132,500
24" SD Easement	0.69	AC	$ 250,000	$ 172,500
36" SD Easement	0.85	AC	$ 250,000	$ 212,500
Subtotal of Land Acquisition				**$ 1,392,500**
TOTAL ESTIMATED COST				**$ 3,190,520**

Table 8

Drainage Infrastructure Cost Estimate by Drainage Zone

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
Drainage Zone CC				
Construction of Major Facilities				
Expand Arekelian Park Detention Basin	10	AF	$ 10,000	$ 100,000
Add'l Excavation Allowance Above Detention Basin WSE	10	AF	$ 10,000	$ 100,000
Excavation in New Park(South Side of Peach Ave. @ 7th St.)	5	AF	$ 10,000	$ 50,000
Pump Station (New - Arekelian Park)	1	LS	$ 250,000	$ 250,000
Pump Station (Det. Basin, NE Corner B Street/Robin Avenue)	1	LS	$ 250,000	$ 250,000
Force Main (Det. Basin, NE Corner B Street/Robin Avenue)	800	LF	$ 60	$ 48,000
Pump Station/Force Main(South Side of Peach Avenue @ 7th St.)	1	LS	$ 300,000	$ 300,000
Construction of Storm Drains				
18" SD	3,130	LF	$ 80	$ 250,400
24" SD	2,580	LF	$ 100	$ 258,000
30" SD	625	LF	$ 125	$ 78,125
Subtotal of Construction				**$ 1,684,525**
Design & Planning @ 10% of Construction Subtotal				**$ 168,453**
Construction Management @ 10% of Construction Subtotal				**$ 168,453**
Contingency @ 15% of Construction Subtotal				**$ 252,679**
Program Implementation @ 5% of Construction Subtotal				**$ 84,226**
Land Acquisition				
Right-of-Way (Arekelian Park)	3.00	AC	$ 250,000	$ 750,000
Subtotal of Land Acquisition				**$ 750,000**
TOTAL ESTIMATED COST				**$ 3,108,335**

Table 9A

City of Livingston

Storm Drainage Impact Fees

Summary Of Drainage Intrastructure Costs Utilized For Fee Calculations

DRAINAGE ZONE*	ESTIMATED COST	
A	$	31,001,254
B	$	9,763,689
C	$	2,868,415
D**	$	2,744,619
F	$	5,301,357
G	$	3,567,078
H	$	6,928,790
I	$	2,806,828
K	$	14,899,180
L	$	3,190,520
SUBTOTAL	**$**	**83,071,730**
Misc. @ 15%	**$**	**12,460,760**
TOTAL	**$**	**95,532,490**

* *The composite of Drainage Zones A, B, C, D, F, G, H, I, K, and L were considered to be representative for a single zone drainage impact fee calculation pertaining to the entire Storm Drainage Master Plan study area. Drainage Zones E, J, and CC were considered less representative and were not utilized in the calculation.*

** *Costs pertain to properties south of Vinewood Ave/B St, only.*

Table 9B
City of Livingston
Storm Drainage Impact Fees

Representative Area Less Public Facilities, Parks/Open Space and Conservation Reserve (Acres)*	Total Infrastructure Cost (Including Misc. @ 15%)	Land Use Category	Acreage by Land Use Category	Proportional Land Use Area	Percent Impervious	Proportional Funding Factor (Land Use % times % Impervious)	Proportional Funding Responsibility (Funding Factor % of Total)	Total Fee Responsibility	Impact Fee (Per Acre)	Average Dwelling Units Per Acre (Residential)	Impact Fee (Per Dwelling Unit)
5,796.3	$ 95,532,490	Low-Density Residential	2274.8	39.25%	40%	0.1570	28.9%	$ 27,609,566	$ 12,137	4.5	$ 2,697
	$ 95,532,490	Medium-Density Residential	244.2	4.21%	55%	0.0232	4.3%	$ 4,075,348	$ 16,689	9	$ 1,854
	$ 95,532,490	High-Density Residential	81.1	1.40%	65%	0.0091	1.7%	$ 1,599,523	$ 19,723	20	$ 986
	$ 95,532,490	All Commercial Designations	877.0	15.13%	85%	0.1286	23.7%	$ 22,619,077	$ 25,791		N/A
	$ 95,532,490	Limited Industrial	101.6	1.75%	85%	0.0149	2.7%	$ 2,620,409	$ 25,791		N/A
	$ 95,532,490	Urban Reserve	2217.6	38.26%	55%	0.2104	38.7%	$ 37,008,567	$ 16,689		N/A
			5796.3	100.00%		0.5432	100.0%	$ 95,532,490			

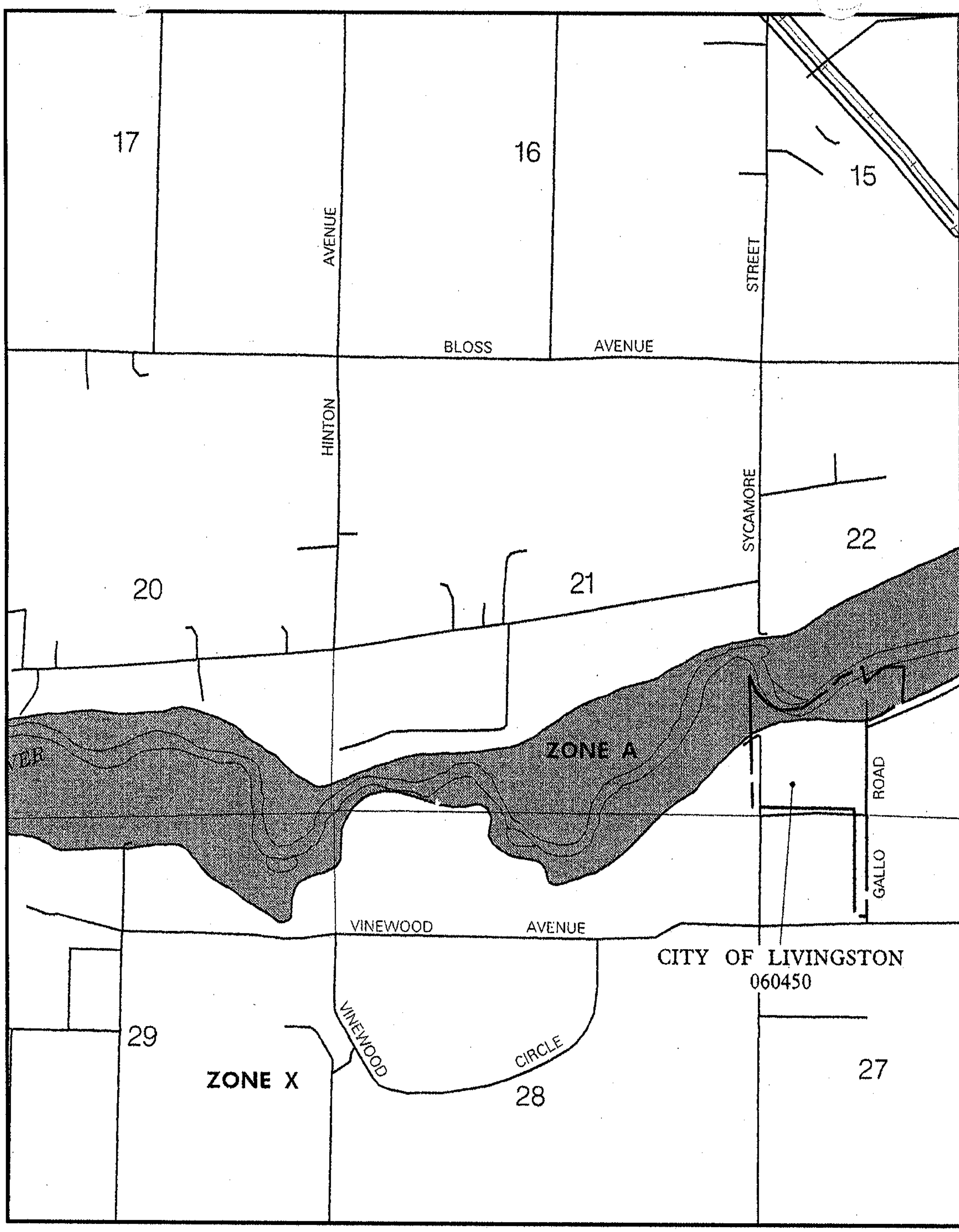
* Representative area for impact fee calculations pertaining to the entire Storm Drainage Master Plan study area includes Drainage Zones A,B,C,D,F,G,H,I, K AND L.

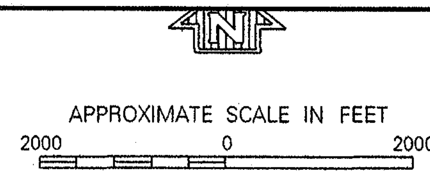
Appendix

Storm Water
Consulting Inc.

FEMA
FIRM Panels 175 and 200

Storm Water Consulting Inc.





NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MERCED COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 175 OF 1225
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

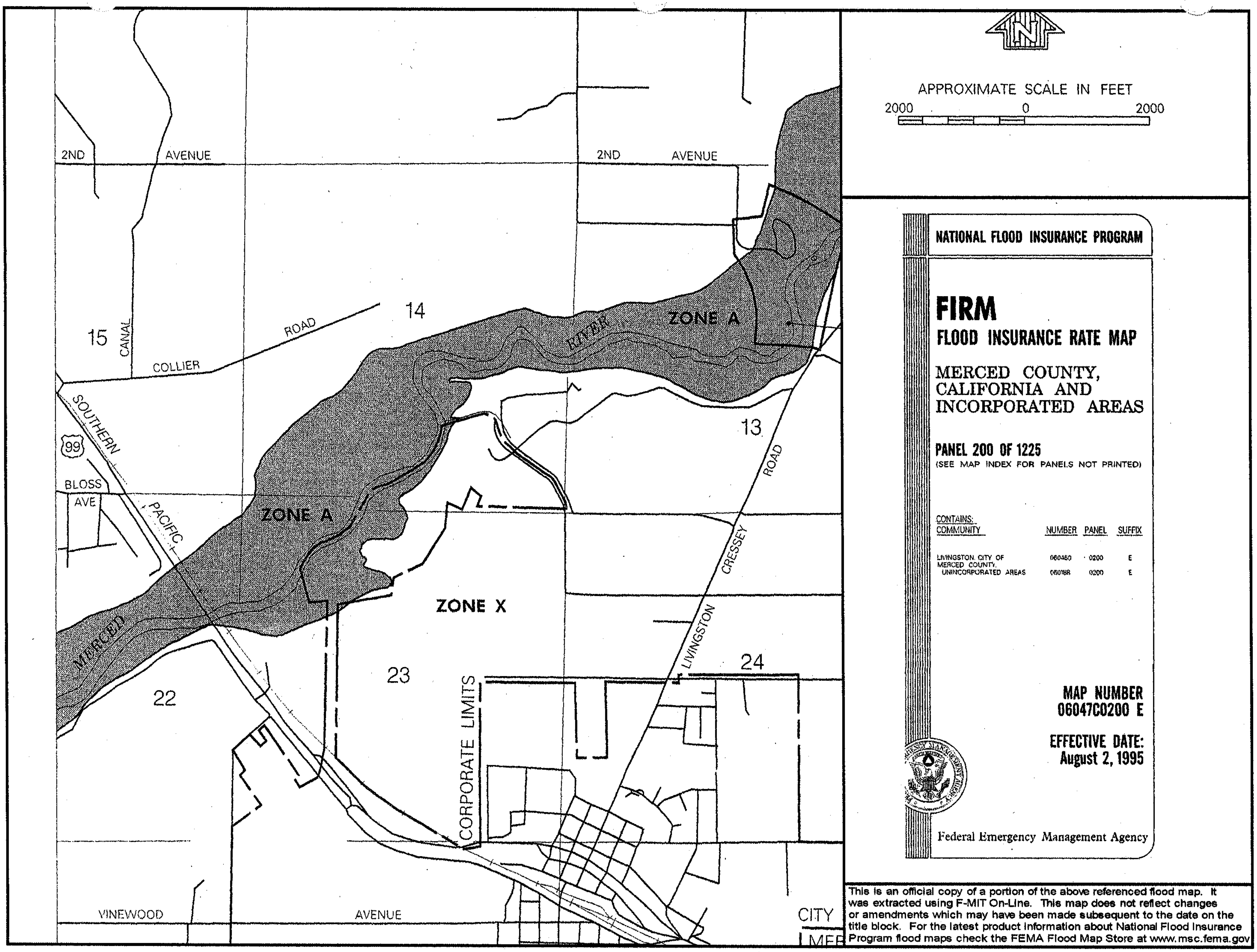
COMMUNITY	NUMBER	PANEL	SUFFIX
LIVINGSTON, CITY OF	060450	0175	E
MERCED COUNTY, UNINCORPORATED AREAS	060188	0175	E

MAP NUMBER
06047C0175 E

EFFECTIVE DATE:
August 2, 1995

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



APPROXIMATE SCALE IN FEET
2000
0
2000
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
MERCED COUNTY, CALIFORNIA AND INCORPORATED AREAS
PANEL 200 OF 1225
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
LIVINGSTON, CITY OF 060460 0200 E
MERCED COUNTY, UNINCORPORATED AREAS 060188 0200 E
MAP NUMBER 06047C0200 E
EFFECTIVE DATE: August 2, 1995
Federal Emergency Management Agency
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov
2ND AVENUE
2ND AVENUE
15
CANAL
COLLIER ROAD
14
ZONE A
RIVER
ZONE A
MERCED
SOUTHERN PACIFIC
99
BLOSS AVE
13
LIVINGSTON CRESSEY ROAD
ZONE X
23
24
22
CORPORATE LIMITS
VINEWOOD AVENUE
CITY

Sample

MID Drainage Agreement

Storm Water Consulting Inc.

Received from MID 5-19-04

SUBDIVISION DRAINAGE AGREEMENT

This Agreement is entered into between MERCED IRRIGATION DISTRICT for MERCED IRRIGATION DISTRICT DRAINAGE IMPROVEMENT DISTRICT NO. I (collectively referred to as "District"), and ______________________, whose address is ______________________________________, Calif. _______, (hereafter referred to as "Owner") for **"Subdivision Name Here"**.

RECITALS

WHEREAS, pursuant to California Water Code 22981, the District has formed a California Drainage District known as Merced Irrigation District Drainage Improvement District No. I; and

WHEREAS, the District has certain canals, laterals, pumps, wells, gates, valves, rights-of-way, easements, fee property and other tangible and intangible interests and facilities for the distribution of water (herein collectively "facilities" of District); and

WHEREAS, Owner is vested in fee certain real property (hereafter the "Property") legally described in Exhibit "A" attached hereto and incorporated herein by this reference; and

WHEREAS, the property is located within Merced Irrigation District Drainage Improvement District No. 1; and

WHEREAS, Owner desires to develop said property for residential and/or commercial purposes and desires to use certain facilities of the District for drainage of storm waters from said property; and

WHEREAS, certain facilities of the District are physically capable of modification to accommodate Owner's desire to develop; and

WHEREAS, development by Owner using District facilities to provide storm drainage, adds, expands, modifies, creates and enlarges facilities; or adds, expands, modifies, creates or enlarges burdens, obligations and/or responsibilities of the District.

THEREFORE, IT IS AGREED AS FOLLOWS:

AGREEMENT

1. Real Property Being Developed. Owner plans to develop for residential or commercial purposes the real property as set forth on Exhibit "A" attached hereto and incorporated herein, hereinafter "Property." Said property as set forth on Exhibit "A" also represents the drainage area to be covered by this agreement.

2. Modification of District Facilities. ____Owner's subdivision will drain to ______________________ located ____________of this development, Modifications to MID facilities are to be completed in the manner described in the improvement plans for "_____________" shown on Exhibit "B".

3. Drainage Request. Owner specifically requests and asks the District to provide said property storm drainage using facilities of the District.

4. Consent of District. The District consents and agrees to receive the drainage of said property to the facilities as hereinafter set forth, subject to all terms and conditions of this Agreement.

5. Work of Owner. Owner agrees to install, at Owner's sole cost and expense, the drainage improvements to said property.

6. Agreement Fee. Owner agrees to pay to the District a non-refundable sum of TWO HUNDRED AND 00/100 DOLLARS ($200.00) for the engineering and administrative costs associated with the preparation and filing of this agreement.

7. Capital Fees. Owner agrees to pay or cause to be paid to the District as and for consideration of such drainage acceptance and capacity reservation the following one time only fees under this section:

a. The prevailing connection fee set by the Board of Directors through public hearing being TWO HUNDRED FIVE AND 00/100 DOLLARS ($205.00) per lot of the Subdivision.

b. The connection fees per lot as set forth in subparagraph "a" above shall be paid by Owner upon the close of escrow of each lot concluding the first transfer of such lot by Owner following execution of the Agreement. Owner grants District a lien upon the property in the amount of TWO HUNDRED FIVE AND 00/100 DOLLARS ($205.00) per lot which may be satisfied as to each individual lot upon the payment of the fee for such lot as set forth above. An "Agreement Creating Lien Upon Real Property" shown as Exhibit "D" will be recorded to perfect this lien.

COMMERCIAL $2,113.00 PER IMPERM. AC. CONNECTION FEE

8. Annual Maintenance Fees.

a. Owner acknowledges that the property is contained within the Merced Irrigation District Drainage Improvement District No. 1, which is a validly, established Drainage Improvement District of the Merced Irrigation District. Owner is aware that execution of this Agreement, construction and/or modification of District facilities and connection of Owner's property to such drainage facilities, singly or jointly constitute consent by Owner to the annual drainage fee levied by the District which at the execution of this Agreement is TWELVE AND 30/100 DOLLARS ($12.30) per residential lot, and ONE HUNDRED TWENTY-SIX AND 76/100 DOLLARS ($126.76) per acre of impermeable surface for commercial/commercial office/or industrial developments. Such fees are subject to annual review by the Directors of the District.

b. By execution of this Agreement, Owner consents and agrees that, as a condition precedent to District's performance, a memorandum of this Agreement will be executed by the parties and recorded by District concurrent with execution of this Agreement, substantially as set forth in Exhibit "C" attached hereto and incorporated herein by this reference.

c. Owner consents to the collection of the annual assessment on Owner's annual Merced County property tax bill. Said amount shall constitute a lien on the property until paid.

9. Limitations on Discharge. In consideration of the consent of District to permit the discharge of waters from the property into the facilities of the District based on the property's contribution to the local drainage area and in the manner and amount as specified and at the location referred to herein, Owner agrees that at no time shall the rate of discharge into facilities of the District exceed ____ G.P.M.

10. Changes. No modification, change, or alteration of the facilities of the District or to the planned drainage method, facilities, plans or the rate and manner of drainage set forth herein, will be made by Owner without the specific written approval and consent of District first had and received.

11. Failure to Make Payments - Lien on Property. Failure of Owner to make any payments, under paragraphs 7 and/or 8, when due to the District as specified in this Agreement

shall become a lien upon the real property subject hereto. Should said property be subdivided into other lawful parcels at the time of non-payment, said lien will attach to the non-paying parcel.

12. Drainage Defined. Drainage as used herein includes only domestic drainage and storm water runoff, and excludes any and all other types of drainage, including industrial drainage, and hazardous waste. Swimming pool water may not be drained into facilities of the District without the specific consent of the District first had and obtained. Such consent shall be conditioned, as a minimum, upon a satisfactory water report of the quality of said water prior to discharge.

13. Injunctions/Remedies. In the event Owner is in breach of any aspect of this Agreement, the District may cause all discharge into the facilities of the District to terminate, and may seek and obtain through appropriate court action an injunction precluding all further use of facilities of the District for the purpose herein set forth. This remedy is in addition to any and all other remedies the District may have in law or equity and in addition to any damages to which the District may be entitled for any breach hereof by Owner or wrongful discharge into facilities of the District from the property subject hereto. In the event the District establishes a wrongful discharge of water or breach of this Agreement, District shall be entitled to damages in an amount according to proof.

14. Liability for Hazardous Discharge. No discharge of waters into the facilities of the District shall occur, which discharges are not environmentally safe and harmless to flora and fauna as determined by the District. All discharges of water effluent or materials of any nature into facilities of the District by Owner shall be of a purity certified and approved as safe for such discharge, as water purity standards are established by the Environmental Protection Agency of the United States of America, the State of California, the County of Merced, and the District. All discharges shall be free and clear of noxious odor and particulate matter other than as satisfies the applicable quality standards. In addition to having purity sufficient for discharge, such discharges shall be safe and nondeleterious to any agrarian or husbandry use.

15. Pumping Charges and Costs. In connection with any reservoir impounding of drainage water for the purposes of regulation prior to discharge into facilities of the District, Owner shall be entirely responsible for any and all costs of installing said pump, its maintenance, power charges, and repair.

16. Hold Harmless. Owner agrees to indemnify and to hold the District free, clear and harmless from and against any and all and every form of liability, claim, suit or action of every kind, name or description whatsoever asserted or brought against the Merced Irrigation District or the Drainage District for or on account of any injuries to real or personal property or injuries or death sustained to any person or persons caused or arising out of this Agreement, the drainage activities, discharge, impounding or flooding as a result of this drainage agreement.

17. Maintenance Requirement of Ditches, Fences. Owner shall be responsible for the specific maintenance and repair of the property, any impound facilities, discharge facilities, and fences or other safety measures connected therewith.

18. Title to Improvements. All improvements placed in fee title, easements, rights-of-way, or other title properties of District by Owner pursuant to this Agreement and for the use and benefit of District shall, upon acceptance thereof by the District, become the property of District, and Owner shall have no claim thereon.

19. Corporate Resolution. In the event Owner is a business entity other than a sole proprietorship, the appropriate corporation resolution or authorization to enter into this Agreement and bind the real property subject hereto as herein set forth shall be first delivered to the District in form satisfactory to District. Owner specifically understands that this Agreement shall not be binding upon the District without said authorization first having been delivered to and approved by the District.

20. Development. Development as used herein means the conversion of real property subject hereto to uses for residential purposes, including apartments, single family residential, duplexes, fourplexes, multi-unit apartments, condominiums, greenbelts, and recreation areas. It further means offices, shopping areas, shopping malls, mini-malls, storage and retainer basins, public facilities, and all uses similar or related thereto. The former means "Residential" and the latter means "Commercial/Commercial Office".

21. Severability. It is intended that each paragraph of this Agreement shall be viewed as separate and divisible, and in the event that any paragraph shall be held to be invalid, the remaining paragraphs shall continue to be in full force and effect.

22. Attorney's Fees. Should any litigation be commenced between the parties to this Agreement concerning this Agreement or the rights and duties of either in relation thereto, the party prevailing in such litigation shall be entitled, in addition to such other relief as may be granted in the litigation, to a reasonable sum as and for his attorney's fees in such litigation or in a separate action brought for that purpose.

23. Successors and Assigns. This Agreement shall be binding on and shall inure to the benefit of the heirs, executors, administrators, successors and assigns of the parties hereto, and shall run with the land.

24. Notices. Except as otherwise expressly provided by law, any and all notices or other communications required or permitted by this Agreement or by law to be served on or given to any party hereto by any other party hereto shall be in writing and shall be deemed duly served and given when personally delivered to the party to whom they are directed, or in lieu of such personal service, when deposited in the United States mail, first class postage prepaid, addressed as follows:

MERCED IRRIGATION DISTRICT DRAINAGE IMPROVEMENT DISTRICT NO. I
P. O. Box 2288
Merced, Ca. 95344

DEVELOPER'S NAME HERE
Address
__________, Ca.

Either party hereto may change their address for the purpose of this paragraph by giving written notice of such change to the other parties in the manner provided in this paragraph.

25. Governing Law. This Agreement, and all matters relating to the Agreement shall be governed by the laws of the State of California in force at the time any need for interpretation of this Agreement or any decisions or holding concerning this Agreement arises.

26. Amendments. This Agreement may be amended only by a writing signed by all of the parties to this Agreement.

27. Titles. The titles of paragraphs of this Agreement are solely for the convenience of the parties, and are not part of the Agreement.

EXECUTED at Merced, California this _____ day of _______________, 2004.

MERCED IRRIGATION DISTRICT DRAINAGE IMPROVEMENT DISTRICT NO. I	OWNER: DEVELOPER
By: ______________________________ Ross Rogers, General Manager	By: ______________________________

STATE OF CALIFORNIA }
COUNTY OF _____________ }ss

On this _______ day of _____________, 2004, before me, the undersigned, a Notary Public in and for said State, personally appeared ____________________________________, personally known to me (or proved on the basis of satisfactory evidence) to be the persons whose names are subscribed to the within SUBDIVISION DRAINAGE AGREEMENT and acknowledged to me that they executed the same in their authorized capacities, and that by their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

____
Notary Public in and for said State

EXHIBIT "A"

LEGAL DESCRIPTION

THE REAL PROPERTY REFERRED TO IN THIS AGREEMENT IS SITUATE IN THE STATE OF CALIFORNIA, COUNTY OF MERCED, AND IS DESCRIBED AS FOLLOWS:

EXHIBIT "B"

Currently the affected reach of the District's ______________Lateral is located _______ of the project site. This is an existing facility already used to convey storm drainage water from the City of __________, and as shown the improvement plans for:

"__________________"

Prepared By:

(Engineer's Name Here)
Address
___________, CA

EXHIBIT "C"

RECORDING REQUESTED BY
AND WHEN RECORDED RETURN TO:

Engineering Department
Merced Irrigation District
744 West 20th Street(95340)
P.O. Box 2288
Merced, California 95344-0288

THIS SPACE FOR RECORDERS USE

MEMORANDUM OF DRAINAGE AGREEMENT

_______________________________, whose address is _________________________, _____________, Calif. _______, for "_____________" (hereafter "Owner"), and the Merced Irrigation District Drainage Improvement District No. I, (hereafter "District"), have entered into a Subdivision Drainage Agreement. This memorandum is a summary of such agreement and is recorded to provide notice of the pertinent terms of the Agreement. Any interested party may review the full agreement at the Offices of Merced Irrigation District Drainage Improvement District No. I.

The essential terms of the Agreement are:

1. Real Property: The terms of the Agreement affect real property located in Merced County, California, and legally described as set forth in Exhibit "A" attached hereto and incorporated herein by this reference.

2. Drainage: Pursuant to the terms of the Agreement, the subject property will be provided storm drainage services as set forth thereon.

3. Fees: The property and each subdivided parcel thereof shall be assessed an annual drainage fee established by the District as modified from time to time. Said fee shall be collected on the real property tax rolls of Merced County, and shall constitute a lien on the property in favor of the District annually until paid. Additionally, a one-time connection fee of TWO HUNDRED FIVE AND 00/100 DOLLARS ($205.00) per lot is due and payable to the District upon the first transfer of each lot by Owner after the execution of the Agreement as evidenced by "Agreement Creating Lien Upon Real Estate" recorded concurrently herewith.

4. Remedies: In the event of non-payment or in the event Owner is causing toxic or other unacceptable substances to be discharged to the District facilities, District may disconnect the property, seek restraining orders or damages, or both.

5. Pumping Charges and Costs: If this property has a drainage detention facility with or without pumps, the maintenance of such facilities is not the responsibility of the District.

EXECUTED at Merced, California this _____ day of _______________, 2004.

MERCED IRRIGATION DISTRICT DRAINAGE IMPROVEMENT DISTRICT No. I	OWNER: DEVELOPER
By: *DO NOT SIGN - EXHIBIT ONLY* ______________________________ Ross Rogers General Manager	By: *DO NOT SIGN - EXHIBIT ONLY* ______________________________

STATE OF CALIFORNIA}
COUNTY OF _____________ }ss

On this ________ day of ______________, 2004, before me, the undersigned, a Notary Public in and for said State, personally appeared ____, personally known to me (or proved on the basis of satisfactory evidence) to be the persons whose names are subscribed to the within MEMORANDUM OF DRAINAGE AGREEMENT and acknowledged to me that they executed the same in their authorized capacities, and that by their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

____
Notary Public in and for said State

EXHIBIT "D"

RECORDING REQUESTED BY AND WHEN RECORDED RETURN TO: Engineering Department Merced Irrigation District 744 West 20th Street(95340) P.O. Box 2288 Merced, California 95344-0288	THIS SPACE FOR RECORDERS USE

AGREEMENT CREATING LIEN UPON REAL ESTATE

This Agreement is made this ______ day of ______________, 2003 by and between ______________________________, whose address is ________________________, _____________, Calif. _______ (herein referred to as Grantor) and the Merced Irrigation District Drainage Improvement District No. I, (herein referred to as Grantee).

WHEREAS, Grantor wishes to develop the real property located in Merced County, California, and legally described as set forth in Exhibit "A" attached hereto and incorporated herein by this reference; and

WHEREAS, Grantor has entered into an agreement of even date and as evidenced by a "Memorandum of Drainage Agreement" recorded concurrently herewith; and

WHEREAS, Grantor has agreed pursuant to Section (7), Paragraph "b" of said agreement to a one-time connection fee of TWO HUNDRED FIVE AND 00/100 DOLLARS ($205.00) per lot, upon development, due and payable to the District upon the first transfer of each lot by Grantor after the execution of the Agreement which further grants a lien to the District for such fee on each lot of the property described in Exhibit "A".

THEREFORE, THE PARTIES HERETO DO MUTUALLY AGREE AS FOLLOWS:

1. Grantor hereby grants to Grantee a lien against the real property described in the attached Exhibit "A" as security under the above referenced agreement.

2. That the lien shall be for payment of said connection fees.

3. The lien created herein shall be superior to all other liens or encumbrances on the real property described in Exhibit "A".

4. That the lien shall become null and void as to each and every lot upon the issuance of a partial release by Grantee. Grantee shall respond to written request for demand and forward said partial release to escrow agent of Grantor upon payment; otherwise the lien shall remain in full force and effect.

IN WITNESS HEREOF the parties hereto have executed this Agreement as the date first above written.

MERCED IRRIGATION DISTRICT DRAINAGE IMPROVEMENT DISTRICT NO. I	OWNER: DEVELOPER
DO NOT SIGN - EXHIBIT ONLY By: ____________________ Ross Rogers General Manager	*DO NOT SIGN - EXHIBIT ONLY* By: ____________________

STATE OF CALIFORNIA}
COUNTY OF ____________} ss

On this _______ day of ____________, 2004, before me, the undersigned, a Notary Public in and for said State, personally appeared ______________________________, personally known to me (or proved on the basis of satisfactory evidence) to be the persons whose names are subscribed to the within AGREEMENT CREATING LIEN UPON REAL ESTATE and acknowledged to me that they executed the same in their authorized capacities, and that by their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

____
Notary Public in and for said State

RECORDING REQUESTED BY
AND WHEN RECORDED RETURN TO:

Engineering Department
Merced Irrigation District
744 West 20th Street(95340)
P.O. Box 2288
Merced, California 95344-0288

THIS SPACE FOR RECORDERS USE

MEMORANDUM OF DRAINAGE AGREEMENT

___________________________________, whose address is _______________________________, ___________, Calif. ______, for "____________" (hereafter "Owner"), and the Merced Irrigation District Drainage Improvement District No. I, (hereafter "District"), have entered into a Subdivision Drainage Agreement. This memorandum is a summary of such agreement and is recorded to provide notice of the pertinent terms of the Agreement. Any interested party may review the full agreement at the Offices of Merced Irrigation District Drainage Improvement District No. I.

The essential terms of the Agreement are:

1. Real Property: The terms of the Agreement affect real property located in Merced County, California, and legally described as set forth in Exhibit "A" attached hereto and incorporated herein by this reference.

2. Drainage: Pursuant to the terms of the Agreement, the subject property will be provided storm drainage services as set forth thereon.

3. Fees: The property and each subdivided parcel thereof shall be assessed an annual drainage fee established by the District as modified from time to time. Said fee shall be collected on the real property tax rolls of Merced County, and shall constitute a lien on the property in favor of the District annually until paid. Additionally, a one-time connection fee of TWO HUNDRED FIVE AND 00/100 DOLLARS ($205.00) per lot is due and payable to the District upon the first transfer of each lot by Owner after the execution of the Agreement as evidenced by "Agreement Creating Lien Upon Real Estate" recorded concurrently herewith.

4. Remedies: In the event of non-payment or in the event Owner is causing toxic or other unacceptable substances to be discharged to the District facilities, District may disconnect the property, seek restraining orders or damages, or both.

5. Pumping Charges and Costs: If this property has a drainage detention facility with or without pumps, the maintenance of such facilities is not the responsibility of the District.

EXECUTED at Merced, California this _____ day of _______________, 2004.

MERCED IRRIGATION DISTRICT
DRAINAGE IMPROVEMENT DISTRICT No. I

OWNER:
DEVELOPER

By: ______________________________
Ross Rogers
General Manager

By: ______________________________

STATE OF CALIFORNIA}
COUNTY OF _____________ }ss

On this _______ day of _____________, 2004, before me, the undersigned, a Notary Public in and for said State, personally appeared ____________________________________, personally known to me (or proved on the basis of satisfactory evidence) to be the persons whose names are subscribed to the within MEMORANDUM OF DRAINAGE AGREEMENT and acknowledged to me that they executed the same in their authorized capacities, and that by their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

____
Notary Public in and for said State

RECORDING REQUESTED BY
AND WHEN RECORDED RETURN TO:

Engineering Department
Merced Irrigation District
744 West 20th Street(95340)
P.O. Box 2288
Merced, California 95344-0288

THIS SPACE FOR RECORDERS USE

AGREEMENT CREATING LIEN UPON REAL ESTATE

This Agreement is made this ______ day of ______________, 2004 by and between ______________________________, whose address is _______________, Calif. ______ (herein referred to as Grantor) and the Merced Irrigation District Drainage Improvement District No. I, (herein referred to as Grantee).

WHEREAS, Grantor wishes to develop the real property located in Merced County, California, and legally described as set forth in Exhibit "A" attached hereto and incorporated herein by this reference; and

WHEREAS, Grantor has entered into an agreement of even date and as evidenced by a "Memorandum of Drainage Agreement" recorded concurrently herewith; and

WHEREAS, Grantor has Agreed Pursuant to Section (7), Paragraph "b" of said agreement to a one-time connection fee of TWO HUNDRED FIVE AND 00/100 DOLLARS ($205.00) per lot, upon development, due and payable to the District upon the first transfer of each lot by Grantor after the execution of the Agreement which further grants a lien to the District for such fee on each lot of the property described in Exhibit "A".

THEREFORE, THE PARTIES HERETO DO MUTUALLY AGREE AS FOLLOWS:

1. Grantor hereby grants to Grantee a lien against the real property described in the attached Exhibit "A" as security under the above referenced agreement.

2. That the lien shall be for payment of said connection fees.

3. The lien created herein shall be superior to all other liens or encumbrances on the real property described in Exhibit "A".

4. That the lien shall become null and void as to each and every lot upon the issuance of a partial release by Grantee. Grantee shall respond to written request for demand and forward said partial release to escrow agent of Grantor upon payment; otherwise the lien shall remain in full force and effect.

IN WITNESS HEREOF the parties hereto have executed this Agreement as the date first above written.

MERCED IRRIGATION DISTRICT
DRAINAGE IMPROVEMENT DISTRICT NO. I

OWNER:
DEVELOPER

By: ______________________________
Ross Rogers
General Manager

By: ______________________________

STATE OF CALIFORNIA}
COUNTY OF ____________} ss

On this ________ day of _____________, 2004, before me, the undersigned, a Notary Public in and for said State, personally appeared ______________________________, personally known to me (or proved on the basis of satisfactory evidence) to be the persons whose names are subscribed to the within AGREEMENT CREATING LIEN UPON REAL ESTATE and acknowledged to me that they executed the same in their authorized capacities, and that by their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

____
Notary Public in and for said State

PARTIAL RELEASE OF LIEN

WHEREAS, on ____________________, 2003, _________________________, whose address is __________________________, Calif. ______ (hereinafter referred to as Grantor) and the MERCED IRRIGATION DISTRICT DRAINAGE IMPROVEMENT DISTRICT NO. I (hereinafter referred to as Grantee) have entered into an "Agreement Creating Lien Upon Real Estate", which agreement was recorded as instrument no.:_______________________, Merced County Records; and at this time Grantor has satisfied the conditions for partial release of the lien created in the above described agreement only as to the following described property:

Lot (   ) as shown on map entitled "__________" recorded___________,2003 in Volume ______ of Official Plats, at Pages___,___, &____, Merced County Records.

APN:_____-_____-_____

THEREFORE, THE GRANTEE HEREBY RELEASES all of its right, title and interest in the herein described property from the abovementioned "Agreement Creating Lien Upon Real Estate".

All other terms of said Agreement remain in full force and effect.

GRANTEE:
MERCED IRRIGATION DISTRICT
DRAINAGE IMPROVEMENT DISTRICT NO. I

By:___________________________________

Minutes of Meetings
with MID (5-19-04 & 8-2-05)

Storm Water Consulting Inc.

Storm Water Consulting Inc. 1899 Sapphire Way, El Dorado Hills, CA 95762 Phone: (916) 801-3962 Fax: (916 933-4375

MEMORANDUM

Date: May 26, 2004

To: Those Listed Below

From: Jim Nelson (representing Harris & Associates)

Subject: **City of Livingston Storm Drainage Master Plan**
Minutes of Meeting with Merced Irrigation District (5-19-04)
Harris Project No. 041-0008.01

A meeting was held on May 19, 2004 at the offices of the Merced Irrigation District (MID) to discuss the forthcoming preparation of a Storm Drainage Master Plan (SDMP) for the City of Livingston and opportunities and constraints associated with utilizing MID irrigation facilities as points of storm drainage outfall. The following individuals participated in the meeting:

- Robert Acker, Director of Facilities and Planning, MID
- Hicham Eltal, Manager of Engineering, Water Resources, MID
- Ron Price, Associate Engineer, Water Resources, MID
- Greg Thompson, Facilities Specialist, MID
- Jim Nelson, SDMP Project Manager, Storm Water Consulting, Inc.

Initially, Mr. Nelson provided a brief overview of the nature and scope of the forthcoming SDMP preparation and indicated that it is likely that it will be the City's desire to continue to utilize MID facilities as points of storm drainage outfall for urban runoff produced by future development. Mr. Nelson also stated that a goal for future storm drainage facilities will be to consolidate City storm drainage infrastructure within larger drainage watersheds (sub-basins) to provide greater opportunities to incorporate the use of greenbelt conveyance corridors and larger joint-use parks/detention basins as key infrastructure elements. These types of elements will enhance the public recreation and aesthetic benefits associated with storm drainage facilities and improve storm water quality.

A current aerial photograph obtained by Harris and Associates was utilized as a point of reference and work map for subsequent discussions.

The following is a synopsis of relevant items discussed at the meeting:

- MID staff identified several City detention ponds that utilize pumping facilities and discharge at low rates into MID irrigation canals. The discharge rates are regulated by Subdivision Drainage Agreements established between either developers or the City and MID. The allowable discharge rates are low, generally ranging from about 100 gallons per minute (gpm) to 800 gpm. [These rates may be converted to cubic feet per second (cfs) by dividing them by a factor of 448.8 gpm/cfs; and hence, are in the range of about 0.2 cfs to 1.8 cfs.]
- For the most part, MID facilities in the Livingston area carry irrigation water in the summer and storm water in the winter (based on rates allowed by Subdivision Drainage Agreements). However, there are periods of "overlap" from September through November and from March through May when irrigation water and storm water may be competing for the same capacity in MID facilities. In certain instances, MID may need to request a temporary delay in pumping of detention ponds during these periods of overlap.
- MID provided a sample Subdivision Drainage Agreement, including standard provisions and exhibits currently utilized by MID. These agreements call for the payment of a one time <u>connection fee</u> and an <u>annual maintenance fee</u> in order for storm water discharges to be authorized. The connection fee is paid to MID upon the close of escrow for individual parcels and subdivision lots. The annual maintenance fee is collected by MID as an annual assessment on Merced County property tax bills for individual parcels and subdivision lots.
- Current one time connection fees are: $205 per subdivision lot and $2,113 per impermeable acre of commercial/commercial office/industrial development.
- Current annual maintenance fees are: $12.30 per subdivision lot and $126.76 per impermeable acre of commercial/commercial office/industrial development.
- MID would like to see funding and financing options discussed in the SDMP, as related to the utilization of their facilities as points of storm drainage outfall. Mr. Nelson indicated that the scope of the SDMP includes a general discussion of funding alternatives for storm drainage infrastructure and an actual calculation of "impact fees" that may be applicable to <u>new development areas</u> in conformance with AB 1600. The possibility of incorporating the one time MID connection fee into an overall impact fee for new development areas may merit consideration; however, it appeared that the annual maintenance fee would continue to need to be assessed via other mechanisms as it is a continuing annual fee that is periodically subject to change.
- As an action subsequent to the City's adoption of the new SDMP, MID requested that a Memorandum of Understanding (MOU) between the City and MID be formulated and executed, indicating how fee collections will be made and how funds will be dispensed to MID.

- MID indicated that they would provide Mr. Nelson with an APN listing of properties that are currently subject to an annual maintenance fee assessment from MID in the Livingston area.
- Mr. Nelson indicated that, where possible, the SDMP may recommend the elimination of some existing detention ponds when storm drainage facilities for existing development areas may be incorporated into larger scale storm drainage facilities that will also serve future development.
- MID indicated that their facilities in the Livingston area include main lines and minor laterals. Main lines will generally be acceptable points of outfall for City storm drainage facilities. Minor laterals have limited capacity and will generally not provide suitable points for storm drainage outfall. The northeast quadrant of the SDMP study area was identified by MID as an area containing only minor laterals. New storm drainage facilities in this area will probably need to include one or more force mains to deliver low rates of storm water to the Livingston Canal to the north or the Arena Canal to the south. MID indicated that they would provide Mr. Nelson with a map of their facilities in the Livingston area delineating main lines and minor laterals within 1 week to aid in the preparation of the SDMP.
- If greater rates of discharge are desired by the City than are currently allowable based on limitations on the downstream capacity of MID facilities, MID will consider performing capital improvements to relevant facilities to improve capacity. These capital improvements will need to be funded by new development. MID staff expressed a willingness to determine the nature and cost of these capital improvements, if applicable, for use by the City's consulting team in their preparation of the SDMP.
- MID staff appointed Greg Thompson as their main point of contact for future coordination between the City's SDMP consulting team and MID.

At the conclusion of the meeting, Mr. Nelson thanked MID staff for their time and input and indicated that the consultant team would continue to coordinate with MID periodically during the preparation of the SDMP.

Distribution:

MID - Greg Thompson, Robert Acker, Hicham Eltal, Ron Price
City of Livingston – Nanda Gottiparthy
Harris and Associates – Steve Roberts, Doug Blatchford, Jodi Almassy
PMC – Brian Millar, Melissa Anthony
MIG – Sharon McNamee, Lauren Schmitt

Storm Water Consulting Inc. 1899 Sapphire Way, El Dorado Hills, CA 95762 Phone: (916) 801-3962 Fax: (916 933-4375

MEMORANDUM

Date: August 4, 2005

To: Those Listed Below

From: Jim Nelson

Subject: **City of Livingston Storm Drainage Master Plan**
Minutes of Meeting with Merced Irrigation District (8-2-05)
Harris Project No. 041-0008.01; SWC Project No. 2004-15

A meeting was held on August 2, 2005 at the offices of the Merced Irrigation District (MID) to obtain MID input with regard to the draft version of the Storm Drainage Master Plan (SDMP) for the City of Livingston for incorporation into the forthcoming final version of the SDMP. Discussions included the contents of MID's letter dated July 1, 2005 that was submitted to the City of Livingston addressing MID's concerns about limitations in the capacity of their facilities to accept additional storm drainage in the absence of selected capital improvements. The following individuals participated in the meeting:

- Robert Acker, Director of Facilities and Planning, MID
- Hicham Eltal, Manager of Engineering, Water Resources, MID
- Larry Williams, Facilities Specialist, MID
- Bryan Kelly, Senior Engineer, MID
- Jim Nelson, SDMP Project Manager, Storm Water Consulting, Inc.

The following is a synopsis of relevant items discussed at the meeting:

- MID indicated that they have currently committed to accept a combined peak flow of about 12 cfs of City storm drainage in their facilities.
- In order for additional capacity to be provided to serve new development projects, MID will need to periodically upgrade portions of their facilities that act as the "critical capacity" at the time where additional capacity is needed. There is currently a roughly 1,600 L.F. segment of underground drain serving the Arena Canal south of the City that needs to be enlarged before additional storm drainage flows can be accepted.
- MID will work directly with developers and make arrangements for them to provide the funding needed to make applicable system capacity upgrades when needed. MID will manage the funding provided by developers for these capital improvements and any reimbursement agreements needed between MID and applicable developers.

- Mr. Nelson indicated that the draft version of the SDMP cites a combined projected total peak discharge of 9.25 cfs to MID facilities upon the buildout of the City's master planned storm drainage infrastructure. However, in the interim, it is likely that the existing MID commitment of to accept 12 cfs will need to be incrementally increased to serve development projects prior to construction of various elements of the City's master planned storm drainage facilities.
- MID stipulated that all new development that will utilize MID facilities as a point of outfall for storm drainage will be required to execute a Drainage Agreement or a Deferred Drainage Agreement with MID. This stipulation will be incorporated into the final version of the SDMP.
- MID indicated that there are a few existing developments that are draining to detention basins that discharge into MID facilities which are not covered by an existing Drainage Agreement and that the City needs to work with them to resolve this issue.
- MID will provide Mr. Nelson with language and/or details to incorporate into the final version of the SDMP relating to selected MID design requirements for pump systems that discharge storm drainage into MID facilities.
- MID indicated that the McCoy Lateral cannot be utilized as a point of outfall to serve Drainage Zone B. Instead, the Arena Canal to the east should be utilized for this purpose. Mr. Nelson indicated that the final version of the SDMP would reflect this change.
- MID indicated that the existing detention pond at the northeast corner of Winton Parkway and B Street is proposed to incorporate a force main that discharges into the Garibaldi/Hammett Lateral to the north (within Drainage Zone CC). Mr. Nelson indicated that this force main would be depicted in the final version of the SDMP.
- MID asked if they could be provided with a full size plot of Exhibit A from the draft version of the SDMP for their use. Mr. Nelson indicated that he would forward a full size plot to MID.
- MID indicated that Larry Williams will be their new primary point of contact for future coordination between the City's SDMP consulting team and MID, replacing Greg Thompson in this role.

At the conclusion of the meeting, Mr. Nelson thanked MID staff for their time, input and cooperation regarding the preparation of the City's SDMP.

Distribution:

MID – Larry Williams, Robert Acker, Hicham Eltal, Bryan Kelly
City of Livingston – Gerald Forde, Nanda Gottiparthy
Harris and Associates – Steve Roberts

HEC-1
Input/Output

Storm Water Consulting Inc.

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*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*             VERSION 4.1               *
*                                       *
* RUN DATE  15JUN07  TIME  14:08:01     *
*                                       *
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*****************************************
*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*        609 SECOND STREET              *
*     DAVIS, CALIFORNIA 95616           *
*         (916) 756-1104                *
*                                       *
*****************************************
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X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X         XXXXX  X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

ID  CITY OF LIVINGSTON
ID  STORM DRAINAGE MASTER PLAN
ID  10-YR & 100-YR STORM EVENTS
ID  24-HR STORM DURATION
ID  *************************************************************************
ID
ID
IT       5 04FEB05       0     300
IN      30 04FEB05       0
JR    PREC       1  1.3883
IO       5
*DIAGRAM
*
* THIS FINAL MODEL SIMULATES 10-YR AND 100-YR PEAK DISCHARGE FOR THE 24-HR
* STORM EVENT.  THE STUDY AREA HAS BEEN DIVIDED INTO DRAINAGE ZONES A
* THROUGH L TO APPROXIMATE RUNOFF. IN DETERMINING APPROXIMATE STORAGE
* VOLUMES FOR TERMINAL DETENTION BASINS SERVING DRAINAGE ZONES, IT HAS
* BEEN ASSUMED THAT DETENTION PONDS WILL DRAIN BY PUMPING AT VARIOUS RATES
* THAT ARE NOTED IN ANNOTATION BELOW, FORMING THE BASIN RELATIONSHIPS.
*
* DRAINAGE ZONE A HAS BEEN FURTHER SUBDIVIDED INTO TWELVE (12) SUBBASINS.
* CHANNEL PARKWAY ALONG MAGNOLIA AVENUE HAS BEEN REPLACED WITH
* AN UNDERGROUND STORM DRAIN.
* *******************************************************************
* *************** JUNE 8, 2007 REVISED MODEL FILE: LIVNEW4.DAT ********
* **REVISION INCLUDES EXPANSION OF STUDY AREA EAST TO CRESSEY WAY******
*
* BEGIN DRAINAGE ZONE A MODEL
*
* *************** June 8, 2007 *******************
*

KK   A2-1A
KO      3                                    21
KM  NEW BASIN EAST OF SULTANA AND SOUTH OF HWY 99 (SUB-BASIN A2-1A)
KM  Area = 0.734 sq mi
BA   0.734
PB    2.06
*
PC       0   0.008   0.017   0.026   0.035   0.045   0.055   0.065   0.076   0.087
PC   0.099   0.112   0.126    0.14   0.156   0.174   0.194   0.219   0.254   0.303
PC   0.515   0.583   0.624   0.655   0.682   0.706   0.728   0.748   0.766   0.783
PC   0.799   0.815    0.83   0.844   0.857    0.87   0.882   0.893   0.905   0.916
PC   0.926   0.936   0.946   0.956   0.965   0.974   0.983   0.992       1       1
*
LS            84.8
UD    0.71
*
*
* ************ JUNE 8, 2007 ADD DETENTION BASIN A2A  ***************
*
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  25          KK  DETA2A
  26          KO       3
  27          KM  DETENTION BASIN A2A
  28          KM  ASSUMES THE FOLLOWING PARAMETERS:
              *
              * ***************************************************************************
              * *                 BOTTOM WIDTH(FT)                 640
              * *                 BOTTOM LENGTH (FT)               640
              * *                 BOTTOM AREA (AC)                9.40
              * *                 SIDE SLOPES (H:V)                3:1
              * *                 DEPTH (FT)                        10
              * *                 TOP WIDTH (FT)                   700
              * *                 TOP LENGTH (FT)                  700
              * *                 TOP AREA (AC)                  11.25
              * *                 VOLUME (AC-FT)                 57.00
              * *                 DISCHARGE (PUMP)                 0.5
              * *                 BOTTOM ELEVATION(FT)             120
              * *                 TOP ELEVATION (FT)               130
              * ***************************************************************************
              *
  29          RS       1    STOR      -1
  30          SA     9.4   9.585    9.77   9.955   10.14  10.325   10.51  10.695   10.88   11.25
  31          SE     120     121     122     123     124     125     126     127     128     130
  32          SQ       0     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5
              *

  33          KK  RA2-1A
  34          KM  ROUTE FLOW FROM A2-1A TO A2-1
  35          KM  FROM SULTANA DR TO HUNTER RD
  36          RK    3200   0.002   0.015            CIRC     3.5
              *

  37          KK    A2-1
  38          KM  SUBBASIN A2-1
  39          BA   0.450
              * LS          80.5
  40          LS            82.3
  41          UD    0.41
              *

  42          KK  COMB 1
  43          KM  COMBINE FLOW FROM BAISNS A2-1A & A2-1
  44          HC       2
              *

  45          KK    A2-2
  46          KM  SUBBASIN A2-2
  47          BA   0.201
              * LS          76.6
  48          LS            71.2
  49          UD    0.41
              *
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 50           KK    A2-3
 51           KM  SUBBASIN A2-3
 52           BA   0.101
 53           LS            76.1
 54           UD    0.31
              *

 55           KK      A2
 56           KO      3                           21
 57           KM  COMBINE SUBBASIN A2-1, AND SUBBASIN A2-2, & A2-3 ALL BEFORE ENTERING DET A2B
 58           HC      3
              * *************** JUNE 7, 2007 detention data revised *********************
              *

 59           KK  DETA2B
 60           KO      3
 61           KM  DETENTION BASIN A2B
 62           KM  ASSUMES THE FOLLOWING PARAMETERS:
              *
              * ****************************************************************************
              * *                  BOTTOM WIDTH(FT)                 640
              * *                  BOTTOM LENGTH (FT)               640
              * *                  BOTTOM AREA (AC)                 9.40
              * *                  SIDE SLOPES (H:V)                3:1
              * *                  DEPTH (FT)                        10
              * *                  TOP WIDTH (FT)                   700
              * *                  TOP LENGTH (FT)                  700
              * *                  TOP AREA (AC)                  11.25
              * *                  VOLUME (AC-FT)                 54.00
              * *                  DISCHARGE (PUMP)                 0.5
              * *                  BOTTOM ELEVATION(FT)             115
              * *                  TOP ELEVATION (FT)               125
              * ****************************************************************************
              *
 63           RS       1    STOR      -1
              * SA  6.94    7.02     7.1    7.18    7.26    7.34    7.42     7.5    7.58      7.
 64           SA    9.40   9.585   9.770   9.955  10.140  10.325  10.510  10.695  10.880  11.250
 65           SE     115     116     117     118     119     120     121     122     123     125
 66           SQ       0     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5
              *

 67           KK  RCP-AZ
 68           KM  ROUTE DET BASIN OUTFLOW TO CP-AY1 (UPSTREAM REACH )
              * RK  5200  0.0001    0.05            TRAP     100       3
 69           RK    5200  0.0001   0.015            CIRC     2.0
              *

 70           KK    A2-5
 71           KM  SUBBASIN A2-5
 72           BA   0.495
              * LS          72.1
 73           LS            71.2
 74           UD    0.63
              *
```

```
LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          KK    A2-4
          KM  SUBBASIN A2-4
          BA   0.322
          * LS          77.9
          LS               76.5
          UD     0.56
          *

          KK  CPA-Y1
          KM  COMBINE ROUTING OF BASIN FLOW TO STORM DRAIN, SUBBASIN A2-5, AND SUBBASIN A2-4
          HC        3
          *

          KK    A3-1
          KM  SUBBASIN A3-1
          BA   0.152
          LS               78.8
          UD     0.40
          *

          KK    A3-2
          KM  SUBBASIN A3-2
          BA   0.100
          LS               76.0
          UD     0.31
          *

          KK    A3-3
          KM  SUBBASIN A3-3
          BA   0.181
          * LS          77.6
          LS               75.7
          UD     0.52
          *

          KK  CPA-Y2
          KM  COMBINE CP-AY1, SUBBASIN A3-1, SUBBASIN A3-2, AND SUBBASIN A3-3 ALL AT CP-AY2
          HC        4
          *

          KK  RCPAY2
          KM  ROUTE CP-AY2 TO  CP-AX
          * RK  1500  0.0001    0.05                TRAP      100        3
          RK    1500  0.0001   0.015                CIRC      5.5
          *

          KK    A2-6
          KM  SUBBASIN A2-6
          BA   0.468
          * LS          70.8
          LS                 72
          UD     0.56
          *
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 109          KK    CP-AX
 110          KM  COMBINE CP-AY2, AND SUBBASIN A2-6 ALL AT CP-AX
 111          HC        2
              *

 112          KK  RCP-AX
 113          KM  ROUTE CP-AX TO  DETENTION BASIN A1
              * RK  2400  0.0001    0.05              TRAP      100        3
 114          RK    2400  0.0001   0.015              CIRC      6.0
              *

 115          KK    A1-1
 116          KM  SUBBASIN A1-1
 117          BA   0.177
              * LS          70.1
 118          LS              69.6
 119          UD    0.24
              *

 120          KK    A1-2
 121          KM  SUBBASIN A1-2
 122          BA   0.317
              * LS          70.3
 123          LS              69.7
 124          UD    0.23
              *

 125          KK   DETA1
 126          KO      3                                21
 127          KM  COMBINE RCP-AX, SUBBASIN A1-1, AND SUBBASIN A1-2 ALL AT DETENTION BASIN A1
 128          HC        3
              *

 129          KK   DETA1
              * KO      3
              * KO      1       2
 130          KO        3                              21
 131          KM  DETENTION BASIN A1
 132          KM  ASSUMES THE FOLLOWING PARAMETERS:
              *
              * ******************************************************************************
              * *                BOTTOM WIDTH(FT)                    660
              * *                BOTTOM LENGTH (FT)                  660
              * *                BOTTOM AREA (AC)                  10.00
              * *                SIDE SLOPES (H:V)                   3:1
              * *                DEPTH (FT)                           20
              * *                TOP WIDTH (FT)                      700
              * *                TOP LENGTH (FT)                     700
              * *                TOP AREA (AC)                     11.25
              * *                VOLUME (AC-FT)                   212.50
              * *                DISCHARGE (PUMP)                      2
              * *                BOTTOM ELEVATION(FT)                 96
              * *                TOP ELEVATION (FT)                  116
              * ******************************************************************************
              *
```

```
LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

133       RS       1    STOR      -1
134       SA      10   10.13   10.26   10.39   10.52   10.65   10.78   10.91   11.04   11.25
135       SE      96      98     100     102     104     106     108     110     112     116
136       SQ       0      02      02      02      02      02      02      02      02      02
          *
          *
          *
          * BEGIN DRAINAGE ZONE B MODEL
          *

137       KK       B
138       KO       3                               21
139       KM  DRAINAGE ZONE B
140       BA   1.467
          * LS          71.2
141       LS              71.8
142       UD    0.72
          *

143       KK    DETB
          * KO     3
          * KO     1       2
144       KO       3                               21
145       KM  DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE B, SOUTH OF MAGNOLIA
146       KM  ASSUMES THE FOLLOWING PARAMETERS:
          *
          * ***********************************************************************************
          * *                        BOTTOM WIDTH(FT)                      490
          * *                        BOTTOM LENGTH (FT)                    490
          * *                        BOTTOM AREA (AC)                     5.51
          * *                        SIDE SLOPES (H:V)                     3:1
          * *                        DEPTH (FT)                             20
          * *                        TOP WIDTH (FT)                        540
          * *                        BOTTOM LENGTH (FT)                    540
          * *                        TOP AREA (AC)                        6.69
          * *                        VOLUME (AC-FT)                     122.00
          * *                        DISCHARGE (PUMP)                      0.5
          * *                        BOTTOM ELEVATION(FT)                   90
          * *                        TOP ELEVATION (FT)                    110
          * ***********************************************************************************
          *
147       RS       1    STOR      -1
          * SA2.09  2.26    2.44    2.63    2.83    3.03    3.24    3.45    3.67    3.90
148       SA    5.51    5.63    5.75    5.87    5.99    6.11    6.23    6.35    6.47    6.69
149       SE      90      92      94      96      98     100     102     104     106     110
150       SQ       0    0.50    0.50    0.50    0.50    0.50    0.50    0.50    0.50    0.50
          *

151       KK       C
152       KO       3                               21
153       KM  DRAINAGE ZONE C
154       BA   0.391
155       LS              70.4
156       UD    0.35
          * ****************** June 7, 2007 Detention Data Revised **************
          *
```

```
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

157         KK    DETC
            * KO     3
            * KO     1       2
158         KO       3                              21
159         KM  DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE C, ADJACENT ARENA CANAL
160         KM  ASSUMES THE FOLLOWING PARAMETERS:
            *
            * ****************************************************************************
            * *                  BOTTOM WIDTH(FT)                 181
            * *                  BOTTOM LENGTH (FT)               181
            * *                  BOTTOM AREA (AC)                 0.75
            * *                  SIDE SLOPES (H:V)                3:1
            * *                  DEPTH (FT)                       20
            * *                  TOP WIDTH                        289
            * *                  BOTTOM LENGTH (FT)               289
            * *                  TOP AREA (AC)                    1.917
            * *                  VOLUME (AC-FT)                   14.00
            * *                  DISCHARGE (PUMP)                 1
            * *                  BOTTOM ELEVATION(FT)             100
            * *                  TOP ELEVATION (FT)               120
            * ****************************************************************************
            *
161         RS       1    STOR      -1
            * SA  0.28    0.35    0.43    0.51    0.60    0.69    0.79    0.90    1.02      1.
162         SA    0.75    0.88   1.009   1.139   1.269   1.399   1.528   1.658   1.788   1.917
163         SE     100     102     104     106     108     110     112     114     116     118
164         SQ       0       1       1       1       1       1       1       1       1       1
            *

165         KK       D
166         KO       3                              21
167         KM  DRAINAGE ZONE D
            * BA 0.853
168         BA   0.694
            * LS          81.9
169         LS             79.7
170         UD     0.73
            * ****************** June 7, 2007 Detention Data Revised **************
            *

171         KK    DETD
172         KO       3
            * KO     1       2
            * KO     3                              21
173         KM  DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE D, NORTH OF VINEWOOD/B STREET
174         KM  ASSUMES THE FOLLOWING PARAMETERS:
            *
            * ****************************************************************************
            * *                  BOTTOM WIDTH(FT)                 346
            * *                  BOTTOM LENGTH (FT)               346
            * *                  BOTTOM AREA (AC)                 2.75
            * *                  SIDE SLOPES (H:V)                3:1
            * *                  DEPTH (FT)                       20
            * *                  TOP WIDTH (FT)                   454
            * *                  BOTTOM LENGTH (FT)               454
            * *                  TOP AREA (AC)                    4.73
            * *                  VOLUME (AC-FT)                   46.00
            * *                  DISCHARGE (PUMP)                 0.5
            * *                  BOTTOM ELEVATION(FT)             95
            * *                  TOP ELEVATION (FT)               115
            * ****************************************************************************
            *
```

```
LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

175       RS       1    STOR      -1
          * SA2.17   2.36    2.56    2.77    2.98    3.20    3.43    3.66    3.90    4.15
          * SA  3.67    3.92    4.17    4.42    4.67    4.92    5.17    5.42    5.67      5.
176       SA    2.75    2.97    3.19    3.41    3.63    3.85    4.07    4.29    4.51    4.73
177       SE      95      97      99     101     103     105     107     109     111     113
178       SQ       0     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5
          *

179       KK       F
180       KO       3                               21
181       KM  DRAINAGE ZONE F
182       BA   0.647
183       LS              72.5
184       UD    0.50
          * ****************** June 7, 2007 Detention Data Revised **************
          *

185       KK    DETF
186       KO       3
          * KO     1       2
          * KO     3                               21
187       KM  DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE F, SOUTH OF OLIVE AVENUE
188       KM  ASSUMES THE FOLLOWING PARAMETERS:
          *
          * **************************************************************************
          * *                BOTTOM WIDTH(FT)                    295
          * *                BOTTOM LENGTH (FT)                  295
          * *                BOTTOM AREA (AC)                    2.0
          * *                SIDE SLOPES (H:V)                   3:1
          * *                DEPTH (FT)                           20
          * *                TOP WIDTH (FT)                      397
          * *                BOTTOM LENGTH (FT)                  397
          * *                TOP AREA (AC)                      3.62
          * *                VOLUME (AC-FT)                    28.00
          * *                DISCHARGE (PUMP)                    0.5
          * *                BOTTOM ELEVATION(FT)                115
          * *                TOP ELEVATION (FT)                  135
          * **************************************************************************
          *
189       RS       1    STOR      -1
          * SA.674  0.781   0.893   1.012   1.138   1.271   1.410   1.556   1.708   1.867
190       SA     2.0    2.18    2.36    2.54    2.72    2.90    3.08    3.26    3.44    3.62
191       SE     115     117     119     121     123     125     127     129     131     132
192       SQ       0     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5
          *

193       KK       G
194       KO       3                               21
195       KM  DRAINAGE ZONE G
196       BA   0.322
197       LS                81
198       UD    0.53
          * ****************** June 7, 2007 Detention Data Revised **************
          *
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

199           KK    DETG
200           KO       3
              * KO     1       2
              * KO     3                                  21
201           KM  DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE G, ADJACENT HWY 99
202           KM  ASSUMES THE FOLLOWING PARAMETERS:
              *
              * *****************************************************************************
              * *                  BOTTOM WIDTH(FT)                      209
              * *                  BOTTOM LENGTH (FT)                    209
              * *                  BOTTOM AREA (AC)                      1.0
              * *                  SIDE SLOPES (H:V)                     3:1
              * *                  DEPTH (FT)                             20
              * *                  TOP WIDTH (FT)                        318
              * *                  BOTTOM LENGTH (FT)                    318
              * *                  TOP AREA (AC)                        2.32
              * *                  VOLUME (AC-FT)                       16.0
              * *                  DISCHARGE (PUMP)                      0.5
              * *                  BOTTOM ELEVATION(FT)                  115
              * *                  TOP ELEVATION (FT)                    135
              * *****************************************************************************
              *
203           RS       1    STOR      -1
              * SA  0.51    0.60    0.70    0.81    0.92    1.04    1.16    1.30    1.44      1.
204           SA     1.0   1.147   1.293    1.44   1.587   1.733    1.88   2.027   2.173    2.32
205           SE     115     117     119     121     123     125     127     129     131     133
206           SQ       0     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5
              *
              * ****************************************************************
              *
              * ********* JUNE 6, 2007 DRAINAGE ZONE K & DET K ARE ADDED ***************

207           KK       K
208           KO       3                                  21
209           KM  DRAINAGE ZONE K
210           KM  AREA NORTH OF ARENA CANAL & EAST OF SULTANA DR
211           BA    1.50
212           LS            83.5
213           UD    0.85
              *

214           KK    DET K
215           KO       3
216           KM  DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE K, ADJACENT SULTANA DR
217           KM  ASSUMES THE FOLLOWING PARAMETERS:
              *
              * *****************************************************************************
              * *                  BOTTOM WIDTH(FT)                      660
              * *                  BOTTOM LENGTH (FT)                    660
              * *                  BOTTOM AREA (AC)                     10.0
              * *                  SIDE SLOPES (H:V)                     3:1
              * *                  DEPTH (FT)                             15
              * *                  TOP WIDTH (FT)                        750
              * *                  BOTTOM LENGTH (FT)                    750
              * *                  TOP AREA (AC)                       12.91
              * *                  VOLUME (AC-FT)                      108.0
              * *                  DISCHARGE (PUMP)                      0.5
              * *                  BOTTOM ELEVATION(FT)                  125
              * *                  TOP ELEVATION (FT)                    140
              * *****************************************************************************
              *
```

```
LINE     ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

218      RS       1    STOR      -1
219      SA    10.0  10.291  10.582  10.873  11.164  11.455  11.746  12.037  12.328   12.91
220      SE     125   126.5     128   129.5     131   132.5     134   135.5     137     140
221      SQ       0     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5
         *
         * ********* JUNE 6, 2007 DRAINAGE ZONE L & DET L ARE ADDED ****************
         *

222      KK       L
223      KO       3                               21
224      KM  DRAINAGE ZONE L
225      KM  AREA BETWEEN ARENA CANAL & HWY 99 AND EAST OF SULTANA DR
226      BA   0.250
227      LS            81.8
228      UD    0.33
         *

229      KK   DET L
230      KO       3
         * KO     1       2
         * KO     3                               21
231      KM  DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE L, ADJACENT HWY 99
232      KM  ASSUMES THE FOLLOWING PARAMETERS:
         *
         * ****************************************************************************
         * *                 BOTTOM WIDTH(FT)                      247
         * *                 BOTTOM LENGTH (FT)                    247
         * *                 BOTTOM AREA (AC)                     1.40
         * *                 SIDE SLOPES (H:V)                     3:1
         * *                 DEPTH (FT)                             15
         * *                 TOP WIDTH (FT)                        337
         * *                 BOTTOM LENGTH (FT)                    337
         * *                 TOP AREA (AC)                        2.61
         * *                 VOLUME (AC-FT)                      17.00
         * *                 DISCHARGE (PUMP)                      0.5
         * *                 BOTTOM ELEVATION(FT)                  125
         * *                 TOP ELEVATION (FT)                    140
         * ****************************************************************************
         *
233      RS       1    STOR      -1
234      SA     1.4   1.521   1.642   1.763   1.884   2.005   2.126   2.247   2.368    2.61
235      SE     125   126.5     128   129.5     131   132.5     134   135.5     137     140
236      SQ       0     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5
         *
         *

237      KK       H
238      KO       3                               21
239      KM  DRAINAGE ZONE H
240      BA   0.699
         * LS          79.0
241      LS            81.1
242      UD    0.94
         *
         *
```

```
LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

243       KK    DETH
          * KO    3
244       KO     3                            21
245       KM  DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE H, ADJACENT HIGHWAY 99
246       KM  ASSUMES THE FOLLOWING PARAMETERS:
          *
          * ***************************************************************************
          * *                    BOTTOM WIDTH(FT)                 164 ADD 125'= 289  REVISED
          * *                    BOTTOM LENGTH (FT)               375 ADD 125'= 500  2-13-06
          * *                    BOTTOM AREA (AC)                1.41          3.32
          * *                    SIDE SLOPES (H:V)                3:1
          * *                    DEPTH (FT)                        20
          * *                    TOP WIDTH (FT)                   272 ADD 125'= 397
          * *                    BOTTOM LENGTH (FT)               483 ADD 125'= 608
          * *                    TOP AREA (AC)                   3.02          5.54
          * *                    VOLUME (AC-FT)                 39.06         79.74
          * *                    DISCHARGE (PUMP)                 0.5 cfs
          * *                    BOTTOM ELEVATION(FT)             115
          * *                    TOP ELEVATION (FT)               135
          * ***************************************************************************
          *
247       RS       1    STOR      -1
          * SA1.41    1.56    1.72    1.89    2.06    2.24    2.42    2.61    2.81    3.02
248       SA    3.32    3.57    3.82    4.07    4.32    4.57    4.82    5.07    5.32    5.57
249       SE     115     117     119     121     123     125     127     129     131     133
250       SQ       0     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5
          *
          *

251       KK       I
252       KO       3                          21
253       KM  DRAINAGE ZONE I
254       BA   0.314
          * LS          75.3
255       LS            84.5
256       UD     0.40
          * ****************** June 7, 2007 Detention Data Revised **************
          *

257       KK    DETI
258       KO       3
          * KO     1       2
          * KO     3                           21
259       KM  DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE I, SOUTH OF HWY 99
260       KM  ASSUMES THE FOLLOWING PARAMETERS:
          *
          * ***************************************************************************
          * *                    BOTTOM WIDTH(FT)                 181
          * *                    BOTTOM LENGTH (FT)               181
          * *                    BOTTOM AREA (AC)                0.75
          * *                    SIDE SLOPES (H:V)                3:1
          * *                    DEPTH (FT)                        20
          * *                    TOP WIDTH (FT)                   289
          * *                    BOTTOM LENGTH (FT)               289
          * *                    TOP AREA (AC)                  1.917
          * *                    VOLUME (AC-FT)                  16.0
          * *                    DISCHARGE (PUMP)                 0.5
          * *                    BOTTOM ELEVATION(FT)             110
          * *                    TOP ELEVATION (FT)               130
          * ***************************************************************************
          *
```

```
LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 261      RS       1    STOR      -1
          * SA0.37    0.44    0.52    0.61    0.70    0.80    0.91    1.03    1.15    1.27
          * SA  0.49    0.60     .71    0.82    0.93    1.04    1.15    1.26    1.37     1.
 262      SA    0.75    0.88   1.009   1.139   1.269   1.399   1.528   1.658   1.788   1.917
 263      SE     110     112     114     116     118     120     122     124     126     128
 264      SQ       0     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5
          *
 265      ZZ
```

```
            SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
LINE      (V)  ROUTING          (--->)  DIVERSION OR PUMP FLOW

NO.       (.)  CONNECTOR        (<---)  RETURN OF DIVERTED OR PUMPED FLOW

  12        A2-1A
                V
                V
           DETA2A
                V
                V
  33       RA2-1A
                .
                .
  37            .        A2-1
                .           .
                .           .
  42       COMB 1............
                .
  45            .        A2-2
                .           .
                .           .
  50            .           .           A2-3
                .           .              .
                .           .              .
  55           A2........................
                V
                V
  59       DETA2B
                V
                V
  67       RCP-AZ
                .
  70            .        A2-5
                .           .
                .           .
  75            .           .           A2-4
                .           .              .
                .           .              .
  80       CPA-Y1........................
                .
                .
  83            .        A3-1
                .           .
                .           .
                .           .           A3-2
                .           .              .
                .           .              .
  93            .           .              .           A3-3
                .           .              .              .
                .           .              .              .
  98       CPA-Y2....................................
                V
                V
 101       RCPAY2
                .
                .
 104            .        A2-6
                .           .
                .           .
 109        CP-AX............
                V
                V
 112       RCP-AX
                .
                .
 115            .        A1-1
                .           .
                .           .
 120            .           .           A1-2
                .           .              .
                .           .              .
 125        DETA1........................
                V
                V
 129        DETA1
                .
                .
 137            .           B
                .           V
                .           V
 143            .        DETB
                .           .
                .           .
 151            .           .              C
                .           .              V
                .           .              V
 157            .           .           DETC
                .           .              .
                .           .              .
 165            .           .              .              D
                .           .              .              V
                .           .              .              V
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179      .        .        .        .       F
         .        .        .        .       V
         .        .        .        .       V
         .        .        .        .    DETF
185      .        .        .        .       .
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         .        .        .        .       .         G
193      .        .        .        .       .         V
         .        .        .        .       .         V
         .        .        .        .       .      DETG
19.      .        .        .        .       .         .
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         .        .        .        .       .         .        K
207      .        .        .        .       .         .        V
         .        .        .        .       .         .        V
         .        .        .        .       .         .    DET K
214      .        .        .        .       .         .        .
         .        .        .        .       .         .        .
         .        .        .        .       .         .        .        L
222      .        .        .        .       .         .        .        V
         .        .        .        .       .         .        .        V
         .        .        .        .       .         .        .    DET L
229      .        .        .        .       .         .        .        .
         .        .        .        .       .         .        .        .
         .        .        .        .       .         .        .        .        H
237      .        .        .        .       .         .        .        .        V
         .        .        .        .       .         .        .        .        V
         .        .        .        .       .         .        .        .     DETH
243      .        .        .        .       .
*** HEC1 ERROR 5 *** TOO MANY HYDROGRAPHS. COMBINE MORE OFTEN.
         .        .        .        .       .         .        .        .
         .        .        .        .       .         .        .        .        I
251      .        .        .        .       .         .        .        .        V
         .        .        .        .       .         .        .        .        V
         .        .        .        .       .         .        .        .     DETI
257      .        .        .        .       .         .        .        .

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

      1 ERRORS IN STREAM SYSTEM
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*****************************************                        **************************************
*                                       *                        *                                    *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                        *  U.S. ARMY CORPS OF ENGINEERS      *
*              JUN   1998               *                        *  HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.1                 *                        *       609 SECOND STREET            *
*                                       *                        *     DAVIS, CALIFORNIA 95616        *
* RUN DATE   15JUN07  TIME  14:08:01    *                        *         (916) 756-1104             *
*                                       *                        *                                    *
*****************************************                        **************************************



                         CITY OF LIVINGSTON
                         STORM DRAINAGE MASTER PLAN
                         10-YR & 100-YR STORM EVENTS
                         24-HR STORM DURATION
                         ***********************************************************************


  11 IO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                      NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      4FEB 5  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      5FEB 5  ENDING DATE
                     NDTIME       0055  ENDING TIME
                      ICENT         19  CENTURY MARK

                   COMPUTATION INTERVAL     .08 HOURS
                        TOTAL TIME BASE   24.92 HOURS

           ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                      NPLAN            1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                   1.00      1.39


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


              **************
              *            *
  12 KK       *    A2-1A   *
              *            *
              **************

  13 KO           OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        300  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS

                          NEW BASIN EAST OF SULTANA AND SOUTH OF HWY 99 (SUB-BASIN A2-1A)
                          Area = 0.734 sq mi

   9 IN           TIME DATA FOR INPUT TIME SERIES
                      JXMIN         30  TIME INTERVAL IN MINUTES
                     JXDATE      4FEB 5  STARTING DATE
                     JXTIME          0  STARTING TIME

                SUBBASIN RUNOFF DATA

  16 BA           SUBBASIN CHARACTERISTICS
                      TAREA        .73  SUBBASIN AREA

                  PRECIPITATION DATA

  17 PB                STORM        2.06  BASIN TOTAL PRECIPITATION

  18 PI              INCREMENTAL PRECIPITATION PATTERN
                        .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                        .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                        .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.04	.04	.04	.04	.04	.04
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

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23 LS          SCS LOSS RATE
                  STRTL         .36  INITIAL ABSTRACTION
                  CRVNBR      84.80  CURVE NUMBER
                  RTIMP         .00  PERCENT IMPERVIOUS AREA

24 UD          SCS DIMENSIONLESS UNITGRAPH
                  TLAG          .71  LAG
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***

UNIT HYDROGRAPH
45 END-OF-PERIOD ORDINATES

18.	56.	108.	179.	270.	360.	426.	463.	472.	464.
432.	394.	348.	291.	234.	193.	160.	133.	114.	95.
79.	66.	55.	46.	38.	32.	26.	22.	18.	16.
13.	11.	9.	8.	6.	5.	5.	4.	3.	3.
2.	2.	1.	1.	0.					

TOTAL RAINFALL = 2.06, TOTAL LOSS = 1.23, TOTAL EXCESS = .83

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
93.	10.67	(CFS)	41.	16.	16.	16.
		(INCHES)	.517	.824	.824	.824
		(AC-FT)	20.	32.	32.	32.

CUMULATIVE AREA = .73 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION A2-1A
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 2.06, TOTAL LOSS = 1.23, TOTAL EXCESS = .83

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
93.	10.67	(CFS)	41.	16.	16.	16.
		(INCHES)	.517	.824	.824	.824
		(AC-FT)	20.	32.	32.	32.

CUMULATIVE AREA = .73 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION A2-1A
FOR PLAN 1, RATIO = 1.39

TOTAL RAINFALL = 2.86, TOTAL LOSS = 1.40, TOTAL EXCESS = 1.46

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
178.	10.58	(CFS)	73.	29.	28.	28.
		(INCHES)	.925	1.450	1.450	1.450
		(AC-FT)	36.	57.	57.	57.

CUMULATIVE AREA = .73 SQ MI

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*   *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
25 KK         *   DETA2A   *
              *            *
              **************
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26 KO OUTPUT CONTROL VARIABLES

	IPRNT	3	PRINT CONTROL
	IPLOT	0	PLOT CONTROL
	QSCAL	0.	HYDROGRAPH PLOT SCALE

DETENTION BASIN A2A
ASSUMES THE FOLLOWING PARAMETERS:

HYDROGRAPH ROUTING DATA

S STORAGE ROUTING

	NSTPS	1	NUMBER OF SUBREACHES
	ITYP	STOR	TYPE OF INITIAL CONDITION
	RSVRIC	-1.00	INITIAL CONDITION
	X	.00	WORKING R AND D COEFFICIENT

30 SA	AREA	9.4	9.6	9.8	10.0	10.1	10.3	10.5	10.7	10.9	11.3
31 SE	ELEVATION	120.00	121.00	122.00	123.00	124.00	125.00	126.00	127.00	128.00	130.00
32 SQ	DISCHARGE	0.	1.	1.	1.	1.	1.	1.	1.	1.	1.

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	9.49	19.17	29.03	39.08	49.31	59.73	70.33	81.12	103.25
ELEVATION	120.00	121.00	122.00	123.00	124.00	125.00	126.00	127.00	128.00	130.00

*** *** *** *** ***

HYDROGRAPH AT STATION DETA2A
FOR PLAN 1, RATIO = 1.00

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
1.	11.42	(CFS)	1.	0.	0.	0.
		(INCHES)	.006	.015	.015	.015
		(AC-FT)	0.	1.	1.	1.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	24.92-HR
32.	24.92	29.	13.	13.	13.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	24.92-HR
3.26	24.92	122.96	121.39	121.34	121.34

CUMULATIVE AREA = .73 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DETA2A
FOR PLAN 1, RATIO = 1.39

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
1.	10.58	(CFS)	0.	0.	0.	0.
		(INCHES)	.006	.016	.016	.016
		(AC-FT)	0.	1.	1.	1.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	24.92-HR
56.	24.92	51.	25.	24.	24.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	24.92-HR
125.65	24.92	125.20	122.53	122.44	122.44

CUMULATIVE AREA = .73 SQ MI

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*   *
55 KK *   A2 *
*   *
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56 KO OUTPUT CONTROL VARIABLES

	IPRNT	3	PRINT CONTROL
	IPLOT	0	PLOT CONTROL
	QSCAL	0.	HYDROGRAPH PLOT SCALE
	IPNCH	0	PUNCH COMPUTED HYDROGRAPH
	IOUT	21	SAVE HYDROGRAPH ON THIS UNIT
	ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
	ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
	TIMINT	.083	TIME INTERVAL IN HOURS

58 HC HYDROGRAPH COMBINATION
ICOMP 3 NUMBER OF HYDROGRAPHS TO COMBINE

***

*** *** *** *** ***

HYDROGRAPH AT STATION A2
FOR PLAN 1, RATIO = 1.00

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
68.	10.33	(CFS)	28.	12.	11.	11.
		(INCHES)	.172	.290	.290	.290
		(AC-FT)	14.	23.	23.	23.

CUMULATIVE AREA = 1.49 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION A2
FOR PLAN 1, RATIO = 1.39

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
158.	10.25	(CFS)	55.	22.	21.	21.
		(INCHES)	.344	.554	.554	.554
		(AC-FT)	27.	44.	44.	44.

CUMULATIVE AREA = 1.49 SQ MI

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              **************
              *            *
59 KK         *   DETA2B   *
              *            *
              **************
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60 KO OUTPUT CONTROL VARIABLES
IPRNT 3 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE
DETENTION BASIN A2B
ASSUMES THE FOLLOWING PARAMETERS:

HYDROGRAPH ROUTING DATA

63 RS STORAGE ROUTING
NSTPS 1 NUMBER OF SUBREACHES
ITYP STOR TYPE OF INITIAL CONDITION
RSVRIC -1.00 INITIAL CONDITION
X .00 WORKING R AND D COEFFICIENT

64 SA	AREA	9.4	9.6	9.8	10.0	10.1	10.3	10.5	10.7	10.9	11.3
65 SE	ELEVATION	115.00	116.00	117.00	118.00	119.00	120.00	121.00	122.00	123.00	125.00
66 SQ	DISCHARGE	0.	1.	1.	1.	1.	1.	1.	1.	1.	1.

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	9.49	19.17	29.03	39.08	49.31	59.73	70.33	81.12	103.25
ELEVATION	115.00	116.00	117.00	118.00	119.00	120.00	121.00	122.00	123.00	125.00

*** *** *** *** ***

HYDROGRAPH AT STATION DETA2B
FOR PLAN 1, RATIO = 1.00

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
1.	12.92	(CFS)	1.	0.	0.	0.
		(INCHES)	.003	.007	.007	.007
		(AC-FT)	0.	1.	1.	1.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	24.92-HR
22.	24.92	20.	9.	9.	9.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	24.92-HR
117.33	24.92	117.10	115.97	115.93	115.93

CUMULATIVE AREA = 1.49 SQ MI

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    ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION    DETA2B
                          FOR PLAN 1, RATIO = 1.39

  PEAK FLOW      TIME                           MAXIMUM AVERAGE FLOW
    (CFS)        (HR)                  6-HR        24-HR        72-HR       24.92-HR
       1.        10.58      (CFS)        1.           0.           0.             0.
                          (INCHES)     .003         .008         .008           .008
                           (AC-FT)       0.           1.           1.             1.

 PEAK STORAGE    TIME                          MAXIMUM AVERAGE STORAGE
   (AC-FT)       (HR)                  6-HR        24-HR        72-HR       24.92-HR
       43.       24.92                  39.          19.          18.            18.

  PEAK STAGE     TIME                           MAXIMUM AVERAGE STAGE
    (FEET)       (HR)                  6-HR        24-HR        72-HR       24.92-HR
    119.41       24.92               119.04       116.94       116.87         116.87

                        CUMULATIVE AREA =     1.49 SQ MI


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              **************
              *            *
  125 KK      *    DETA1   *
              *            *
              **************

  126 KO            OUTPUT CONTROL VARIABLES
                          IPRNT              3  PRINT CONTROL
                          IPLOT              0  PLOT CONTROL
                          QSCAL             0.  HYDROGRAPH PLOT SCALE
                          IPNCH              0  PUNCH COMPUTED HYDROGRAPH
                          IOUT              21  SAVE HYDROGRAPH ON THIS UNIT
                          ISAV1              1  FIRST ORDINATE PUNCHED OR SAVED
                          ISAV2            300  LAST ORDINATE PUNCHED OR SAVED
                          TIMINT          .083  TIME INTERVAL IN HOURS

                      COMBINE RCP-AX, SUBBASIN A1-1, AND SUBBASIN A1-2 ALL AT DETENTION BASIN A1

  128 HC            HYDROGRAPH COMBINATION
                          ICOMP              3  NUMBER OF HYDROGRAPHS TO COMBINE
                                                                      ***

    ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION     DETA1
                          FOR PLAN 1, RATIO = 1.00

  PEAK FLOW      TIME                           MAXIMUM AVERAGE FLOW
    (CFS)        (HR)                  6-HR        24-HR        72-HR       24.92-HR
      73.        11.00      (CFS)       45.          21.          20.            20.
                          (INCHES)     .113         .209         .209           .209
                           (AC-FT)      22.          41.          41.            41.

                        CUMULATIVE AREA =     3.70 SQ MI

    ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION     DETA1
                          FOR PLAN 1, RATIO = 1.39

  PEAK FLOW      TIME                           MAXIMUM AVERAGE FLOW
    (CFS)        (HR)                  6-HR        24-HR        72-HR       24.92-HR
     228.        10.67      (CFS)      109.          46.          44.            44.
                          (INCHES)     .273         .462         .462           .462
                           (AC-FT)      54.          91.          91.            91.

                        CUMULATIVE AREA =     3.70 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
  129 KK      *    DETA1   *
              *            *
              **************

    J KO            OUTPUT CONTROL VARIABLES
                          IPRNT              3  PRINT CONTROL
                          IPLOT              0  PLOT CONTROL
                          QSCAL             0.  HYDROGRAPH PLOT SCALE
                          IPNCH              0  PUNCH COMPUTED HYDROGRAPH
                          IOUT              21  SAVE HYDROGRAPH ON THIS UNIT
                          ISAV1              1  FIRST ORDINATE PUNCHED OR SAVED
```

TIMINT .083 TIME INTERVAL IN HOURS

DETENTION BASIN A1
ASSUMES THE FOLLOWING PARAMETERS:

HYDROGRAPH ROUTING DATA

133 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	.00	WORKING R AND D COEFFICIENT

134 SA	AREA	10.0	10.1	10.3	10.4	10.5	10.6	10.8	10.9	11.0	11.3
135 SE	ELEVATION	96.00	98.00	100.00	102.00	104.00	106.00	108.00	110.00	112.00	116.00
136 SQ	DISCHARGE	0.	2.	2.	2.	2.	2.	2.	2.	2.	2.

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	20.13	40.52	61.17	82.08	103.25	124.68	146.37	168.32	212.90
ELEVATION	96.00	98.00	100.00	102.00	104.00	106.00	108.00	110.00	112.00	116.00

*** *** *** *** ***

HYDROGRAPH AT STATION DETA1
FOR PLAN 1, RATIO = 1.00

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
2.	15.75	(CFS)	2.	1.	1.	1.
		(INCHES)	.005	.010	.010	.010
		(AC-FT)	1.	2.	2.	2.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	24.92-HR
39.	24.92	34.	14.	14.	14.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	24.92-HR
99.88	24.92	99.36	97.41	97.36	97.36

CUMULATIVE AREA = 3.70 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DETA1
FOR PLAN 1, RATIO = 1.39

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
2.	11.42	(CFS)	2.	1.	1.	1.
		(INCHES)	.005	.012	.012	.012
		(AC-FT)	1.	2.	2.	2.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	24.92-HR
89.	24.92	79.	35.	34.	34.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	24.92-HR
104.63	24.92	103.68	99.45	99.32	99.32

CUMULATIVE AREA = 3.70 SQ MI

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              **************
              *            *
137 KK        *        B   *
              *            *
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138 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	21	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	.083	TIME INTERVAL IN HOURS

DRAINAGE ZONE B

140 BA SUBBASIN CHARACTERISTICS

TAREA	1.47	SUBBASIN AREA

PRECIPITATION DATA

17 PB

STORM	2.06	BASIN TOTAL PRECIPITATION

18 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.04	.04	.04	.04	.04	.04
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

141 LS SCS LOSS RATE

STRTL	.79	INITIAL ABSTRACTION
CRVNBR	71.80	CURVE NUMBER
RTIMP	.00	PERCENT IMPERVIOUS AREA

142 UD SCS DIMENSIONLESS UNITGRAPH

TLAG	.72	LAG

***

UNIT HYDROGRAPH
45 END-OF-PERIOD ORDINATES

34.	109.	208.	344.	520.	698.	830.	907.	929.	922.
863.	791.	705.	597.	483.	395.	329.	275.	234.	197.
165.	135.	115.	96.	81.	67.	56.	47.	39.	33.
27.	23.	19.	16.	13.	11.	10.	8.	7.	6.
5.	4.	3.	2.	1.					

TOTAL RAINFALL = 2.06, TOTAL LOSS = 1.75, TOTAL EXCESS = .31

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
35.	11.08	(CFS)	25.	12.	12.	12.
		(INCHES)	.161	.309	.309	.309
		(AC-FT)	13.	24.	24.	24.

CUMULATIVE AREA = 1.47 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION B
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 2.06, TOTAL LOSS = 1.75, TOTAL EXCESS = .31

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
35.	11.08	(CFS)	25.	12.	12.	12.
		(INCHES)	.161	.309	.309	.309
		(AC-FT)	13.	24.	24.	24.

CUMULATIVE AREA = 1.47 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION B
FOR PLAN 1, RATIO = 1.39

TOTAL RAINFALL = 2.86, TOTAL LOSS = 2.14, TOTAL EXCESS = .72

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
123.	10.75	(CFS)	65.	28.	27.	27.
		(INCHES)	.414	.711	.711	.711
		(AC-FT)	32.	56.	56.	56.

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              **************
              *            *
   KK         *     DETB   *
              *            *
              **************

144 KO             OUTPUT CONTROL VARIABLES
                        IPRNT          3  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        300  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .083  TIME INTERVAL IN HOURS

                            DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE B, SOUTH OF MAGNOLIA
                            ASSUMES THE FOLLOWING PARAMETERS:

               HYDROGRAPH ROUTING DATA

147 RS              STORAGE ROUTING
                        NSTPS          1  NUMBER OF SUBREACHES
                         ITYP       STOR  TYPE OF INITIAL CONDITION
                       RSVRIC      -1.00  INITIAL CONDITION
                            X        .00  WORKING R AND D COEFFICIENT
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148 SA AREA	5.5	5.6	5.8	5.9	6.0	6.1	6.2	6.3	6.5	6.7
149 SE ELEVATION	90.00	92.00	94.00	96.00	98.00	100.00	102.00	104.00	106.00	110.00
150 SQ DISCHARGE	0.	1.	1.	1.	1.	1.	1.	1.	1.	1.

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	11.14	22.52	34.14	46.00	58.10	70.44	83.02	95.84	122.16
ELEVATION	90.00	92.00	94.00	96.00	98.00	100.00	102.00	104.00	106.00	110.00

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                       HYDROGRAPH AT STATION      DETB
                         FOR PLAN 1, RATIO = 1.00

 PEAK FLOW      TIME                              MAXIMUM AVERAGE FLOW
   (CFS)        (HR)                      6-HR        24-HR        72-HR       24.92-HR
      1.       15.50        (CFS)           1.           0.           0.            0.
                          (INCHES)        .003         .006         .006          .006
                           (AC-FT)          0.           1.           1.            1.

 PEAK STORAGE   TIME                              MAXIMUM AVERAGE STORAGE
   (AC-FT)      (HR)                      6-HR        24-HR        72-HR       24.92-HR
      24.      24.92                       20.           8.           8.            8.

 PEAK STAGE     TIME                              MAXIMUM AVERAGE STAGE
   (FEET)       (HR)                      6-HR        24-HR        72-HR       24.92-HR
    94.20      24.92                     93.61        91.50        91.44         91.44

                      CUMULATIVE AREA =     1.47 SQ MI
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                       HYDROGRAPH AT STATION      DETB
                         FOR PLAN 1, RATIO = 1.39

 PEAK FLOW      TIME                              MAXIMUM AVERAGE FLOW
   (CFS)        (HR)                      6-HR        24-HR        72-HR       24.92-HR
      1.       11.42        (CFS)           1.           0.           0.            0.
                          (INCHES)        .003         .007         .007          .007
                           (AC-FT)          0.           1.           1.            1.

 PEAK STORAGE   TIME                              MAXIMUM AVERAGE STORAGE
   (AC-FT)      (HR)                      6-HR        24-HR        72-HR       24.92-HR
      55.      24.92                       49.          21.          21.           21.

 PEAK STAGE     TIME                              MAXIMUM AVERAGE STAGE
   (FEET)       (HR)                      6-HR        24-HR        72-HR       24.92-HR
    99.50      24.92                     98.43        93.74        93.61         93.61

                      CUMULATIVE AREA =     1.47 SQ MI
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            **************
            *            *
151 KK      *         C  *
            *            *
            **************

152 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          3  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                     IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                      IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2        300  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT       .083  TIME INTERVAL IN HOURS

                          DRAINAGE ZONE C

              SUBBASIN RUNOFF DATA

154 BA          SUBBASIN CHARACTERISTICS
                     TAREA        .39  SUBBASIN AREA

                PRECIPITATION DATA

 17 PB               STORM       2.06  BASIN TOTAL PRECIPITATION

 18 PI            INCREMENTAL PRECIPITATION PATTERN
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .01     .01     .01     .01     .01     .01     .01     .01
                     .01     .01     .01     .01     .04     .04     .04     .04     .04     .04
                     .01     .01     .01     .01     .01     .01     .01     .01     .01     .01
                     .01     .01     .01     .01     .01     .01     .01     .01     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                     .00     .00     .00     .00     .00     .00     .00     .00

155 LS            SCS LOSS RATE
                     STRTL        .84  INITIAL ABSTRACTION
                    CRVNBR      70.40  CURVE NUMBER
                     RTIMP        .00  PERCENT IMPERVIOUS AREA

156 UD            SCS DIMENSIONLESS UNITGRAPH
                      TLAG        .35  LAG

                                                         ***

                                                    UNIT HYDROGRAPH
                                               23 END-OF-PERIOD ORDINATES
              54.       169.      348.      464.      480.      423.      333.      221.      156.      113.
              80.        56.       40.       28.       20.       14.       10.        7.        5.        4.
               3.         2.        1.

    TOTAL RAINFALL =      2.06, TOTAL LOSS =      1.79, TOTAL EXCESS =       .27

  PEAK FLOW     TIME                            MAXIMUM AVERAGE FLOW
                                   6-HR        24-HR        72-HR       24.92-HR
    (CFS)       (HR)
                           (CFS)
       9.      10.67                  6.           3.           3.            3.
                         (INCHES)   .141         .274         .274          .274
                          (AC-FT)     3.           6.           6.            6.

                         CUMULATIVE AREA =      .39 SQ MI

      ***          ***          ***          ***          ***

                          HYDROGRAPH AT STATION          C
                            FOR PLAN 1, RATIO = 1.00

    TOTAL RAINFALL =      2.06, TOTAL LOSS =      1.79, TOTAL EXCESS =       .27

  PEAK FLOW     TIME                            MAXIMUM AVERAGE FLOW
                                   6-HR        24-HR        72-HR       24.92-HR
    (CFS)       (HR)
       9.      10.67       (CFS)      6.           3.           3.            3.
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                    (AC-FT)          3.            6.            6.             6.

                    CUMULATIVE AREA =       .39 SQ MI


     ***            ***            ***            ***            ***

                     HYDROGRAPH AT STATION        C
                       FOR PLAN 1, RATIO = 1.39

  TAL RAINFALL =     2.86, TOTAL LOSS =     2.20, TOTAL EXCESS =       .65

 PEAK FLOW      TIME                          MAXIMUM AVERAGE FLOW
   (CFS)        (HR)                 6-HR         24-HR          72-HR        24.92-HR
     38.       10.25       (CFS)      16.            7.             7.             7.
                        (INCHES)     .382          .655           .655           .655
                         (AC-FT)       8.           14.            14.            14.

                     CUMULATIVE AREA =       .39 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


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          *            *
157 KK    *    DETC    *
          *            *
          **************

158 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          3  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                     IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        300  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .083  TIME INTERVAL IN HOURS

                       DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE C, ADJACENT ARENA CANAL
                       ASSUMES THE FOLLOWING PARAMETERS:

             HYDROGRAPH ROUTING DATA

161 RS         STORAGE ROUTING
                    NSTPS          1  NUMBER OF SUBREACHES
                     ITYP       STOR  TYPE OF INITIAL CONDITION
                   RSVRIC      -1.00  INITIAL CONDITION
                        X        .00  WORKING R AND D COEFFICIENT

162 SA              AREA          .8        .9       1.0       1.1       1.3       1.4       1.5       1.7       1.8       1.9

163 SE         ELEVATION      100.00    102.00    104.00    106.00    108.00    110.00    112.00    114.00    116.00    118.00

164 SQ         DISCHARGE          0.        1.        1.        1.        1.        1.        1.        1.        1.        1.

                                                         ***

                                             COMPUTED STORAGE-ELEVATION DATA

          STORAGE        .00      1.63      3.52      5.66      8.07     10.74     13.66     16.85     20.29     24.00
        ELEVATION     100.00    102.00    104.00    106.00    108.00    110.00    112.00    114.00    116.00    118.00

     ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION      DETC
                         FOR PLAN 1, RATIO = 1.00

 PEAK FLOW      TIME                          MAXIMUM AVERAGE FLOW
   (CFS)        (HR)                 6-HR         24-HR          72-HR        24.92-HR
      1.       13.33       (CFS)       1.            1.             1.             1.
                        (INCHES)     .024          .053           .053           .053
                         (AC-FT)       0.            1.             1.             1.

 PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
   (AC-FT)      (HR)                 6-HR         24-HR          72-HR        24.92-HR
      5.       24.50                   4.            2.             2.             2.

 PEAK STAGE     TIME                        MAXIMUM AVERAGE STAGE
   (FEET)       (HR)                 6-HR         24-HR          72-HR        24.92-HR
   105.03      24.58               104.52        101.98         101.90         101.90

                       CUMULATIVE AREA =       .39 SQ MI


     ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION      DETC
                         FOR PLAN 1, RATIO = 1.39
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                                            6-HR        24-HR        72-HR      24.92-HR
  (CFS)        (HR)                           1.          1.           1.          1.
    1.        10.58       (CFS)             .024        .058         .058        .058
                        (INCHES)              0.          1.           1.          1.
                        (AC-FT)

                                              MAXIMUM AVERAGE STORAGE
PEAK STORAGE   TIME                         6-HR        24-HR        72-HR      24.92-HR
  (AC-FT)      (HR)                          11.          5.           5.          5.
     12.      24.67

                                              MAXIMUM AVERAGE STAGE
PF   STAGE     TIME                         6-HR        24-HR        72-HR      24.92-HR
     .T)       (HR)                        110.31      104.89       104.71      104.71
 ...17        24.67

                      CUMULATIVE AREA =       .39 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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           *            *
 165 KK    *       D    *
           *            *
           **************

 166 KO          OUTPUT CONTROL VARIABLES
                      IPRNT             3  PRINT CONTROL
                      IPLOT             0  PLOT CONTROL
                      QSCAL            0.  HYDROGRAPH PLOT SCALE
                      IPNCH             0  PUNCH COMPUTED HYDROGRAPH
                      IOUT             21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1             1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2           300  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT         .083  TIME INTERVAL IN HOURS

                        DRAINAGE ZONE D

               SUBBASIN RUNOFF DATA

 168 BA          SUBBASIN CHARACTERISTICS
                      TAREA           .69  SUBBASIN AREA

                 PRECIPITATION DATA

 17 PB                STORM          2.06  BASIN TOTAL PRECIPITATION

 18 PI             INCREMENTAL PRECIPITATION PATTERN
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .01      .01      .01      .01      .01      .01      .01      .01
                      .01      .01      .01      .01      .04      .04      .04      .04      .04      .04
                      .01      .01      .01      .01      .01      .01      .01      .01      .01      .01
                      .01      .01      .01      .01      .01      .01      .01      .01      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00

 169 LS            SCS LOSS RATE
                      STRTL           .51  INITIAL ABSTRACTION
                      CRVNBR        79.70  CURVE NUMBER
                      RTIMP           .00  PERCENT IMPERVIOUS AREA

 170 UD            SCS DIMENSIONLESS UNITGRAPH
                      TLAG            .73  LAG

                                                  ***

                                             UNIT HYDROGRAPH
                                         46 END-OF-PERIOD ORDINATES
          15.        50.        95.       157.       237.       320.       383.       421.       433.       431.
         407.       375.       337.       289.       235.       191.       160.       134.       113.        96.
          81.        67.        57.        47.        40.        33.        28.        23.        20.        16.
          14.        12.        10.         8.         7.         6.         5.         4.         4.         3.
           3.         2.         2.         1.         1.         0.
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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
52.	10.75	(CFS)	26.	11.	10.	10.
		(INCHES)	.347	.582	.582	.582
		(AC-FT)	13.	22.	22.	22.

CUMULATIVE AREA = .69 SQ MI

** *** *** *** ***

HYDROGRAPH AT STATION D
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 2.06, TOTAL LOSS = 1.47, TOTAL EXCESS = .59

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
52.	10.75	(CFS)	26.	11.	10.	10.
		(INCHES)	.347	.582	.582	.582
		(AC-FT)	13.	22.	22.	22.

CUMULATIVE AREA = .69 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION D
FOR PLAN 1, RATIO = 1.39

TOTAL RAINFALL = 2.86, TOTAL LOSS = 1.73, TOTAL EXCESS = 1.13

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
117.	10.67	(CFS)	52.	21.	20.	20.
		(INCHES)	.701	1.121	1.121	1.121
		(AC-FT)	26.	41.	41.	41.

CUMULATIVE AREA = .69 SQ MI

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              **************
              *            *
   K          *    DETD    *
              *            *
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172 KO OUTPUT CONTROL VARIABLES
IPRNT 3 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE
DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE D, NORTH OF VINEWOOD/B STREET
ASSUMES THE FOLLOWING PARAMETERS:

HYDROGRAPH ROUTING DATA

175 RS STORAGE ROUTING
NSTPS 1 NUMBER OF SUBREACHES
ITYP STOR TYPE OF INITIAL CONDITION
RSVRIC -1.00 INITIAL CONDITION
X .00 WORKING R AND D COEFFICIENT

176 SA	AREA	2.8	3.0	3.2	3.4	3.6	3.8	4.1	4.3	4.5	4.7
177 SE	ELEVATION	95.00	97.00	99.00	101.00	103.00	105.00	107.00	109.00	111.00	113.00
178 SQ	DISCHARGE	0.	1.	1.	1.	1.	1.	1.	1.	1.	1.

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	5.72	11.88	18.48	25.51	32.99	40.91	49.27	58.07	67.31
ELEVATION	95.00	97.00	99.00	101.00	103.00	105.00	107.00	109.00	111.00	113.00

*** *** *** *** ***

HYDROGRAPH AT STATION DETD
FOR PLAN 1, RATIO = 1.00

K FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
1.	11.75	(CFS)	1.	0.	0.	0.
		(INCHES)	.007	.016	.016	.016
		(AC-FT)	0.	1.	1.	1.

PEAK STORAGE TIME MAXIMUM AVERAGE STORAGE

21.	24.92	19.	8.	8.	8.

PEAK STAGE (FEET)	TIME (HR)		MAXIMUM AVERAGE STAGE		
		6-HR	24-HR	72-HR	24.92-HR
101.71	24.92	101.05	97.76	97.66	97.66

CUMULATIVE AREA = .69 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DETD
FOR PLAN 1, RATIO = 1.39

PEAK FLOW (CFS)	TIME (HR)			MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR	24.92-HR
1.	10.67	(CFS)	1.	0.	0.	0.
		(INCHES)	.007	.016	.016	.016
		(AC-FT)	0.	1.	1.	1.

PEAK STORAGE (AC-FT)	TIME (HR)		MAXIMUM AVERAGE STORAGE		
		6-HR	24-HR	72-HR	24.92-HR
41.	24.92	37.	17.	17.	17.

PEAK STAGE (FEET)	TIME (HR)		MAXIMUM AVERAGE STAGE		
		6-HR	24-HR	72-HR	24.92-HR
106.99	24.92	106.01	100.27	100.07	100.07

CUMULATIVE AREA = .69 SQ MI

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              *            *
179 KK        *         F  *
              *            *
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180 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	21	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	.083	TIME INTERVAL IN HOURS

DRAINAGE ZONE F

SUBBASIN RUNOFF DATA

182 BA SUBBASIN CHARACTERISTICS

TAREA	.65	SUBBASIN AREA

PRECIPITATION DATA

17 PB

STORM	2.06	BASIN TOTAL PRECIPITATION

18 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.04	.04	.04	.04	.04	.04
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

183 LS SCS LOSS RATE

STRTL	.76	INITIAL ABSTRACTION
CRVNBR	72.50	CURVE NUMBER

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184 UD          SCS DIMENSIONLESS UNITGRAPH
                      TLAG          .50  LAG

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                                                  UNIT HYDROGRAPH
                                             32 END-OF-PERIOD ORDINATES
          39.       115.       236.       395.       517.       573.       573.       524.       457.       366.
         270.       209.       162.       129.       101.        78.        60.        47.        37.        28.
          22.        17.        14.        11.         8.         6.         5.         4.         3.         2.
           1.         0.

    TOTAL RAINFALL =      2.06, TOTAL LOSS =       1.73, TOTAL EXCESS =       .33

  PEAK FLOW     TIME                            MAXIMUM AVERAGE FLOW
    (CFS)       (HR)                   6-HR        24-HR       72-HR      24.92-HR
      20.      10.67         (CFS)      12.           6.          6.           6.
                          (INCHES)     .177         .332        .332         .332
                           (AC-FT)       6.          11.         11.          11.

                      CUMULATIVE AREA =       .65 SQ MI

     ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION          F
                         FOR PLAN 1, RATIO = 1.00

    TOTAL RAINFALL =      2.06, TOTAL LOSS =       1.73, TOTAL EXCESS =       .33

  PEAK FLOW     TIME                            MAXIMUM AVERAGE FLOW
    (CFS)       (HR)                   6-HR        24-HR       72-HR      24.92-HR
      20.      10.67         (CFS)      12.           6.          6.           6.
                          (INCHES)     .177         .332        .332         .332
                           (AC-FT)       6.          11.         11.          11.

                      CUMULATIVE AREA =       .65 SQ MI

     ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION          F
                         FOR PLAN 1, RATIO = 1.39

    TOTAL RAINFALL =      2.86, TOTAL LOSS =       2.11, TOTAL EXCESS =       .75

  PEAK FLOW     TIME                            MAXIMUM AVERAGE FLOW
    (CFS)       (HR)                   6-HR        24-HR       72-HR      24.92-HR
      69.      10.50         (CFS)      31.          13.         13.          13.
                          (INCHES)     .444         .747        .747         .747
                           (AC-FT)      15.          26.         26.          26.

                      CUMULATIVE AREA =       .65 SQ MI


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              *            *
185 KK        *    DETF    *
              *            *
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186 KO          OUTPUT CONTROL VARIABLES
                      IPRNT              3  PRINT CONTROL
                      IPLOT              0  PLOT CONTROL
                      QSCAL             0.  HYDROGRAPH PLOT SCALE
                        DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE F, SOUTH OF OLIVE AVENUE
                        ASSUMES THE FOLLOWING PARAMETERS:

                HYDROGRAPH ROUTING DATA

189 RS          STORAGE ROUTING
                      NSTPS              1  NUMBER OF SUBREACHES
                       ITYP           STOR  TYPE OF INITIAL CONDITION
                     RSVRIC          -1.00  INITIAL CONDITION
                          X            .00  WORKING R AND D COEFFICIENT

190 SA                AREA         2.0        2.2        2.4        2.5        2.7        2.9        3.1        3.3        3.4        3.6

191 SE           ELEVATION      115.00     117.00     119.00     121.00     123.00     125.00     127.00     129.00     131.00     132.00

192 SQ           DISCHARGE          0.         1.         1.         1.         1.         1.         1.         1.         1.         1.

                                                        ***

                                            COMPUTED STORAGE-ELEVATION DATA

            STORAGE         .00       4.18       8.72      13.62      18.88      24.49      30.47      36.81      43.51      47.04
          ELEVATION      115.00     117.00     119.00     121.00     123.00     125.00     127.00     129.00     131.00     132.00
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      ***              ***              ***              ***              ***

                            HYDROGRAPH AT STATION      DETF
                              FOR PLAN 1, RATIO = 1.00

PEAK FLOW       TIME                              MAXIMUM AVERAGE FLOW
  (CFS)         (HR)                     6-HR         24-HR          72-HR          24.92-HR
     1.         13.83          (CFS)       0.            0.             0.               0.
                            (INCHES)    .007          .016           .016             .016
                             (AC-FT)      0.            1.             1.               1.

PEAK STORAGE    TIME                             MAXIMUM AVERAGE STORAGE
  (AC-FT)       (HR)                     6-HR         24-HR          72-HR          24.92-HR
     11.        24.92                     10.            4.             4.               4.

PEAK STAGE      TIME                              MAXIMUM AVERAGE STAGE
  (FEET)        (HR)                     6-HR         24-HR          72-HR          24.92-HR
  119.89        24.92                  119.32        116.86         116.79           116.79

                           CUMULATIVE AREA =      .65 SQ MI

      ***              ***              ***              ***              ***

                            HYDROGRAPH AT STATION      DETF
                              FOR PLAN 1, RATIO = 1.39

PEAK FLOW       TIME                              MAXIMUM AVERAGE FLOW
  (CFS)         (HR)                     6-HR         24-HR          72-HR          24.92-HR
     1.         10.83          (CFS)       0.            0.             0.               0.
                            (INCHES)    .007          .017           .017             .017
                             (AC-FT)      0.            1.             1.               1.

PEAK STORAGE    TIME                             MAXIMUM AVERAGE STORAGE
  (AC-FT)       (HR)                     6-HR         24-HR          72-HR          24.92-HR
     25.        24.92                     23.           10.            10.              10.

PEAK STAGE      TIME                              MAXIMUM AVERAGE STAGE
  (FEET)        (HR)                     6-HR         24-HR          72-HR          24.92-HR
  125.23        24.92                  124.29        119.31         119.15           119.15

                           CUMULATIVE AREA =      .65 SQ MI

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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               *            *
 193 KK        *        G   *
               *            *
               **************

 194 KO           OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         300  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS

                           DRAINAGE ZONE G

                SUBBASIN RUNOFF DATA

 196 BA           SUBBASIN CHARACTERISTICS
                       TAREA         .32  SUBBASIN AREA

                  PRECIPITATION DATA

  17 PB                STORM        2.06  BASIN TOTAL PRECIPITATION

  18 PI              INCREMENTAL PRECIPITATION PATTERN
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                        .00       .00       .01       .01       .01       .01       .01       .01       .01       .01
                        .01       .01       .01       .01       .04       .04       .04       .04       .04       .04
                        .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
                        .01       .01       .01       .01       .01       .01       .01       .01       .00       .00
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
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      .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
      .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
      .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
      .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
      .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
      .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
      .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
      .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
      .00     .00     .00     .00     .00     .00     .00     .00

1   ;          SCS LOSS RATE
                   STRTL        .47  INITIAL ABSTRACTION
                  CRVNBR      81.00  CURVE NUMBER
                   RTIMP        .00  PERCENT IMPERVIOUS AREA

198 UD         SCS DIMENSIONLESS UNITGRAPH
                    TLAG        .53  LAG

                                                   ***

                                              UNIT HYDROGRAPH
                                          34 END-OF-PERIOD ORDINATES
            17.       50.      101.      171.      232.      265.      272.      259.      232.      197.
           152.      116.       91.       72.       58.       46.       36.       28.       22.       18.
            14.       11.        9.        7.        5.        4.        3.        3.        2.        2.
             1.        1.        1.        0.

    TOTAL RAINFALL =     2.06, TOTAL LOSS =     1.42, TOTAL EXCESS =      .64

  PEAK FLOW      TIME                             MAXIMUM AVERAGE FLOW
                                          6-HR        24-HR        72-HR      24.92-HR
    (CFS)        (HR)
                                (CFS)
      32.       10.42                      14.           6.           5.           5.
                              (INCHES)     .392         .641         .641         .641
                               (AC-FT)       7.          11.          11.          11.

                              CUMULATIVE AREA =      .32 SQ MI

      ***            ***            ***            ***            ***

                                HYDROGRAPH AT STATION        G
                                  FOR PLAN 1, RATIO = 1.00

    TOTAL RAINFALL =     2.06, TOTAL LOSS =     1.42, TOTAL EXCESS =      .64

  PEAK FLOW      TIME                             MAXIMUM AVERAGE FLOW
                                          6-HR        24-HR        72-HR      24.92-HR
    (CFS)        (HR)
                                (CFS)
      32.       10.42                      14.           6.           5.           5.
                              (INCHES)     .392         .641         .641         .641
                               (AC-FT)       7.          11.          11.          11.

                              CUMULATIVE AREA =      .32 SQ MI

      ***            ***            ***            ***            ***

                                HYDROGRAPH AT STATION        G
                                  FOR PLAN 1, RATIO = 1.39

    TOTAL RAINFALL =     2.86, TOTAL LOSS =     1.65, TOTAL EXCESS =     1.21

  PEAK FLOW      TIME                             MAXIMUM AVERAGE FLOW
                                          6-HR        24-HR        72-HR      24.92-HR
    (CFS)        (HR)
                                (CFS)
      70.       10.42                      26.          10.          10.          10.
                              (INCHES)     .761        1.204        1.204        1.204
                               (AC-FT)      13.          21.          21.          21.

                              CUMULATIVE AREA =      .32 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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            *            *
199 KK      *     DETG   *
            *            *
            **************

200 KO           OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                         DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE G, ADJACENT HWY 99
                         ASSUMES THE FOLLOWING PARAMETERS:

              HYDROGRAPH ROUTING DATA

    RS           STORAGE ROUTING
                      NSTPS           1  NUMBER OF SUBREACHES
                       ITYP        STOR  TYPE OF INITIAL CONDITION
                     RSVRIC       -1.00  INITIAL CONDITION
                          X         .00 WORKING R AND D COEFFICIENT

204 SA                AREA         1.0        1.1        1.3        1.4        1.6        1.7        1.9        2.0        2.2        2.3
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205 SE          ELEVATION     115.00   117.00   119.00   121.00   123.00   125.00   127.00   129.00   131.00   133.00

206 SQ          DISCHARGE         0.       1.       1.       1.       1.       1.       1.       1.       1.       1.

                                                        ***

                                          COMPUTED STORAGE-ELEVATION DATA

        STORAGE       .00     2.15     4.58     7.32    10.34    13.66    17.27    21.18    25.38    29.87
      ELEVATION    115.00   117.00   119.00   121.00   123.00   125.00   127.00   129.00   131.00   133.00


   ***           ***          ***          ***          ***

                    HYDROGRAPH AT STATION      DETG
                      FOR PLAN 1, RATIO = 1.00

                                                   MAXIMUM AVERAGE FLOW
 PEAK FLOW      TIME                      6-HR        24-HR        72-HR      24.92-HR
   (CFS)        (HR)
     1.        10.92           (CFS)        1.          0.           0.           0.
                            (INCHES)      .014        .035         .035         .035
                             (AC-FT)        0.          1.           1.           1.

                                                 MAXIMUM AVERAGE STORAGE
PEAK STORAGE    TIME                      6-HR        24-HR        72-HR      24.92-HR
  (AC-FT)       (HR)
    10.        24.92                        9.          4.           4.           4.

                                                   MAXIMUM AVERAGE STAGE
 PEAK STAGE     TIME                      6-HR        24-HR        72-HR      24.92-HR
  (FEET)        (HR)
  123.04       24.92                    122.39      118.53       118.40       118.40

                  CUMULATIVE AREA =        .32 SQ MI


   ***           ***          ***          ***          ***

                    HYDROGRAPH AT STATION      DETG
                      FOR PLAN 1, RATIO = 1.39

                                                   MAXIMUM AVERAGE FLOW
 PEAK FLOW      TIME                      6-HR        24-HR        72-HR      24.92-HR
   (CFS)        (HR)
     1.        10.25           (CFS)        0.          0.           0.           0.
                            (INCHES)      .014        .036         .036         .036
                             (AC-FT)        0.          1.           1.           1.

                                                 MAXIMUM AVERAGE STORAGE
PEAK STORAGE    TIME                      6-HR        24-HR        72-HR      24.92-HR
    -FT)        (HR)
    20.        24.92                       18.          9.           8.           8.

                                                   MAXIMUM AVERAGE STAGE
 PEAK STAGE     TIME                      6-HR        24-HR        72-HR      24.92-HR
  (FEET)        (HR)
  128.42       24.92                    127.54      121.27       121.04       121.04

                  CUMULATIVE AREA =        .32 SQ MI


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              *            *
 207 KK       *      K     *
              *            *
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 208 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         300  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS

                         DRAINAGE ZONE K
                         AREA NORTH OF ARENA CANAL & EAST OF SULTANA DR

               SUBBASIN RUNOFF DATA

 211 BA         SUBBASIN CHARACTERISTICS
                     TAREA        1.50   SUBBASIN AREA

                PRECIPITATION DATA

    PB               STORM        2.06   BASIN TOTAL PRECIPITATION

  18 PI           INCREMENTAL PRECIPITATION PATTERN
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                      .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
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.00	.00	.00	.00	.00	.00	[illegible]			
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.04	.04	.04	.04	.04	.04
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

212 LS SCS LOSS RATE

STRTL	.40	INITIAL ABSTRACTION
CRVNBR	83.50	CURVE NUMBER
RTIMP	.00	PERCENT IMPERVIOUS AREA

213 UD SCS DIMENSIONLESS UNITGRAPH

TLAG	.85	LAG

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UNIT HYDROGRAPH
53 END-OF-PERIOD ORDINATES

23.	74.	140.	227.	340.	476.	607.	709.	776.	808.
811.	794.	748.	694.	633.	557.	466.	388.	331.	283.
243.	211.	183.	158.	135.	115.	99.	85.	74.	62.
54.	46.	40.	34.	29.	25.	22.	19.	16.	14.
12.	10.	9.	8.	7.	6.	5.	4.	3.	3.
2.	1.	0.							

TOTAL RAINFALL = 2.06, TOTAL LOSS = 1.30, TOTAL EXCESS = .76

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
154.	10.83	(CFS)	75.	30.	29.	29.
		(INCHES)	.466	.753	.753	.753
		(AC-FT)	37.	60.	60.	60.

CUMULATIVE AREA = 1.50 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION K
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 2.06, TOTAL LOSS = 1.30, TOTAL EXCESS = .76

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
154.	10.83	(CFS)	75.	30.	29.	29.
		(INCHES)	.466	.753	.753	.753
		(AC-FT)	37.	60.	60.	60.

CUMULATIVE AREA = 1.50 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION K
FOR PLAN 1, RATIO = 1.39

TOTAL RAINFALL = 2.86, TOTAL LOSS = 1.49, TOTAL EXCESS = 1.37

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
304.	10.83	(CFS)	139.	55.	53.	53.
		(INCHES)	.861	1.356	1.356	1.356
		(AC-FT)	69.	108.	108.	108.

CUMULATIVE AREA = 1.50 SQ MI

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              *            *
214 KK        *    DET K   *
              *            *
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215 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE K, ADJACENT SULTANA DR
ASSUMES THE FOLLOWING PARAMETERS:

HYDROGRAPH ROUTING DATA

21[illegible] STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	.00	WORKING R AND D COEFFICIENT

219 SA	AREA	10.0	10.3	10.6	10.9	11.2	11.5	11.7	12.0	12.3	12.9
220 SE	ELEVATION	125.00	126.50	128.00	129.50	131.00	132.50	134.00	135.50	137.00	140.00
221 SQ	DISCHARGE	0.	1.	1.	1.	1.	1.	1.	1.	1.	1.

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COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	15.22	30.87	46.96	63.49	80.45	97.85	115.69	133.96	171.82
ELEVATION	125.00	126.50	128.00	129.50	131.00	132.50	134.00	135.50	137.00	140.00

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HYDROGRAPH AT STATION DET K
FOR PLAN 1, RATIO = 1.00

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
1.	11.42	(CFS)	1.	0.	0.	0.
		(INCHES)	.003	.007	.007	.007
		(AC-FT)	0.	1.	1.	1.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	24.92-HR
60.	24.92	54.	25.	24.	24.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	24.92-HR
[illegible].66	24.92	130.11	127.35	127.27	127.27

CUMULATIVE AREA = 1.50 SQ MI

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HYDROGRAPH AT STATION DET K
FOR PLAN 1, RATIO = 1.39

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
1.	10.67	(CFS)	1.	0.	0.	0.
		(INCHES)	.003	.008	.008	.008
		(AC-FT)	0.	1.	1.	1.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	24.92-HR
108.	24.92	98.	46.	45.	45.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	24.92-HR
134.84	24.92	134.02	129.32	129.16	129.16

CUMULATIVE AREA = 1.50 SQ MI

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222 KK        *        L   *
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223 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	21	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	.083	TIME INTERVAL IN HOURS

AREA BETWEEN ARENA CANAL & HWY 99 AND EAST OF SULTANA DR

SUBBASIN RUNOFF DATA

226 BA SUBBASIN CHARACTERISTICS

TAREA .25 SUBBASIN AREA

PRECIPITATION DATA

1 STORM 2.06 BASIN TOTAL PRECIPITATION

18 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.04	.04	.04	.04	.04	.04
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

227 LS SCS LOSS RATE

STRTL .44 INITIAL ABSTRACTION
CRVNBR 81.80 CURVE NUMBER
RTIMP .00 PERCENT IMPERVIOUS AREA

228 UD SCS DIMENSIONLESS UNITGRAPH

TLAG .33 LAG

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UNIT HYDROGRAPH
22 END-OF-PERIOD ORDINATES

40.	126.	252.	321.	317.	267.	194.	128.	89.	63.
43.	30.	21.	14.	10.	7.	5.	3.	3.	2.
1.	0.								

TOTAL RAINFALL = 2.06, TOTAL LOSS = 1.38, TOTAL EXCESS = .68

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
33.	10.17	(CFS)	11.	5.	4.	4.
		(INCHES)	.421	.679	.679	.679
		(AC-FT)	6.	9.	9.	9.

CUMULATIVE AREA = .25 SQ MI

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HYDROGRAPH AT STATION L
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 2.06, TOTAL LOSS = 1.38, TOTAL EXCESS = .68

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
33.	10.17	(CFS)	11.	5.	4.	4.
		(INCHES)	.421	.679	.679	.679
		(AC-FT)	6.	9.	9.	9.

CUMULATIVE AREA = .25 SQ MI

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HYDROGRAPH AT STATION L
FOR PLAN 1, RATIO = 1.39

TOTAL RAINFALL = 2.86, TOTAL LOSS = 1.60, TOTAL EXCESS = 1.26

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
70.	10.17	(CFS)	21.	8.	8.	8.
		(INCHES)	.799	1.257	1.257	1.257
		(AC-FT)	11.	17.	17.	17.

CUMULATIVE AREA = .25 SQ MI

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K    *   DET L  *
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230 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE L, ADJACENT HWY 99
ASSUMES THE FOLLOWING PARAMETERS:

HYDROGRAPH ROUTING DATA

233 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	.00	WORKING R AND D COEFFICIENT

234 SA	AREA	1.4	1.5	1.6	1.8	1.9	2.0	2.1	2.2	2.4	2.6
235 SE	ELEVATION	125.00	126.50	128.00	129.50	131.00	132.50	134.00	135.50	137.00	140.00
236 SQ	DISCHARGE	0.	1.	1.	1.	1.	1.	1.	1.	1.	1.

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COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	2.19	4.56	7.12	9.85	12.77	15.86	19.14	22.60	30.07
ELEVATION	125.00	126.50	128.00	129.50	131.00	132.50	134.00	135.50	137.00	140.00

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HYDROGRAPH AT STATION DET L
FOR PLAN 1, RATIO = 1.00

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
1.	10.83	(CFS)	0.	0.	0.	0.
		(INCHES)	.019	.046	.046	.046
		(AC-FT)	0.	1.	1.	1.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	24.92-HR
8.	24.67	8.	4.	4.	4.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	24.92-HR
130.23	24.67	129.84	127.34	127.25	127.25

CUMULATIVE AREA = .25 SQ MI

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HYDROGRAPH AT STATION DET L
FOR PLAN 1, RATIO = 1.39

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
1.	10.17	(CFS)	0.	0.	0.	0.
		(INCHES)	.019	.047	.047	.047
		(AC-FT)	0.	1.	1.	1.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	24.92-HR
16.	24.75	15.	7.	7.	7.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	24.92-HR
134.12	24.83	133.53	129.29	129.14	129.14

CUMULATIVE AREA = .25 SQ MI

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238 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        300  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .083  TIME INTERVAL IN HOURS

                          DRAINAGE ZONE H

               SUBBASIN RUNOFF DATA

240 BA          SUBBASIN CHARACTERISTICS
                      TAREA        .70  SUBBASIN AREA

                PRECIPITATION DATA

 17 PB                STORM       2.06  BASIN TOTAL PRECIPITATION

 18 PI            INCREMENTAL PRECIPITATION PATTERN
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .01     .01     .01     .01     .01     .01     .01     .01
                    .01     .01     .01     .01     .04     .04     .04     .04     .04     .04
                    .01     .01     .01     .01     .01     .01     .01     .01     .01     .01
                    .01     .01     .01     .01     .01     .01     .01     .01     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00

241 LS            SCS LOSS RATE
                     STRTL         .47  INITIAL ABSTRACTION
                    CRVNBR       81.10  CURVE NUMBER
                     RTIMP         .00  PERCENT IMPERVIOUS AREA

242 UD            SCS DIMENSIONLESS UNITGRAPH
                      TLAG         .94  LAG

                                                          ***

                                                   UNIT HYDROGRAPH
                                              58 END-OF-PERIOD ORDINATES
                9.       27.       51.       82.      120.      168.      223.      271.      306.      330.
              342.      343.      340.      322.      302.      280.      254.      222.      188.      159.
              138.      120.      105.       92.       81.       70.       62.       53.       46.       40.
               35.       31.       26.       23.       20.       17.       15.       13.       12.       10.
                9.        8.        7.        6.        5.        4.        4.        3.        3.        3.
                2.        2.        2.        1.        1.        1.        1.        0.

      TOTAL RAINFALL =     2.06, TOTAL LOSS =     1.41, TOTAL EXCESS =       .65

    PEAK FLOW      TIME                           MAXIMUM AVERAGE FLOW
                                        6-HR        24-HR       72-HR      24.92-HR
      (CFS)        (HR)
                                (CFS)
        54.       11.00                   29.         12.         12.         12.
                             (INCHES)    .384        .638        .638        .638
                              (AC-FT)     14.         24.         24.         24.

                        CUMULATIVE AREA =       .70 SQ MI


        ***           ***           ***           ***           ***

                          HYDROGRAPH AT STATION          H
                            FOR PLAN 1, RATIO = 1.00

      :OTAL RAINFALL =     2.06, TOTAL LOSS =     1.41, TOTAL EXCESS =       .65

    PEAK FLOW      TIME                           MAXIMUM AVERAGE FLOW
                                        6-HR        24-HR       72-HR      24.92-HR
      (CFS)        (HR)
                                (CFS)
        54.       11.00                   29.         12.         12.         12.
                             (INCHES)    .384        .638        .638        .638
                              (AC-FT)     14.         24.         24.         24.
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                    CUMULATIVE AREA =       .70 SQ MI

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                     HYDROGRAPH AT STATION          H
                       FOR PLAN 1, RATIO = 1.39

 TOTAL RAINFALL =     2.86, TOTAL LOSS =     1.65, TOTAL EXCESS =     1.21

 PEAK FLOW      TIME                         MAXIMUM AVERAGE FLOW
                                     6-HR        24-HR       72-HR      24.92-HR
   (CFS)        (HR)
   115.        10.92      (CFS)       57.         23.         22.          22.
                        (INCHES)     .752        1.198       1.198        1.198
                         (AC-FT)      28.         45.         45.          45.

                    CUMULATIVE AREA =       .70 SQ MI


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            *            *
 243 KK     *     DETH   *
            *            *
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 244 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            3  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                       IOUT           21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2          300  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT         .083  TIME INTERVAL IN HOURS

                       DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE H, ADJACENT HIGHWAY 99
                       ASSUMES THE FOLLOWING PARAMETERS:

              HYDROGRAPH ROUTING DATA

 247 RS          STORAGE ROUTING
                      NSTPS            1  NUMBER OF SUBREACHES
                       ITYP         STOR  TYPE OF INITIAL CONDITION
                     RSVRIC        -1.00  INITIAL CONDITION
                          X          .00  WORKING R AND D COEFFICIENT

 248 SA             AREA         3.3       3.6       3.8       4.1       4.3       4.6       4.8       5.1       5.3       5.6

 249 SE         ELEVATION     115.00    117.00    119.00    121.00    123.00    125.00    127.00    129.00    131.00    133.00

 250 SQ         DISCHARGE         0.        1.        1.        1.        1.        1.        1.        1.        1.        1.

                                                  ***

                                       COMPUTED STORAGE-ELEVATION DATA

            STORAGE          .00      6.89     14.28     22.17     30.55     39.44     48.83     58.72     69.11     80.00
          ELEVATION       115.00    117.00    119.00    121.00    123.00    125.00    127.00    129.00    131.00    133.00

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                     HYDROGRAPH AT STATION       DETH
                       FOR PLAN 1, RATIO = 1.00

 PEAK FLOW      TIME                         MAXIMUM AVERAGE FLOW
                                     6-HR        24-HR       72-HR      24.92-HR
   (CFS)        (HR)
     1.        12.00      (CFS)        1.          0.          0.           0.
                        (INCHES)     .007         .015        .015         .015
                         (AC-FT)       0.          1.          1.           1.

 PEAK STORAGE   TIME                       MAXIMUM AVERAGE STORAGE
                                     6-HR        24-HR       72-HR      24.92-HR
   (AC-FT)      (HR)
     23.       24.92                  21.          9.          9.           9.

 PEAK STAGE     TIME                        MAXIMUM AVERAGE STAGE
                                     6-HR        24-HR       72-HR      24.92-HR
   (FEET)       (HR)
   121.25      24.92               120.62      117.55      117.45       117.45

                    CUMULATIVE AREA =       .70 SQ MI

     ***             ***             ***             ***             ***

                     HYDROGRAPH AT STATION       DETH
                       FOR PLAN 1, RATIO = 1.39

 PEAK FLOW      TIME                         MAXIMUM AVERAGE FLOW
                                     6-HR        24-HR       72-HR      24.92-HR
   (CFS)        (HR)
```

(INCHES)	.007	.016	.016	.016
(AC-FT)	0.	1.	1.	1.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	24.92-HR
44.	24.92	40.	18.	18.	18.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	24.92-HR
1[illegible].98	24.92	125.07	119.77	119.59	119.59

CUMULATIVE AREA = .70 SQ MI

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              **************
              *            *
251 KK        *      I     *
              *            *
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252 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	21	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	.083	TIME INTERVAL IN HOURS

DRAINAGE ZONE I

SUBBASIN RUNOFF DATA

254 BA SUBBASIN CHARACTERISTICS

TAREA .31 SUBBASIN AREA

PRECIPITATION DATA

17 PB STORM 2.06 BASIN TOTAL PRECIPITATION

18 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.04	.04	.04	.04	.04	.04
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

255 LS SCS LOSS RATE

STRTL	.37	INITIAL ABSTRACTION
CRVNBR	84.50	CURVE NUMBER
RTIMP	.00	PERCENT IMPERVIOUS AREA

256 UD SCS DIMENSIONLESS UNITGRAPH

TLAG .40 LAG

***

UNIT HYDROGRAPH
26 END-OF-PERIOD ORDINATES

32.	97.	205.	303.	342.	334.	290.	230.	159.	116.
87.	65.	47.	35.	25.	18.	14.	10.	7.	5.
4.	3.	2.	2.	1.	0.				

TOTAL RAINFALL = 2.06, TOTAL LOSS = 1.25, TOTAL EXCESS = .81

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR

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                  (INCHES)      .512         .812         .812         .812
                  (AC-FT)         9.          14.          14.          14.

                  CUMULATIVE AREA =      .31 SQ MI


    ***          ***          ***          ***          ***

                   HYDROGRAPH AT STATION          I
                     FOR PLAN 1, RATIO = 1.00

 TOTAL RAINFALL =     2.06, TOTAL LOSS =     1.25, TOTAL EXCESS =        .81

 PEAK FLOW       TIME                         MAXIMUM AVERAGE FLOW
   (CFS)         (HR)                6-HR        24-HR        72-HR      24.92-HR
     51.        10.25      (CFS)       17.           7.           7.           7.
                         (INCHES)     .512         .812         .812         .812
                          (AC-FT)       9.          14.          14.          14.

                  CUMULATIVE AREA =      .31 SQ MI


    ***          ***          ***          ***          ***

                   HYDROGRAPH AT STATION          I
                     FOR PLAN 1, RATIO = 1.39

 TOTAL RAINFALL =     2.86, TOTAL LOSS =     1.42, TOTAL EXCESS =       1.44

 PEAK FLOW       TIME                         MAXIMUM AVERAGE FLOW
   (CFS)         (HR)                6-HR        24-HR        72-HR      24.92-HR
     98.        10.25      (CFS)       31.          12.          12.          12.
                         (INCHES)     .917        1.435        1.435        1.435
                          (AC-FT)      15.          24.          24.          24.

                  CUMULATIVE AREA =      .31 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
 257 KK       *    DETI    *
              *            *
              **************

     KO          OUTPUT CONTROL VARIABLES
                      IPRNT              3  PRINT CONTROL
                      IPLOT              0  PLOT CONTROL
                      QSCAL             0.  HYDROGRAPH PLOT SCALE
                        DETENTION BASIN AT TERMINUS OF DRAINAGE ZONE I, SOUTH OF HWY 99
                        ASSUMES THE FOLLOWING PARAMETERS:

               HYDROGRAPH ROUTING DATA

 261 RS           STORAGE ROUTING
                      NSTPS              1  NUMBER OF SUBREACHES
                       ITYP           STOR  TYPE OF INITIAL CONDITION
                     RSVRIC          -1.00  INITIAL CONDITION
                          X            .00  WORKING R AND D COEFFICIENT

 262 SA              AREA         .8        .9       1.0       1.1       1.3       1.4       1.5       1.7       1.8       1.9

 263 SE         ELEVATION     110.00    112.00    114.00    116.00    118.00    120.00    122.00    124.00    126.00    128.00

 264 SQ         DISCHARGE         0.        1.        1.        1.        1.        1.        1.        1.        1.        1.

                                                     ***

                                              COMPUTED STORAGE-ELEVATION DATA

          STORAGE        .00      1.63      3.52      5.66      8.07     10.74     13.66     16.85     20.29     24.00
        ELEVATION     110.00    112.00    114.00    116.00    118.00    120.00    122.00    124.00    126.00    128.00

    ***          ***          ***          ***          ***

                   HYDROGRAPH AT STATION       DETI
                     FOR PLAN 1, RATIO = 1.00

 PEAK FLOW       TIME                         MAXIMUM AVERAGE FLOW
   (CFS)         (HR)                6-HR        24-HR        72-HR      24.92-HR
      1.        10.25      (CFS)        1.           0.           0.           0.
                         (INCHES)     .015         .037         .037         .037
                          (AC-FT)       0.           1.           1.           1.

 PEAK STORAGE    TIME                         MAXIMUM AVERAGE STORAGE
   (AC-FT)       (HR)                6-HR        24-HR        72-HR      24.92-HR
     13.        24.83                  12.           6.           6.           6.

 PEAK STAGE      TIME                         MAXIMUM AVERAGE STAGE
```

121.53	24.92	120.80	115.43	115.23	115.23

CUMULATIVE AREA = .31 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DETI
FOR PLAN 1, RATIO = 1.39

P LOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
1.	9.83	(CFS)	1.	0.	0.	0.
		(INCHES)	.015	.039	.039	.039
		(AC-FT)	0.	1.	1.	1.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	24.92-HR
23.	24.92	22.	11.	10.	10.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	24.92-HR
127.67	24.92	126.73	118.75	118.43	118.43

CUMULATIVE AREA = .31 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 1.00	 RATIO 2 1.39
HYDROGRAPH AT	A2-1A	.73	1	FLOW	93.	178.
				TIME	10.67	10.58
ROUTED TO	DETA2A	.73	1	FLOW	1.	1.
				TIME	11.42	10.58
			** PEAK STAGES IN FEET **			
			1	STAGE	123.26	125.65
				TIME	24.92	24.92
ROUTED TO	RA2-1A	.73	1	FLOW	0.	1.
				TIME	11.75	10.92
HYDROGRAPH AT	A2-1	.45	1	FLOW	58.	120.
				TIME	10.25	10.25
2 COMBINED AT	COMB 1	1.18	1	FLOW	58.	120.
				TIME	10.25	10.25
HYDROGRAPH AT	A2-2	.20	1	FLOW	5.	20.
				TIME	10.67	10.33
HYDROGRAPH AT	A2-3	.10	1	FLOW	7.	19.
				TIME	10.25	10.17
3 COMBINED AT	A2	1.49	1	FLOW	68.	158.
				TIME	10.33	10.25
ROUTED TO	DETA2B	1.49	1	FLOW	1.	1.
				TIME	12.92	10.58
			** PEAK STAGES IN FEET **			
			1	STAGE	117.33	119.41
				TIME	24.92	24.92
ROUTED TO	RCP-AZ	1.49	1	FLOW	0.	1.
				TIME	14.83	12.58
H[illegible]GRAPH AT	A2-5	.50	1	FLOW	11.	41.
				TIME	10.92	10.67
HYDROGRAPH AT	A2-4	.32	1	FLOW	18.	48.
				TIME	10.58	10.50
3 COMBINED AT	CPA-Y1	2.30	1	FLOW	28.	88.
				TIME	10.75	10.58
HYDROGRAPH AT	A3-1	.15	1	FLOW	13.	32.
				TIME	10.33	10.25
HYDROGRAPH AT	A3-2	.10	1	FLOW	7.	18.
				TIME	10.25	10.17
HYDROGRAPH AT	A3-3	.18	1	FLOW	9.	26.
				TIME	10.58	10.42
4 COMBINED AT	CPA-Y2	2.74	1	FLOW	53.	154.
				TIME	10.58	10.42
ROUTED TO	RCPAY2	2.74	1	FLOW	52.	153.
				TIME	10.75	10.58
HYDROGRAPH AT	A2-6	.47	1	FLOW	13.	45.
				TIME	10.83	10.58
2 COMBINED AT	CP-AX	3.20	1	FLOW	65.	198.
				TIME	10.75	10.58
ROUTED TO	RCP-AX	3.20	1	FLOW	65.	197.
				TIME	11.00	10.75
HYDROGRAPH AT	A1-1	.18	1	FLOW	4.	18.
				TIME	10.58	10.17
HYDROGRAPH AT	A1-2	.32	1	FLOW	7.	34.
				TIME	10.58	10.17
3 COMBINED AT	DETA1	3.70	1	FLOW	73.	228.
				TIME	11.00	10.67
ROUTED TO	DETA1	3.70	1	FLOW	2.	2.
				TIME	15.75	11.42
			** PEAK STAGES IN FEET **			
			1	STAGE	99.88	104.63
				TIME	24.92	24.92

HYDROGRAPH AT	B	1.47	1	FLOW	35.	123.
				TIME	11.08	10.75
ROUTED TO	DETB	1.47	1	FLOW	1.	1.
				TIME	15.50	11.42
			** PEAK STAGES IN FEET **			
			1	STAGE	94.20	99.50
				TIME	24.92	24.92
HYDROGRAPH AT	C	.39	1	FLOW	9.	38.
				TIME	10.67	10.25
ROUTED TO	DETC	.39	1	FLOW	1.	1.
				TIME	13.33	10.58
			** PEAK STAGES IN FEET **			
			1	STAGE	105.03	111.17
				TIME	24.58	24.67
HYDROGRAPH AT	D	.69	1	FLOW	52.	117.
				TIME	10.75	10.67
ROUTED TO	DETD	.69	1	FLOW	1.	1.
				TIME	11.75	10.67
			** PEAK STAGES IN FEET **			
			1	STAGE	101.71	106.99
				TIME	24.92	24.92
HYDROGRAPH AT	F	.65	1	FLOW	20.	69.
				TIME	10.67	10.50
ROUTED TO	DETF	.65	1	FLOW	1.	1.
				TIME	13.83	10.83
			** PEAK STAGES IN FEET **			
			1	STAGE	119.89	125.23
				TIME	24.92	24.92
HYDROGRAPH AT	G	.32	1	FLOW	32.	70.
				TIME	10.42	10.42
ROUTED TO	DETG	.32	1	FLOW	1.	1.
				TIME	10.92	10.25
			** PEAK STAGES IN FEET **			
			1	STAGE	123.04	128.42
				TIME	24.92	24.92
HYDROGRAPH AT	K	1.50	1	FLOW	154.	304.
				TIME	10.83	10.83
ROUTED TO	DET K	1.50	1	FLOW	1.	1.
				TIME	11.42	10.67
			** PEAK STAGES IN FEET **			
			1	STAGE	130.66	134.84
				TIME	24.92	24.92
HYDROGRAPH AT	L	.25	1	FLOW	33.	70.
				TIME	10.17	10.17
ROUTED TO	DET L	.25	1	FLOW	1.	1.
				TIME	10.83	10.17
			** PEAK STAGES IN FEET **			
			1	STAGE	130.23	134.12
				TIME	24.67	24.83
HYDROGRAPH AT	H	.70	1	FLOW	54.	115.
				TIME	11.00	10.92
ROUTED TO	DETH	.70	1	FLOW	1.	1.
				TIME	12.00	10.92
			** PEAK STAGES IN FEET **			
			1	STAGE	121.25	125.98
				TIME	24.92	24.92
HYDROGRAPH AT	I	.31	1	FLOW	51.	98.
				TIME	10.25	10.25
ROUTED TO	DETI	.31	1	FLOW	1.	1.
				TIME	10.25	9.83
			** PEAK STAGES IN FEET **			
			1	STAGE	121.53	127.67
				TIME	24.92	24.92

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                    SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                        (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                INTERPOLATED TO
                                                           COMPUTATION INTERVAL
    ISTAQ   ELEMENT     DT      PEAK    TIME TO   VOLUME     DT      PEAK    TIME TO     VOLUME
                                          PEAK                                 PEAK

                       (MIN)    (CFS)     (MIN)     (IN)    (MIN)    (CFS)    (MIN)       (IN)

   FOR PLAN = 1  RATIO= 1.00
    RA2-1A  MANE       5.00      .50    1499.62      .01    5.00      .50   1495.00       .01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5924E+00 EXCESS= .0000E+00 OUTFLOW= .5820E+00 BASIN STORAGE= .1229E-01 PERCENT ERROR=   -.3

   FOR PLAN = 1  RATIO= 1.39
    RA2-1A  MANE       5.00      .50    1499.90      .02    5.00      .50   1495.00       .02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6193E+00 EXCESS= .0000E+00 OUTFLOW= .6092E+00 BASIN STORAGE= .1243E-01 PERCENT ERROR=   -.4

   FOR PLAN = 1  RATIO= 1.00
    RCP-AZ  MANE       5.00      .50     890.58      .01    5.00      .50    895.00       .01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5753E+00 EXCESS= .0000E+00 OUTFLOW= .4766E+00 BASIN STORAGE= .9781E-01 PERCENT ERROR=    .2

   FOR PLAN = 1  RATIO= 1.39
    RCP-AZ  MANE       5.00      .50     754.86      .01    5.00      .50    755.00       .01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6142E+00 EXCESS= .0000E+00 OUTFLOW= .5160E+00 BASIN STORAGE= .9781E-01 PERCENT ERROR=    .1

   FOR PLAN = 1  RATIO= 1.00
    RCPAY2  MANE       3.96    52.61     642.83      .19    5.00    52.47    645.00       .19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2715E+02 EXCESS= .0000E+00 OUTFLOW= .2704E+02 BASIN STORAGE= .9794E-01 PERCENT ERROR=    .1

   FOR PLAN = 1  RATIO= 1.39
    RCPAY2  MANE       3.20   153.80     631.48      .39    5.00   153.27    635.00       .39

C[illegible]NUITY SUMMARY (AC-FT) - INFLOW= .5723E+02 EXCESS= .0000E+00 OUTFLOW= .5706E+02 BASIN STORAGE= .1450E+00 PERCENT ERROR=    .0

   FOR PLAN = 1  RATIO= 1.00
    RCP-AX  MANE       4.56    64.96     659.31      .20    5.00    64.87    660.00       .20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3494E+02 EXCESS= .0000E+00 OUTFLOW= .3462E+02 BASIN STORAGE= .3074E+00 PERCENT ERROR=    .0

   FOR PLAN = 1  RATIO= 1.39
    RCP-AX  MANE       4.82   197.79     642.16      .44    5.00   197.11    645.00       .44

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7512E+02 EXCESS= .0000E+00 OUTFLOW= .7470E+02 BASIN STORAGE= .3794E+00 PERCENT ERROR=    .0


*** NORMAL END OF HEC-1 ***
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