CITY-WIDE STORM DRAINAGE STUDY

May 6, 2003

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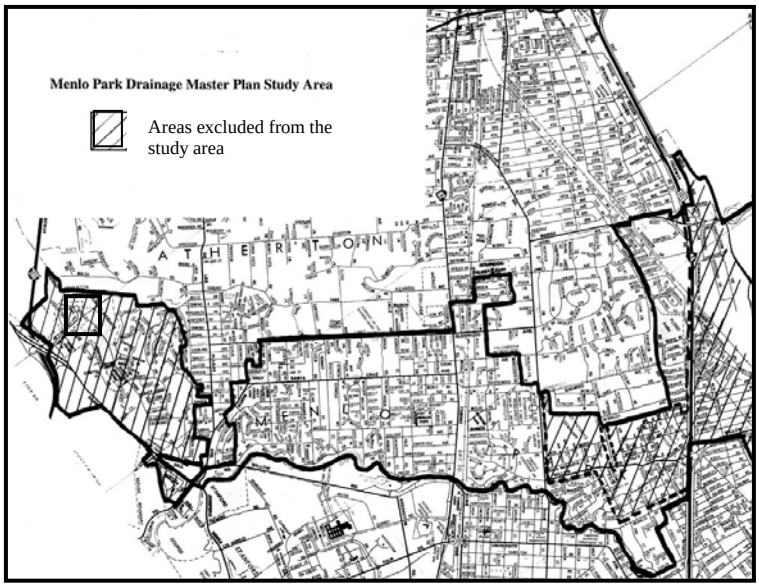
INTRODUCTION

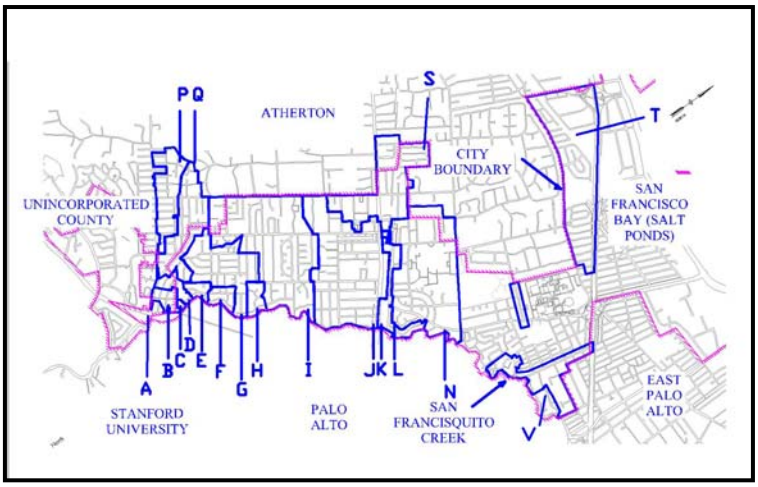


Menlo Park Storm Drainage Study Project Area

The following Drainage Study documents the existing City stormwater drainage system and drainage deficiencies. The report prioritizes recommendations for system repairs and additions that will need to be made to the storm drain collection system to significantly reduce storm drain problems in the City of Menlo Park. This Drainage Study is for the City storm drainage facilities and does not include regional drainage facilities such as San Francisquito Creek and Atherton Channel.

BACKGROUND

The City of Menlo Park has experienced flooding, to varying degrees on an ongoing basis. Flooding can vary from nuisance ponding that occurs whenever there is rainfall of 0.5 inch or more, major flooding occurs when San Francisquito Creek overflows its banks.



Studied Drainage System Boundaries

Within the study area, the City storm water drainage system consists of 18 storm drainage systems that discharge into San Francisquito Creek, Atherton Channel, and through East Palo Alto into San Francisco Bay. A previous analysis of the City drainage system was conducted as part of a study prepared by David M. Griffith and Associates in August 1990 titled, "The City Wide Storm Drainage Study and Proposed Improvements". This study provided recommended system improvements and project costs. The August 1990 Report did not include support calculations documenting sizes for proposed facilities.

Other studies of the City stormwater drainage systems have been limited to individual systems, and the corresponding hydraulic and hydrologic information has not been readily accessible or maintained. The City compiled a schematic map showing the approximate location of all storm drain facilities and has maintained listings of pipe sizes, ground elevations, and pipe inverts for most of the City systems.

Flooding at 185 Spruce Ave North of El Camino Real

In 2000, the City hired Towill Associates to digitize the existing storm drain systems and add it to the city's GIS map. Towill completed the majority of this work and transferred their results to BKF. BKF utilized the Towill database and digitized figures as source material for this study.

IMPLEMENTATION PLAN

This Implementation Plan presents recommendations for phasing improvements to upgrade the City's storm drainage system. The Implementation Plan is based on recommended improvements shown on Figures 5a through 5c in Appendix A.

PURPOSE

The purpose of the City-wide Storm Drainage Study is to documents the existing City stormwater drainage system, identify drainage deficiencies and prioritize system repairs and upgrades to correct the deficiencies. This Drainage Study addresses the City-owned storm drainage facilities and does not include regional drainage facilities such as San Francisquito Creek and Atherton Channel. Facilities within unincorporated San Mateo County that flow to Atherton Channel are included in the analyses where these facilities provide service to portions of Menlo Park. The Sharon Heights area and Belle Haven drainage area were not included in this study. The Belle Haven was evaluated as a part of a recent specific Master Plan and the Sharon Heights area has not experienced significant flooding.

EXISTING CAPITAL IMPROVEMENT PROGRAM

Currently, the City does not have a Capital Improvement Program for upgrading their storm drainage system. Upgrades that are made by the City tend to be based on nuisance complaints and have not addressed the major system deficiencies. Upgrades of major drainage systems have been constructed by site developers as a condition of development, and have not been guided by Master Plan requirements.

PROPOSED CAPITAL IMPROVEMENT PROGRAM

This Storm Drainage Study presents costs and facilities sizes necessary to provide a consistent level of storm drainage protection throughout the City. Systems with deficient

storm drain lines are noted and replacement pipe sizes are determined. The identified improvements to provide a consistent level of storm drainage protection throughout the City are estimated at a total cost of $38.7 million. However, many of the necessary improvements require outfalls to San Francisquito Creek. Currently, the potential for downstream flood risk of San Francisquito Creek and the Atherton Channel limits the implementation of many of the improvements identified. Increasing line sizes within the City could increase peak flows to the Creek, increasing downstream flood risk. Improvements in this category total $23.3 million.

Proposed improvements are placed in two priority groups.

Project A – Projects that do not require construction of new outfalls to San Francisquito Creek or the Atherton Channel: Total Cost - $15.4 million
Project B – Projects that require new outfalls and increase peak flows to San Francisquito Creek or Atherton Channel: Total Cost - $23.3 million

Within each priority classification, highest priority is given to projects that improve the level of service to areas where storm water frequently floods properties, and lower priority is given to projects that eliminate nuisance localized ponding in the gutter.

Priority 1. Reduce probability of existing property flooding.
Priority 2. Reduce probability of flooding that forces closure of key roadways.
Priority 3. Correct deficiencies that cause downstream flooding problems.
Priority 4. Correct drainage problems that cause runoff to encroach on travelway.
Priority 5. Correct drainage problems such as nuisance ponding in the gutter, inadequate bubble-up structures, and other similar problems.

Due to the large cost of the improvements, Priorities A1 through A4 should be addressed first. These projects represent a total cost of $8,161,000.

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CITY-WIDE STORM DRAINAGE STUDY

IMPLEMENTATION PLAN

TABLE 1a

Capital Improvement Program for Upgrading Storm Drainage System

Priority	System	**Description**	Cost
A1	G	**Magnolia Drive / Stanford Court** – Flooding occurs in the vicinity of Stanford Court as a result of undersized lines downstream on Magnolia Drive. Upsizing 530 feet of line from 12-inch diameter to 24-inch diameter will improve drainage through an upstream system that has been improved.	$123,000
A1	S	**Spruce Avenue** – Flooding occurs at Spruce Avenue. Storm system does not have an inlet at Spruce Avenue with the railroad acting as a barrier to surface flows. Improve requires 250 feet of 24-inch storm drain, and an inlet at Spruce Avenue.	$80,000
A2	N	**Middlefield Road** - A parallel storm drain is proposed along Middlefield Road. The storm drain would connect to a recently constructed 48-inch diameter outfall into San Francisquito Creek. The parallel storm drain is needed to relieve flooding that requires road closures of Middlefield Road, Ravenswood Avenue, and Oak Grove Avenue.	$4,633,000
A2	V	**Euclid Avenue** – A significant drainage area flows to Euclid Avenue with no collection system. It is likely that the flooding could disrupt traffic during a major storm event.	$288,000
A3	I	**Middle Avenue** – Middle Avenue is susceptible to flooding due to undersized facilities to the Creek and upstream flooding that overflows into the drainage area. 1,620 feet of 24-inch diameter line is proposed. *Allows the removal of bubble-up storm drain catch basins. Provides backbone for draining Hobart Street, Cotton Street and Hermosa Way.*	$373,000
A4	N	**Oak Grove Avenue** - The proposed line relieves flows received along Oak Grove Avenue and discharges to the proposed Middlefield Avenue parallel storm drain (Priority A2)	$1,699,000

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CITY-WIDE STORM DRAINAGE STUDY

IMPLEMENTATION PLAN

TABLE 1a

Capital Improvement Program for Upgrading Storm Drainage System

A4	BH	**Frontage 101, Menalto Ave to Laurel Ave and Santa Monica Avenue** – Proposes 830 feet of 24-inch diameter line to provide backbone for storm drain to Menalto Avenue; and 2,510 feet of 15-inch storm drain to reduce flows at intersections along Menalto Avenue. The proposed Santa Monica Avenue Drainage Lines would serve an Area with no collection system.	$945,000
A5	JK	**Harvard & Cornell** – Proposes addition of valley gutter to eliminate localized ponding.	$10,000
		Total Improvements (Priorities A1 to A4 & Harvard/Cornell)	**$8,151,000**
A5	F	System to Bay Laurel Drive Outfall	$26,000
A5	G	System to Olive Street Outfall	$536,000
A5	I	System to Arbor Road Outfall	$1,524,000
A5	JK	System to El Camino Real Outfall	$1,976,000
A5	L	System to Alma Street Outfall	$208,000
A5	N	System to Middlefield Road Outfall	$1,270,000
A5	T	Systems to Highway 101 Outfalls	$1,400,000
A5	V	Systems to Euclid Avenue Outfall	$275,000
		Total Improvements (Priorities A5)	**$7,215,000**
		Total Improvements (Priorities A1 through A5)	**$15,400,000**

DRAINAGE STUDY SUMMARY

BKF has completed the hydrologic and hydraulic analyses of the City systems. The City system is comprised of 17 individual systems that serve 17 drainage areas within the City. The drainage boundaries for these systems are shown on Figure 1 in Appendix A.

Drainage Patterns

The City of Menlo Park extends from the San Francisco Bay southwesterly up into the foothills. While the ground slopes northeasterly toward the Bay, the storm drain collection system discharges to two waterways. The area north of Middlefield Road drains to the Bay through either the Belle Haven Storm Drain system or through City of East Palo Alto Storm Drain lines. The collection system south of Middlefield Road drains to the two major storm water collection channels: Atherton Channel on the northwest and San Francisquito Creek on the southeast.

The drainage system that carries water through Menlo Park to the Belle Haven Storm Drain System was constructed in the 1990's. There have not been any significant drainage problems in this area since the improvements were made. As a result, the Belle Haven system was not included in this study.

Sharon Heights is recently constructed and has steeper slopes than the remainder of the City. This portion of the City was also excluded from the study.

San Francisquito Creek forms the boundary between Palo Alto and Menlo Park. San Francisquito Creek is a major waterway that drains a 42 square mile watershed. Flow rates as high as 7,100 cfs were observed in the creek during the February 2, 1998 storm event.

The other major water course that services the City is the Atherton Channel. The Atherton Channel drains a 6 square mile watershed and services Atherton, unincorporated San Mateo County, and Redwood in addition to Menlo Park.

The fact that water in the improved collection system flows perpendicular to the natural ground contours south of Middlefield Road has several consequences. First, most of the storm drain trunk line systems slope at less than 1 percent. This limits the flow capacity of the system. Second, when system capacity is exceeded, excess flows that overtop the enclosed drainage system flows northeasterly to the adjacent downstream drainage system. Any overflow in an upstream system adds flows to the downstream system, usually worsening conditions in downstream systems. This "domino effect" can result in ponding and/or flooding occurring in multiple systems from one overflow in an upstream system.

The analyses show that there is a likelihood of significant flow in the street during the 10-year storm event for most drainage systems in the City. Typically, flow in the street reaches the outfall slower than flow through a piped system. As a result, unintentional stormwater detention occurs. This detention decreases peak flow rates through the system, but increases the duration of surface and localized flooding.

The areas in the City with deficient storm drainage based on a 10-year design storm criterion are indicated on Figures 2a, 2b and 2c in Appendix A. The reported deficiencies do not account for overtopping flows from upstream systems. Areas that are not served by an underground storm drainage system are shown as cross hatched in yellow on the figures. Existing storm drain systems that have sufficient capacity are shown in blue. The locations of deficient storm drain facilities are shown in red. Proposed storm drains needed to service areas not presently serviced by existing systems are indicated in green. Where deficiencies were found, the existing pipe size is shown along with the pipe size that would be needed to handle the flow.

As a part of the Drainage Study, BKF evaluated regional solutions. Regional solutions consist of the installation of new “interceptor” storm drain lines that collect storm water from the upstream storm drain and divert it into a new pipeline rather than increasing the size of the down stream system. One regional solution was identified that had costs equivalent to replacement of the existing line. The Interceptor lines that were evaluated are shown in orange on Figure 6 in Appendix A. Because there is not a clear advantage to the “interceptor line” BKF recommends that the City base Drainage Study decisions on the replacement of the existing line. During the project design phase, the option of the interceptor line should be re-evaluated.

There are drainage deficiencies that will occur as a result of flow overtopping San Francisquito Creek. Figure 3 in Appendix A shows top of bank and water surface elevations for the 100-year event. It also shows the limits of flooding identified by the Federal Emergency Management Agency (FEMA) in 1999 and the locations where flow is expected to overtop from San Francisquito Creek. The Belle-Haven area in the vicinity of Bayfront Expressway is shown as subject to inundation during a 100-year storm event. This area is considered in the 100-year floodplain because of high tides in San Francisco Bay and not because of deficiencies in storm drainage. FEMA analyses are based on major Creek systems and, for Menlo Park, do not include evaluations of the local storm systems.

Recommendations

Based on our analyses of the City’s existing drainage systems, significant portions of the systems are not capable of providing a 10-year storm event level of service. In addition, portions of the existing system, particularly the corrugated metal pipe installations shown on Figure B1 in Appendix B, are failing structurally and need replacing.

Table 2, on page 25, lists, in priority order, the deficiencies that were found, and the approximate cost of repair. Priorities were established as follows:

Priority 1- Elimination of existing property flooding.

Priority 2- Elimination of flooding that forces frequent closures of key roadways.

Priority 3 - Corrections to deficiencies that cause downstream flooding problems.

Priority 4 - Corrections to drainage problems that cause water to encroach into the travel way.

Priority 5 - Corrections to drainage problems, nuisance ponding in the gutter, inadequate bubble-up structures, and other similar problems.

Priority 1 improvements consist of an outfall to San Francisquito Creek at Arbor Road, an outfall to Atherton Channel west of the railroad and storm drainage improvements in the vicinity of Stanford Court and Magnolia Drive. The Arbor Road outfall, System I, would significantly reduce overflow to Middle Avenue for a cost of $2,300,000. The Atherton Channel system, System S1, is needed to convey flows from east of the railroad to Atherton Channel. The total cost for Priority 1 improvements is $2,700,000. Areas benefiting from Priority 1 improvements are shown on Figure 4 in Appendix A.

Priority 2 improvements are necessary to prevent road closure and consist of improvements to El Camino Real, Middlefield Road, and Euclid Avenue. The existing El Camino Real system, System JK, is undersized and causes ponding in Alto Lane when system capacity is exceeded. During a major storm event, closure of El Camino Real would be likely. Cost of improvements is $5,800,000. The existing Middlefield Road system is undersized. Road closures occurred during recent December 2002 rainfalls. Cost of improvements is $4,600,000. The Euclid Avenue system receives overland flows from a significant area resulting in high street flows. Cost for improvements is $256,000. The total cost for Priority 2 improvements is $10,800,000.

Priority 3 improvements are necessary to reduce overflows to downstream systems. The Olive Street outfall to San Francisquito Creek, System G, is undersized. Spill could affect two downstream systems. The cost to upsize the Olive Street line is $900,000. The

drainage area to the Arbor Road outfall extends from Valparaiso Avenue. Flows in excess of the system capacity flow down Valparaiso Avenue and Santa Cruz Avenue. The cost for improvements is $4,460,000. The total cost for Priority 3 improvements is $5,400,000.

Priority 4 and 5 improvements correct nuisance ponding issues and are required throughout the City. The improvements are numerous and are required for all Systems except B, C, D and H.

SYSTEM IDENTIFICATION

The drainage system pipe diameter and line inverts are taken from several sources. In 1969, the City prepared an inventory of the existing storm drain system. This information was assembled in a binder and was supplied to Towill Inc., along with information on storm drain lines that have been installed since 1969. Towill added the information to the City GIS map that they had previously prepared. BKF used the Towill map for the initial system identification. The Towill GIS mapping results were reviewed by BKF and updates made as needed. BKF collected drawings for the University Heights Drainage System from the County of San Mateo and Highway 101 Improvement Plans from the Marsh Road Interchange project. These drawings identified systems that were not shown on the City or Towill drawings.

In most locations rim and invert elevations were available from the GIS maps or old improvement plans. Where they were not found, BKF field surveyed rim and invert elevations. For the remaining systems, BKF used the rim elevations developed by Towill and determined the invert elevation by measuring the distance from the rim to the invert of the manhole.

Pipe sizes are as presented on the City Drainage Map printed in September of 2001 unless determined to be different from BKF field review or from sizes shown on Improvement Plans.

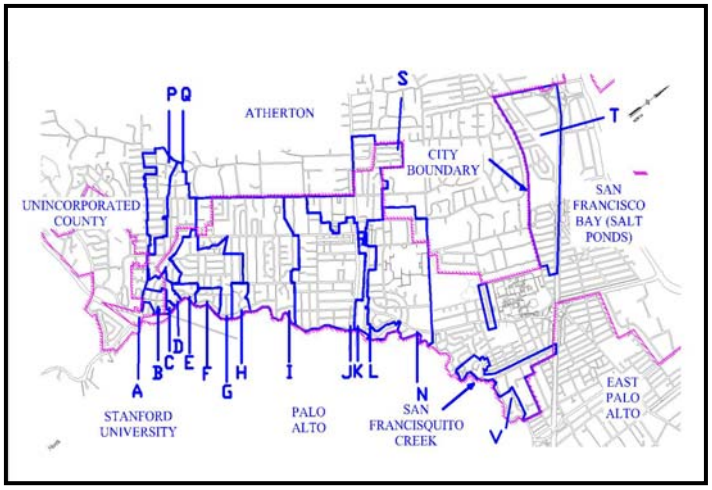
The methodology and design criteria used for analyzing the City's drainage system are presented in Appendix E.

DRAINAGE ISSUES

The City of Menlo Park has drainage issues that affect various regions of the City as well as problems that affect individual properties. The regional problems generally affect many property owners and usually occur only when there is a significant storm event. These problems occur as a result of deficiencies in the existing storm drain collection system. The problems that are seen by isolated individual property owners occur whenever there is rainfall in excess of 0.5 inches and are generally caused by the total lack of drainage facilities. The following information looks at these two conditions and presents our findings.

Regional Drainage Problems

There are 17 major drainage systems that serve the City. Drainage boundaries for the individual systems are shown on Figure 1. Detailed drainage boundaries and inlet locations are shown on Figures contained in Appendix D. The following describes each system:



Study Drainage System Boundaries

System A - System A discharges to San Francisquito Creek near the Sand Hill Road Bridge. This system is a combination of piped system and flow through swales. This area will be significantly affected by the proposed Sand Hill Road widening project. The existing swales are under-sized. *The culverts under the driveways along Sand Hill Road are clogged and subject to overtopping*.

System B - System B discharges to San Francisquito Creek near the Sand Hill Road Bridge. *This system has adequate flow capacity*.

System C - System C discharges to San Francisquito Creek near Bay Laurel Drive. The line passes through private property. The line has adequate flow capacity. The outfall structure at the Creek consists of exposed corrugated metal pipe. There is no energy dissipater at the Creek. The structural stability of the pipe outfall should be reviewed. *The storm drain line sizes for System C are adequate.*

System D - System D discharges to San Francisquito Creek near Bay Laurel Drive. We were not able to locate an outfall structure for this line. *The line conveys the 10-year storm event.*

System E – System E discharges to San Francisquito Creek near Bay Laurel Drive. System E does not have adequate flow capacity. During a 10-year storm event, about 3 cfs will flow to the east to System F. *The street has capacity for 3 cfs, and this is not a critical system.*

System F - System F discharges to San Francisquito Creek near Bay Laurel Drive. The upper portion of the system has adequate flow capacity. *The system near the Creek is under-sized.* System F also receives street flow from System E. The outfall structure should be replaced with a larger line.

System G - System G discharges to San Francisquito Creek near Olive Street. The System G drainage area is 138 acres. *Much of the system is under-sized*. The system has flow capacity for between 20 and 50 percent of the 10-year storm event. Flow in excess of the system capacity will be conveyed as overland flow down Middle Avenue. *The lack of flow capacity of System G contributes to drainage problems on Middle Avenue*. The portion of the system on Magnolia Drive is given a high priority because this restriction causes deficiencies in the system up to Stanford Court. The portion of the storm drain line on Olive Street is given a high priority because overtopping affects the downstream systems. The remainder of the system is given a lower priority because flow can be conveyed in the streets without significantly affecting the travelway.

System H - System H discharges to San Francisquito Creek near Bay Laurel Drive. *The system has adequate flow capacity for a 10-year storm event.* There is no well-defined flow path from Cotton Place to Bay Laurel Drive in the event the system plugs.

System I - System I discharges to San Francisquito Creek near Arbor Road. The System I drainage area is 351 acres. *The drainage system is undersized for direct runoff*. The system has flow capacity for between 10 and 50 percent of the 10-year storm event. In addition, the system receives overflow runoff from Systems G. Overtopping flows from System G are to Middle Avenue and Santa Cruz Avenue. The portion of the system on Arbor Road to the outfall is given high priority. *Flooding occurs in the area and overflows are to El Camino Real*. The remainder of the system is given a lower priority because flow can be conveyed in the streets without significantly affecting the travelway.

System J & K – Systems J and K discharge to San Francisquito Creek at El Camino Real. Systems J consists of a 36-inch diameter CMP storm drain line located in an alley west of El Camino Real. *The drainage system is undersized for*

direct runoff. In addition, during a 10-year storm event, there will be significant overtopping flow from both Systems K and I. *During a 10-year event, excess flows are conveyed in the street to El Camino Real.*

The railroad tracks at El Camino Real are a barrier to flows. During a 10-year event, all excess flows from upstream systems are conveyed to the vicinity of El Camino Real. There is a 30-inch storm drain line that conveys street flows to El Camino Real west under the railroad to System L. There is significant fall across the railroad. This line has flow capacity for about 40 cfs. It is likely that during a 2- to 5-year storm event, there will be significant unintentional detention of upstream flows in El Camino Real. In addition, the street flow will arrive at a later time than local inflows. Based on City observations, there has not been significant flooding on El Camino Real. This is likely because of unintentional storage of water that occurs upstream during storm events and because of discharge of excess flows in the storm drain line under the railroad.

System L – System L discharges to San Francisquito Creek at Alma Street. *The drainage system is undersized for direct runoff*. In addition, there is a high potential for San Francisquito Creek to overtop its banks in this area. See Figure 3 in Appendix A. High flows in the Creek can prevent System L from discharging to the Creek. *During high flows in the Creek, excess flows will exit the system and flow to the Willow Road/Belle Haven storm drain system.* System L improvements are given a lower priority because Alma Street is not a significant travelway.

System M - There is no System M.

System N – System N discharges to San Francisquito Creek at Middlefield Road. *The storm drain system does not have sufficient flow capacity*. The system has flow capacity for between 10 and 30 percent of the 10-year storm event. There are several deficiencies to System N. First, during a 10-year storm event, the flow in

San Francisquito Creek will be near the top of the bank. This prevents discharge of the system into the Creek. Second, Middlefield Road slopes away from the Creek. During peak flow periods, ponding occurs at the low point of the system, which is at Middlefield Road between Ravenswood Avenue and Oak Grove Avenue.

The portions of the System N improvements that are on Middlefield Road are given a high priority because Middlefield Road is closed during flooding.

System O – There is no System O.

System P – System P discharges to Atherton Channel at Camino Al Lago. *System P has adequate flow capacity for all but a short section.* Minor street flow would occur during a 10-year event. *The street has capacity for 3 cfs, and this is not a critical system*. The System P improvements are given a low priority.

System Q - System Q discharges to Atherton Channel at Camino Po Los Arboles. *System Q has adequate flow capacity in most areas*. There are a couple of areas where minor flows may overtop from the system. There appears to be adequate street flow capacity to downstream systems in these areas. The System Q improvements are given a low priority.

System R - There is no System R.

System S – System S discharges to Atherton Channel upstream of Middlefield Road. System S has a 120-acre drainage area. *This system is significantly undersized*. Significant bottlenecks occur at the railroad crossings. Runoff in excess of the pipe capacity of the storm drain lines crossing the Railroad will pond adjacent to the Railroad.

Increasing the size of culverts under the railroad would increase flows to east of the tracks, where lines are also under-sized. The system should be constructed to Atherton Channel to assure that upstream improvements do not cause downstream flooding.

System S1 is an existing 18-inch diameter line to Atherton Channel west of the Railroad was investigated. There is little available slope in this direction. Spruce Avenue current has no inlets to this existing line. An inlet should be provided and the line from Spruce Avenue to Atherton Channel should be upgraded to 24-inch diameter to accommodate the additional flow. Extending the connection to collect runoff from System S does not appear warranted.

System T – System T is a series of drainage areas that flow to Highway 101 storm drain lines. The Highway 101 storm drainage lines discharge to systems through east Menlo Park and East Palo Alto. There is one significant storm drain line that collects Flood Park and Bay Road. Otherwise, *there are no significant drainage facilities.* There have been complaints of ponding in the vicinity of Iris Lane and Bay Road.

Local drainage lines are proposed in this area. These lines are not a high priority.

System U – System U consists of two storm drain lines on Coleman Avenue. *These lines have adequate flow capacity*.

System V – System V are storm drain systems near Woodland Avenue that flow to the east toward systems in East Palo Alto. The Pope Street system is 48-inch diameter and is sized to convey flows that overtop the Creek. Euclid Avenue flows to a system that was expanded as a part of the University Circle project. *There is a significant drainage area that must flow through streets to Euclid Avenue*.

System BH – System BH are storm drains within the Belle-Haven system. System BH is outside the scope of the Drainage Study. However, as a part of the Drainage Study, several lines were identified that should be included in the Capital Improvements program. *Menalto Avenue is a low-lying area without a drainage system. Upper Santa Monica from Middlefield Road to Nash Avenue is an area that does not have a storm drain system and potentially receives overflows from the Middlefield Road system.*

The analyses for the above recommendations are presented in Appendix D. Analyses for each drainage area are placed behind a Figure that shows the drainage area. The letter, indicated by "x", identifies the system analyzed. For each system, there is, (1) a Figure showing the drainage system, (2) an existing system hydraulics Table (x.1), (3) an existing system hydrology table (x.2), (4) a proposed system hydraulics table (x.3), and (5) a proposed system hydrology table (x.4).

One regional alternative was evaluated and is shown on Figure 6 in Appendix A. This system consists of a line on Middle Avenue that intercepts Systems G and I. In addition, the line reduces flows to systems J and K. For the Regional Alternative, results are presented in a proposed system hydraulics table (x.1), a proposed system hydrology table (x.2) and a cost table (x.3). The regional solution had similar costs to replacement of lines in existing locations.

Proposed line sizes are summarized in Figures 2a, 2b and 2c.

The following are also addressed as a part of regional solutions:

Outfalls - Recommended improvements for systems E, F, G, I, J&K, and L require increasing the size of the outfall at San Francisquito Creek. Improvements

for System S require increasing the size of the outfall to the Atherton Channel. In some cases, there may be a concern that the increased outfall size will lead to increased flooding of San Francisquito Creek or Atherton Channel. As discussed previously, correcting Creek deficiencies to allow changes in system peak discharge rates is a regional issue that must be addressed outside of this Drainage Study.

It is recommended that flap gate structures be included on the proposed outfalls. For the larger outfall pipes, manifolds may be needed to reduce the size of the flap gate.

Overland Flow Paths - There are portions of the City where drainage occurs through streets and gutters. In many portions of the City, this is acceptable and may provide an adequate level of service during storm events. Figure 7 in Appendix A shows the approximate flow capacity of streets where storm drain facilities are not adequate. The reported flow capacities are conceptual and do not account for localized system low-points. In general, the purpose of the reported flow capacity is to assist in prioritizing improvements. During final design, the City should adjust lengths of proposed line to take full advantage of available gutter flow.

Individual Drainage Problems

The City keeps records of areas where there are complaints by residents, or problems noted by maintenance crews. These areas are shown on Figure B1. In Appendix B, problem areas are shown and possible solutions are presented. In general there are three types of problems have been found:

Typical nuisance ponding

- The first is the nuisance ponding that is due to the lack of established surface drainage paths. The installation of concrete gutters with continuous slopes would solve most of these problems.
- The second is the minor flooding problems that occur during or immediately after major storm events. These problems are generally caused by insufficient capacity in the underground collection system or overflows from upstream systems that do not have sufficient capacity.

Minor flooding condition

- The third are flooding problems due to overflows of the discharge waterways that are intended to carry water to the Bay. These conditions occur when San Francisquito Creek or Atherton Channel overflow its banks.

Of the three types of problems, the City can only directly impact the first two. The installation of new gutters is possible, but would be extremely costly on a city wide basis. It would also change the character of the community.

Making improvements to the existing collection system would be the most cost effective way to reduce the minor flooding problem. Improvements would include 1) the extension of storm drain line into areas that are not presently served, 2) replacing undersized storm drain pipelines and 3) installing interceptor storm drain lines that divert storm water before it reaches portions of the existing system that do not have sufficient capacity, 4) retaining water in ponds for future release, and 5) the use of drywells to facilitate infiltration of storm drainage. These alternatives will be disused in the following section.

The overflows of these major water courses are potentially the most devastating of the storm drain problems affecting the City. Unfortunately they are beyond the direct control

of the City of Menlo Park and need to be looked at by a coalition of local governments or jurisdictions. For San Francisquito Creek, the San Francisquito Creek Joint Power Authority assists with coordinating Creek activity. Member groups include Santa Clara Valley Water District and San Mateo Flood Control District. For Atherton Channel, the Atherton Channel Flood Control District coordinates Channel activities. The City needs to take an active roll in working with these jurisdictions to increase channel capacity to minimize the flooding problem.

PRIORITY OF IMPROVEMENTS

The following section provides a priority of drainage solutions for the City's Storm Drainage system. Priorities were established as follows:

- Top priority is projects that improve the level of service to areas where storm waters frequently flood existing properties.
- Second priority is given to projects that improve the level of service to areas where flooding forces frequent road closures.
- Third priority is given to projects where the project will correct deficiencies that cause downstream flooding problems.
- The fourth priority is projects that correct problems that cause major disruption of critical travelway.
- Fifth priority is for other conditions, including nuisance ponding in the gutter, inadequate bubble-up structures, and other similar problems.

In addition, the City needs to maintain the existing system. In some areas, there are rusted corrugated metal pipes that must be replaced. Replacement of these pipes should be based on safety requirements, rather than hydraulic concerns. Where failure of a rusted pipe would cause a safety problem, replacement should be given highest priority.

Many System improvements contain both high priority improvements and low priority improvements. High priority improvements are listed on Table 2. A detailed list of the priority for each length of storm drain is provided on the Tables in Appendix C. Table D2 is a list of the high priority improvements. Table D3 is a summary of the cost for each priority of improvement by drainage system.

EVALUATION OF ALTERNATE IMPROVEMENTS

The following presents an evaluation of alternative methods for improving drainage within the City. Three options are available for controlling stormwater. The first option is the construction of new or replacement storm drain systems that convey runoff to the receiving water (San Francisquito Creek or Atherton Channel). The second method is to retain runoff in storage basins for release at later times after the peak of the storm has passed. The third option is to construct facilities that improve infiltration of runoff to the groundwater system. This study focuses on the first option, construction of storm drain facilities. Stormwater detention is effective in areas of proposed development where land is available for storage of stormwater. Currently, the City of Menlo Park is at or near build-out, and there is insufficient land available in areas where drainage systems are inadequate for effective stormwater storage. Improved infiltration is possible, but is not sufficient to correct the existing drainage deficiencies.

Alternatives for Upgrading Storm Drain Systems

Replace In-Place - Existing lines are replaced with lines sized to convey a 10-year storm event. Line sizes are shown on Figures 2a, 2b and 2c in Appendix A. Detailed costs for replacement facilities are presented in Appendix C.

Regional Solutions – Regional Solutions are used to correct drainage deficiencies at multiple drainage areas. One Regional Solution is shown on Figure 6. (Shown as orange). The cost for the Regional Solution is summarized on Table 1 and compared with equivalent level of service with improvements to Systems G, I, J and K. There is little benefit with the Regional Solution. The Regional Solution is a single outfall to San Francisquito Creek at a new location, instead of two outfalls at existing locations. The Regional Solution is not recommended because it does not provide a significant benefit over use of the current drainage pattern.

Additional Facilities – There are portions of the City where significant flow is allowed to occur through the streets in gutters and swales. These areas are shown on Figure 2 with yellow crosshatching. In some areas, facilities are recommended to reduce the required flow through street travel way. Locations of additional lines are shown on Figures 2a, 2b and 2c as brown lines. The costs for these additional facilities are summarized on the following Table, with additional detail provided on Tables in Appendix C.

Table 2 - Cost for Correcting System Deficiencies
(see Appendix C for more detailed cost estimate)

	Priority 1	Priority 2	Priority 3	Priority 4	Priority 5	
	Total ($)	Total ($)	Total ($)	Total ($)	Total ($)	Total ($)
System E					$ 130,000	$ 130,000
System F					$ 144,000	$ 144,000
System G	$123,000		$ 899,000	$ 816,000	$870,000	$2,707,000
System I	$2,310,000		$4,458,000	$ 341,000	$1,704,000	$8,812,000
System J&K		$5,835,000		$ 433,000	$3,215,000	$9,483,000
System L					$1,403,000	$1,403,000
System N		$4,633,000		$1,699,000	$1,270,000	$7,601,000
System P					$ 133,000	$ 133,000
System Q				$ 399,000	$ 645,000	$1,043,000
System S	$80,000			$ 18,000	$4,045,000	$4,1141,000
System T					$1,254,000	$1,254,000
System V		$ 288,000			$ 275,000	$ 563,000
System BH		$ 288,000		$ 348,000	$ 597,000	$ 945,000
Total Cost	$2,513,000	$10,755,000	$5,356,000	$4,052,000	$15,827,000	$38,500,000

The priority of improvements is presented on Figure 5 in Appendix A. The following provides justification for the Priority 1, 2 and 3 projects.

Priority 1 – Priority 1 Improvements are necessary to prevent building flooding. Areas that benefit from Priority 1 Improvements are shown on Figure 4a.

System I – Middle Avenue - Middle Avenue is susceptible to flooding because of undersized drainage facilities to the Creek and because of upstream flooding that overflows into the drainage area. Upsizing the outfall storm drain line on Arbor Road will significant reduce the flooding potential along Middle Avenue. In addition, this project would reduce overflows to El Camino Real. The System I, Priority 1 project cost is $2,310,000.

The project can be broken into several phases.

- The first phase is replace and upsize the storm drain line on Arbor Road from the outfall to about 500 feet upstream at a cost of about $850,000.
- The second phase is replace and upsize the storm drain line on Arbor Road from Phase 1 termination to Middle Avenue for a cost of about $980,000.
- The third phase is extending the system to Middle Avenue and San Mateo Drive. The cost for the third phase is about $480,000.

System S1 – Spruce Avenue – Flooding occurs at Spruce Avenue. The System S1 storm drain system does not have an inlet at Spruce Avenue. Currently, the railroad acts as a barrier to surface flows from Spruce Avenue. System overflows are conveyed as surface flow parallel to the tracks to Atherton Channel, flooding houses along the flow path. Upsizing the final storm drain to the Creek would allow construction of an inlet at Spruce Avenue. The System S1, Priority 1 project cost is $269,000.

System G – Magnolia Drive / Stanford Court – Flooding occurs in the vicinity of Stanford Court as a result of undersized lines downstream on Magnolia Drive. Upsizing 530 feet of line from 12-inch diameter to 24-inch diameter will improve drainage through an upstream system that has been improved. The System G, Priority 1 project cost is $123,000.

Priority 2 - Priority 2 Improvements are necessary to prevent road closures. Areas that benefit from Priority 1 Improvements are shown on Figure 4b.

System JK – Alto Lane / El Camino Real – All overflows from upstream systems will be toward El Camino Real. It is likely that ponding first occurs on Alto Lane and excess flows are released to a 30-inch storm drain line to the Alma System prior to road closures for typical storm events. A major storm event could result in the closure of El Camino Real. The System JK, Priority 2 project cost is $5,800,000.

System N – Middlefield Road - A parallel storm drain is proposed along Middlefield Road. The storm drain would connect to a recently constructed 48-inch diameter outfall into San Francisquito Creek. The parallel storm drain is needed to relieve flooding that requires road closures of Middlefield Road, Ravenswood Avenue, and Oak Grove Avenue. The System N, Priority 2 project cost is $4,600,000.

System V – Euclid Avenue – A significant drainage area flows to Euclid Avenue with no collection system. It is likely that the flooding could disrupt traffic during a major storm event. The System V, Priority 2 project cost is $288,000.

Priority 3 – Priority 3 improvements are necessary to reduce overflows to downstream systems. Areas that benefit from Priority 3 Improvements are shown on Figure 4c.

System G – Overland Flow - Overflows from the System G system are to System I. There can be a "domino effect", with these overflows continuing to El Camino Real. The System G, Priority 3 project cost is $900,000.

System I – Overland Flow - Overflows from the System I system are to El Camino Real. Currently, a portion of Middle Avenue does not have a storm drain. A storm drain would be provided to collect flows to improve collection into the Priority 1 storm drain line. Lines on Valparaiso Avenue, Santa Cruz Avenue and Arbor Drive are proposed to collect flows and convey flows to the Priority 1 system, thereby reducing the potential for overtopping to the El Camino Real system. The System I, Priority 3 project cost is $4,458,000.

Schedules for implementing Priority 1 through 3 improvements are presented in Table C5 in Appendix C.

CONCLUSIONS

There are major deficiencies in the existing City storm drain systems. Common drainage system concerns are undersized storm drain lines, bubble-up storm drain systems, and areas without storm drain systems. In addition, there are significant concerns with inadequate flow capacity of San Francisquito Creek and Atherton Channel.

The purpose of this report is to address storm drainage system concerns. Correction of San Francisquito Creek and Atherton Channel flooding concerns are a regional problem that is outside the scope of this study. However, coordination with agencies responsible for the Creek and Channel will be necessary as a part of correcting the existing storm drain system deficiencies.

The City's storm drain system problem areas are identified on Figures 2 and 3. Storm drain line sizes presented for correcting these deficiencies are shown on Figure 2. The cost for implementing measures required to provide a 10-year level of storm drain protection throughout the system is about $38,500,000. The cost for Priority 1 improvements is about $2,700,000. Given the high cost of implementing measures for correcting all noted deficiencies, a phased approach is recommended as described in Tables 1a through 1e.

The City should begin to solve the regional problems by starting at the outfall points. During interim phases, there may be substantially more capacity in a system than can enter the line. Where projects are phased, oversized catch basin inlets should be considered to allow surface flows to enter the upsized portion of the line. For systems that discharge to San Francisquito Creek, improvements to one drainage system will reduce flood potential to downstream systems by reducing system overflows.

Solutions to the local drainage problems can potentially increase property values by eliminating public nuisances and traffic hazards associated with water that ponds in the street for prolonged time periods.

APPENDIX A

Figures

Figure 1	Drainage Area Boundaries
Figure 2a, b, c	Existing and Proposed Storm Drain Line Sizes
Figure 3	San Francisquito Creek Water Levels and Spill Points
Figure 4a	Areas Benefiting from Priority 1 Improvements
Figure 4b	Areas Benefiting from Priority 2 Improvements
Figure 4c	Areas Benefiting from Priority 3 Improvements
Figure 5a, b, c	Priority of Improvements
Figure 6	Regional Solution Alternative
Figure 7	Flow Capacity of Overland Flow Path

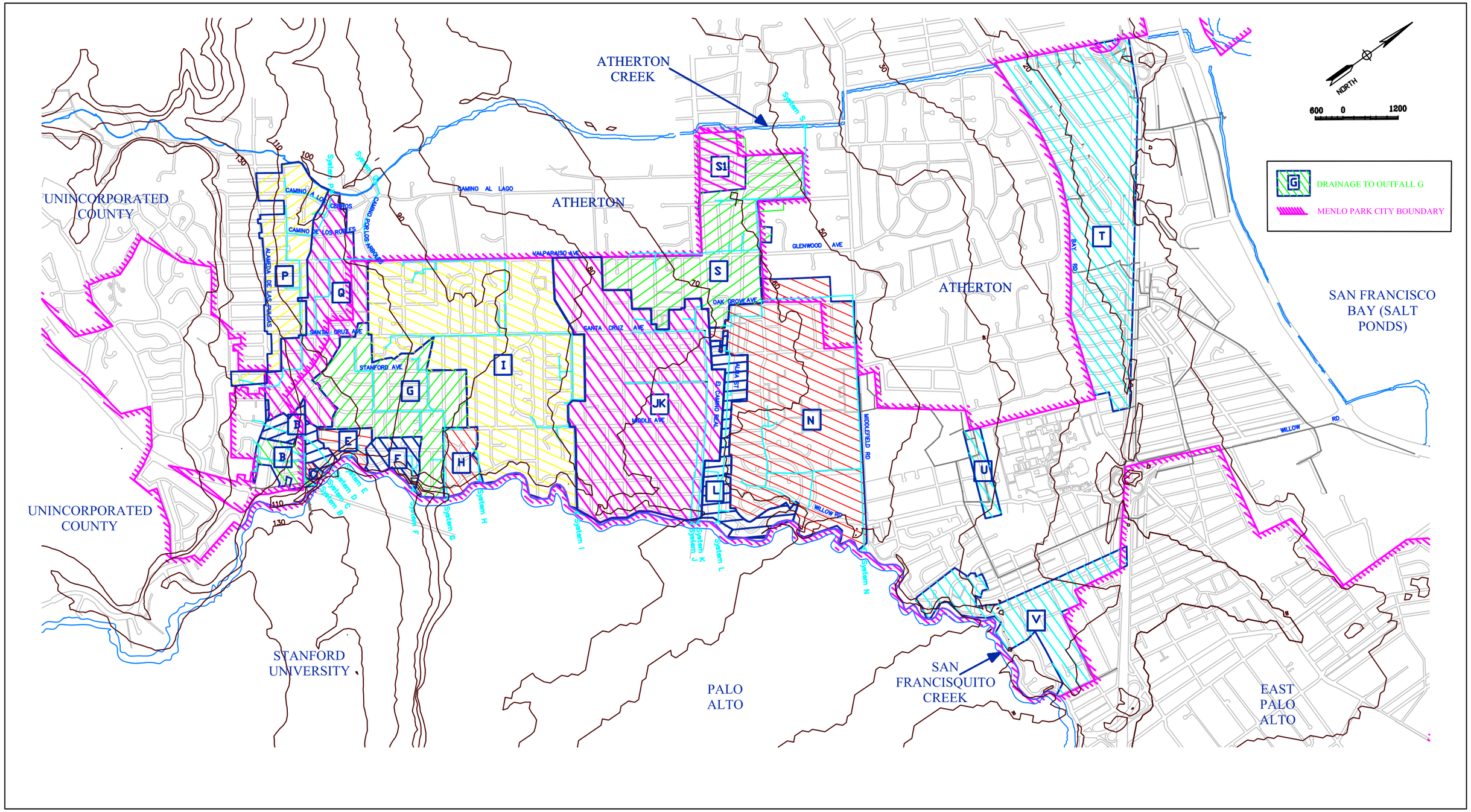


FIGURE 1
STORM SYSTEM DRAINAGE AREAS

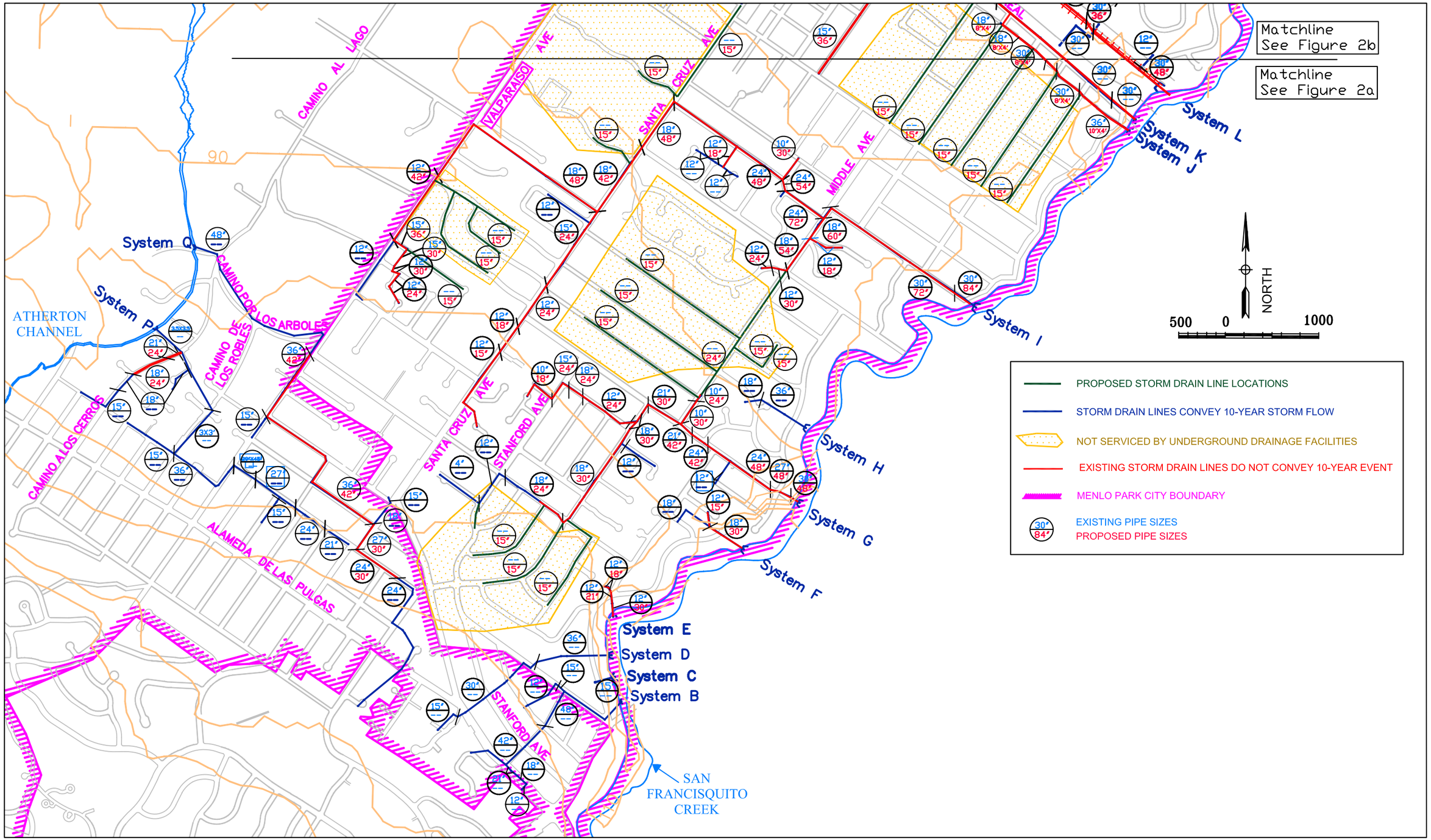


FIGURE 2a
EXISTING AND PROPOSED STORM DRAIN SYSTEMS

BKF

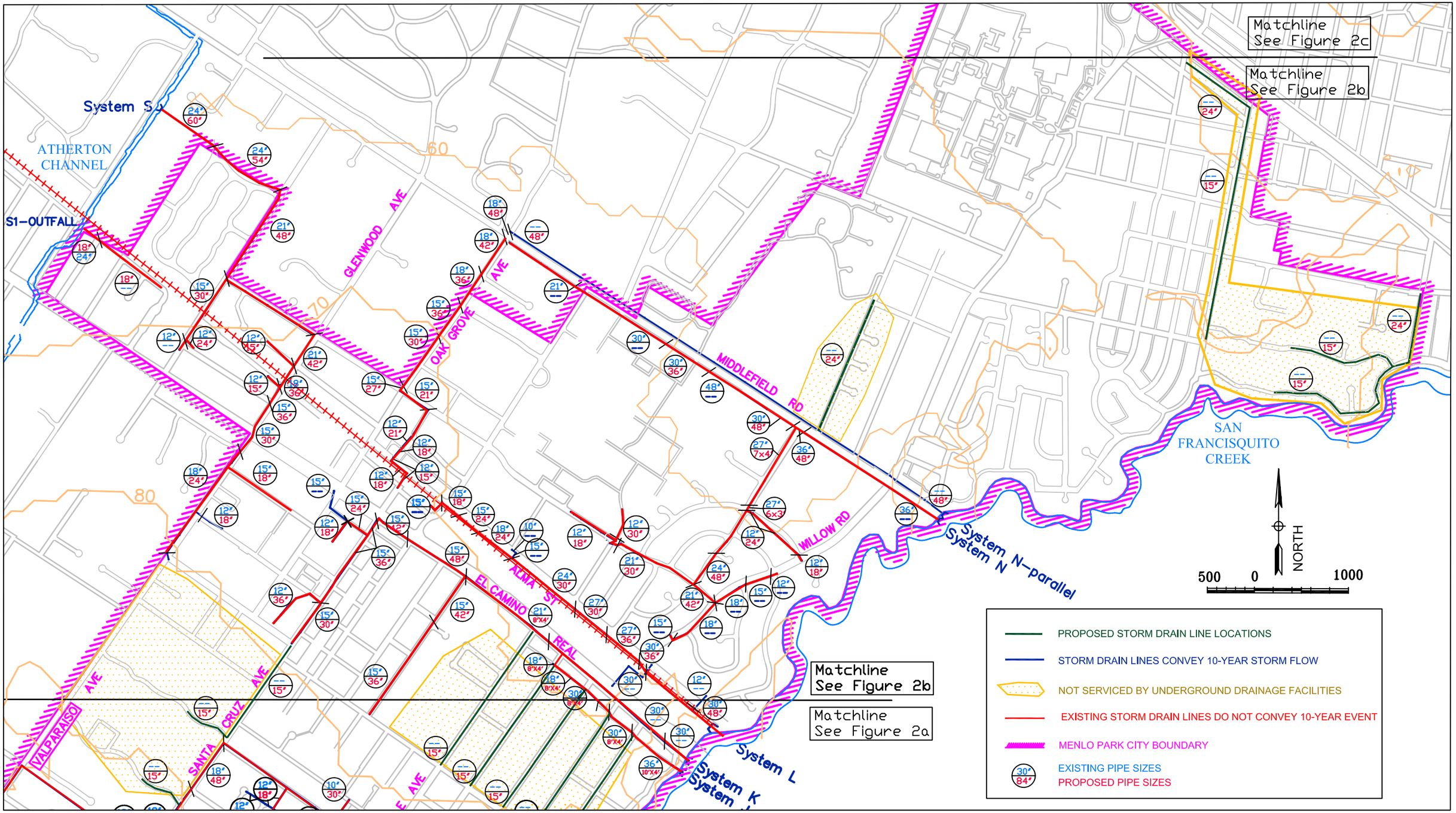


FIGURE 2b
EXISTING AND PROPOSED STORM DRAIN SYSTEMS

BKF

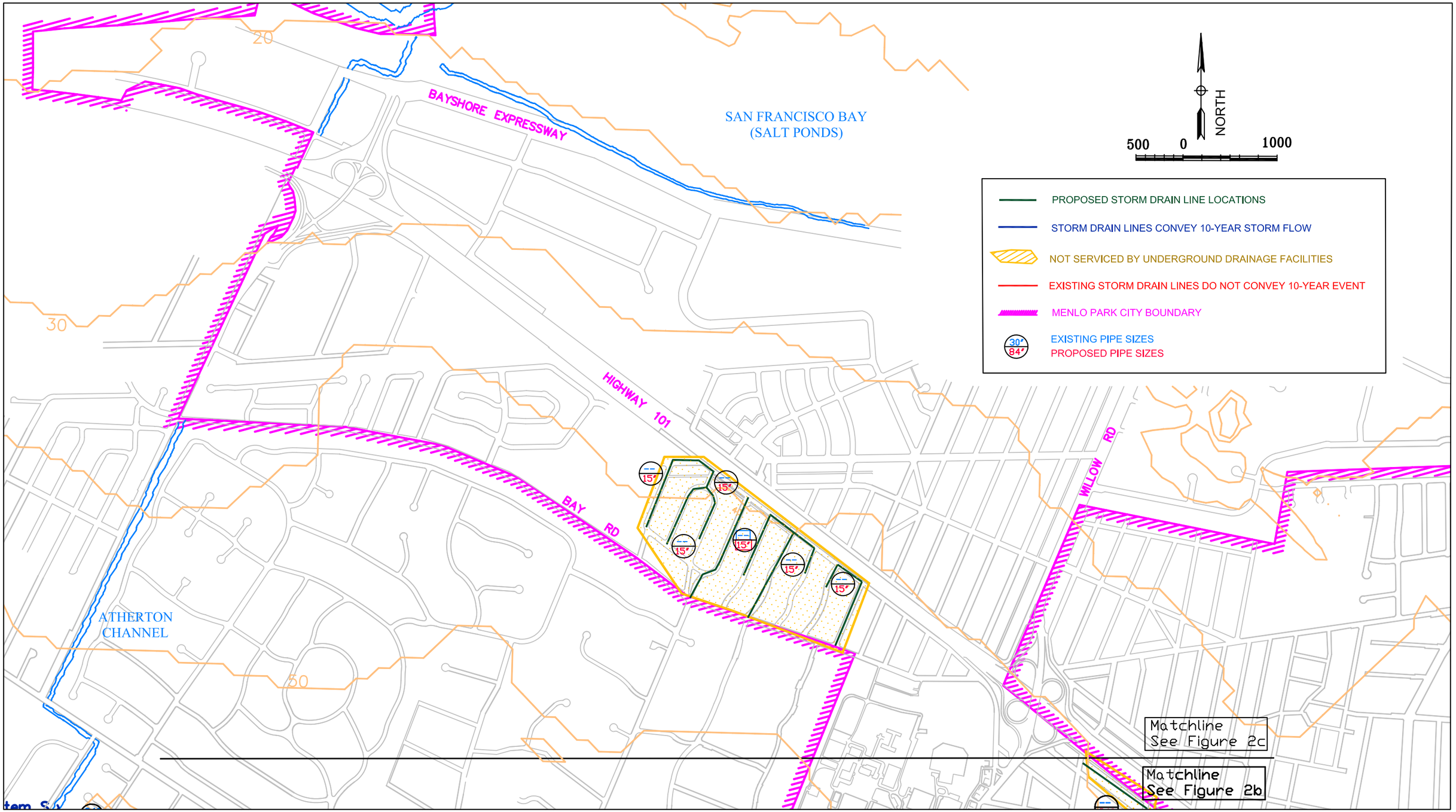


FIGURE 2c
EXISTING AND PROPOSED STORM DRAIN SYSTEMS

BKF

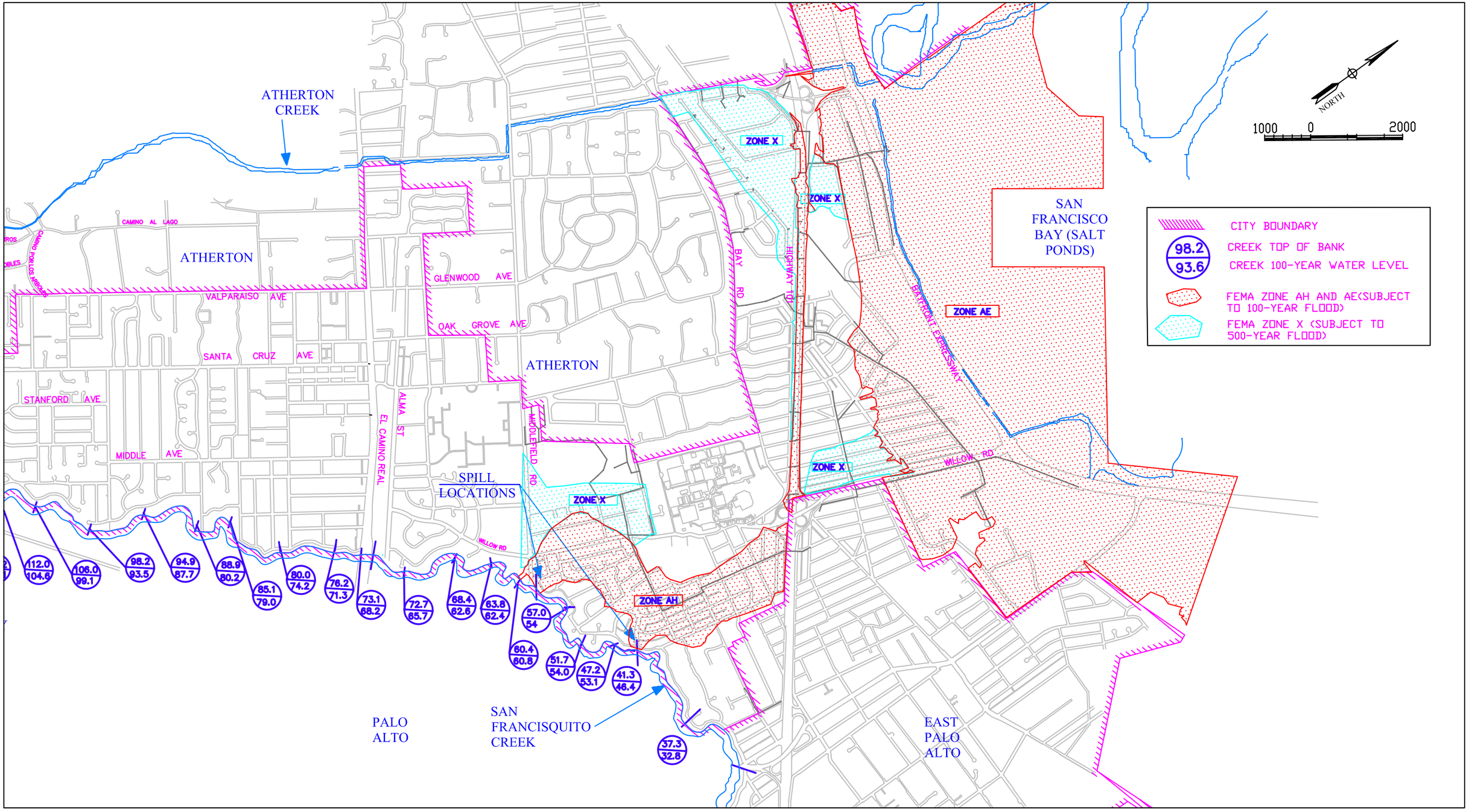


FIGURE 3
SAN FRANCISQUITO CREEK WATER LEVELS, SPILL POINTS AND FLOOD ZONES

BKF

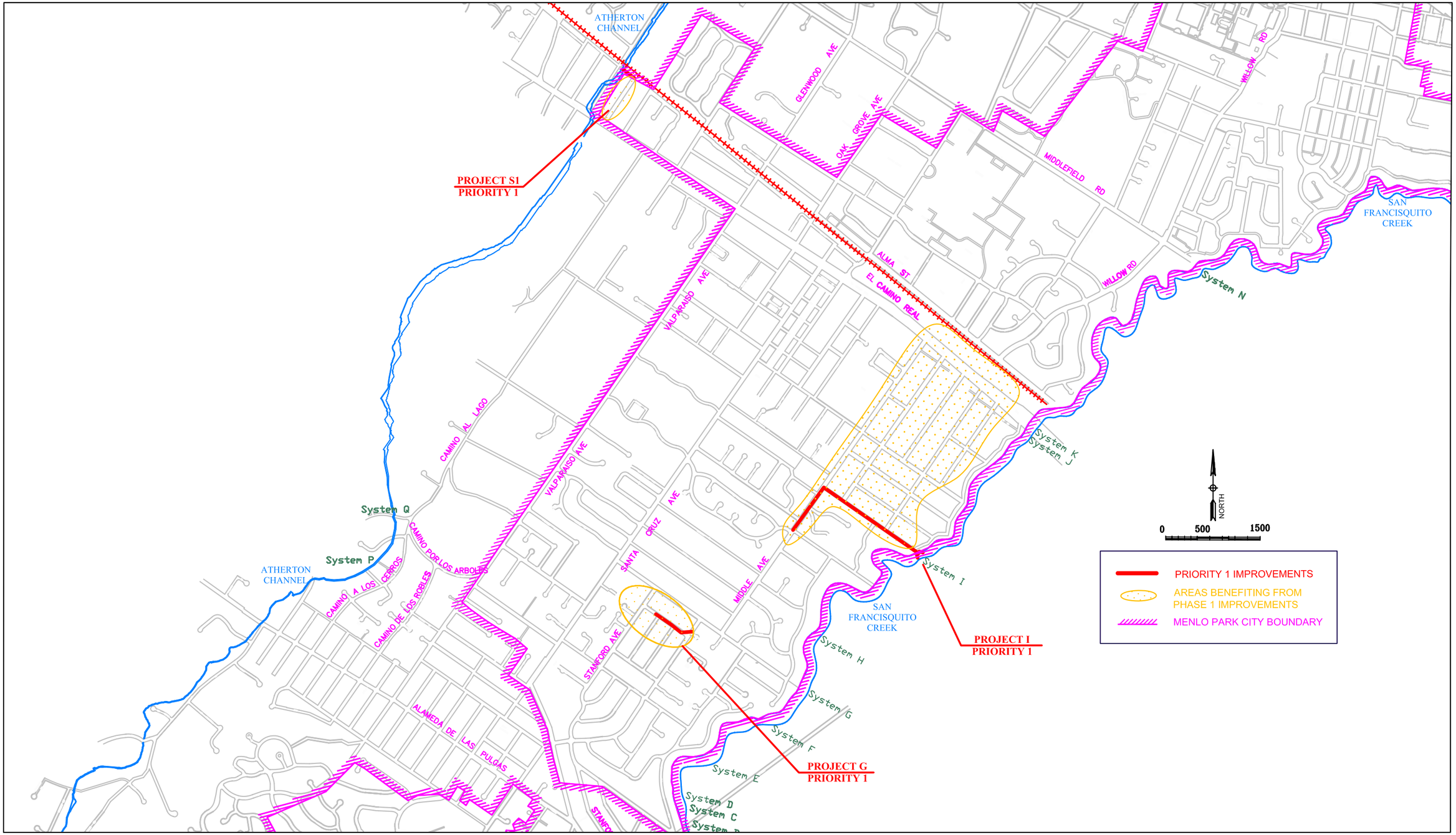


FIGURE 4a
AREAS BENEFITING FROM PRIORITY 1 IMPROVEMENTS

BKF

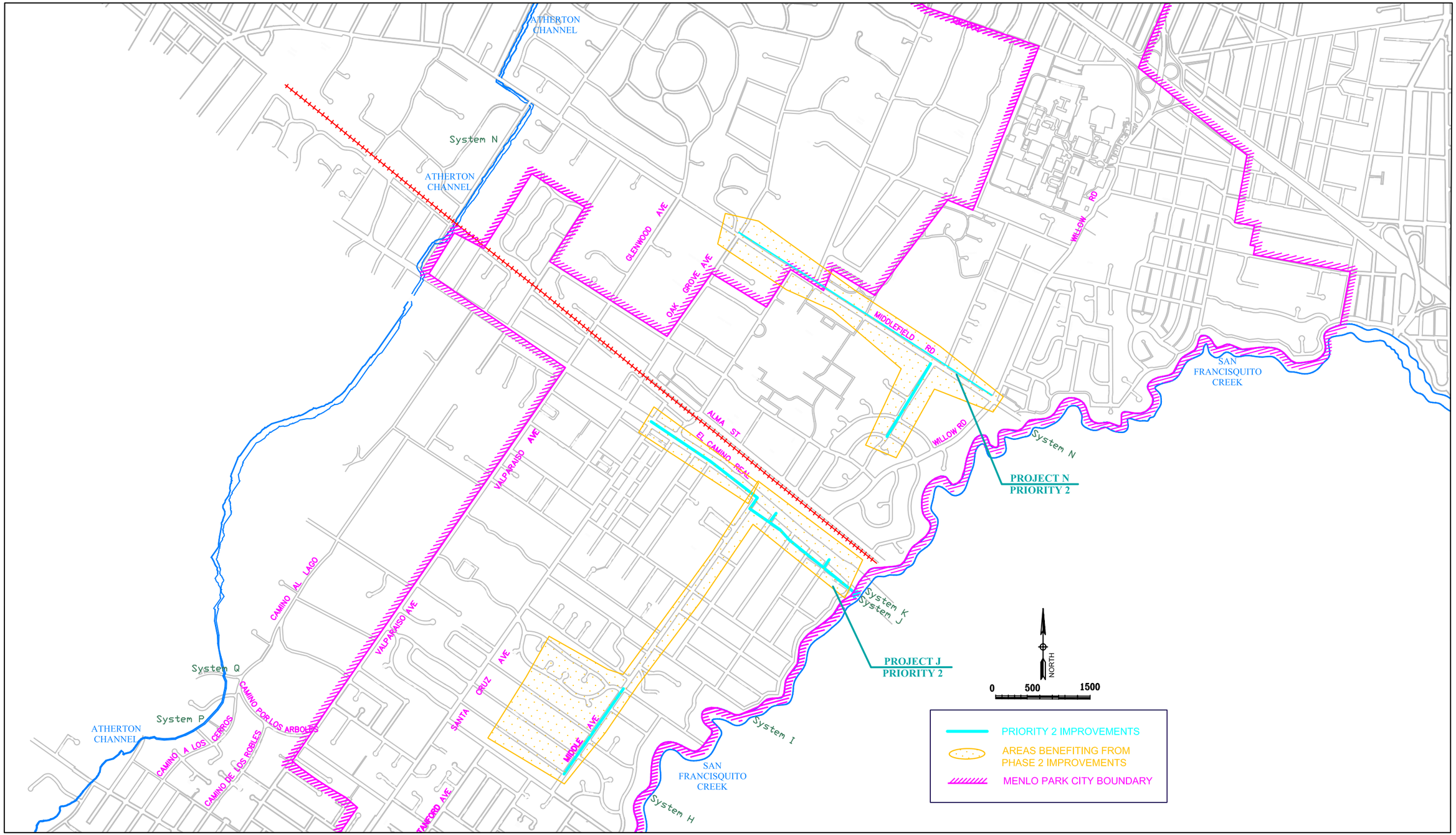


FIGURE 4b
AREAS BENEFITING FROM PRIORITY 2 IMPROVEMENTS

BkF

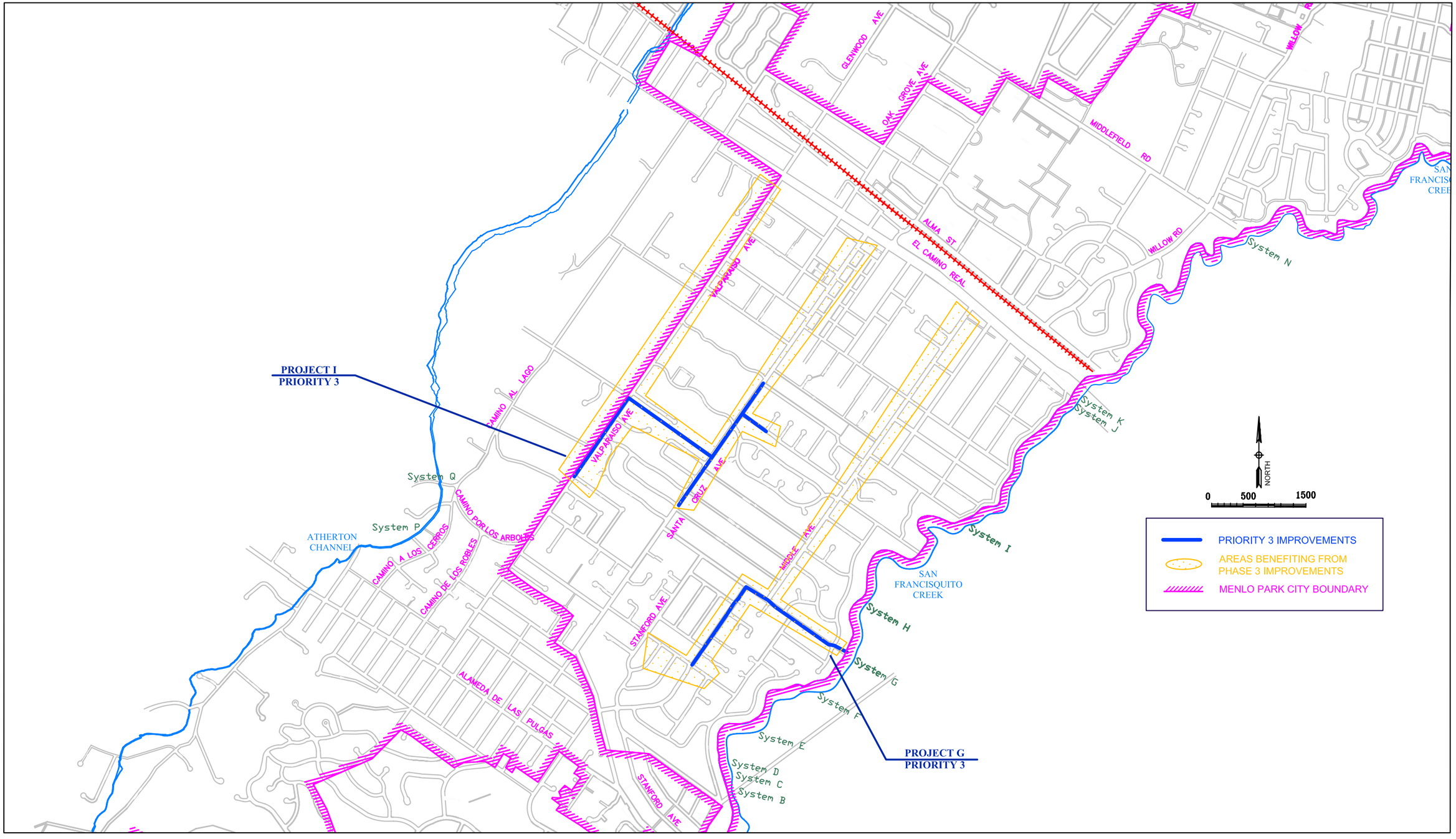


FIGURE 4c
AREAS BENEFITING FROM PRIORITY 3 IMPROVEMENTS

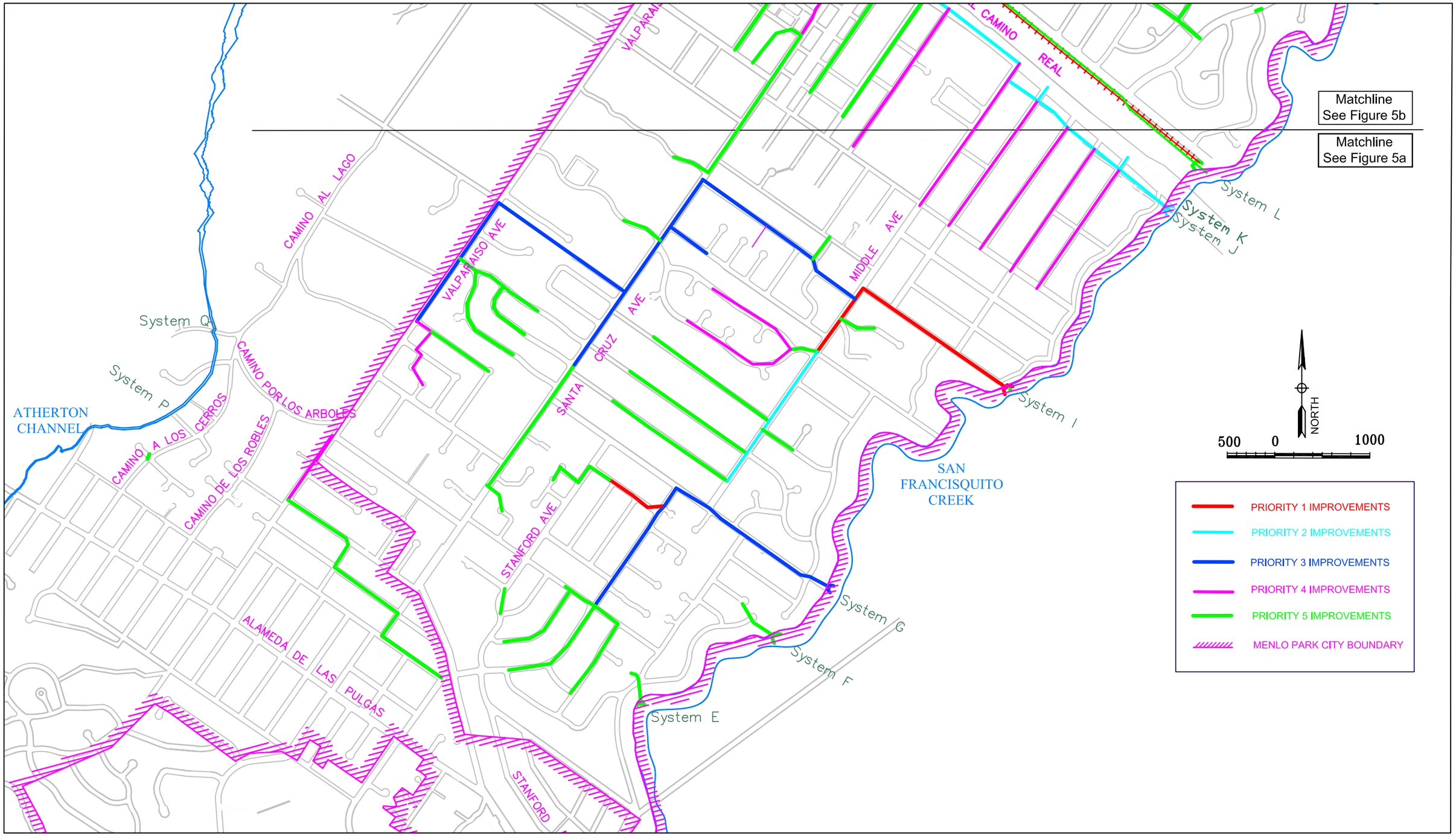


FIGURE 5a
PRIORITY OF DRAINAGE IMPROVEMENTS

BKF

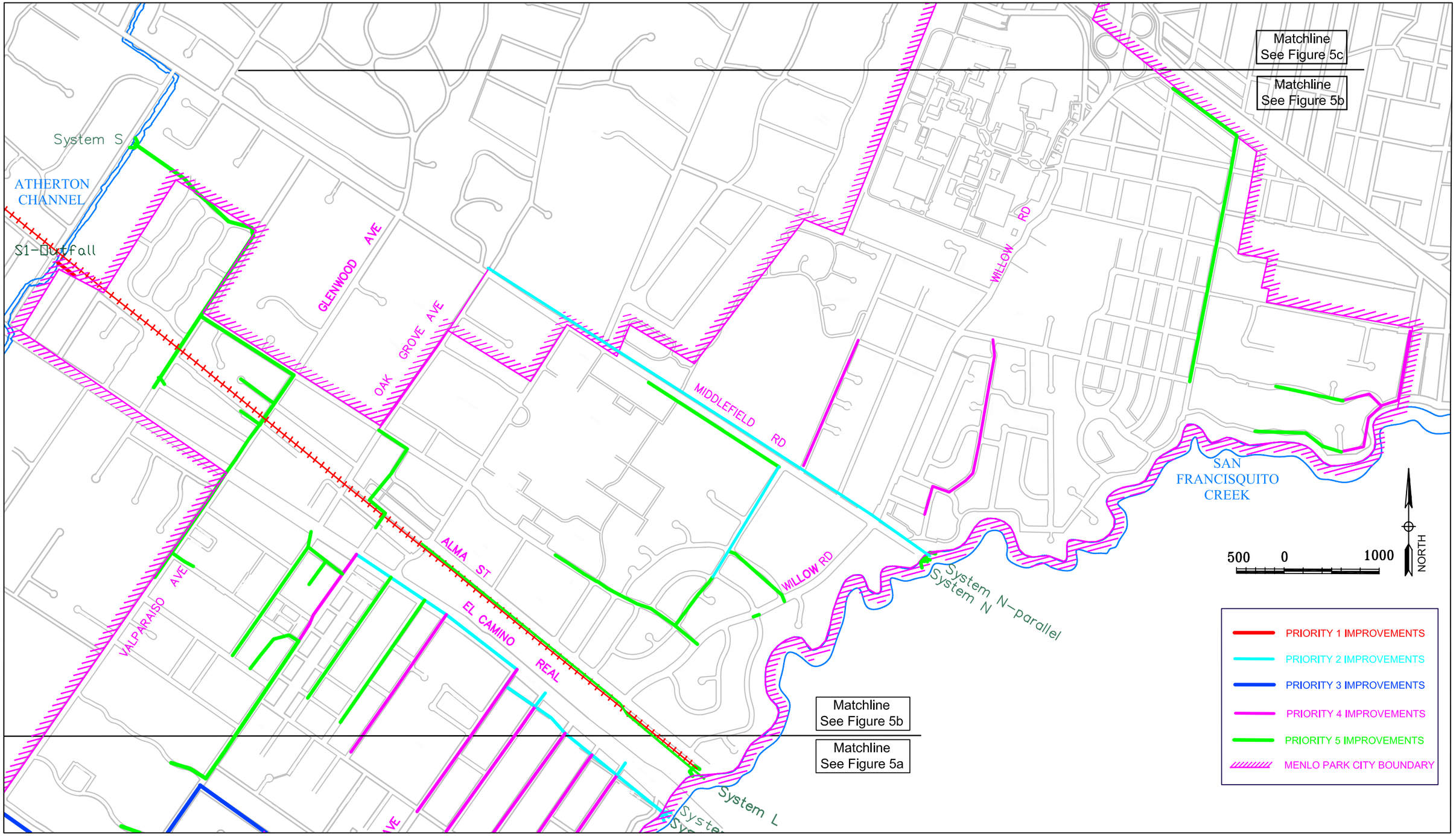


FIGURE 5b
PRIORITY OF DRAINAGE IMPROVEMENTS

BKF

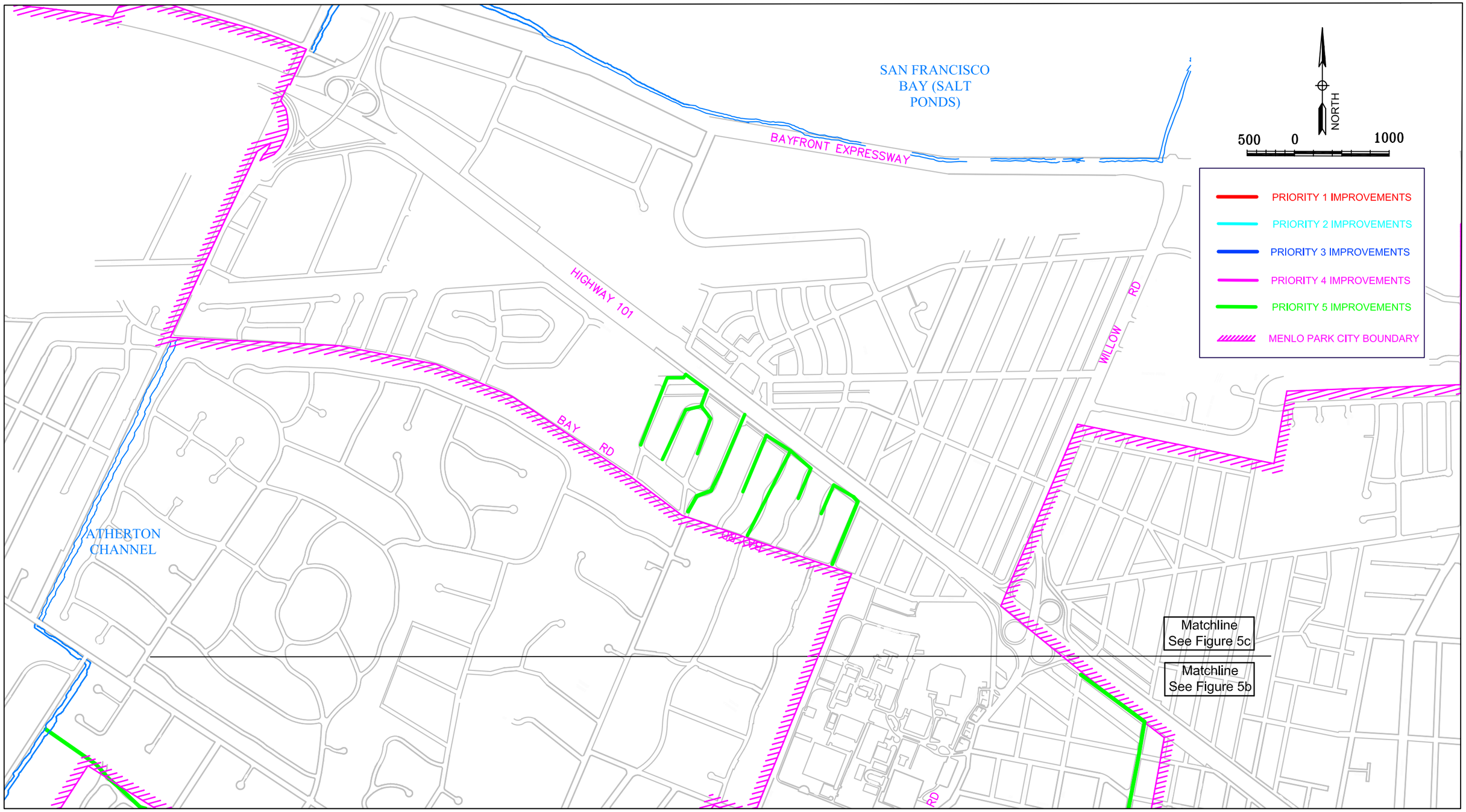


FIGURE 5c
PRIORITY OF DRAINAGE IMPROVEMENTS

BKF

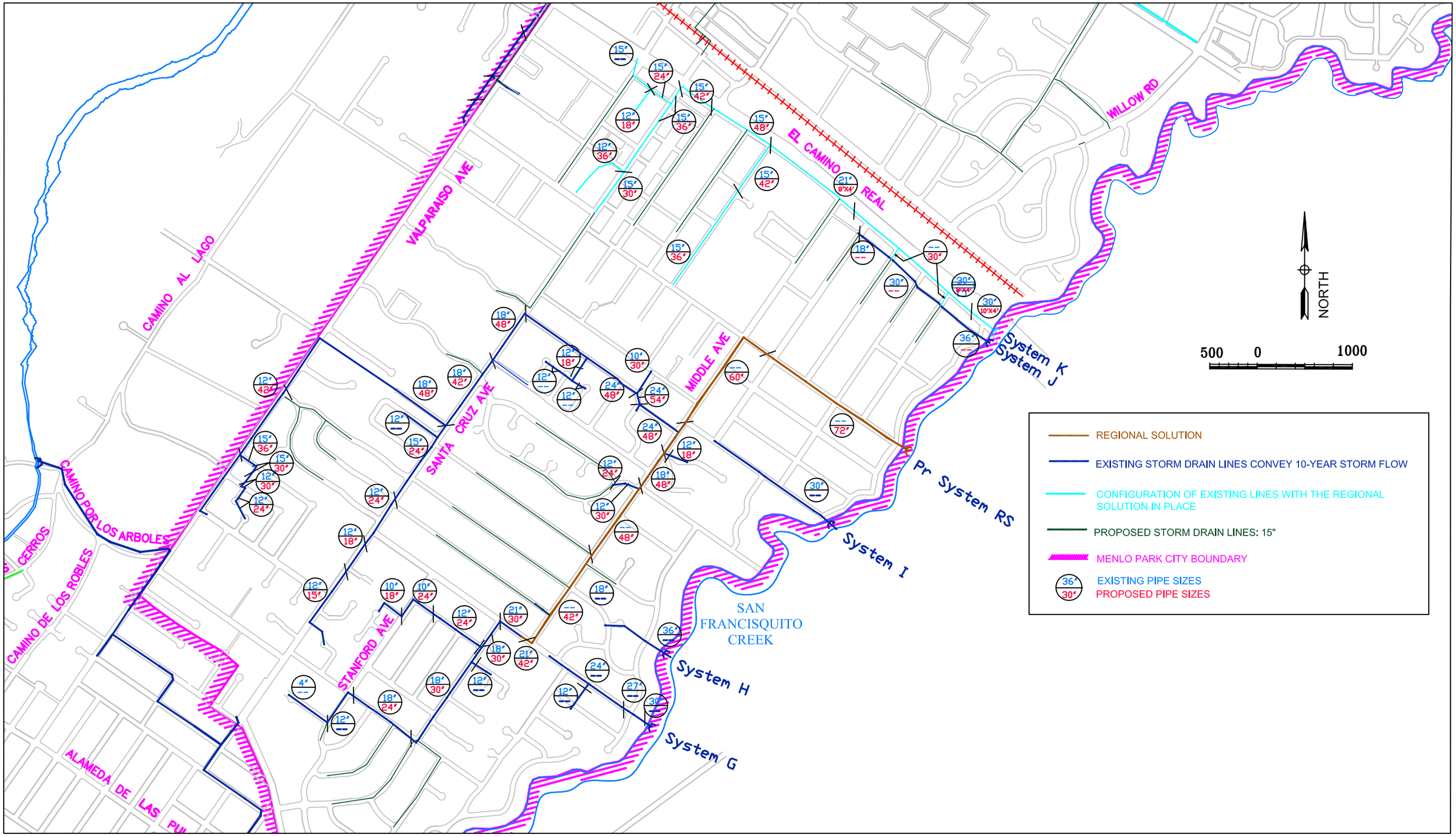


FIGURE 6
REGIONAL SOLUTION ALTERNATIVE

BKF

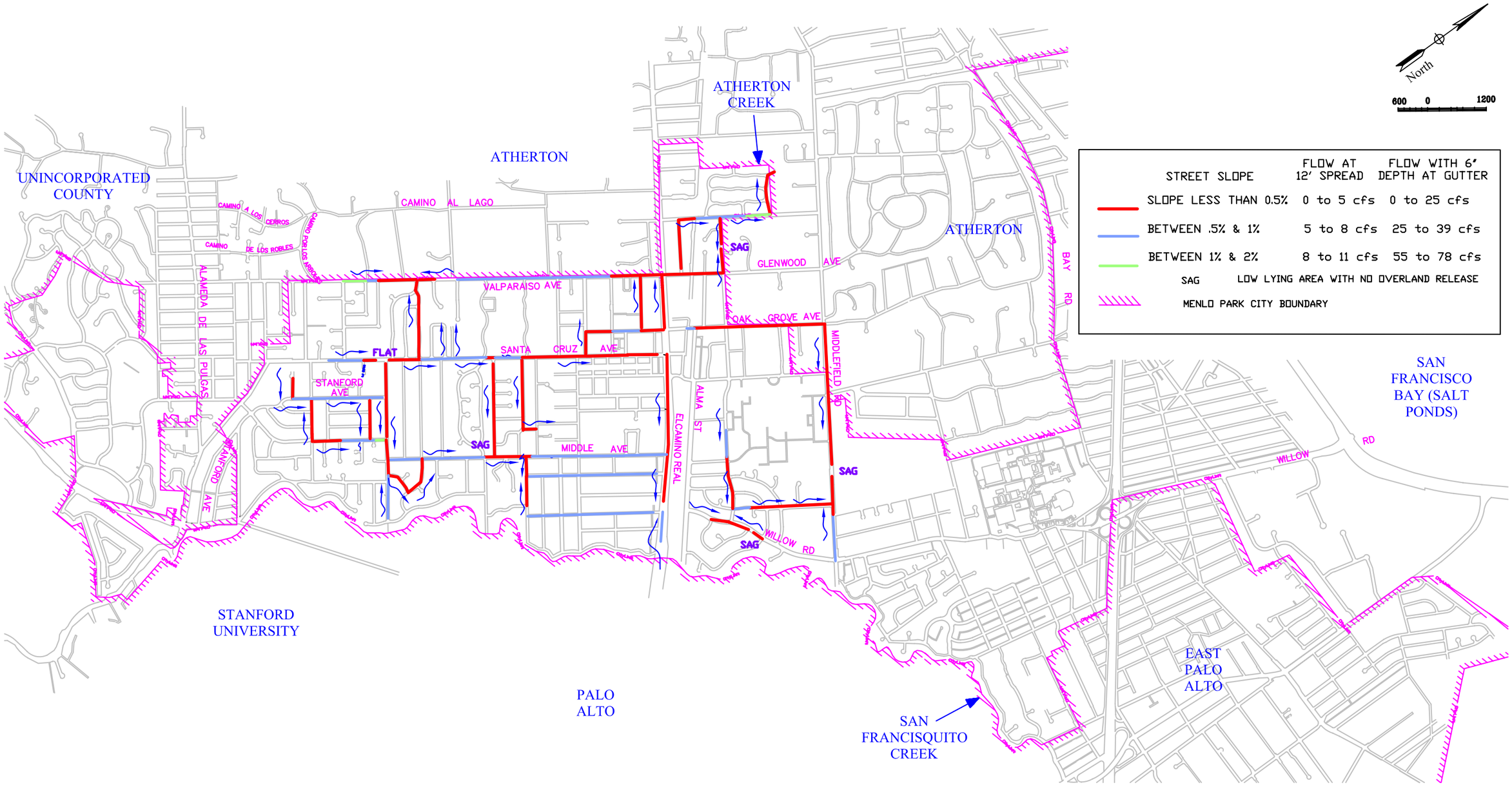


FIGURE 7
FLOW CAPACITY OF OVERLAND FLOW PATH

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APPENDIX B

Description of Problem Areas

The following Appendix presents descriptions of individual problem areas that have been identified by either residents of Menlo Park or the City staff. The list is based on specific complaints, and is not a list of all expected deficiencies.

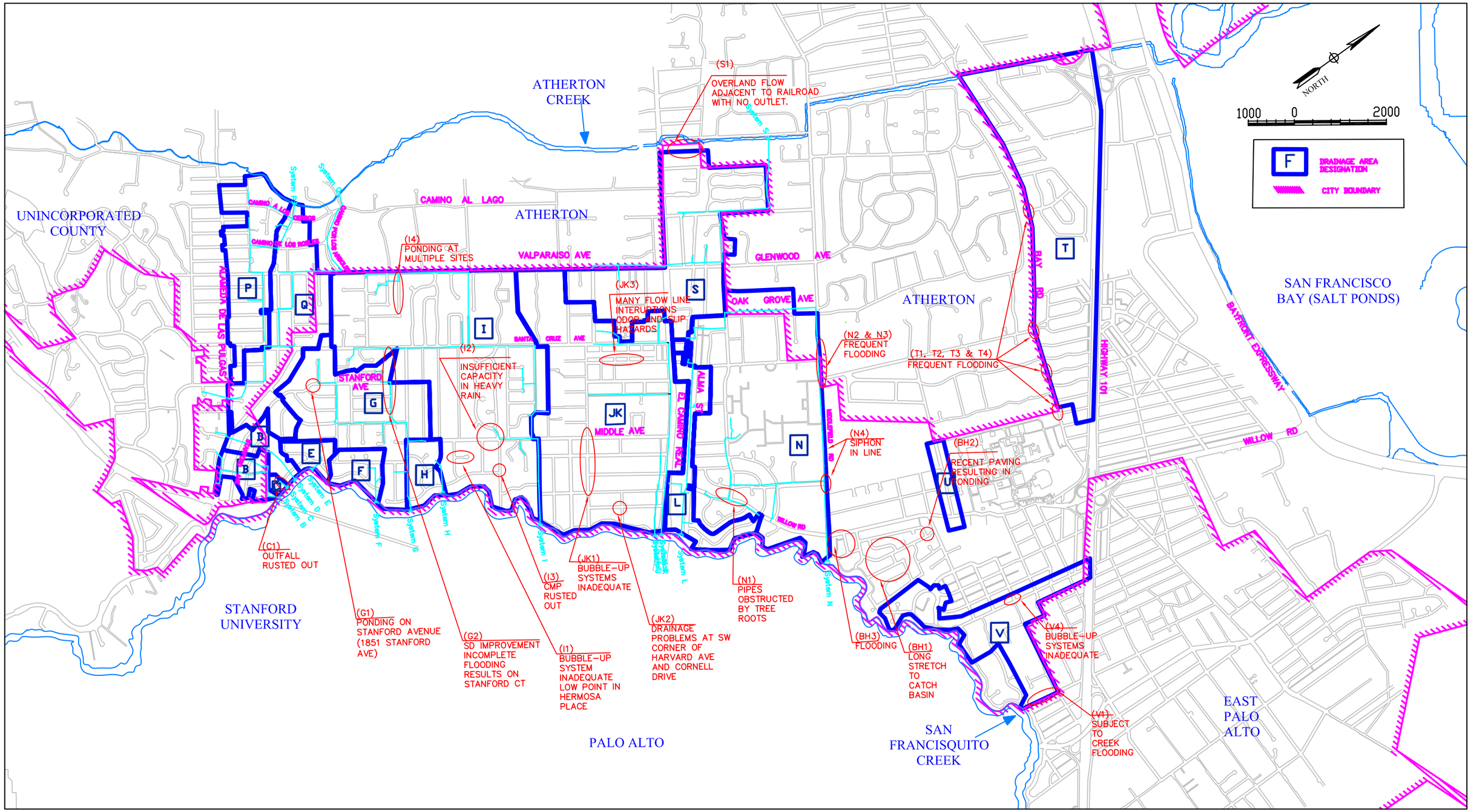


FIGURE B1
IDENTIFIED PROBLEM AREAS

1975 OAK AVENUE

LOCATION:
Outfall into San Francisquito Creek in front of 1975 Oak Avenue.

PROBLEM: From City Maintenance officials, 12-inch diameter outfall into San Francisquito Creek is rusted out.

POSSIBLE SOLUTIONS: Replace existing 165 feet 12-inch diameter outfall pipe with a new 12-inch diameter outfall pipe. Construct new outfall structure at creek.

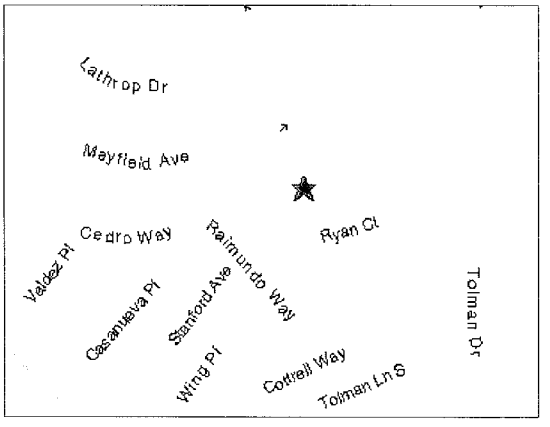
FIGURE C1
MENLO PARK

BKF

1851 STANFORD AVENUE

At the intersection of Stanford Avenue and Edgewood Lane, looking south of Stanford Avenue. Can see ponding in roadway gutter low spot.

In front of 1851 Stanford Avenue, looking south on Stanford Avenue. Can see ponding in front of house.



LOCATION:
In front of house 1851 Stanford Avenue.

PROBLEM: From City Maintenance officials, ponding occurs along the front of 1851 Stanford Avenue.

RECOMMENDATIONS FOR FURTHER INVESTIGATION: Survey existing low spot in roadway.

POSSIBLE SOLUTIONS: Build inlet at intersection of Stanford Avenue and Edgewood Lane (low spot) and use 12-inch diameter pipe to connect to existing system 250 feet to the north on Stanford Avenue.

Build curb and gutter along roadway to direct runoff to an existing inlet location 250 feet to the northeast from 1851 Stanford Avenue. Construct proposed System G facilities.

FIGURE G1
MENLO PARK

BKF

MAGNOLIA STREET

On Magnolia Street, looking at house 820. Can see storm drain inlet is not in valley gutter flow line.

On Magnolia Street, looking southeast. Roadway is weathered, signs of ponding. No curb or gutter on south side of street.

On Magnolia Street, looking southeast. Ponding at low spots.

LOCATION:
Magnolia Street between Stanford Avenue and Oakdell Drive.

PROBLEM: From City Maintenance officials, Magnolia Street storm improvements are in complete and flooding results.

RECOMMENDATIONS FOR FURTHER INVESTIGATION: Refer to storm drain improvement as-built plans along Magnolia Street. From hydraulic calculations, determine pipe capacity and suitable pipe replacement size, if necessary.

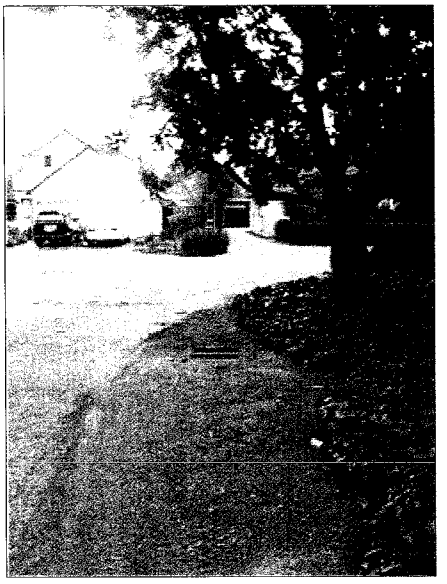
POSSIBLE SOLUTIONS: Relocate inlets at low spots in valley gutter. Construct valley gutter on south side of street to existing inlet to relieve ponding. Construct System G proposed facilities.

FIGURE G2
MENLO PARK

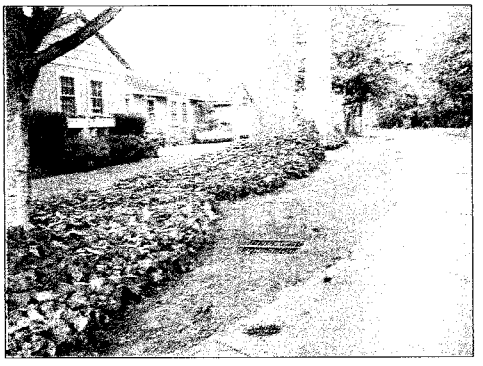
BKF

INTERSECTION OF HERMOSA WAY AND HERMOS PLACE

On Hermosa Place, looking southwest. Can see inlet for bubble-up. No roadway curb or gutter on Hermosa Place.



On Hermosa Way, looking northeast. Can see bubble-up inlet. No roadway curb or gutter on Hermosa Way.



LOCATION:
Intersection of Hermosa Way and Hermosa Place.

PROBLEM: From City Maintenance officials, bubble-up system at the intersection of Hermosa Way and Hermosa Place is inadequate.

POSSIBLE SOLUTIONS: Connect bubble-up system to existing storm drain system 300 feet to the northwest on Middle Avenue with 15-inch diameter pipe to connect from bubble-up to existing inlet. Construct System I proposed facilities.

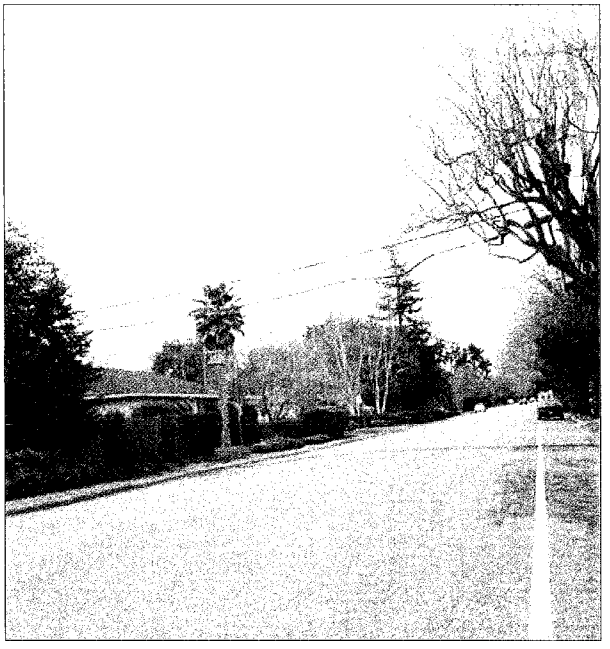
FIGURE I1
MENLO PARK

BKF

1200 Middle Avenue To 1220 Middle Avenue

On Middle Avenue, looking south. Roadway is weathered.

On Middle Avenue, looking south. Roadway looks weathered down.



LOCATION:
Middle Avenue between intersections with Santa Rita Avenue and San Mateo Drive (House1200 to 1220).

PROBLEM: From City Maintenance officials, there is insufficient capacity in existing 15-inch diameter storm drain lines along Middle Avenue during heavy rainfall.

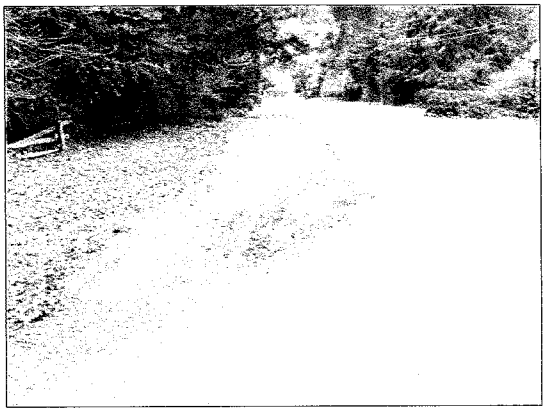
POSSIBLE SOLUTIONS: **Construct** Regional Solution 1 facilities.

FIGURE I2
MENLO PARK

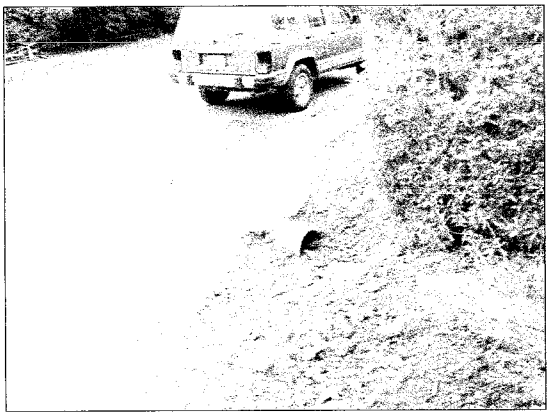
BKF

Intersection of San Mateo Drive with Laurel Drive

Southeast corner of San Mateo Drive and Laurel Drive intersection, looking southwest. Ponding at inlet location. Could not find inlet in field.



Southwest corner of San Mateo Drive and Laurel Drive intersection. Looking south. Can see corrugated pipe has rotted out.



Intersection of San Mateo Drive and Laurel Drive, looking west.

LOCATION:
Intersection of San Mateo Drive and Laurel Drive.

PROBLEM: From City Maintenance officials, 12-inch diameter corrugated pipe has rusted out on the southeast corner of San Mateo Drive and Laurel Drive.

RECOMMENDATIONS FOR FURTHER INVESTIGATION: TV inspection to check pipe joints, pipe material, inlet location. From hydraulic calculations, determine pipe capacity and suitable pipe replacement size, if necessary.

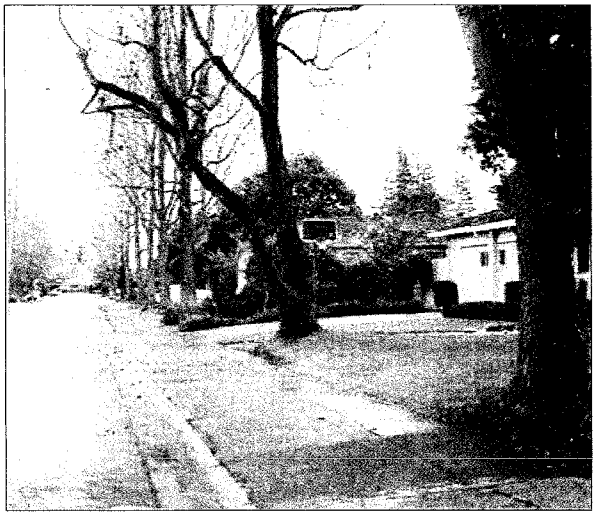
POSSIBLE SOLUTIONS: Replace existing 12-inch diameter pipe at intersection of San Mateo Drive and Laurel Drive. Provide adequate cover over 12-inch diameter pipe with soil where needed.

FIGURE 13
MENLO PARK

BKF

17 Politzer Drive to 73 Politzer Drive

In front of 21 Politzer Drive, looking west. Valley gutter along edge of roadway.



LOCATION:
Politzer Drive.

PROBLEM: From City Maintenance officials, ponding occurs in multiple areas along Politzer Drive.

POSSIBLE SOLUTIONS: Build inlet at low spot in valley gutter and connect to existing 15-inch diameter storm drain to the west. Use a 15-inch diameter pipe for connection from proposed inlet to existing system.

FIGURE I4
MENLO PARK

BKF

204 University Drive to 459 University Drive

Corner of University Drive and College Avenue, looking west. Bubble-up system inlet.

Intersection of University Drive and College Avenue, looking southwest.

Corner of University Drive and College Avenue, looking west. Bubble-up system inlet.

LOCATION:
University Drive between intersections with Cambridge Avenue and Middle Avenue (House 204 to 459).

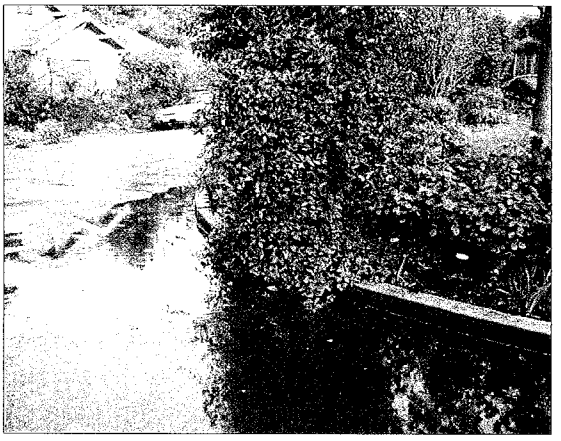
PROBLEM: From City Maintenance officials, 12-inch diameter bubble-up systems along University Drive are inadequate. Ponding occurs frequently at these locations..

POSSIBLE SOLUTIONS: Construct Regional Solution 1 facilities.

FIGURE JK1
MENLO PARK

BKF

INTERESECTION OF HARVARD AND CORNELL



Southwest corner of Harvard Avenue and Cornell Drive, looking east. Ponding at corner of intersection.

Southwest corner of Harvard Avenue and Cornell Drive, looking west. Ponding at corner of intersection.

LOCATION:
Southwest corner of Harvard Avenue and Cornell Drive intersection.

PROBLEM: From City Maintenance officials, drainage problems result in flooding at the southwest corner of the intersection of Harvard Avenue and Cornell Drive.

POSSIBLE SOLUTIONS: Build inlet at corner location of Harvard Avenue and Cornell Drive and connect to an existing 30-inch diameter storm drain line on El Camino Real to the north via a proposed 15-inch diameter pipe.

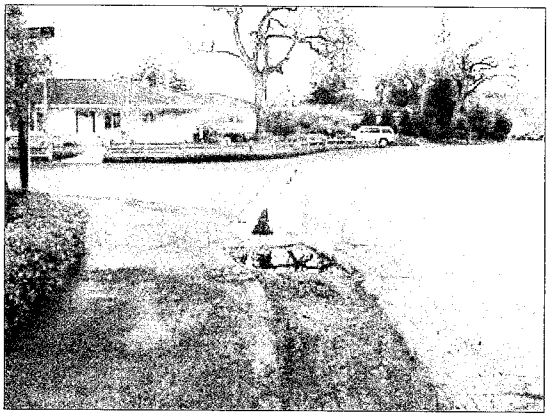
Repave pavement to direct runoff from southwest corner of Harvard Avenue and Cornell Drive to an existing 36-inch diameter storm drain lane on El Camino Real to the north.

FIGURE JK2
MENLO PARK

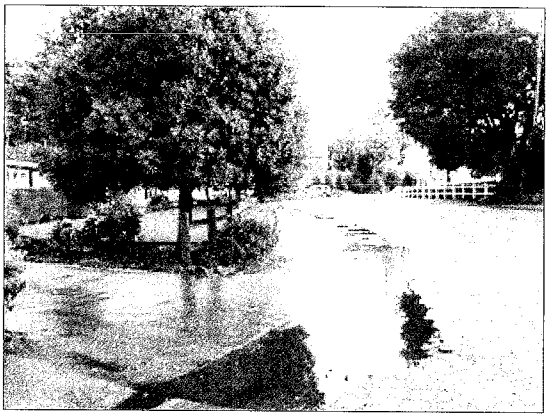
BKF

650 MENLO AVENUE TO 830 MENLO AVENUE

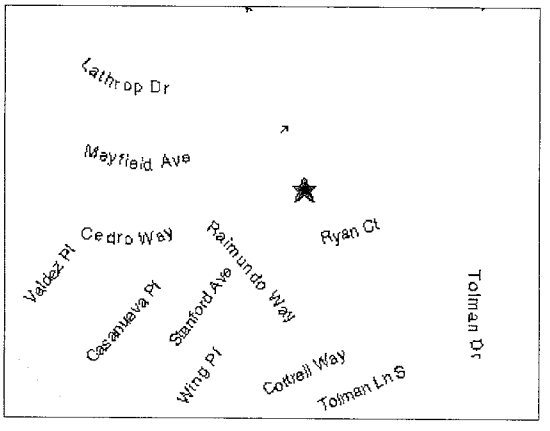
In front of 720 Menlo Avenue, looking north on Menlo Avenue. Can see roadway curb and gutter deformations.



In front to 750 Menlo Avenue, looking north on Menlo Avenue. Can see roadway curb and gutter deformations.



In front of 830 Menlo Avenue, looking north on Menlo Avenue. Can see ponding in roadway gutter.



LOCATION:
Menlo Avenue between intersections with Evelyn Street and Curtis Street (Building 650 to 830).

PROBLEM: From City Maintenance officials, roadway gutter flow line interruptions caused by roadway deformations. Ponding along roadway gutter generate odor and slip hazards.

RECOMMENDATIONS FOR FURTHER INVESTIGATION: Obtain survey information to determine low and high roadway elevations along Menlo Avenue. From gutter calculations, determine roadway gutter flow depth and spread.

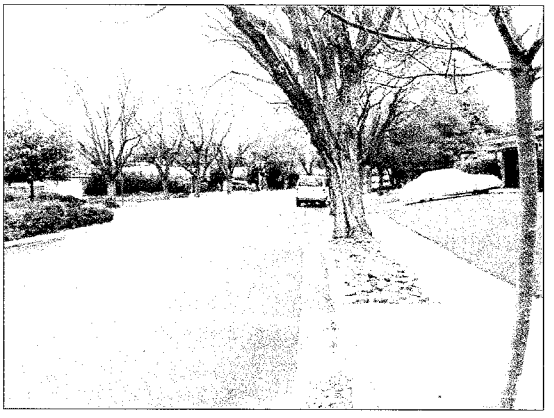
POSSIBLE SOLUTIONS: Repair roadway curb and gutter where necessary for a smooth flow line.

FIGURE JK3
MENLO PARK

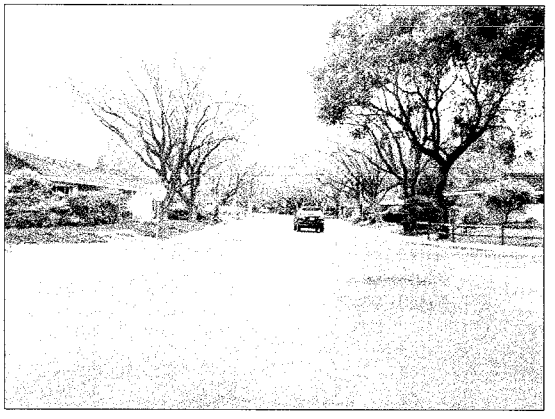
BKF

29 Willow Road to 49 Willow Road

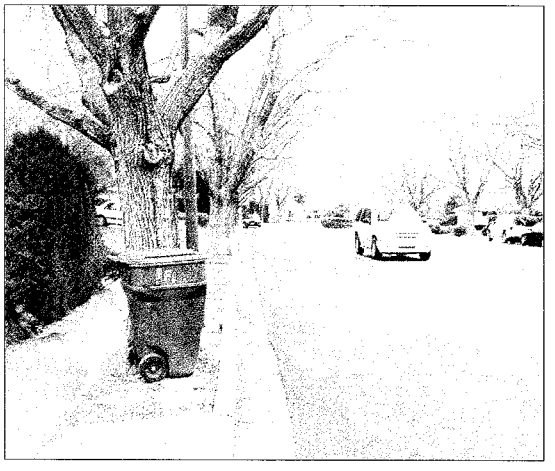
In front of 27 Willow Road, looking north on Willow Road. Can see tree roots deforming roadway curb and gutter.



At the intersection of Willow Road and Laurel Street, looking west on Laurel Street. Many trees along roadway.



In front of 27 Willow Road, looking south on Willow Road. Can see tree roots deforming curb and gutter.



LOCATION:
Willow Road between intersections with Claremont Way (house 29 to 49).

PROBLEM: From City Maintenance officials, 18-inch diameter storm drain along Willow Road is obstructed by tree roots that cause blockage and resulting flooding. Tree roots are also deform-

RECOMMENDATIONS FOR FURTHER INVESTIGATION: TV inspection to check pipe joints and pipe material. From hydraulic calculations, determine pipe capacity and suitable pipe replacement size, if necessary. Obtain arborist recommendation if tree roots larger than 2-inch diameter are found.

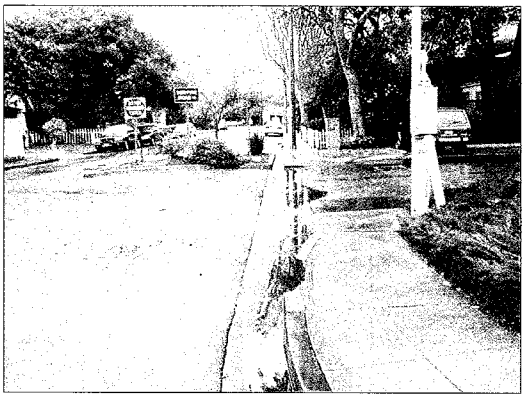
POSSIBLE SOLUTIONS: Construct proposed System N facilities. At additional inlets at local low points.

FIGURE N1
MENLO PARK

BKF

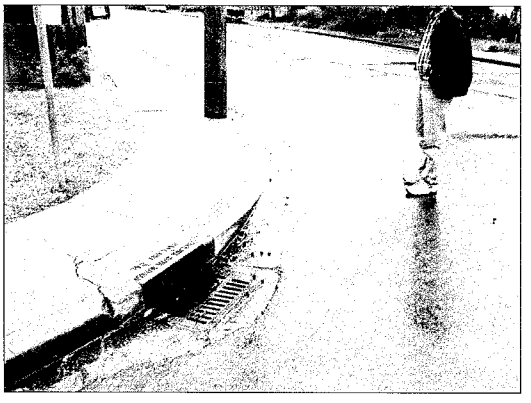
CLOVER LANE

Intersection of Willow Road and Clover Lane, looking east. Can see flooding along roadway gutter.



In front of 105 Clover Lane, looking east. Can see flooding in roadway gutter.

Intersection of Baywood Avenue and Clover Lane, looking northwest. Can see storm drain inlet at intersection.



LOCATION:
Clover Lane, between Baywood Avenue and Willow Road.

PROBLEM: From City Maintenance officials, flooding occurs along roadway gutter on Clover Lane caused by low spots.

RECOMMENDATIONS FOR FURTHER INVESTIGATION: From hydraulic calculations, determine pipe capacity. From gutter flow calculations, determine roadway gutter flow depth and spread. Obtain survey information to determine low spots along Clover Lane.

POSSIBLE SOLUTIONS: Build inlets at determined low spots along Clover Lane and use 15-inch diameter pipes to connect to existing storm drain system to the south on Baywood Avenue.

Regrade gutter to direct runoff to existing inlet located at the intersection of Clover Lane and Baywood avenue.

FIGURE N2
MENLO PARK

BKF

INTERSECTION OF MIDDLEFIELD ROAD AND RINGWOOD AVENUE

At the intersection of Meddlefield Road and Ringwood Avenue, looking north. Can see flooding present in low spot of pavement.

LOCATION:
Intersection of Middlefield Road and Ringwood Avenue.

PROBLEM: From City Maintenance officials, flooding occurs at the intersection of Middlefield Road and Ringwood Avenue. Pavement is too low to prevent flooding and lowering pipes are not feasible.

RECOMMENDATIONS FOR FURTHER INVESTIGATION: Obtain survey information for low and high spots at the intersection of Middlefield Road and Ringwood Avenue.

POSSIBLE SOLUTIONS: Construct the proposed System N Middlefield Road parallel storm drain facilities.

FIGURE N3
MENLO PARK

BKF

INTERSECTION OF MIDDLEFIELD ROAD AND LINFIELD DRIVE

LOCATION:
Intersection of Middlefield Road and Linfield Road.

PROBLEM: From City Maintenance officials, restrictive design hampers flow.

RECOMMENDATIONS FOR FURTHER INVESTIGATION: From hydraulic calculations, determine pipe capacity and suitable pipe replacement size, if necessary. Investigate possible design alternatives.

POSSIBLE SOLUTIONS: Construct the proposed System N Middlefield Road parallel storm drain facility. Drain the low point of the existing storm drain line to the proposed parallel storm drain.

FIGURE N4
MENLO PARK

BKF

SPRUCE AVENUE

LOCATION:
Spruce Avenue, between El Camino Real and the railroad.

PROBLEM: Significant runoff ponds in the area.

RECOMMENDATIONS FOR FURTHER INVESTIGATION: Determine size and location of line to Atherton Channel.

POSSIBLE SOLUTIONS: Construct System S storm drainage facilities.

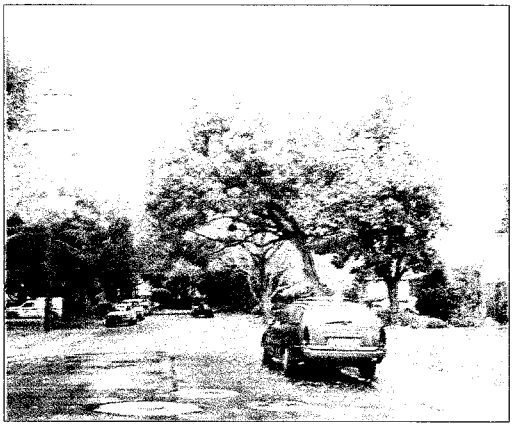
FIGURE S1
MENLO PARK

BKF

INTERSECTION OF MARMONA DRIVE AND ROBIN WAY

Intersection of Marmona Drive and Robin Way, looking southwest. Runoff can be seen in valley gutter.

Intersection of Marmona Drive and Robin Way, looking south.



LOCATION:
Residential area bounded by Willow road, Gilbert Avenue, Concord Drive, and San Francisquito Creek.

PROBLEM: From City Maintenance officials, residential area has a long stretch to a catch basin. Ponding occurs in multiple areas.

RECOMMENDATIONS FOR FURTHER INVESTIGATION: From gutter calculations, determine gutter flow depth and spread. Obtain survey information on low and high spots within the residential bounded area.

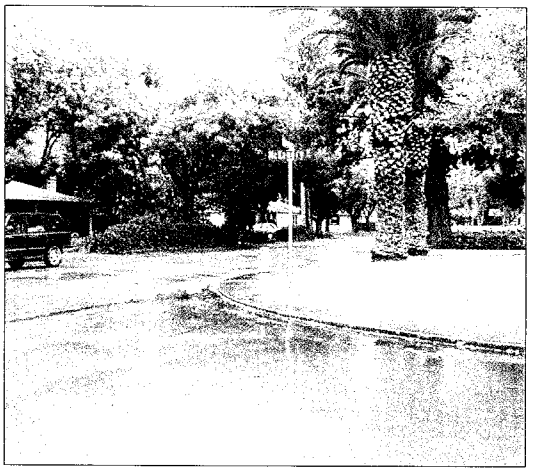
POSSIBLE SOLUTIONS: Construct proposed System V facilities.

FIGURE V1
MENLO PARK

BKF

Intersection of Gilbert Avenue and Marmona Drive

Intersection of Gilbert Avenue and Marmona Drive, looking south-east. Can see runoff in roadway valley gutter.



LOCATION:
Intersection of Gilbert Avenue and Marmona Drive.

PROBLEM: From City Maintenance officials, recent roadway paving resulted in flooding.

RECOMMENDATIONS FOR FURTHER INVESTIGATION: Obtain survey information to determine low and high spots on the roadway.

POSSIBLE SOLUTIONS: Construct 15-inch storm drain to convey runoff to storm drain system 200 feet to the north on Gilbert Avenue

FIGURE V2
MENLO PARK

BKF

1900 EUCLID AVENUE TO 1998 EUCLID AVENUE

LOCATION:
Euclid Avenue between the intersections with Woodland Avenue and O'Conner Street (house 1900 to 1998).

PROBLEM: From City Maintenance officials, Euclid Avenue is subject to creek flooding.

POSSIBLE SOLUTIONS: Current calculations for creek show that there is adequate channel flow capacity for unobstructed flow conditions. In February 1998, a fallen tree obstructed flows at the Newell bridge, creating upstream increases in water levels that resulted in spill at this location. If acceptable to the JPA, the embankment should be raised in this are to increase the available freeboard.

FIGURE V3
MENLO PARK

BKF

1995 MENALTO AVENUE

Intersection of Menalto Avenue and West O'Connor Street, looking south on Menalto. Can see bubble-up system inlet.

LOCATION:
Intersection of Menalto Avenue and West O'Connor Street, in front of 1995 Menalto Avenue.

PROBLEM: From City Maintenance officials, bubble-up system is inadequate. As a result, flooding occurs.

RECOMMENDATIONS FOR FURTHER INVESTIGATION: Obtain survey information to determine low and high spots on the roadway.

POSSIBLE SOLUTIONS: Connect bubble-up system to existing storm drain system 650 feet to the west on Laurel Street with 15-inch diameter pipe.

FIGURE V4
MENLO PARK

BKF

APPENDIX C

Cost and Priority of Improvements

The following Appendix contains a priority and costs for the proposed improvements. General locations of laterals and trunk lines are shown on Figures contained in Appendix D. Priority of improvements are shown on Figure 5 in Appendix A. Information supporting unit costs are presented in Appendix F.

Table C1 summarizes the cost of improvements by System. Table C2 presents costs for the high priority (Priority 1, 2, and 3) projects. Table C3 summarizes the total project cost by priority for the Systems.
Detail breakdowns for each system are provided with a priority, a length and a location. Construction costs are presented in Table x.5.

The basis for the construction cost is presented in Table C4. The cost includes, (1) mobilization, (2) Contractor's overhead and profit, (3) adjustments to the year 2003, and (4) adjustments for work in San Mateo County. The costs do not include work associated with obtaining approval to work in San Francisquito Creek or Atherton Channel. Project involving work in these facilities will be required to obtain approvals from California Department of Fish and Game and California Regional Water Quality Control Board. Approval would likely be required from the United States Corps of Engineers. In addition, improvements to the flow capacity of these waterways may be required as a condition for modifying system outlet works.

DESCRIPTION OF PIPELINE UNIT COSTS

The following Appendix presents miscellaneous analyses used in developing the Drainage Study.

1. Unit Costs – Unit costs for pipeline installation are presented in Table C4. Costs are developed based on unit cost information presented in Construction Cost manuals. Costs are increased to account for, (1) mobilization, (2) overhead & profit, (3) typical shoring, and (4) typical dewatering. The costs are adjusted to account for construction in the Bay Area. Two costs are presented. The first cost is for construction on a bare site. This is presented to allow comparison with costs from development projects.

   Factors are then presented that account for the cost for construction in a developed urban area. These costs include repaving, disposal of excess dirt, traffic control and utility relocation. These costs will vary with location, and a single factor is used citywide. During final design, these factors should be adjusted. Costs are based on an ENR Construction Cost index of 6,581 in January of 2003.

   The recommended improvements are generally shallow because of the topography and outfall restrictions. No adjustments are applied for depth of pipeline. In general, the cost will be higher where the cover exceeds 5 feet and will be slightly less where the cover is 3 feet.

   In some areas, it may be necessary to have less than three feet of cover. In these areas, there may be additional cost required to protect the pipe.

   Construction costs are based on the use of reinforced concrete pipe. Savings of about 20 percent may occur if High Density Poly-Ethylene (HDPD) pipe is used. This should be considered on a project by project basis.

   An additional factor of 60 percent is then included to account for the following:

1. Contingency – 20%
2. Design, survey, geotechnical evaluation and construction monitoring – 30%
3. City Administration – 10%

Costs do not include permitting, mitigation or off-site improvements to Atherton Channel or San Francisquito Creek.

TABLE C.1
MENLO PARK STORM DRAIN MASTER PLAN
Cost for Correcting System Deficiencies

Drainage Area (see Figure 1 for Boundaries)	Length of Pipe Constructed (feet)	Construction Cost Pipe ($)	Outfall Diameter (inches)	Outfall Cost ($)	Construction Cost ($)	Administrati & Design 1 ($)
System E	390	$ 57,000	30	$ 25,000	$ 82,000	$ 49,000
System F	430	$ 65,000	30	$ 25,000	$ 90,000	$ 54,000
System G	6,030	$1,652,000	48	$ 40,000	$1,692,000	$1,016,000
System I	14,260	$5,548,000	84	$ 75,000	$5,623,000	$3,374,000
System J&K	8,850	$5,777,000	10'x4'	$ 150,000	$5,927,000	$3,556,000
System L	3,780	$ 837,000	48	$ 40,000	$ 877,000	$ 526,000
System N	15,530	$4,751,000	-	-	$4,751,000	$2,851,000
System P	580	$ 83,000	-	-	$ 83,000	$ 50,000
System Q	2,480	$ 652,000	-	-	$ 652,000	$ 392,000
System S	8,570	$2,509,000	60	$ 80,000	$2,589,000	$1,553,000
System T	6,875	$ 875,000	-	-	$ 875,000	$ 525,000
System V	3,090	$ 352,000	-	-	$ 352,000	$ 211,000
System BH	4,850	$ 590,470	-	-	$ 590,470	$ 355,000
Total	**75,715**	**$23,748,470**		**$ 435,000**	**$24,183,470**	**$14,512,00**
Regional System A	31,750	$10,866,000	10'x4' & 72	$ 220,000	$11,086,000	$6,652,000
Sum of G, I, J & K	29,140	$12,977,000	10'x4' 48 & 72	$ 265,000	$13,242,000	$6,310,000

1/ Administration and Design is 60% of construction and includes Design, survey, geotechnical, construction administration and City administration.
Costs are based on an ENR Construction Cost Index of 6,581 in January 2003.

TABLE C.2
MENLO PARK STORM DRAIN MASTER PLAN
Priority Improvements

Drainage Area (see Figure 1 for Boundaries)	Priority (see Figure 5 for Priorities)	Improvement Description	Justification for Priority
System G	3	Olive Street Outfall	Overtopping is to Middle Road
System I	1	Arbor Road	Flooding Occurs on Middle Road & San Mateo A
System I	3	Santa Cruz Ave and Middle Road	Flow Overtops to El Camino Real
System J&K	2	El Camino Real	Flooding would Disrupt El Camino Real Traffic
System N	2	Middlefield Road	Flooding would Disrupt Middlefield Road Traffi
System S	1	Outfall at Spruce	Flooding occurs at Spruce
System V	2	Euclid Storm Drain	Flooding on Euclid would Disrupt Traffic
Total			

TABLE C.3
MENLO PARK STORM DRAIN MASTER PLAN
Cost for Correcting System Deficiencies

PRIORITY A - MINIMAL IMPACT ON SAN FRANCISQUITO CREEK / ATHERTON CHANNEL FLOWS

	Priority 1	Priority 2	Priority 3	Priority 4	Priority 5	
	Total ($)	Total ($)	Total ($)	Total ($)	Total ($)	Total ($)
System E	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
System F	$ 0	$ 0	$ 0	$ 0	$ 26,000	$ 26,000
System G	$ 123,000	$ 0	$ 0	$ 0	$ 536,000	$ 659,000
System I	$ 0	$ 0	$ 373,000	$ 0	$1,524,000	$1,897,000
System J&K	$ 0	$ 0	$ 0	$ 0	$1,976,000	$1,976,000
System L	$ 0	$ 0	$ 0	$ 0	$ 208,000	$ 208,000
System N	$ 0	$4,633,000	$ 0	$1,699,000	$1,270,000	$7,602,000
System P	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
System Q	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
System S	$ 79,000	$ 0	$ 0	$ 0	$ 0	$ 79,000
System T	$ 0	$ 0	$ 0	$ 0	$1,400,000	$1,400,000
System V	$ 0	$ 288,000	$ 0	$ 0	$ 275,000	$ 563,000
System BH	$ 0	$ 0	$ 0	$ 945,000	$ 0	$ 945,000
Total Cost	**$ 202,000**	**$4,921,000**	**$ 373,000**	**$2,644,000**	**$7,215,000**	**$15,355,000**

PRIORITY B - IMPACT ON SAN FRANCISQUITO CREEK / ATHERTON CHANNEL FLOWS

	Priority 1	Priority 2	Priority 3	Priority 4	Priority 5	
	Total ($)	Total ($)	Total ($)	Total ($)	Total ($)	Total ($)
System E	$ 0	$ 0	$ 0	$ 0	$ 130,000	$ 130,000
System F	$ 0	$ 0	$ 0	$ 0	$ 118,000	$ 118,000
System G	$ 0	$ 0	$ 899,000	$ 816,000	$ 334,000	$2,049,000
System I	$2,310,000	$ 0	$4,085,000	$ 341,000	$ 365,000	$7,101,000
System J&K	$ 0	$5,835,000	$ 0	$ 433,000	$1,239,000	$7,507,000
System L	$ 0	$ 0	$ 0	$ 0	$1,195,000	$1,195,000
System N	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
System P	$ 0	$ 0	$ 0	$ 0	$ 133,000	$ 133,000
System Q	$ 0	$ 0	$ 0	$ 399,000	$ 645,000	$1,044,000
System S	$ 1,000	$ 0	$ 0	$ 18,000	$4,045,000	$4,064,000
System T	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
System V	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
System BH	$ 0	$ 0	$ 0	- $ 597,000	$ 597,000	$ 0
Total Cost	**$2,311,000**	**$5,835,000**	**$4,984,000**	**$1,410,000**	**$8,801,000**	**$23,341,000**

TABLE C4
MENLO PARK STORM DRAIN MASTER PLAN
Pipe Costs

Pipe Diameter (inches)	Trench Depth (feet)	Trench Width (feet)	Pipe RCP ($/ft)	Install ($/ft)	Undeveloped Site Subtotal ($/ft)	Disposal ($/ft)	Repaving ($/ft)	Traffic Control ($/ft)	Util Reloc ($/
15	5	3	$16.98	$51.64	$69.00	$6.11	$6.00	$8.96	$10.
18	6	3	$17.12	$59.16	$76.00	$7.33	$6.00	$10.67	$14.
24	6	4	$24.98	$69.59	$95.00	$9.78	$8.00	$13.18	$18.
30	7	4	$34.39	$90.97	$125.00	$11.41	$8.00	$16.00	$22.
36	7	6	$49.12	$123.66	$173.00	$17.11	$12.00	$18.67	$26.
42	8	7	$66.67	$151.45	$218.00	$22.81	$14.00	$20.36	$30.
48	8	7	$83.51	$165.33	$249.00	$22.81	$14.00	$22.40	$34.
54	9	8	$105.26	$195.46	$301.00	$29.33	$16.00	$24.89	$38.
60	9	8	$133.33	$208.62	$342.00	$29.33	$16.00	$28.00	$42.
66	10	10	$168.42	$247.49	$416.00	$40.74	$20.00	$32.00	$46.
72	10	10	$189.47	$254.61	$444.00	$40.74	$20.00	$37.33	$50.
84	11	12	$343.85	$301.71	$646.00	$53.78	$24.00	$56.00	$50.

Install and pipe costs are developed comparing values from various cost guides and BKF experience..
Costs are based on an ENR Construction Cost Index of 6,581 in January 2003.
Costs are for RCP. Cost for HDPE can be 20 to 30% lower.
Additional information used for developing unit costs is presented in Appendix E.
Costs do not include permitting, mitigation or off-site improvements to Creek or channels.

Table C.E1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA E
System E Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
EPT-04	ET-04	ET-03	12 inch	18 inch	48	114	$ 5,472	5
EPT-03	ET-03	ET-02	12 inch	18 inch	52	114	$ 5,928	5
EPT-02	ET-02	ET-01	12 inch	21 inch	130	125	$ 16,250	5
EPT-01	ET-01	E-Outfall	12 inch	30 inch	156	183	$ 28,548	5
Pipe Total					386		$ 56,198	
Outfall					30 inch		$ 25,000	
Construction Total							$ 81,198	

Table C.E2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA E
Construction Cost - By Priority

Priority	Replacement Line (feet)	Replacement Line ($)	Additional Line (feet)	Additional Line ($)	Outfall ($)	Total Cost ($)
1	0	$ -				$ -
2	0	$ -				$ -
3	0	$ -				$ -
4	0	$ -				$ -
5	386	$ 56,200			$ 25,000	$ 81,200
Pipe Total	386	$ 56,200	0	$ -	$ 25,000	$ 81,200

Table C.F1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA F
System F Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
FPL-0201	FL-0201	FT-02	12 inch	15 inch	161	101	$ 16,261	5
FPT-02	FT-02	FT-01	18 inch	30 inch	41	183	$ 7,503	5
FPT-01	FT-01	F-Outfall	18 inch	30 inch	224	183	$ 40,992	5
Pipe Total					426		$ 64,756	
Outfall					30 inch		$ 25,000	
Construction Total							$ 89,756	

Table C.F2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA F
Construction Cost - By Priority

Priority	Replacement Line (feet)	Replacement Line ($)	Additional Line (feet)	Additional Line ($)	Outfall ($)	Total Cost ($)
1	0	$ -				$ -
2	0	$ -				$ -
3	0	$ -				$ -
4	0	$ -				$ -
5	0	$ 64,760			$ 25,000	$ 89,760
Pipe Total	0	$ 64,760	0	$ -	$ 25,000	$ 89,760

Table C.G1.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA G
System G Construction Cost and Priotity

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)		Total Cost ($)	Priority
GPL-1010	GL-1010	GL-1009	10 inch	18 inch	98	114	$	11,172	5
GPL-1009	GL-1009	GL-1008	10 inch	18 inch	211	114	$	24,054	5
GPL-1008	GL-1008	GL-1007	15 inch	24 inch	180	144	$	25,920	5
GPl-1007	GL-1007	GL-1006	15 inch	24 inch	60	144	$	8,640	5
GPL-1006	GL-1006	GL-1005	18 inch	24 inch	220	144	$	31,680	5
GPL-1005	GL-1005	GL-1004	18 inch	24 inch	86	144	$	12,384	5
GPL-1004	GL-1004	GL-1003	12 inch	24 inch	199	144	$	28,656	1
GPL-1003	GL-1003	GL-1002	12 inch	24 inch	78	144	$	11,232	1
GPL-1002	GL-1002	GL-1001	12 inch	24 inch	201	144	$	28,944	1
GPL-1001	GL-1001	GT-10	12 inch	24 inch	55	144	$	7,920	1
GPL-0802	GL-0802	GL-0801	10 inch	24 inch	28	144	$	4,032	5
GPL-0801	GL-0801	GT-08	10 inch	36 inch	368	247	$	90,896	5
GPT-27	GT-27	GT-26	15 inch	15 inch	470	101	$	-	5
GPT-26	GT-26	GT-25	12 inch	12 inch	343	0	$	-	5
GPT-25	GT-25	GT-24	12 inch	12 inch	46	0	$	-	5
GPT-24	GT-24	GT-23	18 inch	24 inch	232	144	$	33,408	4
GPT-23	GT-23	GT-22	18 inch	24 inch	70	144	$	10,080	4
GPT-22	GT-22	GT-21	18 inch	24 inch	220	144	$	31,680	4
GPT-21	GT-21	GT-20	18 inch	24 inch	67	144	$	9,648	4
GPT-20	GT-20	GT-19	18 inch	24 inch	195	144	$	28,080	4
GPT-19	GT-19	GT-18	18 inch	30 inch	65	183	$	11,895	4
GPT-18	GT-18	GT-17	18 inch	30 inch	53	183	$	9,699	4
GPT-17	GT-17	GT-16	18 inch	30 inch	215	183	$	39,345	4
GPT-16	GT-16	GT-15	18 inch	30 inch	59	183	$	10,797	4
GPT-15	GT-15	GT-14	18 inch	30 inch	246	183	$	45,018	4
GPT-14	GT-14	GT-13	18 inch	30 inch	60	183	$	10,980	4
GPT-13	GT-13	GT-12	18 inch	30 inch	393	183	$	71,919	4
GPT-12	GT-12	GT-11	18 inch	30 inch	70	183	$	12,810	4
GPT-11	GT-11	GT-10	18 inch	30 inch	118	183	$	21,594	4
GPT-10	GT-10	GT-09	18 inch	36 inch	335	247	$	82,745	4

Table C.G1.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA G
System G Construction Cost and Priotity

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
GPT-09	GT-09	GT-08	21 inch	36 inch	325	247	$ 80,275	4
GPT-08	GT-08	GT-07	21 inch	48 inch	317	343	$ 108,731	3
GPT-07	GT-07	GT-06	24 inch	48 inch	164	343	$ 56,252	3
GPT-06	GT-06	GT-05	24 inch	48 inch	48	343	$ 16,464	3
GPT-05	GT-05	GT-04	24 inch	48 inch	288	343	$ 98,784	3
GPT-04	GT-04	GT-03	24 inch	48 inch	443	343	$ 151,949	3
GPT-03	GT-03	GT-02	27 inch	48 inch	53	343	$ 18,179	3
GPT-02	GT-02	GT-01	27 inch	48 inch	97	343	$ 33,271	3
GPT-01	GT-01	G-Outfall	30 inch	48 inch	110	343	$ 37,730	3
New Laterals					6886			
White Oak				15 inch	1200	101	$ 121,200	5
Oak Dell				15 inch	1165	101	$ 117,665	5
Doris				15 inch	950	101	$ 95,950	5
					3315			
Pipe Total					10201		$ 1,651,678	
Outfall					48 inch		$ 40,000	
Construction Total							$ 1,691,678	

Table C.G1.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA G
System G Construction Cost and Priotity

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
GPT-09	GT-09	GT-08	21 inch	36 inch	325	247	$ 80,275	4
GPT-08	GT-08	GT-07	21 inch	48 inch	317	343	$ 108,731	3
GPT-07	GT-07	GT-06	24 inch	48 inch	164	343	$ 56,252	3
GPT-06	GT-06	GT-05	24 inch	48 inch	48	343	$ 16,464	3
GPT-05	GT-05	GT-04	24 inch	48 inch	288	343	$ 98,784	3
GPT-04	GT-04	GT-03	24 inch	48 inch	443	343	$ 151,949	3
GPT-03	GT-03	GT-02	27 inch	48 inch	53	343	$ 18,179	3
GPT-02	GT-02	GT-01	27 inch	48 inch	97	343	$ 33,271	3
GPT-01	GT-01	G-Outfall	30 inch	48 inch	110	343	$ 37,730	3
New Laterals					6886			
White Oak				15 inch	1200	101	$ 121,200	5
Oak Dell				15 inch	1165	101	$ 117,665	5
Doris				15 inch	950	101	$ 95,950	5
					3315			
Pipe Total					10201		$ 1,651,678	
Outfall					48 inch		$ 40,000	
Construction Total							$ 1,691,678	

Table C.G2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA G
Construction Cost - By Priority

Priority	Replacement Line (feet)	Replacement Line ($)	Additional Line (feet)	Additional Line ($)	Outfall ($)	Total Cost ($)
1	1126794	$ 76,760	0	0		$ 76,760
2	0	$ -	0	0		$ -
3	1520	$ 521,360	0	0	$ 40,000	$ 561,360
4	2723	$ 509,980	0	0		$ 509,980
5	2110	$ 208,780	3315	$ 334,815		$ 543,595
Pipe Total	1133147	$ 1,316,880	3315	$ 334,815	$ 40,000	$ 1,691,695

Table C.I1.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA I
System I Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
IPL-170707	IL-170707	IL-170706	12 inch	24 inch	167	144	$ 24,048	4
IPL-170706	IL-170706	IL-170705	12 inch	24 inch	178	144	$ 25,632	4
IPL-170705	IL-170705	IL-170704	12 inch	30 inch	43	183	$ 7,869	4
IPL-170704	IL-170704	IL-170703	12 inch	30 inch	44	183	$ 8,052	4
IPL-170703	IL-170703	IL-170702	15 inch	30 inch	220	183	$ 40,260	4
IPL-170702	IL-170702	IL-170701	15 inch	30 inch	29	183	$ 5,307	4
IPL-170701	IL-170701	IL-1707	15 inch	36 inch	216	247	$ 53,352	4
IPL-1707	IL-1707	IL-1706	12 inch	42 inch	241	306	$ 73,746	3
IPL-1706	IL-1706	IL-1705	12 inch	42 inch	520	306	$ 159,120	3
IPL-1705	IL-1705	IL-1704	12 inch	42 inch	65	306	$ 19,890	3
IPL-1704	IL-1704	IL-1703	18 inch	48 inch	284	343	$ 97,412	3
IPL-1703	IL-1703	IL-1702	18 inch	48 inch	387	343	$ 132,741	3
IPL-1702	IL-1702	IL-1701	18 inch	48 inch	946	343	$ 324,478	3
IPL-1701	IL-1701	IT-17	18 inch	48 inch	661	343	$ 226,723	3
IPL-1201	IL-1201	IT-12	12 inch	18 inch	268	114	$ 30,552	5
IPL2-120102	IL2-120102	IL2-120101	12 inch	12 inch	155		$ -	5
IPL2-120101	IL2-120101	IL-1201	12 inch	12 inch	93		$ -	5
IPL-0901	IL-0901	IT-09	12 inch	24 inch	310	144	$ 44,640	5
IPL-0801	IL-0801	IT-08	12 inch	18 inch	45	114	$ 5,130	5
IPL-0706	IL-0706	IL-0705	12 inch	24 inch	59	144	$ 8,496	4
IPL-0705	IL-0705	IL-0704	12 inch	30 inch	218	183	$ 39,894	4
IPL-0704	IL-0704	IL-0703	18 inch	54 inch	343	410	$ 140,630	1
IPL-0703	IL-0703	IL-0702	18 inch	54 inch	92	410	$ 37,720	1
IPL-070202	IL-070202	IL-070201	12 inch	18 inch	314	114	$ 35,796	5
IPL-070201	IL-070201	IL-0702	12 inch	18 inch	39	114	$ 4,446	5
IPL-0702	IL-0702	IL-0701	18 inch	60 inch	217	458	$ 99,386	1
IPL-0701	IL-0701	IT-07	18 inch	60 inch	51	458	$ 23,358	1
IPT-29	IT-29	IT-28	12 inch	15 inch	139	101	$ 14,039	5
IPT-28	IT-28	IT-27	12 inch	15 inch	164	101	$ 16,564	5
IPT-27	IT-27	IT-26	12 inch	15 inch	401	101	$ 40,501	5
IPT-26	IT-26	IT-25	12 inch	15 inch	250	101	$ 25,250	5
IPT-25	IT-25	IT-24	12 inch	18 inch	360	114	$ 41,040	5
IPT-24	IT-24	IT-23	12 inch	24 inch	119	144	$ 17,136	3
IPT-23	IT-23	IT-22	12 inch	24 inch	378	144	$ 54,432	3
IPT-22	IT-22	IT-21	15 inch	24 inch	300	144	$ 43,200	3
IPT-21	IT-21	IT-20	15 inch	24 inch	253	144	$ 36,432	3
IPT-20	IT-20	IT-19	15 inch	24 inch	184	144	$ 26,496	3
IPT-19	IT-19	IT-18	15 inch	24 inch	114	144	$ 16,416	3
IPT-18	IT-18	IT-17	15 inch	24 inch	145	144	$ 20,880	3
IPT-17	IT-17	IT-16	18 inch	42 inch	270	306	$ 82,620	3
IPT-16	IT-16	IT-15	18 inch	42 inch	396	306	$ 121,176	3
IPT-15	IT-15	IT-14	18 inch	42 inch	178	306	$ 54,468	3
IPT-14	IT-14	IT-13	18 inch	48 inch	570	343	$ 195,510	3
IPT-13	IT-13	IT-12	24 inch	48 inch	812	343	$ 278,516	3

Table C.I1.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA I
System I Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)		Total Cost ($)	Priority
IPT-12	IT-12	IT-11	24 inch	48 inch	368	343	$	126,224	3
IPT-11	IT-11	IT-10	24 inch	48 inch	51	343	$	17,493	3
IPT-10	IT-10	IT-09	24 inch	48 inch	206	343	$	70,658	3
IPT-09	IT-09	IT-08	24 inch	54 inch	70	410	$	28,700	3
IPT-08	IT-08	IT-07	24 inch	72 inch	455	593	$	269,815	3
IPT-07	IT-07	IT-06	30 inch	72 inch	98	593	$	58,114	3
IPT-06	IT-06	IT-05	30 inch	72 inch	412	593	$	244,316	1
IPT-05	IT-05	IT-04	30 inch	72 inch	536	593	$	317,848	1
IPT-04	IT-04	IT-03	30 inch	72 inch	79	593	$	46,847	1
IPT-03	IT-03	IT-02	30 inch	72 inch	678	593	$	402,054	1
IPT-02	IT-02	IT-01	30 inch	84 inch	41	830	$	34,030	1
IPT-01	IT-01	I-Outfall	30 inch	84 inch	27	830	$	22,410	1
Replacement Total							$	4,391,863	
Additional Line									
Hobart (northeast)				15 inch	950	101	$	95,950	5
Hobart (southwest)				15 inch	1430	101	$	144,430	5
Cotton (northeast)				15 inch	990	101	$	99,990	5
Cotton (southwest)				15 inch	1450	101	$	146,450	5
Hermosa (northeast)				15 inch	1450	101	$	146,450	5
Hermosa (southwest)				15 inch	375	101	$	37,875	5
Hermosa Pl				15 inch	305	101	$	30,805	5
Hillview				15 inch	990	101	$	99,990	5
Middle				24 inch	1620	144	$	233,280	3
San Mateo Drive				15 inch	450	101	$	45,450	5
Politzer				15 inch	740	101	$	74,740	5
Additional Lines, Total							$	1,155,410	
Pipe Total					14,259		$	5,547,273	
Outfall					84 inch		$	75,000	
Construction Total							$	5,622,273	

Table C.I2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA I
Construction Cost - By Priority

Priority	Replacement Line (feet)	Replacement Line ($)	Additional Line (feet)	Additional Line ($)	Outfall ($)	Total Cost ($)
1	2476	$ 1,368,599	0	$ -	$ 75,000	$ 1,443,599
2	0	$ -	0	$ -		$ -
3	8071	$ 2,552,396	1620	$ 233,280		$ 2,785,676
4	1174	$ 212,910	0	$ -		$ 212,910
5	2538	$ 257,958	9130	$ 922,130		$ 1,180,088
Pipe Total	14259	$ 4,391,863	10750	$ 1,155,410	$ 75,000	$ 5,622,273

Table C.JK1.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREAS J&K
Systems J&K Construction Cost, Line J connected to Line J

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
JPT-08	JT-08	JT-07		30 inch	115	183	$ 21,045	2
JPT-05	JT-05	JT-04		30 inch	123	183	$ 22,509	2
KPL-2405	KL-2405	KL-2404	12 inch	36 inch	111	247	$ 27,417	5
KPL-2404	KL-2404	KL-2403	12 inch	36 inch	104	247	$ 25,688	5
KPL-2403	KL-2403	KL-2402	12 inch	36 inch	140	247	$ 34,580	5
KPL-2402	KL-2402	KL-2401	12 inch	36 inch	139	247	$ 34,333	5
KPL-2401	KL-2401	KT-24	12 inch	36 inch	119	247	$ 29,393	5
KPL-190102	KL-190102	KL-190101	12 inch	18 inch	151	114	$ 17,214	5
KPL-190101	KL-190101	KL-1901	12 inch	18 inch	153	114	$ 17,442	5
KPL-1901	KL-1901	KT-19	15 inch	24 inch	214	144	$ 30,816	5
KPL-0905	KL-0905	KL-0904	15 inch	36 inch	746	247	$ 184,262	5
KPL-0904	KL-0904	KL-0903	15 inch	36 inch	417	247	$ 102,999	5
KPL-0903	KL-0903	KL-0902	15 inch	36 inch	35	247	$ 8,645	5
KPL-0902	KL-0902	KL-0901	15 inch	42 inch	536	306	$ 164,016	5
KPL-0901	KL-0901	KT-09	15 inch	42 inch	23	306	$ 7,038	5
KPT-26	KT-27	KT-26	15 inch	30 inch	94	183	$ 17,202	5
KPT-25	KT-26	KT-25	15 inch	30 inch	300	183	$ 54,900	5
KPT-24	KT-25	KT-24	15 inch	30 inch	100	183	$ 18,300	5
KPT-23	KT-24	KT-23	15 inch	36 inch	41	247	$ 10,127	4
KPT-22	KT-23	KT-22	15 inch	36 inch	159	247	$ 39,273	4
KPT-21	KT-22	KT-21	15 inch	36 inch	92	247	$ 22,724	4
KPT-20	KT-21	KT-20	15 inch	36 inch	41	247	$ 10,127	4
KPT-19	KT-20	KT-19	15 inch	36 inch	568	247	$ 140,296	4
KPT-18	KT-19	KT-18	15 inch	36 inch	181	247	$ 44,707	4
KPT-17	KT-18	KT-17	15 inch	42 inch	11	306	$ 3,366	4
KPT-16	KT-17	KT-16	15 inch	42 inch	49	306	$ 14,994	2
KPT-15	KT-16	KT-15	15 inch	42 inch	350	306	$ 107,100	2
KPT-14	KT-15	KT-13	15 inch	48 inch	68	343	$ 23,324	2
KPT-13	KT-13	KT-12	15 inch	48 inch	329	343	$ 112,847	2
KPT-12	KT-12	KT-11	15 inch	48 inch	90	343	$ 30,870	2
KPT-11	KT-11	KT-10	15 inch	48 inch	194	343	$ 66,542	2
KPT-10	KT-10	KT-09	15 inch	48 inch	51	343	$ 17,493	2
KPT-09	KT-09	KT-08	21 inch	8 x 4 ft	788	1000	$ 788,000	2
KPT-08	KT-08	KT-07	21 inch	8 x 4 ft	82	1000	$ 82,000	2
KPT-07	KT-07	KT-06	21 inch	8 x 4 ft	86	1000	$ 86,000	2
KPT-06	KT-06	KT-05	30 inch	8 x 4 ft	297	1000	$ 297,000	2

Table C.JK1.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREAS J&K
Systems J&K Construction Cost, Line J connected to Line J

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)		Total Cost ($)	Priority
KPT-05	KT-05	KT-04	30 inch	8 x 4 ft	417	1000	$	417,000	2
KPT-04	KT-04	KT-03	30 inch	8 x 4 ft	230	1000	$	230,000	2
KPT-03	KT-03	KT-02	30 inch	8 x 4 ft	197	1000	$	197,000	2
KPT-02	KT-02	KT-01	30 inch	8 x 4 ft	510	1000	$	510,000	2
KPT-01	KT-01	K-Outfall	30 inch	10 x 4 ft	394	1200	$	472,800	2
Replacement Pipe							$	4,541,389	
Additional Pipe									
Harvard				15 inch	1440	101	$	145,440	5
Cambridge				15 inch	1470	101	$	148,470	5
Partridge				15 inch	1510	101	$	152,510	5
College				15 inch	1570	101	$	158,570	5
Live Oak				15 inch	1540	101	$	155,540	5
Menlo				15 inch	1540	101	$	155,540	5
Oak Grove				18 inch	1390	114	$	158,460	5
Santa Cruz				15 inch	1190	101	$	120,190	5
Arbor				15 inch	400	101	$	40,400	5
							$	1,235,120	
Pipe Total					8,496		$	5,776,509	
Outfall					10 x 4 ft		$	150,000	
Construction Total							$	5,926,509	

Box culvert from KT-09 to Outlet should be constructed on Alto Lane.

Table C.JK2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA JK
Construction Cost - By Priority

Priority	Replacement Line (feet)	Replacement Line ($)	Additional Line (feet)	Additional Line ($)	Outfall ($)	Total Cost ($)
1	0	$ -	0	$ -		$ -
2	4370	$ 3,496,524	0	$ -	$ 150,000	$ 3,646,524
3	0	$ -	0	$ -		$ -
4	1093	$ 270,620	0	$ -		$ 270,620
5	3382	$ 774,245	12050	$ 1,235,120		$ 2,009,365
Pipe Total	8845	$ 4,541,389	12050	$ 1,235,120	$ 150,000	$ 5,926,509

Table C.L1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA L
System L Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
LPT-11	LT-11	LT-10	15 inch	18 inch	211	114	$ 24,054	5
LPT-10	LT-10	LT-09	15 inch	24 inch	281	144	$ 40,464	5
LPT-09	LT-09	LT-08	18 inch	24 inch	453	144	$ 65,232	5
LPT-08	LT-08	LT-07	24 inch	30 inch	205	183	$ 37,515	5
LPT-07	LT-07	LT-06	24 inch	30 inch	348	183	$ 63,684	5
LPT-06	LT-06	LT-05	24 inch	30 inch	311	183	$ 56,913	5
LPT-05	LT-05	LT-04	27 inch	30 inch	430	183	$ 78,690	5
LPT-04	LT-04	LT-03	27 inch	36 inch	449	247	$ 110,903	5
LPT-03	LT-03	LT-02	30 inch	36 inch	135	247	$ 33,345	5
LPT-02	LT-02	LT-01	30 inch	48 inch	641	343	$ 219,863	5
LPT-01	LT-01	L-Outfall	30 inch	48 inch	309	343	$ 105,987	5
Pipe Total					3773		$ 836,650	
Outfall					48 inch		$ 40,000	
Construction Total							$ 876,650	

Table C.L2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA L
Construction Cost - By Priority

Priority	Replacement Line (feet)	Replacement Line ($)	Additional Line (feet)	Additional Line ($)	Outfall ($)	Total Cost ($)
1	0	$ -				$ -
2	0	$ -				$ -
3	0	$ -				$ -
4	0	$ -				$ -
5	3773	$ 836,650			$ 40,000	$ 876,650
Pipe Total	3773	$ 836,650	0	$ -	$ 40,000	$ 876,650

Table C.N1.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA N
System N Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)		Total Cost ($)	Priority
NPL-0418	NL-0418	NL-0417	12 inch	24 inch	114	144	$	16,416	5
NPL-0417	NL-0417	NL-0416	12 inch	24 inch	103	144	$	14,832	5
NPL1-041606	NL1-041606	NL1-041605	12 inch	18 inch	43	114	$	4,902	5
NPL1-041605	NL1-041605	NL1-041604	12 inch	18 inch	109	114	$	12,426	5
NPL1-041604	NL1-041604	NL1-041603	12 inch	18 inch	67	114	$	7,638	5
NPL1-041603	NL1-041603	NL1-041602	12 inch	18 inch	47	114	$	5,358	5
NPL1-041602	NL1-041602	NL1-041601	12 inch	18 inch	83	114	$	9,462	5
NPL1-041601	NL1-041601	NL-0416	12 inch	18 inch	98	114	$	11,172	5
NPL-0416	NL-0416	NL-0415	12 inch	24 inch	99	144	$	14,256	5
NPL-0415	NL-0415	NL-0414	13 inch	24 inch	57	144	$	8,208	5
NPL-0414	NL-0414	NL-0413	12 inch	24 inch	11	144	$	1,584	5
NPL-0413	NL-0413	NL-0412	12 inch	24 inch	45	144	$	6,480	5
NPL-0412	NL-0412	NL-0411	12 inch	30 inch	110	183	$	20,130	5
NPL-0411	NL-0411	NL-0410	12 inch	30 inch	111	183	$	20,313	5
NPL-0410	NL-0410	NL-0409	12 inch	30 inch	268	183	$	49,044	5
NPL-0409	NL-0409	NL-0408	12 inch	30 inch	208	183	$	38,064	5
NPL-0408	NL-0408	NL-0407	12 inch	30 inch	250	183	$	45,750	5
NPL-040702	NL-040702	NL-040701	21 inch	30 inch	282	183	$	51,606	5
NPL-040701	NL-040701	NL-0407	21 inch	30 inch	43	183	$	7,869	5
NPL-0407	NL-0407	NL-0406	21 inch	42 inch	443	306	$	135,558	5
NPL-0406	NL-0406	NL-0405	24 inch	48 inch	193	343	$	66,199	5
NPL-0405	NL-0405	NL-0404	24 inch	48 inch	41	343	$	14,063	2
NPL-0404	NL-0404	NL-0403	24 inch	48 inch	321	343	$	110,103	2
NPL-040303	NL-040303	NL-040302	12 inch	18 inch	66	114	$	7,524	5
NPL-040302	NL-040302	NL-040301	12 inch	24 inch	700	144	$	100,800	5
NPL-040301	NL-040301	NL-0403	12 inch	24 inch	60	144	$	8,640	5
NPL-0403	NL-0403	NL-0402	27 inch	6 x 3 ft	38	800	$	30,400	2
NPL-0402	NL-0402	NL-0401	27 inch	7 x 4 ft	360	900	$	324,000	2
NPL-0401	NL-0401	NT-04	27 inch	7 x 4 ft	647	900	$	582,300	2

Table C.N1.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA N
System N Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
NPT-29	NT-29	NT-28	12 inch	15 inch	197	101	$ 19,897	5
NPT-28	NT-28	NT-27	12 inch	18 inch	233	114	$ 26,562	5
NPT-27	NT-27	NT-26	12 inch	15 inch	63	101	$ 6,363	5
NPT-26	NT-26	NT-25	12 inch	18 inch	119	114	$ 13,566	5
NPT-25	NT-25	NT-24	12 inch	21 inch	168	125	$ 21,000	5
NPT-24	NT-24	NT-23	15 inch	21 inch	335	125	$ 41,875	5
NPT-23	NT-23	NT-22	15 inch	27 inch	167	160	$ 26,720	4
NPT-22	NT-22	NT-21	15 inch	27 inch	163	160	$ 26,080	4
NPT-21	NT-21	NT-20	15 inch	27 inch	60	160	$ 9,600	4
NPT-20	NT-20	NT-19	15 inch	30 inch	281	183	$ 51,423	4
NPT-19	NT-19	NT-18	15 inch	30 inch	61	183	$ 11,163	4
NPT-18	NT-18	NT-17	15 inch	30 inch	340	183	$ 62,220	4
NPT-17	NT-17	NT-16	15 inch	36 inch	430	247	$ 106,210	4
NPT-16	NT-16	NT-15	18 inch	36 inch	382	247	$ 94,354	4
NPT-15	NT-15	NT-14	18 inch	42 inch	431	306	$ 131,886	4
NPT-14	NT-14	NT-13	18 inch	48 inch	46	343	$ 15,778	4
NPT-08	NT-08	NT-07	30 inch	36 inch	541	247	$ 133,627	4
NPT-07	NT-07	NT-06	30 inch	48 inch	355	343	$ 121,765	4
NPT-06	NT-06	NT-05	30 inch	48 inch	387	343	$ 132,741	4
NPT-05	NT-05	NT-04	30 inch	48 inch	327	343	$ 112,161	4
NPT-04	NT-04	NT-03	36 inch	48 inch	75	343	$ 25,725	4
NPar-13				48 inch	66	343	$ 22,638	2
NPar-12				48 inch	903	343	$ 309,729	2
NPar-11				48 inch	126	343	$ 43,218	2
NPar-10				48 inch	714	343	$ 244,902	2
NPar-09				48 inch	330	343	$ 113,190	2
NPar-08				48 inch	551	343	$ 188,993	2
NPar-07				48 inch	393	343	$ 134,799	2
NPar-06				48 inch	703	343	$ 241,129	2
NPar-05				48 inch	122	343	$ 41,846	2
NPar-04				48 inch	981	343	$ 336,483	2
NPar-03				48 inch	97	343	$ 33,271	2
NPar-02				48 inch	362	343	$ 124,166	2
Pipe Total					15,526		$ 4,750,177	
Construction Total							$ 4,750,177	

Table C.N2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA N
Construction Cost - By Priority

Priority	Replacement Line (feet)	Replacement Line ($)	Additional Line (feet)	Additional Line ($)	Outfall ($)	Total Cost ($)
1	0	$ -	0	$ -		$ -
2	1407	$ 1,060,866	5348	$ 1,834,364		$ 2,895,230
3	0	$ -	0	$ -		$ -
4	4046	$ 1,061,453	0	$ -		$ 1,061,453
5	4725	$ 793,494	0	$ -		$ 793,494
Pipe Total	10178	$ 2,915,813	5348	$ 1,834,364	$ -	$ 4,750,177

Table C.P1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA P
System P Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
PLP-0103	PL-0103	PL-0102	18 inch	24 inch	209	144	$ 30,096	5
PLP-0102	PL-0102	PL-0101	18 inch	24 inch	190	144	$ 27,360	5
PLP-0101	PL-0101	PT-01	21 inch	24 inch	174	144	$ 25,056	5
Pipe Total					573		$ 82,512	
Construction Total							$ 82,512	

Table C.P2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA P
Construction Cost - By Priority

Priority	Replacement Line (feet)	Replacement Line ($)	Additional Line (feet)	Additional Line ($)	Outfall ($)	Total Cost ($)
1	0	$ -				$ -
2	0	$ -				$ -
3	0	$ -				$ -
4	0	$ -				$ -
5	573	$ 82,512				$ 82,512
Pipe Total	573	$ 82,512	0	$ -	$ -	$ 82,512

Table C.Q1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA Q
System Q Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
QPT-20	QT-20	QT-19	24 inch	30 inch	527	183	$ 96,441	5
QPT-19	QT-19	QT-18	27 inch	30 inch	322	183	$ 58,926	5
QPT-15	QT-15	QT-14	36 inch	42 inch	52	306	$ 15,912	5
QPT-14	QT-14	QT-13	36 inch	42 inch	163	306	$ 49,878	5
QPT-13	QT-13	QT-12	36 inch	42 inch	593	306	$ 181,458	5
QPT-12	QT-12	QT-11	36 inch	42 inch	306	306	$ 93,636	4
QPT-11	QT-11	QT-10	36 inch	42 inch	267	306	$ 81,702	4
QPT-10	QT-10	QT-09	36 inch	42 inch	100	306	$ 30,600	4
QPT-09	QT-09	QT-08	36 inch	42 inch	141	306	$ 43,146	4
Pipe Total					2471		$ 651,699	
Construction Total							$ 651,699	

Table C.Q2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA Q
Construction Cost - By Priority

Priority	Replacement Line (feet)	($)	Additional Line (feet)	($)	Outfall ($)	Total Cost ($)
1	0	$ -				$ -
2	0	$ -				$ -
3	0	$ -				$ -
4	814	$ 249,084				$ 249,084
5	1657	$ 402,615				$ 402,615
Pipe Total	2471	$ 651,699	0	$ -	$ -	$ 651,699

Table C.S1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA S
System S Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
S1	IS1-1	O-S1	18 inch	24 inch	205	144	$ 29,520	1
SPL1-2302	SL1-2302	SL1-2301	12 inch	18 inch	146	114	$ 16,644	5
SPL-1401	SL-1401	ST-14	12 inch	18 inch	384	114	$ 43,776	5
SPL1-080201	SL1-080201	SL-0802	12 inch	24 inch	47	144	$ 6,768	5
SPL-1701	SL-1701	ST-17	12 inch	15 inch	159	101	$ 16,059	5
SPL1-2301	SL1-2301	ST-23	12 inch	18 inch	189	114	$ 21,546	5
SPL1-080202	SL1-080202	SL1-080201	15 inch	24 inch	76	144	$ 10,944	4
SPL-0802	SL-0802	SL-0801	12 inch	30 inch	322	183	$ 58,926	5
SPL-0801	SL-0801	ST-08	15 inch	30 inch	478	183	$ 87,474	5
SPT-26	ST-26	ST-25	18 inch	24 inch	78	144	$ 11,232	5
SPT-25	ST-25	ST-24	18 inch	24 inch	226	144	$ 32,544	5
SPT-24	ST-24	ST-23	18 inch	24 inch	303	144	$ 43,632	5
SPT-23	ST-23	ST-22	18 inch	24 inch	566	144	$ 81,504	5
SPT-22	ST-22	ST-21	15 inch	30 inch	79	183	$ 14,457	5
SPT-21	ST-21	ST-20	15 inch	30 inch	355	183	$ 64,965	5
SPT-20	ST-20	ST-19	15 inch	30 inch	99	183	$ 18,117	5
SPT-19	ST-19	ST-18	15 inch	30 inch	302	183	$ 55,266	5
SPT-18	ST-18	ST-17	15 inch	36 inch	205	247	$ 50,635	5
SPT-17	ST-17	ST-16	18 inch	36 inch	21	247	$ 5,187	5
SPT-16	ST-16	ST-15	18 inch	36 inch	51	247	$ 12,597	5
SPT-15	ST-15	ST-14	18 inch	42 inch	196	306	$ 59,976	5
SPT-14	ST-14	ST-13	21 inch	42 inch	389	306	$ 119,034	5
SPT-13	ST-13	ST-12	21 inch	48 inch	588	343	$ 201,684	5
SPT-12	ST-12	ST-11	21 inch	48 inch	195	343	$ 66,885	5
SPT-11	ST-11	ST-10	21 inch	48 inch	85	343	$ 29,155	5
SPT-10	ST-10	ST-09	21 inch	48 inch	201	343	$ 68,943	5
SPT-09	ST-09	ST-08	21 inch	48 inch	40	343	$ 13,720	5
SPT-08	ST-08	ST-07	21 inch	48 inch	516	343	$ 176,988	5
SPT-07	ST-07	ST-06	21 inch	48 inch	511	343	$ 175,273	5
SPT-06	ST-06	ST-05	21 inch	48 inch	81	343	$ 27,783	5
SPT-05	ST-05	ST-04	24 inch	54 inch	234	410	$ 95,940	5
SPT-04	ST-04	ST-03	24 inch	54 inch	251	410	$ 102,910	5
SPT-03	ST-03	ST-02	24 inch	54 inch	272	410	$ 111,520	5
SPT-02	ST-02	ST-01	24 inch	54 inch	133	410	$ 54,530	5
SPT-01	ST-01	S-Outfall	24 inch	60 inch	786	458	$ 359,988	5
Replacement Pipe							$ 2,346,122	
Bore and Jack								
	SPT-15				150		$ 94,500	5
	SPL-0801				150		$ 67,500	5
Pipe Total					8564		$ 2,508,122	
Outfall					60 inch		$ 80,000	
Construction Total							$ 2,588,122	

Table C.S2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA S
Construction Cost - By Priority

Priority	Replacement Line (feet)	Replacement Line ($)	Additional Line (feet)	Additional Line ($)	Outfall ($)	Total Cost ($)
1	205	$ 29,520			$ 20,000	$ 49,520
2	0	$ -				$ -
3	0	$ -				$ -
4	76	$ 10,944				$ 10,944
5	8788	$ 2,467,658			$ 60,000	$ 2,527,658
Pipe Total	9069	$ 2,508,122	0	$ -	$ 80,000	$ 2,588,122

Table C.T1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA T
System T Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
Additional Line								
	Del Norte			18 inch	940	114	$ 107,160	5
	Tehama			18 inch	1210	114	$ 137,940	5
	Sonoma			18 inch	565	114	$ 64,410	5
	Ringwood			18 inch	1200	114	$ 136,800	5
	Oakland			18 inch	950	114	$ 108,300	5
	Menlo Oaks			18 inch	1100	114	$ 125,400	5
	Almanor			18 inch	350	114	$ 39,900	5
	Berkeley			18 inch	560	114	$ 63,840	5
	Henderson			18 inch	800	114	$ 91,200	5
Pipe Total					6875		$ 874,950	

Table C.T2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA T
Construction Cost - By Priority

Priority	Replacement Line (feet)	($)	Additional Line (feet)	($)	Outfall ($)	Total Cost ($)
1			0	$ -		$ -
2			0	$ -		$ -
3			0	$ -		$ -
4			0	$ -		$ -
5			7675	$ 874,950		$ 874,950
Pipe Total	0	$ -	7675	$ 874,950	$ -	$ 874,950

Table C.V1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA V
System V Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
Additional Line								
	Woodland			15 inch	980	101	$ 98,980	5
	Oak			15 inch	720	101	$ 72,720	5
	Oak			15 inch	470	101	$ 47,470	2
	Euclid			24 inch	920	144	$ 132,480	2
Pipe Total					3090		$ 351,650	

Table C.V2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA V
Construction Cost - By Priority

Priority	Replacement Line (feet)	Replacement Line ($)	Additional Line (feet)	Additional Line ($)	Outfall ($)	Total Cost ($)
1			0	$ -		$ -
2			1390	$ 179,950		$ 179,950
3			0	$ -		$ -
4			0	$ -		$ -
5			1700	$ 171,700		$ 171,700
Pipe Total	0	$ -	3090	$ 351,650	$ -	$ 351,650

Table C.BH1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA BH
System BH Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
Additional Line								
	Menalta			15 inch	2510	101	$ 253,510	5
	101 Frontage			24 inch	830	144	$ 119,520	5
	Santa Monica			24 inch	1510	144	$ 217,440	4
Pipe Total					4850		$ 590,470	

Table C.BH2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA BH
Construction Cost - By Priority

Priority	Replacement Line (feet)	Replacement Line ($)	Additional Line (feet)	Additional Line ($)	Outfall ($)	Total Cost ($)
1			0	$ -		$ -
2			0	$ -		$ -
3			0	$ -		$ -
4			1510	$ 217,440		$ 217,440
5			3340	$ 373,030		$ 373,030
Pipe Total	0	$ -	4850	$ 590,470	$ -	$ 590,470

Table C.RS1.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA G, I, J & K
Regional Solution A Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
GPL-1010	GL-1010	GL-1009	10 inch	18 inch	98	114	$ 11,172	5
GPL-1009	GL-1009	GL-1008	10 inch	18 inch	211	114	$ 24,054	5
GPL-1008	GL-1008	GL-1007	15 inch	24 inch	180	144	$ 25,920	5
GPl-1007	GL-1007	GL-1006	15 inch	24 inch	60	144	$ 8,640	5
GPL-1006	GL-1006	GL-1005	18 inch	24 inch	220	144	$ 31,680	5
GPL-1005	GL-1005	GL-1004	18 inch	24 inch	86	144	$ 12,384	5
GPL-1004	GL-1004	GL-1003	12 inch	24 inch	199	144	$ 28,656	5
GPL-1003	GL-1003	GL-1002	12 inch	24 inch	78	144	$ 11,232	5
GPL-1002	GL-1002	GL-1001	12 inch	24 inch	201	144	$ 28,944	5
GPL-1001	GL-1001	GT-10	12 inch	24 inch	55	144	$ 7,920	5
GPT-27	GT-27	GT-26	15 inch	18 inch	470	114	$ 53,580	5
GPT-26	GT-26	GT-25	12 inch	18 inch	343	114	$ 39,102	5
GPT-25	GT-25	GT-24	12 inch	18 inch	46	114	$ 5,244	5
GPT-24	GT-24	GT-23	18 inch	24 inch	232	144	$ 33,408	4
GPT-23	GT-23	GT-22	18 inch	24 inch	70	144	$ 10,080	4
GPT-22	GT-22	GT-21	18 inch	24 inch	220	144	$ 31,680	4
GPT-21	GT-21	GT-20	18 inch	24 inch	67	144	$ 9,648	4
GPT-20	GT-20	GT-19	18 inch	24 inch	195	144	$ 28,080	4
GPT-19	GT-19	GT-18	18 inch	24 inch	65	144	$ 9,360	4
GPT-18	GT-18	GT-17	18 inch	30 inch	53	183	$ 9,699	4
GPT-17	GT-17	GT-16	18 inch	30 inch	215	183	$ 39,345	4
GPT-16	GT-16	GT-15	18 inch	30 inch	59	183	$ 10,797	4
GPT-15	GT-15	GT-14	18 inch	30 inch	246	183	$ 45,018	4
GPT-14	GT-14	GT-13	18 inch	30 inch	60	183	$ 10,980	4
GPT-13	GT-13	GT-12	18 inch	30 inch	393	183	$ 71,919	4
GPT-12	GT-12	GT-11	18 inch	30 inch	70	183	$ 12,810	4
GPT-11	GT-11	GT-10	18 inch	36 inch	118	247	$ 29,146	4
GPT-10	GT-10	GT-09	18 inch	36 inch	335	247	$ 82,745	4
GPT-09	GT-09	GT-08	21 inch	36 inch	325	247	$ 80,275	4
IPL-170707	IL-170707	IL-170706	12 inch	24 inch	167	144	$ 24,048	2
IPL-170706	IL-170706	IL-170705	12 inch	24 inch	178	144	$ 25,632	2
IPL-170705	IL-170705	IL-170704	12 inch	30 inch	43	183	$ 7,869	2
IPL-170704	IL-170704	IL-170703	12 inch	30 inch	44	183	$ 8,052	2
IPL-170703	IL-170703	IL-170702	15 inch	30 inch	220	183	$ 40,260	2
IPL-170702	IL-170702	IL-170701	15 inch	30 inch	29	183	$ 5,307	2
IPL-170701	IL-170701	IL-1707	15 inch	36 inch	216	247	$ 53,352	2
IPL2-120102	IL2-120102	IL2-120101	12 inch	18 inch	155	114	$ 17,670	5
IPL2-120101	IL2-120101	IL-1201	12 inch	18 inch	93	114	$ 10,602	5
IPL-070202	IL-070202	IL-070201	12 inch	15 inch	314	101	$ 31,714	2
IPL-070201	IL-070201	IL-0702	12 inch	15 inch	39	101	$ 3,939	2
IPL-1707	IL-1707	IL-1706	12 inch	42 inch	241	306	$ 73,746	2
IPL-1706	IL-1706	IL-1705	12 inch	42 inch	520	306	$ 159,120	2
IPL-1705	IL-1705	IL-1704	12 inch	42 inch	65	306	$ 19,890	2
IPL-1704	IL-1704	IL-1703	18 inch	48 inch	284	343	$ 97,412	2
IPL-1703	IL-1703	IL-1702	18 inch	48 inch	387	343	$ 132,741	2
IPL-1702	IL-1702	IL-1701	18 inch	48 inch	946	343	$ 324,478	2
IPL-1701	IL-1701	IT-17	18 inch	48 inch	661	343	$ 226,723	2
IPL-1201	IL-1201	IT-12	12 inch	18 inch	268	114	$ 30,552	2
IPL-0901	IL-0901	IT-09	12 inch	24 inch	310	144	$ 44,640	2
IPL-0801	IL-0801	IT-08	12 inch	18 inch	45	114	$ 5,130	2
IPL-0705	IL-0705	IL-0704	12 inch	18 inch	218	114	$ 24,852	2
IPL-0701	IL-0701	IT-07	18 inch	24 inch	51	144	$ 7,344	2

Table C.RS1.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA G, I, J & K
Regional Solution A Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
IPT-29	IT-29	IT-28	12 inch	15 inch	139	101	$ 14,039	5
IPT-28	IT-28	IT-27	12 inch	15 inch	164	101	$ 16,564	5
IPT-27	IT-27	IT-26	12 inch	15 inch	401	101	$ 40,501	5
IPT-26	IT-26	IT-25	12 inch	15 inch	250	101	$ 25,250	5
IPT-25	IT-25	IT-24	12 inch	18 inch	360	114	$ 41,040	5
IPT-24	IT-24	IT-23	12 inch	24 inch	119	144	$ 17,136	2
IPT-23	IT-23	IT-22	12 inch	24 inch	378	144	$ 54,432	2
IPT-22	IT-22	IT-21	15 inch	24 inch	300	144	$ 43,200	2
IPT-21	IT-21	IT-20	15 inch	24 inch	253	144	$ 36,432	2
IPT-20	IT-20	IT-19	15 inch	24 inch	184	144	$ 26,496	2
IPT-19	IT-19	IT-18	15 inch	36 inch	114	247	$ 28,158	2
IPT-18	IT-18	IT-17	15 inch	36 inch	145	247	$ 35,815	2
IPT-17	IT-17	IT-16	18 inch	42 inch	270	306	$ 82,620	2
IPT-16	IT-16	IT-15	18 inch	42 inch	396	306	$ 121,176	2
IPT-15	IT-15	IT-14	18 inch	48 inch	178	343	$ 61,054	2
IPT-14	IT-14	IT-13	18 inch	48 inch	570	343	$ 195,510	2
IPT-13	IT-13	IT-12	24 inch	48 inch	812	343	$ 278,516	2
IPT-12	IT-12	IT-11	24 inch	48 inch	368	343	$ 126,224	2
IPT-11	IT-11	IT-10	24 inch	48 inch	51	343	$ 17,493	2
IPT-10	IT-10	IT-09	24 inch	48 inch	206	343	$ 70,658	2
IPT-09	IT-09	IT-08	24 inch	48 inch	70	343	$ 24,010	2
IPT-08	IT-08	IT-07	24 inch	48 inch	455	343	$ 156,065	2
IPT-07	IT-07	IT-06	30 inch	48 inch	98	343	$ 33,614	2
RSPL-0901	IT-06	RS-09	0.0	48 inch	118	343	$ 40,474	1
KPL-190102	KL-190102	KL-190101	12 inch	18 inch	151	114	$ 17,214	5
KPL-190101	KL-190101	KL-1901	12 inch	18 inch	153	114	$ 17,442	5
KPL-2405	KL-2405	KL-2404	12 inch	36 inch	111	247	$ 27,417	5
KPL-2404	KL-2404	KL-2403	12 inch	36 inch	104	247	$ 25,688	5
KPL-2403	KL-2403	KL-2402	12 inch	36 inch	140	247	$ 34,580	5
KPL-2402	KL-2402	KL-2401	12 inch	36 inch	139	247	$ 34,333	5
KPL-2401	KL-2401	KT-24	12 inch	36 inch	119	247	$ 29,393	5
KPL-1901	KL-1901	KT-19	15 inch	24 inch	214	144	$ 30,816	5
KPL-0905	KL-0905	KL-0904	15 inch	36 inch	746	247	$ 184,262	5
KPL-0904	KL-0904	KL-0903	15 inch	36 inch	417	247	$ 102,999	5
KPL-0903	KL-0903	KL-0902	15 inch	36 inch	35	247	$ 8,645	5
KPL-0902	KL-0902	KL-0901	15 inch	42 inch	536	306	$ 164,016	5
KPL-0901	KL-0901	KT-09	15 inch	42 inch	23	306	$ 7,038	5

Table C.RS1.3
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA G, I, J & K
Regional Solution A Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
KPT-26	KT-27	KT-26	15 inch	30 inch	94	183	$ 17,202	5
KPT-25	KT-26	KT-25	15 inch	30 inch	300	183	$ 54,900	5
KPT-24	KT-25	KT-24	15 inch	30 inch	100	183	$ 18,300	5
KPT-23	KT-24	KT-23	15 inch	36 inch	41	247	$ 10,127	4
KPT-22	KT-23	KT-22	15 inch	36 inch	159	247	$ 39,273	4
KPT-21	KT-22	KT-21	15 inch	36 inch	92	247	$ 22,724	4
KPT-20	KT-21	KT-20	15 inch	36 inch	41	247	$ 10,127	4
KPT-19	KT-20	KT-19	15 inch	36 inch	568	247	$ 140,296	4
KPT-18	KT-19	KT-18	15 inch	36 inch	181	247	$ 44,707	4
KPT-17	KT-18	KT-17	15 inch	42 inch	11	306	$ 3,366	4
KPT-16	KT-17	KT-16	15 inch	42 inch	49	306	$ 14,994	2
KPT-15	KT-16	KT-15	15 inch	42 inch	350	306	$ 107,100	2
KPT-14	KT-15	KT-13	15 inch	48 inch	68	343	$ 23,324	2
KPT-13	KT-13	KT-12	15 inch	48 inch	329	343	$ 112,847	2
KPT-12	KT-12	KT-11	15 inch	48 inch	90	343	$ 30,870	2
KPT-11	KT-11	KT-10	15 inch	48 inch	194	343	$ 66,542	2
KPT-10	KT-10	KT-09	15 inch	48 inch	51	343	$ 17,493	2
KPT-09	KT-09	KT-08	21 inch	8 x 4 ft	788	1000	$ 788,000	2
KPT-08	KT-08	KT-07	21 inch	8 x 4 ft	82	1000	$ 82,000	2
KPT-07	KT-07	KT-06	21 inch	8 x 4 ft	86	1000	$ 86,000	2
KPT-06	KT-06	KT-05	30 inch	8 x 4 ft	297	1000	$ 297,000	2
KPT-05	KT-05	KT-04	30 inch	8 x 4 ft	417	1000	$ 417,000	2
KPT-04	KT-04	KT-03	30 inch	8 x 4 ft	230	1000	$ 230,000	2
KPT-03	KT-03	KT-02	30 inch	8 x 4 ft	197	1000	$ 197,000	2
KPT-02	KT-02	KT-01	30 inch	8 x 4 ft	510	1000	$ 510,000	2
KPT-01	KT-01	K-Outfall	30 inch	10 x 4 ft	394	1200	$ 472,800	2
JPT-08	JT-08	KT-05	0.0	24 inch	115	144	$ 16,560	2
JPT-04	JT-04	KT-02	0.0	30 inch	131	183	$ 23,973	2
Replacement Pipe					25,716		$ 8,303,436	

Table C.RS1.4
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA G, I, J & K
Regional Solution A Construction Cost

Pipe #	Upstream Node	Downstream Node	Pipe Diameter Existing (inches)	Pipe Diameter Proposed (inches)	Length (feet)	Unit Cost ($)	Total Cost ($)	Priority
Additional Pipe								
RSP-17	GT-08	RS-16		36 inch	159	247	$ 39,273	1
RSP-16	RS-16	RS-15		42 inch	360	306	$ 110,160	1
RSP-15	RS-15	RS-14		42 inch	358	306	$ 109,548	1
RSP-14	RS-14	RS-13		42 inch	433	306	$ 132,498	1
RSP-13	RS-13	RS-12		48 inch	474	343	$ 162,582	1
RSP-12	RS-12	RS-11		48 inch	385	343	$ 132,055	1
RSP-11	RS-11	RS-10		48 inch	435	343	$ 149,205	1
RSP-10	RS-10	RS-09		48 inch	395	343	$ 135,485	1
RSP-09	RS-09	RS-08		60 inch	284	458	$ 130,072	1
RSP-08	RS-08	RS-07		60 inch	424	458	$ 194,192	1
RSP-07	RS-07	RS-06		60 inch	371	458	$ 169,918	1
RSP-06	RS-06	RS-05		60 inch	304	458	$ 139,232	1
RSP-05	RS-05	RS-04		72 inch	395	593	$ 234,235	1
RSP-04	RS-04	RS-03		72 inch	390	593	$ 231,270	1
RSP-03	RS-03	RS-02		72 inch	339	593	$ 201,027	1
RSP-02	RS-02	RS-01		72 inch	348	593	$ 206,364	1
RSP-01	RS-01	RS-Outlet		72 inch	143	593	$ 84,799	1
Live Oak				15 inch	1540	101	$ 155,540	5
Menlo				15 inch	1540	101	$ 155,540	5
Santa Cruz				15 inch	1190	101	$ 120,190	5
Arbor				15 inch	920	101	$ 92,920	5
White Oak				15 inch	1200	101	$ 121,200	5
Oak Dell				15 inch	1165	101	$ 117,665	5
Doris				15 inch	950	101	$ 95,950	5
Hobart (northeast)				15 inch	950	101	$ 95,950	5
Hobart (southwest)				15 inch	1430	101	$ 144,430	5
Cotton (northeast)				15 inch	990	101	$ 99,990	5
Cotton (southwest)				15 inch	1450	101	$ 146,450	5
Hermosa				15 inch	1450	101	$ 146,450	5
Hillview				15 inch	990	101	$ 99,990	5
San Mateo Drive				15 inch	1070	101	$ 108,070	5
Additional Pipe Total					22,832		$ 4,262,250	
Outfall Regional					72 inch		$ 70,000	
Outfall JK					10 x 4 ft		$ 150,000	
Construction Total							$ 12,785,686	

Table C.RS2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA S
Construction Cost - By Priority

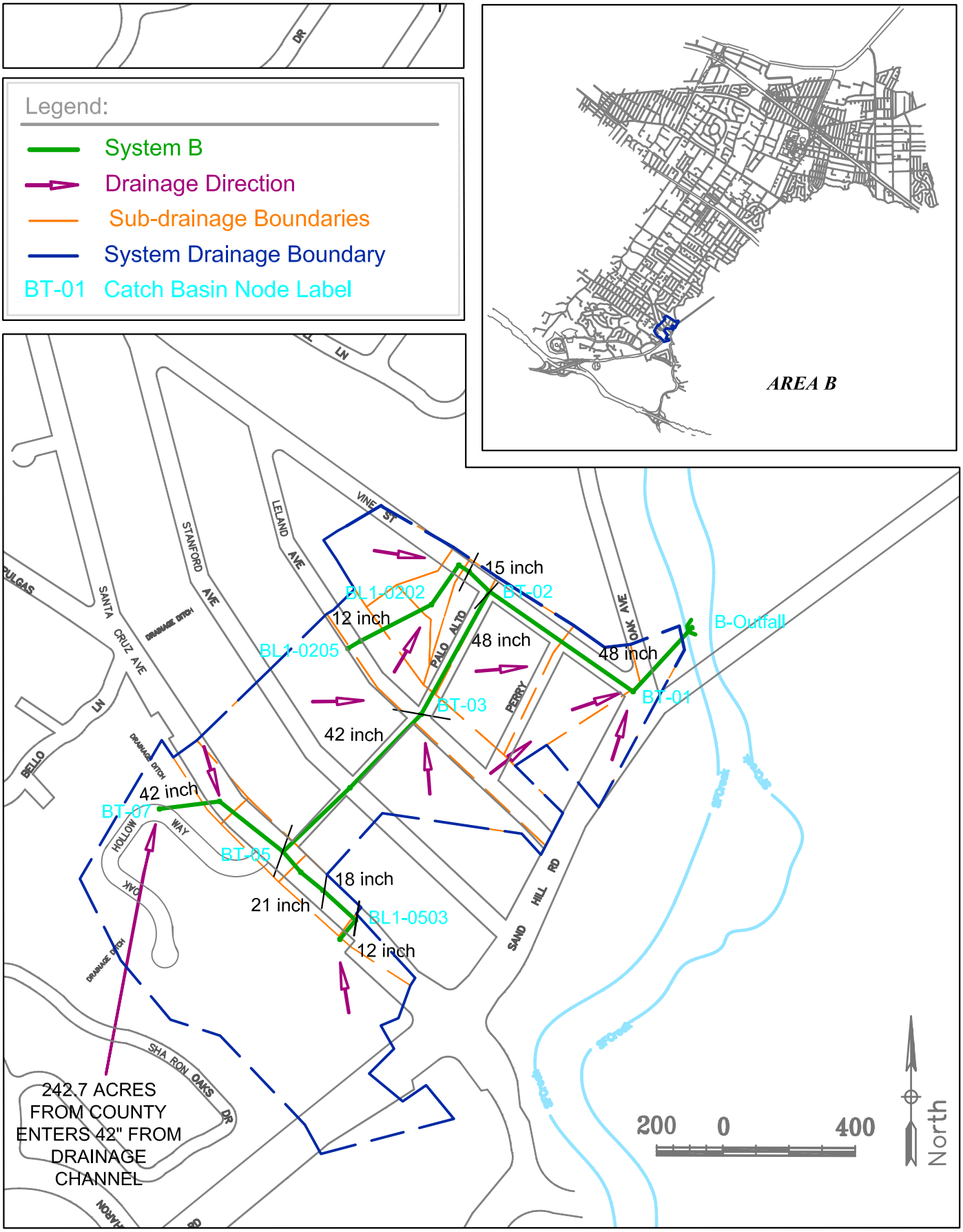
Priority	Replacement Line (feet)	Replacement Line ($)	Additional Line (feet)	Additional Line ($)	Outfall ($)	Total Cost ($)
1	118	$ 40,474	5854	$ 2,561,915	$ 220,000	$ 2,822,389
2	14591	$ 6,248,913	0	$ -		$ 6,248,913
3	0	$ -	0	$ -		$ -
4	3816	$ 785,610	0	$ -		$ 785,610
5	7191	$ 1,228,439	15908	$ 1,700,335		$ 2,928,774
Pipe Total	25716	$ 8,303,436	21762	$ 4,262,250	$ 220,000	$ 12,785,686

APPENDIX D

Analyses of Existing and Proposed Conditions

The following Appendix contains the analyses used to support the pipes sizes shown on Figure 2 and the line size used for the costs presented in Appendix C. Analyses are presented by drainage area. For each system, a Figure is presented that shows flow direction, drainage boundaries, and existing pipe sizes. An existing system hydraulic analysis table (x.1) shows flow capacity of the pipes, cover, and available freeboard. An existing system hydrologic analysis is presented in Table (x.2). Table x.2 shows the drainage area, runoff coefficient, time of concentration and runoff rate. If there is adequate freeboard for the system, no further analysis is presented.

If there are deficient pipes, an analysis of proposed conditions is provided. Table x.3 shows the hydraulic analysis and x.4 shows the hydrologic analysis.



AREA B SYSTEM

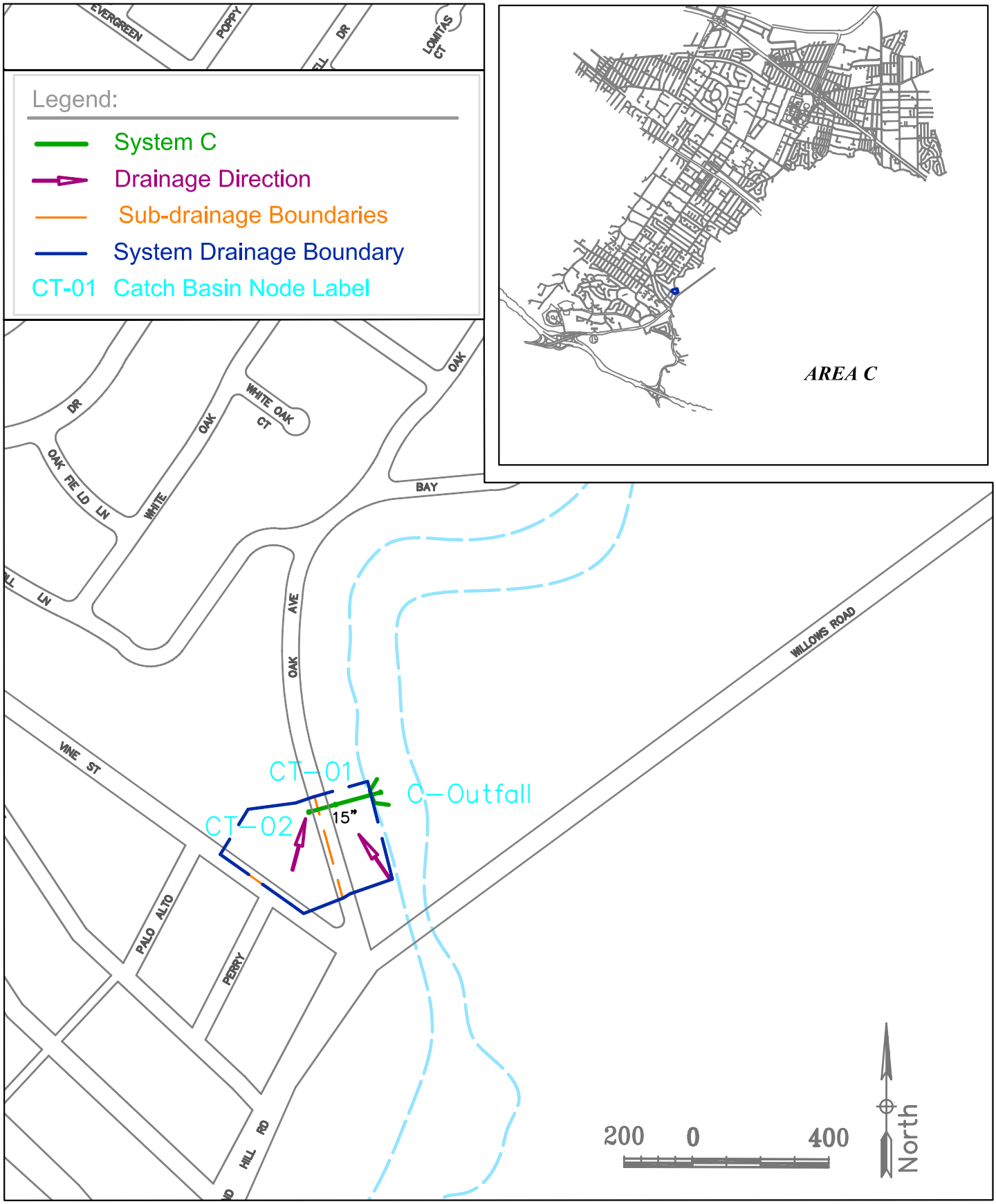
BKF

Table D.B1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA B
Existing Hydraulics: 10-Year Event with Outfall water depth = 100 ft

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs)	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s)
								Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
BPL1-0504	BL1-0504	BL1-0503	0.33	7.24	12 inch	62	0.0413	140.66	138.10	149.66	147.35	140.90	138.25	8.8	8.0	3.5
BPL1-0503	BL1-0503	BL1-0502	0.33	9.42	18 inch	123	0.0080	138.10	137.11	147.35	146.61	138.31	138.10	9.0	7.8	1.2
BPL1-0502	BL1-0502	BL1-0501	0.82	20.59	21 inch	90	0.0169	137.11	135.59	146.61	145.59	138.10	138.10	8.5	7.8	0.5
BPL1-0501	BL1-0501	BT-05	0.80	17.24	21 inch	49	0.0118	135.59	135.01	145.59	145.55	138.10	138.10	7.5	8.3	0.3
BPL1-0205	BL1-0205	BL1-0204	0.82	6.00	12 inch	30	0.0283	122.00	121.15	127.00	126.40	122.38	121.54	4.6	4.0	2.9
BPL1-0204	BL1-0204	BL1-0203	0.81	3.82	12 inch	277	0.0115	121.15	117.97	126.40	123.47	121.53	118.48	4.9	4.3	2.5
BPL1-0203	BL1-0203	BL1-0202	1.04	2.37	12 inch	145	0.0044	117.97	117.33	123.47	123.11	118.43	118.15	5.0	4.5	2.2
BPL1-0202	BL1-0202	BL1-0201	2.21	10.80	12 inch	37	0.0919	117.33	113.93	123.11	123.19	117.97	115.39	5.1	4.8	3.5
BPL1-0201	BL1-0201	BT-02	3.56	19.60	15 inch	24	0.0921	113.93	111.72	123.19	123.34	115.34	115.27	7.8	8.0	2.9
BPT-07	BT-07	BT-06	101.37	201.39	42 inch	138	0.0401	145.00	139.47	155.00	149.97	148.08	143.08	6.9	6.5	10.9
BPT-06	BT-06	BT-05	101.13	139.79	42 inch	231	0.0193	139.47	135.01	149.97	145.55	142.55	139.29	7.4	7.0	10.9
BPT-05	BT-05	BT-04	100.93	148.92	42 inch	272	0.0219	135.01	129.05	145.55	136.06	138.09	132.28	7.5	7.0	11.1
BPT-04	BT-04	BT-03	103.39	149.00	42 inch	372	0.0219	129.05	120.89	136.06	127.82	132.16	124.21	3.9	3.5	11.2
BPT-03	BT-03	BT-02	102.50	230.85	48 inch	355	0.0258	120.89	111.72	127.82	123.34	123.96	115.67	3.9	2.9	9.0
BPT-02	BT-02	BT-01	103.61	199.28	48 inch	519	0.0192	111.72	101.73	123.34	115.19	114.80	106.00	8.5	7.6	9.1
BPT-01	BT-01	B-Outfall	103.44	92.76	48 inch	199	0.0042	101.73	100.90	115.19	103.90	105.31	103.98	9.9	9.5	9.3
						2923.00										

Table D.B2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA B
Existing Hydrology: 10-Year Event

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
BL1-0504	149.66	140.66	.34		.40	.14		.14	0.0	0.0	2.44	0.3
BL1-0503	147.35	138.10	.00		.40	.00		.14	0.0	0.3	2.44	0.3
BL1-0502	146.61	137.11	.49		.40	.20		.33	0.0	2.0	2.44	0.8
BL1-0501	145.59	135.59	.00		.40	.00		.33	0.0	5.2	2.38	0.8
BL1-0205	127.00	122.00	1.20		.40	.48		.48	10.0	10.0	1.69	0.8
BL1-0204	126.40	121.15	.00		.40	.00		.48	0.0	10.2	1.67	0.8
BL1-0203	123.47	117.97	.49		.40	.20		.68	10.0	12.0	1.53	1.0
BL1-0202	123.11	117.33	2.06		.40	.82		1.50	10.0	13.1	1.46	2.2
BL1-0201	123.19	113.93	2.33		.40	.93		2.43	10.0	13.3	1.45	3.6
BT-07	155.00	145.00	242.70		.40	97.08	242.70	97.08	25.0	25.0	1.04	101.4
BT-06	149.97	139.47	.50		.40	.20	243.20	97.28	10.0	25.2	1.03	101.1
BT-05	145.55	135.01	.51	.83	.40	.20	244.54	97.82	10.0	25.6	1.02	100.9
BT-04	136.06	129.05	8.08		.40	3.23	252.62	101.05	10.0	26.0	1.02	103.4
BT-03	127.82	120.89	.66		.40	.26	253.28	101.31	10.0	26.5	1.00	102.5
BT-02	123.34	111.72	.00	6.08	.40	.00	259.36	103.74	0.0	27.2	0.99	103.6
BT-01	115.19	101.73	4.38		.40	1.75	263.74	105.50	10.0	28.1	0.97	103.4
B-Outfall	103.90	100.90	.00		.00	.00	263.74	105.50	0.0	28.5	0.97	102.8



AREA C SYSTEM

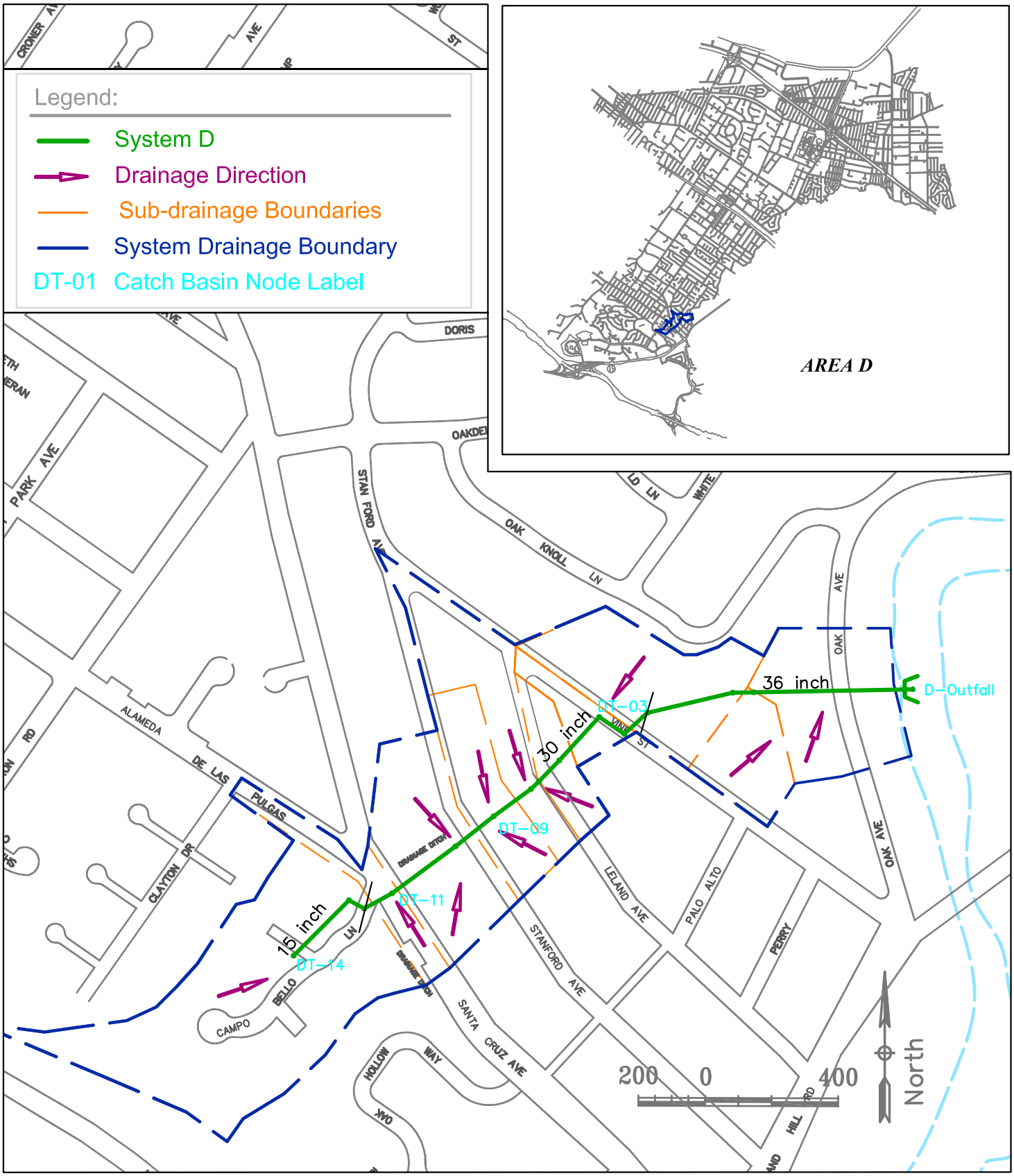
BkF

Table D.C1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA C
Existing Hydraulics: 10-Year Event with Free Outfall

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs)	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s)
								Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
CPT-02	CT-02	CT-01	2.23	1.44	15 inch	81	0.0005	105.93	105.89	111.73	111.74	107.32	107.22	4.4	4.6	1.8
CPT-01	CT-01	C-Outfall	3.58	1.46	15 inch	137	0.0005	105.89	105.82	111.74	106.03	107.20	106.58	4.5	4.6	3.7
						218.00										

Table D.C2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA C
Existing Hydrology: 10-Year Event

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
CT-02	111.73	105.93	1.64		0.8	1.31	1.64	1.31	10	10.0	1.69	2.23
CT-01	111.74	105.89	1.09		0.8	0.87	2.73	2.18	10	10.7	1.62	3.58
C-Outfall	106.03	105.82	0		0	0	2.73	2.18	0	11.4	1.58	3.47



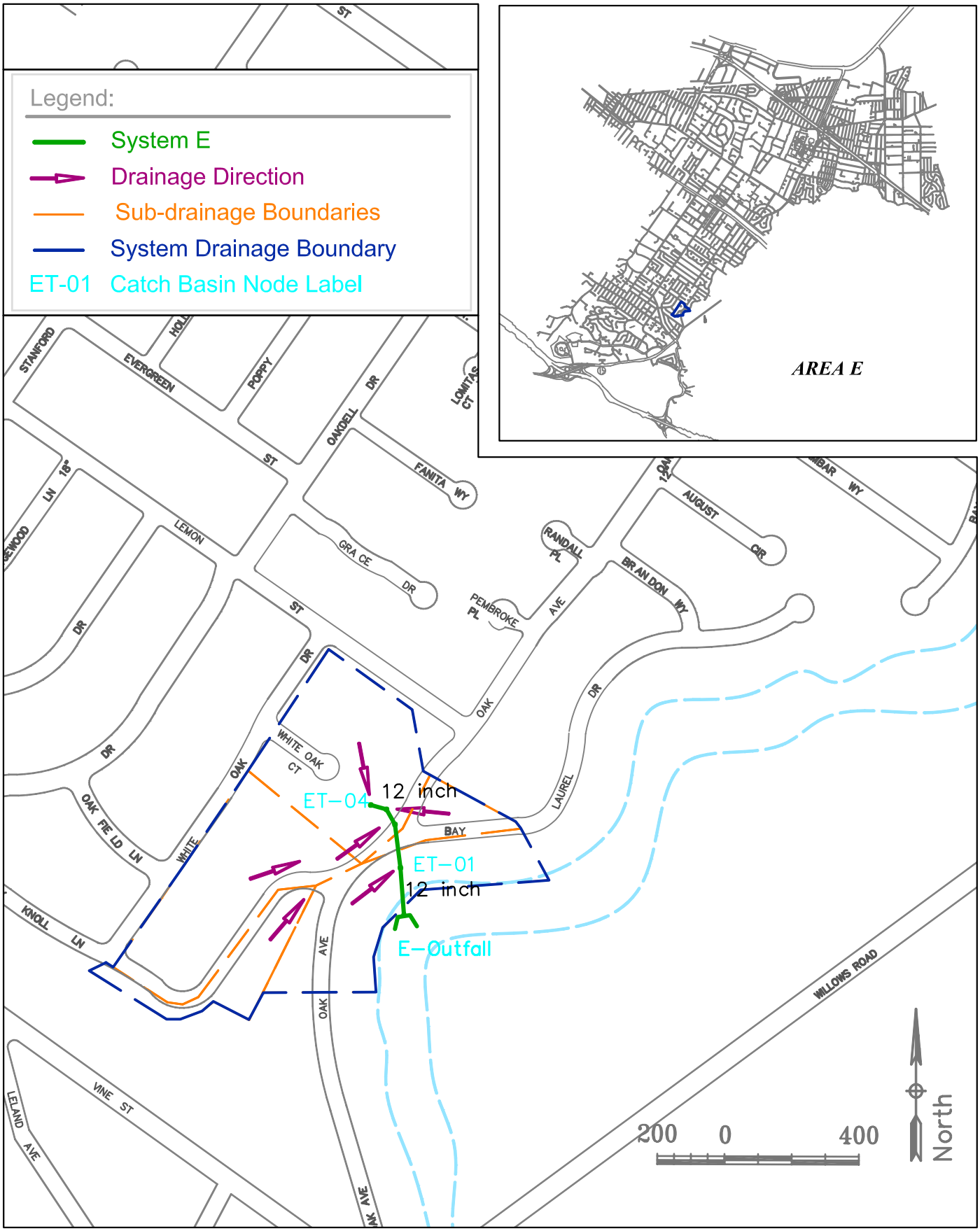
AREA D SYSTEM

Table D.D1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA D
Existing Hydraulics: 10-Year Event with Outfall water level = 95.2

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs)	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s)
								Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
DPT-14	DT-14	DT-13	8.7	10.2	15 inch	235	0.0251	144.12	138.23	156.90	144.93	145.26	139.97	11.6	11.5	7.2
DPT-13	DT-13	DT-12	8.4	10.2	15 inch	52	0.0250	138.23	136.93	144.93	146.68	139.36	137.82	5.6	5.5	8.1
DPT-12	DT-12	DT-11	8.4	64.9	30 inch	95	0.0251	136.93	134.55	146.68	143.79	137.89	135.60	8.8	7.3	4.6
DPT-11	DT-11	DT-10	9.2	64.9	30 inch	237	0.0251	134.55	128.61	143.79	135.21	135.56	129.76	8.2	6.7	4.6
DPT-10	DT-10	DT-09	11.3	64.9	30 inch	146	0.0251	128.61	124.95	135.21	131.68	129.74	126.16	5.5	4.1	5.0
DPT-09	DT-09	DT-08	12.4	64.9	30 inch	139	0.0250	124.95	121.47	131.68	129.65	126.13	122.79	5.6	4.2	5.1
DPT-08	DT-08	DT-07	14.0	65.1	30 inch	33	0.0252	121.47	120.64	129.65	129.22	122.73	121.97	6.9	5.7	5.5
DPT-07	DT-07	DT-06	14.7	65.0	30 inch	88	0.0251	120.64	118.43	129.22	128.13	121.93	119.75	7.3	6.1	5.7
DPT-06	DT-06	DT-05	14.5	64.9	30 inch	177	0.0250	118.43	114.00	128.13	125.15	119.71	115.77	8.4	7.2	4.8
DPT-05	DT-05	DT-04	18.1	64.9	30 inch	91	0.0251	114.00	111.72	125.15	124.55	115.44	113.47	9.7	8.7	5.5
DPT-04	DT-04	DT-03	17.9	65.0	30 inch	94	0.0251	111.72	109.36	124.55	122.37	113.15	110.84	11.4	10.3	6.0
DPT-03	DT-03	DT-02	17.7	105.5	36 inch	264	0.0250	109.36	102.75	122.37	121.22	110.71	104.22	11.7	10.0	5.4
DPT-02	DT-02	DT-01	19.0	105.6	36 inch	63	0.0251	102.75	101.17	121.22	121.26	104.15	102.74	17.1	15.5	5.5
DPT-01	DT-01	D-Outfall	23.0	105.6	36 inch	420	0.0250	101.17	90.65	121.26	97.35	102.71	95.20	18.6	17.1	4.8

Table D.D2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA D
Existing Hydrology: 10-Year Event

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
DT-14	156.90	144.12	10.20		0.50	5.10	10.20	5.10	10.0	10.0	1.69	8.68
DT-13	144.93	138.23	0.00		0.00	0.00	10.20	5.10	10.0	10.5	1.64	8.44
DT-12	146.68	136.93	0.00		0.00	0.00	10.20	5.10	10.0	10.7	1.63	8.39
DT-11	143.79	134.55	1.47		0.40	0.59	11.67	5.69	10.0	11.0	1.60	9.20
DT-10	135.21	128.61	3.93		0.40	1.57	15.60	7.26	10.0	11.9	1.54	11.28
DT-09	131.68	124.95	2.27		0.40	0.91	17.87	8.17	10.0	12.4	1.51	12.42
DT-08	129.65	121.47	3.09		0.40	1.24	20.96	9.40	10.0	12.8	1.48	14.03
DT-07	129.22	120.64	1.20		0.40	0.48	22.16	9.88	10.0	12.9	1.47	14.68
DT-06	128.13	118.43	0.00		0.00	0.00	22.16	9.88	10.0	13.2	1.46	14.53
DT-05	125.15	114.00	4.83		0.56	2.70	26.99	12.59	10.0	13.8	1.42	18.06
DT-04	124.55	111.72	0.00		0.00	0.00	26.99	12.59	10.0	14.1	1.41	17.87
DT-03	122.37	109.36	0.00		0.00	0.00	26.99	12.59	10.0	14.3	1.39	17.70
DT-02	121.22	102.75	1.70		0.80	1.36	28.69	13.95	10.0	15.1	1.35	19.04
DT-01	121.26	101.17	3.78		0.80	3.02	32.47	16.97	10.0	15.3	1.35	23.02
D-Outfall	97.35	90.65	0.00		0.00	0.00	32.47	16.97	0.0	16.8	1.28	21.92



AREA E SYSTEM

BkF

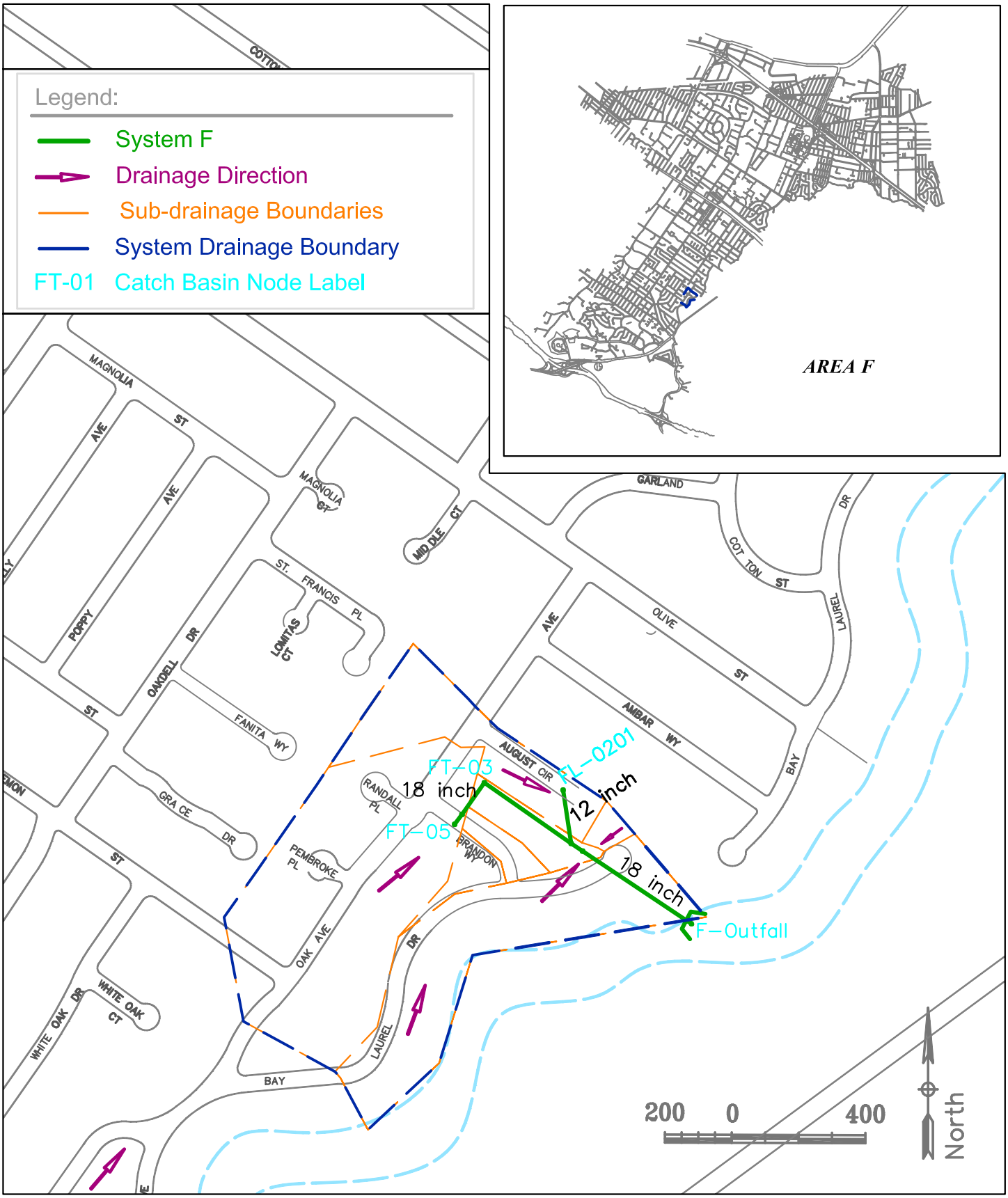
Table D.E1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA E
Existing Hydraulics: 10-Year Event with Free Outfall

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity 1/ (ft/s)
								Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
EPT-04	ET-04	ET-03	7.4	3.6	12 inch	48	0.0104	105.30	104.80	109.92	108.99	111.04	108.99	**ABOVE RIM**	3.6	9.4
EPT-03	ET-03	ET-02	7.3	3.5	12 inch	52	0.0096	104.80	104.30	108.99	108.81	111.01	108.81	**ABOVE RIM**	3.2	9.3
EPT-02	ET-02	ET-01	7.9	2.2	12 inch	130	0.0038	104.30	103.80	108.81	105.51	111.96	105.51	**ABOVE RIM**	3.5	10.1
EPT-01	ET-01	E-Outfall	10.4	0.9	12 inch	156	0.0019	103.80	103.50	105.51	107.28	149.67	104.49	**ABOVE RIM**	0.7	13.2

1/ Time of Concentration and Hydraulic Grade Line based on all flow in pipes.

Table D.E2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA E
Existing Hydrology: 10-Year Event

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
ET-04	109.92	105.30	10.82		0.40	4.33	10.82	4.33	10.0	10.0	1.69	7.4
ET-03	108.99	104.80	.00		0.40	.00	10.82	4.33	10.0	10.1	1.68	7.3
ET-02	108.81	104.30	.95		0.40	.38	11.77	4.71	10.0	10.2	1.67	7.9
ET-01	105.51	103.80	3.80		0.40	1.52	15.57	6.23	10.0	10.4	1.65	10.4
E-Outfall	107.28	103.50	.00		0.00	.00	15.57	6.23	0.0	10.6	1.64	10.3



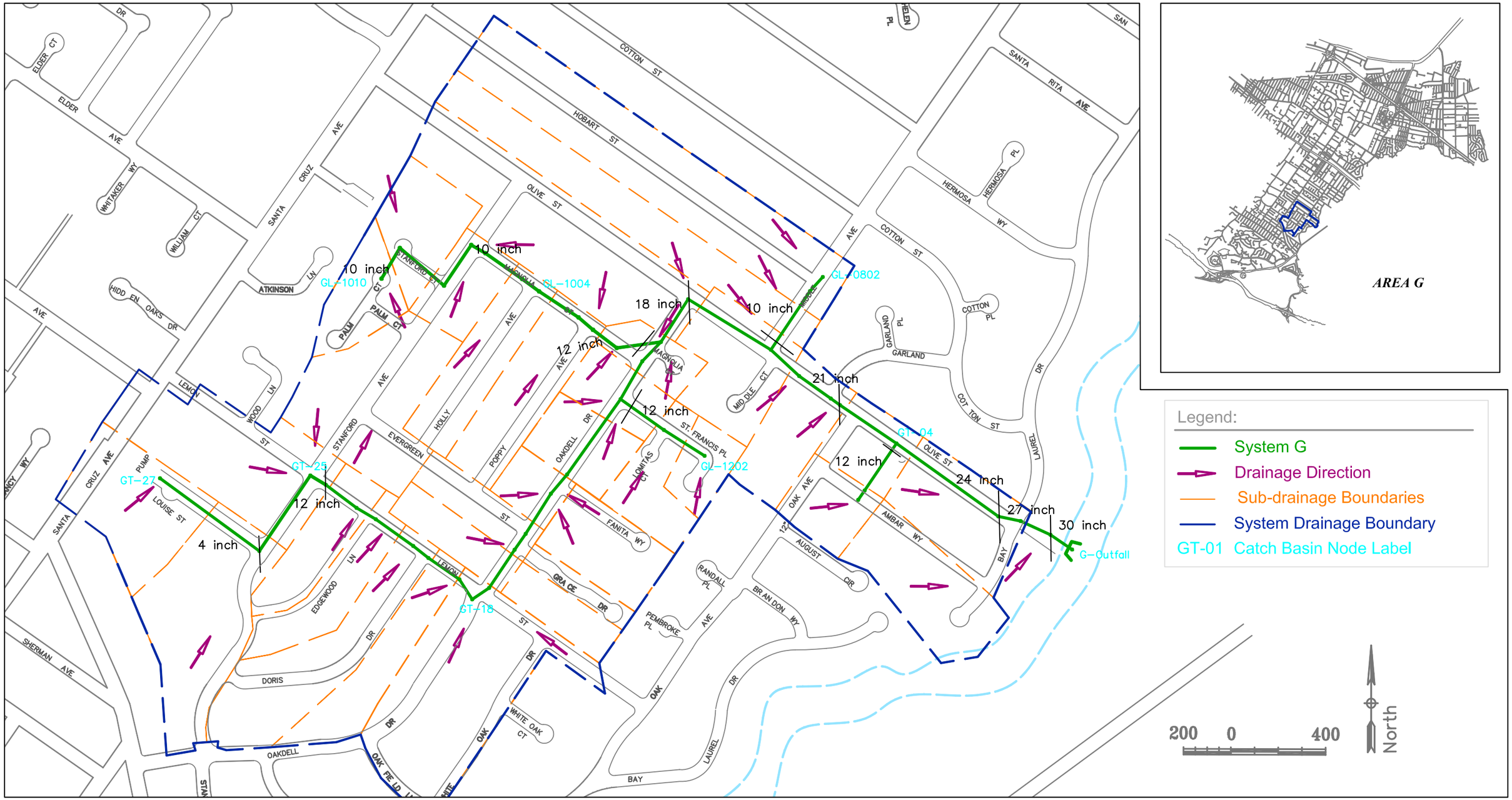
AREA F SYSTEM

Table D.F1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA F
Existing Hydraulics: 10-Year Event with Free Outfall

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs)	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s)
								Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
FPL-0201	FL-0201	FT-02	2.2	1.6	12 inch	161	0.0020	96.40	96.08	99.47	100.00	100.59	100.00	**ABOVE RIM**	2.1	2.7
FPT-05	FT-05	FT-04	6.9	5.5	18 inch	37	0.0027	97.10	97.00	102.24	101.87	101.90	101.74	0.3	3.6	3.9
FPT-04	FT-04	FT-03	7.2	5.3	18 inch	116	0.0025	97.00	96.71	101.87	101.12	101.67	101.12	0.2	3.4	4.1
FPT-03	FT-03	FT-02	7.7	4.7	18 inch	317	0.0020	96.71	96.08	101.12	100.00	101.68	100.00	**ABOVE RIM**	2.9	4.3
FPT-02	FT-02	FT-01	9.2	2.5	18 inch	41	0.0020	96.08	96.00	100.00	99.96	101.03	99.96	**ABOVE RIM**	2.4	5.2
FPT-01	FT-01	F-Outfall	13.2	4.0	18 inch	224	0.0049	96.00	94.90	99.96	95.00	108.40	96.26	**ABOVE RIM**	2.5	7.7

Table D.F2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA F
Existing Hydrology: 10-Year Event

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
FL-0201	99.47	96.40	3.16		0.40	1.26		1.26	10.0	10.0	1.69	2.2
FT-05	102.24	97.10	10.16		0.40	4.06	10.16	4.06	10.0	10.0	1.69	6.9
FT-04	101.87	97.00	0.51		0.40	0.20	10.67	4.27	10.0	10.2	1.67	7.2
FT-03	101.12	96.71	0.95		0.40	0.38	11.62	4.65	10.0	10.6	1.63	7.7
FT-02	100.00	96.08	0	3.16	0.40	0.00	14.78	5.91	10.0	11.9	1.54	9.2
FT-01	99.96	96.00	6.58		0.40	2.63	21.36	8.54	10.0	12.0	1.53	13.2
F-Outfall	95.00	94.90	0		0.00	0.00	21.36	8.54	0.0	12.5	1.50	12.9



AREA G SYSTEM

BkF

Table D.G1.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA G
Existing Hydraulics: 10-Year Event with Outfall

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Total Discharge (cfs) 2/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s) 1/
									Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
GPL-1202	GL-1202	GL-1201	1.2	1.2	2.3	12 inch	53	0.0042	95.12	94.90	99.76	99.84	99.90	99.84	**ABOVE RIM**	3.6	1.6
GPL-1201	GL-1201	GT-12	3.1	3.1	0.8	12 inch	186	0.0005	94.90	94.81	99.84	100.00	101.41	100.00	**ABOVE RIM**	3.9	4.0
GPL-1010	GL-1010	GL-1009	1.8	1.8	0.9	10 inch	98	0.0016	96.00	95.84	100.00	99.92	100.56	99.92	**ABOVE RIM**	3.2	3.2
GPL-1009	GL-1009	GL-1008	4.0	3.8	0.7	10 inch	211	0.0010	95.84	95.62	99.92	99.98	106.94	99.98	**ABOVE RIM**	3.3	7.3
GPL-1008	GL-1008	GL-1007	8.6	7.7	0.8	10 inch	180	0.0012	95.62	95.40	99.98	99.68	127.07	99.68	**ABOVE RIM**	3.5	15.7
GPl-1007	GL-1007	GL-1006	10.1	8.8	0.8	10 inch	60	0.0013	95.40	95.32	99.68	99.59	112.27	99.59	**ABOVE RIM**	3.5	18.5
GPL-1006	GL-1006	GL-1005	10.1	8.7	0.7	10 inch	220	0.0010	95.32	95.10	99.59	99.40	145.65	99.40	**ABOVE RIM**	3.4	18.4
GPL-1005	GL-1005	GL-1004	10.0	8.3	1.2	12 inch	86	0.0012	95.10	95.00	99.40	99.33	106.04	99.33	**ABOVE RIM**	3.3	12.7
GPL-1004	GL-1004	GL-1003	12.5	10.4	1.8	12 inch	199	0.0025	95.00	94.50	99.33	98.30	122.74	98.30	**ABOVE RIM**	3.3	15.9
GPL-1003	GL-1003	GL-1002	12.4	10.2	2.0	12 inch	78	0.0032	94.50	94.25	98.30	98.11	107.51	98.11	**ABOVE RIM**	2.8	15.8
GPL-1002	GL-1002	GL-1001	15.3	12.5	1.8	12 inch	201	0.0025	94.25	93.75	98.11	97.49	134.60	97.49	**ABOVE RIM**	2.9	19.5
GPL-1001	GL-1001	GT-10	15.2	12.3	3.5	12 inch	55	0.0096	93.75	93.22	97.49	97.32	107.32	97.32	**ABOVE RIM**	2.7	19.3
GPL-0802	GL-0802	GL-0801	7.9	7.9	2.7	10 inch	28	0.0154	86.80	86.37	89.17	89.32	92.96	89.32	**ABOVE RIM**	1.5	14.5
GPL-0801	GL-0801	GT-08	12.5	12.4	0.5	10 inch	368	0.0005	86.37	86.20	89.32	91.96	211.81	91.96	**ABOVE RIM**	2.1	22.9
GPL-0402	GL-0402	GL-0401	1.6	1.6	2.0	12 inch	48	0.0031	88.75	88.60	94.69	93.72	93.82	93.72	0.9	4.9	2.1
GPL-0401	GL-0401	GT-04	5.0	5.0	4.8	12 inch	240	0.0182	88.60	84.24	93.72	91.87	96.60	91.87	**ABOVE RIM**	4.1	6.4

1/ Discharge and velocity are calculated using time of concentration with all flow in pipe. 2,311
2/ Discharge is calculated using proposed conditions.

Table D.G1.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA G
Existing Hydraulics: 10-Year Event with Outfall

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Total Discharge (cfs) 2/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s) 1/
									Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
GPT-27	GT-27	GT-26	2.3	2.3	1.7	15 inch	470	0.0007	105.20	104.89	108.00	107.69	108.31	107.69	**ABOVE RIM**	1.6	1.9
GPT-26	GT-26	GT-25	4.7	4.4	3.1	12 inch	343	0.0077	104.89	102.25	107.69	105.10	111.09	105.10	**ABOVE RIM**	1.8	6.0
GPT-25	GT-25	GT-24	8.9	8.2	4.0	12 inch	46	0.0128	102.25	101.66	105.10	105.00	107.89	105.00	**ABOVE RIM**	1.9	11.4
GPT-24	GT-24	GT-23	8.9	8.2	8.9	18 inch	232	0.0072	101.66	100.00	105.00	105.99	107.66	105.99	**ABOVE RIM**	1.8	5.0
GPT-23	GT-23	GT-22	10.3	9.4	5.6	18 inch	70	0.0029	100.00	99.80	105.99	106.30	106.98	106.30	**ABOVE RIM**	4.5	5.8
GPT-22	GT-22	GT-21	12.0	10.8	5.5	18 inch	220	0.0027	99.80	99.20	106.30	106.79	109.66	106.79	**ABOVE RIM**	5.0	6.8
GPT-21	GT-21	GT-20	11.8	10.5	5.7	18 inch	67	0.0030	99.20	99.00	106.79	107.05	107.89	107.05	**ABOVE RIM**	6.1	6.7
GPT-20	GT-20	GT-19	15.1	13.4	-5.8	18 inch	195	- 0.0031	99.00	99.60	107.05	107.58	111.60	107.58	**ABOVE RIM**	6.6	8.5
GPT-19	GT-19	GT-18	16.8	14.8	15.4	18 inch	65	0.0215	99.60	98.20	107.58	107.87	109.53	107.87	**ABOVE RIM**	6.5	9.5
GPT-18	GT-18	GT-17	22.2	19.6	6.5	18 inch	53	0.0038	98.20	98.00	107.87	107.04	109.41	107.04	**ABOVE RIM**	8.2	12.6
GPT-17	GT-17	GT-16	22.2	19.5	-10.5	18 inch	215	- 0.0100	98.00	100.15	107.04	104.56	114.14	104.56	**ABOVE RIM**	7.5	12.6
GPT-16	GT-16	GT-15	23.0	20.9	-5.3	18 inch	59	- 0.0025	100.15	100.30	104.56	104.85	107.69	104.85	**ABOVE RIM**	2.9	13.0
GPT-15	GT-15	GT-14	25.0	22.2	8.7	18 inch	246	0.0068	100.30	98.62	104.85	102.61	116.59	102.61	**ABOVE RIM**	3.1	14.2
GPT-14	GT-14	GT-13	26.1	22.5	14.6	18 inch	60	0.0193	98.62	97.46	102.61	102.04	105.75	102.04	**ABOVE RIM**	2.5	14.8
GPT-13	GT-13	GT-12	27.9	23.9	8.6	18 inch	393	0.0067	97.46	94.81	102.04	100.00	127.63	100.00	**ABOVE RIM**	3.1	15.8
GPT-12	GT-12	GT-11	32.3	27.5	9.6	18 inch	70	0.0084	94.81	94.22	100.00	99.22	105.85	99.22	**ABOVE RIM**	3.7	18.3
GPT-11	GT-11	GT-10	32.3	27.4	9.7	18 inch	118	0.0085	94.22	93.22	99.22	97.32	108.45	97.32	**ABOVE RIM**	3.5	18.3
GPT-10	GT-10	GT-09	45.1	38.1	11.8	18 inch	335	0.0126	93.22	89.00	97.32	93.98	155.61	93.98	**ABOVE RIM**	2.6	25.5
GPT-09	GT-09	GT-08	49.6	41.5	14.7	21 inch	325	0.0086	89.00	86.20	93.98	91.96	123.84	91.96	**ABOVE RIM**	3.2	20.6
GPT-08	GT-08	GT-07	60.3	50.0	11.0	21 inch	317	0.0048	86.20	84.68	91.96	90.00	135.96	90.00	**ABOVE RIM**	4.0	25.1
GPT-07	GT-07	GT-06	60.0	48.8	18.4	24 inch	164	0.0066	84.68	83.60	90.00	90.56	102.09	90.56	**ABOVE RIM**	3.3	19.1
GPT-06	GT-06	GT-05	61.5	49.7	14.6	24 inch	48	0.0042	83.60	83.40	90.56	90.87	94.42	90.87	**ABOVE RIM**	5.0	19.6
GPT-05	GT-05	GT-04	61.4	49.5	-12.2	24 inch	288	- 0.0029	83.40	84.24	90.87	91.87	113.12	91.87	**ABOVE RIM**	5.5	19.6
GPT-04	GT-04	GT-03	65.7	52.2	9.0	24 inch	443	0.0016	84.24	83.54	91.87	93.79	131.18	93.79	**ABOVE RIM**	5.6	20.9
GPT-03	GT-03	GT-02	67.3	52.5	11.3	27 inch	53	0.0013	83.54	83.47	93.79	94.16	96.66	94.16	**ABOVE RIM**	8.0	16.9
GPT-02	GT-02	GT-01	67.2	52.3	8.9	27 inch	97	0.0008	83.47	83.39	94.16	95.00	99.57	95.00	**ABOVE RIM**	8.4	16.9
GPT-01	GT-01	G-Outfall	67.0	52.0	8.7	30 inch	110	0.0015	83.39	83.22	95.00	95.00	95.71	85.65	**ABOVE RIM**	9.1	13.7

1/ Discharge and velocity are calculated using time of concentration with all flow in pipe.
2/ Discharge is calculated using proposed conditions.

5,102

Table D.G2.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA G
Existing Hydrology: 10-Year Event

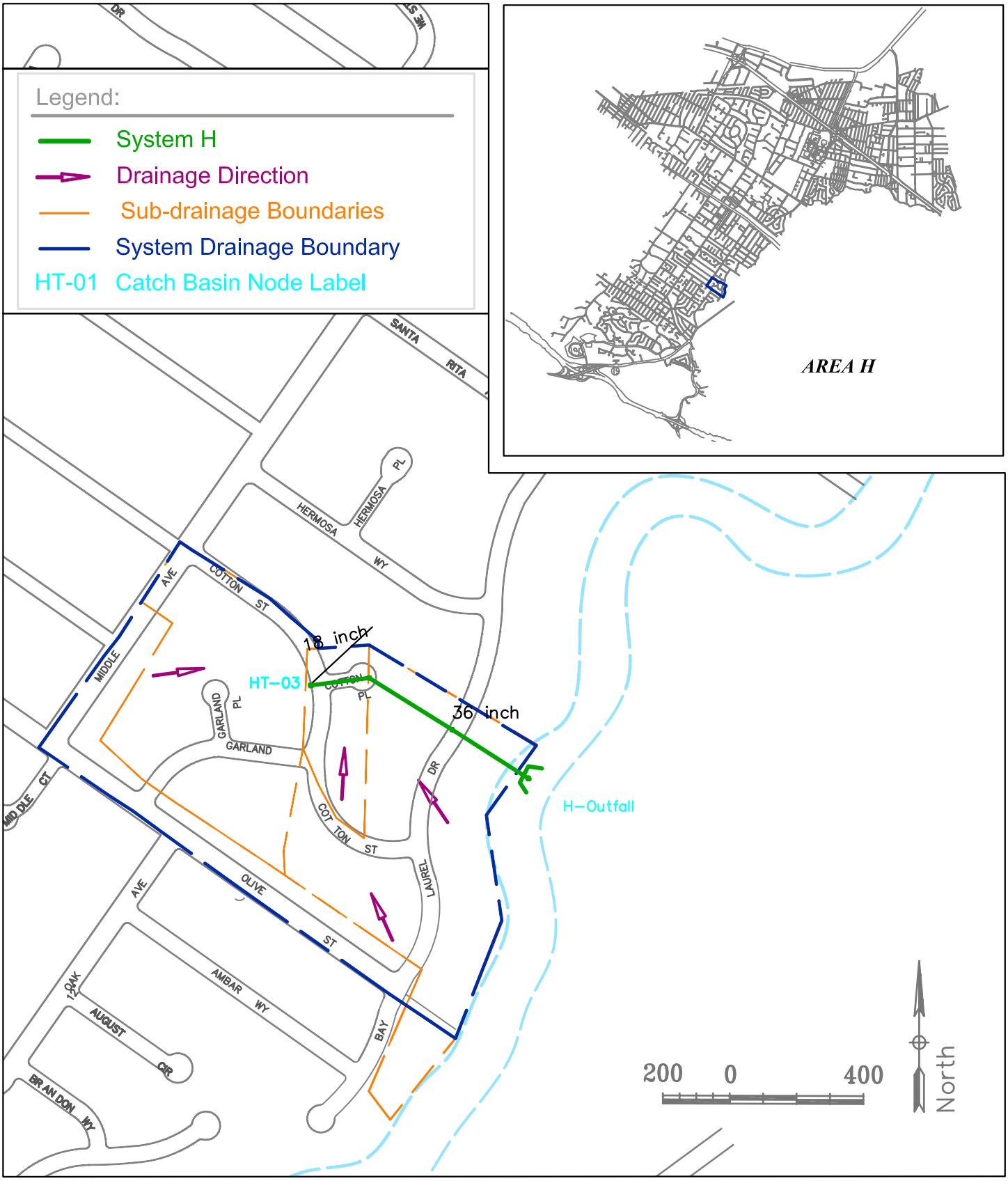
Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge 1/ (cfs)
GL-1202	99.76	95.12	1.80		0.40	0.72			10	10.0	1.69	1.2
GL-1201	99.84	94.90	2.90		0.40	1.16			10	10.6	1.64	3.1
GL-1010	100.00	96.00	2.60		0.40	1.04			10	10.0	1.69	1.8
GL-1009	99.92	95.84	3.40		0.40	1.36			10	10.5	1.64	4.0
GL-1008	99.98	95.62	7.20		0.40	2.88			10	11.0	1.61	8.6
GL-1007	99.68	95.40	2.50		0.40	1.00			10	11.2	1.59	10.1
GL-1006	99.59	95.32	0.00		0.40	0.00			10	11.2	1.59	10.1
GL-1005	99.40	95.10	0.00		0.40	0.00			10	11.4	1.57	10.0
GL-1004	99.33	95.00	4.10		0.40	1.64			10	11.5	1.56	12.5
GL-1003	98.30	94.50	0.00		0.40	0.00			10	11.8	1.55	12.4
GL-1002	98.11	94.25	4.80		0.40	1.92			10	11.8	1.54	15.3
GL-1001	97.49	93.75	0.00		0.40	0.00			10	12.0	1.53	15.2
GL-0802	89.17	86.80	11.60		0.40	4.64			10	10.0	1.69	7.9
GL-0801	89.32	86.37	6.80		0.40	2.72			10	10.0	1.69	12.5
GL-0402	94.69	88.75	2.40		0.40	0.96			10	10.0	1.69	1.6
GL-0401	93.72	88.60	5.10		0.40	2.04			10	10.4	1.65	5.0

1/ Discharge and velocity are calculated using time of concentration with all flow in pipe.

Table D.G2.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA G
Existing Hydrology: 10-Year Event

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge 1/ (cfs)
GT-27	108.00	105.20	5.50		0.25	1.38	5.50	1.38	10	10.0	1.69	2.3
GT-26	107.69	104.89	7.80		0.25	1.95	13.30	3.33	10	14.1	1.41	4.7
GT-25	105.10	102.25	8.00		0.40	3.20	21.30	6.53	10	15.1	1.36	8.9
GT-24	105.00	101.66	0.00		0.40	0.00	21.30	6.53	10	15.1	1.35	8.9
GT-23	105.99	100.00	3.10		0.40	1.24	24.40	7.77	10	15.9	1.32	10.3
GT-22	106.30	99.80	3.30		0.40	1.32	27.70	9.09	10	16.1	1.31	12.0
GT-21	106.79	99.20	0.00		0.40	0.00	27.70	9.09	10	16.6	1.29	11.8
GT-20	107.05	99.00	6.50		0.40	2.60	34.20	11.69	10	16.8	1.28	15.1
GT-19	107.58	99.60	3.70		0.40	1.48	37.90	13.17	10	17.2	1.27	16.8
GT-18	107.87	98.20	10.80		0.40	4.32	48.70	17.48	10	17.3	1.26	22.2
GT-17	107.04	98.00	0.00		0.40	0.00	48.70	17.48	10	17.4	1.26	22.2
GT-16	104.56	100.15	2.10		0.40	0.84	50.80	18.32	10	17.7	1.25	23.0
GT-15	104.85	100.30	4.10		0.40	1.64	54.90	19.96	10	17.7	1.24	25.0
GT-14	102.61	98.62	2.60		0.40	1.04	57.50	21	10	18.0	1.23	26.1
GT-13	102.04	97.46	3.60		0.40	1.44	61.10	22.45	10	18.1	1.23	27.9
GT-12	100.00	94.81	5.10	4.70	0.40	2.04	70.90	26.36	10	18.5	1.22	32.3
GT-11	99.22	94.22	0.00		0.40	0.00	70.90	26.36	10	18.6	1.21	32.3
GT-10	97.32	93.22	1.81	24.60	0.40	0.72	97.31	36.93	10	18.7	1.21	45.1
GT-09	93.98	89.00	10.00		0.40	4.00	107.31	40.93	10	18.9	1.20	49.6
GT-08	91.96	86.20	4.60	18.40	0.40	1.84	130.31	50.13	10	19.2	1.19	60.3
GT-07	90.00	84.68	0.00		0.40	0.00	130.31	50.13	10	19.4	1.19	60.0
GT-06	90.56	83.60	3.70		0.40	1.48	134.01	51.61	10	19.5	1.18	61.5
GT-05	90.87	83.40	0.00		0.40	0.00	134.01	51.61	10	19.6	1.18	61.4
GT-04	91.87	84.24	2.40	7.50	0.40	0.96	143.91	55.57	10	19.8	1.17	65.7
GT-03	93.79	83.54	4.70		0.40	1.88	148.61	57.45	10	20.2	1.16	67.3
GT-02	94.16	83.47	0.00		0.40	0.00	148.61	57.45	10	20.2	1.16	67.2
GT-01	95.00	83.39	0.00		0.40	0.00	148.61	57.45	10	20.3	1.16	67.0
G-Outfall	95.00	83.22	0.00		0.00	0.00	148.61	57.45	0	20.4	1.15	66.8

1/ Discharge and velocity are calculated using time of concentration with all flow in pipe.



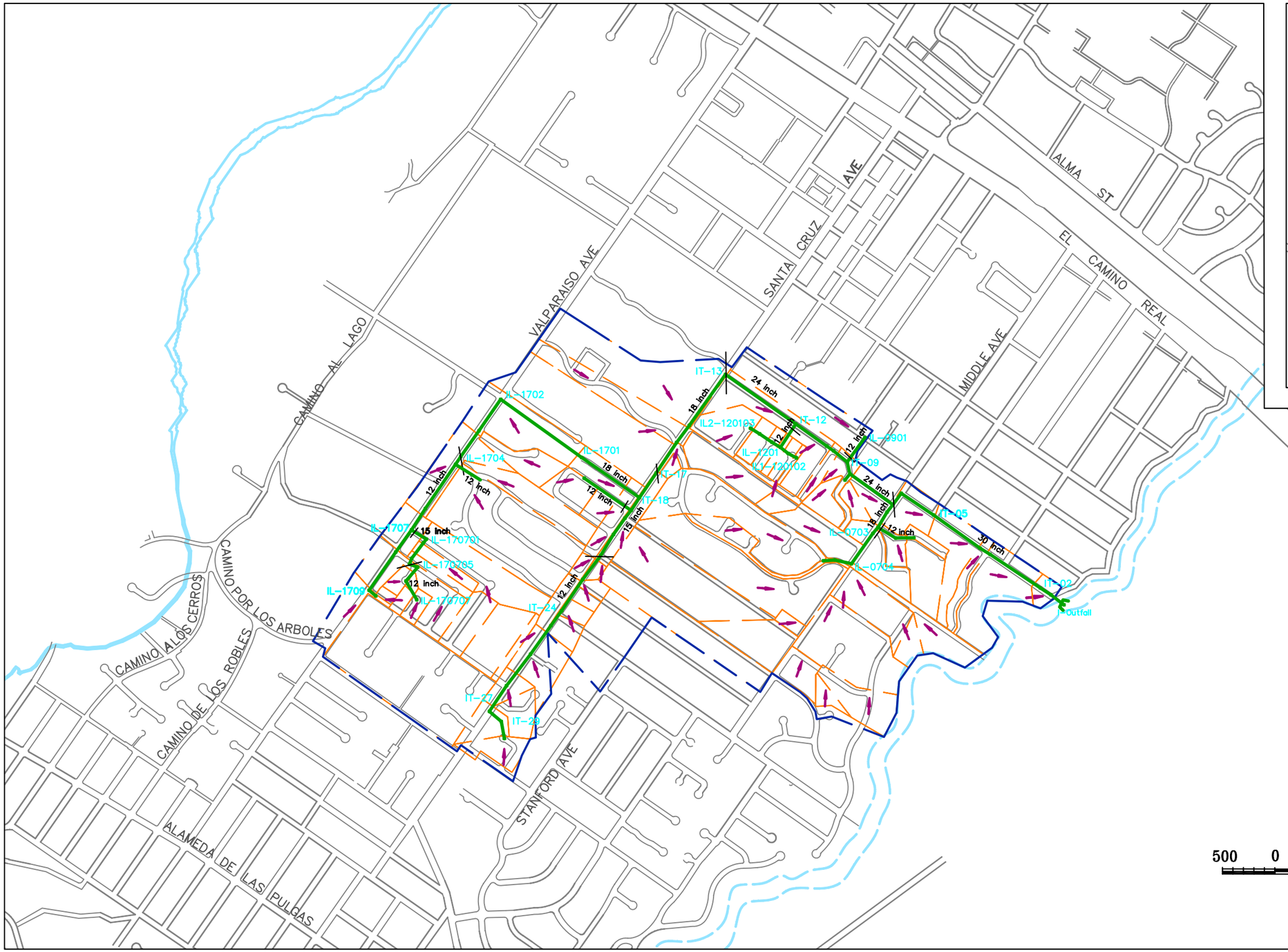
AREA H SYSTEM

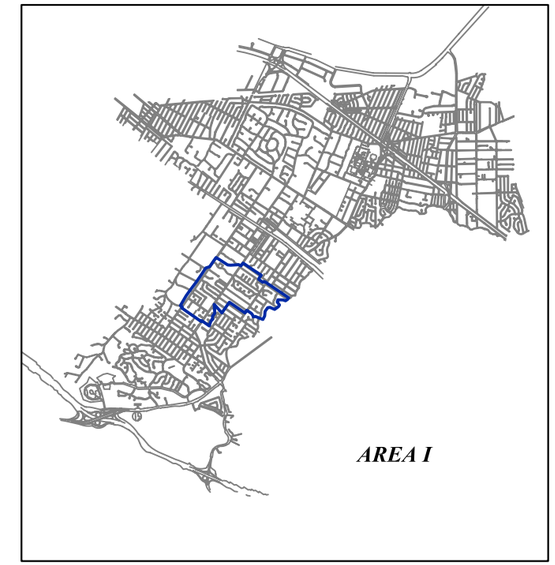
Table D.H1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA H
Existing Hydraulics: 10-Year Event with Free Outfall

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs)	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s)
								Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
HPT-03	HT-03	HT-02	5.7	7.7	18 inch	176	0.0054	82.80	81.85	86.47	86.79	83.75	83.16	2.7	2.2	4.1
HPT-02	HT-02	HT-01	14.0	69.8	36 inch	293	0.0110	81.85	78.64	86.79	90.00	83.04	80.65	3.8	1.9	4.1
HPT-01	HT-01	H-Outfall	13.2	15.2	36 inch	362	0.0018	78.64	78.00	90.00	90.00	80.65	79.16	9.3	8.4	3.9

Table D.H2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA H
Existing Hydrology: 10-Year Event

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
HT-03	86.47	82.80	8.30		0.40	3.32	8.30	3.32	10	10.0	1.69	5.7
HT-02	86.79	81.85	13.00		0.40	5.20	21.30	8.52	10	10.7	1.63	14.0
HT-01	90.00	78.64	0.00		0.40	0.00	21.30	8.52	10	11.9	1.54	13.2
H-Outfall	90.00	78.00	0.00		0.00	0.00	21.30	8.52	0	13.5	1.44	12.4





AREA I SYSTEM

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Table D.I1.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA I
Existing Hydraulics: 10-Year Event with Outfall water level = 73.6 ft

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Total Discharge (cfs) 2/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity 1/ (ft/s)
									Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
IPL-1801	IL-1801	IT-18	1.1	1.1	2.7	12 inch	419	0.0057	84.08	81.69	89.50	90.00	90.42	90.00	**ABOVE RIM**	4.4	1.4
IPL-1710	IL-1710	IL-1709	1.0	1.0	3.1	12 inch	26	0.0077	88.20	88.00	94.17	94.00	88.80	88.80	5.4	5.0	1.7
IPL-1709	IL-1709	IL-1708	1.0	1.0	2.3	12 inch	419	0.0043	88.00	86.20	94.00	90.00	88.77	88.48	5.2	5.0	1.4
IPL-1708	IL-1708	IL-1707	0.8	0.9	3.4	12 inch	269	0.0091	86.20	83.76	90.00	88.35	88.48	88.35	1.5	2.8	1.0
IPL-170707	IL-170707	IL-170706	15.5	15.5	2.9	12 inch	167	0.0065	88.00	86.92	94.44	91.36	122.92	91.36	**ABOVE RIM**	5.4	19.7
IPL-170706	IL-170706	IL-170705	16.2	15.9	2.3	12 inch	178	0.0040	86.92	86.20	91.36	89.64	126.55	89.64	**ABOVE RIM**	3.4	20.7
IPL-170705	IL-170705	IL-170704	16.1	15.5	1.7	12 inch	43	0.0023	86.20	86.10	89.64	89.73	98.51	89.73	**ABOVE RIM**	2.4	20.5
IPL-170704	IL-170704	IL-170703	16.1	15.3	1.7	12 inch	44	0.0023	86.10	86.00	89.73	90.00	98.96	90.00	**ABOVE RIM**	2.6	20.5
IPL-170703	IL-170703	IL-170702	20.8	19.6	5.6	15 inch	220	0.0075	86.00	84.35	90.00	88.56	111.26	88.56	**ABOVE RIM**	2.8	16.9
IPL-170702	IL-170702	IL-170701	29.7	27.3	7.1	15 inch	29	0.0121	84.35	84.00	88.56	87.39	93.53	87.39	**ABOVE RIM**	3.0	24.2
IPL-170701	IL-170701	IL-1707	29.7	27.2	2.2	15 inch	216	0.0011	84.00	83.76	87.39	88.35	133.99	88.35	**ABOVE RIM**	2.1	24.2
IPL-1707	IL-1707	IL-1706	22.6	26.6	-0.9	12 inch	241	- 0.0006	83.76	83.90	88.35	87.55	184.44	87.55	**ABOVE RIM**	3.6	28.8
IPL-1706	IL-1706	IL-1705	22.5	25.3	1.8	12 inch	520	0.0025	83.90	82.60	87.55	85.56	293.08	85.56	**ABOVE RIM**	2.7	28.7
IPL-1705	IL-1705	IL-1704	36.5	37.5	1.7	12 inch	65	0.0023	82.60	82.45	85.56	85.24	153.36	85.24	**ABOVE RIM**	2.0	46.4
IPL-1704	IL-1704	IL-1703	36.5	37.2	2.9	18 inch	284	0.0008	82.45	82.23	85.24	86.10	120.30	86.10	**ABOVE RIM**	1.3	20.6
IPL-1703	IL-1703	IL-1702	37.9	37.3	2.8	18 inch	387	0.0007	82.23	81.95	86.10	85.00	135.44	85.00	**ABOVE RIM**	2.4	21.5
IPL-1702	IL-1702	IL-1701	41.1	38.7	2.9	18 inch	946	0.0008	81.95	81.24	85.00	88.68	233.25	88.68	**ABOVE RIM**	1.6	23.2
IPL-1701	IL-1701	IT-17	43.9	37.9	0.8	18 inch	661	0.0001	81.24	81.20	88.68	88.94	204.57	88.94	**ABOVE RIM**	5.9	24.9
IPL2-120103	IL2-120103	IL2-120102	3.0	3.0	3.7	12 inch	92	0.0109	76.00	75.00	81.33	81.06	81.72	81.06	**ABOVE RIM**	4.3	3.8
IPL2-120102	IL2-120102	IL2-120101	4.1	4.1	0.5	12 inch	155	0.0002	75.00	74.97	81.06	80.62	82.67	80.62	**ABOVE RIM**	5.1	5.2
IPL2-120101	IL2-120101	IL-1201	4.0	3.9	4.2	12 inch	93	0.0139	74.97	73.68	80.62	79.46	80.63	79.46	**ABOVE RIM**	4.7	5.1
IPL1-120102	IL1-120102	IL1-120101	0.8	0.8	6.8	12 inch	68	0.0360	77.85	75.40	80.21	80.25	79.61	79.58	0.6	1.4	1.0
IPL1-120101	IL1-120101	IL-1201	1.2	1.2	4.9	12 inch	92	0.0187	75.40	73.68	80.25	79.46	79.57	79.46	0.7	3.9	1.5
IPL-1201	IL-1201	IT-12	6.0	6.0	2.3	12 inch	268	0.0041	73.68	72.57	79.46	79.48	86.99	79.48	**ABOVE RIM**	4.8	7.6
IPL-0901	IL-0901	IT-09	3.8	3.8	0.9	12 inch	310	0.0006	71.52	71.33	76.22	76.95	80.48	76.95	**ABOVE RIM**	3.7	4.8
IPL-0801	IL-0801	IT-08	4.5	4.5	2.3	12 inch	45	0.0040	71.30	71.12	77.19	76.92	77.64	76.92	**ABOVE RIM**	4.9	5.8
IPL-0706	IL-0706	IL-0705	15.6	15.6	3.6	12 inch	59	0.0102	77.50	76.90	79.97	79.95	91.23	79.95	**ABOVE RIM**	1.5	19.8
IPL-0705	IL-0705	IL-0704	15.5	15.4	1.0	12 inch	218	0.0007	76.90	76.74	79.95	80.02	121.50	80.02	**ABOVE RIM**	2.1	19.8
IPL-0704	IL-0704	IL-0703	71.5	68.0	5.1	18 inch	343	0.0023	76.74	75.94	80.02	79.55	238.45	79.55	**ABOVE RIM**	1.8	40.5
IPL-0703	IL-0703	IL-0702	75.8	68.8	15.3	18 inch	92	0.0211	75.94	74.00	79.55	79.17	127.04	79.17	**ABOVE RIM**	2.1	42.9
IPL-070202	IL-070202	IL-070201	0.0	6.9	1.8	12 inch	314	0.0026	75.00	74.19	77.82	78.90	78.90	78.90	**ABOVE RIM**	1.8	0.0
IPL-070201	IL-070201	IL-0702	0.0	6.5	2.5	12 inch	39	0.0049	74.19	74.00	78.90	79.17	79.17	79.17	**ABOVE RIM**	3.7	0.0
IPL-0702	IL-0702	IL-0701	75.6	73.9	5.8	18 inch	217	0.0030	74.00	73.34	79.17	78.44	190.93	78.44	**ABOVE RIM**	3.7	42.8
IPL-0701	IL-0701	IT-07	75.3	71.3	29.0	18 inch	51	0.0763	73.34	69.45	78.44	77.99	104.20	77.99	**ABOVE RIM**	3.6	42.6

1/ Discharge and velocity are calculated using time of concentration with all flow in pipe.
2/ Discharge for proposed conditions.

Table D.I1.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA I
Existing Hydraulics: 10-Year Event with Outfall water level = 73.6 ft

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Total Discharge (cfs) 2/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity 1/ (ft/s)
									Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
IPT-29	IT-29	IT-28	3.9	3.9	1.9	12 inch	139	0.0029	98.40	98.00	101.92	100.92	102.57	100.92	**ABOVE RIM**	2.5	4.9
IPT-28	IT-28	IT-27	3.8	3.7	2.8	12 inch	164	0.0061	98.00	97.00	100.92	101.48	103.33	101.48	**ABOVE RIM**	1.9	4.8
IPT-27	IT-27	IT-26	3.7	3.6	3.4	12 inch	401	0.0092	97.00	93.30	101.48	98.77	103.05	98.77	**ABOVE RIM**	3.5	4.7
IPT-26	IT-26	IT-25	6.3	6.1	3.7	12 inch	250	0.0107	93.30	90.62	98.77	96.51	104.32	96.51	**ABOVE RIM**	4.5	8.0
IPT-25	IT-25	IT-24	9.4	9.0	0.0	12 inch	360	0.0000	90.62	90.62	96.51	95.00	120.16	95.00	**ABOVE RIM**	4.9	12.0
IPT-24	IT-24	IT-23	10.7	10.1	3.3	12 inch	119	0.0087	90.62	89.59	95.00	95.00	105.81	95.00	**ABOVE RIM**	3.4	13.7
IPT-23	IT-23	IT-22	12.4	11.4	2.3	12 inch	378	0.0042	89.59	88.00	95.00	94.33	139.77	94.33	**ABOVE RIM**	4.4	15.7
IPT-22	IT-22	IT-21	13.1	11.6	2.3	15 inch	300	0.0013	88.00	87.61	94.33	93.18	105.57	93.18	**ABOVE RIM**	5.1	10.7
IPT-21	IT-21	IT-20	13.7	12.0	5.0	15 inch	253	0.0060	87.61	86.09	93.18	91.78	103.16	91.78	**ABOVE RIM**	4.3	11.2
IPT-20	IT-20	IT-19	15.1	13.1	5.4	15 inch	184	0.0069	86.09	84.82	91.78	90.34	100.41	90.34	**ABOVE RIM**	4.4	12.3
IPT-19	IT-19	IT-18	15.0	12.9	10.7	15 inch	114	0.0275	84.82	81.69	90.34	90.00	96.13	90.00	**ABOVE RIM**	4.3	12.2
IPT-18	IT-18	IT-17	15.8	13.6	3.8	15 inch	145	0.0034	81.69	81.20	90.00	88.94	97.61	88.94	**ABOVE RIM**	7.1	12.9
IPT-17	IT-17	IT-16	57.9	47.3	4.3	18 inch	270	0.0017	81.20	80.75	88.94	87.02	168.92	87.02	**ABOVE RIM**	6.2	32.7
IPT-16	IT-16	IT-15	61.2	49.5	11.5	18 inch	396	0.0120	80.75	76.00	87.02	84.85	219.19	84.85	**ABOVE RIM**	4.8	34.6
IPT-15	IT-15	IT-14	65.3	52.0	5.8	18 inch	178	0.0030	76.00	75.46	84.85	83.98	152.83	83.98	**ABOVE RIM**	7.4	37.0
IPT-14	IT-14	IT-13	68.4	54.1	6.4	18 inch	570	0.0036	75.46	73.38	83.98	80.00	321.79	80.00	**ABOVE RIM**	7.0	38.7
IPT-13	IT-13	IT-12	75.0	57.8	7.1	24 inch	812	0.0010	73.38	72.57	80.00	79.48	168.82	79.48	**ABOVE RIM**	4.6	23.9
IPT-12	IT-12	IT-11	83.8	62.7	7.3	24 inch	368	0.0010	72.57	72.19	79.48	77.81	128.30	77.81	**ABOVE RIM**	4.9	26.7
IPT-11	IT-11	IT-10	83.5	61.9	7.8	24 inch	51	0.0012	72.19	72.13	77.81	77.32	84.27	77.32	**ABOVE RIM**	3.6	26.6
IPT-10	IT-10	IT-09	83.5	61.7	14.1	24 inch	206	0.0039	72.13	71.33	77.32	76.95	105.00	76.95	**ABOVE RIM**	3.2	26.6
IPT-09	IT-09	IT-08	85.6	63.0	12.4	24 inch	70	0.0030	71.33	71.12	76.95	76.92	86.95	76.92	**ABOVE RIM**	3.6	27.3
IPT-08	IT-08	IT-07	88.4	64.8	13.7	24 inch	455	0.0037	71.12	69.45	76.92	77.99	147.46	77.99	**ABOVE RIM**	3.8	28.1
IPT-07	IT-07	IT-06	136.3	99.6	0.0	30 inch	98	0.0000	69.45	69.45	77.99	77.92	88.74	77.92	**ABOVE RIM**	6.0	27.8
IPT-06	IT-06	IT-05	136.1	99.1	9.3	30 inch	412	0.0005	69.45	69.24	77.92	76.18	121.55	76.18	**ABOVE RIM**	6.0	27.7
IPT-05	IT-05	IT-04	135.4	96.9	9.2	30 inch	536	0.0005	69.24	68.97	76.18	78.01	136.39	78.01	**ABOVE RIM**	4.4	27.6
IPT-04	IT-04	IT-03	139.8	97.9	9.2	30 inch	79	0.0005	68.97	68.93	78.01	78.24	87.42	78.24	**ABOVE RIM**	6.5	28.5
IPT-03	IT-03	IT-02	143.8	100.4	9.2	30 inch	678	0.0005	68.93	68.59	78.24	82.58	165.96	82.58	**ABOVE RIM**	6.8	29.3
IPT-02	IT-02	IT-01	142.6	97.2	24.0	30 inch	41	0.0034	68.59	68.45	82.58	82.20	84.15	79.19	**ABOVE RIM**	11.5	29.1
IPT-01	IT-01	I-Outfall	142.9	97.1	7.9	30 inch	27	0.0004	68.45	68.44	82.20	86.40	76.88	73.60	5.3	11.3	29.1

1/ Discharge and velocity are calculated using time of concentration with all flow in pipe.
2/ Discharge for proposed conditions.

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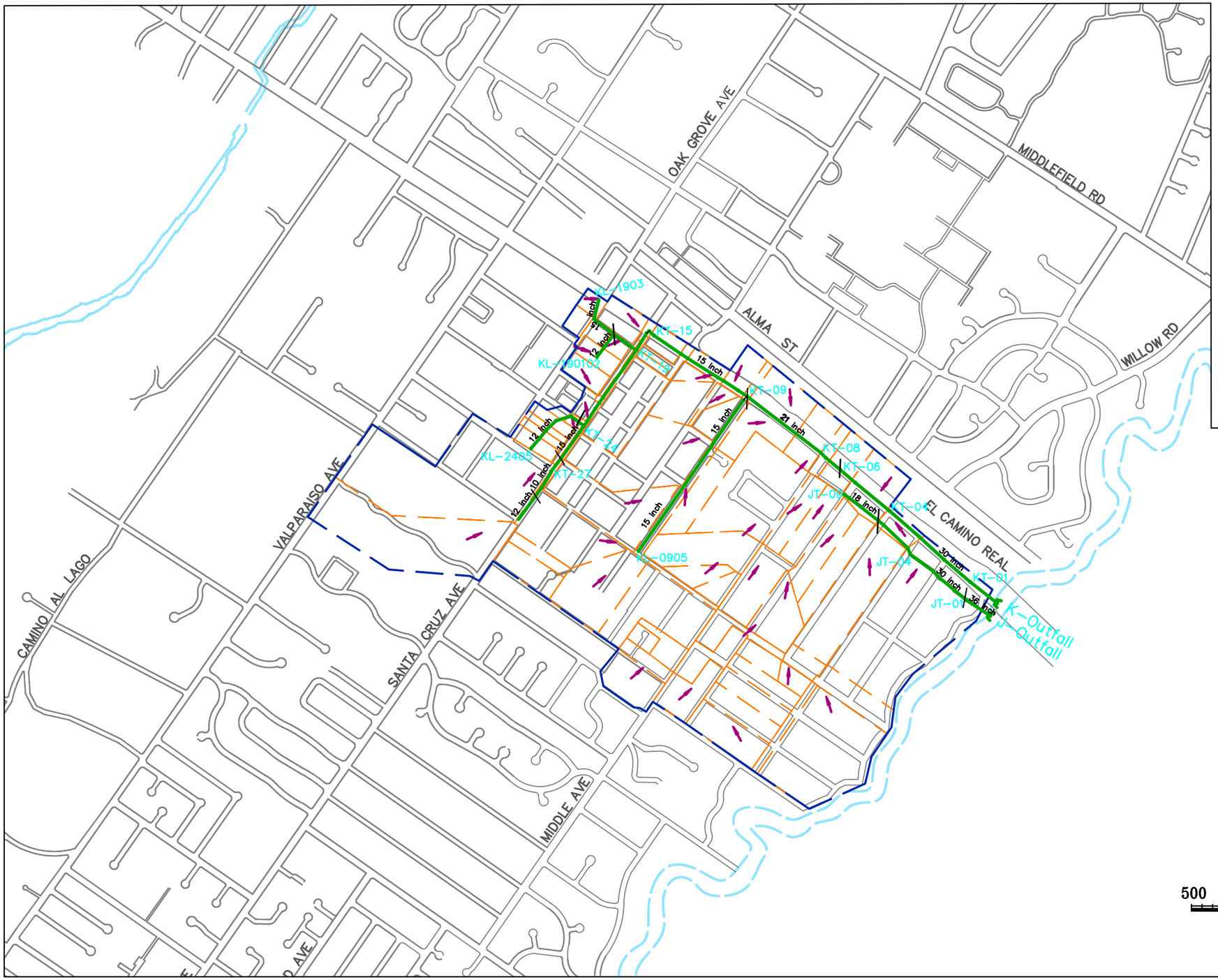
Table D.I2.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA I
Existing Hydrology: 10-Year Event

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
IL-1801	89.50	84.08	1.66		0.40	0.66			10	10.0	1.69	1.1
IL-1710	94.17	88.20	1.43		0.40	0.57			10	10.0	1.69	1.0
IL-1709	94.00	88.00	0.00		0.40	0.00			10	10.3	1.67	1.0
IL-1708	90.00	86.20	0.00		0.00	0.00			10	15.4	1.34	0.8
IL-170707	94.44	88.00	27.58		0.33	9.10			10	10.0	1.69	15.5
IL-170706	91.36	86.92	1.26		0.40	0.50			10	10.1	1.68	16.2
IL-170705	89.64	86.20	0.00		0.00	0.00			10	10.3	1.66	16.1
IL-170704	89.73	86.10	0.00		0.00	0.00			10	10.3	1.66	16.1
IL-170703	90.00	86.00	7.04		0.40	2.82			10	10.4	1.66	20.8
IL-170702	88.56	84.35	12.38		0.45	5.57			10	10.6	1.64	29.7
IL-170701	87.39	84.00	0.00		0.00	0.00			10	10.6	1.64	29.7
IL-1707	88.35	83.76	1.60		0.40	0.64			10	20.0	1.17	22.6
IL-1706	87.55	83.90	0.00		0.00	0.00			10	20.1	1.16	22.5
IL-1705	85.56	82.60	30.41		0.40	12.16			10	20.4	1.15	36.5
IL-1704	85.24	82.45	0.00		0.00	0.00			10	20.5	1.15	36.5
IL-1703	86.10	82.23	3.66		0.40	1.46			10	20.7	1.15	37.9
IL-1702	85.00	81.95	7.48		0.40	2.99			10	21.0	1.14	41.1
IL-1701	88.68	81.24	7.90		0.40	3.16			10	21.7	1.12	43.9
IL2-120103	81.33	76.00	4.42		0.40	1.77			10	10.0	1.69	3.0
IL2-120102	81.06	75.00	1.72		0.40	0.69			10	10.4	1.65	4.1
IL2-120101	80.62	74.97	0.00		0.00	0.00			10	10.9	1.61	4.0
IL1-120102	80.21	77.85	1.11		0.40	0.44			10	10.0	1.69	0.8
IL1-120101	80.25	75.40	0.77		0.40	0.31			10	11.2	1.59	1.2
IL-1201	79.46	73.68	1.71		0.40	0.68			10	12.2	1.52	6.0
IL-0901	76.22	71.52	4.46		0.50	2.23			10	10.0	1.69	3.8
IL-0801	77.19	71.30	7.10		0.37	2.66			10	10.0	1.69	4.5
IL-0706	79.97	77.50	22.89		0.40	9.16			10	10.0	1.69	15.6
IL-0705	79.95	76.90	0.00		0.00	0.00			10	10.1	1.68	15.5
IL-0704	80.02	76.74	83.44		0.40	33.38			10	10.2	1.67	71.5
IL-0703	79.55	75.94	7.18		0.40	2.87			10	10.4	1.66	75.8
IL-070202	77.82	75.00	10.13		0.00	0.00			10	10.0	0.00	0.0
IL-070201	78.90	74.19	0.00		0.00	0.00			10	10.0	0.00	0.0
IL-0702	79.17	74.00	0.00		0.00	0.00			10	10.4	1.65	75.6
IL-0701	78.44	73.34	0.00		0.00	0.00			10	10.5	1.65	75.3

Table D.I2.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA I
Existing Hydrology: 10-Year Event

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
IT-29	101.92	98.40	5.70		0.40	2.28	5.70	2.28	10	10.0	1.69	3.9
IT-28	100.92	98.00	0.00		0.00	0.00	5.70	2.28	10	10.5	1.65	3.8
IT-27	101.48	97.00	0.00		0.00	0.00	5.70	2.28	10	11.0	1.60	3.7
IT-26	98.77	93.30	4.70		0.40	1.88	10.40	4.16	10	12.5	1.50	6.3
IT-25	96.51	90.62	5.50		0.40	2.20	15.90	6.36	10	13.0	1.47	9.4
IT-24	95.00	90.62	2.60		0.40	1.04	18.50	7.4	10	13.5	1.44	10.7
IT-23	95.00	89.59	2.90		0.40	1.16	21.40	8.56	10	13.6	1.43	12.4
IT-22	94.33	88.00	1.70		0.40	0.68	23.10	9.24	10	14.0	1.41	13.1
IT-21	93.18	87.61	1.43		0.40	0.57	24.53	9.81	10	14.5	1.39	13.7
IT-20	91.78	86.09	2.90		0.40	1.16	27.43	10.97	10	14.9	1.37	15.1
IT-19	90.34	84.82	0.00		0.00	0.00	27.43	10.97	10	15.1	1.35	15.0
IT-18	90.00	81.69	0.00	1.66	0.00	0.00	29.09	11.64	10	15.3	1.35	15.8
IT-17	88.94	81.20	3.18	100.74	0.40	1.27	133.01	51.89	10	22.1	1.11	57.9
IT-16	87.02	80.75	7.92		0.40	3.17	140.93	55.06	10	22.3	1.10	61.2
IT-15	84.85	76.00	10.00		0.40	4.00	150.93	59.06	10	22.4	1.10	65.3
IT-14	83.98	75.46	6.92		0.42	2.91	157.85	61.97	10	22.5	1.10	68.4
IT-13	80.00	73.38	15.98		0.40	6.39	173.83	68.36	10	22.8	1.09	75.0
IT-12	79.48	72.57	11.37	9.73	0.45	5.09	194.93	77.34	10	23.3	1.07	83.8
IT-11	77.81	72.19	0.41		0.40	0.16	195.34	77.51	10	23.6	1.07	83.5
IT-10	77.32	72.13	0.00		0.00	0.00	195.34	77.51	10	23.6	1.07	83.5
IT-09	76.95	71.33	0.00	4.46	0.00	0.00	199.80	79.74	10	23.7	1.07	85.6
IT-08	76.92	71.12	0.00	7.10	0.00	0.00	206.90	82.39	10	23.8	1.06	88.4
IT-07	77.99	69.45	0.00	123.64	0.00	0.00	330.54	127.8	10	24.0	1.06	136.3
IT-06	77.92	69.45	0.00		0.00	0.00	330.54	127.8	10	24.1	1.06	136.1
IT-05	76.18	69.24	0.00		0.40	0.00	330.54	127.8	10	24.3	1.05	135.4
IT-04	78.01	68.97	12.78		0.40	5.11	343.32	132.91	10	24.7	1.04	139.8
IT-03	78.24	68.93	9.94		0.40	3.98	353.26	136.89	10	24.7	1.04	143.8
IT-02	82.58	68.59	0.00		0.40	0.00	353.26	136.89	10	25.1	1.03	142.6
IT-01	82.20	68.45	0.73		0.40	0.29	353.99	137.18	10	25.1	1.03	142.9
I-Outfall	86.40	68.44	0.00		0.00	0.00	353.99	137.18	0	25.1	1.03	142.8



AREA JK SYSTEM

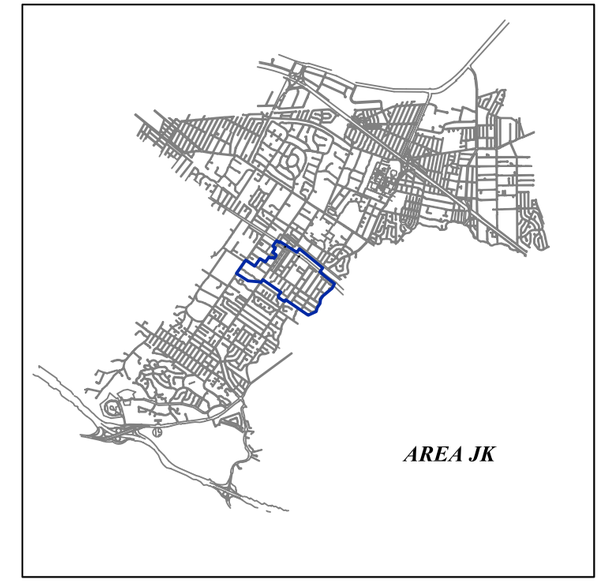


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Table D.JK1.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREAS JK
Existing Hydraulics: 10-Year Event with Outfall water level J = 62 ft and K = 61.8 ft

Storm Drain System	Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Total Discharge (cfs) 2/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s) 1/
										Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
J	JPT-09	JT-09	JT-08	6.2	6.2	0.8	18 inch	46	0.0002	57.72	57.71	62.04	62.03	62.57	62.03	**ABOVE RIM**	2.8	41.6
J	JPT-08	JT-08	JT-07	29.4	29.4	2.1	18 inch	363	0.0014	57.71	57.21	62.03	61.89	159.01	61.89	**ABOVE RIM**	2.8	52.6
J	JPT-07	JT-07	JT-06	35.1	34.0	16.1	30 inch	61	0.0052	57.21	56.89	61.89	61.57	63.10	61.57	**ABOVE RIM**	2.2	52.5
J	JPT-06	JT-06	JT-05	44.6	43.0	22.4	30 inch	334	0.0102	56.89	53.50	61.57	61.03	74.46	61.03	**ABOVE RIM**	2.2	52.4
J	JPT-05	JT-05	JT-04	43.3	40.7	11.9	30 inch	35	0.0029	53.50	53.40	61.03	60.88	62.21	60.88	**ABOVE RIM**	5.0	58.2
J	JPT-04	JT-04	JT-03	43.1	40.5	2.9	30 inch	299	0.0002	53.40	53.35	60.88	62.00	73.26	62.00	**ABOVE RIM**	5.0	64.1
J	JPT-03	JT-03	JT-02	42.0	38.7	22.5	36 inch	36	0.0039	53.35	53.21	62.00	63.21	63.70	63.21	**ABOVE RIM**	5.7	53.5
J	JPT-02	JT-02	JT-01	73.7	67.7	16.2	36 inch	229	0.0020	53.21	52.75	63.21	67.32	76.85	67.32	**ABOVE RIM**	7.0	59.9
J	JPT-01	JT-01	J-Outfall	72.5	66.3	16.9	36 inch	342	0.0022	52.75	52.00	67.32	55.00	75.78	62.00	**ABOVE RIM**	11.6	59.9
K	KPL-2405	KL-2405	KL-2404	28.6	28.6	1.6	12 inch	111	0.0020	72.58	72.36	75.13	75.00	146.27	75.00	**ABOVE RIM**	1.6	36.4
K	KPL-2404	KL-2404	KL-2403	28.5	27.9	1.6	12 inch	104	0.0021	72.36	72.14	75.00	75.00	141.41	75.00	**ABOVE RIM**	1.6	36.3
K	KPL-2403	KL-2403	KL-2402	28.4	27.3	1.2	12 inch	140	0.0012	72.14	71.97	75.00	74.06	163.01	74.06	**ABOVE RIM**	1.9	36.2
K	KPL-2402	KL-2402	KL-2401	28.3	26.5	1.5	12 inch	139	0.0017	71.97	71.74	74.06	74.03	161.74	74.03	**ABOVE RIM**	1.1	36.0
K	KPL-2401	KL-2401	KT-24	28.2	25.8	1.9	12 inch	119	0.0029	71.74	71.40	74.03	74.78	149.37	74.78	**ABOVE RIM**	1.3	35.9
K	KPL-1903	KL-1903	KL-1902	1.5	1.5	3.0	15 inch	137	0.0021	66.69	66.40	69.13	69.15	68.66	68.59	0.5	1.2	1.2
K	KPL-1902	KL-1902	KL-1901	1.4	1.4	0.0	15 inch	229	0.0000	66.40	66.40	69.15	68.47	68.57	68.47	0.6	1.5	1.1
K	KPL-190102	KL-190102	KL-190101	4.3	4.3	2.1	12 inch	151	0.0033	67.40	66.90	69.69	69.69	71.88	69.69	**ABOVE RIM**	1.3	5.5
K	KPL-190101	KL-190101	KL-1901	4.2	4.2	2.0	12 inch	153	0.0033	66.90	66.40	69.69	68.47	70.58	68.47	**ABOVE RIM**	1.8	5.3
K	KPL-1901	KL-1901	KT-19	4.6	4.7	2.3	15 inch	214	0.0013	66.40	66.12	68.47	69.85	70.94	69.85	**ABOVE RIM**	0.8	3.8
K	KPL-0905	KL-0905	KL-0904	20.9	20.9	4.1	15 inch	746	0.0040	67.98	64.98	72.54	69.23	147.61	69.23	**ABOVE RIM**	3.3	17.1
K	KPL-0904	KL-0904	KL-0903	37.3	32.1	4.1	15 inch	417	0.0041	64.98	63.28	69.23	66.78	205.56	66.78	**ABOVE RIM**	3.0	30.4
K	KPL-0903	KL-0903	KL-0902	40.5	33.4	4.1	15 inch	35	0.0040	63.28	63.14	66.78	66.64	80.41	66.64	**ABOVE RIM**	2.3	33.0
K	KPL-0902	KL-0902	KL-0901	61.6	50.7	4.0	15 inch	536	0.0039	63.14	61.05	66.64	65.00	552.77	65.00	**ABOVE RIM**	2.3	50.2
K	KPL-0901	KL-0901	KT-09	61.1	48.2	-18.0	15 inch	23	- 0.0774	61.05	62.83	65.00	65.00	85.57	65.00	**ABOVE RIM**	2.7	49.8

1/ Discharge and velocity are calculated using time of concentration with all flow in pipe.
2/ Discharge is calculated using proposed conditions.

Table D.JK1.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREAS JK
Existing Hydraulics: 10-Year Event with Outfall water level J = 62 ft and K = 61.8 ft

Storm Drain System	Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Total Discharge (cfs) 2/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s) 1/
										Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
K	KPT-26	KT-27	KT-26	19.3	19.3	3.0	15 inch	94	0.0021	73.00	72.80	76.02	76.04	84.39	76.04	**ABOVE RIM**	1.8	15.7
K	KPT-25	KT-26	KT-25	19.1	18.9	3.3	15 inch	300	0.0027	72.80	72.00	76.04	75.13	101.48	75.13	**ABOVE RIM**	2.0	15.6
K	KPT-24	KT-25	KT-24	19.1	17.9	5.0	15 inch	100	0.0060	72.00	71.40	75.13	74.78	83.48	74.78	**ABOVE RIM**	1.9	15.5
K	KPT-23	KT-24	KT-23	47.1	42.7	4.5	15 inch	41	0.0049	71.40	71.20	74.78	74.65	96.49	74.65	**ABOVE RIM**	2.1	38.4
K	KPT-22	KT-23	KT-22	47.1	42.5	5.1	15 inch	159	0.0062	71.20	70.22	74.65	73.73	158.26	73.73	**ABOVE RIM**	2.2	38.4
K	KPT-21	KT-22	KT-21	47.7	42.4	4.9	15 inch	92	0.0057	70.22	69.70	73.73	72.93	123.11	72.93	**ABOVE RIM**	2.3	38.9
K	KPT-20	KT-21	KT-20	47.6	42.0	4.5	15 inch	41	0.0049	69.70	69.50	72.93	72.61	94.89	72.61	**ABOVE RIM**	2.0	38.8
K	KPT-19	KT-20	KT-19	50.6	44.5	5.0	15 inch	568	0.0060	69.50	66.12	72.61	69.85	418.64	69.85	**ABOVE RIM**	1.9	41.3
K	KPT-18	KT-19	KT-18	47.3	45.7	2.4	15 inch	181	0.0014	66.12	65.87	69.85	69.60	166.61	69.60	**ABOVE RIM**	2.5	38.5
K	KPT-17	KT-18	KT-17	50.4	48.1	-20.5	15 inch	11	- 0.1009	65.87	66.98	69.60	69.50	76.19	69.50	**ABOVE RIM**	2.5	41.0
K	KPT-16	KT-17	KT-16	51.1	48.7	3.6	15 inch	49	0.0031	66.98	66.83	69.50	69.44	100.10	69.44	**ABOVE RIM**	1.3	41.6
K	KPT-15	KT-16	KT-15	51.1	48.5	2.4	15 inch	350	0.0014	66.83	66.33	69.44	69.02	287.74	69.02	**ABOVE RIM**	1.4	41.6
K	KPT-14	KT-15	KT-13	64.5	59.8	4.6	15 inch	68	0.0051	66.33	65.98	69.02	69.25	137.07	69.25	**ABOVE RIM**	1.4	52.6
K	KPT-13	KT-13	KT-12	64.5	59.5	4.1	15 inch	329	0.0040	65.98	64.68	69.25	67.70	395.36	67.70	**ABOVE RIM**	2.0	52.5
K	KPT-12	KT-12	KT-11	64.3	58.3	4.6	15 inch	90	0.0050	64.68	64.23	67.70	66.82	155.85	66.82	**ABOVE RIM**	1.8	52.4
K	KPT-11	KT-11	KT-10	71.5	64.6	5.1	15 inch	194	0.0062	64.23	63.03	66.82	65.00	302.54	65.00	**ABOVE RIM**	1.3	58.2
K	KPT-10	KT-10	KT-09	78.6	70.2	4.1	15 inch	51	0.0039	63.03	62.83	65.00	65.00	140.52	65.00	**ABOVE RIM**	0.7	64.1
K	KPT-09	KT-09	KT-08	128.8	114.8	11.9	21 inch	788	0.0056	62.83	58.39	65.00	62.42	582.93	62.42	**ABOVE RIM**	0.4	53.5
K	KPT-08	KT-08	KT-07	144.1	121.9	-10.9	21 inch	82	- 0.0048	58.39	58.78	62.42	62.27	130.11	62.27	**ABOVE RIM**	2.3	59.9
K	KPT-07	KT-07	KT-06	144.0	121.2	13.2	21 inch	86	0.0070	58.78	58.18	62.27	62.19	133.24	62.19	**ABOVE RIM**	1.7	59.9
K	KPT-06	KT-06	KT-05	172.4	144.2	34.1	30 inch	297	0.0069	58.18	56.13	62.19	62.04	114.49	62.04	**ABOVE RIM**	1.5	35.1
K	KPT-05	KT-05	KT-04	175.5	144.9	16.2	30 inch	417	0.0016	56.13	55.48	62.04	62.14	138.53	62.14	**ABOVE RIM**	3.4	35.8
K	KPT-04	KT-04	KT-03	180.6	146.2	16.0	30 inch	230	0.0015	55.48	55.13	62.14	62.02	106.60	62.02	**ABOVE RIM**	4.2	36.8
K	KPT-03	KT-03	KT-02	182.2	146.1	11.3	30 inch	197	0.0008	55.13	54.98	62.02	61.91	100.81	61.91	**ABOVE RIM**	4.4	37.1
K	KPT-02	KT-02	KT-01	181.8	144.5	13.5	30 inch	510	0.0011	54.98	54.43	61.91	67.78	167.93	67.78	**ABOVE RIM**	4.4	37.0
K	KPT-01	KT-01	K-Outfall	180.5	140.9	12.6	30 inch	394	0.0009	54.43	54.06	67.78	66.10	138.11	61.80	**ABOVE RIM**	10.9	36.8

1/ Discharge and velocity are calculated using time of concentration with all flow in pipe.
2/ Discharge is calculated using proposed conditions.

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Table D.JK2.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREAS D.JK2.1
Existing Hydrology: 10-Year Event

Storm Drain System	Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge 1/ (cfs)
J	JT-09	62.04	57.72	9.04		0.40	3.62	9.04	3.62	10	10	1.69	6.2
J	JT-08	62.03	57.71	34.70		0.40	13.88	43.74	17.50	10	10.22	1.67	29.4
J	JT-07	61.89	57.21	9.45		0.40	3.78	53.19	21.28	10	10.58	1.64	35.1
J	JT-06	61.57	56.89	14.75		0.40	5.90	67.94	27.18	10	10.73	1.63	44.6
J	JT-05	61.03	53.50	0.00		0.00	0.00	67.94	27.18	10	11.34	1.58	43.3
J	JT-04	60.88	53.40	0.00		0.00	0.00	67.94	27.18	10	11.41	1.57	43.1
J	JT-03	62.00	53.35	0.00		0.00	0.00	67.94	27.18	10	11.97	1.53	42.0
J	JT-02	63.21	53.21	51.74		0.40	20.70	119.68	47.87	10	12.07	1.53	73.7
J	JT-01	67.32	52.75	0.00		0.00	0.00	119.68	47.87	10	12.44	1.5	72.5
J	J-Outfall	55.00	52.00	0.00		0.00	0.00	119.68	47.87	0	13	1.47	70.9
K	KL-2405	75.13	72.58	33.55		0.50	16.77		16.77	10	10	1.69	28.6
K	KL-2404	75.00	72.36	0.00		0.00	0.00		16.77	10	10.05	1.68	28.5
K	KL-2403	75.00	72.14	0.00		0.00	0.00		16.77	10	10.1	1.68	28.4
K	KL-2402	74.06	71.97	0.00		0.00	0.00		16.77	10	10.16	1.67	28.3
K	KL-2401	74.03	71.74	0.00		0.00	0.00		16.77	10	10.23	1.67	28.2
K	KL-1903	69.13	66.69	1.75		0.50	0.88		0.88	10	10	1.69	1.5
K	KL-1902	69.15	66.40	0.00		0.00	0.00		0.88	10	11.88	1.54	1.4
K	KL-190102	69.69	67.40	2.80		0.90	2.52		2.52	10	10	1.69	4.3
K	KL-190101	69.69	66.90	0.00		0.00	0.00		2.52	10	10.46	1.65	4.2
K	KL-1901	68.47	66.40	0.00		0.00	0.00		3.40	10	15.33	1.34	4.6
K	KL-0905	72.54	67.98	25.11		0.49	12.30		12.30	10	10	1.69	20.9
K	KL-0904	69.23	64.98	11.59		0.90	10.43		22.73	10	10.73	1.63	37.3
K	KL-0903	66.78	63.28	4.23		0.54	2.27		25.00	10	10.96	1.61	40.5
K	KL-0902	66.64	63.14	14.50		0.90	13.05		38.05	10	10.98	1.61	61.6
K	KL-0901	65.00	61.05	0.00		0.00	0.00		38.05	10	11.15	1.59	61.1

1/ Discharge, velocity and time of concentration are based on all flow in pipe.

Table D.JK2.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREAS D.JK2.2
Existing Hydrology: 10-Year Event

Storm Drain System	Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge 1/ (cfs)
K	KT-27	76.02	73.00	21.75		0.52	11.31	21.75	11.31	10	10	1.69	19.3
K	KT-26	76.04	72.80	0.00		0.00	0.00	21.75	11.31	10	10.1	1.68	19.1
K	KT-25	75.13	72.00	0.15		0.90	0.14	21.90	11.45	10	10.42	1.65	19.1
K	KT-24	74.78	71.40	0.28	33.55	0.90	0.25	55.73	28.47	10	10.53	1.64	47.1
K	KT-23	74.65	71.20	0.00		0.00	0.00	55.73	28.47	10	10.55	1.64	47.1
K	KT-22	73.73	70.22	0.52		0.90	0.47	56.25	28.94	10	10.61	1.64	47.7
K	KT-21	72.93	69.70	0.00		0.00	0.00	56.25	28.94	10	10.65	1.63	47.6
K	KT-20	72.61	69.50	2.06		0.90	1.85	58.31	30.79	10	10.67	1.63	50.6
K	KT-19	69.85	66.12	2.05	4.55	0.90	1.84	64.91	36.03	10	16.28	1.3	47.3
K	KT-18	69.60	65.87	2.71		0.90	2.44	67.62	38.47	10	16.36	1.3	50.4
K	KT-17	69.50	66.98	0.63		0.90	0.57	68.25	39.04	10	16.36	1.3	51.1
K	KT-16	69.44	66.83	0.00		0.00	0.00	68.25	39.04	10	16.38	1.3	51.1
K	KT-15	69.02	66.33	11.67		0.90	10.50	79.92	49.54	10	16.52	1.29	64.5
K	KT-13	69.25	65.98	0.00		0.00	0.00	79.92	49.54	10	16.55	1.29	64.5
K	KT-12	67.70	64.68	0.00		0.00	0.00	79.92	49.54	10	16.65	1.29	64.3
K	KT-11	66.82	64.23	6.25		0.90	5.63	86.17	55.17	10	16.68	1.29	71.5
K	KT-10	65.00	63.03	6.23		0.90	5.61	92.40	60.78	10	16.73	1.28	78.6
K	KT-09	65.00	62.83	0.87	55.43	0.90	0.78	148.70	99.61	10	16.75	1.28	128.8
K	KT-08	62.42	58.39	14.15		0.90	12.74	162.85	112.35	10	16.99	1.27	144.1
K	KT-07	62.27	58.78	0.00		0.00	0.00	162.85	112.35	10	17.02	1.27	144.0
K	KT-06	62.19	58.18	44.42		0.50	22.21	207.27	134.56	10	17.04	1.27	172.4
K	KT-05	62.04	56.13	3.44		0.90	3.10	210.71	137.65	10	17.18	1.27	175.5
K	KT-04	62.14	55.48	5.32		0.90	4.79	216.03	142.44	10	17.37	1.26	180.6
K	KT-03	62.02	55.13	1.98		0.90	1.78	218.01	144.22	10	17.48	1.25	182.2
K	KT-02	61.91	54.98	0.00		0.00	0.00	218.01	144.22	10	17.57	1.25	181.8
K	KT-01	67.78	54.43	0.00		0.00	0.00	218.01	144.22	10	17.8	1.24	180.5
K	K-Outfall	66.10	54.06	0.00		0.00	0.00	218.01	144.22	0	17.98	1.24	179.5

1/ Discharge, velocity and time of concentration are based on all flow in pipe.

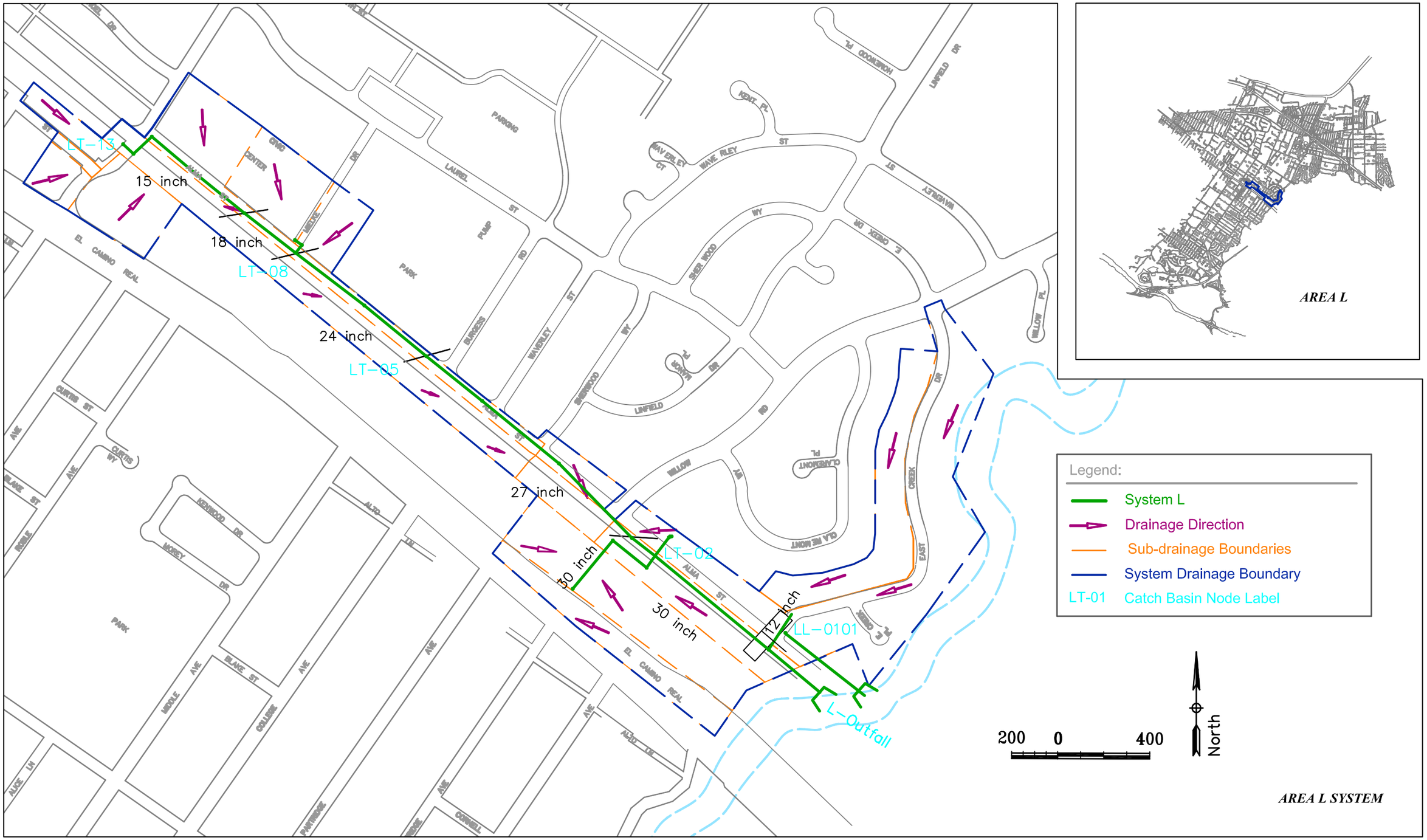

LT-13
15 inch
18 inch
LT-08
24 inch
LT-05
27 inch
30 inch
LT-02
30 inch
12 inch
LL-0101
L-Outfall
EL CAMINO REAL
LAUREL ST
PARKING
PUMP
PARK
BURGESS
WAVERLEY ST
SUNWOOD
LINFIELD DR
WAVERLEY ST
SHER WOOD WY
E. CREEK DR
LINFIELD DR
WILLOW PL
HOLLYWOOD PL
KENT PL
WAVERLEY CT
WAVERLEY ST
CLAREMONT PL
CLAREMONT
ALMA ST
CURTIS ST
BLAKE ST
ROBLE AVE
KENWOOD DR
MOREY DR
MIDDLE AVE
COLLEGE AVE
PARKRIDGE
CORNELL
ALTO DR
ALICE LN
EAST CREEK
Legend:
System L
Drainage Direction
Sub-drainage Boundaries
System Drainage Boundary
LT-01 Catch Basin Node Label
200 0 400
North
AREA L
AREA L SYSTEM

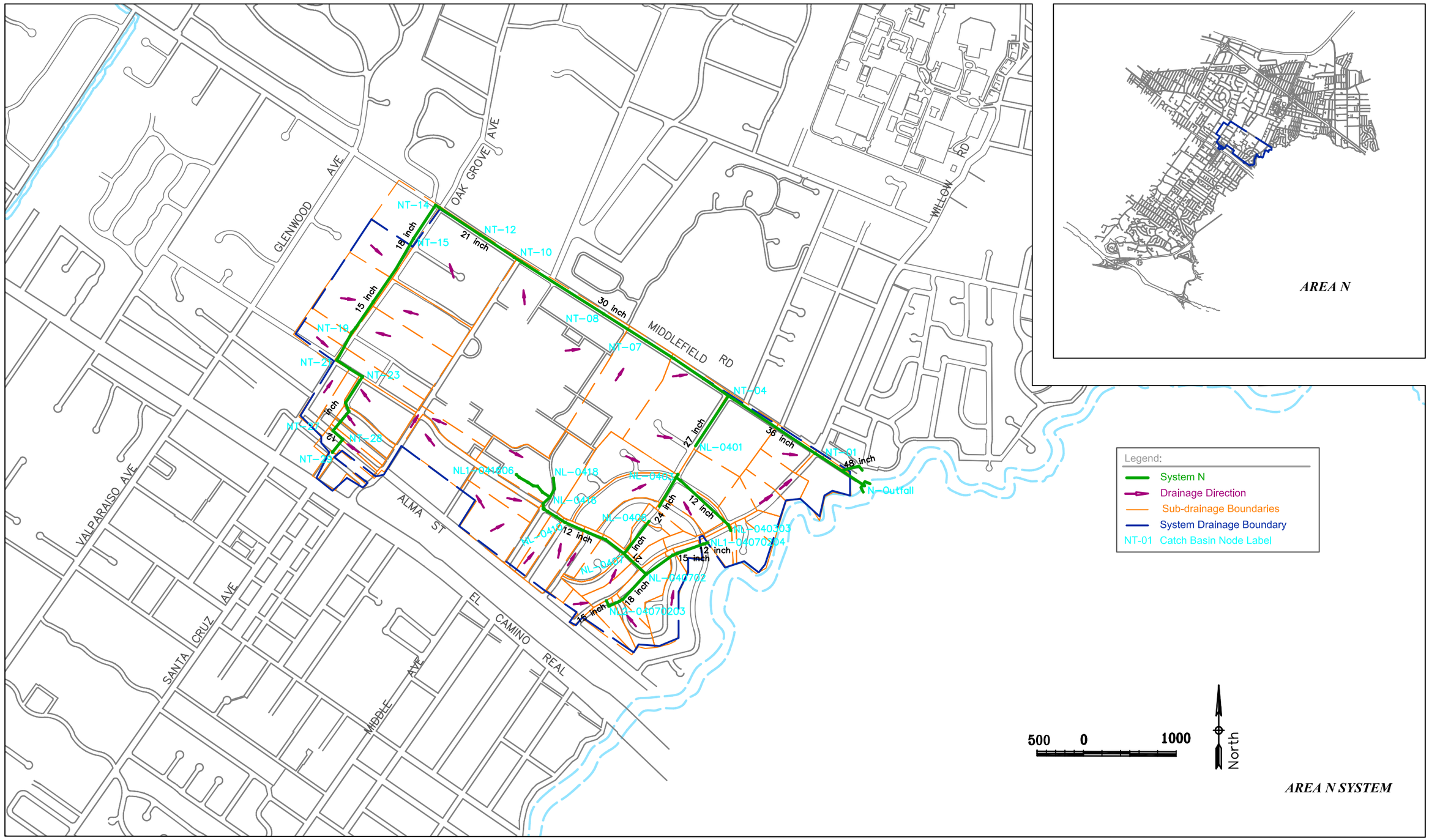
Table D.L1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA L
Existing Hydraulics: 10-Year Event with Outfall water level = 60.5 ft

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Total Discharge (cfs) 2/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s) 1/
									Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
LPL-0802	LL-0802	LL-0801	2.3	2.3	0.9	10 inch	54	0.0019	57.60	57.50	62.74	60.65	60.99	60.37	1.8	4.3	4.3
LPL-0801	LL-0801	LT-08	2.3	2.3	0.0	15 inch	74	0.0000	57.50	57.50	60.65	60.20	60.30	60.20	0.4	1.9	1.9
LPL2-0201	LL2-0201	LT-02	3.9	3.9	127.8	30 inch	100	0.0971	63.40	53.69	66.06	59.61	64.05	59.61	2.0	0.2	2.3
LPL1-0203	LL1-0203	LL1-0202	4.9	4.9	0.0	30 inch	272	0.0000	55.08	55.08	61.45	65.00	60.04	60.01	1.4	3.9	1.0
LPL1-0202	LL1-0202	LL1-0201	11.7	12.5	11.9	30 inch	189	0.0008	54.66	54.50	65.00	69.67	59.90	59.75	5.1	7.8	2.4
LPL1-0201	LL1-0201	LT-02	11.2	12.1	46.5	30 inch	63	0.0129	54.50	53.69	69.67	59.61	59.66	59.61	10.0	12.7	2.3
LPL-0101	LL-0101	LT-01	4.1	4.1	7.2	12 inch	215	0.0411	62.50	53.67	67.19	58.64	63.35	58.64	3.8	3.7	5.4
LPT-13	LT-13	LT-12	1.7	1.7	2.4	15 inch	67	0.0013	63.15	63.06	66.53	66.09	66.13	66.09	0.4	2.1	1.4
LPT-12	LT-12	LT-11	3.2	3.2	8.7	15 inch	115	0.0179	63.06	61.00	66.09	65.77	66.04	65.77	0.0	1.8	2.6
LPT-11	LT-11	LT-10	6.9	7.0	3.9	15 inch	211	0.0037	61.00	60.22	65.77	65.00	67.40	65.00	**ABOVE RIM**	3.5	5.6
LPT-10	LT-10	LT-09	12.9	12.9	3.9	15 inch	281	0.0037	60.22	59.18	65.00	64.93	76.09	64.93	**ABOVE RIM**	3.5	10.5
LPT-09	LT-09	LT-08	14.8	14.4	6.4	18 inch	453	0.0037	59.18	57.50	64.93	60.20	69.13	60.20	**ABOVE RIM**	4.3	8.4
LPT-08	LT-08	LT-07	16.6	16.0	15.3	24 inch	205	0.0046	57.50	56.56	60.20	60.00	61.10	60.00	**ABOVE RIM**	0.7	5.3
LPT-07	LT-07	LT-06	17.5	16.7	8.1	24 inch	348	0.0013	56.56	56.11	60.00	59.91	62.00	59.91	**ABOVE RIM**	1.4	5.6
LPT-06	LT-06	LT-05	18.4	17.3	13.0	24 inch	311	0.0033	56.11	55.09	59.91	57.90	59.96	57.90	**ABOVE RIM**	1.8	5.9
LPT-05	LT-05	LT-04	19.1	17.8	5.2	27 inch	430	0.0010	55.09	54.67	57.90	58.92	64.50	58.92	**ABOVE RIM**	0.6	4.8
LPT-04	LT-04	LT-03	19.7	18.2	5.3	27 inch	449	0.0010	54.67	54.22	58.92	59.39	65.58	59.39	**ABOVE RIM**	2.0	5.0
LPT-03	LT-03	LT-02	21.6	19.4	25.7	30 inch	135	0.0039	54.22	53.69	59.39	59.61	59.98	59.61	**ABOVE RIM**	2.7	4.4
LPT-02	LT-02	LT-01	37.4	33.5	2.3	30 inch	641	0.0000	53.69	53.67	59.61	58.64	63.96	58.64	**ABOVE RIM**	3.4	7.6
LPT-01	LT-01	L-Outfall	44.8	38.8	1.8	30 inch	309	0.0001	53.67	53.65	58.64	58.17	73.05	60.50	**ABOVE RIM**	2.5	9.1

1/ Discharge and velocity are calculated using time of concentration with all flow in pipes.
2/ Discharge is calculated using proposed system.

Table D.L2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA L
Existing Hydrology: 10-Year Event with Outfall water level = 60.5 ft

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
LL-0802	62.74	57.60	1.53		0.90	1.38			10	10.0	1.69	2.3
LL-0801	60.65	57.50	.00		0.90	0.00			10	10.2	1.67	2.3
LL2-0201	66.06	63.40	2.57		0.90	2.31			10	10.0	1.69	3.9
LL1-0203	61.45	55.08	3.22		0.90	2.90			10	10.0	1.69	4.9
LL1-0202	65.00	54.66	6.08		0.90	5.47			10	14.5	1.38	11.7
LL1-0201	69.67	54.50	.00		0.90	0.00			10	15.8	1.32	11.2
LL-0101	67.19	62.50	4.78		0.50	2.39			10	10.0	1.69	4.1
LT-13	66.53	63.15	1.09		0.90	0.98	1.09	0.98	10	10.0	1.69	1.7
LT-12	66.09	63.06	1.06		0.90	0.95	2.15	1.94	10	10.8	1.62	3.2
LT-11	65.77	61.00	2.71		0.90	2.44	4.86	4.37	10	11.6	1.56	6.9
LT-10	65.00	60.22	4.48		0.90	4.03	9.34	8.41	10	12.2	1.52	12.9
LT-09	64.93	59.18	1.57		0.90	1.41	10.91	9.82	10	12.6	1.49	14.8
LT-08	60.20	57.50	.30		0.90	0.27	11.21	11.47	10	13.5	1.44	16.6
LT-07	60.00	56.56	1.06	1.53	0.90	0.95	13.80	12.42	10	14.2	1.40	17.5
LT-06	59.91	56.11	1.25		0.90	1.12	15.05	13.55	10	15.2	1.35	18.4
LT-05	57.90	55.09	1.04		0.90	0.94	16.09	14.48	10	16.1	1.31	19.1
LT-04	58.92	54.67	1.29		0.90	1.16	17.38	15.64	10	17.6	1.25	19.7
LT-03	59.39	54.22	2.51		0.90	2.26	19.89	17.9	10	19.1	1.20	21.6
LT-02	59.61	53.69	3.19	11.87	0.90	2.87	34.95	31.46	10	19.6	1.18	37.4
LT-01	58.64	53.67	10.48	4.78	0.50	5.24	50.21	39.09	10	21.0	1.14	44.8
L-Outfall	58.17	53.65	.00		0.00	0.00	50.21	39.09	0	21.6	1.12	44.1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OAK GROVE AVE
WILLOW RD
MIDDLEFIELD RD
VALPARAISO AVE
SANTA CRUZ AVE
MIDDLE AVE
ALMA ST
EL CAMINO REAL
NT-14
NT-15
NT-12
NT-10
NT-08
NT-07
NT-04
NT-01
NT-19
NT-22
NT-23
NT-21
NT-28
NT-25
NL-0401
NL-0418
NL-0406
NL-040303
NL1-04070204
NL-040702
NL2-04070203
N-Outfall
18 inch
21 inch
30 inch
15 inch
12 inch
27 inch
36 inch
48 inch
24 inch
15 inch
18 inch
Legend:
System N
Drainage Direction
Sub-drainage Boundaries
System Drainage Boundary
NT-01 Catch Basin Node Label
500 0 1000
North
AREA N
AREA N SYSTEM

BkF

Table D.N1.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA N
Existing Hydraulics: 10-Year Event with Outfall water depth = 54.8 ft

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Total Discharge (cfs) 2/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s) 1/
									Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
NPL-0418	NL-0418	NL-0417	6.9	6.9	2.0	12 inch	114	0.0031	52.15	51.80	59.23	57.62	61.89	57.62	**ABOVE RIM**	6.1	2.0
NPL-0417	NL-0417	NL-0416	7.4	7.2	1.9	12 inch	103	0.0029	51.80	51.50	57.62	57.30	61.75	57.30	**ABOVE RIM**	4.8	2.9
NPL1-041606	NL1-041606	NL1-041605	6.4	5.1	2.8	12 inch	43	0.0060	54.17	53.91	60.61	60.75	62.13	60.75	**ABOVE RIM**	5.4	8.1
NPL1-041605	NL1-041605	NL1-041604	6.3	5.0	2.8	12 inch	109	0.0060	53.91	53.26	60.75	60.69	64.14	60.69	**ABOVE RIM**	5.8	8.1
NPL1-041604	NL1-041604	NL1-041603	6.3	4.9	2.8	12 inch	67	0.0060	53.26	52.86	60.69	59.93	62.00	59.93	**ABOVE RIM**	6.4	8.0
NPL1-041603	NL1-041603	NL1-041602	6.2	4.9	2.8	12 inch	47	0.0060	52.86	52.58	59.93	59.49	60.92	59.49	**ABOVE RIM**	6.1	7.9
NPL1-041602	NL1-041602	NL1-041601	6.2	4.8	2.7	12 inch	83	0.0059	52.58	52.09	59.49	58.33	60.84	58.33	**ABOVE RIM**	5.9	7.9
NPL1-041601	NL1-041601	NL-0416	6.1	4.7	2.8	12 inch	98	0.0060	52.09	51.50	58.33	57.30	60.21	57.30	**ABOVE RIM**	5.2	7.8
NPL-0416	NL-0416	NL-0415	13.2	10.1	3.2	12 inch	99	0.0080	51.50	50.71	57.30	57.08	70.70	57.08	**ABOVE RIM**	4.8	16.8
NPL-0415	NL-0415	NL-0414	14.1	10.7	-2.1	12 inch	57	-0.0033	50.71	50.90	57.08	56.76	65.66	56.76	**ABOVE RIM**	5.4	17.9
NPL-0414	NL-0414	NL-0413	17.3	13.0	1.5	12 inch	11	0.0018	50.90	50.88	56.76	56.64	59.23	56.64	**ABOVE RIM**	4.9	22.0
NPL-0413	NL-0413	NL-0412	21.6	16.2	3.3	12 inch	45	0.0084	50.88	50.50	56.64	56.32	72.82	56.32	**ABOVE RIM**	4.8	27.5
NPL-0412	NL-0412	NL-0411	22.9	17.1	0.8	12 inch	110	0.0005	50.50	50.45	56.32	55.35	100.61	55.35	**ABOVE RIM**	4.8	29.1
NPL-0411	NL-0411	NL-0410	26.0	19.3	1.3	12 inch	111	0.0014	50.45	50.30	55.35	55.00	114.11	55.00	**ABOVE RIM**	3.9	33.1
NPL-0410	NL-0410	NL-0409	25.9	19.0	2.5	12 inch	268	0.0049	50.30	49.00	55.00	54.80	196.76	54.80	**ABOVE RIM**	3.7	33.0
NPL-0409	NL-0409	NL-0408	29.3	21.0	1.6	12 inch	208	0.0020	49.00	48.58	54.80	54.38	195.21	54.38	**ABOVE RIM**	4.8	37.3
NPL-0408	NL-0408	NL-0407	30.8	21.8	2.5	12 inch	250	0.0050	48.58	47.32	54.38	54.75	241.72	54.75	**ABOVE RIM**	4.8	39.2
NPL2-04070204	NL2-04070204	NL2-04070203	1.1	1.1	10.0	15 inch	63	0.0238	53.50	52.00	57.08	57.08	57.10	57.08	**ABOVE RIM**	2.3	0.9
NPL2-04070203	NL2-04070203	NL2-04070202	2.1	2.1	7.0	18 inch	123	0.0044	52.00	51.46	57.08	57.28	57.33	57.28	**ABOVE RIM**	3.6	1.2
NPL2-04070202	NL2-04070202	NL2-04070201	3.5	3.6	10.0	18 inch	44	0.0091	51.46	51.06	57.28	57.65	57.70	57.65	**ABOVE RIM**	4.3	2.0
NPL2-04070201	NL2-04070201	NL-040702	5.2	5.4	10.9	18 inch	369	0.0108	51.06	47.09	57.65	57.19	58.08	57.19	**ABOVE RIM**	5.1	2.9
NPL1-04070204	NL1-04070204	NL1-04070203	0.9	0.9	3.1	12 inch	47	0.0077	52.14	51.78	57.81	57.46	55.22	55.19	2.6	4.7	1.2
NPL1-04070203	NL1-04070203	NL1-04070202	1.9	1.9	6.1	15 inch	303	0.0089	51.78	49.07	57.46	54.92	55.18	54.92	2.3	4.4	1.5
NPL1-04070202	NL1-04070202	NL1-04070201	5.5	5.5	7.0	18 inch	52	0.0044	49.07	48.84	54.92	54.87	55.01	54.87	**ABOVE RIM**	4.4	3.1
NPL1-04070201	NL1-04070201	NL-040702	5.4	5.4	7.4	18 inch	351	0.0050	48.84	47.09	54.87	57.19	58.13	57.19	**ABOVE RIM**	4.5	3.1
NPL-040702	NL-040702	NL-040701	15.1	15.1	-5.6	21 inch	282	-0.0012	47.09	47.44	57.19	54.84	57.41	54.84	**ABOVE RIM**	8.4	6.3
NPL-040701	NL-040701	NL-0407	16.3	15.9	8.4	21 inch	43	0.0028	47.44	47.32	54.84	54.75	55.21	54.75	**ABOVE RIM**	5.7	6.8
NPL-0407	NL-0407	NL-0406	43.2	36.8	11.3	21 inch	443	0.0051	47.32	45.05	54.75	51.82	84.78	51.82	**ABOVE RIM**	5.7	18.0
NPL-0406	NL-0406	NL-0405	45.4	37.5	10.2	24 inch	193	0.0020	45.05	44.66	51.82	51.10	58.88	51.10	**ABOVE RIM**	4.8	14.5
NPL-0405	NL-0405	NL-0404	47.5	38.6	10.6	24 inch	41	0.0022	44.66	44.57	51.10	50.96	52.77	50.96	**ABOVE RIM**	4.4	15.1
NPL-0404	NL-0404	NL-0403	49.4	40.1	11.8	24 inch	321	0.0027	44.57	43.69	50.96	50.33	65.66	50.33	**ABOVE RIM**	4.4	15.7
NPL-040303	NL-040303	NL-040302	7.8	7.8	4.3	12 inch	66	0.0147	51.87	50.90	56.27	55.30	58.49	55.30	**ABOVE RIM**	3.4	10.0
NPL-040302	NL-040302	NL-040301	10.8	10.7	2.9	12 inch	700	0.0066	50.90	46.31	55.30	50.71	114.56	50.71	**ABOVE RIM**	3.4	13.7
NPL-040301	NL-040301	NL-0403	19.0	17.5	7.4	12 inch	60	0.0437	46.31	43.69	50.71	50.33	67.39	50.33	**ABOVE RIM**	3.4	24.2
NPL-0403	NL-0403	NL-0402	66.6	52.7	15.1	27 inch	38	0.0024	43.69	43.60	50.33	50.41	52.17	50.41	**ABOVE RIM**	4.4	16.8
NPL-0402	NL-0402	NL-0401	78.1	61.6	9.8	27 inch	360	0.0010	43.60	43.24	50.41	50.98	73.85	50.98	**ABOVE RIM**	4.6	19.6
NPL-0401	NL-0401	NT-04	78.2	59.3	9.8	27 inch	647	0.0010	43.24	42.59	50.98	49.97	91.19	49.97	**ABOVE RIM**	5.5	19.7

Table D.N1.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA N
Existing Hydraulics: 10-Year Event with Outfall water depth = 54.8 ft

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Total Discharge (cfs) 2/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s) 1/
									Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
NPT-29	NT-29	NT-28	3.2	3.2	1.1	12 inch	197	0.0010	60.91	60.72	65.61	64.21	65.76	64.21	**ABOVE RIM**	3.7	4.0
NPT-28	NT-28	NT-27	3.0	3.0	2.2	12 inch	233	0.0036	60.62	59.77	64.21	64.42	66.11	64.42	**ABOVE RIM**	2.6	3.9
NPT-27	NT-27	NT-26	4.8	4.7	2.2	12 inch	63	0.0038	59.67	59.43	64.42	63.13	64.28	63.13	0.1	3.8	6.1
NPT-26	NT-26	NT-25	4.8	4.6	2.1	12 inch	119	0.0036	59.43	59.00	63.13	62.19	64.33	62.19	**ABOVE RIM**	2.7	6.1
NPT-25	NT-25	NT-24	5.2	5.0	1.2	12 inch	168	0.0011	58.89	58.70	62.19	61.35	64.90	61.35	**ABOVE RIM**	2.3	6.6
NPT-24	NT-24	NT-23	6.3	5.9	3.5	15 inch	335	0.0030	58.70	57.70	61.35	61.22	64.44	61.22	**ABOVE RIM**	1.4	5.2
NPT-23	NT-23	NT-22	11.0	10.1	3.4	15 inch	167	0.0028	57.70	57.24	61.22	60.57	65.39	60.57	**ABOVE RIM**	2.3	8.9
NPT-22	NT-22	NT-21	12.9	11.7	3.2	15 inch	163	0.0025	57.24	56.83	60.57	60.88	67.37	60.88	**ABOVE RIM**	2.1	10.5
NPT-21	NT-21	NT-20	19.5	17.3	5.8	15 inch	60	0.0082	56.83	56.34	60.88	60.00	65.44	60.00	**ABOVE RIM**	2.8	15.9
NPT-20	NT-20	NT-19	20.7	18.4	4.1	15 inch	281	0.0041	56.34	55.20	60.00	58.65	87.56	58.65	**ABOVE RIM**	2.4	16.9
NPT-19	NT-19	NT-18	23.9	20.9	3.6	15 inch	61	0.0031	55.20	55.01	58.65	58.27	66.63	58.27	**ABOVE RIM**	2.2	19.5
NPT-18	NT-18	NT-17	26.0	22.7	4.4	15 inch	340	0.0047	55.01	53.42	58.27	56.91	112.11	56.91	**ABOVE RIM**	2.0	21.2
NPT-17	NT-17	NT-16	30.7	26.3	3.5	15 inch	430	0.0029	53.42	52.16	56.91	55.46	152.66	55.46	**ABOVE RIM**	2.2	25.0
NPT-16	NT-16	NT-15	37.6	31.4	6.4	18 inch	382	0.0037	52.16	50.75	55.46	54.50	103.55	54.50	**ABOVE RIM**	1.8	21.3
NPT-15	NT-15	NT-14	43.0	35.4	5.4	18 inch	431	0.0026	50.75	49.62	54.50	53.91	126.08	53.91	**ABOVE RIM**	2.3	24.3
NPT-14	NT-14	NT-13	44.6	35.6	22.0	18 inch	46	0.0439	49.62	47.60	53.91	53.87	62.15	53.87	**ABOVE RIM**	2.8	25.2
NPT-13	NT-13	NT-12	44.5	35.3	6.8	21 inch	531	0.0018	49.54	48.56	53.87	53.40	95.34	53.40	**ABOVE RIM**	2.6	18.5
NPT-12	NT-12	NT-11	43.8	31.4	6.9	21 inch	75	0.0019	48.56	48.42	53.40	53.33	59.07	53.33	**ABOVE RIM**	3.1	18.2
NPT-11	NT-11	NT-10	43.7	41.5	6.8	21 inch	367	0.0019	48.42	47.74	53.33	53.01	80.98	53.01	**ABOVE RIM**	3.2	18.2
NPT-10	NT-10	NT-09	55.2	57.5	13.7	30 inch	90	0.0011	42.70	42.60	53.01	52.93	54.56	52.93	**ABOVE RIM**	7.8	11.3
NPT-09	NT-09	NT-08	76.1	75.4	17.6	30 inch	1051	0.0018	47.58	45.64	52.93	52.00	88.23	52.00	**ABOVE RIM**	2.9	15.5
NPT-08	NT-08	NT-07	99.0	74.4	7.7	30 inch	541	0.0004	45.64	45.45	52.00	53.03	84.57	53.03	**ABOVE RIM**	3.9	20.2
NPT-07	NT-07	NT-06	99.9	83.3	6.9	30 inch	355	0.0003	41.40	41.30	53.03	49.59	70.64	49.59	**ABOVE RIM**	9.1	20.4
NPT-06	NT-06	NT-05	113.6	128.4	5.5	30 inch	387	0.0002	45.45	45.38	49.59	49.81	79.51	49.81	**ABOVE RIM**	1.6	23.2
NPT-05	NT-05	NT-04	114.2	115.7	5.6	30 inch	327	0.0002	45.38	45.32	49.81	49.97	75.35	49.97	**ABOVE RIM**	1.9	23.3
NPT-04	NT-04	NT-03	190.6	117.9	34.4	36 inch	75	0.0027	39.00	38.80	49.97	49.96	56.09	49.96	**ABOVE RIM**	8.0	27.0
NPT-03	NT-03	NT-02	197.9	116.6	15.0	36 inch	1049	0.0005	45.27	44.74	49.96	56.71	149.07	56.71	**ABOVE RIM**	1.7	28.0
NPT-02	NT-02	NT-01	197.8	116.8	14.2	36 inch	88	0.0005	44.74	44.70	56.71	56.82	64.57	56.82	**ABOVE RIM**	9.0	28.0
NPT-01	NT-01	N-Outfall	199.2	116.8	15.2	36 inch	386	0.0005	44.70	44.50	56.82	57.60	89.26	54.80	**ABOVE RIM**	9.1	28.2

1/ Discharge, velocity and time of concentration are calculated for conditions with all flow forced into the pipe.
2/ Flow is from proposed conditions with pipe sizes increased.

Table D.N2.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA N
Existing Hydrology: 10-Year Event with Outfall water depth = 54.8 ft

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
NL-0418	59.23	52.15	6.75		0.60	4.05			10.0	10.0	1.69	6.9
NL-0417	57.62	51.80	1.75		0.20	0.35			10.0	10.2	1.67	7.4
NL1-041606	60.61	54.17	6.24		0.60	3.74			10.0	10.0	1.69	6.4
NL1-041605	60.75	53.91	0.00		0.00	0.00			10.0	10.1	1.68	6.3
NL1-041604	60.69	53.26	0.00		0.00	0.00			10.0	10.3	1.66	6.3
NL1-041603	59.93	52.86	0.00		0.00	0.00			10.0	10.5	1.65	6.2
NL1-041602	59.49	52.58	0.00		0.00	0.00			10.0	10.6	1.64	6.2
NL1-041601	58.33	52.09	0.00		0.00	0.00			10.0	10.7	1.63	6.1
NL-0416	57.30	51.50	0.00		0.00	0.00			10.0	10.9	1.61	13.2
NL-0415	57.08	50.71	1.15		0.50	0.57			10.0	11.0	1.60	14.1
NL-0414	56.76	50.90	5.78		0.35	2.02			10.0	11.1	1.60	17.3
NL-0413	56.64	50.88	7.59		0.35	2.66			10.0	11.1	1.60	21.6
NL-0412	56.32	50.50	1.63		0.50	0.82			10.0	11.1	1.60	22.9
NL-0411	55.35	50.45	4.01		0.50	2.00			10.0	11.2	1.59	26.0
NL-0410	55.00	50.30	0.00		0.50	0.00			10.0	11.2	1.59	25.9
NL-0409	54.80	49.00	4.47		0.50	2.23			10.0	11.4	1.58	29.3
NL-0408	54.38	48.58	2.05		0.50	1.02			10.0	11.5	1.57	30.8
NL2-04070204	57.08	53.50	1.30		0.50	0.65			10.0	10.0	1.69	1.1
NL2-04070203	57.08	52.00	1.27		0.50	0.64			10.0	11.2	1.59	2.1
NL2-04070202	57.28	51.46	2.08		0.50	1.04			10.0	12.9	1.47	3.5
NL2-04070201	57.65	51.06	2.41		0.50	1.21			10.0	13.3	1.45	5.2
NL1-04070204	57.81	52.14	1.10		0.50	0.55			10.0	10.0	1.69	0.9
NL1-04070203	57.46	51.78	1.19		0.50	0.60			10.0	10.7	1.63	1.9
NL1-04070202	54.92	49.07	5.43		0.50	2.71			10.0	14.0	1.41	5.5
NL1-04070201	54.87	48.84	0.00		0.00	0.00			10.0	14.2	1.40	5.4
NL-040702	57.19	47.09	8.15		0.50	4.08			10.0	16.1	1.31	15.1
NL-040701	54.84	47.44	2.42		0.50	1.21			10.0	16.9	1.28	16.3
NL-0407	54.75	47.32	3.04		0.50	1.52			10.0	17.0	1.27	43.2
NL-0406	51.82	45.05	4.34		0.50	2.17			10.0	17.4	1.26	45.4
NL-0405	51.10	44.66	3.84		0.50	1.92			10.0	17.6	1.25	47.5
NL-0404	50.96	44.57	3.14		0.50	1.57			10.0	17.7	1.25	49.4
NL-040303	56.27	51.87	7.67		0.60	4.60			10.0	10.0	1.69	7.8
NL-040302	55.30	50.90	2.93		0.60	1.76			10.0	10.1	1.68	10.8
NL-040301	50.71	46.31	8.94		0.60	5.36			10.0	11.0	1.61	19.0
NL-0403	50.33	43.69	4.94		0.50	2.47			10.0	18.0	1.23	66.6
NL-0402	50.41	43.60	18.57		0.50	9.29			10.0	18.0	1.23	78.1
NL-0401	50.98	43.24	1.30		0.50	0.65			10.0	18.3	1.22	78.2

Table D.N2.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA N
Existing Hydrology: 10-Year Event with Outfall water depth = 54.8 ft

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
NT-29	65.61	60.91	3.10		0.60	1.86	3.10	1.86	10.0	10.0	1.69	3.2
NT-28	64.21	60.62	0.00		0.60	0.00	3.10	1.86	10.0	10.8	1.62	3.0
NT-27	64.42	59.67	2.06		0.60	1.24	5.16	3.10	10.0	11.8	1.54	4.8
NT-26	63.13	59.43	0.00		0.50	0.00	5.16	3.10	10.0	12.0	1.53	4.8
NT-25	62.19	58.89	0.61		0.50	0.31	5.77	3.40	10.0	12.3	1.51	5.2
NT-24	61.35	58.70	1.67		0.50	0.84	7.44	4.24	10.0	12.7	1.48	6.3
NT-23	61.22	57.70	6.85		0.50	3.42	14.29	7.66	10.0	13.8	1.42	11.0
NT-22	60.57	57.24	2.89		0.50	1.45	17.18	9.11	10.0	14.1	1.40	12.9
NT-21	60.88	56.83	7.96		0.60	4.78	25.14	13.88	10.0	14.4	1.39	19.5
NT-20	60.00	56.34	2.34		0.40	0.94	27.48	14.82	10.0	14.5	1.39	20.7
NT-19	58.65	55.20	6.14		0.40	2.46	33.62	17.27	10.0	14.7	1.37	23.9
NT-18	58.27	55.01	3.91		0.40	1.56	37.53	18.84	10.0	14.8	1.37	26.0
NT-17	56.91	53.42	9.01		0.40	3.60	46.54	22.44	10.0	15.1	1.36	30.7
NT-16	55.46	52.16	13.35		0.40	5.34	59.89	27.78	10.0	15.3	1.34	37.6
NT-15	54.50	50.75	10.68		0.40	4.27	70.57	32.05	10.0	15.6	1.33	43.0
NT-14	53.91	49.62	3.80		0.40	1.52	74.37	33.57	10.0	15.9	1.32	44.6
NT-13	53.87	49.54	0.00		0.60	0.00	74.37	33.57	10.0	16.0	1.32	44.5
NT-12	53.40	48.56	0.00		0.60	0.00	74.37	33.57	10.0	16.4	1.30	43.8
NT-11	53.33	48.42	0.00		0.60	0.00	74.37	33.57	10.0	16.5	1.29	43.7
NT-10	53.01	47.74	18.55		0.50	9.28	92.92	42.85	10.0	16.9	1.28	55.2
NT-09	52.93	47.58	27.47		0.60	16.48	120.39	59.33	10.0	17.0	1.27	76.1
NT-08	52.00	45.64	34.20		0.60	20.52	154.59	79.85	10.0	18.1	1.23	99.0
NT-07	53.03	41.40	2.88		0.60	1.73	157.47	81.58	10.0	18.6	1.21	99.9
NT-06	49.59	45.45	20.00		0.60	12.00	177.47	93.58	10.0	18.9	1.20	113.6
NT-05	49.81	45.38	2.12		0.60	1.27	179.59	94.85	10.0	19.1	1.19	114.2
NT-04	49.97	45.32	9.24	125.48	0.10	0.92	314.31	159.24	10.0	19.4	1.19	190.6
NT-03	49.96	45.27	10.51		0.60	6.31	324.82	165.54	10.0	19.4	1.19	197.9
NT-02	56.71	44.74	4.68		0.60	2.81	329.50	168.35	10.0	20.0	1.17	197.8
NT-01	56.82	44.70	2.34		0.60	1.40	331.84	169.76	10.0	20.1	1.16	199.2
N-Outfall	57.60	44.50	0.00		0.00	0.00	331.84	169.76	0.0	20.3	1.16	198.0

331.84
cumareacheck

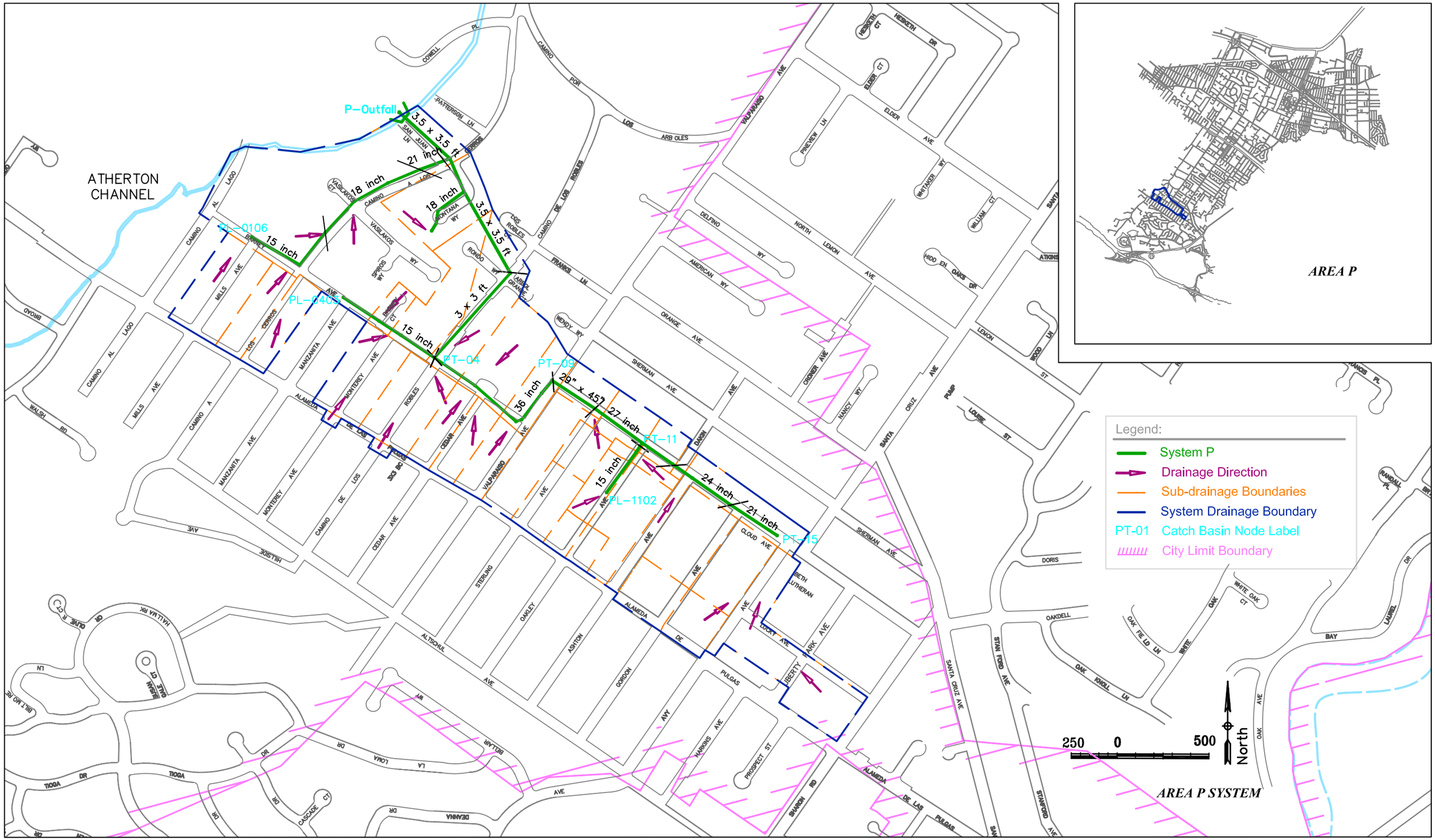
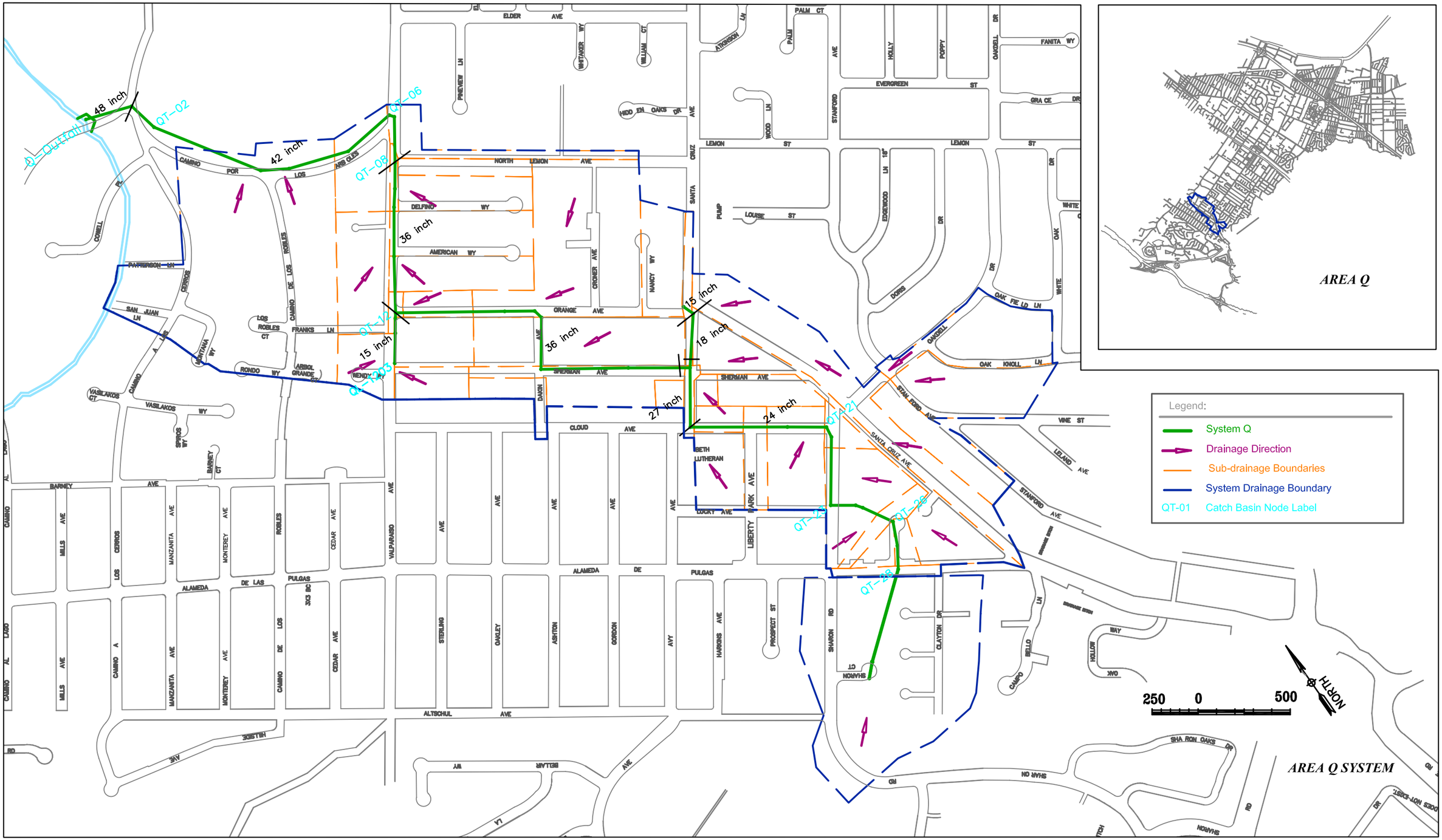

ATHERTON CHANNEL
P-Outfall
3.5 x 3.5 ft
21 inch
18 inch
18 inch
3.5 x 3.5 ft
15 inch
PL-0106
PL-0400
3 x 3 ft
15 inch
PT-04
PT-09
36 inch
29" x 45"
27 inch
PT-11
15 inch
PL-1102
24 inch
21 inch
PT-15
AREA P
Legend:
System P
Drainage Direction
Sub-drainage Boundaries
System Drainage Boundary
PT-01 Catch Basin Node Label
City Limit Boundary
250 0 500
North
AREA P SYSTEM

Table D.P1
MENLO PARK STORM DRAINAGE MASTER PLAN
NEW DRAINAGE AREA P
Existing Hydraulics: 10-Year Event with Free Outfall

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs)	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s)
								Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
PLP-1102	PL-1102	PL-1101	4.04	5.13	15 inch	270	0.0063	104.00	102.30	106.20	105.50	105.31	104.26	0.9	0.95	3.3
PLP-1101	PL-1101	PT-11	4.22	3.99	15 inch	63	0.0038	102.29	102.05	105.50	106.00	104.20	103.93	1.3	1.96	3.4
PLP-0403	PL-0403	PL-0402	0.54	2.69	15 inch	231	0.0017	100.40	100.00	103.60	103.20	101.00	100.97	2.6	1.95	0.7
PLP-0402	PL-0402	PL-0401	0.44	4.32	15 inch	145	0.0045	100.00	99.35	103.20	102.50	100.97	100.96	2.2	1.95	0.4
PLP-0401	PL-0401	PT-04	3.18	4.02	15 inch	219	0.0039	99.35	98.50	102.50	103.50	100.93	100.41	1.6	1.90	2.6
PLP-0203	PL-0203	PL-0202	1.03	6.71	18 inch	49	0.0041	95.70	95.50	99.00	99.30	97.13	97.13	1.9	1.80	0.6
PLP-0202	PL-0202	PL-0201	0.97	4.93	18 inch	68	0.0022	95.50	95.35	99.30	99.40	97.12	97.12	2.2	2.30	0.6
PLP-0201	PL-0201	PT-02	0.88	4.55	18 inch	176	0.0019	95.33	95.00	99.40	99.50	97.12	97.10	2.3	2.57	0.5
PLP-0106	PL-0106	PL-0105	2.58	4.91	15 inch	303	0.0058	102.50	100.75	107.10	105.50	103.37	102.94	3.7	3.35	2.5
PLP-0105	PL-0105	PL-0104	4.73	5.37	15 inch	224	0.0069	100.75	99.20	105.50	102.00	102.66	101.46	2.8	3.50	3.9
PLP-0104	PL-0104	PL-0103	4.54	8.72	18 inch	232	0.0069	99.20	97.60	102.00	101.00	101.43	101.00	0.6	1.30	2.6
PLP-0103	PL-0103	PL-0102	14.81	7.62	18 inch	209	0.0053	97.35	96.25	101.00	99.50	103.65	99.50	**ABOVE RIM**	2.15	8.4
PLP-0102	PL-0102	PL-0101	14.59	7.62	18 inch	190	0.0053	96.25	95.25	99.50	98.80	102.22	98.55	**ABOVE RIM**	1.75	8.3
PLP-0101	PL-0101	PT-01	14.39	8.49	21 inch	174	0.0029	95.00	94.50	98.80	99.80	98.40	96.97	0.4	2.05	6.0
PTP-15	PT-15	PT-14	7.45	8.18	21 inch	300	0.0027	106.30	105.50	108.80	108.36	107.64	106.96	1.2	0.75	3.6
PTP-14	PT-14	PT-13	9.12	19.67	24 inch	258	0.0076	105.85	103.90	108.36	107.37	106.93	105.09	1.4	0.51	5.0
PTP-13	PT-13	PT-12	12.37	14.77	24 inch	129	0.0043	103.65	103.10	107.37	106.46	105.05	104.36	2.3	1.72	5.6
PTP-12	PT-12	PT-11	12.77	10.87	27 inch	203	0.0012	102.30	102.05	106.46	106.00	104.27	103.93	2.2	1.91	3.5
PTP-11	PT-11	PT-10	16.98	16.9	27 inch	319	0.0030	102.05	101.10	106.00	104.40	103.87	102.54	2.1	1.70	5.6
PTP-10	PT-10	PT-09	17.78	37.52	29"x45"	278	0.0020	99.25	98.70	104.40	104.60	101.80	101.64	2.6	1.40	2.7
PTP-09	PT-09	PT-08	18.78	22.23	36 inch	90	0.0011	98.70	98.60	104.60	103.70	101.53	101.47	3.1	2.90	2.7
PTP-08	PT-08	PT-07	20.26	20.5	36 inch	180	0.0009	98.60	98.43	103.70	104.10	101.46	101.31	2.2	2.10	2.9
PTP-07	PT-07	PT-06	19.63	20.11	36 inch	33	0.0009	98.43	98.40	104.10	104.20	101.25	101.22	2.8	2.67	2.9
PTP-06	PT-06	PT-05	20.46	-21.2	36 inch	297	-0.0010	98.40	98.70	104.20	104.20	101.12	100.68	3.1	2.80	3.6
PTP-05	PT-05	PT-04	23.1	40.12	36 inch	268	0.0036	98.70	97.73	104.20	103.50	100.63	100.41	3.6	2.50	4.1
PTP-04	PT-04	PT-03	27.24	49.46	3 x 3 ft	619	0.0034	98.50	96.40	103.50	103.24	100.11	98.08	3.4	2.00	5.5
PTP-03	PT-03	PT-02	26.12	67.11	3.5 x 3.5 ft	510	0.0027	96.40	95.00	103.24	99.50	97.86	97.12	5.4	3.34	4.3
PTP-02	PT-02	PT-01	25.69	64.7	3.5 x 3.5 ft	196	0.0026	95.00	94.50	99.50	99.80	97.09	96.99	2.4	1.00	3.2
PTP-01	PT-01	P-Outfall	35.68	40.51	3.5 x 3.5 ft	500	0.0010	94.50	94.00	99.80	98.50	96.89	95.48	2.9	1.80	5.6

Table D.P2
MENLO PARK STORM DRAINAGE MASTER PLAN
NEW DRAINAGE AREA P
Existing Hydrology: 10-Year Event

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
PL-1102	106.20	104.00	5.94		0.40	2.38		2.38	10	10.0	1.69	4.0
PL-1101	105.50	102.30	0.70		0.40	0.28		2.66	10	11.4	1.58	4.2
PL-0403	103.60	100.40	0.80		0.40	0.32		0.32	10	10.0	1.69	0.5
PL-0402	103.20	100.00	0.00		0.40	0.00		0.32	10	15.2	1.35	0.4
PL-0401	102.50	99.35	6.20		0.40	2.48		2.8	10	21.4	1.13	3.2
PL-0203	99.00	95.70	1.52		0.40	0.61		0.61	10	10.0	1.69	1.0
PL-0202	99.30	95.50	0.00		0.00	0.00		0.61	10	11.4	1.58	1.0
PL-0201	99.40	95.35	0.00		0.00	0.00		0.61	10	13.5	1.44	0.9
PL-0106	107.10	102.50	3.79		0.40	1.52		1.52	10	10.0	1.69	2.6
PL-0105	105.50	100.75	3.89		0.40	1.56		3.07	10	12.1	1.53	4.7
PL-0104	102.00	99.20	0.00		0.00	0.00		3.07	10	13.0	1.47	4.5
PL-0103	101.00	97.40	18.86		0.40	7.54		10.62	10	14.5	1.38	14.8
PL-0102	99.50	96.25	0.00		0.00	0.00		10.62	10	14.9	1.36	14.6
PL-0101	98.80	95.00	0.00		0.00	0.00		10.62	10	15.3	1.35	14.4
PT-15	108.80	106.30	10.95		0.40	4.38	10.95	4.38	10	10.0	1.69	7.5
PT-14	108.36	105.25	3.40		0.40	1.36	14.35	5.74	10	11.4	1.58	9.1
PT-13	107.37	103.65	5.89		0.40	2.36	20.24	8.1	10	12.2	1.52	12.4
PT-12	106.46	103.10	1.00		0.40	0.40	21.24	8.5	10	12.6	1.49	12.8
PT-11	106.00	102.05	1.50	6.64	0.40	0.60	29.38	11.75	10	13.6	1.43	17.0
PT-10	104.40	99.25	2.50		0.40	1.00	31.88	12.75	10	14.5	1.38	17.8
PT-09	104.60	98.70	3.86		0.40	1.54	35.74	14.3	10	16.3	1.30	18.8
PT-08	103.70	98.60	3.51		0.40	1.40	39.25	15.7	10	16.8	1.28	20.3
PT-07	104.10	98.43	0.00		0.40	0.00	39.25	15.7	10	17.8	1.24	19.6
PT-06	104.20	98.40	1.90		0.40	0.76	41.15	16.46	10	18.0	1.23	20.5
PT-05	104.20	98.70	7.17		0.40	2.87	48.32	19.33	10	19.4	1.19	23.1
PT-04	103.50	98.50	6.80	7.00	0.40	2.72	62.12	24.85	10	22.8	1.09	27.2
PT-03	103.24	96.40	0.00		0.00	0.00	62.12	24.85	10	24.7	1.04	26.1
PT-02	99.50	95.00	0.00	1.52	0.00	0.00	63.64	25.46	10	26.7	1.00	25.7
PT-01	99.80	94.50	0.00	26.54	0.00	0.00	90.18	36.07	10	27.7	0.98	35.7
P-Outfall	98.50	94.00	0.00		0.00	0.00	90.18	36.07	0	29.2	0.95	34.7


AREA Q SYSTEM
AREA Q
Legend:
System Q
Drainage Direction
Sub-drainage Boundaries
System Drainage Boundary
QT-01 Catch Basin Node Label
48 inch
42 inch
36 inch
36 inch
15 inch
15 inch
18 inch
27 inch
24 inch
QT-01
QT-02
QT-06
QT-08
QT-12
QT-13
QT-21
QT-22
QT-23
QT-28
250 0 500
NORTH

BKF

Table D.Q1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA Q
Existing Hydraulics: 10-Year Event with Outfall water depth = 84.95 ft

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs)	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s)
								Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
QPL-1802	QL-1802	QL-1801	3.7	3.1	15 inch	64	0.0023	98.80	98.65	105.01	106.75	106.47	106.26	**ABOVE RIM**	5.0	3.0
QPL-1801	QL-1801	QT-18	3.7	4.5	18 inch	295	0.0018	98.65	98.12	106.75	105.74	106.10	105.74	0.7	6.6	2.1
QPL-1203	QL-1203	QL-1202	2.7	7.1	15 inch	164	0.0122	100.00	98.00	109.75	104.07	102.32	102.04	7.4	8.5	2.2
QPL-1202	QL-1202	QL-1201	4.2	4.3	15 inch	79	0.0044	98.00	97.65	104.07	102.62	101.98	101.64	2.1	4.8	3.4
QPL-1201	QL-1201	QT-12	4.1	3.6	15 inch	32	0.0031	97.65	97.55	102.62	102.01	101.59	101.45	1.0	3.7	3.4
QPT-28	QT-28	QT-27	14.8	34.2	24 inch	131	0.0229	139.50	136.50	144.47	143.50	140.89	138.04	3.6	3.0	6.0
QPT-27	QT-27	QT-26	15.4	74.0	24 inch	134	0.1070	136.50	122.16	143.50	134.25	137.92	123.95	5.6	5.0	5.8
QPT-26	QT-26	QT-25	15.9	20.0	24 inch	180	0.0078	122.16	120.76	134.25	132.53	123.60	122.41	10.7	10.1	6.2
QPT-25	QT-25	QT-24	18.2	23.2	24 inch	41	0.0105	120.76	120.33	132.53	122.50	122.30	121.69	10.2	9.8	7.5
QPT-24	QT-24	QT-23	18.2	33.7	24 inch	135	0.0222	119.00	116.00	122.50	121.60	120.53	119.48	2.0	1.5	6.4
QPT-23	QT-23	QT-22	17.9	21.7	24 inch	371	0.0092	113.00	109.60	121.60	117.22	118.71	116.40	2.9	6.6	5.7
QPT-22	QT-22	QT-21	17.6	31.3	24 inch	60	0.0192	109.60	108.45	117.22	115.64	116.00	115.64	1.2	5.6	5.6
QPT-21	QT-21	QT-20	27.9	30.9	24 inch	212	0.0186	108.45	104.50	115.64	111.12	114.34	111.12	1.3	5.2	8.9
QPT-20	QT-20	QT-19	28.4	19.7	24 inch	527	0.0076	104.50	100.50	111.12	108.71	117.03	108.71	**ABOVE RIM**	4.6	9.1
QPT-19	QT-19	QT-18	29.3	25.5	27 inch	322	0.0068	100.30	98.12	108.71	105.74	108.62	105.74	0.1	6.2	7.4
QPT-18	QT-18	QT-17	37.0	38.0	36 inch	335	0.0033	97.70	96.61	105.74	104.86	105.89	104.86	**ABOVE RIM**	5.0	5.2
QPT-17	QT-17	QT-16	37.7	41.1	36 inch	474	0.0038	96.61	94.81	104.86	107.33	106.31	104.79	**ABOVE RIM**	5.3	5.3
QPT-16	QT-16	QT-15	40.2	47.4	36 inch	281	0.0051	94.81	93.39	107.33	103.04	104.06	103.04	3.3	9.5	5.7
QPT-15	QT-15	QT-14	41.5	35.8	36 inch	52	0.0029	93.39	93.24	103.04	102.50	102.70	102.50	0.3	6.7	5.9
QPT-14	QT-14	QT-13	47.5	40.5	36 inch	163	0.0037	93.24	92.64	102.50	101.93	102.76	101.93	**ABOVE RIM**	6.3	6.7
QPT-13	QT-13	QT-12	46.9	40.1	36 inch	593	0.0036	92.64	90.50	101.93	102.01	103.36	100.42	**ABOVE RIM**	6.3	6.6
QPT-12	QT-12	QT-11	48.9	40.9	36 inch	306	0.0038	90.50	89.35	102.01	99.07	99.35	97.70	2.7	8.5	6.9
QPT-11	QT-11	QT-10	53.5	43.2	36 inch	267	0.0042	89.35	88.23	99.07	99.77	97.56	95.84	1.5	6.7	7.6
QPT-10	QT-10	QT-09	54.2	46.2	36 inch	100	0.0048	88.23	87.75	99.77	99.92	95.67	95.01	4.1	8.5	7.7
QPT-09	QT-09	QT-08	54.7	51.5	36 inch	141	0.0060	87.75	86.91	99.92	99.50	94.85	93.90	5.1	9.2	7.7
QPT-08	QT-08	QT-07	54.3	61.0	42 inch	250	0.0037	86.91	85.99	99.50	98.25	93.79	93.07	5.7	9.1	5.7
QPT-07	QT-07	QT-06	53.4	102.3	42 inch	30	0.0103	85.99	85.68	98.25	97.66	92.42	92.34	5.8	8.8	5.6
QPT-06	QT-06	QT-05	53.3	54.8	42 inch	297	0.0030	85.68	84.80	97.66	96.39	91.75	90.92	5.9	8.5	5.5
QPT-05	QT-05	QT-04	52.2	-38.9	42 inch	334	-0.0015	84.80	85.30	96.39	97.47	90.62	89.72	5.8	8.1	5.4
QPT-04	QT-04	QT-03	58.6	80.4	42 inch	155	0.0064	85.30	84.31	97.47	97.03	89.49	88.96	8.0	8.7	6.1
QPT-03	QT-03	QT-02	58.1	61.2	42 inch	625	0.0037	84.31	82.00	97.03	92.92	88.58	86.50	8.5	9.2	6.0
QPT-02	QT-02	QT-01	56.1	46.9	42 inch	166	0.0022	82.00	81.64	92.92	91.35	86.27	85.75	6.7	7.4	5.8
QPT-01	QT-01	Q-Outfall	55.6	52.7	48 inch	439	0.0013	81.64	81.05	91.35	91.55	85.53	84.95	5.8	5.7	4.5

Table D.Q2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA Q
Existing Hydrology: 10-Year Event

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
QL-1802	105.01	98.80	7.30		0.30	2.19			10	10.0	1.7	3.7
QL-1801	106.75	98.65	0.00		0.00	0.00			10	10.4	1.7	3.7
QL-1203	109.75	100.00	3.90		0.40	1.56			10	10.0	1.7	2.7
QL-1202	104.07	98.00	2.70		0.40	1.08			10	11.3	1.6	4.2
QL-1201	102.62	97.65	0.00		0.00	0.00			10	11.7	1.6	4.1
QT-28	144.47	139.50	21.70		0.40	8.68	21.70	8.68	10	10.0	1.7	14.8
QT-27	143.50	136.50	1.40		0.40	0.56	23.10	9.24	10	10.4	1.7	15.4
QT-26	134.25	122.16	1.10		0.40	0.44	24.20	9.68	10	10.7	1.6	15.9
QT-25	132.53	120.76	4.30		0.40	1.72	28.50	11.40	10	11.2	1.6	18.2
QT-24	122.50	119.00	0.00		0.00	0.00	28.50	11.40	10	11.3	1.6	18.2
QT-23	121.60	113.00	0.00		0.00	0.00	28.50	11.40	10	11.7	1.6	17.9
QT-22	117.22	109.60	0.90		0.40	0.36	29.40	11.76	10	12.8	1.5	17.6
QT-21	115.64	108.45	17.60		0.40	7.04	47.00	18.80	10	12.9	1.5	27.9
QT-20	111.12	104.50	1.70		0.40	0.68	48.70	19.48	10	13.3	1.5	28.4
QT-19	108.71	100.30	3.40		0.40	1.36	52.10	20.84	10	14.3	1.4	29.3
QT-18	105.74	97.70	10.00	7.30	0.40	4.00	69.40	27.03	10	15.0	1.4	37.0
QT-17	104.86	96.61	3.90		0.40	1.56	73.30	28.59	10	16.1	1.3	37.7
QT-16	107.33	94.81	8.40		0.40	3.36	81.70	31.95	10	17.6	1.3	40.2
QT-15	103.04	93.39	6.00		0.30	1.80	87.70	33.75	10	18.4	1.2	41.5
QT-14	102.50	93.24	12.60		0.40	5.04	100.30	38.79	10	18.6	1.2	47.5
QT-13	101.93	92.64	0.00		0.00	0.00	100.30	38.79	10	19.0	1.2	46.9
QT-12	102.01	90.50	1.60	6.60	0.40	0.64	108.50	42.07	10	20.5	1.2	48.9
QT-11	99.07	89.35	12.10		0.40	4.84	120.60	46.91	10	21.2	1.1	53.5
QT-10	99.77	88.23	3.20		0.40	1.28	123.80	48.19	10	21.8	1.1	54.2
QT-09	99.92	87.75	1.90		0.40	0.76	125.70	48.95	10	22.0	1.1	54.7
QT-08	99.50	86.91	0.00		0.00	0.00	125.70	48.95	10	22.3	1.1	54.3
QT-07	98.25	85.99	0.00		0.00	0.00	125.70	48.95	10	23.0	1.1	53.4
QT-06	97.66	85.68	0.00		0.00	0.00	125.70	48.95	10	23.1	1.1	53.3
QT-05	96.39	84.80	0.00		0.00	0.00	125.70	48.95	10	24.0	1.1	52.2
QT-04	97.47	85.30	18.10		0.40	7.24	143.80	56.19	10	25.0	1.0	58.6
QT-03	97.03	84.31	0.00		0.00	0.00	143.80	56.19	10	25.5	1.0	58.1
QT-02	92.92	82.00	0.00		0.00	0.00	143.80	56.19	10	27.2	1.0	56.1
QT-01	91.35	81.64	0.00		0.00	0.00	143.80	56.19	10	27.7	1.0	55.6
Q-Outfall	91.55	81.05	0.00		0.00	0.00	143.80	56.19	0	29.3	1.0	53.9

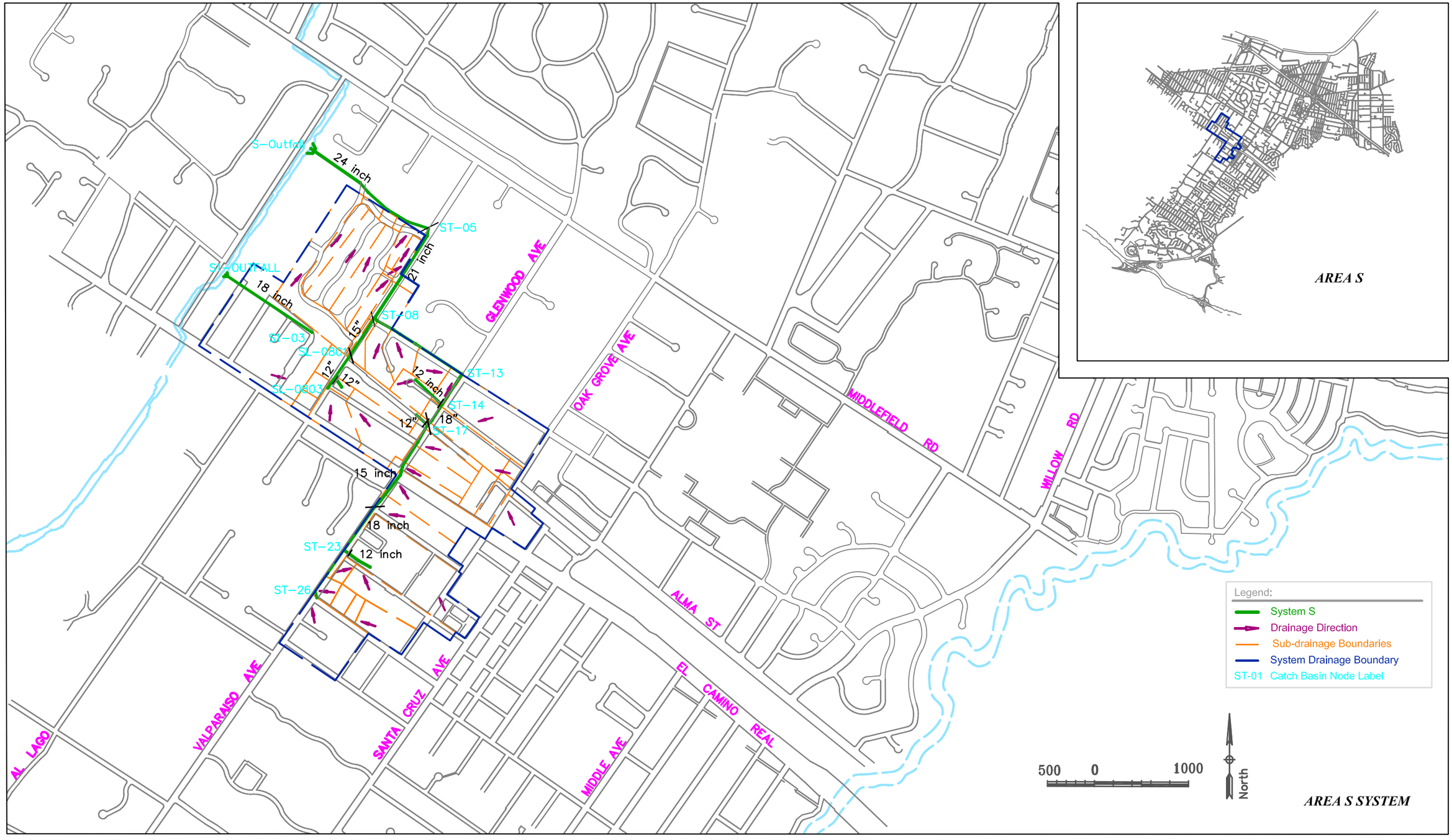

S-Outfall
24 inch
ST-05
21 inch
SL-OUTFALL
18 inch
ST-08
SL-03
15"
SL-0801
12"
12"
SL-0803
12 inch
ST-13
ST-14
12"
18"
ST-17
15 inch
18 inch
ST-23
12 inch
ST-26
GLENWOOD AVE
OAK GROVE AVE
MIDDLEFIELD RD
WILLOW RD
ALMA ST
EL CAMINO REAL
MIDDLE AVE
SANTA CRUZ AVE
VALPARAISO AVE
AL LAGO
AREA S
Legend:
System S
Drainage Direction
Sub-drainage Boundaries
System Drainage Boundary
ST-01 Catch Basin Node Label
500 0 1000
North
AREA S SYSTEM

Table D.S1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA S
Existing Hydraulics: 10-Year Event with Outfall water depth = 45.15 ft

Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Total Discharge (cfs) 2/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s) 1/	Velocity (ft/s) 2/
									Upstream	Downstream	Upstream	Downstream	Upstream	Downstream				
SPL1-2301	SL1-2301	ST-23	6.3	5.6	2.1	12 inch	189	0.0034	68.19	67.54	70.00	70.14	76.01	70.14	**ABOVE RIM**	0.8	8.0	2.1
SPL1-080202	SL1-080202	SL1-080201	11.7	6.0	0.0	12 inch	76	0.0000	58.60	58.60	61.37	61.36	69.49	61.36	**ABOVE RIM**	1.8	14.8	1.8
SPL-1401	SL-1401	ST-14	1.9	2.1	0.7	12 inch	384	0.0003	56.50	56.37	58.38	60.60	61.68	60.60	**ABOVE RIM**	0.9	2.4	0.5
SPL1-2302	SL1-2302	SL1-2301	5.7	1.9	2.0	12 inch	146	0.0033	68.67	68.19	70.00	70.00	73.67	70.00	**ABOVE RIM**	0.3	7.2	0.3
SPL-0803	SL-0803	SL-0802	1.6	21.7	2.0	12 inch	104	0.0030	58.81	58.50	61.28	61.05	61.25	61.05	0.0	1.5	2.0	2.8
SPL1-080201	SL1-080201	SL-0802	11.6	22.1	3.0	15 inch	47	0.0021	58.60	58.50	61.36	61.05	62.57	61.05	**ABOVE RIM**	1.5	9.5	2.8
SPL-1701	SL-1701	ST-17	2.1	21.6	1.7	12 inch	159	0.0023	58.20	57.83	61.21	61.50	62.06	61.50	**ABOVE RIM**	2.0	2.7	1.8
SPL-0802	SL-0802	SL-0801	14.2	41.8	3.1	12 inch	322	0.0075	58.50	56.10	61.05	61.07	112.23	61.07	**ABOVE RIM**	1.6	18.1	5.4
SPL-0801	SL-0801	ST-08	23.1	39.9	6.1	15 inch	478	0.0090	56.10	51.81	61.07	57.60	118.49	57.60	**ABOVE RIM**	3.7	18.8	4.0
SPT-26	ST-26	ST-25	11.6	14.8	8.7	18 inch	78	0.0068	73.60	73.07	75.00	74.47	75.44	74.47	**ABOVE RIM**	-0.1	6.7	3.1
SPT-25	ST-25	ST-24	11.5	14.5	9.0	18 inch	226	0.0073	73.07	71.43	74.47	72.83	75.56	72.83	**ABOVE RIM**	-0.1	6.6	3.5
SPT-24	ST-24	ST-23	11.3	13.8	11.9	18 inch	303	0.0128	71.43	67.54	72.83	70.14	73.65	70.14	**ABOVE RIM**	-0.1	6.4	2.8
SPT-23	ST-23	ST-22	15.7	18.1	6.7	18 inch	566	0.0040	67.54	65.25	70.14	67.82	80.52	67.82	**ABOVE RIM**	1.1	8.9	2.1
SPT-22	ST-22	ST-21	30.1	30.9	10.2	15 inch	79	0.0249	65.22	63.25	67.82	67.02	84.16	67.02	**ABOVE RIM**	1.4	24.5	2.5
SPT-21	ST-21	ST-20	30.1	30.5	0.0	15 inch	355	0.0000	63.25	63.25	67.02	64.70	326.48	64.70	**ABOVE RIM**	2.5	24.5	2.5
SPT-20	ST-20	ST-19	35.0	33.5	1.6	15 inch	99	0.0020	63.25	63.05	64.70	64.70	163.86	64.70	**ABOVE RIM**	0.2	28.5	3.6
SPT-19	ST-19	ST-18	36.5	34.6	4.6	15 inch	302	0.0051	60.82	59.28	64.70	63.00	159.47	63.00	**ABOVE RIM**	2.6	29.8	3.8
SPT-18	ST-18	ST-17	43.3	39.8	4.9	15 inch	205	0.0059	59.28	58.08	63.00	61.50	153.40	61.50	**ABOVE RIM**	2.5	35.2	4.6
SPT-17	ST-17	ST-16	44.6	40.5	7.9	18 inch	21	0.0057	57.83	57.71	61.50	63.97	67.76	63.97	**ABOVE RIM**	2.2	25.2	4.1
SPT-16	ST-16	ST-15	45.2	40.9	8.8	18 inch	51	0.0071	57.71	57.35	63.97	64.16	73.61	64.16	**ABOVE RIM**	4.8	25.6	3.8
SPT-15	ST-15	ST-14	54.5	49.1	7.4	18 inch	196	0.0050	57.35	56.37	64.16	60.60	113.30	60.60	**ABOVE RIM**	5.3	30.8	4.6
SPT-14	ST-14	ST-13	58.7	45.7	12.6	21 inch	389	0.0063	56.37	53.93	60.60	58.40	111.76	58.40	**ABOVE RIM**	2.5	24.4	3.2
SPT-13	ST-13	ST-12	64.2	49.7	5.0	21 inch	588	0.0010	53.93	53.34	58.40	56.50	152.88	56.50	**ABOVE RIM**	2.7	26.7	2.5
SPT-12	ST-12	ST-11	64.6	48.8	5.0	21 inch	195	0.0010	53.34	53.15	56.50	57.00	89.46	57.00	**ABOVE RIM**	1.4	26.9	2.8
SPT-11	ST-11	ST-10	65.8	50.4	6.7	21 inch	85	0.0018	53.15	53.00	57.00	57.00	71.67	57.00	**ABOVE RIM**	2.1	27.4	3.1
SPT-10	ST-10	ST-09	67.2	51.1	7.7	21 inch	201	0.0024	53.00	52.52	57.00	57.80	93.90	57.80	**ABOVE RIM**	2.3	27.9	3.3
SPT-09	ST-09	ST-08	68.8	51.7	21.1	21 inch	40	0.0178	52.52	51.81	57.80	57.60	65.15	57.60	**ABOVE RIM**	3.5	28.6	3.5
SPT-08	ST-08	ST-07	85.5	72.7	13.2	21 inch	516	0.0069	51.81	48.23	57.60	54.10	204.40	54.10	**ABOVE RIM**	4.0	35.6	4.9
SPT-07	ST-07	ST-06	86.3	72.0	16.6	21 inch	511	0.0110	48.23	42.62	54.10	49.20	200.94	49.20	**ABOVE RIM**	4.1	35.9	4.1
SPT-06	ST-06	ST-05	87.7	71.4	-22.1	21 inch	81	-0.0195	42.62	44.20	49.20	48.93	73.73	48.93	**ABOVE RIM**	4.8	36.5	3.2
SPT-05	ST-05	ST-04	87.6	71.0	12.3	24 inch	234	0.0029	44.20	43.51	48.93	48.34	83.43	48.34	**ABOVE RIM**	2.7	27.9	3.8
SPT-04	ST-04	ST-03	91.0	72.6	11.9	24 inch	251	0.0027	43.51	42.82	48.34	48.10	88.69	48.10	**ABOVE RIM**	2.8	29.0	3.8
SPT-03	ST-03	ST-02	94.9	74.5	12.4	24 inch	272	0.0030	42.82	42.00	48.10	48.60	96.49	48.60	**ABOVE RIM**	3.3	30.2	3.9
SPT-02	ST-02	ST-01	101.7	83.9	14.1	24 inch	133	0.0039	42.00	41.48	48.60	46.20	73.10	46.20	**ABOVE RIM**	4.6	32.4	4.2
SPT-01	ST-01	S-Outfall	101.6	83.4	12.6	24 inch	786	0.0031	41.52	39.07	46.20	45.15	203.58	45.15	**ABOVE RIM**	2.7	32.3	4.7

1/ Discharge is calculated using time of concentration with all flow in pipe.
2/ Discharge is calculated using time of concentration full flow pipe velocity.

Table D.S2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA S
Existing Hydrology: 10-Year Event with Outfall water depth = 45.15 ft

Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
SL1-2301	70.00	68.19	0.87		0.50	0.44			10	10.3	1.66	6.28
SL1-080202	61.37	58.60	7.61		0.90	6.85			10	10.0	1.69	11.65
SL-1401	58.38	56.50	2.78		0.40	1.11			10	10.0	1.69	1.89
SL1-2302	70.00	68.67	6.15		0.54	3.32			10	10.0	1.69	5.65
SL-0803	61.28	58.81	1.03		0.90	0.93			10	10.0	1.69	1.58
SL1-080201	61.36	58.60	4.91		0.00	0.00			10	10.1	1.68	11.60
SL-1701	61.21	58.20	1.38		0.90	1.24			10	10.0	1.69	2.11
SL-0802	61.05	58.50	1.05		0.90	0.95			10	10.9	1.62	14.20
SL-0801	61.07	56.10	6.27		0.90	5.64			10	11.2	1.59	23.05
ST-26	75.00	73.60	17.60		0.50	8.80	17.60	8.8	16.2	16.2	1.31	11.58
ST-25	74.47	73.07	0.00		0.00	0.00	17.60	8.8	10	16.4	1.30	11.51
ST-24	72.83	71.43	0.00		0.00	0.00	17.60	8.8	10	17.0	1.27	11.30
ST-23	70.14	67.54	0.00	8.48	0.00	0.00	26.08	12.56	15.6	17.8	1.24	15.73
ST-22	67.82	65.25	22.98		0.54	12.41	49.06	24.97	19.1	19.1	1.20	30.09
ST-21	67.02	63.25	0.00		0.00	0.00	49.06	24.97	10	19.2	1.19	30.05
ST-20	64.70	63.25	8.32		0.52	4.33	57.38	29.29	15.7	19.4	1.19	35.02
ST-19	64.70	60.82	1.44		0.90	1.30	58.82	30.59	10	19.5	1.18	36.51
ST-18	63.00	59.28	6.46		0.90	5.81	65.28	36.4	10	19.6	1.18	43.25
ST-17	61.50	57.83	0.00	2.78	0.90	0.00	68.06	37.64	10	19.7	1.18	44.61
ST-16	63.97	57.71	0.59		0.90	0.53	68.65	38.17	10	19.7	1.18	45.22
ST-15	64.16	57.35	8.72		0.90	7.85	77.37	46.02	19	19.8	1.17	54.47
ST-14	60.60	56.37	6.48	6.15	0.40	2.59	90.00	49.73	17.3	19.9	1.17	58.68
ST-13	58.40	53.93	12.54		0.40	5.02	102.54	54.74	10	20.1	1.16	64.15
ST-12	56.50	53.34	2.40		0.40	0.96	104.94	55.7	10	20.5	1.15	64.64
ST-11	57.00	53.15	2.96		0.40	1.18	107.90	56.89	10	20.6	1.15	65.81
ST-10	57.00	53.00	3.08		0.40	1.23	110.98	58.12	10	20.7	1.15	67.15
ST-09	57.80	52.52	4.10		0.40	1.64	115.08	59.76	10	20.8	1.14	68.83
ST-08	57.60	51.81	0.41	14.64	0.40	0.16	130.13	74.29	10	20.8	1.14	85.51
ST-07	54.10	48.23	2.36		0.50	1.18	132.49	75.47	10	21.1	1.13	86.34
ST-06	49.20	42.62	3.26		0.50	1.63	135.75	77.1	10	21.3	1.13	87.68
ST-05	48.93	44.20	0.00		0.00	0.00	135.75	77.1	10	21.3	1.13	87.60
ST-04	48.34	43.51	6.49		0.50	3.25	142.24	80.34	10	21.5	1.12	90.96
ST-03	48.10	42.82	7.58		0.50	3.79	149.82	84.13	10	21.6	1.12	94.92
ST-02	48.60	42.00	13.75		0.50	6.88	163.57	91.01	22	22.0	1.11	101.73
ST-01	46.20	41.52	0.00		0.00	0.00	163.57	91.01	10	22.1	1.11	101.56
S-Outfall	45.15	39.07	0.00		0.00	0.00	163.57	91.01	0	22.5	1.10	100.58

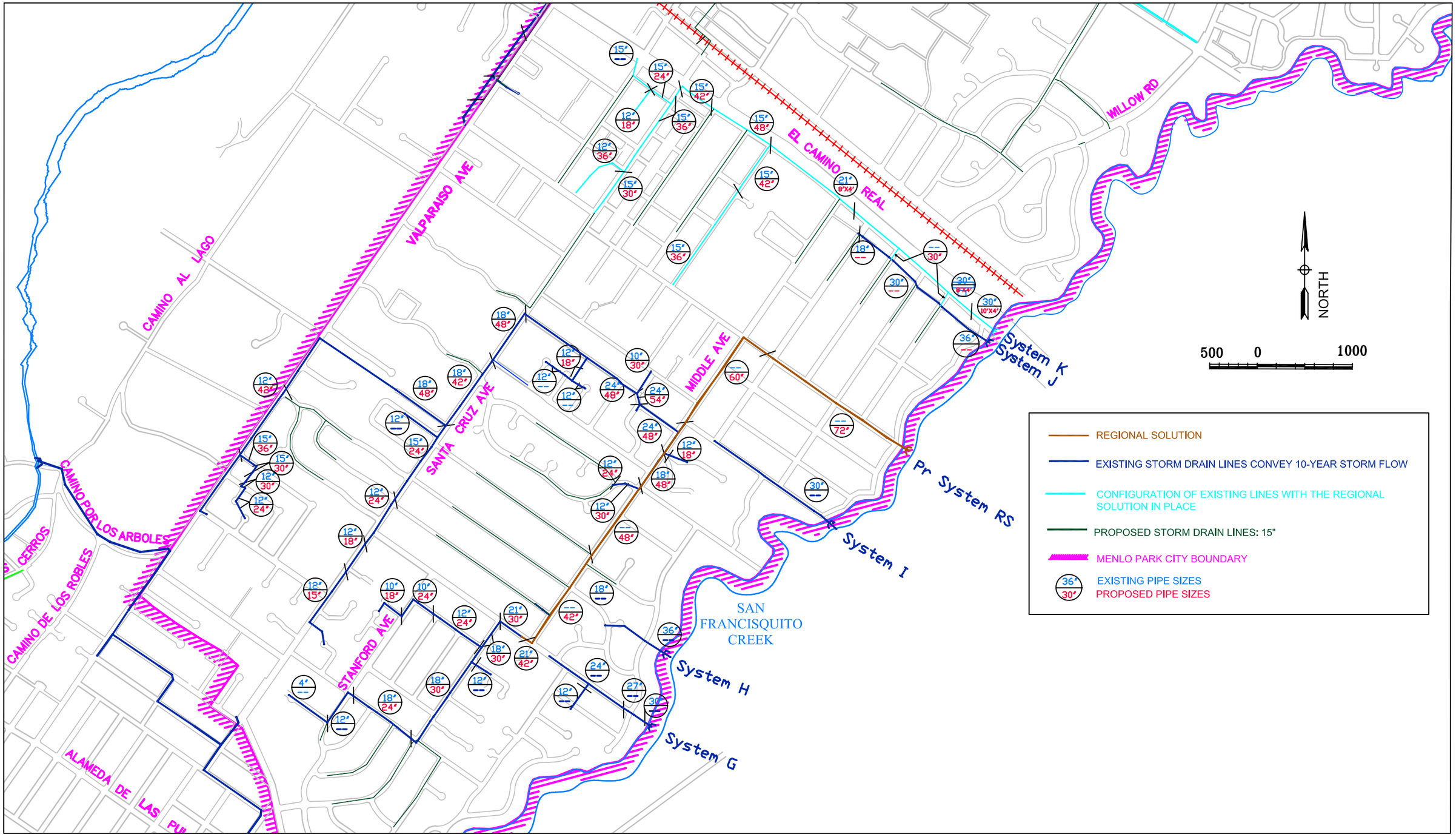


FIGURE 6
REGIONAL SOLUTION ALTERNATIVE

BKF

Table D.RS1.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA RS
Proposed Hydraulics: 10-Year Event with Regional Solution in Areas G and I

Storm Drain System	Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s)
									Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
G	GPL-1202	GL-1202	GL-1201	1.2	2.3	12 inch	53	0.0042	95.12	94.90	99.76	99.84	97.91	97.85	1.9	3.6	1.6
G	GPL-1201	GL-1201	GT-12	3.1	1.7	12 inch	186	0.0022	94.90	94.50	99.84	100.00	97.76	96.34	2.1	3.9	4.0
G	GPL-1010	GL-1010	GL-1009	1.8	3.4	18 inch	98	0.0010	95.46	95.36	100.00	99.92	97.58	97.55	2.4	3.0	1.0
G	GPL-1009	GL-1009	GL-1008	3.8	3.3	18 inch	211	0.0010	95.36	95.15	99.92	99.98	97.44	97.17	2.5	3.1	2.1
G	GPL-1008	GL-1008	GL-1007	7.7	7.2	24 inch	180	0.0010	95.15	94.97	99.98	99.68	97.04	96.86	2.9	2.8	2.5
G	GPl-1007	GL-1007	GL-1006	8.8	7.2	24 inch	60	0.0010	94.97	94.91	99.68	99.59	96.67	96.58	3.0	2.7	3.1
G	GPL-1006	GL-1006	GL-1005	8.7	7.2	24 inch	220	0.0010	94.91	94.69	99.59	99.40	96.56	96.17	3.0	2.7	3.3
G	GPL-1005	GL-1005	GL-1004	8.3	7.3	24 inch	86	0.0010	94.69	94.60	99.40	99.33	96.14	95.93	3.3	2.7	3.6
G	GPL-1004	GL-1004	GL-1003	10.4	14.3	24 inch	199	0.0040	94.60	93.80	99.33	98.30	95.86	95.01	3.5	2.7	5.1
G	GPL-1003	GL-1003	GL-1002	10.2	21.3	24 inch	78	0.0088	93.80	93.11	98.30	98.11	94.94	94.77	3.4	2.5	4.6
G	GPL-1002	GL-1002	GL-1001	12.5	12.6	24 inch	201	0.0031	93.11	92.49	98.11	97.49	94.70	93.85	3.4	3.0	5.1
G	GPL-1001	GL-1001	GT-10	12.3	33.0	24 inch	55	0.0213	92.49	91.32	97.49	97.32	93.75	93.53	3.7	3.0	4.9
G	GPL-0802	GL-0802	GL-0801	2.2	1.2	12 inch	28	0.0011	84.60	84.57	89.17	89.32	85.76	85.65	3.4	3.6	2.8
G	GPL-0801	GL-0801	RS-15	2.2	4.8	12 inch	149	0.0179	84.57	81.91	89.32	89.17	85.20	84.11	4.1	3.8	3.5
G	GPT-27	GT-27	GT-26	2.3	3.3	18 inch	470	0.0010	103.47	103.00	108.00	107.69	107.13	106.90	0.9	3.0	1.3
G	GPT-26	GT-26	GT-25	4.4	5.4	15 inch	343	0.0070	103.00	100.60	107.69	105.10	106.70	105.10	1.0	3.4	3.6
G	GPT-25	GT-25	GT-24	8.2	7.4	15 inch	46	0.0130	100.60	100.00	105.10	105.00	104.38	103.63	0.7	3.3	6.7
G	GPT-24	GT-24	GT-23	8.2	8.5	24 inch	232	0.0014	100.00	99.67	105.00	105.99	103.52	103.22	1.5	3.0	2.6
G	GPT-23	GT-23	GT-22	9.4	7.2	24 inch	70	0.0010	99.67	99.60	105.99	106.30	103.19	103.07	2.8	4.3	3.0
G	GPT-22	GT-22	GT-21	10.8	9.7	24 inch	220	0.0018	99.60	99.20	106.30	106.79	103.02	102.52	3.3	4.7	3.5
G	GPT-21	GT-21	GT-20	10.5	12.4	24 inch	67	0.0030	99.20	99.00	106.79	107.05	102.49	102.34	4.3	5.6	3.4
G	GPT-20	GT-20	GT-19	13.4	7.2	24 inch	195	0.0010	99.00	98.80	107.05	107.58	102.28	101.59	4.8	6.1	4.3
G	GPT-19	GT-19	GT-18	14.8	24.6	24 inch	65	0.0118	98.80	98.03	107.58	107.87	101.51	101.23	6.1	6.8	4.7
G	GPT-18	GT-18	GT-17	19.6	13.8	30 inch	53	0.0011	98.03	97.97	107.87	107.04	100.51	100.40	7.4	7.3	4.0
G	GPT-17	GT-17	GT-16	19.5	12.8	30 inch	215	0.0010	97.97	97.76	107.04	104.56	100.33	99.84	6.7	6.6	4.3
G	GPT-16	GT-16	GT-15	20.9	13.1	30 inch	59	0.0010	97.76	97.70	104.56	104.85	99.77	99.49	4.8	4.3	5.3
G	GPT-15	GT-15	GT-14	22.3	27.4	30 inch	246	0.0045	97.70	96.60	104.85	102.61	99.41	98.74	5.4	4.7	5.6
G	GPT-14	GT-14	GT-13	22.5	13.0	30 inch	60	0.0010	96.60	96.54	102.61	102.04	98.68	98.36	3.9	3.5	5.5
G	GPT-13	GT-13	GT-12	24.0	29.6	30 inch	393	0.0052	96.54	94.50	102.04	100.00	98.25	96.41	3.8	3.0	6.3
G	GPT-12	GT-12	GT-11	27.5	43.3	30 inch	70	0.0111	94.50	93.72	100.00	99.22	96.29	95.60	3.7	3.0	7.1
G	GPT-11	GT-11	GT-10	27.4	58.5	30 inch	118	0.0203	93.72	91.32	99.22	97.32	95.51	93.46	3.7	3.0	6.7
G	GPT-10	GT-10	GT-09	38.2	66.6	36 inch	335	0.0100	91.32	87.98	97.32	93.98	93.33	91.28	4.0	3.0	6.5
G	GPT-09	GT-09	GT-08	41.5	71.9	36 inch	325	0.0116	87.98	84.20	93.98	91.96	90.08	87.60	3.9	3.0	6.9

Table D.RS1.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA RS
Proposed Hydraulics: 10-Year Event with Regional Solution in Areas G and I

Storm Drain System	Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s)
									Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
G	IPL2-120103	IL2-120103	IL2-120102	3.0	3.7	12 inch	92	0.0109	76.00	75.00	81.33	81.06	78.18	77.53	3.1	4.3	3.8
G	IPL2-120102	IL2-120102	IL2-120101	4.1	1.5	18 inch	155	0.0002	75.00	74.97	81.06	80.62	77.45	77.22	3.6	4.6	2.3
G	IPL2-120101	IL2-120101	IL-1201	3.9	16.5	18 inch	93	0.0246	74.97	72.68	80.62	79.46	77.19	77.07	3.4	4.2	2.2
G	IPL1-120102	IL1-120102	IL1-120101	1.0	6.8	12 inch	68	0.0360	76.85	74.40	80.21	80.25	77.28	77.29	2.9	2.4	2.3
G	IPL1-120101	IL1-120101	IL-1201	1.5	4.9	12 inch	92	0.0187	74.40	72.68	80.25	79.46	77.26	77.10	3.0	4.9	1.9
G	IPL-170707	IL-170707	IL-170706	15.5	18.2	24 inch	167	0.0065	87.00	85.92	94.44	91.36	88.76	88.07	5.7	5.4	5.1
G	IPL-170706	IL-170706	IL-170705	15.9	25.3	24 inch	178	0.0125	85.92	83.70	91.36	89.64	87.36	85.92	4.0	3.4	5.8
G	IPL-170705	IL-170705	IL-170704	15.5	34.3	30 inch	43	0.0070	83.70	83.40	89.64	89.73	85.70	85.68	3.9	3.4	3.5
G	IPL-170704	IL-170704	IL-170703	15.3	39.1	30 inch	44	0.0091	83.40	83.00	89.73	90.00	85.47	85.45	4.3	3.8	3.3
G	IPL-170703	IL-170703	IL-170702	19.6	23.1	30 inch	220	0.0032	83.00	82.30	90.00	88.56	85.40	84.91	4.6	4.5	4.1
G	IPL-170702	IL-170702	IL-170701	26.4	136.2	30 inch	29	0.1103	82.30	79.10	88.56	87.39	84.86	84.74	3.7	3.8	5.5
G	IPL-170701	IL-170701	IL-1707	26.3	24.9	36 inch	216	0.0014	79.10	78.80	87.39	88.35	84.46	84.11	2.9	5.3	3.8
G	IPL-070202	IL-070202	IL-070201	2.8	2.3	15 inch	314	0.0013	71.90	71.50	77.82	78.90	75.39	74.82	2.4	4.7	2.3
G	IPL-070201	IL-070201	IL-0702	2.5	7.3	15 inch	39	0.0128	71.50	71.00	78.90	79.17	74.78	74.72	4.1	6.2	2.0
G	IPL-1801	IL-1801	IT-18	1.1	2.7	12 inch	419	0.0057	84.08	81.69	89.50	90.00	84.53	82.88	5.0	4.4	2.4
G	IPL-1710	IL-1710	IL-1709	1.0	3.1	12 inch	26	0.0077	87.20	87.00	94.17	94.00	87.61	87.51	6.6	6.0	2.8
G	IPL-1709	IL-1709	IL-1708	1.0	2.3	12 inch	419	0.0043	87.00	85.20	94.00	90.00	87.45	85.62	6.6	6.0	3.0
G	IPL-1708	IL-1708	IL-1707	0.9	5.5	12 inch	269	0.0238	85.20	78.80	90.00	88.35	85.59	84.03	4.4	3.8	2.1
G	IPL-1707	IL-1707	IL-1706	25.8	35.5	42 inch	241	0.0012	78.80	78.50	88.35	87.55	84.00	83.84	4.3	6.1	2.7
G	IPL-1706	IL-1706	IL-1705	24.5	34.2	42 inch	520	0.0012	78.50	77.90	87.55	85.56	83.83	83.52	3.7	5.6	2.5
G	IPL-1705	IL-1705	IL-1704	36.6	39.5	42 inch	65	0.0015	77.90	77.80	85.56	85.24	83.50	83.42	2.1	4.2	3.8
G	IPL-1704	IL-1704	IL-1703	36.3	46.7	48 inch	284	0.0011	77.80	77.50	85.24	86.10	83.41	83.23	**1.8**	3.4	2.9
G	IPL-1703	IL-1703	IL-1702	36.5	46.2	48 inch	387	0.0010	77.50	77.10	86.10	85.00	83.22	82.97	2.9	4.6	2.9
G	IPL-1702	IL-1702	IL-1701	37.8	46.7	48 inch	946	0.0011	77.10	76.10	85.00	88.68	82.77	82.12	2.2	3.9	3.0
G	IPL-1701	IL-1701	IT-17	37.0	46.7	48 inch	661	0.0011	76.10	75.40	88.68	88.94	82.11	81.67	6.6	8.6	2.9
G	IPL-1201	IL-1201	IT-12	6.2	6.8	18 inch	268	0.0041	72.68	71.57	79.46	79.48	76.91	75.98	2.6	5.3	3.5
G	IPL-0901	IL-0901	IT-09	0.0	13.0	24 inch	310	0.0033	70.52	69.50	76.22	76.95	74.41	74.41	1.8	3.7	0.0
G	IPL-0801	IL-0801	IT-08	0.0	22.1	18 inch	45	0.0444	70.30	68.30	77.19	76.92	74.93	74.93	2.3	5.4	0.0
G	IPL-0706	IL-0706	IL-0705	1.4	4.6	12 inch	59	0.0169	75.00	74.00	79.97	79.95	77.04	76.95	2.9	4.0	1.7
G	IPL-0705	IL-0705	IL-0704	5.2	10.1	18 inch	218	0.0092	74.00	72.00	79.95	80.02	76.64	76.10	3.3	4.5	3.0
G	IPL-0704	IL-0704	IL-0703	5.6	5.1	18 inch	343	0.0023	72.00	71.20	80.02	79.55	75.87	74.92	4.1	6.5	3.1
G	IPL-0703	IL-0703	IL-0702	5.1	4.9	18 inch	92	0.0022	71.20	71.00	79.55	79.17	74.88	74.66	4.7	6.9	2.9
G	IPL-0702	IL-0702	IL-0701	8.7	7.1	18 inch	217	0.0046	71.00	70.00	79.17	78.44	74.50	73.00	4.7	6.7	5.0
G	IPL-0701	IL-0701	IT-07	8.5	47.0	24 inch	51	0.0431	70.00	67.80	78.44	77.99	72.93	72.86	5.5	6.4	2.7
G	IPT-29	IT-29	IT-28	3.9	3.5	15 inch	139	0.0029	98.40	98.00	101.92	100.92	99.62	99.18	2.3	2.3	3.2
G	IPT-28	IT-28	IT-27	3.7	5.0	15 inch	164	0.0061	98.00	97.00	100.92	101.48	98.85	98.41	2.1	1.7	3.6
G	IPT-27	IT-27	IT-26	3.6	6.2	15 inch	401	0.0092	97.00	93.30	101.48	98.77	98.21	96.97	3.3	3.2	3.0
G	IPT-26	IT-26	IT-25	6.0	6.7	15 inch	250	0.0107	93.30	90.62	98.77	96.51	96.86	94.72	1.9	4.2	4.9
G	IPT-25	IT-25	IT-24	8.9	0.0	18 inch	360	0.0000	90.62	90.62	96.51	95.00	94.53	91.94	2.0	4.4	5.2
G	IPT-24	IT-24	IT-23	9.9	21.1	24 inch	119	0.0087	90.62	89.59	95.00	95.00	91.74	91.12	3.3	2.4	4.6
G	IPT-23	IT-23	IT-22	11.3	14.7	24 inch	378	0.0042	89.59	88.00	95.00	94.33	90.90	89.99	4.1	3.4	4.4
G	IPT-22	IT-22	IT-21	11.6	8.2	24 inch	300	0.0013	88.00	87.61	94.33	93.18	89.93	88.94	4.4	4.3	4.5
G	IPT-21	IT-21	IT-20	12.0	17.5	24 inch	253	0.0060	87.61	86.09	93.18	91.78	88.85	87.48	4.3	3.6	5.5
G	IPT-20	IT-20	IT-19	13.1	18.8	24 inch	184	0.0069	86.09	84.82	91.78	90.34	87.39	86.05	4.4	3.7	6.3
G	IPT-19	IT-19	IT-18	12.9	110.5	36 inch	114	0.0275	84.82	81.69	90.34	90.00	85.96	82.93	4.4	2.5	4.9
G	IPT-18	IT-18	IT-17	13.6	138.9	36 inch	145	0.0434	81.69	75.40	90.00	88.94	82.86	81.57	7.1	5.3	3.6
G	IPT-17	IT-17	IT-16	46.4	33.5	42 inch	270	0.0011	75.40	75.10	88.94	87.02	81.45	80.88	7.5	10.0	4.8
G	IPT-16	IT-16	IT-15	52.1	32.0	42 inch	396	0.0010	75.10	74.70	87.02	84.85	80.83	79.78	6.2	8.4	5.4
G	IPT-15	IT-15	IT-14	57.0	52.7	48 inch	178	0.0013	74.70	74.46	84.85	83.98	79.74	79.46	5.1	6.2	4.5
G	IPT-14	IT-14	IT-13	62.8	86.8	48 inch	570	0.0036	74.46	72.38	83.98	80.00	79.42	78.34	4.6	5.5	5.0
G	IPT-13	IT-13	IT-12	66.4	45.4	48 inch	812	0.0010	72.38	71.57	80.00	79.48	77.74	76.02	2.3	3.6	5.3
G	IPT-12	IT-12	IT-11	67.4	69.8	48 inch	368	0.0024	71.57	70.70	79.48	77.81	75.96	75.15	3.5	3.9	5.3
G	IPT-11	IT-11	IT-10	66.4	142.2	48 inch	51	0.0098	70.70	70.20	77.81	77.32	75.11	75.00	2.7	3.1	5.3
G	IPT-10	IT-10	IT-09	66.3	83.7	48 inch	206	0.0034	70.20	69.50	77.32	76.95	74.90	74.46	2.4	3.1	5.3
G	IPT-09	IT-09	IT-08	65.7	188.1	48 inch	70	0.0171	69.50	68.30	76.95	76.92	74.36	74.22	2.6	3.5	5.2
G	IPT-08	IT-08	IT-07	65.5	47.6	48 inch	455	0.0011	68.30	67.80	76.92	77.99	74.02	73.08	2.9	4.6	5.2
G	IPT-07	IT-07	IT-06	69.1	64.9	48 inch	98	0.0020	67.80	67.60	77.99	77.92	72.57	72.34	5.4	6.2	5.5

Table D.RS1.3
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA RS
Proposed Hydraulics: 10-Year Event with Regional Solution in Areas G and I

Storm Drain System	Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s)
									Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
I-RS	RSPL-0901	IT-06	RS-09	68.9	59.1	48 inch	118	0.0017	67.60	67.40	77.92	77.92	71.76	71.49	6.2	6.3	5.5
G-RS	RSP-17	GT-08	RS-16	40.8	23.7	36 inch	159	0.0013	84.20	84.00	91.96	91.96	**87.52**	86.92	4.4	4.8	5.8
RS	RSP-16	RS-16	RS-15	42.3	76.7	42 inch	360	0.0058	84.00	81.91	91.96	89.17	86.03	84.22	5.9	4.5	6.8
RS	RSP-15	RS-15	RS-14	48.8	84.4	42 inch	358	0.0070	81.91	79.39	89.17	86.69	84.09	81.75	5.1	3.8	7.4
RS	RSP-14	RS-14	RS-13	51.6	80.3	42 inch	433	0.0064	79.39	76.63	86.69	84.25	81.64	79.07	5.1	3.8	7.6
RS	RSP-13	RS-13	RS-12	61.1	98.7	48 inch	474	0.0047	76.63	74.39	84.25	82.26	78.99	76.94	5.3	3.6	7.6
RS	RSP-12	RS-12	RS-11	66.8	116.7	48 inch	385	0.0066	74.39	71.85	82.26	80.02	76.86	74.60	5.4	3.9	7.7
RS	RSP-11	RS-11	RS-10	75.8	104.4	48 inch	435	0.0053	71.85	69.55	80.02	79.17	74.49	72.32	5.5	4.2	8.4
RS	RSP-10	RS-10	RS-09	76.7	106.0	48 inch	395	0.0054	69.55	67.40	79.17	77.92	72.20	71.09	7.0	5.6	7.5
RS	RSP-09	RS-09	RS-08	134.1	242.9	60 inch	284	0.0087	67.40	64.93	77.92	75.73	70.88	70.72	7.0	5.5	8.0
RS	RSP-08	RS-08	RS-07	133.2	185.9	60 inch	424	0.0051	64.93	62.77	75.73	73.82	70.65	69.55	5.1	5.8	6.8
RS	RSP-07	RS-07	RS-06	133.9	179.9	60 inch	371	0.0048	62.77	61.00	73.82	72.25	69.49	68.52	4.3	6.1	6.8
RS	RSP-06	RS-06	RS-05	135.3	198.7	60 inch	304	0.0058	61.00	59.23	72.25	70.00	67.64	66.82	4.6	6.3	6.9
RS	RSP-05	RS-05	RS-04	134.2	323.9	72 inch	395	0.0058	59.23	56.92	70.00	71.00	66.80	66.41	3.2	4.8	4.7
RS	RSP-04	RS-04	RS-03	137.4	323.1	72 inch	390	0.0058	56.92	54.65	71.00	73.00	66.37	65.96	4.6	8.1	4.8
RS	RSP-03	RS-03	RS-02	135.4	322.8	72 inch	339	0.0058	54.65	52.68	73.00	73.00	65.94	65.60	7.1	12.4	4.8
RS	RSP-02	RS-02	RS-01	139.3	323.4	72 inch	348	0.0058	52.68	50.65	73.00	69.00	65.57	65.19	7.4	14.3	4.9
RS	RSP-01	RS-01	**RS-Outlet**	137.6	322.6	72 inch	143	0.0058	50.65	49.82	69.00	66.50	65.15	65.00	3.8	12.4	4.8
G	GPL-0402	GL-0402	GL-0401	1.6	2.0	12 inch	48	0.0031	88.75	88.60	94.69	93.72	90.62	90.52	4.1	4.9	2.1
G	GPL-0401	GL-0401	GT-04	5.0	4.8	12 inch	240	0.0182	88.60	84.24	93.72	91.87	90.32	85.58	3.4	4.1	6.4
G	GPT-07	GT-07	GT-06	2.5	18.4	24 inch	164	0.0066	84.68	83.60	90.00	90.56	85.60	85.60	4.4	3.3	1.3
G	GPT-06	GT-06	GT-05	2.3	14.6	24 inch	48	0.0042	83.60	83.40	90.56	90.87	85.60	85.60	5.0	5.0	0.7
G	GPT-05	GT-05	GT-04	2.2	-12.2	24 inch	288	- 0.0029	83.40	84.24	90.87	91.87	85.60	85.56	5.3	5.5	0.8
G	GPT-04	GT-04	GT-03	6.6	9.0	24 inch	443	0.0016	84.24	83.54	91.87	93.79	85.54	84.96	6.3	5.6	2.9
G	GPT-03	GT-03	GT-02	8.3	11.3	27 inch	53	0.0013	83.54	83.47	93.79	94.16	84.95	84.87	8.8	8.0	3.2
G	GPT-02	GT-02	GT-01	8.2	8.9	27 inch	97	0.0008	83.47	83.39	94.16	95.00	84.84	84.62	9.3	8.4	3.5
G	GPT-01	GT-01	**G-Outfall**	8.1	16.1	30 inch	110	0.0015	83.39	83.22	95.00	95.00	84.58	84.17	10.4	9.1	4.1
I	IPT-05	IT-05	IT-04	6.0	9.2	30 inch	536	0.0005	69.24	68.97	76.18	78.01	74.24	74.12	1.9	4.4	1.2
I	IPT-04	IT-04	IT-03	4.5	9.2	30 inch	79	0.0005	68.97	68.93	78.01	78.24	74.12	74.11	3.9	6.5	0.9
I	IPT-03	IT-03	IT-02	10.6	9.2	30 inch	678	0.0005	68.93	68.59	78.24	82.58	74.10	73.65	4.1	6.8	2.2
I	IPT-02	IT-02	IT-01	9.3	24.0	30 inch	41	0.0034	68.59	68.45	82.58	82.20	73.64	73.62	8.9	11.5	1.9
I	IPT-01	IT-01	**I-Outfall**	9.2	7.9	30 inch	27	0.0004	68.45	68.44	82.20	86.40	73.61	73.60	8.6	11.3	1.9
K	KPL-190102	KL-190102	KL-190101	4.3	6.0	18 inch	151	0.0033	67.40	66.90	69.69	69.69	68.33	67.74	1.4	0.8	4.0
K	KPL-190101	KL-190101	KL-1901	4.2	13.4	18 inch	153	0.0163	66.90	64.40	69.69	68.47	67.68	67.45	2.0	1.3	3.4
K	KPL-2405	KL-2405	KL-2404	28.6	28.3	36 inch	111	0.0018	68.40	68.20	75.13	75.00	73.65	73.45	1.5	3.7	4.0
K	KPL-2404	KL-2404	KL-2403	27.9	29.3	36 inch	104	0.0019	68.20	68.00	75.00	75.00	73.41	73.23	1.6	3.8	3.9
K	KPL-2403	KL-2403	KL-2402	27.3	25.2	36 inch	140	0.0014	68.00	67.80	75.00	74.06	73.20	72.96	1.8	4.0	3.9
K	KPL-2402	KL-2402	KL-2401	26.5	25.3	36 inch	139	0.0014	67.80	67.60	74.06	74.03	72.79	72.57	1.3	3.3	3.8
K	KPL-2401	KL-2401	KT-24	25.8	27.3	36 inch	119	0.0017	67.60	67.40	74.03	74.78	72.37	72.19	1.7	3.4	3.6
K	KPL-1903	KL-1903	KL-1902	1.5	3.0	15 inch	137	0.0021	66.69	66.40	69.13	69.15	67.61	67.55	1.5	1.2	1.4
K	KPL-1902	KL-1902	KL-1901	1.4	6.0	15 inch	229	0.0087	66.40	64.40	69.15	68.47	67.53	67.43	1.6	1.5	1.2
K	KPL-1901	KL-1901	KT-19	4.7	9.8	24 inch	214	0.0019	64.40	64.00	68.47	69.85	67.41	67.32	1.1	2.1	1.5
K	KPL-0905	KL-0905	KL-0904	18.5	21.8	36 inch	746	0.0011	60.00	59.20	72.54	69.23	63.58	63.00	9.0	9.5	2.6
K	KPL-0904	KL-0904	KL-0903	29.5	23.1	36 inch	417	0.0012	59.20	58.70	69.23	66.78	62.97	62.15	6.3	7.0	4.2
K	KPL-0903	KL-0903	KL-0902	30.9	35.7	36 inch	35	0.0029	58.70	58.60	66.78	66.64	62.11	62.03	4.7	5.1	4.4
K	KPL-0902	KL-0902	KL-0901	47.7	33.7	42 inch	536	0.0011	58.60	58.00	66.64	65.00	61.98	60.70	4.7	4.5	5.5
K	KPL-0901	KL-0901	KT-09	45.4	66.3	42 inch	23	0.0043	58.00	57.90	65.00	65.00	60.63	60.61	4.4	3.5	5.8

Table D.RS1.4
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA RS
Proposed Hydraulics: 10-Year Event with Regional Solution in Areas G and I

Storm Drain System	Pipe #	Upstream Node	Downstream Node	Total Discharge (cfs) 1/	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Slope (ft/ft)	Invert Elevation		Ground/Rim Elevation		HGL Elevation		Freeboard (feet)	Upstream Cover (feet)	Velocity (ft/s)
									Upstream	Downstream	Upstream	Downstream	Upstream	Downstream			
K	KPT-26	KT-27	KT-26	19.3	18.9	30 inch	94	0.0021	69.00	68.80	76.02	76.04	73.11	72.90	2.9	4.5	3.9
K	KPT-25	KT-26	KT-25	18.9	21.2	30 inch	300	0.0027	68.80	68.00	76.04	75.13	72.83	72.20	3.2	4.7	3.8
K	KPT-24	KT-25	KT-24	17.9	31.8	30 inch	100	0.0060	68.00	67.40	75.13	74.78	72.17	71.98	3.0	4.6	3.7
K	KPT-23	KT-24	KT-23	42.7	46.6	36 inch	41	0.0049	67.40	67.20	74.78	74.65	71.85	71.68	2.9	4.4	6.0
K	KPT-22	KT-23	KT-22	42.5	23.7	36 inch	159	0.0013	67.20	67.00	74.65	73.73	71.58	70.94	3.1	4.5	6.0
K	KPT-21	KT-22	KT-21	42.4	22.0	36 inch	92	0.0011	67.00	66.90	73.73	72.93	70.73	70.36	3.0	3.7	6.0
K	KPT-20	KT-21	KT-20	42.0	46.6	36 inch	41	0.0049	66.90	66.70	72.93	72.61	70.17	70.01	2.8	3.0	5.9
K	KPT-19	KT-20	KT-19	44.5	46.0	36 inch	568	0.0048	66.70	64.00	72.61	69.85	69.91	67.38	2.7	2.9	6.3
K	KPT-18	KT-19	KT-18	45.7	49.6	36 inch	181	0.0055	64.00	63.00	69.85	69.60	67.27	66.42	2.6	2.9	6.5
K	KPT-17	KT-18	KT-17	48.1	253.8	42 inch	11	0.0636	63.00	62.30	69.60	69.50	66.10	66.13	3.5	3.1	5.2
K	KPT-16	KT-17	KT-16	48.8	45.5	42 inch	49	0.0020	62.30	62.20	69.50	69.44	65.81	65.69	3.7	3.7	5.1
K	KPT-15	KT-16	KT-15	48.5	24.1	42 inch	350	0.0006	62.20	62.00	69.44	69.02	65.59	64.61	3.8	3.7	5.7
K	KPT-14	KT-15	KT-13	59.8	77.9	48 inch	68	0.0029	62.00	61.80	69.02	69.25	64.56	64.28	4.5	3.0	7.2
K	KPT-13	KT-13	KT-12	59.5	86.8	48 inch	329	0.0036	61.80	60.60	69.25	67.70	64.23	62.97	5.0	3.5	7.6
K	KPT-12	KT-12	KT-11	58.4	229.6	48 inch	90	0.0256	60.60	58.30	67.70	66.82	62.90	61.57	4.8	3.1	6.6
K	KPT-11	KT-11	KT-10	64.6	46.1	48 inch	194	0.0010	58.30	58.10	66.82	65.00	61.53	60.83	5.3	4.5	6.5
K	KPT-10	KT-10	KT-09	70.2	90.0	48 inch	51	0.0039	58.10	57.90	65.00	65.00	60.75	60.54	4.3	2.9	8.0
K	KPT-09	KT-09	KT-08	113.2	157.9	8 x 4 ft	788	0.0013	57.90	56.90	65.00	62.42	60.50	59.61	4.5	3.1	5.3
K	KPT-08	KT-08	KT-07	120.5	218.8	8 x 4 ft	82	0.0024	56.90	56.70	62.42	62.27	59.58	59.53	2.8	1.5	5.5
K	KPT-07	KT-07	KT-06	119.8	213.7	8 x 4 ft	86	0.0023	56.70	56.50	62.27	62.19	59.51	59.47	2.8	1.6	5.2
K	KPT-06	KT-06	KT-05	133.3	156.4	8 x 4 ft	297	0.0012	56.50	56.13	62.19	62.04	59.45	59.10	2.7	1.7	5.6
K	KPT-05	KT-05	KT-04	141.0	174.9	8 x 4 ft	417	0.0016	56.13	55.48	62.04	62.14	59.07	58.61	3.0	1.9	5.8
K	KPT-04	KT-04	KT-03	142.4	172.9	8 x 4 ft	230	0.0015	55.48	55.13	62.14	62.02	58.59	58.38	3.6	2.7	5.6
K	KPT-03	KT-03	KT-02	142.2	122.3	8 x 4 ft	197	0.0008	55.13	54.98	62.02	61.91	58.36	58.11	3.7	2.9	5.6
K	KPT-02	KT-02	KT-01	149.3	145.5	8 x 4 ft	510	0.0011	54.98	54.43	61.91	67.78	58.08	57.03	3.8	2.9	6.6
K	KPT-01	KT-01	**K-Outfall**	145.7	177.7	10 x 4 ft	394	0.0009	54.43	54.06	67.78	66.10	56.99	55.93	10.8	9.4	6.7
J	JPT-09	JT-09	JT-08	5.8	5.9	18 inch	46	0.0109	56.50	56.00	62.04	62.03	60.23	59.75	1.8	4.0	3.3
J	JPT-08	JT-08	KT-05	11.2	-7.6	24 inch	115	- 0.0011	56.00	56.13	62.03	62.04	59.48	59.20	2.6	4.0	3.6
J	JPT-07	JT-07	JT-06	6.4	20.1	30 inch	61	0.0082	54.50	54.00	61.89	61.57	60.03	59.98	1.9	4.9	1.3
J	JPT-06	JT-06	JT-05	14.3	8.6	30 inch	334	0.0015	54.00	53.50	61.57	61.03	59.95	58.56	1.6	5.1	2.9
J	JPT-05	JT-05	JT-04	13.1	11.9	30 inch	35	0.0029	53.50	53.40	61.03	60.88	58.49	58.37	2.5	5.0	2.7
J	JPT-04	JT-04	KT-02	13.0	-45.0	30 inch	131	- 0.0121	53.40	54.98	60.88	61.91	58.23	58.10	2.7	5.0	2.7
J	JPT-03	JT-03	JT-02	0.0	22.5	36 inch	36	0.0039	53.35	53.21	62.00	63.21	55.87	55.87	6.1	5.7	0.0
J	JPT-02	JT-02	JT-01	19.8	16.2	36 inch	229	0.0020	53.21	52.75	63.21	67.32	55.85	55.16	7.4	7.0	3.1
J	JPT-01	JT-01	**J-Outfall**	18.7	16.9	36 inch	342	0.0022	52.75	52.00	67.32	55.00	55.15	53.38	12.2	11.6	4.5
H	HPT-03	HT-03	HT-02	5.7	16.6	24 inch	176	0.0054	82.80	81.85	86.47	86.79	83.64	83.16	2.8	1.7	3.6
H	HPT-02	HT-02	HT-01	14.0	69.8	36 inch	293	0.0110	81.85	78.64	86.79	90.00	83.04	80.11	3.8	1.9	4.7
H	HPT-01	HT-01	**H-Outfall**	13.3	28.0	36 inch	362	0.0018	78.64	78.00	90.00	90.00	80.09	79.16	9.9	8.4	4.6

Table D.RS2.1
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA RS
Proposed Hydrology: 10-Year Event with Regional Solution in Areas G and I

Storm Drain System	Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
G	GL-1202	99.76	95.12	1.80		0.40	0.72		0.72	10	10.0	1.69	1.2
G	GL-1201	99.84	94.90	2.90		0.40	1.16		1.88	10	10.6	1.64	3.1
G	GL-1010	100.00	95.46	2.60		0.40	1.04		1.04	10	10.0	1.69	1.8
G	GL-1009	99.92	95.36	3.40		0.40	1.36		2.4	10	11.6	1.56	3.8
G	GL-1008	99.98	95.15	7.20		0.40	2.88		5.28	10	13.3	1.45	7.7
G	GL-1007	99.68	94.97	2.50		0.40	1.00		6.28	10	14.5	1.39	8.8
G	GL-1006	99.59	94.91	0.00		0.40	0.00		6.28	10	14.8	1.37	8.7
G	GL-1005	99.40	94.69	0.00		0.40	0.00		6.28	10	15.9	1.32	8.3
G	GL-1004	99.33	94.60	4.10		0.40	1.64		7.92	10	16.3	1.30	10.4
G	GL-1003	98.30	93.80	0.00		0.40	0.00		7.92	10	17.0	1.27	10.2
G	GL-1002	98.11	93.11	4.80		0.40	1.92		9.84	10	17.2	1.26	12.5
G	GL-1001	97.49	92.49	0.00		0.40	0.00		9.84	10	17.9	1.24	12.3
G	GL-0802	89.17	84.60	3.20		0.40	1.28		1.28	10	10.0	1.69	2.2
G	GL-0801	89.32	84.57	0.00		0.40	0.00		1.28	10	10.2	1.67	2.2
G	GT-27	108.00	103.47	5.50		0.25	1.38	5.50	1.38	10	10.0	1.69	2.3
G	GT-26	107.69	103.00	7.80		0.25	1.95	13.30	3.33	10	15.9	1.32	4.4
G	GT-25	105.10	100.60	8.00		0.40	3.20	21.30	6.53	10	17.5	1.25	8.2
G	GT-24	105.00	100.00	0.00		0.40	0.00	21.30	6.53	10	17.6	1.25	8.2
G	GT-23	105.99	99.67	3.10		0.40	1.24	24.40	7.77	10	19.1	1.20	9.4
G	GT-22	106.30	99.60	3.30		0.40	1.32	27.70	9.09	10	19.5	1.18	10.8
G	GT-21	106.79	99.20	0.00		0.40	0.00	27.70	9.09	10	20.6	1.15	10.5
G	GT-20	107.05	99.00	6.50		0.40	2.60	34.20	11.69	10	20.9	1.14	13.4
G	GT-19	107.58	98.80	3.70		0.40	1.48	37.90	13.17	10	21.7	1.12	14.8
G	GT-18	107.87	98.03	10.80		0.40	4.32	48.70	17.48	10	21.9	1.11	19.6
G	GT-17	107.04	97.97	0.00		0.40	0.00	48.70	17.48	10	22.1	1.11	19.5
G	GT-16	104.56	97.76	4.10		0.40	1.64	52.80	19.12	10	22.9	1.08	20.9
G	GT-15	104.85	97.70	3.30		0.40	1.32	56.10	20.45	10	23.1	1.08	22.3
G	GT-14	102.61	96.60	1.50		0.40	0.60	57.60	21.05	10	23.9	1.06	22.5
G	GT-13	102.04	96.54	3.60		0.40	1.44	61.20	22.49	10	24.0	1.06	24.0
G	GT-12	100.00	94.50	5.10	4.70	0.40	2.04	71.00	26.41	10	25.1	1.03	27.5
G	GT-11	99.22	93.72	0.00		0.40	0.00	71.00	26.41	10	25.2	1.03	27.4
G	GT-10	97.32	91.32	1.80	24.60	0.40	0.72	97.40	36.97	10	25.5	1.02	38.2
G	GT-09	93.98	87.98	9.80		0.40	3.92	107.20	40.89	10	26.4	1.01	41.5
G	GT-08	91.96	84.20	0.00	3.20	0.40	0.00	110.40	40.89	10	27.2	0.99	40.8

Table D.RS2.2
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA RS
Proposed Hydrology: 10-Year Event with Regional Solution in Areas G and I

Storm Drain System	Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
I	IL-1801	89.50	84.08	1.66		0.40	0.66		0.66	10	10.0	1.69	1.1
I	IL-1710	94.17	87.20	1.43		0.40	0.57		0.57	10	10.0	1.69	1.0
I	IL-1709	94.00	87.00	0.00		0.40	0.00		0.57	10	10.2	1.67	1.0
I	IL-1708	90.00	85.20	0.00		0.40	0.00		0.57	10	12.5	1.50	0.9
I	IL-170707	94.44	87.00	27.58		0.33	9.10		9.1	10	10.0	1.69	15.5
I	IL-170706	91.36	85.92	1.26		0.40	0.50		9.61	10	10.5	1.64	15.9
I	IL-170705	89.64	83.70	0.00		0.40	0.00		9.61	10	11.1	1.60	15.5
I	IL-170704	89.73	83.40	0.00		0.40	0.00		9.61	10	11.3	1.58	15.3
I	IL-170703	90.00	83.00	7.04		0.40	2.82		12.42	10	11.5	1.57	19.6
I	IL-170702	88.56	82.30	12.38		0.40	4.95		17.37	10	12.4	1.51	26.4
I	IL-170701	87.39	79.10	0.00		0.40	0.00		17.37	10	12.5	1.50	26.3
I	IL-1707	88.35	78.80	1.60		0.40	0.64		18.59	10	14.7	1.38	25.8
I	IL-1706	87.55	78.50	0.00		0.40	0.00		18.59	10	16.2	1.31	24.5
I	IL-1705	85.56	77.90	30.41		0.40	12.16		30.75	10	19.6	1.18	36.6
I	IL-1704	85.24	77.80	0.00		0.40	0.00		30.75	10	19.9	1.17	36.3
I	IL-1703	86.10	77.50	3.66		0.40	1.46		32.21	10	21.5	1.12	36.5
I	IL-1702	85.00	77.10	7.48		0.40	2.99		35.21	10	23.7	1.06	37.8
I	IL-1701	88.68	76.10	7.90		0.40	3.16		38.37	10	29.0	0.96	37.0
I	IL2-120103	81.33	76.00	4.42		0.40	1.77		1.77	10	10.0	1.69	3.0
I	IL2-120102	81.06	75.00	1.72		0.40	0.69		2.46	10	10.4	1.65	4.1
I	IL2-120101	80.62	74.97	0.00		0.40	0.00		2.46	10	11.5	1.57	3.9
I	IL1-120102	80.21	76.85	1.52		0.40	0.61		0.61	10	10.0	1.69	1.0
I	IL1-120101	80.25	74.40	0.77		0.40	0.31		0.92	10	10.5	1.64	1.5
I	IL-1201	79.46	72.68	1.71		0.40	0.68		4.06	10	12.2	1.52	6.2
I	IL-0901	76.22	70.52	0.00		0.50	0.00		0	10	10.0	0.00	0.0
I	IL-0801	77.19	70.30	0.00		0.37	0.00		0	10	10.0	0.00	0.0
I	IL-0706	79.97	75.00	2.00		0.40	0.80		0.8	10	10.0	1.69	1.4
I	IL-0705	79.95	74.00	5.90		0.40	2.36		3.16	10	10.6	1.64	5.2
I	IL-0704	80.02	72.00	1.00		0.40	0.40		3.56	10	11.8	1.55	5.6
I	IL-0703	79.55	71.20	0.00		0.40	0.00		3.56	10	13.6	1.43	5.1
I	IL-070202	77.82	71.90	3.60		0.45	1.62		1.62	10	10.0	1.69	2.8
I	IL-070201	78.90	71.50	0.00		0.40	0.00		1.62	10	12.3	1.51	2.5
I	IL-0702	79.17	71.00	2.50		0.40	1.00		6.18	10	14.2	1.40	8.7
I	IL-0701	78.44	70.00	0.00		0.40	0.00		6.18	10	14.9	1.37	8.5

Table D.RS2.3
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA RS
Proposed Hydrology: 10-Year Event with Regional Solution in Areas G and I

Storm Drain System	Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
I	IT-29	101.92	98.40	5.70		0.40	2.28	5.70	2.28	10	10.0	1.69	3.9
I	IT-28	100.92	98.00	0.00		0.40	0.00	5.70	2.28	10	10.7	1.63	3.7
I	IT-27	101.48	97.00	0.00		0.40	0.00	5.70	2.28	10	11.5	1.57	3.6
I	IT-26	98.77	93.30	4.70		0.40	1.88	10.40	4.16	10	13.7	1.43	6.0
I	IT-25	96.51	90.62	5.50		0.40	2.20	15.90	6.36	10	14.6	1.38	8.9
I	IT-24	95.00	90.62	2.60		0.40	1.04	18.50	7.4	10	15.8	1.32	9.9
I	IT-23	95.00	89.59	2.90		0.40	1.16	21.40	8.56	10	16.2	1.31	11.3
I	IT-22	94.33	88.00	1.70		0.40	0.68	23.10	9.24	10	17.6	1.25	11.6
I	IT-21	93.18	87.61	1.43		0.40	0.57	24.53	9.81	10	18.7	1.21	12.0
I	IT-20	91.78	86.09	2.90		0.40	1.16	27.43	10.97	10	19.5	1.18	13.1
I	IT-19	90.34	84.82	0.00		0.40	0.00	27.43	10.97	10	20.0	1.17	12.9
I	IT-18	90.00	81.69	0.00	1.66	0.40	0.00	29.09	11.64	10	20.4	1.15	13.6
I	IT-17	88.94	75.40	3.18	100.74	0.40	1.27	133.01	51.27	10	32.7	0.90	46.4
I	IT-16	87.02	75.10	17.92		0.40	7.17	150.93	58.44	10	33.7	0.88	52.1
I	IT-15	84.85	74.70	17.00		0.40	6.80	167.93	65.24	10	34.9	0.87	57.0
I	IT-14	83.98	74.46	17.28		0.42	7.26	185.21	72.5	10	35.6	0.86	62.8
I	IT-13	80.00	72.38	15.98		0.40	6.39	201.19	78.89	10	37.5	0.84	66.4
I	IT-12	79.48	71.57	0.00	10.14	0.45	0.00	211.33	82.95	10	40.0	0.81	67.4
I	IT-11	77.81	70.70	0.00		0.40	0.00	211.33	82.95	10	41.2	0.79	66.4
I	IT-10	77.32	70.20	0.00		0.40	0.00	211.33	82.95	10	41.3	0.79	66.3
I	IT-09	76.95	69.50	0.00	0.00	0.40	0.00	211.33	82.95	10	42.0	0.79	65.7
I	IT-08	76.92	68.30	0.00	0.00	0.40	0.00	211.33	82.95	10	42.2	0.78	65.5
I	IT-07	77.99	67.80	0.00	15.00	0.40	0.00	226.33	89.13	10	43.7	0.77	69.1
I	IT-06	77.92	67.60	0.00		0.40	0.00	226.33	89.13	10	44.0	0.77	68.9
RS	RS-16	91.96	84.00	4.60	110.40	0.40	1.84	115.00	42.73	10	27.6	0.98	42.3
RS	RS-15	89.17	81.91	15.20		0.40	6.08	130.20	50.09	10	28.5	0.97	48.8
RS	RS-14	86.69	79.39	9.20		0.40	3.68	139.40	53.77	10	29.3	0.95	51.6
RS	RS-13	84.25	76.63	27.60		0.40	11.04	167.00	64.81	10	30.3	0.94	61.1
RS	RS-12	82.26	74.39	18.20		0.40	7.28	185.20	72.09	10	31.3	0.92	66.8
RS	RS-11	80.02	71.85	27.30		0.40	10.92	212.50	83.01	10	32.2	0.91	75.8
RS	RS-10	79.17	69.55	5.50		0.40	2.20	218.00	85.21	10	33.0	0.89	76.7
RS	RS-09	77.92	67.40	0.00	226.33	0.00	0.00	444.33	174.33	0	44.3	0.76	134.1
RS	RS-08	75.73	64.93	0.00		0.00	0.00	444.33	174.33	0	44.9	0.76	133.2
RS	RS-07	73.82	62.77	7.80		0.40	3.12	452.13	177.45	10	46.0	0.75	133.9
RS	RS-06	72.25	61.00	9.40		0.40	3.76	461.53	181.21	10	46.9	0.74	135.3
RS	RS-05	70.00	59.23	0.00		0.00	0.00	461.53	181.21	0	47.6	0.73	134.2
RS	RS-04	71.00	56.92	17.95		0.40	7.18	479.48	188.39	10	49.0	0.72	137.4
RS	RS-03	73.00	54.65	0.00		0.00	0.00	479.48	188.39	0	50.4	0.71	135.4
RS	RS-02	73.00	52.68	19.30		0.40	7.72	498.78	196.11	10	51.5	0.70	139.3
RS	RS-01	69.00	50.65	0.00		0.00	0.00	498.78	196.11	0	52.7	0.70	137.6
RS	RS-Outlet	66.50	49.82	0.00		0.00	0.00	498.78	196.11	0	53.2	0.69	136.9

Table D.RS2.4
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA RS
Proposed Hydrology: 10-Year Event with Regional Solution in Areas G and I

Storm Drain System	Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
G	GT-07	90.00	84.68	3.70		0.40	1.48	3.70	1.48	10	10.0	1.69	2.5
G	GT-06	90.56	83.60	0.00		0.40	0.00	3.70	1.48	10	12.1	1.52	2.3
G	GT-05	90.87	83.40	0.00		0.40	0.00	3.70	1.48	10	13.2	1.45	2.2
G	GL-0402	94.69	88.75	2.40		0.40	0.96		0.96	10	10.0	1.69	1.6
G	GL-0401	93.72	88.60	5.10		0.40	2.04		3	10	10.4	1.65	5.0
G	GT-04	91.87	84.24	2.40	7.50	0.40	0.96	9.90	5.44	10	18.9	1.20	6.6
G	GT-03	93.79	83.54	4.70		0.40	1.88	14.60	7.32	10	21.5	1.12	8.3
G	GT-02	94.16	83.47	0.00		0.40	0.00	14.60	7.32	10	21.8	1.12	8.2
G	GT-01	95.00	83.39	0.00		0.40	0.00	14.60	7.32	10	22.2	1.10	8.1
G	G-Outfall	95.00	83.22	0.00		0.00	0.00	14.60	7.32	0	22.7	1.09	8.1
I	IT-05	76.18	69.24	8.80		0.40	3.52	8.80	3.52	10	10.0	1.69	6.0
I	IT-04	78.01	68.97	0.00		0.40	0.00	8.80	3.52	10	17.3	1.26	4.5
I	IT-03	78.24	68.93	12.90		0.40	5.16	21.70	8.68	10	18.8	1.21	10.6
I	IT-02	82.58	68.59	0.00		0.40	0.00	21.70	8.68	10	24.0	1.06	9.3
I	IT-01	82.20	68.45	0.00		0.40	0.00	21.70	8.68	10	24.4	1.05	9.2
I	I-Outfall	86.40	68.44	0.00		0.00	0.00	21.70	8.68	0	24.6	1.04	9.1
K	KL-2405	75.13	68.40	33.55		0.50	16.77		16.77	10	10.0	1.69	28.6
K	KL-2404	75.00	68.20	0.00		0.90	0.00		16.77	10	10.5	1.65	27.9
K	KL-2403	75.00	68.00	0.00		0.90	0.00		16.77	10	10.9	1.61	27.3
K	KL-2402	74.06	67.80	0.00		0.90	0.00		16.77	10	11.5	1.57	26.5
K	KL-2401	74.03	67.60	0.00		0.90	0.00		16.77	10	12.1	1.52	25.8
K	KL-1903	69.13	66.69	1.75		0.50	0.88		0.88	10	10.0	1.69	1.5
K	KL-1902	69.15	66.40	0.00		0.90	0.00		0.88	10	11.6	1.56	1.4
K	KL-190102	69.69	67.40	2.80		0.90	2.52		2.52	10	10.0	1.69	4.3
K	KL-190101	69.69	66.90	0.00		0.90	0.00		2.52	10	10.6	1.63	4.2
K	KL-1901	68.47	64.40	0.00		0.90	0.00		3.4	10	15.0	1.36	4.7
K	KL-0905	72.54	60.00	22.24		0.49	10.90		10.9	10	10.0	1.69	18.5
K	KL-0904	69.23	59.20	11.59		0.90	10.43		21.33	10	14.7	1.37	29.5
K	KL-0903	66.78	58.70	4.23		0.54	2.28		23.61	10	16.4	1.30	30.9
K	KL-0902	66.64	58.60	14.50		0.90	13.05		36.66	10	16.5	1.29	47.7
K	KL-0901	65.00	58.00	0.00		0.90	0.00		36.66	10	18.2	1.23	45.4

Table D.RS2.5
MENLO PARK STORM DRAINAGE MASTER PLAN
DRAINAGE AREA RS
Proposed Hydrology: 10-Year Event with Regional Solution in Areas G and I

Storm Drain System	Node #	Ground Elevation (ft)	Sump Elevation (ft)	Inlet Area (acres)	Lateral Area (Acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	Discharge (cfs)
K	KT-27	76.02	69.00	21.75		0.52	11.31	21.75	11.31	10	10.0	1.69	19.3
K	KT-26	76.04	68.80	0.00		0.90	0.00	21.75	11.31	10	10.4	1.65	18.9
K	KT-25	75.13	68.00	0.15		0.90	0.14	21.90	11.45	10	11.7	1.55	17.9
K	KT-24	74.78	67.40	0.28	33.55	0.90	0.25	55.73	28.47	10	12.7	1.49	42.7
K	KT-23	74.65	67.20	0.00		0.90	0.00	55.73	28.47	10	12.8	1.48	42.5
K	KT-22	73.73	67.00	0.52		0.90	0.47	56.25	28.94	10	13.2	1.45	42.4
K	KT-21	72.93	66.90	0.00		0.90	0.00	56.25	28.94	10	13.5	1.44	42.0
K	KT-20	72.61	66.70	2.06		0.90	1.85	58.31	30.79	10	13.6	1.43	44.5
K	KT-19	69.85	64.00	2.05	4.55	0.90	1.84	64.91	36.03	10	17.4	1.26	45.7
K	KT-18	69.60	63.00	2.71		0.90	2.44	67.62	38.47	10	17.8	1.24	48.1
K	KT-17	69.50	62.30	0.63		0.90	0.57	68.25	39.04	10	17.9	1.24	48.8
K	KT-16	69.44	62.20	0.00		0.90	0.00	68.25	39.04	10	18.0	1.23	48.5
K	KT-15	69.02	62.00	11.67		0.90	10.50	79.92	49.54	10	19.1	1.20	59.8
K	KT-13	69.25	61.80	0.00		0.90	0.00	79.92	49.54	10	19.2	1.19	59.5
K	KT-12	67.70	60.60	0.00		0.90	0.00	79.92	49.54	10	19.9	1.17	58.4
K	KT-11	66.82	58.30	6.25		0.90	5.63	86.17	55.17	10	20.2	1.16	64.6
K	KT-10	65.00	58.10	6.23		0.90	5.61	92.40	60.78	10	20.7	1.15	70.2
K	KT-09	65.00	57.90	0.87	52.56	0.90	0.78	145.83	98.22	10	20.8	1.14	113.2
K	KT-08	62.42	56.90	14.15		0.90	12.74	159.98	110.96	10	23.2	1.08	120.5
K	KT-07	62.27	56.70	0.00		0.90	0.00	159.98	110.96	10	23.5	1.07	119.8
K	KT-06	62.19	56.50	26.64		0.50	13.32	186.62	124.28	10	23.8	1.06	133.3
K	KT-05	62.04	56.13	3.44		0.90	3.10	190.06	134.02	10	24.7	1.04	141.0
K	KT-04	62.14	55.48	5.32		0.90	4.79	195.38	138.81	10	25.8	1.02	142.4
K	KT-03	62.02	55.13	1.98		0.90	1.78	197.36	140.59	10	26.5	1.00	142.2
K	KT-02	61.91	54.98	0.00		0.90	0.00	197.36	149.35	10	27.1	0.99	149.3
K	KT-01	67.78	54.43	0.00		0.90	0.00	197.36	149.35	10	28.4	0.97	145.7
K	K-Outfall	66.10	54.06	0.00		0.00	0.00	197.36	149.35	0	29.4	0.95	143.1
J	JT-09	62.04	56.50	8.55		0.40	3.42	8.55	3.42	10	10.0	1.69	5.8
J	JT-08	62.03	56.00	8.07		0.40	3.23	16.62	6.65	10	10.2	1.67	11.2
J	JT-07	61.89	54.50	9.45		0.40	3.78	26.07	3.78	10	10.0	1.69	6.4
J	JT-06	61.57	54.00	12.45		0.40	4.98	38.52	8.76	10	10.8	1.62	14.3
J	JT-05	61.03	53.50	0.00		0.40	0.00	38.52	8.76	10	12.7	1.49	13.1
J	JT-04	60.88	53.40	0.00		0.40	0.00	38.52	8.76	10	12.9	1.47	13.0
J	JT-03	62.00	53.35	0.00		0.40	0.00	38.52	0	10	10.0	0.00	0.0
J	JT-02	63.21	53.21	29.14		0.40	11.66	67.66	11.66	10	10.0	1.69	19.8
J	JT-01	67.32	52.75	0.00		0.40	0.00	67.66	11.66	10	11.2	1.59	18.7
J	J-Outfall	55.00	52.00	0.00		0.00	0.00	67.66	11.66	0	12.5	1.50	17.6
H	HT-03	86.47	82.80	8.40		0.40	3.36	8.40	3.36	10	10.0	1.69	5.7
H	HT-02	86.79	81.85	13.00		0.40	5.20	21.40	8.56	10	10.8	1.62	14.0
H	HT-01	90.00	78.64	0.00		0.40	0.00	21.40	8.56	10	11.9	1.54	13.3
H	H-Outfall	90.00	78.00	0.00		0.00	0.00	21.40	8.56	0	13.2	1.46	12.6

APPENDIX E

Basis of Calculations

This Appendix includes a description of the Methodology and Design Criteria used in this report. In addition it also contains:

1. Precipitation Intensity Duration Frequency Equation

   Table E2 presents data used for the intensity-duration-frequency equation.

2. Flow in Street

   The flow capacity in the street is approximated using the analyses presented in Table E3. Analyses are based on Manning's Equation for the range of slope of the street. Calculations are presented for a depth at the gutter flow line of 6 inches and for a gutter spread width of 12 feet. Calculations are based on a 50-foot wide street with a 2 percent crown. Calculations are used to assess the priority of improvements and should not be used for design purposes.

3. Runoff Coefficients

   Figure E1 presents the runoff coefficients used in the analyses.

Methodology and Design Criteria

The drainage system flow capacity is evaluated using the StormCad computer program by Haestad Methods version 4.1.1. The program uses the Rational Method. The following describes the model input:

Existing Systems Level of Protection - Existing storm drain systems are evaluated for a 10-year storm event. Systems are considered adequate if the 10-year storm event is contained below the rim elevation of the inlet. Because many storm drain systems do not currently provide this level of protection, there is potential that street flows will overtop the curb. Future development below the grade of the street should be avoided unless it can be shown that the street and drainage system can convey the 100-year flow.

Proposed Systems Level of Protection - Improvements are sized for a 10-year storm event with the water level at least one foot below the gutter flow line elevation. During the design phase, the City may want to investigate the option of sizing improvements for a 25-year storm event for facilities that service areas greater than 100 acres.

Providing higher levels of service could increase flows to San Francisquito Creek, Atherton Channel and East Palo Storm Drainage System. Agreements will be needed with other Cities when changes are made to outfall pipes. Though the cost for piping to provide a 25-year level of protection would be small in comparison to the total project cost, the cost would be significant if upgrades to San Francisquito Creek and Atherton Channel are required.

Drainage Areas – The City drainage areas are shown on Figure 1, with detailed drainage maps presented in Appendix A. Drainage areas are based on a review of, (1) street patterns, (2) contours shown on County 400 scale drawings, and (3)

flow areas shown on maps contained in the City Drainage Binder which was originally prepared in 1969 and updated periodically.

Runoff Coefficients – A runoff coefficient of 0.025 is used for open space areas, 0.40 is used for residential areas and 0.60 to 0.90 is used for commercial areas. Areas are identified from an aerial photo of the City taken in June of 2000. Runoff coefficients are for a 10-year storm event and should be increased by 10 percent for a 25-year event and by 25 percent for a 100-year event.

To prevent future increases in stormwater runoff, future development should be required to provide stormwater detention for the 10 and 100-year storm event.

Time of Concentration – An initial time of concentration of 10 minutes is used for flow to the initial inlet, based on an inlet within about 500 feet of the upstream discharge point. Where the gutter flow distance is longer than 500 feet, a longer initial time of concentration is used. The initial time of concentration is calculated as:

Tc = 10 minutes + (Length to first inlet – 500') / (2 fps * 60 seconds/minute)

Rainfall Intensity – The rainfall intensity is from Menlo Park precipitation intensity-duration-frequency values and published in California Department of Water Resources Bulletin 195. This Bulletin was updated in November 1982 and again in August 1986. The precipitation intensity-duration-frequency values used are from the August 1986 update. The Intensity equation for the 10-year event is based on a best fit for precipitation values presented for 15 and 30 minutes. The equation used is:

$$I_{10\text{-year}} = 5.76 / \text{Time of Concentration}^{.533}$$

Calculations supporting the Intensity-Duration-Frequency equation are presented in Appendix E.

Starting Water Level – Where practical, the systems are analyzed using 10-year water levels for San Francisquito Creek and Atherton Channel. In some areas, the 10-year water level in the Creek is above ground levels. In these areas, a water level at the top of the outfall pipe is used. In the portion of the City west of El Camino Real, the water level in the channel at the peak of a 10-year storm event is often greater than ground levels at system manholes. At these locations, there will be no drainage to the Creek when Creek levels are higher than system ground levels. Since there is a several hour lag between the peak of storm events and peak flow in San Francisquito Creek, design for the simultaneous peak is not practical. Pumping the 10-year storm event peak flow rates is not considered for the following reasons:

1. The receiving bodies (San Francisquito Creek and Atherton Channel) have flow capacity problems that will are worsened by the addition of flow pumped during the peak flow period. It is unlikely that pumping of peak flows would be accepted by other Cities and Towns affected by flooding from the Creek and Channel.

2. The cost for construction and maintenance of a pump station is high. The infrequent need for the pump station is not likely to justify the cost.

For systems that discharge through East Palo Alto, the downstream water level is set at the roadway elevation on the east side of Highway 101. The water level in San Francisquito Creek is from an HEC-RAS computer model of the Creek developed by Santa Clara Valley Water District from survey in 2001.

Pipe Roughness – A pipe roughness of 0.013 is used for all smooth-walled pipes. A roughness factor of 0.024 is used for corrugated metal pipe.

Junction Losses – Bend losses are computed using the Federal Highway Administration, Hydraulic Engineering Circular 22 (HEC-22) junction loss method. For this analysis, all manholes are considered having a flat bottom. Manholes where the bottom is rounded at the bottom will have a lower junction loss.

TABLE E1
MENLO PARK STORM DRAIN MASTER PLAN
Pipe Costs

Pipe Diameter (inches)	Trench Depth (feet)	Trench Width (feet)	Pipe RCP ($/ft)	Install ($/ft)	Undeveloped Site Subtotal ($/ft)	Disposal ($/ft)	Repaving ($/ft)	Traffic Control ($/ft)	Util Reloc ($/
15	5	3	$16.98	$51.64	$69.00	$6.11	$6.00	$8.96	$10.
18	6	3	$17.12	$59.16	$76.00	$7.33	$6.00	$10.67	$14.
24	6	4	$24.98	$69.59	$95.00	$9.78	$8.00	$13.18	$18.
30	7	4	$34.39	$90.97	$125.00	$11.41	$8.00	$16.00	$22.
36	7	6	$49.12	$123.66	$173.00	$17.11	$12.00	$18.67	$26.
42	8	7	$66.67	$151.45	$218.00	$22.81	$14.00	$20.36	$30.
48	8	7	$83.51	$165.33	$249.00	$22.81	$14.00	$22.40	$34.
54	9	8	$105.26	$195.46	$301.00	$29.33	$16.00	$24.89	$38.
60	9	8	$133.33	$208.62	$342.00	$29.33	$16.00	$28.00	$42.
66	10	10	$168.42	$247.49	$416.00	$40.74	$20.00	$32.00	$46.
72	10	10	$189.47	$254.61	$444.00	$40.74	$20.00	$37.33	$50.
84	11	12	$343.85	$301.71	$646.00	$53.78	$24.00	$56.00	$50.

Install and pipe costs are developed comparing values from various cost guides and BKF experience.
Costs are based on an ENR Construction Cost Index of 6,581 in January 2003.
Costs are for RCP. Cost for HDPE can be 20 to 30% lower.
Costs do not include permitting, mitigation or off-site improvements to Creek or channels.

TABLE E2
MENLO PARK STORM DRAINAGE MASTER PLAN
Intensity-Duration-Frequency Equation

Rainfall Duration (minutes)	Rainfall Amount (inches)	Rainfall Intensity (in/hr)	K
15	.34	1.36	5.76
30	.47	0.94	5.76

K average	5.76
Stand Dev.	0.0004
n =	0.533

From 1984 DWR Bulletin 195.

$I = K / Tc^n$

Intensity-Duration Frequency Table Using Above Equation

Rainfall Duration (minutes)	Rainfall Amount (inches)	Rainfall Intensity (in/hr)
10	.28	1.69
11	.29	1.60
12	.31	1.53
13	.32	1.47
14	.33	1.41
15	.34	1.36
20	.39	1.17
25	.43	1.04
30	.47	0.94

TABLE E3
MENLO PARK MASTER PLAN
STORM DRAINAGE ANALYSES
Calculation of Peak Street Flow with no Flow in Gutter

		Gutter Flow							
Street Slope	n	T (feet)	Sx (ft/ft)	Depth (feet)	S (ft/ft)	Flow per gutter (cfs)	**Flow in Street (cfs)**	Area per gutter (sf)	Velocity (fps)
Flat	0.016	12.0	0.02	0.24	0.000	0	**0**	1.4	0.0
0.5%	0.016	12.0	0.02	0.24	0.005	3	**5**	1.4	1.9
1%	0.016	12.0	0.02	0.24	0.010	4	**8**	1.4	2.7
2%	0.016	12.0	0.02	0.24	0.020	5	**11**	1.4	3.8
Flat	0.016	25.0	0.02	0.5	0.002	12	**25**	6.3	2.0
0.5%	0.016	25.0	0.02	0.5	0.005	19	**39**	6.3	3.1
1%	0.016	25.0	0.02	0.5	0.010	27	**55**	6.3	4.4
2%	0.016	25.0	0.02	0.5	0.020	39	**78**	6.3	6.2

Given:

Q = flow rate, cfs

K = 0.56	K =	0.56	
n = Roughness	n =	0.016	
Sx = Cross slope, feet/feet	Sx =	0.02	ft/ft
d = T*Sx, depth in gutter, feet	d =	varies	feet

Flow is per side of the street

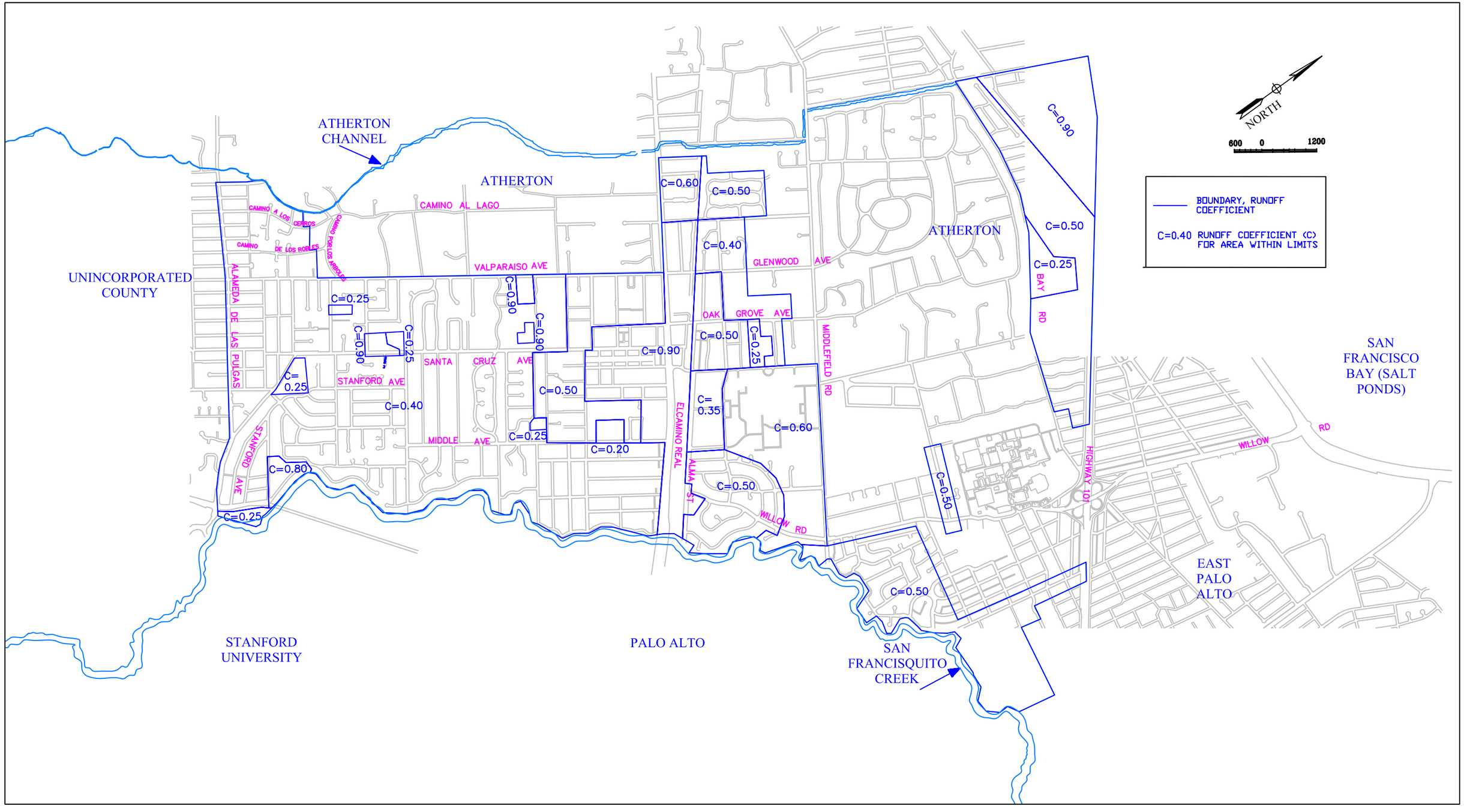


FIGURE E1
RUNOFF COEFFICIENTS