DRAINAGE REPORT

MCDOT Project No. #68927-2

Ellsworth Road – Phase 2
Ray Rd. to Portobello Ave.

December 2004

Stantec

Prepared for: Maricopa County Department of Transportation
Prepared by: Stantec Consulting Inc

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1.0 Introduction

1.1 GENERAL

This drainage report is prepared for the Maricopa County Department of Transportation (MCDOT), the Flood Control District of Maricopa County (FCDMC), and the City of Mesa as part of the design of Ellsworth Road from Ray Road to Portobello Avenue in Mesa, Arizona. The project includes on-site roadway drainage design as well as offsite drainage design for the roadway. The FCDMC and City of Mesa are participating with MCDOT in project implementation. This report presents the drainage analysis and results for the project. The project location is shown on Figure 1.

Ellsworth Road will be constructed in phases. An ultimate 7-lane roadway section has been identified, however, an interim 5-lane section will be constructed in undeveloped sections of the corridor. The roadway drainage design is based on the ultimate section with temporary catch basins located along the interim roadway sections.

1.2 STUDY AREA

The study area is characterized predominantly by open desert land. However, residential development is replacing the open desert environment north of Elliot Road and this trend is expected to continue across the watershed. The drainage area is bounded by the Central Arizona Project (CAP) Canal on the east and the East Maricopa Floodway (EMF) on the west. The General Motors Desert Proving Grounds (GMDPG) is located immediately east of Ellsworth Road and serves as a 4-mile barrier to flow from the east from Pecos Road north to Elliot Road. It is intended that regional (100-year offsite) flows cross Ellsworth Road at three main locations:

1) Elliot Wash - 1/4 mile north of Elliot Road

2) Elliot Drain – ¼ mile south of Elliot Road

3) Powerline Floodway (PLF) - Ray Road alignment.

1.3 EXISTING DATA AND REPORTS

The design of improvements to manage offsite drainage impacting Ellsworth Road is based on a preliminary channel design concept presented in the *East Mesa Area Drainage Master Plan, Recommended Design Report, FCDMC #95-32, July 1998 (ADMP)* prepared by Dibble & Associates for the FCDMC. The ADMP proposes a system of channels and detention basins that will collect runoff east of the roadway and convey the runoff westerly across Ellsworth Road.

The preliminary design was subsequently refined as part of the *Design Concept Report, Ellsworth Road to Baseline Road, October 1999 (DCR)*, prepared by Dibble & Associates as a subconsultant to CH2MHill for MCDOT. The preliminary roadway drainage concept was developed as part of the DCR. The roadway drainage concept utilizes the planned flood control improvements as outfalls for the roadway drainage.

The hydrologic analysis and 70 percent drainage design was prepared by Dibble & Associates as a subconsultant to CH2MHill for MCDOT. The 70 percent design was submitted in June 2002. Subsequent to that submittal, the design was reviewed by the stakeholders and revisions were made to the drainage design by Dibble & Associates. That design forms the starting point for the design presented herein.

Soil properties are described in the following documents. *Report on Geotechnical Investigation, August 6, 2001, Speedie and Associates*, presents the site investigations, laboratory results, and design recommendations for the roadway project. *Supplemental Drainage Channel, Ellsworth Road – Germann to ½ Mile N. of Elliot, draft dated August 3, 2001, Speedie and Associates*, presents the results of investigations along the Ellsworth Channel alignment for use in channel lining design. *Geotechnical Design for Ellsworth Road Drainage Channel, January 28, 2002, Memorandum by CH2Mhill* presents recommendations for structure foundations within the channel and gradation recommendations for gravel mulch channel lining material.

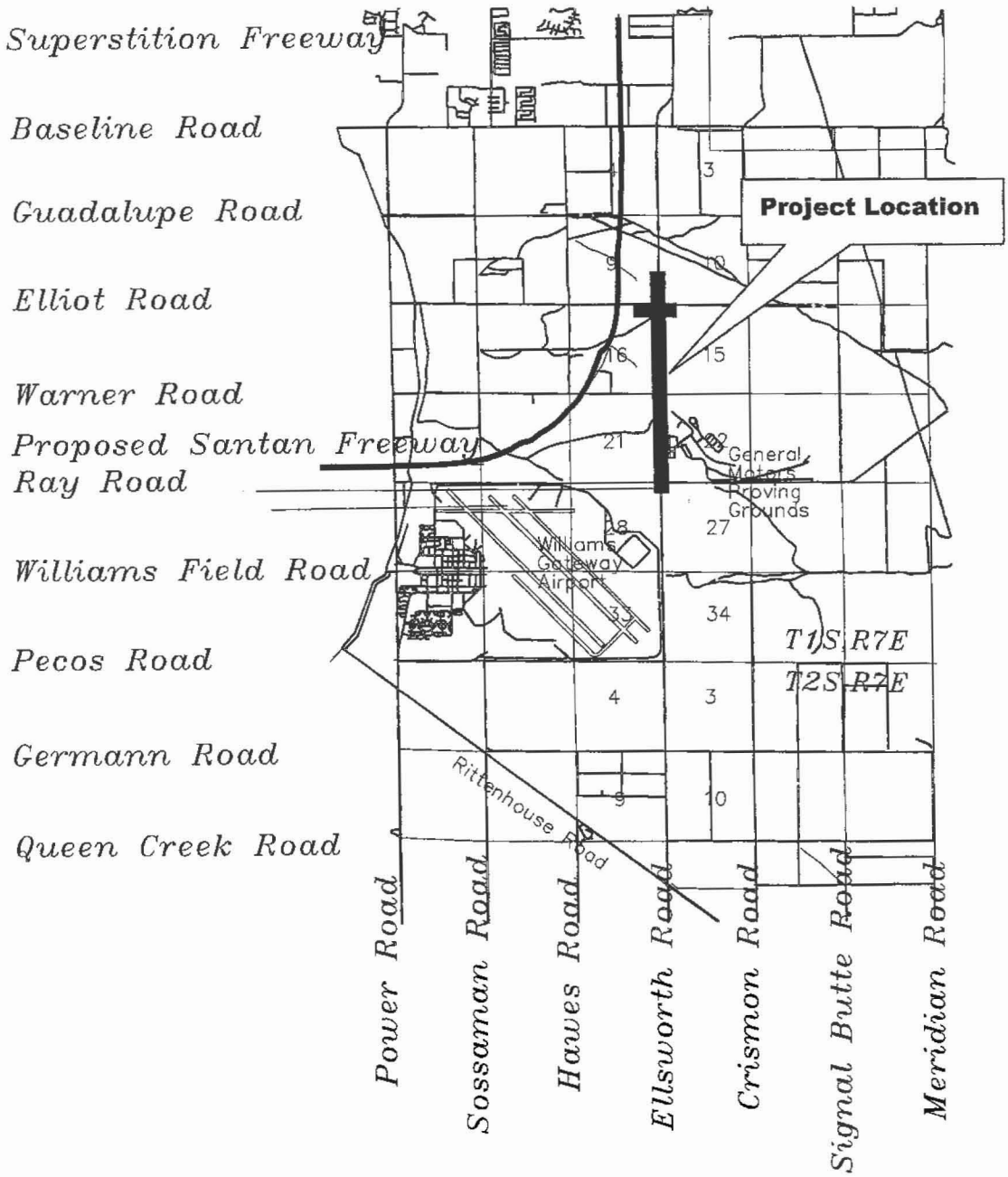

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Figure 1 – Project Location

2.0 Design Criteria

2.1 APPLICABLE STANDARDS

The *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology, January 1, 1995*, (Hydrology Manual), and *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics, January 28, 1996,* (Hydraulics Manual), as well as the City of Mesa's drainage requirements as stated in the *City of Mesa Procedure Manual, Engineering and Design Standards* (Procedure Manual) are used as the basis for drainage design. Additionally, design criteria are adopted based on information presented in the ADMP. The specific criteria used in this analysis are contained in the following sections.

2.2. WATERSHED CONDITIONS

Watershed condition describes the level of development within the watershed. For purposes of this project, two watershed conditions are considered:

2.2.1 Existing Condition

Existing watershed condition is defined as the development conditions at the time of design, which differentiates between natural, undeveloped or agricultural areas and areas that have been developed with single-family residential, commercial, industrial, or some other land use that exists at the time of the hydrology modeling.

2.2.2 Developed Conditions

Developed watershed condition is defined as the development conditions at build-out, which is based on the improvement of natural, undeveloped or agricultural areas into the ultimate development conditions as described by the appropriate land use plan.

2.3 CAPITAL IMPROVEMENT PROJECT (CIP) CONDITIONS

CIP condition describes the level of implementation of the East Mesa ADMP within the watershed. For purposes of the hydrologic modeling and structure analysis for this project, three CIP conditions are considered:

Pre CIP

The Pre-CIP (existing condition) is defined as the runoff patterns and routing before implementation of any of the recommended projects from the East Mesa ADMP and before construction of the Ellsworth Road project.

Interim CIP

The Interim CIP condition is defined as the runoff patterns and routing immediately upon completion of the Ellsworth Road construction. This includes the Crismon lateral to the Elliot Basin and the new Ellsworth Road profile and drainage system.

The 100-year HEC-1 model for this condition is MIDCURD.DAT.

Full CIP

The full CIP condition is defined as the runoff patterns and routing upon full implementation of the recommended projects from the East Mesa ADMP. This includes construction of the Siphon Draw, Pecos North, and Pecos South Basins and the associated channels.

The 100-year HEC-1 model for this condition is SEBT-N2.DAT.

2.4 RAINFALL

Design rainfall depths are developed from rainfall isopluvial maps contained in the Hydrology Manual. The design assumption is a minimum time of concentration of ten minutes should be used in performing the pavement drainage analysis and the K_b in the T_c equation is based on minimal roughness, Type A for pavement runoff.

A site-specific rainfall intensity-duration-frequency (IDF) curve is developed for use in the pavement drainage analysis and design. Rainfall depth-duration-frequency data used to develop the IDF curve is developed using procedures from the ADOT Hydrology Manual and the rainfall depths presented in Section 3. The rainfall depth-duration-frequency worksheet and the IDF curve data are contained in Appendix A.

2.5 ROADWAY INUNDATION

An interim and ultimate construction phase is planned for Ellsworth Road. The ultimate planned roadway is an Urban Road of Regional Significance (URRS) consisting of a 7-lane section with a median and full curb and gutter and 5' sidewalks on both sides. The interim roadway design consists of a 5-lane section without curb and gutter. Runoff is allowed to collect on each side of the road. Under the ultimate condition the runoff collects in the right-most driving/ bicycle lane for each direction of traffic flow. Under the interim condition the runoff collects in the roadside ditch, again on either side of the road. For either condition the maximum allowable spread of runoff on the road is 17 feet. Pavement drainage is collected with catch basins and conveyed to a suitable outfall via storm drains or roadside ditches. The following criteria from the City of Mesa Procedure Manual apply to the on-site drainage:

- Streets shall be designed to carry runoff from a 10-year peak storm. Arterial streets and major collectors shall be designed to concentrate the runoff spread to one (1) lane. The peak flows from a 100-year storm shall be carried within the cross-section between the right-of-way lines.
- In cases where the peak flows from the design storm exceed the street capacity, underground pipes of sufficient size to carry the excess shall be installed.

In addition to the above City of Mesa requirements, the following criteria from the Hydraulics Manual have also been adopted for roadway drainage.

- Roadside ditches are to be sized to prevent the 10-year storm runoff from saturating the pavement sub-grade.

- Roadside ditch side slopes are to be no steeper than 4H:1V within the roadway clear zone.
- Trapezoidal channel bottoms are a minimum of 4 feet wide for maintenance purposes.
- V-shaped channels are allowed in lieu of a trapezoidal channel.

2.6 CATCH BASINS

Catch basins are placed as necessary to meet the roadway inundation criteria and at intersections to prevent cross street flow. City of Mesa M-64 double grated catch basins are used for the ultimate roadway section and MAG 535, Type F grated catch basins are used for the interim section. The interim catch basins will need to be replaced with curb inlets when the ultimate roadway improvements are constructed. The interception capacity of catch basins is reduced to account for plugging by debris. Grated catch basin capacity is reduced by 50 percent in sump conditions and by 40 percent in continuous grade conditions.

2.7 STORM DRAINS

Pipe sizing and layout meet the following requirements:

- Storm drains are sized for the 10-year inlet flows and the requirement to limit the hydraulic grade line to a minimum of 1.0 foot below the inlet structures using a Manning's n value of 0.013 for reinforced concrete pipe. Manning's n value used for reinforced concrete box culverts is 0.015.
- The minimum pipe diameter is 24 inches for mainline storm drains and 18 inches for catch basin connector pipes.
- Pipes shall not project into the pavement subgrade.
- Maximum spacing of manholes is 600 feet for pipes between 18 and 30 inches diameter,
  800 feet for pipes between 30 and 60 inches, and
  1300 feet for pipes 60 inches diameter and larger.

- Minimum flowing full velocities of 2 feet/second are maintained where possible.

2.8 OPEN CHANNELS

The channel design employed in this project is based on the "stable channel" design approach, which means that the channel bed and banks are designed to remain fixed without eroding from the design flow event.

- The Elliot Wash Outfall Channel is analyzed for the 100-year, 6-hour event. It conveys flows within the excavated channel up to approximately the 50-year, 6-hour event, however larger flood events will break out of this channel and enter the historic flow path. Freeboard is not provided as the channel is designed to be overtopped.
- Channels are designed for subcritical flow with Froude numbers less than or equal to 0.86.

2.9 CULVERTS

The culvert design must consider a range of conditions, which may be encountered during the service life of the project. The culvert performance must, at a minimum, not make conditions worse than before the project was constructed. Conversely, the ultimate culvert performance must provide the minimum level of protection established by the drainage design criteria. Levels of protection between these two extremes may be realized between the period of initial construction and the ultimate build-out of the watershed. The conditions to be analyzed for culvert design are described in terms of the level of development within the contributing watershed (watershed condition), which impacts the amount of runoff generated by a storm event, and by the level of implementation of the recommended plan from the East Mesa ADMP (CIP condition), which impacts the routing and attenuation of the runoff prior to reaching Ellsworth Road.

Cross-road culverts passing under Ellsworth Road are to be sized for the 50-year, 6-hour peak discharge at a minimum. Under Interim-CIP conditions the culverts are sized to match the Pre-CIP water surface elevation at the road crossing considering

the combined culvert and overtopping flow for the 100-year, 6-hour discharge with no plugging factor applied. Under Full-CIP conditions the culverts will be sized for the 50-year, 6-hour peak discharge with no culvert plugging factor applied. The combined culvert and overtopping flow for the 100-year discharge will be limited to a maximum 6-inch overtopping depth. The condition requiring the largest culvert size will govern.

- Box Culverts shall have a minimum height of 4 feet in desert wash areas. A minimum of 1 foot of cover is required over the top of the box culvert for a full roadway structural section. If adequate cover cannot be provided, traffic may drive directly on the box culvert top slab. Approach slabs shall be included for box culverts without cover.
- Handrails will be provided around culvert headwalls with a vertical drop of 2.5 feet or greater from the top of headwall to the culvert flowline.
- Trash rack / access barriers will be provided as required for safety at culvert inlets.
- Pier widths in box culverts are modeled with one foot of debris accumulation on each side of the pier to account for weeds and other debris that may wrap around the piers during a storm event. Debris is modeled by adding two feet to the design pier width for each pier. The debris plugging criteria is applied to the developed conditions design discharge, but is relaxed for the capacity check of the higher existing conditions discharge.

3.0 Hydrology

3.1 INTRODUCTION

Hydrology used in the design of the drainage features includes both rainfall-runoff modeling and Rational Method calculations. The locations of the various drainage features are shown in Figure 2. Rational Method calculations were used in the storm drain design and the area drain design for the GM property runoff collected by the storm drain, and are herein referred to as On-site Hydrology. Rainfall-runoff modeling was used in the design of the Elliot Wash culvert and the Elliot Road storm drain lateral and are herein referred to as Off-site Hydrology.

3.2 OFF-SITE HYDROLOGY

Rainfall-runoff models used for the design of the Elliot Wash culvert and Elliot Road storm drain lateral were prepared by others and provided by the FCDMC. The HEC-1 models were originally prepared as part of the East Mesa ADMP. The design rainfall input to the ADMP model was the 100-year, 24-hour storm.

The ADMP model was modified to reflect an interim condition and a future condition. The interim condition model represents the existing land use conditions within the watershed and incorporates the proposed drainage improvements recommended as part of the ADMP that are already or will be completed at the time the roadway improvements are completed. This model is referred to as the Interim CIP Condition model. The future condition model represents the future land use conditions along with all the proposed drainage improvements that were recommended as part of the ADMP. This model is referred to as the Full CIP Condition model. Both models were reviewed by Stantec for acceptance. The key finding of the review was that, according to FCDMC guidelines as specified in the *Drainage Design Manual for Maricopa County, Volume I, Hydrology*, herein referred to as the Hydrology Manual, the design rainfall criteria for the size of drainage areas associated with the culvert and storm drain lateral should be the 6-hour storm. Therefore, HEC-1 models for

both Interim and Full CIP conditions were created for the 6-hour storm and input and output files for those models are provided digitally along with original 24-hour storm models on CD-ROM in Appendix E. The peak discharges in cubic feet per second at the culvert and storm drain lateral for the 6-hour storm are shown in comparison with the 24-hour storm discharges in Table 2

Table 2 - Comparison of 100-year peak discharges for the 6- and 24-hour storm

Interim CIP			Full CIP			
HEC-1 ID	6-Hour cfs	24-Hour cfs	HEC-1 ID	6-Hour cfs	24-Hour cfs	Comment
CP67E	568	465	C67E	645	297	Elliot Wash culvert
STUBDI	301	180	R66D	490	350	Elliot Rd. S.D. Lateral

3.4 ON-SITE HYDROLOGY

The peak discharge to each proposed catch basin, for both Interim and Full CIP conditions for both 10- and 100-year return periods were estimated using the Rational Method. The Rational Method was also used to estimate the 100-year peak discharges for the design of the storm drain improvements fronting GM. Calculation worksheets for the roadway storm drain hydrology are provided in Appendix A.

Runoff coefficients for both the 10- and 100-year return periods were selected based on information and guidance contained in the Hydrology Manual. Runoff coefficients are a function of surface type. Runoff coefficients for the surface types associated with the roadway and GM area are listed in Table 3. The runoff coefficient used for the estimation of peak discharge is areally weighted based on the percent area of the individual surface types present in each drainage basin. Those calculations are presented on the Rational Method worksheets provided in Appendix A.

Table 3 - Runoff coefficients for use in the Rational Method

	Runoff Coefficient		
Surface Type	**10-Year**	**100-Year**	**Comment**
Pavement	0.85	0.95	
Gravel Roadways & Shoulders	0.70	0.75	Median
Gravel Roadways & Shoulders	0.70	0.88	Shoulder
Undeveloped Desert	0.35	0.45	Adjacent to roadway
Heavy Industry	N/A	0.90	GM Area

The estimation of rainfall intensity as prescribed in the Hydrology Manual is an iterative procedure and is a function of the time of concentration. The Time of Concentration, Tc equation is a function of the flow path length and slope and a watershed resistance coefficient. The flow path length and slope to each catch basin was estimated from the proposed roadway plans. A minimum Tc of 10 minutes is assumed. The watershed resistance coefficient is a function of the general surface conditions and drainage area. Guidance for the selection of the general surface conditions is provided in the Hydrology Manual. The general surface condition selected for all on-site calculations is Type A: minimal roughness. The Intensity-Duration-Frequency, I-D-F, relation was developed from site-specific Depth-Duration-Frequency, D-D-F statistics. The D-D-F statistics were developed from the isopluvial maps provided in the Hydrology Manual and the PREFRE computer program. The resulting D-D-F statistics and site-specific I-D-F relation is provided in Appendix A as Tables A-1 and A-2, respectively. The flow path length and slope, watershed resistance coefficient and resulting Tc and intensity for each point of interest are shown in the Rational Method calculations provided in Appendix A.

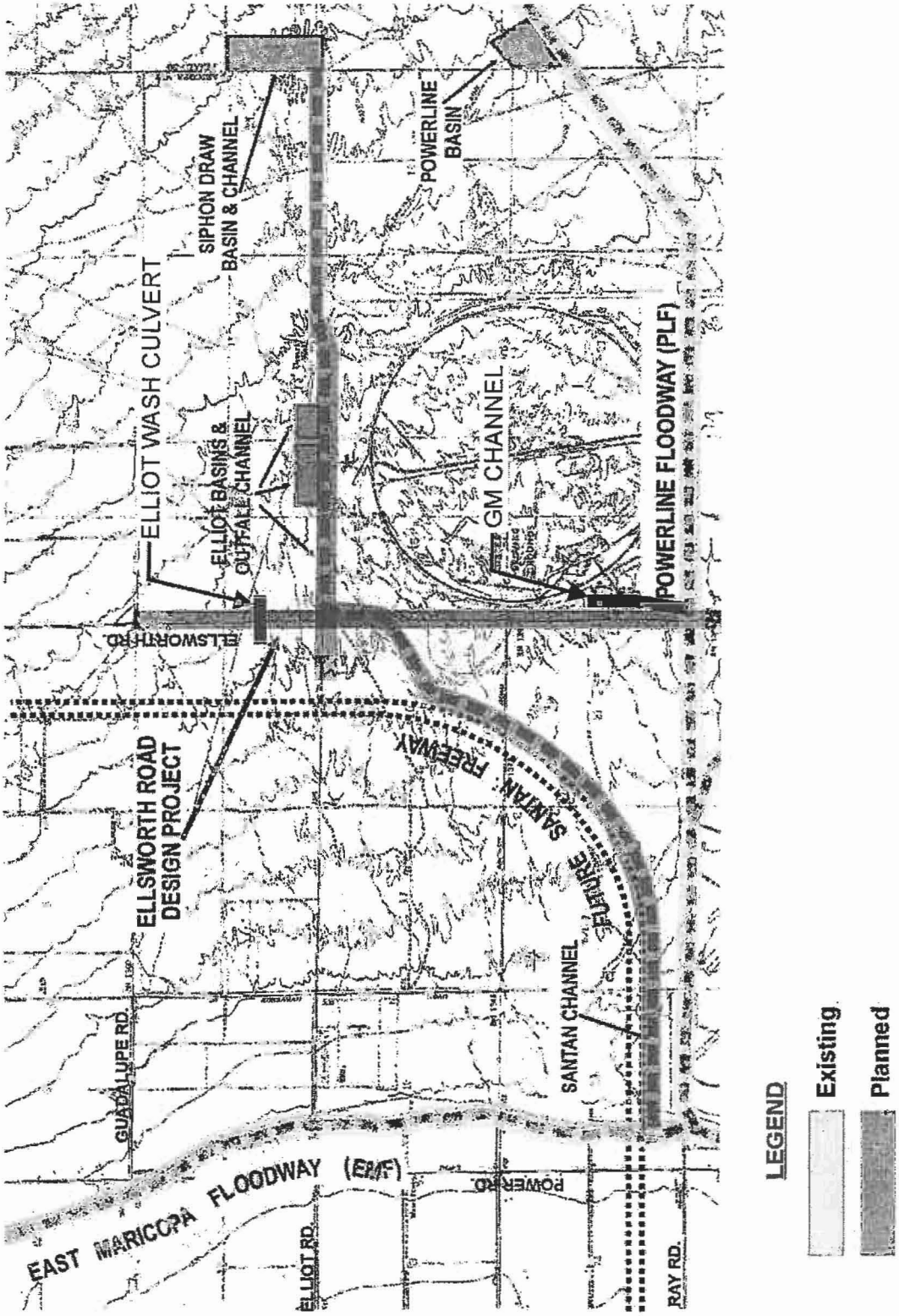

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Figure 2 - Existing & Proposed Drainage Facilities

4.0 HYDRAULICS

4.1 ROADWAY DRAINAGE

4.1.1 Methodology

Pavement and inlet hydraulic calculations are based on procedures contained in the *Federal Highway Administration Hydraulic Engineering Circular No. 12, Drainage of Highway Pavements, 1996* (HEC-12).

Storm drain hydraulic grade line calculations are performed using StormCad and are made using an iterative procedure that applies Bernoulli's energy equation between downstream and upstream ends of each line in the system. Manning's equation is used to determine head losses due to pipe friction. Junction losses are estimated by using the City of Los Angeles Thompson equation. Manhole losses are computed as K times the velocity head. The values of K and H_L are input manually into StormCad based on criteria adapted from HEC-12.

As stated previously, the proposed improvements to Ellsworth Road represent an interim design, delaying the ultimate roadway design section for construction at a later date. In most locations along Ellsworth Road, the pavement design extends to only two lanes with no curb and gutter. The additional driving lane, bicycle lane, curb and gutter and sidewalk will be added in the ultimate design construction. The catch basin and storm drain system design is based on the criteria required for the ultimate proposed roadway section. Drainage areas and runoff characteristics are estimated for both the interim roadway section and the ultimate roadway section. In order to adequately capture runoff in the interim condition, MAG 535, Type F grated catch basins are utilized in place of the ultimate City of Mesa M-64 combination curb inlet catch basins. Interim basins are placed at the invert of a roadside ditch as part of the roadway typical section. Roadside ditches are placed only in roadside cut conditions. In roadside fill conditions, runoff is allowed to flow away from the roadway into natural runoff paths where possible. In fill conditions where positive drainage away from the

roadway does not exist, such as on the upstream side of the roadway, shallow ponding occurs within the roadway right-of-way; depths do not exceed 8 inches and water surface elevations are below the roadway subgrade.

Given the increased slope away from the pavement of the unpaved shoulder of the interim roadway/ROW section, the elevation of the interim grated inlets is lower than that of the ultimate M-64 inlets. Therefore, it is necessary to design these catch basins at the lower elevation in the interim. In the future, when construction of the ultimate roadway section is completed, it is the intention of this storm drain design that construction of the M-64 inlets will require minimal reconstruction of the interim catch basins and the connector pipe will not need replacement. Where inlets are left out in the interim roadside fill condition, the connector pipe is to be installed at the appropriate slope to accommodate the future curb and gutter and catch basin and then plugged.

4.1.2 Assumptions

The following assumptions are made in performing the pavement drainage analysis:

- The 10-year design discharge used for inlet sizing is based on the runoff generated within the road right-of-way for the ultimate section
- The gutter flow reduction factor for parked vehicles is 1.0, since parking will not be allowed

4.2 CHANNELS

The Elliot Wash Outfall Channel is sized to convey the design flows without causing excessive tailwater conditions at the box culvert crossing of Ellsworth Road. It also provides a positive outfall by daylighting west of Ellsworth Road. The channel is designed to be unlined.

Hydraulic analysis of the channel using HEC-RAS is performed for the 50- and 100-year storm discharges. The channel is not designed to convey the entire 100-year flow, but to provide an outfall for the culvert. Significant flow breaks out during the

larger flood events and continues to sheet flow westerly along the historic flow path. Analysis of the channel is performed to determine the tailwater hydraulic rating which controls the flow through the culvert.

4.3 CULVERTS

New culverts are sized using standard culvert design methodology considering inlet or outlet control as presented in Federal Highway Administration, Hydraulic Design Series No. 5, Hydraulic Design of Highway Culverts, September 1985. The calculations check for inlet control, pipe barrel (friction), or tail water control. The condition resulting in the highest computed headwater elevation governs. Hydraulic analysis for the Elliot Wash culvert is performed with HEC-RAS.

The existing conditions, pre-CIP flow at the Elliot Wash dip section is 1169 cubic feet per second with a water surface elevation of approximately 1407.72 at the roadway. The proposed Elliot Wash culvert is designed to pass the 100-year, 6-hour storm runoff of 645 cubic feet per second without raising the water surface elevation at the roadway above the existing condition water surface elevation. The culvert will pass the entire flow without any overtopping. It will also pass the design storm which is the 50-year, 6-hour storm runoff of 289 cubic feet per second.

4.4 AREA DRAINS

Drainage areas and runoff characteristics for the 10- and 100-year flood are estimated for the areas of GM which drain towards Ellsworth Road. Grated inlet area drains are designed to intercept these flows. These inlets are connected into the storm drain mainline in Ellsworth Road. Hydraulic analysis is conducted assuming weir flow conditions, 50% clogging and maintaining water depths at the inlets between 8 – 12 inches.

5.0 RESULTS & RECOMMENDATIONS

5.1 ROADWAY DRAINAGE DESIGN

The hydrology and hydraulic analysis is performed using a combination of Excel spreadsheets and StormCad software. Rational method runoff, spread and inlet capacity calculations and summaries are presented in Appendix A.

The storm drain system consists of 9 independent systems as shown in Table 4.

Table 4 – Storm Drain Systems

Roadway	Station	Station	Outfall
Ellsworth Road	259+50	181+00	Powerline Floodway
Ellsworth Road	264+40	268+50	Elliot Drain
Ellsworth Road	280+20	268+90	Elliot Drain
Ellsworth Road	299+00	283+70	Elliot Drain
Ellsworth Road	316+70	301+00	Elliot Wash culvert
Elliot Road	284+10	281+74	Elliot Drain
Elliot Road	28+55	15+35	Santan Freeway Stormdrain
Elliot Road	32+45	32+45	Elliot Drain
Elliot Road	36+00	36+00	Elliot Drain

Schematic figures of the storm drain system network are presented in Appendix A and B. Storm drain hydraulic analysis calculations are presented in Appendix B.

The main line storm drain pipe sizes range from 24 to 60 inches in diameter. As stated previously, the storm drains are designed to manage runoff generated within the ultimate roadway section, including sidewalk where applicable.

In the interim condition, an increased percentage of un-paved section within the right of way results in a reduction in C factor, and a subsequent reduction in runoff flow

values from those derived from the ultimate design. This reduction provides an additional factor of safety in the interim condition.

City of Mesa standard M-64, double grate catch basins are used where curb and gutter is installed. A maximum spread of 17 feet is maintained throughout the roadway. Where curb and gutter is not constructed, MAG Std Detail 535 Type 'F' catch basins with a concrete apron are used for the interim condition catch basins. In the interim construction each MAG 535 catch basin will be bounded by a transverse dike on the downstream side, creating a localized sump. It should be noted that, because runoff is delivered to interim inlets via unlined roadside ditches, there exists the need for additional maintenance of the catch basins and connector pipes to remove sediment.

5.1.1 100-year Roadway Drainage

As stated in Section 2.5, runoff from the 100-year storm should be contained within the right-of-way of the proposed roadway section. In the interim condition, where curb and gutter is not constructed, a portion of the 100-year runoff will leave the roadway section, as it does now, and is not contained within the roadway right-of-way limits. However, to check that existing development is not negatively impacted at locations where runoff leaves the roadway section, areas of runoff concentration have been investigated. Upon review of runoff concentration points it appears that the volume of 100-year roadway runoff leaving the right of way will be reduced from the existing condition and will leave the right of way without negative effects.

5.1.2 Elliot Wash Outfall System

The Elliot Wash Outfall System collects runoff from Ellsworth Road south of Portobello Avenue at approximately station 316+70 to the proposed box culvert crossing Ellsworth Road at the existing location of Elliot Wash near station 301+90. Portobello Avenue is located ¼ mile south of Guadalupe Road. Both offsite runoff and half street runoff from Ellsworth Road generated north of Portobello Avenue are intercepted by improvements already in place as part of the Mesquite Canyon Phase

1 Subdivision. This subdivision directs offsite runoff into onsite retention basins, into the existing Guadalupe Road storm drain system, or into existing natural washes on the west side of Ellsworth Road, allowing the natural watershed topography to carry this water away from Ellsworth Road. Runoff generated within this subdivision is retained on site. At Portobello Avenue a local high point exists in Ellsworth Road and just north of Portobello Avenue at approximately station 321+40 is an existing catch basin in a localized sump, effectively restricting flows to enter Ellsworth Road from north of Portobello Avenue. Runoff generated on the western half of Ellsworth Road is allowed to drain to the west, into the natural watershed topography, and away from Ellsworth Road. An 8 inch bleed off line from the subdivision retention basin will be tied into the roadway storm drain manhole located at approximately station 316+70.

5.1.3 Elliot Drain Outfall System

An existing regional drainage system exists adjacent to Elliot Road and Ellsworth Road south of Elliot Road. This system, referred to as the Elliot Drain, collects flow from several locations near the intersection of Elliot Road and Crimson Road and consists of underground pipes extending from the Elliot Basins along Elliot Road, continuing along the east side of Ellsworth Road, crossing beneath the road in a culvert at station 268+60, and discharging into an existing wash west of Ellsworth Road. Built into this existing system is a 90 inch diameter pipe stubout on the east side of Ellsworth Road, south of Elliot Road at approximately station 281+74. This pipe will be extended across Elliot Road with a 90 inch pipe connecting to the existing stubout. An inlet will be constructed at the northeast corner of Elliot Road and Ellsworth Road at approximately station 284+10. The inlet is designed to pass the 100-year, 6-hour storm runoff of 490 cubic feet per second. The 90 inch pipe will convey primarily offsite, overland flow generated northeast of the project which drains naturally to this point.

Runoff from Elliot Road, east of Ellsworth Road is intercepted and conveyed by two cross drains at stations 32+45 and 36+00 which connect to the Elliot Drain existing 114 inch pipe.

5.1.4 North Elliot Drain Outfall System

This section of storm drain collects runoff on Ellsworth Road from Elliot Road south to the Elliot Drain crossing of Ellsworth Road at approximately Station 268+60. At the Elliot Drain, the proposed 24 inch storm drain connects to the north barrel of the existing twin 102 inch pipes.

5.1.5 South Elliot Drain Outfall System

The South Elliot Drain Outfall System collects runoff from the Elliot Drain System crossing of Ellsworth Road at approximately Station 268+60 to a location ¼ mile south of the Elliot Drain, at approximately Station 264+40. A percentage of flows are allowed to bypass the inlets, flow south and enter the Powerline Floodway Outfall System. This storm drain connects to an existing 24 inch stubout on the south barrel of the existing twin 102 inch pipes.

5.1.6 Santan Freeway Channel Outfall System

The Santan Freeway Channel Outfall System collects runoff along Elliot Road from Ellsworth Road at station 30+00 west to the proposed Santan freeway. It ties into an existing stubout at approximately station 15+35 constructed by ADOT. This storm drain continues west where it connects to the Santan Freeway Channel. A percentage of flow will bypass the inlets at approximately station 16+00 and will enter the channel.

5.1.7 Powerline Floodway Outfall System

The Powerline Floodway outfall system collects runoff from approximately station 264+00 south to the Powerline Floodway at approximately station 178+40.

Due to the grading of the right of way outside of the paved section, offsite flows are not anticipated to enter the system except in front of the GMDPG from approximately Station 181+00 to 208+00.

Within the developed area of General Motors are several, small drainage basins that drain directly to Ellsworth Road. These include the employee parking lot, main driveway, visitor parking lot and portions of the main office building. In its current condition, runoff from minor storms collects along Ellsworth Road from approximately station 207+75 to the south and is either conveyed in an existing culvert under the road or continues to the south in a roadside swale to the Powerline Floodway. Larger storms such as the 50- and 100-year events flow over the existing roadway. The roadway storm drain in this area is upsized to 60 inch diameter to handle the 100-year runoff from General Motors in addition to the roadway runoff. Additional grated inlet area drains are provided at the easterly roadway right of way line which intercept this flow. The existing culvert at approximately 204+45 will be reconstructed using reinforced concrete pipe and will continue to pass flow under the roadway.

The GMDPG adjacent to Ellsworth Road north of station 208+00 contains large berms running parallel to the roadway. These berms prevent offsite runoff from impacting the roadway. In some areas, the maintenance road and back side of these berms contribute runoff to the roadway. These small additional flows are incorporated into the storm drain design. The storm drain connects to a 60 inch pipe stubout at station 181+00 constructed during Phase 1 of this project by others. Flows exit the system at the Powerline Floodway Channel on the west side of Ellsworth Road.

The roadway profile drops to a low point at a number of locations along the system reducing the pipe and/or hydraulic grade line cover at the inlets to near the minimum design criteria values.

5.2 ELLIOT WASH CULVERT

Elliot Wash crosses Ellsworth Road ¼-mile north of Elliot Road at approximately station 301+90. The road currently crosses the wash in a dip-section without a culvert. The proposed culvert is a 2-10' x 5' reinforced concrete box culvert which will pass 645 cubic feet per second.

100 YR, 645

6.0 REFERENCES

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Appendix A

Rational Method and Roadway Hydraulic Calculations

22 December 2004

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Table A-1
Site specific depth-duration-frequency statistics

Duration	Rainfall Depth, in inches					
minutes	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
5	0.28	0.39	0.46	0.56	0.64	0.71
10	0.42	0.59	0.70	0.86	0.98	1.10
15	0.52	0.74	0.89	1.09	1.25	1.41
30	0.68	0.99	1.20	1.47	1.69	1.91
60	0.83	1.22	1.48	1.84	2.11	2.38
120	0.92	1.34	1.62	2.00	2.30	2.59
180	0.99	1.42	1.72	2.12	2.43	2.73
360	1.10	1.58	1.89	2.33	2.67	3.00
720	1.23	1.74	2.09	2.57	2.93	3.30
1440	1.35	1.91	2.29	2.80	3.20	3.60

Table A-2
Site specific intensity-duration-frequency statistics

Duration	Average Intensity, in in/hr					
minutes	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
5	3.36	4.68	5.52	6.72	7.68	8.52
10	2.52	3.54	4.20	5.16	5.88	6.60
15	2.08	2.96	3.56	4.36	5.00	5.64
30	1.36	1.98	2.40	2.94	3.38	3.82
60	0.83	1.22	1.48	1.84	2.11	2.38
120	0.46	0.67	0.81	1.00	1.15	1.30
180	0.33	0.47	0.57	0.71	0.81	0.91
360	0.18	0.26	0.32	0.39	0.45	0.50
720	0.10	0.15	0.17	0.21	0.24	0.28
1440	0.06	0.08	0.10	0.12	0.13	0.15

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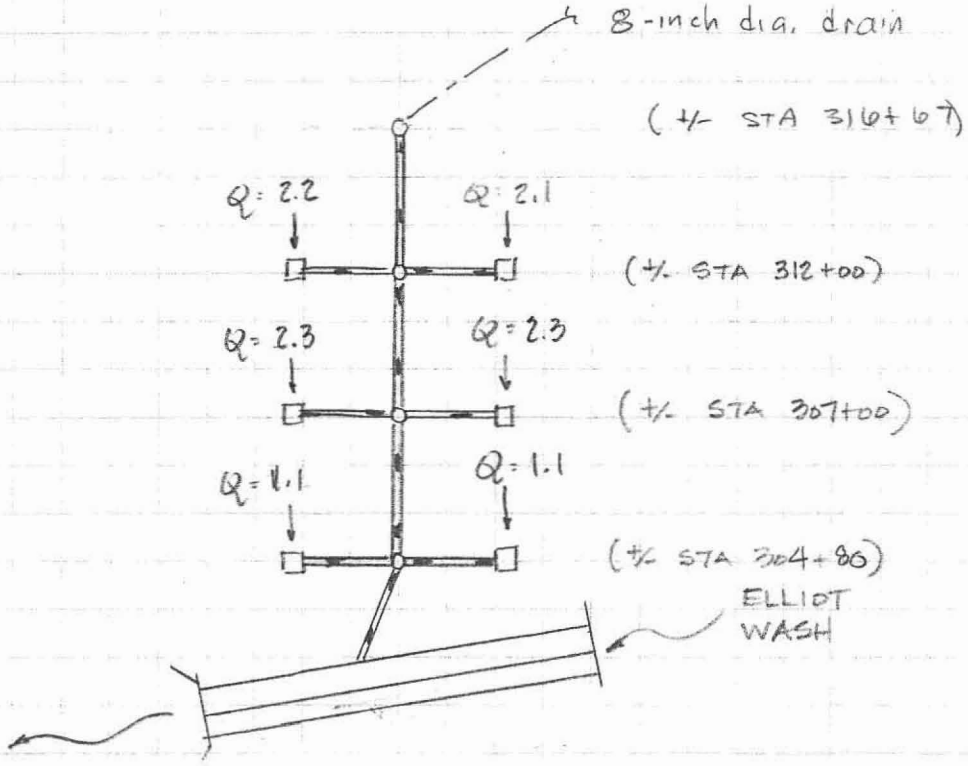
ELLSWORTH RD. DRAINAGE DESIGN

STORM DRAIN FLOWS

10-YR FULL CIP CONDITION



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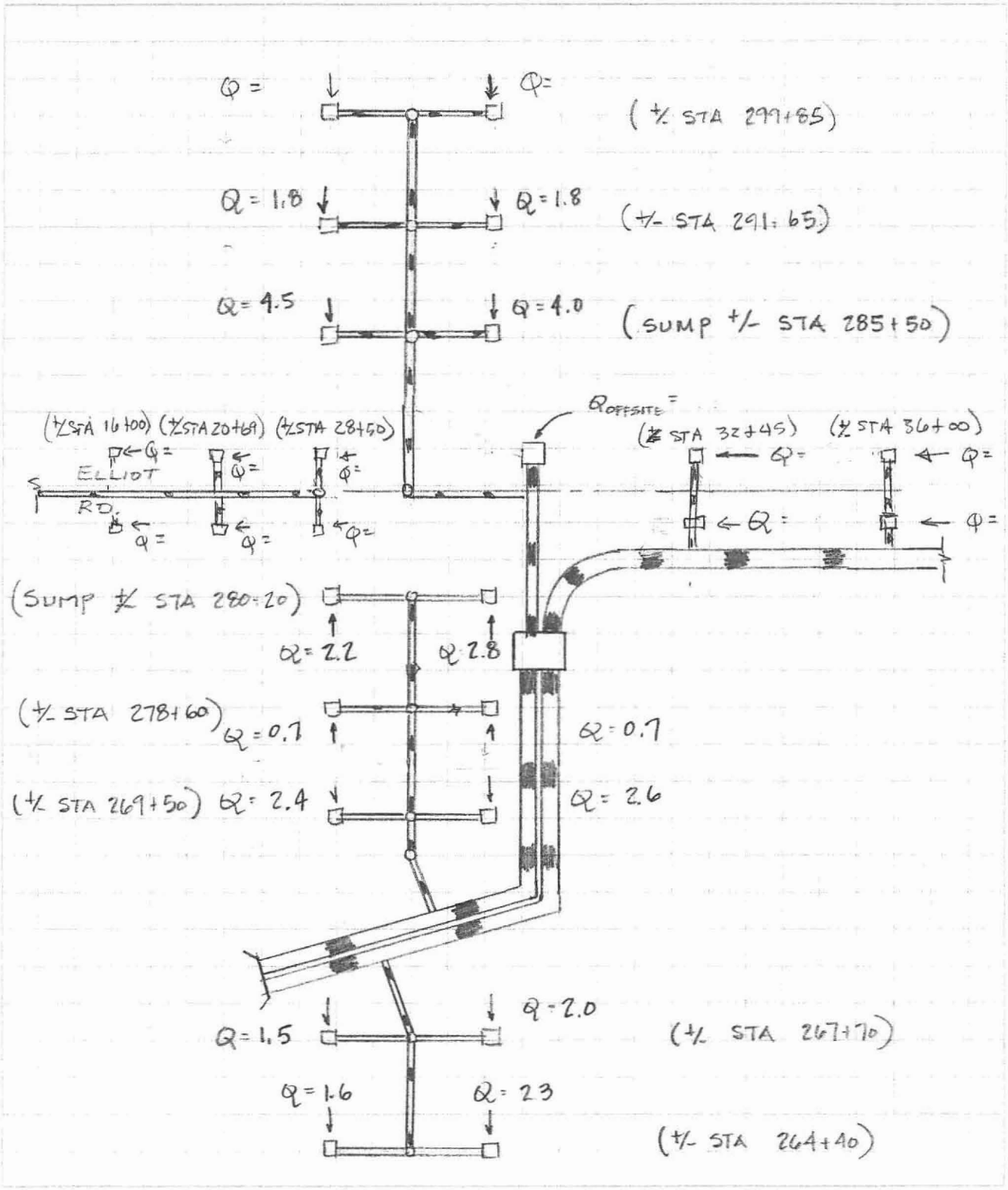
Stantec



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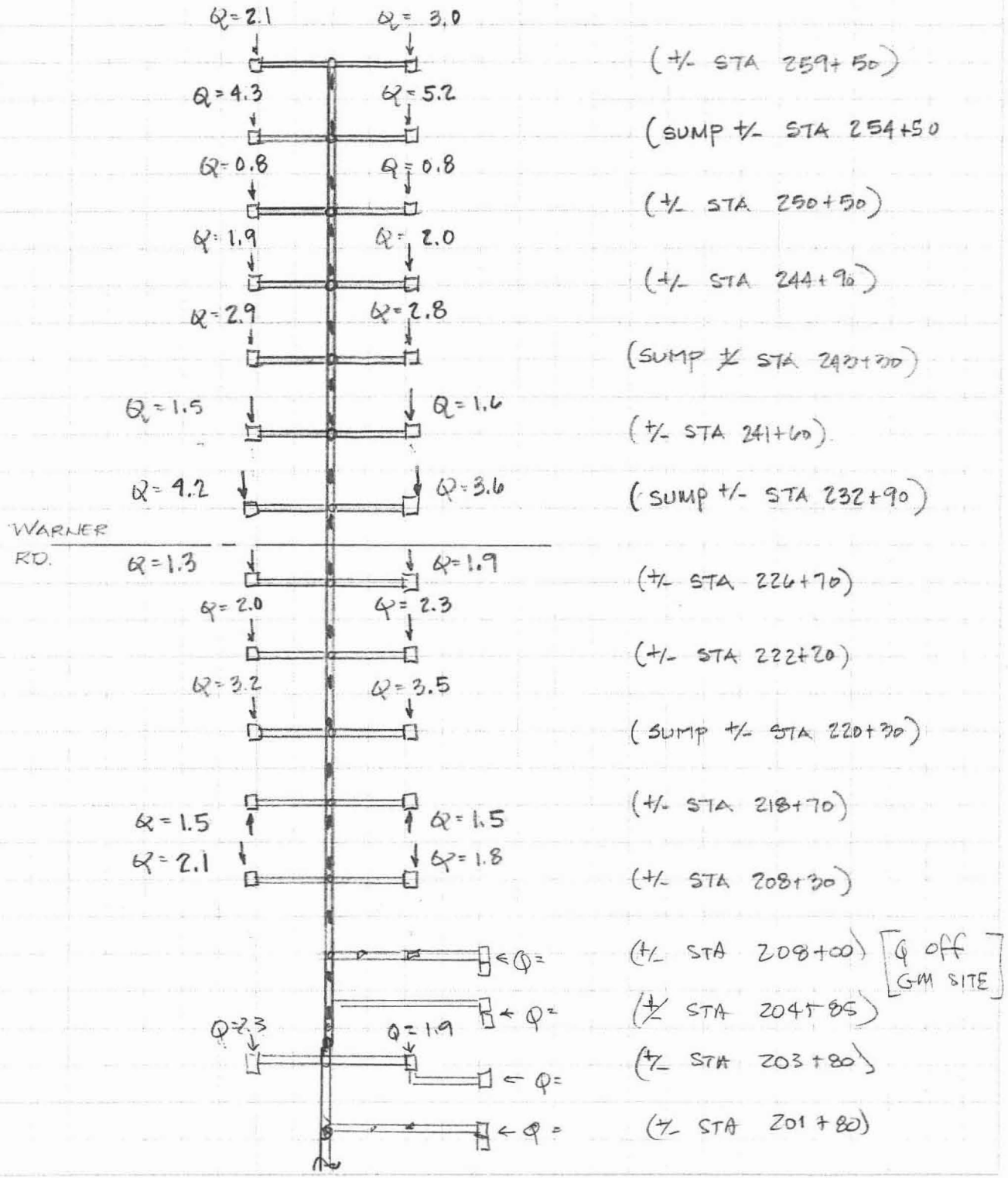

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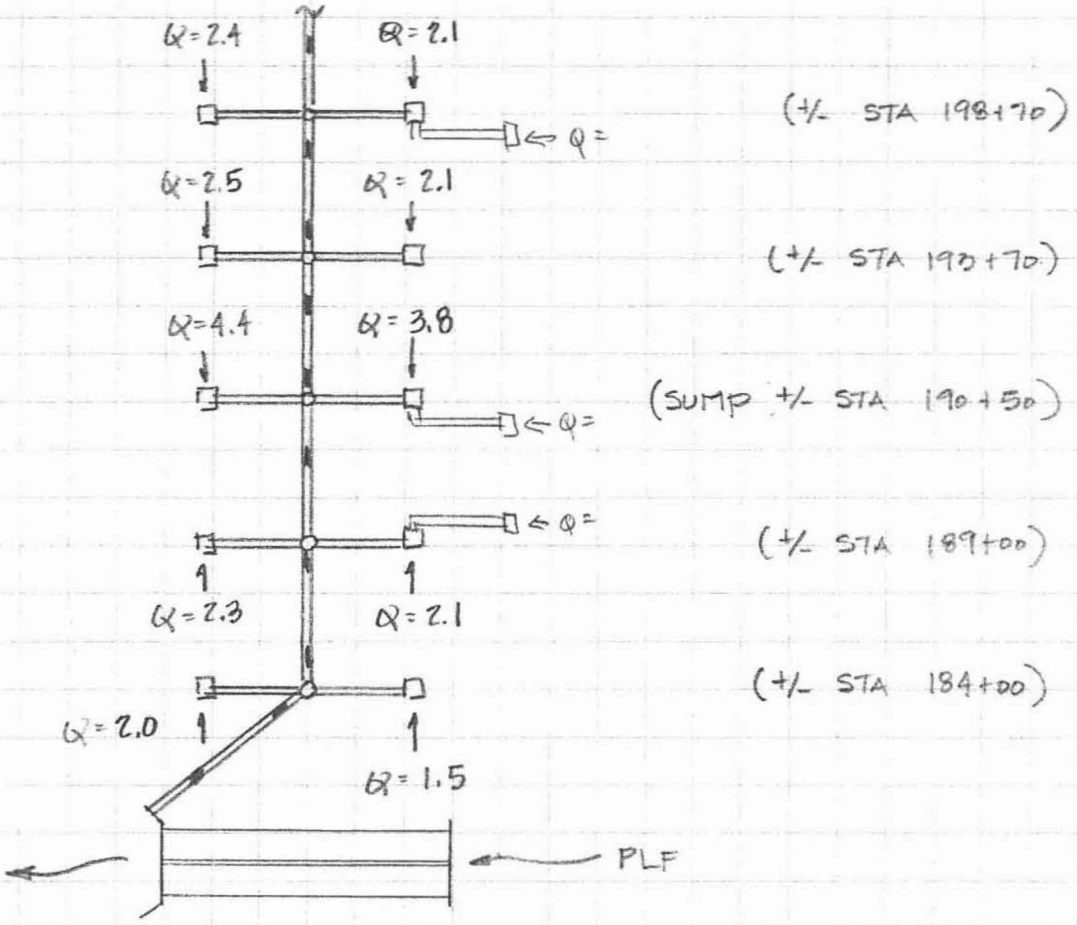

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Table A-3
Summary of interim CIP condition peak discharges along Ellsworth Road

Catch Basin Station	Drainage Area acres	10-Year Intensity in/hr	10-Year C-Value	10-Year Flow cfs	100-Year Intensity in/hr	100-Year C-Value	100-Year Flow cfs
312+00.00 R	1.06	4.20	0.77	3.4	6.60	0.77	5.4
312+00.00 L	1.26	4.20	0.69	3.7	6.60	0.81	6.8
307+07.57 R	0.74	4.20	0.77	2.4	6.60	0.90	4.3
307+07.57 L	0.73	4.09	0.76	2.3	6.60	0.89	4.3
303+13.86 R	0.59	3.48	0.76	1.6	5.95	0.89	3.1
303+13.86 L	0.59	4.20	0.76	1.9	6.60	0.89	3.5
299+85.77 R	0.49	4.20	0.76	1.6	6.60	0.89	2.9
299+75.94 L	0.50	4.20	0.77	1.6	6.60	0.90	3.0
291+65.67 R	1.22	3.05	0.76	2.9	5.32	0.89	5.8
291+65.67 L	1.21	3.96	0.76	3.7	6.60	0.89	7.1
285+52.37 R	1.10	3.15	0.77	2.7	5.57	0.90	5.5
285+52.37 L	1.24	3.35	0.79	3.3	5.86	0.91	6.7
280+27.11 R	0.76	3.90	0.81	2.4	6.54	0.92	4.6
280+17.27 L	0.61	3.85	0.78	1.8	6.48	0.91	3.6
278+63.07 R	0.24	4.20	0.77	0.8	6.60	0.89	1.4
278+63.07 L	0.24	4.20	0.76	0.8	6.60	0.89	1.4
269+54.28 R	1.44	3.88	0.67	3.7	6.57	0.79	7.5
269+54.28 L	1.11	3.91	0.76	3.3	6.60	0.89	6.6
267+70.55 R	0.70	4.20	0.50	1.5	6.60	0.61	2.8
267+70.55 L	0.27	4.20	0.76	0.9	6.60	0.89	1.6
264+42.47 R	1.14	4.20	0.51	2.4	6.60	0.61	4.6
264+32.53 L	0.51	4.20	0.76	1.6	6.60	0.89	3.0
259+51.64 R	1.63	4.20	0.51	3.5	6.60	0.62	6.7
259+43.68 L	0.74	4.20	0.77	2.4	6.60	0.90	4.4
254+61.50 R	1.29	4.20	0.66	3.5	6.60	0.77	6.6
254+61.50 L	1.03	3.63	0.77	2.9	6.18	0.91	5.8
250+54.67 R	0.36	4.20	0.64	1.0	6.60	0.76	1.8
250+54.67 L	0.29	4.20	0.76	0.9	6.60	0.89	1.7
244+93.75 R	1.05	4.20	0.64	2.8	6.60	0.75	5.2
244+93.75 L	0.84	4.20	0.76	2.7	6.60	0.89	4.9
243+29.71 R	0.61	4.20	0.64	1.6	6.60	0.75	3.0
243+29.71 L	0.49	4.20	0.76	1.6	6.60	0.89	2.9
241+65.57 R	0.79	4.20	0.64	2.1	6.60	0.75	3.9
241+65.57 L	0.62	4.20	0.76	2.0	6.60	0.89	3.7
232+91.08 R	1.06	4.20	0.64	2.8	6.60	0.75	5.3
232+91.08 L	1.04	4.20	0.79	3.4	6.60	0.91	6.2
226+69.50 R	0.94	4.20	0.68	2.7	6.60	0.79	4.9
226+69.50 L	0.51	4.20	0.78	1.7	6.60	0.91	3.0
222+20.00 R	0.83	4.20	0.64	2.2	0.00	0.00	0.0
222+20.00 L	0.67	4.20	0.76	2.2	0.00	0.00	0.0
220+33.02 R	0.65	2.98	0.64	1.2	0.00	0.00	0.0
220+33.02 L	0.52	4.20	0.76	1.7	0.00	0.00	0.0
218+68.98 R	0.82	4.20	0.64	2.2	0.00	0.00	0.0
218+68.98 L	0.66	4.20	0.76	2.1	6.60	0.89	3.9
208+32.28 R	0.77	4.02	0.75	2.3	6.60	0.87	4.5

Table A-3
Summary of interim CIP condition peak discharges along Ellsworth Road

Catch Basin Station	Drainage Area acres	10-Year Intensity in/hr	10-Year C-Value	10-Year Flow cfs	100-Year Intensity in/hr	100-Year C-Value	100-Year Flow cfs
208+32.28 L	0.91	4.03	0.77	2.8	6.60	0.90	5.4
203+76.28 R	0.56	4.20	0.79	1.9	6.60	0.91	3.4
203+76.28 L	0.71	4.20	0.78	2.3	6.60	0.91	4.3
198+67.75 R	0.65	4.03	0.79	2.1	6.60	0.91	3.9
198+67.75 L	0.76	4.20	0.77	2.5	6.60	0.90	4.5
193+75.63 R	0.62	3.54	0.78	1.7	6.04	0.90	3.4
193+75.63 L	0.73	3.55	0.76	2.0	6.05	0.89	4.0
190+47.46 R	0.60	4.20	0.78	2.0	6.60	0.90	3.6
190+47.46 L	0.71	4.20	0.76	2.3	6.60	0.89	4.2
188+99.90 R	0.59	3.81	0.78	1.8	6.43	0.90	3.4
188+99.90 L	0.77	3.82	0.77	2.3	6.45	0.90	4.5
184+07.99 R	0.56	4.20	0.81	1.9	6.60	0.93	3.4
184+07.99 L	0.78	4.20	0.79	2.6	6.60	0.92	4.8

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Interim CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 312+00.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	21,871		0.50	0.85
Shoulder	15,502	3,705	0.44	0.70
Median	4,989		0.11	0.70

Total Area = 1.06 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1417.71 feet			
D/S Elev =	1410.63 feet			
Length =	700.00 feet	0.133 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.40 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 312+00.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	19,598	0.45	0.85
Shoulder	20,330	0.47	0.70
Median	5,060	0.12	0.70
Off-site	10,050	0.23	0.35

Total Area = 1.26 acres
Weighted C = 0.69

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1417.71 feet			
D/S Elev =	1410.63 feet			
Length =	700.00 feet	0.133 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.40 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	4 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Interim CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 307+07.57 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	14,335		0.33	0.85
Shoulder	4,529	9,183	0.31	0.70
Median	3,979		0.09	0.70

Total Area = 0.74 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.63 feet			
D/S Elev =	1408.9 feet			
Length =	492.43 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0035 ft/ft	18.55 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 307+07.57 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	13,769	0.32	0.85
Shoulder	14,292	0.33	0.70
Median	3,900	0.09	0.70

Total Area = 0.73 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.63 feet			
D/S Elev =	1409.56 feet			
Length =	492.43 feet	0.093 miles	T_c =	10.8 minutes
Slope =	0.0022 ft/ft	11.47 ft/mile	Intesity =	4.09 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 303+13.86 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	11,037	0.25	0.85
Shoulder	11,452	0.26	0.70
Median	3,150	0.07	0.70

Total Area = 0.59 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1408.9 feet			
D/S Elev =	1408.72 feet			
Length =	393.71 feet	0.075 miles	T_c =	15.7 minutes
Slope =	0.0005 ft/ft	2.41 ft/mile	**Intesity =**	3.48 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 303+13.86 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	11,036	0.25	0.85
Shoulder	11,445	0.26	0.70
Median	3,157	0.07	0.70

Total Area = 0.59 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1409.56 feet			
D/S Elev =	1408.79 feet			
Length =	393.71 feet	0.075 miles	T_c =	10.0 minutes
Slope =	0.0020 ft/ft	10.33 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Interim CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 299+85.77 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	9,144	0.21	0.85
Shoulder	9,493	0.22	0.70
Median	2,605	0.06	0.70

Total Area = 0.49 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1409.56 feet			
D/S Elev =	1405.32 feet			
Length =	328.09 feet	0.062 miles	T_c =	10.0 minutes
Slope =	0.0129 ft/ft	68.23 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 299+75.94 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	10,017	0.23	0.85
Shoulder	9,241	0.21	0.70
Median	2,707	0.06	0.70

Total Area = 0.50 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1408.9 feet			
D/S Elev =	1407.43 feet			
Length =	337.92 feet	0.064 miles	T_c =	10.0 minutes
Slope =	0.0044 ft/ft	22.97 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 291+65.67 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	22,955	0.53	0.85
Shoulder	23,817	0.55	0.70
Median	6,566	0.15	0.70

Total Area = 1.22 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1405.32 feet			
D/S Elev =	1404.81 feet			
Length =	820.10 feet	0.155 miles	T_c =	20.2 minutes
Slope =	0.0006 ft/ft	3.28 ft/mile	**Intesity =**	3.05 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.17 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 291+65.67 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	22,640	0.52	0.85
Shoulder	23,464	0.54	0.70
Median	6,466	0.15	0.70

Total Area = 1.21 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1407.43 feet			
D/S Elev =	1404.61 feet			
Length =	810.27 feet	0.153 miles	T_c =	11.8 minutes
Slope =	0.0035 ft/ft	18.38 ft/mile	**Intesity =**	3.96 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.17 in/hr		**Peak Discharge =**	4 cfs

Catch Basin Station: 285+52.37 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	17,158	5,960	0.53	0.85
Shoulder	16,681	3,518	0.46	0.70
Median	4,157	260	0.10	0.70

Total Area = 1.10 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.81 feet			
D/S Elev =	1404.48 feet			
Length =	613.30 feet	0.116 miles	T_c =	19.0 minutes
Slope =	0.0005 ft/ft	2.84 ft/mile	**Intesity =**	3.15 in/hr
Kb =	0.04			
$i_{assumed}$ =	3.78 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 285+52.37 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	23,447	10,057	0.77	0.85
Shoulder	14,207	2,237	0.38	0.70
Median	4,049	229	0.10	0.70

Total Area = 1.24 acres
Weighted C = 0.79

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.81 feet			
D/S Elev =	1404.34 feet			
Length =	613.30 feet	0.116 miles	T_c =	16.9 minutes
Slope =	0.0008 ft/ft	4.05 ft/mile	**Intesity =**	3.35 in/hr
Kb =	0.04			
$i_{assumed}$ =	3.81 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 280+27.11 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	17,186	6,927	0.55	0.85
Shoulder	4,299	3,202	0.17	0.70
Median	473	1,141	0.04	0.70

Total Area = 0.76 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.72 feet			
D/S Elev =	1402.37 feet			
Length =	375.26 feet	0.071 miles	T_c =	12.2 minutes
Slope =	0.0009 ft/ft	4.92 ft/mile	Intesity =	3.90 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 280+17.27 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	9,694	4,287	0.32	0.85
Shoulder	6,849	4,004	0.25	0.70
Median	534	1,170	0.04	0.70

Total Area = 0.61 acres
Weighted C = 0.78

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.72 feet			
D/S Elev =	1402.37 feet			
Length =	385.10 feet	0.073 miles	T_c =	12.6 minutes
Slope =	0.0009 ft/ft	4.80 ft/mile	Intesity =	3.85 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 278+63.07 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	4,861	0.11	0.85
Shoulder	4,338	0.10	0.70
Median	1,436	0.03	0.70

Total Area = 0.24 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.72 feet			
Length =	163.07 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0113 ft/ft	59.90 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	1 cfs

Catch Basin Station: 278+63.07 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	4,579	0.11	0.85
Shoulder	4,619	0.11	0.70
Median	1,436	0.03	0.70

Total Area = 0.24 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.72 feet			
Length =	163.07 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0113 ft/ft	59.90 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	1 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Interim CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 269+54.28 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	20,857	0.48	0.85
Shoulder	21,617	0.50	0.70
Median	5,966	0.14	0.70
Off-site	14,307	0.33	0.35

Total Area = 1.44 acres
Weighted C = 0.67

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.46 feet			
Length =	745.72 feet	0.141 miles	T_c =	12.4 minutes
Slope =	0.0028 ft/ft	14.94 ft/mile	**Intesity =**	3.88 in/hr
Kb =	0.04			
$i_{assumed}$ =	3.81 in/hr		**Peak Discharge =**	4 cfs

Catch Basin Station: 269+54.28 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	20,855	0.48	0.85
Shoulder	21,619	0.50	0.70
Median	5,966	0.14	0.70

Total Area = 1.11 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.22 feet			
Length =	745.72 feet	0.141 miles	T_c =	12.1 minutes
Slope =	0.0032 ft/ft	16.64 ft/mile	**Intesity =**	3.91 in/hr
Kb =	0.04			
$i_{assumed}$ =	3.8 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 267+70.55 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	5,221	0.12	0.85
Shoulder	3,943	0.09	0.70
Median	1,472	0.03	0.70
Off-site	19,667	0.45	0.35

Total Area = 0.70 acres
Weighted C = 0.50

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.71 feet			
D/S Elev =	1402.25 feet			
Length =	183.73 feet	0.035 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.22 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	1 cfs

Catch Basin Station: 267+70.55 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	5,145	0.12	0.85
Shoulder	5,333	0.12	0.70
Median	1,472	0.03	0.70

Total Area = 0.27 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.71 feet			
D/S Elev =	1402.25 feet			
Length =	183.73 feet	0.035 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.22 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	1 cfs

Catch Basin Station: 264+42.47 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	9,370	0.22	0.85
Shoulder	6,047	0.14	0.70
Median	2,627	0.06	0.70
Off-site	31,431	0.72	0.35

Total Area = 1.14 acres
Weighted C = 0.51

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.25 feet			
D/S Elev =	1401.43 feet			
Length =	328.08 feet	0.062 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.20 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 264+32.53 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	9,483	0.22	0.85
Shoulder	9,831	0.23	0.70
Median	2,713	0.06	0.70

Total Area = 0.51 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.25 feet			
D/S Elev =	1401.4 feet			
Length =	338.02 feet	0.064 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.28 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 259+51.64 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	14,018	0.32	0.85
Shoulder	9,048	0.21	0.70
Median	3,622	0.08	0.70
Off-site	44,478	1.02	0.35

Total Area = 1.63 acres
Weighted C = 0.51

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1401.43 feet			
D/S Elev =	1400.17 feet			
Length =	490.83 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0026 ft/ft	13.55 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	4 cfs

Catch Basin Station: 259+43.68 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	14,386	0.33	0.85
Shoulder	14,182	0.33	0.70
Median	3,568	0.08	0.70

Total Area = 0.74 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1401.4 feet			
D/S Elev =	1398.63 feet			
Length =	488.85 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0057 ft/ft	29.92 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.15 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 254+61.50 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	17,362	6,213		0.54	0.85
Shoulder	9,034	3,907		0.30	0.70
Median	421	329	1,623	0.05	0.70
Off-site	11,810	5,353		0.39	0.35

Total Area = 1.29 acres
Weighted C = 0.66

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1400.17 feet			
D/S Elev =	1398.38 feet			
Length =	490.14 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0037 ft/ft	19.28 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.17 in/hr		**Peak Discharge =**	4 cfs

Catch Basin Station: 254+61.50 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	16,286	5,931		0.51	0.85
Shoulder	13,961	6,148		0.46	0.70
Median	300	490	1,610	0.06	0.70

Total Area = 1.03 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.63 feet			
D/S Elev =	1398.24 feet			
Length =	482.18 feet	0.091 miles	T_c =	14.4 minutes
Slope =	0.0008 ft/ft	4.27 ft/mile	**Intesity =**	3.63 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.17 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 250+54.67 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	5,566	0.13	0.85
Shoulder	3,593	0.08	0.70
Median	1,560	0.04	0.70
Off-site	4,923	0.11	0.35

Total Area = 0.36 acres
Weighted C = 0.64

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1399.49 feet			
D/S Elev =	1398.51 feet			
Length =	195.33 feet	0.037 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.49 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	1 cfs

Catch Basin Station: 250+54.67 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	5,454	0.13	0.85
Shoulder	5,653	0.13	0.70
Median	1,560	0.04	0.70

Total Area = 0.29 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1399.49 feet			
D/S Elev =	1398.51 feet			
Length =	195.33 feet	0.037 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.49 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	1 cfs

Catch Basin Station: 244+93.75 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	16,023	0.37	0.85
Shoulder	10,342	0.24	0.70
Median	4,492	0.10	0.70
Off-site	14,680	0.34	0.35

Total Area = 1.05 acres
Weighted C = 0.64

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.51 feet			
D/S Elev =	1395.71 feet			
Length =	560.92 feet	0.106 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.36 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 244+93.75 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	15,700	0.36	0.85
Shoulder	16,275	0.37	0.70
Median	4,491	0.10	0.70

Total Area = 0.84 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.51 feet			
D/S Elev =	1395.71 feet			
Length =	560.92 feet	0.106 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.36 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 243+29.71 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	4,685	4,685		0.22	0.85
Shoulder	3,024	3,024		0.14	0.70
Median	1,313	1,313		0.06	0.70
Off-site	4,272	4,412		0.20	0.35

Total Area = 0.61 acres
Weighted C = 0.64

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.52 feet			
D/S Elev =	1394.98 feet			
Length =	164.04 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.38 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 243+29.71 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	4,591	4,591		0.21	0.85
Shoulder	4,759	4,759		0.22	0.70
Median	1,313	1,313		0.06	0.70

Total Area = 0.49 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.52 feet			
D/S Elev =	1394.98 feet			
Length =	164.04 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.38 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 241+65.57 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	11,881	0.27	0.85
Shoulder	7,669	0.18	0.70
Median	3,331	0.08	0.70
Off-site	11,373	0.26	0.35

Total Area = 0.79 acres
Weighted C = 0.64

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396.97 feet			
D/S Elev =	1395.52 feet			
Length =	415.57 feet	0.079 miles	T_c =	10.0 minutes
Slope =	0.0035 ft/ft	18.42 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 241+65.57 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	11,642	0.27	0.85
Shoulder	12,068	0.28	0.70
Median	3,330	0.08	0.70

Total Area = 0.62 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396.97 feet			
D/S Elev =	1395.52 feet			
Length =	415.57 feet	0.079 miles	T_c =	10.0 minutes
Slope =	0.0035 ft/ft	18.42 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 232+91.08 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	13,067	4,618	0.41	0.85
Shoulder	7,300	2,186	0.22	0.70
Median	2,871	254	0.07	0.70
Off-site	12,389	3,666	0.37	0.35

Total Area = 1.06 acres
Weighted C = 0.64

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396.97 feet			
D/S Elev =	1395.74 feet			
Length =	458.92 feet	0.087 miles	T_c =	10.0 minutes
Slope =	0.0027 ft/ft	14.15 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 232+91.08 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	16,700	8,972	0.59	0.85
Shoulder	12,140	4,307	0.38	0.70
Median	2,818	238	0.07	0.70

Total Area = 1.04 acres
Weighted C = 0.79

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396.97 feet			
D/S Elev =	1395.74 feet			
Length =	458.92 feet	0.087 miles	T_c =	10.0 minutes
Slope =	0.0027 ft/ft	14.15 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 226+69.50 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,519	0.49	0.85
Shoulder	6,843	0.16	0.70
Median	853	0.02	0.70
Off-site	11,670	0.27	0.35

Total Area = 0.94 acres
Weighted C = 0.68

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.96 feet			
D/S Elev =	1394.18 feet			
Length =	471.58 feet	0.089 miles	T_c =	10.0 minutes
Slope =	0.0038 ft/ft	19.93 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 226+69.50 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	11,802	0.27	0.85
Shoulder	9,416	0.22	0.70
Median	828	0.02	0.70

Total Area = 0.51 acres
Weighted C = 0.78

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.96 feet			
D/S Elev =	1394.18 feet			
Length =	471.58 feet	0.089 miles	T_c =	10.0 minutes
Slope =	0.0038 ft/ft	19.93 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 222+20.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	12,922	0.30	0.85
Shoulder	7,960	0.18	0.70
Median	3,906	0.09	0.70
Off-site	11,475	0.26	0.35

Total Area = 0.83 acres
Weighted C = 0.64

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1394.18 feet			
D/S Elev =	1392.68 feet			
Length =	449.50 feet	0.085 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.62 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.19 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 222+20.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	12,585	0.29	0.85
Shoulder	12,713	0.29	0.70
Median	3,875	0.09	0.70

Total Area = 0.67 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1394.18 feet			
D/S Elev =	1392.68 feet			
Length =	449.50 feet	0.085 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.62 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.18 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 220+33.02 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	5,336	4,685	0.23	0.85
Shoulder	3,444	3,024	0.15	0.70
Median	1,496	1,313	0.06	0.70
Off-site	4,719	4,172	0.20	0.35

Total Area = 0.65 acres
Weighted C = 0.64

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1392.69 feet			
D/S Elev =	1392.68 feet			
Length =	186.98 feet	0.035 miles	T_c =	21.0 minutes
Slope =	0.0001 ft/ft	0.28 ft/mile	**Intesity =**	2.98 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	1 cfs

Catch Basin Station: 220+33.02 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	5,229	4,591	0.23	0.85
Shoulder	5,419	4,759	0.23	0.70
Median	1,496	1,313	0.06	0.70

Total Area = 0.52 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1392.68 feet			
D/S Elev =	1391.9 feet			
Length =	186.98 feet	0.035 miles	T_c =	10.0 minutes
Slope =	0.0042 ft/ft	22.03 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 218+68.98 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	12,684	0.29	0.85
Shoulder	8,188	0.19	0.70
Median	3,556	0.08	0.70
Off-site	11,212	0.26	0.35

Total Area = 0.82 acres
Weighted C = 0.64

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.25 feet			
Length =	443.98 feet	0.084 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.40 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 218+68.98 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	12,429	0.29	0.85
Shoulder	12,884	0.30	0.70
Median	3,555	0.08	0.70

Total Area = 0.66 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.25 feet			
Length =	443.98 feet	0.084 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.40 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 208+32.28 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	16,928	0.39	0.85
Shoulder	10,928	0.25	0.70
Median	3,656	0.08	0.70
Off-site	2,214	0.05	0.35

Total Area = 0.77 acres
Weighted C = 0.75

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.89 feet			
Length =	592.72 feet	0.112 miles	T_c =	11.3 minutes
Slope =	0.0027 ft/ft	14.07 ft/mile	**Intesity =**	4.02 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.02 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 208+32.28 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	18,780	0.43	0.85
Shoulder	17,196	0.39	0.70
Median	3,646	0.08	0.70

Total Area = 0.91 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.89 feet			
Length =	592.72 feet	0.112 miles	T_c =	11.2 minutes
Slope =	0.0027 ft/ft	14.07 ft/mile	**Intesity =**	4.03 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.03 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 203+76.28 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	14,930		0.34	0.85
Shoulder	1,098	6,908	0.18	0.70
Median	1,440	57	0.03	0.70

Total Area = 0.56 acres
Weighted C = 0.79

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1393.89 feet			
D/S Elev =	1390.6 feet			
Length =	456.00 feet	0.086 miles	T_c =	10.0 minutes
Slope =	0.0072 ft/ft	38.09 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 203+76.28 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	16,317		0.37	0.85
Shoulder	13,228		0.30	0.70
Median	59	1,491	0.04	0.70

Total Area = 0.71 acres
Weighted C = 0.78

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1393.89 feet			
D/S Elev =	1391.12 feet			
Length =	456.00 feet	0.086 miles	T_c =	10.0 minutes
Slope =	0.0061 ft/ft	32.07 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 198+67.75 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	16,904			0.39	0.85
Shoulder	657	2,962	4,686	0.19	0.70
Median	25	3,263		0.08	0.70

Total Area = 0.65 acres
Weighted C = 0.79

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1390.6 feet			
D/S Elev =	1389.55 feet			
Length =	508.53 feet	0.096 miles	T_c =	11.2 minutes
Slope =	0.0021 ft/ft	10.90 ft/mile	Intesity =	4.03 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.15 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 198+67.75 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	15,185		0.35	0.85
Shoulder	14,752		0.34	0.70
Median	25	3,180	0.07	0.70

Total Area = 0.76 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1391.12 feet			
D/S Elev =	1389.55 feet			
Length =	508.53 feet	0.096 miles	T_c =	10.0 minutes
Slope =	0.0031 ft/ft	16.30 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.16 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 193+75.63 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	13,773	0.32	0.85
Shoulder	9,355	0.21	0.70
Median	3,939	0.09	0.70

Total Area = 0.62 acres
Weighted C = 0.78

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.55 feet			
D/S Elev =	1389.19 feet			
Length =	492.12 feet	0.093 miles	T_c =	15.2 minutes
Slope =	0.0007 ft/ft	3.86 ft/mile	**Intesity =**	3.54 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.17 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 193+75.63 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	13,772	0.32	0.85
Shoulder	14,276	0.33	0.70
Median	3,940	0.09	0.70

Total Area = 0.73 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.55 feet			
D/S Elev =	1389.19 feet			
Length =	492.12 feet	0.093 miles	T_c =	15.1 minutes
Slope =	0.0007 ft/ft	3.86 ft/mile	**Intesity =**	3.55 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.18 in/hr		**Peak Discharge =**	2 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Interim CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 190+47.46 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	9,176	4,137	0.31	0.85
Shoulder	6,233	2,810	0.21	0.70
Median	2,625	1,183	0.09	0.70

Total Area = 0.60 acres
Weighted C = 0.78

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.19 feet			
D/S Elev =	1388.52 feet			
Length =	328.17 feet	0.062 miles	T_c =	10.0 minutes
Slope =	0.0020 ft/ft	10.78 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 190+47.46 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	9,176	4,137	0.31	0.85
Shoulder	9,512	4,289	0.32	0.70
Median	2,625	1,183	0.09	0.70

Total Area = 0.71 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.19 feet			
D/S Elev =	1388 feet			
Length =	328.17 feet	0.062 miles	T_c =	10.0 minutes
Slope =	0.0036 ft/ft	19.15 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 188+99.90 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	13,783	0.32	0.85
Shoulder	9,138	0.21	0.70
Median	2,753	0.06	0.70

Total Area = 0.59 acres
Weighted C = 0.78

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.07 feet			
D/S Elev =	1388.45 feet			
Length =	491.91 feet	0.093 miles	T_c =	12.9 minutes
Slope =	0.0013 ft/ft	6.65 ft/mile	**Intesity =**	3.81 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.12 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 188+99.90 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	16,621	0.38	0.85
Shoulder	14,065	0.32	0.70
Median	2,737	0.06	0.70

Total Area = 0.77 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.07 feet			
D/S Elev =	1388.45 feet			
Length =	491.91 feet	0.093 miles	T_c =	12.8 minutes
Slope =	0.0013 ft/ft	6.65 ft/mile	**Intesity =**	3.82 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.13 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 184+07.99 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	17,457		0.40	0.85
Shoulder	2,059	4,465	0.15	0.70
Median	219	361	0.01	0.70

Total Area = 0.56 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1391.66 feet			
D/S Elev =	1389.07 feet			
Length =	482.58 feet	0.091 miles	T_c =	10.0 minutes
Slope =	0.0054 ft/ft	28.34 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.03 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 184+07.99 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	21,449		0.49	0.85
Shoulder	12,043		0.28	0.70
Median	233	353	0.01	0.70

Total Area = 0.78 acres
Weighted C = 0.79

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1391.66 feet			
D/S Elev =	1389.07 feet			
Length =	482.58 feet	0.091 miles	T_c =	10.0 minutes
Slope =	0.0054 ft/ft	28.34 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.05 in/hr		**Peak Discharge =**	3 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Interim CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 312+00.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	21,871		0.50	0.85
Shoulder	15,502	3,705	0.44	0.70
Median	4,989		0.11	0.70

Total Area = 1.06 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1417.71 feet			
D/S Elev =	1410.63 feet			
Length =	700.00 feet	0.133 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.40 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Catch Basin Station: 312+00.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	19,598	0.45	0.95
Shoulder	20,330	0.47	0.88
Median	5,060	0.12	0.75
Off-site	10,050	0.23	0.45

Total Area = 1.26 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1417.71 feet			
D/S Elev =	1410.63 feet			
Length =	700.00 feet	0.133 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.40 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	7 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Interim CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 307+07.57 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	14,335		0.33	0.95
Shoulder	4,529	9,183	0.31	0.88
Median	3,979		0.09	0.75

Total Area = 0.74 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.63 feet			
D/S Elev =	1408.9 feet			
Length =	492.43 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0035 ft/ft	18.55 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 307+07.57 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	13,769	0.32	0.95
Shoulder	14,292	0.33	0.88
Median	3,900	0.09	0.75

Total Area = 0.73 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.63 feet			
D/S Elev =	1409.56 feet			
Length =	492.43 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0022 ft/ft	11.47 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 303+13.86 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	11,037	0.25	0.95
Shoulder	11,452	0.26	0.88
Median	3,150	0.07	0.75

Total Area = 0.59 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1408.9 feet			
D/S Elev =	1408.72 feet			
Length =	393.71 feet	0.075 miles	T_c =	13.3 minutes
Slope =	0.0005 ft/ft	2.41 ft/mile	Intesity =	5.95 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 303+13.86 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	11,036	0.25	0.95
Shoulder	11,445	0.26	0.88
Median	3,157	0.07	0.75

Total Area = 0.59 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1409.56 feet			
D/S Elev =	1408.79 feet			
Length =	393.71 feet	0.075 miles	T_c =	10.0 minutes
Slope =	0.0020 ft/ft	10.33 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Interim CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 299+85.77 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	9,144	0.21	0.95
Shoulder	9,493	0.22	0.88
Median	2,605	0.06	0.75

Total Area = 0.49 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1409.56 feet			
D/S Elev =	1405.32 feet			
Length =	328.09 feet	0.062 miles	T_c =	10.0 minutes
Slope =	0.0129 ft/ft	68.23 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 299+75.94 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	10,017	0.23	0.95
Shoulder	9,241	0.21	0.88
Median	2,707	0.06	0.75

Total Area = 0.50 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1408.9 feet			
D/S Elev =	1407.43 feet			
Length =	337.92 feet	0.064 miles	T_c =	10.0 minutes
Slope =	0.0044 ft/ft	22.97 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 291+65.67 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	22,955	0.53	0.95
Shoulder	23,817	0.55	0.88
Median	6,566	0.15	0.75

Total Area = 1.22 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1405.32 feet			
D/S Elev =	1404.81 feet			
Length =	820.10 feet	0.155 miles	T_c =	16.9 minutes
Slope =	0.0006 ft/ft	3.28 ft/mile	Intesity =	5.32 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	6 cfs

Catch Basin Station: 291+65.67 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	22,640	0.52	0.95
Shoulder	23,464	0.54	0.88
Median	6,466	0.15	0.75

Total Area = 1.21 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1407.43 feet			
D/S Elev =	1404.61 feet			
Length =	810.27 feet	0.153 miles	T_c =	10.0 minutes
Slope =	0.0035 ft/ft	18.38 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	7 cfs

Catch Basin Station: 285+52.37 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	17,158	5,960	0.53	0.95
Shoulder	16,681	3,518	0.46	0.88
Median	4,157	260	0.10	0.75

Total Area = 1.10 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.81 feet			
D/S Elev =	1404.48 feet			
Length =	613.30 feet	0.116 miles	T_c =	15.4 minutes
Slope =	0.0005 ft/ft	2.84 ft/mile	Intesity =	5.57 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	6 cfs

Catch Basin Station: 285+52.37 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	23,447	10,057	0.77	0.95
Shoulder	14,207	2,237	0.38	0.88
Median	4,049	229	0.10	0.75

Total Area = 1.24 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.81 feet			
D/S Elev =	1404.34 feet			
Length =	613.30 feet	0.116 miles	T_c =	13.7 minutes
Slope =	0.0008 ft/ft	4.05 ft/mile	Intesity =	5.86 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	7 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Interim CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 280+27.11 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	17,186	6,927	0.55	0.95
Shoulder	4,299	3,202	0.17	0.88
Median	473	1,141	0.04	0.75

Total Area = 0.76 acres
Weighted C = 0.92

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.72 feet			
D/S Elev =	1402.37 feet			
Length =	375.26 feet	0.071 miles	T_c =	10.3 minutes
Slope =	0.0009 ft/ft	4.92 ft/mile	Intesity =	6.54 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Catch Basin Station: 280+17.27 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	9,694	4,287	0.32	0.95
Shoulder	6,849	4,004	0.25	0.88
Median	534	1,170	0.04	0.75

Total Area = 0.61 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.72 feet			
D/S Elev =	1402.37 feet			
Length =	385.10 feet	0.073 miles	T_c =	10.6 minutes
Slope =	0.0009 ft/ft	4.80 ft/mile	Intesity =	6.48 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 278+63.07 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	4,861	0.11	0.95
Shoulder	4,338	0.10	0.88
Median	1,436	0.03	0.75

Total Area = 0.24 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.72 feet			
Length =	163.07 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0113 ft/ft	59.90 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	1 cfs

Catch Basin Station: 278+63.07 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	4,579	0.11	0.95
Shoulder	4,619	0.11	0.88
Median	1,436	0.03	0.75

Total Area = 0.24 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.72 feet			
Length =	163.07 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0113 ft/ft	59.90 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	1 cfs

Catch Basin Station: 269+54.28 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	20,857	0.48	0.95
Shoulder	21,617	0.50	0.88
Median	5,966	0.14	0.75
Off-site	14,307	0.33	0.45

Total Area = 1.44 acres
Weighted C = 0.79

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.46 feet			
Length =	745.72 feet	0.141 miles	T_c =	10.1 minutes
Slope =	0.0028 ft/ft	14.94 ft/mile	**Intesity =**	6.57 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.45 in/hr		**Peak Discharge =**	8 cfs

Catch Basin Station: 269+54.28 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	20,855	0.48	0.95
Shoulder	21,619	0.50	0.88
Median	5,966	0.14	0.75

Total Area = 1.11 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.22 feet			
Length =	745.72 feet	0.141 miles	T_c =	10.0 minutes
Slope =	0.0032 ft/ft	16.64 ft/mile	**Intesity =**	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.5 in/hr		**Peak Discharge =**	7 cfs

Catch Basin Station: 267+70.55 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	5,221	0.12	0.95
Shoulder	3,943	0.09	0.88
Median	1,472	0.03	0.75
Off-site	19,667	0.45	0.45

Total Area = 0.70 acres
Weighted C = 0.61

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.71 feet			
D/S Elev =	1402.25 feet			
Length =	183.73 feet	0.035 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.22 ft/mile	**Intesity =**	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 267+70.55 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	5,145	0.12	0.95
Shoulder	5,333	0.12	0.88
Median	1,472	0.03	0.75

Total Area = 0.27 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.71 feet			
D/S Elev =	1402.25 feet			
Length =	183.73 feet	0.035 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.22 ft/mile	**Intesity =**	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 264+42.47 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	9,370	0.22	0.95
Shoulder	6,047	0.14	0.88
Median	2,627	0.06	0.75
Off-site	31,431	0.72	0.45

Total Area = 1.14 acres
Weighted C = 0.61

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.25 feet			
D/S Elev =	1401.43 feet			
Length =	328.08 feet	0.062 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.20 ft/mile	**Intesity =**	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	5 cfs

Catch Basin Station: 264+32.53 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	9,483	0.22	0.95
Shoulder	9,831	0.23	0.88
Median	2,713	0.06	0.75

Total Area = 0.51 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.25 feet			
D/S Elev =	1401.4 feet			
Length =	338.02 feet	0.064 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.28 ft/mile	**Intesity =**	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 259+51.64 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	14,018	0.32	0.95
Shoulder	9,048	0.21	0.88
Median	3,622	0.08	0.75
Off-site	44,478	1.02	0.45

Total Area = 1.63 acres
Weighted C = 0.62

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1401.43 feet			
D/S Elev =	1400.17 feet			
Length =	490.83 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0026 ft/ft	13.55 ft/mile	**Intesity =**	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	7 cfs

Catch Basin Station: 259+43.68 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	14,386	0.33	0.95
Shoulder	14,182	0.33	0.88
Median	3,568	0.08	0.75

Total Area = 0.74 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1401.4 feet			
D/S Elev =	1398.63 feet			
Length =	488.85 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0057 ft/ft	29.92 ft/mile	**Intesity =**	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	4 cfs

Catch Basin Station: 254+61.50 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	17,362	6,213		0.54	0.95
Shoulder	9,034	3,907		0.30	0.88
Median	421	329	1,623	0.05	0.75
Off-site	11,810	5,353		0.39	0.45

Total Area = 1.29 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1400.2 feet				
D/S Elev =	1398.38 feet				
Length =	490.14 feet	0.093 miles		T_c =	10.0 minutes
Slope =	0.0037 ft/ft	19.61 ft/mile		Intesity =	6.60 in/hr
Kb =	0.04				
$i_{assumed}$ =	6.6 in/hr			Peak Discharge =	7 cfs

Catch Basin Station: 254+61.50 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	16,286	5,931		0.51	0.95
Shoulder	13,961	6,148		0.46	0.88
Median	300	490	1,610	0.06	0.75

Total Area = 1.03 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.63 feet				
D/S Elev =	1398.24 feet				
Length =	482.18 feet	0.091 miles		T_c =	12.1 minutes
Slope =	0.0008 ft/ft	4.27 ft/mile		Intesity =	6.18 in/hr
Kb =	0.04				
$i_{assumed}$ =	6.6 in/hr			Peak Discharge =	6 cfs

Catch Basin Station: 250+54.67 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	5,566	0.13	0.95
Shoulder	3,593	0.08	0.88
Median	1,560	0.04	0.75
Off-site	4,923	0.11	0.45

Total Area = 0.36 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1399.49 feet			
D/S Elev =	1398.51 feet			
Length =	195.33 feet	0.037 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.49 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 250+54.67 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	5,454	0.13	0.95
Shoulder	5,653	0.13	0.88
Median	1,560	0.04	0.75

Total Area = 0.29 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1399.49 feet			
D/S Elev =	1398.51 feet			
Length =	195.33 feet	0.037 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.49 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	2 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Interim CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 244+93.75 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	16,023	0.37	0.95
Shoulder	10,342	0.24	0.88
Median	4,492	0.10	0.75
Off-site	14,680	0.34	0.45

Total Area = 1.05 acres
Weighted C = 0.75

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.51 feet			
D/S Elev =	1395.71 feet			
Length =	560.92 feet	0.106 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.36 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Catch Basin Station: 244+93.75 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	15,700	0.36	0.95
Shoulder	16,275	0.37	0.88
Median	4,491	0.10	0.75

Total Area = 0.84 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.51 feet			
D/S Elev =	1395.71 feet			
Length =	560.92 feet	0.106 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.36 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Catch Basin Station: 243+29.71 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	4,685	4,685		0.22	0.95
Shoulder	3,024	3,024		0.14	0.88
Median	1,313	1,313		0.06	0.75
Off-site	4,272	4,412		0.20	0.45

Total Area = 0.61 acres
Weighted C = 0.75

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.52 feet			
D/S Elev =	1394.98 feet			
Length =	164.04 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.38 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 243+29.71 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	4,591	4,591		0.21	0.95
Shoulder	4,759	4,759		0.22	0.88
Median	1,313	1,313		0.06	0.75

Total Area = 0.49 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.52 feet			
D/S Elev =	1394.98 feet			
Length =	164.04 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.38 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 241+65.57 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	11,881	0.27	0.95
Shoulder	7,669	0.18	0.88
Median	3,331	0.08	0.75
Off-site	11,373	0.26	0.45

Total Area = 0.79 acres
Weighted C = 0.75

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396.97 feet			
D/S Elev =	1395.52 feet			
Length =	415.57 feet	0.079 miles	T_c =	10.0 minutes
Slope =	0.0035 ft/ft	18.42 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 241+65.57 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	11,642	0.27	0.95
Shoulder	12,068	0.28	0.88
Median	3,330	0.08	0.75

Total Area = 0.62 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396.97 feet			
D/S Elev =	1395.52 feet			
Length =	415.57 feet	0.079 miles	T_c =	10.0 minutes
Slope =	0.0035 ft/ft	18.42 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 232+91.08 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	13,067	4,618	0.41	0.95
Shoulder	7,300	2,186	0.22	0.88
Median	2,871	254	0.07	0.75
Off-site	12,389	3,666	0.37	0.45

Total Area = 1.06 acres
Weighted C = 0.75

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396.97 feet			
D/S Elev =	1395.74 feet			
Length =	458.92 feet	0.087 miles	T_c =	10.0 minutes
Slope =	0.0027 ft/ft	14.15 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Catch Basin Station: 232+91.08 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	16,700	8,972	0.59	0.95
Shoulder	12,140	4,307	0.38	0.88
Median	2,818	238	0.07	0.75

Total Area = 1.04 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396.97 feet			
D/S Elev =	1395.74 feet			
Length =	458.92 feet	0.087 miles	T_c =	10.0 minutes
Slope =	0.0027 ft/ft	14.15 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	6 cfs

Catch Basin Station: 226+69.50 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,519	0.49	0.95
Shoulder	6,843	0.16	0.88
Median	853	0.02	0.75
Off-site	11,670	0.27	0.45

Total Area = 0.94 acres
Weighted C = 0.79

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.96 feet			
D/S Elev =	1394.18 feet			
Length =	471.58 feet	0.089 miles	T_c =	10.0 minutes
Slope =	0.0038 ft/ft	19.93 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Catch Basin Station: 226+69.50 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	11,802	0.27	0.95
Shoulder	9,416	0.22	0.88
Median	828	0.02	0.75

Total Area = 0.51 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.96 feet			
D/S Elev =	1394.18 feet			
Length =	471.58 feet	0.089 miles	T_c =	10.0 minutes
Slope =	0.0038 ft/ft	19.93 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 222+20.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	12,922	0.30	0.95
Shoulder	7,960	0.18	0.88
Median	3,906	0.09	0.75
Off-site	11,475	0.26	0.45

Total Area = 0.83 acres
Weighted C = 0.75

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1394.18 feet			
D/S Elev =	1392.68 feet			
Length =	449.50 feet	0.085 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.62 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 222+20.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	12,585	0.29	0.95
Shoulder	12,713	0.29	0.88
Median	3,875	0.09	0.75

Total Area = 0.67 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1394.18 feet			
D/S Elev =	1392.68 feet			
Length =	449.50 feet	0.085 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.62 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 220+33.02 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	5,336	4,685	0.23	0.95
Shoulder	3,444	3,024	0.15	0.88
Median	1,496	1,313	0.06	0.75
Off-site	4719	4172	0.20	0.45

Total Area = 0.65 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1392.68 feet			
D/S Elev =	1392.67 feet			
Length =	186.98 feet	0.035 miles	T_c =	17.7 minutes
Slope =	0.0001 ft/ft	0.28 ft/mile	Intesity =	5.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 220+33.02 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	5,229	4,591	0.23	0.95
Shoulder	5,419	4,759	0.23	0.88
Median	1,496	1,313	0.06	0.75

Total Area = 0.52 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1392.68 feet			
D/S Elev =	1391.9 feet			
Length =	186.98 feet	0.035 miles	T_c =	10.0 minutes
Slope =	0.0042 ft/ft	22.03 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 218+68.98 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	12,684	0.29	0.95
Shoulder	8,188	0.19	0.88
Median	3,556	0.08	0.75
Off-site	11,212	0.26	0.45

Total Area = 0.82 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.25 feet			
Length =	443.98 feet	0.084 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.40 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 218+68.98 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	12,429	0.29	0.95
Shoulder	12,884	0.30	0.88
Median	3,555	0.08	0.75

Total Area = 0.66 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.25 feet			
Length =	443.98 feet	0.084 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.40 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 208+32.28 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	16,928	0.39	0.95
Shoulder	10,928	0.25	0.88
Median	3,656	0.08	0.75
Off-site	2,214	0.05	0.45

Total Area = 0.77 acres
Weighted C = 0.87

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.89 feet			
Length =	592.72 feet	0.112 miles	T_c =	10.0 minutes
Slope =	0.0027 ft/ft	14.07 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 208+32.28 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	18,780	0.43	0.95
Shoulder	17,196	0.39	0.88
Median	3,646	0.08	0.75

Total Area = 0.91 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.89 feet			
Length =	592.72 feet	0.112 miles	T_c =	10.0 minutes
Slope =	0.0027 ft/ft	14.07 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Catch Basin Station: 203+76.28 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	14,930		0.34	0.95
Shoulder	1,098	6,908	0.18	0.88
Median	1,440	57	0.03	0.75

Total Area = 0.56 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1393.89 feet			
D/S Elev =	1390.6 feet			
Length =	456.00 feet	0.086 miles	T_c =	10.0 minutes
Slope =	0.0072 ft/ft	38.09 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 203+76.28 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	16,317		0.37	0.95
Shoulder	13,228		0.30	0.88
Median	59	1,491	0.04	0.75

Total Area = 0.71 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1393.89 feet			
D/S Elev =	1391.12 feet			
Length =	456.00 feet	0.086 miles	T_c =	10.0 minutes
Slope =	0.0061 ft/ft	32.07 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Interim CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 198+67.75 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	16,904			0.39	0.95
Shoulder	657	2,962	4,686	0.19	0.88
Median	25	3,263		0.08	0.75

Total Area = 0.65 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1390.6 feet			
D/S Elev =	1389.55 feet			
Length =	508.53 feet	0.096 miles	T_c =	10.0 minutes
Slope =	0.0021 ft/ft	10.90 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 198+67.75 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	15,185		0.35	0.95
Shoulder	14,752		0.34	0.88
Median	25	3,180	0.07	0.75

Total Area = 0.76 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1391.12 feet			
D/S Elev =	1389.55 feet			
Length =	508.53 feet	0.096 miles	T_c =	10.0 minutes
Slope =	0.0031 ft/ft	16.30 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Interim CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 193+75.63 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	13,773	0.32	0.95
Shoulder	9,355	0.21	0.88
Median	3,939	0.09	0.75

Total Area = 0.62 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.55 feet			
D/S Elev =	1389.19 feet			
Length =	492.12 feet	0.093 miles	T_c =	12.8 minutes
Slope =	0.0007 ft/ft	3.86 ft/mile	Intesity =	6.04 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 193+75.63 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	13,772	0.32	0.95
Shoulder	14,276	0.33	0.88
Median	3,940	0.09	0.75

Total Area = 0.73 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.55 feet			
D/S Elev =	1389.19 feet			
Length =	492.12 feet	0.093 miles	T_c =	12.7 minutes
Slope =	0.0007 ft/ft	3.86 ft/mile	Intesity =	6.05 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Interim CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 190+47.46 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	9,176	4,137	0.31	0.95
Shoulder	6,233	2,810	0.21	0.88
Median	2,625	1,183	0.09	0.75

Total Area = 0.60 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.19 feet			
D/S Elev =	1388.52 feet			
Length =	328.17 feet	0.062 miles	T_c =	10.0 minutes
Slope =	0.0020 ft/ft	10.78 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 190+47.46 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	9,176	4,137	0.31	0.95
Shoulder	9,512	4,289	0.32	0.88
Median	2,625	1,183	0.09	0.75

Total Area = 0.71 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.19 feet			
D/S Elev =	1388 feet			
Length =	328.17 feet	0.062 miles	T_c =	10.0 minutes
Slope =	0.0036 ft/ft	19.15 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 188+99.90 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	13,783	0.32	0.95
Shoulder	9,138	0.21	0.88
Median	2,753	0.06	0.75

Total Area = 0.59 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.07 feet			
D/S Elev =	1388.45 feet			
Length =	491.91 feet	0.093 miles	T_c =	10.8 minutes
Slope =	0.0013 ft/ft	6.65 ft/mile	Intesity =	6.43 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 188+99.90 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	16,621	0.38	0.95
Shoulder	14,065	0.32	0.88
Median	2,737	0.06	0.75

Total Area = 0.77 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.07 feet			
D/S Elev =	1388.45 feet			
Length =	491.91 feet	0.093 miles	T_c =	10.7 minutes
Slope =	0.0013 ft/ft	6.65 ft/mile	Intesity =	6.45 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Interim CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 184+07.99 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	17,457		0.40	0.95
Shoulder	2,059	4,465	0.15	0.88
Median	219	361	0.01	0.75

Total Area = 0.56 acres
Weighted C = 0.93

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1391.66 feet			
D/S Elev =	1389.07 feet			
Length =	482.58 feet	0.091 miles	T_c =	10.0 minutes
Slope =	0.0054 ft/ft	28.34 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 184+07.99 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	21,449		0.49	0.95
Shoulder	12,043		0.28	0.88
Median	233	353	0.01	0.75

Total Area = 0.78 acres
Weighted C = 0.92

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1391.66 feet			
D/S Elev =	1389.07 feet			
Length =	482.58 feet	0.091 miles	T_c =	10.0 minutes
Slope =	0.0054 ft/ft	28.34 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Table A-4
Summary of full CIP condition peak discharges along Ellsworth Road

Catch Basin Station	Drainage Area acres	10-Year Intensity in/hr	10-Year C-value	10-Year Flow cfs	100-Year Intensity in/hr	100-Year C-value	100-Year Flow cfs
312+00.00 R	1.06	4.20	0.81	3.6	6.60	0.92	6.4
312+00.00 L	1.26	4.20	0.72	3.8	6.60	0.83	6.9
307+07.57 R	0.74	4.20	0.80	2.5	6.60	0.91	4.4
307+07.57 L	0.73	4.09	0.80	2.4	6.60	0.91	4.4
303+13.86 R	0.59	3.48	0.80	1.6	5.95	0.91	3.2
303+13.86 L	0.59	4.20	0.80	2.0	6.60	0.91	3.5
299+85.77 R	0.49	4.20	0.80	1.6	6.60	0.91	2.9
299+75.94 L	0.50	4.20	0.80	1.7	6.60	0.91	3.0
291+65.67 R	1.22	3.80	0.80	3.7	6.42	0.91	7.2
291+65.67 L	1.21	4.20	0.80	4.1	6.60	0.91	7.3
285+52.37 R	1.10	3.15	0.81	2.8	5.57	0.92	5.6
285+52.37 L	1.25	3.35	0.83	3.5	5.86	0.93	6.8
280+27.11 R	0.76	3.90	0.84	2.5	6.54	0.94	4.7
280+17.27 L	0.61	3.85	0.82	1.9	6.48	0.93	3.7
278+63.07 R	0.24	4.20	0.81	0.8	6.60	0.91	1.5
278+63.07 L	0.24	4.20	0.80	0.8	6.60	0.91	1.5
269+54.28 R	1.44	3.88	0.70	3.9	6.59	0.81	7.7
269+54.28 L	1.11	3.91	0.80	3.5	6.60	0.91	6.7
267+70.55 R	0.70	4.20	0.51	1.5	6.60	0.61	2.8
267+70.55 L	0.27	4.20	0.80	0.9	6.60	0.91	1.7
264+42.47 R	1.14	4.20	0.52	2.5	6.60	0.62	4.7
264+32.53 L	0.51	4.20	0.80	1.7	6.60	0.91	3.0
259+51.64 R	1.63	4.20	0.53	3.6	6.60	0.63	6.7
259+43.68 L	0.74	4.20	0.80	2.5	6.60	0.91	4.4
254+61.50 R	1.29	4.20	0.68	3.7	6.60	0.79	6.7
254+61.50 L	1.03	3.63	0.81	3.0	6.18	0.93	5.9
250+54.67 R	0.36	4.20	0.67	1.0	6.60	0.77	1.8
250+54.67 L	0.29	4.20	0.80	1.0	6.60	0.91	1.7
244+93.75 R	1.05	4.20	0.67	2.9	6.60	0.77	5.3
244+93.75 L	0.84	4.20	0.80	2.8	6.60	0.91	5.0
243+29.71 R	0.61	4.20	0.67	1.7	6.60	0.77	3.1
243+29.71 L	0.49	4.20	0.80	1.6	6.60	0.91	2.9
241+65.57 R	0.79	4.20	0.66	2.2	6.60	0.76	4.0
241+65.57 L	0.62	4.20	0.80	2.1	6.60	0.91	3.7
232+91.08 R	1.06	4.20	0.67	3.0	6.60	0.77	5.4
232+91.08 L	1.04	4.20	0.82	3.6	6.60	0.93	6.3
226+69.50 R	0.94	4.20	0.71	2.8	6.60	0.81	5.0
226+69.50 L	0.51	4.20	0.82	1.7	6.60	0.93	3.1
222+20.00 R	0.83	4.20	0.67	2.3	0.00	0.00	0.0
222+20.00 L	0.67	4.20	0.80	2.3	0.00	0.00	0.0
220+33.02 R	0.65	2.98	0.67	1.3	0.00	0.00	0.0
220+33.02 L	0.52	4.20	0.80	1.8	0.00	0.00	0.0
218+68.98 R	0.82	4.20	0.67	2.3	0.00	0.00	0.0
218+68.98 L	0.66	4.20	0.80	2.2	6.60	0.91	4.0
208+32.28 R	0.77	4.02	0.79	2.5	6.60	0.89	4.6

Table A-4
Summary of full CIP condition peak discharges along Ellsworth Road

Catch Basin Station	Drainage Area acres	10-Year Intensity in/hr	10-Year C-value	10-Year Flow cfs	100-Year Intensity in/hr	100-Year C-value	100-Year Flow cfs
208+32.28 L	0.91	4.03	0.81	3.0	6.60	0.92	5.5
203+76.28 R	0.56	4.20	0.83	2.0	6.60	0.93	3.5
203+76.28 L	0.71	4.20	0.81	2.4	6.60	0.93	4.4
198+67.75 R	0.66	4.03	0.83	2.2	6.60	0.92	4.0
198+67.75 L	0.76	4.20	0.81	2.6	6.60	0.92	4.6
193+75.63 R	0.62	3.54	0.82	1.8	6.04	0.92	3.4
193+75.63 L	0.73	3.55	0.80	2.1	6.05	0.91	4.1
190+47.46 R	0.60	4.20	0.82	2.1	6.60	0.92	3.6
190+47.46 L	0.71	4.20	0.80	2.4	6.60	0.91	4.3
188+99.90 R	0.59	3.81	0.83	1.9	6.43	0.92	3.5
188+99.90 L	0.77	3.82	0.81	2.4	6.45	0.92	4.6
184+07.99 R	0.57	4.20	0.85	2.0	6.60	0.94	3.6
184+07.99 L	0.78	4.20	0.83	2.7	6.60	0.94	4.8

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 312+00.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	32,532		0.75	0.85
Shoulder	6,917	1,633	0.20	0.70
Median	4,989		0.11	0.70

Total Area = 1.06 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1417.71 feet			
D/S Elev =	1410.63 feet			
Length =	700.00 feet	0.133 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.40 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 312+00.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	30,770	0.71	0.85
Shoulder	9,140	0.21	0.70
Median	5,060	0.12	0.70
Off-site	10,050	0.23	0.35

Total Area = 1.26 acres
Weighted C = 0.72

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1417.71 feet			
D/S Elev =	1410.63 feet			
Length =	700.00 feet	0.133 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.40 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	4 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 307+07.57 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	21,998		0.50	0.85
Shoulder	1,983	4,070	0.14	0.70
Median	3,979		0.09	0.70

Total Area = 0.74 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.63 feet			
D/S Elev =	1408.9 feet			
Length =	492.43 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0035 ft/ft	18.55 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 307+07.57 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,641	0.50	0.85
Shoulder	6,404	0.15	0.70
Median	3,900	0.09	0.70

Total Area = 0.73 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.63 feet			
D/S Elev =	1409.56 feet			
Length =	492.43 feet	0.093 miles	T_c =	10.8 minutes
Slope =	0.0022 ft/ft	11.47 ft/mile	Intesity =	4.09 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 303+13.86 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	17,354	0.40	0.85
Shoulder	5,132	0.12	0.70
Median	3,150	0.07	0.70

Total Area = 0.59 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1408.9 feet			
D/S Elev =	1408.72 feet			
Length =	393.71 feet	0.075 miles	T_c =	15.7 minutes
Slope =	0.0005 ft/ft	2.41 ft/mile	Intesity =	3.48 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 303+13.86 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	17,345	0.40	0.85
Shoulder	5,133	0.12	0.70
Median	3,157	0.07	0.70

Total Area = 0.59 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1409.56 feet			
D/S Elev =	1408.79 feet			
Length =	393.71 feet	0.075 miles	T_c =	10.0 minutes
Slope =	0.0020 ft/ft	10.33 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 299+85.77 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	14,379	0.33	0.85
Shoulder	4,252	0.10	0.70
Median	2,605	0.06	0.70

Total Area = 0.49 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1409.56 feet			
D/S Elev =	1405.32 feet			
Length =	345.77 feet	0.065 miles	T_c =	10.0 minutes
Slope =	0.0123 ft/ft	64.75 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 299+75.94 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	15,205	0.35	0.85
Shoulder	4,056	0.09	0.70
Median	2,707	0.06	0.70

Total Area = 0.50 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1408.9 feet			
D/S Elev =	1407.43 feet			
Length =	335.94 feet	0.064 miles	T_c =	10.0 minutes
Slope =	0.0044 ft/ft	23.10 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 291+65.67 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	36,088	0.83	0.85
Shoulder	10,674	0.25	0.70
Median	6,566	0.15	0.70

Total Area = 1.22 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1405.32 feet			
D/S Elev =	1404.81 feet			
Length =	474.33 feet	0.090 miles	T_c =	13.0 minutes
Slope =	0.0011 ft/ft	5.68 ft/mile	**Intesity =**	3.80 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.17 in/hr		**Peak Discharge =**	4 cfs

Catch Basin Station: 291+65.67 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	35,573	0.82	0.85
Shoulder	10,530	0.24	0.70
Median	6,466	0.15	0.70

Total Area = 1.21 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1407.43 feet			
D/S Elev =	1404.61 feet			
Length =	474.33 feet	0.090 miles	T_c =	10.0 minutes
Slope =	0.0059 ft/ft	31.39 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.17 in/hr		**Peak Discharge =**	4 cfs

Catch Basin Station: 285+52.37 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	26,966	8,239	0.81	0.85
Shoulder	6,869	1,238	0.19	0.70
Median	4,157	260	0.10	0.70

Total Area = 1.10 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.81 feet			
D/S Elev =	1404.48 feet			
Length =	613.30 feet	0.116 miles	T_c =	19.0 minutes
Slope =	0.0005 ft/ft	2.84 ft/mile	**Intesity =**	3.15 in/hr
Kb =	0.04			
$i_{assumed}$ =	3.78 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 285+52.37 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	33,301	12,331	1.05	0.85
Shoulder	4,353		0.10	0.70
Median	4,049	229	0.10	0.70

Total Area = 1.25 acres
Weighted C = 0.83

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.81 feet			
D/S Elev =	1404.34 feet			
Length =	613.30 feet	0.116 miles	T_c =	16.9 minutes
Slope =	0.0008 ft/ft	4.05 ft/mile	**Intesity =**	3.35 in/hr
Kb =	0.04			
$i_{assumed}$ =	3.81 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 280+27.11 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	21,617	9,418	0.71	0.85
Shoulder	576		0.01	0.70
Median	465	1,137	0.04	0.70

Total Area = 0.76 acres
Weighted C = 0.84

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.72 feet				
D/S Elev =	1402.37 feet				
Length =	375.26 feet	0.071 miles		T_c =	12.2 minutes
Slope =	0.0009 ft/ft	4.92 ft/mile		Intesity =	3.90 in/hr
Kb =	0.04				
$i_{assumed}$ =	4.2 in/hr			Peak Discharge =	2 cfs

Catch Basin Station: 280+17.27 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	14,057	6,737	0.48	0.85
Shoulder	2,486	1,554	0.09	0.70
Median	545	1,170	0.04	0.70

Total Area = 0.61 acres
Weighted C = 0.82

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.72 feet				
D/S Elev =	1402.37 feet				
Length =	385.10 feet	0.073 miles		T_c =	12.6 minutes
Slope =	0.0009 ft/ft	4.80 ft/mile		Intesity =	3.85 in/hr
Kb =	0.04				
$i_{assumed}$ =	4.2 in/hr			Peak Discharge =	2 cfs

Catch Basin Station: 278+63.07 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	7,478	0.17	0.85
Shoulder	1,721	0.04	0.70
Median	1,436	0.03	0.70

Total Area = 0.24 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.72 feet			
Length =	163.07 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0113 ft/ft	59.90 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	1 cfs

Catch Basin Station: 278+63.07 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	7,197	0.17	0.85
Shoulder	2,001	0.05	0.70
Median	1,436	0.03	0.70

Total Area = 0.24 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.72 feet			
Length =	163.07 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0113 ft/ft	59.90 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	1 cfs

Catch Basin Station: 269+54.28 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	32,777	0.75	0.85
Shoulder	9,698	0.22	0.70
Median	5,966	0.14	0.70
Off-site	14,306	0.33	0.35

Total Area = 1.44 acres
Weighted C = 0.70

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.46 feet			
Length =	745.72 feet	0.141 miles	T_c =	12.4 minutes
Slope =	0.0028 ft/ft	14.94 ft/mile	Intesity =	3.88 in/hr
Kb =	0.04			
$i_{assumed}$ =	3.81 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 269+54.28 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	32,775	0.75	0.85
Shoulder	9,699	0.22	0.70
Median	5,966	0.14	0.70

Total Area = 1.11 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.22 feet			
Length =	745.72 feet	0.141 miles	T_c =	12.1 minutes
Slope =	0.0032 ft/ft	16.64 ft/mile	Intesity =	3.91 in/hr
Kb =	0.04			
$i_{assumed}$ =	3.8 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 267+70.55 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	8,086	0.19	0.85
Shoulder	1,077	0.02	0.70
Median	1,472	0.03	0.70
Off-site	19,667	0.45	0.35

Total Area = 0.70 acres
Weighted C = 0.51

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.71 feet			
D/S Elev =	1402.25 feet			
Length =	183.73 feet	0.035 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.22 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	1 cfs

Catch Basin Station: 267+70.55 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	8,086	0.19	0.85
Shoulder	2,393	0.05	0.70
Median	1,472	0.03	0.70

Total Area = 0.27 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.71 feet			
D/S Elev =	1402.25 feet			
Length =	183.73 feet	0.035 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.22 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	1 cfs

Catch Basin Station: 264+42.47 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	14,429	0.33	0.85
Shoulder	988	0.02	0.70
Median	2,627	0.06	0.70
Off-site	31,431	0.72	0.35

Total Area = 1.14 acres
Weighted C = 0.52

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.25 feet			
D/S Elev =	1401.43 feet			
Length =	328.08 feet	0.062 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.20 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 264+32.53 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	14,904	0.34	0.85
Shoulder	4,410	0.10	0.70
Median	2,713	0.06	0.70

Total Area = 0.51 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.25 feet			
D/S Elev =	1401.4 feet			
Length =	338.02 feet	0.064 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.28 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 259+51.64 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,588	0.50	0.85
Shoulder	1,479	0.03	0.70
Median	3,622	0.08	0.70
Off-site	44,478	1.02	0.35

Total Area = 1.63 acres
Weighted C = 0.53

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1401.43 feet			
D/S Elev =	1400.17 feet			
Length =	490.83 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0026 ft/ft	13.55 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 259+43.68 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	22,205	0.51	0.85
Shoulder	6,362	0.15	0.70
Median	3,568	0.08	0.70

Total Area = 0.74 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1401.4 feet			
D/S Elev =	1398.63 feet			
Length =	488.85 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0057 ft/ft	29.92 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.15 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 254+61.50 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	24,919	9,482		0.79	0.85
Shoulder	1,477	639		0.05	0.70
Median	329	421	1,623	0.05	0.70
Off-site	11,810	5,353		0.39	0.35

Total Area = 1.29 acres
Weighted C = 0.68

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1400.2 feet			
D/S Elev =	1398.38 feet			
Length =	490.14 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0037 ft/ft	19.61 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.17 in/hr		**Peak Discharge =**	4 cfs

Catch Basin Station: 254+61.50 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	23,984	9,321		0.76	0.85
Shoulder	6,263	2,758		0.21	0.70
Median	300	490	1,610	0.06	0.70

Total Area = 1.03 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.63 feet			
D/S Elev =	1398.24 feet			
Length =	482.18 feet	0.091 miles	T_c =	14.4 minutes
Slope =	0.0008 ft/ft	4.27 ft/mile	**Intesity =**	3.63 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.17 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 250+54.67 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	8,571	0.20	0.85
Shoulder	587	0.01	0.70
Median	1,560	0.04	0.70
Off-site	4,923	0.11	0.35

Total Area = 0.36 acres
Weighted C = 0.67

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1399.49 feet			
D/S Elev =	1398.51 feet			
Length =	195.33 feet	0.037 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.49 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	1 cfs

Catch Basin Station: 250+54.67 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	8,571	0.20	0.85
Shoulder	2,536	0.06	0.70
Median	1,560	0.04	0.70

Total Area = 0.29 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1399.49 feet			
D/S Elev =	1398.51 feet			
Length =	195.33 feet	0.037 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.49 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	1 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 244+93.75 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	24,675	0.57	0.85
Shoulder	1,690	0.04	0.70
Median	4,492	0.10	0.70
Off-site	14,680	0.34	0.35

Total Area = 1.05 acres
Weighted C = 0.67

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.51 feet			
D/S Elev =	1395.71 feet			
Length =	560.92 feet	0.106 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.36 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 244+93.75 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	24,675	0.57	0.85
Shoulder	7,300	0.17	0.70
Median	4,491	0.10	0.70

Total Area = 0.84 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.51 feet			
D/S Elev =	1395.71 feet			
Length =	560.92 feet	0.106 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.36 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 243+29.71 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	7,215	7,215	0.33	0.85
Shoulder	494	494	0.02	0.70
Median	1,313	1,313	0.06	0.70
Off-site	4,272	4,412	0.20	0.35

Total Area = 0.61 acres
Weighted C = 0.67

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.52 feet			
D/S Elev =	1394.98 feet			
Length =	164.04 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.38 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 243+29.71 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	7,215	7,215	0.33	0.85
Shoulder	2,134	2,135	0.10	0.70
Median	1,313	1,313	0.06	0.70

Total Area = 0.49 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.52 feet			
D/S Elev =	1394.98 feet			
Length =	164.04 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.38 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 241+65.57 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	18,297	0.42	0.85
Shoulder	1,253	0.03	0.70
Median	3,331	0.08	0.70
Off-site	11,373	0.26	0.35

Total Area = 0.79 acres
Weighted C = 0.66

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396.97 feet			
D/S Elev =	1395.52 feet			
Length =	415.57 feet	0.079 miles	T_c =	10.0 minutes
Slope =	0.0035 ft/ft	18.42 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 241+65.57 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	18,297	0.42	0.85
Shoulder	5,413	0.12	0.70
Median	3,330	0.08	0.70

Total Area = 0.62 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396.97 feet			
D/S Elev =	1395.52 feet			
Length =	415.57 feet	0.079 miles	T_c =	10.0 minutes
Slope =	0.0035 ft/ft	18.42 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 232+91.08 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	20,123	6,954	0.62	0.85
Shoulder	412		0.01	0.70
Median	2,871	254	0.07	0.70
Off-site	12,220	3,516	0.36	0.35

Total Area = 1.06 acres
Weighted C = 0.67

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396.97 feet			
D/S Elev =	1395.74 feet			
Length =	458.92 feet	0.087 miles	T_c =	10.0 minutes
Slope =	0.0027 ft/ft	14.15 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 232+91.08 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	24,017	11,804	0.82	0.85
Shoulder	4,822	1,475	0.14	0.70
Median	2,818	238	0.07	0.70

Total Area = 1.04 acres
Weighted C = 0.82

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396.97 feet			
D/S Elev =	1395.74 feet			
Length =	458.92 feet	0.087 miles	T_c =	10.0 minutes
Slope =	0.0027 ft/ft	14.15 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 226+69.50 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	28,789	0.66	0.85
Shoulder		0.00	0.70
Median	853	0.02	0.70
Off-site	11,243	0.26	0.35

Total Area = 0.94 acres
Weighted C = 0.71

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.96 feet			
D/S Elev =	1394.18 feet			
Length =	471.58 feet	0.089 miles	T_c =	10.0 minutes
Slope =	0.0038 ft/ft	19.93 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 226+69.50 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	17,880	0.41	0.85
Shoulder	3,338	0.08	0.70
Median	853	0.02	0.70

Total Area = 0.51 acres
Weighted C = 0.82

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.96 feet			
D/S Elev =	1394.18 feet			
Length =	471.58 feet	0.089 miles	T_c =	10.0 minutes
Slope =	0.0038 ft/ft	19.93 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 222+20.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	19,857	0.46	0.85
Shoulder	1,025	0.02	0.70
Median	3,906	0.09	0.70
Off-site	11,475	0.26	0.35

Total Area = 0.83 acres
Weighted C = 0.67

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1394.18 feet			
D/S Elev =	1392.68 feet			
Length =	449.50 feet	0.085 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.62 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.19 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 222+20.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	19,778	0.45	0.85
Shoulder	5,520	0.13	0.70
Median	3,875	0.09	0.70

Total Area = 0.67 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1394.18 feet			
D/S Elev =	1392.68 feet			
Length =	449.50 feet	0.085 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.62 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.18 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 220+33.02 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	8,217	7,215	0.35	0.85
Shoulder	563	494	0.02	0.70
Median	1,496	1,313	0.06	0.70
Off-site	4,719	4,172	0.20	0.35

Total Area = 0.65 acres
Weighted C = 0.67

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1392.68 feet			
D/S Elev =	1392.67 feet			
Length =	186.98 feet	0.035 miles	T_c =	21.0 minutes
Slope =	0.0001 ft/ft	0.28 ft/mile	**Intesity =**	2.98 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	1 cfs

Catch Basin Station: 220+33.02 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	8,217	7,215	0.35	0.85
Shoulder	2,431	2,135	0.10	0.70
Median	1,496	1,313	0.06	0.70

Total Area = 0.52 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1392.68 feet			
D/S Elev =	1391.9 feet			
Length =	186.98 feet	0.035 miles	T_c =	10.0 minutes
Slope =	0.0042 ft/ft	22.03 ft/mile	**Intesity =**	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 218+68.98 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	19,533	0.45	0.85
Shoulder	1,338	0.03	0.70
Median	3,556	0.08	0.70
Off-site	11,212	0.26	0.35

Total Area = 0.82 acres
Weighted C = 0.67

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.25 feet			
Length =	443.98 feet	0.084 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.40 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 218+68.98 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	19,533	0.45	0.85
Shoulder	5,780	0.13	0.70
Median	3,555	0.08	0.70

Total Area = 0.66 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.25 feet			
Length =	443.98 feet	0.084 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.40 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 208+32.28 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	26,070	0.60	0.85
Shoulder	1,787	0.04	0.70
Median	3,656	0.08	0.70
Off-site	2,214	0.05	0.35

Total Area = 0.77 acres
Weighted C = 0.79

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.89 feet			
Length =	592.72 feet	0.112 miles	T_c =	11.3 minutes
Slope =	0.0027 ft/ft	14.07 ft/mile	Intesity =	4.02 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.02 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 208+32.28 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	28,262	0.65	0.85
Shoulder	7,714	0.18	0.70
Median	3,646	0.08	0.70

Total Area = 0.91 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.89 feet			
Length =	592.72 feet	0.112 miles	T_c =	11.2 minutes
Slope =	0.0027 ft/ft	14.07 ft/mile	Intesity =	4.03 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.03 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 203+76.28 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	21,781		0.50	0.85
Shoulder	157	1,072	0.03	0.70
Median	1,440	57	0.03	0.70

Total Area = 0.56 acres
Weighted C = 0.83

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1393.89 feet			
D/S Elev =	1390.6 feet			
Length =	456.00 feet	0.086 miles	T_c =	10.0 minutes
Slope =	0.0072 ft/ft	38.09 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 203+76.28 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	23,611		0.54	0.85
Shoulder	5,934		0.14	0.70
Median	59	1,491	0.04	0.70

Total Area = 0.71 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1393.89 feet			
D/S Elev =	1391.12 feet			
Length =	456.00 feet	0.086 miles	T_c =	10.0 minutes
Slope =	0.0061 ft/ft	32.07 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 198+67.75 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	24,128			0.55	0.85
Shoulder	82	424	721	0.03	0.70
Median	25	3,263		0.08	0.70

Total Area = 0.66 acres
Weighted C = 0.83

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1390.6 feet			
D/S Elev =	1389.55 feet			
Length =	508.53 feet	0.096 miles	T_c =	11.2 minutes
Slope =	0.0021 ft/ft	10.90 ft/mile	Intesity =	4.03 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.15 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 198+67.75 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	23,319			0.54	0.85
Shoulder	6,618			0.15	0.70
Median	25	3,180		0.07	0.70

Total Area = 0.76 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1391.12 feet			
D/S Elev =	1389.55 feet			
Length =	508.53 feet	0.096 miles	T_c =	10.0 minutes
Slope =	0.0031 ft/ft	16.30 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.16 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 193+75.63 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,644	0.50	0.85
Shoulder	1,483	0.03	0.70
Median	3,939	0.09	0.70

Total Area = 0.62 acres
Weighted C = 0.82

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.55 feet			
D/S Elev =	1389.19 feet			
Length =	492.12 feet	0.093 miles	T_c =	15.2 minutes
Slope =	0.0007 ft/ft	3.86 ft/mile	Intesity =	3.54 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.17 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 193+75.63 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,644	0.50	0.85
Shoulder	6,404	0.15	0.70
Median	3,940	0.09	0.70

Total Area = 0.73 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.55 feet			
D/S Elev =	1389.19 feet			
Length =	492.12 feet	0.093 miles	T_c =	15.1 minutes
Slope =	0.0007 ft/ft	3.86 ft/mile	Intesity =	3.55 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.18 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 190+47.46 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	14,421	6,502	0.48	0.85
Shoulder	988	446	0.03	0.70
Median	2,625	1,183	0.09	0.70

Total Area = 0.60 acres
Weighted C = 0.82

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.19 feet			
D/S Elev =	1388.52 feet			
Length =	328.17 feet	0.062 miles	T_c =	10.0 minutes
Slope =	0.0020 ft/ft	10.78 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 190+47.46 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	14,421	6,502	0.48	0.85
Shoulder	4,267	1,924	0.14	0.70
Median	2,625	1,183	0.09	0.70

Total Area = 0.71 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.19 feet			
D/S Elev =	1388 feet			
Length =	328.17 feet	0.062 miles	T_c =	10.0 minutes
Slope =	0.0036 ft/ft	19.15 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 188+99.90 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,453	0.49	0.85
Shoulder	1,469	0.03	0.70
Median	2,753	0.06	0.70

Total Area = 0.59 acres
Weighted C = 0.83

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.07 feet			
D/S Elev =	1388.45 feet			
Length =	491.91 feet	0.093 miles	T_c =	12.9 minutes
Slope =	0.0013 ft/ft	6.65 ft/mile	Intesity =	3.81 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.12 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 188+99.90 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	24,292	0.56	0.85
Shoulder	6,393	0.15	0.70
Median	2,737	0.06	0.70

Total Area = 0.77 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.07 feet			
D/S Elev =	1388.45 feet			
Length =	491.91 feet	0.093 miles	T_c =	12.8 minutes
Slope =	0.0013 ft/ft	6.65 ft/mile	Intesity =	3.82 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.13 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 184+07.99 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	24,183		0.56	0.85
Shoulder	191		0.00	0.70
Median	219	361	0.01	0.70

Total Area = 0.57 acres
Weighted C = 0.85

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1391.66 feet			
D/S Elev =	1389.07 feet			
Length =	482.58 feet	0.091 miles	T_c =	10.0 minutes
Slope =	0.0054 ft/ft	28.34 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.03 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 184+07.99 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	28,764		0.66	0.85
Shoulder	4,728		0.11	0.70
Median	233	353	0.01	0.70

Total Area = 0.78 acres
Weighted C = 0.83

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1391.66 feet			
D/S Elev =	1389.07 feet			
Length =	482.58 feet	0.091 miles	T_c =	10.0 minutes
Slope =	0.0054 ft/ft	28.34 ft/mile	Intesity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.05 in/hr		**Peak Discharge =**	3 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 312+00.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	32,532		0.75	0.95
Shoulder	6,917	1,633	0.20	0.88
Median	4,989		0.11	0.75

Total Area = 1.06 acres
Weighted C = 0.92

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1417.71 feet			
D/S Elev =	1410.63 feet			
Length =	700.00 feet	0.133 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.40 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	6 cfs

Catch Basin Station: 312+00.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	30,770	0.71	0.95
Shoulder	9,140	0.21	0.88
Median	5,060	0.12	0.75
Off-site	10,050	0.23	0.45

Total Area = 1.26 acres
Weighted C = 0.83

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1417.71 feet			
D/S Elev =	1410.63 feet			
Length =	700.00 feet	0.133 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.40 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	7 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 307+07.57 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	21,998		0.50	0.95
Shoulder	1,983	4,070	0.14	0.88
Median	3,979		0.09	0.75

Total Area = 0.74 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.63 feet			
D/S Elev =	1408.9 feet			
Length =	492.43 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0035 ft/ft	18.55 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 307+07.57 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,641	0.50	0.95
Shoulder	6,404	0.15	0.88
Median	3,900	0.09	0.75

Total Area = 0.73 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.63 feet			
D/S Elev =	1409.56 feet			
Length =	492.43 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0022 ft/ft	11.47 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 303+13.86 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	17,354	0.40	0.95
Shoulder	5,132	0.12	0.88
Median	3,150	0.07	0.75

Total Area = 0.59 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1408.9 feet			
D/S Elev =	1408.72 feet			
Length =	393.71 feet	0.075 miles	T_c =	13.3 minutes
Slope =	0.0005 ft/ft	2.41 ft/mile	Intesity =	5.95 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 303+13.86 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	17,345	0.40	0.95
Shoulder	5,133	0.12	0.88
Median	3,157	0.07	0.75

Total Area = 0.59 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1409.56 feet			
D/S Elev =	1408.79 feet			
Length =	393.71 feet	0.075 miles	T_c =	10.0 minutes
Slope =	0.0020 ft/ft	10.33 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	4 cfs

Catch Basin Station: 299+85.77 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	14,379	0.33	0.95
Shoulder	4,252	0.10	0.88
Median	2,605	0.06	0.75

Total Area = 0.49 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1409.56 feet			
D/S Elev =	1405.32 feet			
Length =	345.77 feet	0.065 miles	T_c =	10.0 minutes
Slope =	0.0123 ft/ft	64.75 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 299+75.94 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	15,205	0.35	0.95
Shoulder	4,056	0.09	0.88
Median	2,707	0.06	0.75

Total Area = 0.50 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1408.9 feet			
D/S Elev =	1407.43 feet			
Length =	335.94 feet	0.064 miles	T_c =	10.0 minutes
Slope =	0.0044 ft/ft	23.10 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 291+65.67 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	36,088	0.83	0.95
Shoulder	10,674	0.25	0.88
Median	6,566	0.15	0.75

Total Area = 1.22 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1405.32 feet			
D/S Elev =	1404.81 feet			
Length =	474.33 feet	0.090 miles	T_c =	10.9 minutes
Slope =	0.0011 ft/ft	5.68 ft/mile	Intesity =	6.42 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	7 cfs

Catch Basin Station: 291+65.67 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	35,573	0.82	0.95
Shoulder	10,530	0.24	0.88
Median	6,466	0.15	0.75

Total Area = 1.21 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1407.43 feet			
D/S Elev =	1404.61 feet			
Length =	474.33 feet	0.090 miles	T_c =	10.0 minutes
Slope =	0.0059 ft/ft	31.39 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	7 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 285+52.37 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	26,966	8,239	0.81	0.95
Shoulder	6,869	1,238	0.19	0.88
Median	4,157	260	0.10	0.75

Total Area = 1.10 acres
Weighted C = 0.92

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.81 feet			
D/S Elev =	1404.48 feet			
Length =	613.30 feet	0.116 miles	T_c =	15.4 minutes
Slope =	0.0005 ft/ft	2.84 ft/mile	Intesity =	5.57 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	6 cfs

Catch Basin Station: 285+52.37 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	33,301	12,331	1.05	0.95
Shoulder	4,353		0.10	0.88
Median	4,049	229	0.10	0.75

Total Area = 1.25 acres
Weighted C = 0.93

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.81 feet			
D/S Elev =	1404.34 feet			
Length =	613.30 feet	0.116 miles	T_c =	13.7 minutes
Slope =	0.0008 ft/ft	4.05 ft/mile	Intesity =	5.86 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	7 cfs

Catch Basin Station: 280+27.11 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	21,617	9,418	0.71	0.95
Shoulder	576		0.01	0.88
Median	465	1,137	0.04	0.75

Total Area = 0.76 acres
Weighted C = 0.94

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.72 feet			
D/S Elev =	1402.37 feet			
Length =	375.26 feet	0.071 miles	T_c =	10.3 minutes
Slope =	0.0009 ft/ft	4.92 ft/mile	Intesity =	6.54 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Catch Basin Station: 280+17.27 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	14,057	6,737	0.48	0.95
Shoulder	2,486	1,554	0.09	0.88
Median	545	1,170	0.04	0.75

Total Area = 0.61 acres
Weighted C = 0.93

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.72 feet			
D/S Elev =	1402.37 feet			
Length =	385.10 feet	0.073 miles	T_c =	10.6 minutes
Slope =	0.0009 ft/ft	4.80 ft/mile	Intesity =	6.48 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 278+63.07 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	7,478	0.17	0.95
Shoulder	1,721	0.04	0.88
Median	1,436	0.03	0.75

Total Area = 0.24 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.72 feet			
Length =	163.07 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0113 ft/ft	59.90 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	1 cfs

Catch Basin Station: 278+63.07 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	7,197	0.17	0.95
Shoulder	2,001	0.05	0.88
Median	1,436	0.03	0.75

Total Area = 0.24 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.72 feet			
Length =	163.07 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0113 ft/ft	59.90 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	1 cfs

Catch Basin Station: 269+54.28 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	32,777	0.75	0.95
Shoulder	9,698	0.22	0.88
Median	5,966	0.14	0.75
Off-site	14,306	0.33	0.45

Total Area = 1.44 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.46 feet			
Length =	745.72 feet	0.141 miles	T_c =	10.0 minutes
Slope =	0.0028 ft/ft	14.94 ft/mile	Intesity =	6.59 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	8 cfs

Catch Basin Station: 269+54.28 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	32,775	0.75	0.95
Shoulder	9,699	0.22	0.88
Median	5,966	0.14	0.75

Total Area = 1.11 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.57 feet			
D/S Elev =	1402.22 feet			
Length =	745.72 feet	0.141 miles	T_c =	10.0 minutes
Slope =	0.0032 ft/ft	16.64 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	7 cfs

Catch Basin Station: 267+70.55 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	8,086	0.19	0.95
Shoulder	1,077	0.02	0.88
Median	1,472	0.03	0.75
Off-site	19,667	0.45	0.45

Total Area = 0.70 acres
Weighted C = 0.61

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.71 feet			
D/S Elev =	1402.25 feet			
Length =	183.73 feet	0.035 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.22 ft/mile	**Intesity =**	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 267+70.55 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	8,086	0.19	0.95
Shoulder	2,393	0.05	0.88
Median	1,472	0.03	0.75

Total Area = 0.27 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.71 feet			
D/S Elev =	1402.25 feet			
Length =	183.73 feet	0.035 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.22 ft/mile	**Intesity =**	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	2 cfs

Catch Basin Station: 264+42.47 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	14,429	0.33	0.95
Shoulder	988	0.02	0.88
Median	2,627	0.06	0.75
Off-site	31,431	0.72	0.45

Total Area = 1.14 acres
Weighted C = 0.62

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.25 feet			
D/S Elev =	1401.43 feet			
Length =	328.08 feet	0.062 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.20 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Catch Basin Station: 264+32.53 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	14,904	0.34	0.95
Shoulder	4,410	0.10	0.88
Median	2,713	0.06	0.75

Total Area = 0.51 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1402.25 feet			
D/S Elev =	1401.4 feet			
Length =	338.02 feet	0.064 miles	T_c =	10.0 minutes
Slope =	0.0025 ft/ft	13.28 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 259+51.64 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,588	0.50	0.95
Shoulder	1,479	0.03	0.88
Median	3,622	0.08	0.75
Off-site	44,478	1.02	0.45

Total Area = 1.63 acres
Weighted C = 0.63

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1401.43 feet			
D/S Elev =	1400.17 feet			
Length =	490.83 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0026 ft/ft	13.55 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	7 cfs

Catch Basin Station: 259+43.68 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	22,205	0.51	0.95
Shoulder	6,362	0.15	0.88
Median	3,568	0.08	0.75

Total Area = 0.74 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1401.4 feet			
D/S Elev =	1398.63 feet			
Length =	488.85 feet	0.093 miles	T_c =	10.0 minutes
Slope =	0.0057 ft/ft	29.92 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 254+61.50 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	24,919	9,482		0.79	0.95
Shoulder	1,477	639		0.05	0.88
Median	329	421	1,623	0.05	0.75
Off-site	11,810	5,353		0.39	0.45

Total Area = 1.29 acres
Weighted C = 0.79

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1400.2 feet				
D/S Elev =	1398.38 feet				
Length =	490.14 feet	0.093 miles		T_c =	10.0 minutes
Slope =	0.0037 ft/ft	19.61 ft/mile		Intesity =	6.60 in/hr
Kb =	0.04				
$i_{assumed}$ =	6.6 in/hr			Peak Discharge =	7 cfs

Catch Basin Station: 254+61.50 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	23,984	9,321		0.76	0.95
Shoulder	6,263	2,758		0.21	0.88
Median	300	490	1,610	0.06	0.75

Total Area = 1.03 acres
Weighted C = 0.93

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.63 feet				
D/S Elev =	1398.24 feet				
Length =	482.18 feet	0.091 miles		T_c =	12.1 minutes
Slope =	0.0008 ft/ft	4.27 ft/mile		Intesity =	6.18 in/hr
Kb =	0.04				
$i_{assumed}$ =	6.6 in/hr			Peak Discharge =	6 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 250+54.67 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	8,571	0.20	0.95
Shoulder	587	0.01	0.88
Median	1,560	0.04	0.75
Off-site	4,923	0.11	0.45

Total Area = 0.36 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1399.49 feet			
D/S Elev =	1398.51 feet			
Length =	195.33 feet	0.037 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.49 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 250+54.67 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	8,571	0.20	0.95
Shoulder	2,536	0.06	0.88
Median	1,560	0.04	0.75

Total Area = 0.29 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1399.49 feet			
D/S Elev =	1398.51 feet			
Length =	195.33 feet	0.037 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.49 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	2 cfs

Catch Basin Station: 244+93.75 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	24,675	0.57	0.95
Shoulder	1,690	0.04	0.88
Median	4,492	0.10	0.75
Off-site	14,680	0.34	0.45

Total Area = 1.05 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.51 feet			
D/S Elev =	1395.71 feet			
Length =	560.92 feet	0.106 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.36 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Catch Basin Station: 244+93.75 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	24,675	0.57	0.95
Shoulder	7,300	0.17	0.88
Median	4,491	0.10	0.75

Total Area = 0.84 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.51 feet			
D/S Elev =	1395.71 feet			
Length =	560.92 feet	0.106 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.36 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Catch Basin Station: 243+29.71 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	7,215	7,215	0.33	0.95
Shoulder	494	494	0.02	0.88
Median	1,313	1,313	0.06	0.75
Off-site	4,272	4,412	0.20	0.45

Total Area = 0.61 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.52 feet			
D/S Elev =	1394.98 feet			
Length =	164.04 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.38 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 243+29.71 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	7,215	7,215	0.33	0.95
Shoulder	2,134	2,135	0.10	0.88
Median	1,313	1,313	0.06	0.75

Total Area = 0.49 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.52 feet			
D/S Elev =	1394.98 feet			
Length =	164.04 feet	0.031 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.38 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 241+65.57 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	18,297	0.42	0.95
Shoulder	1,253	0.03	0.88
Median	3,331	0.08	0.75
Off-site	11,373	0.26	0.45

Total Area = 0.79 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396.97 feet			
D/S Elev =	1395.52 feet			
Length =	415.57 feet	0.079 miles	T_c =	10.0 minutes
Slope =	0.0035 ft/ft	18.42 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 241+65.57 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	18,297	0.42	0.95
Shoulder	5,413	0.12	0.88
Median	3,330	0.08	0.75

Total Area = 0.62 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396.97 feet			
D/S Elev =	1395.52 feet			
Length =	415.57 feet	0.079 miles	T_c =	10.0 minutes
Slope =	0.0035 ft/ft	18.42 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 232+91.08 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	20,123	6,954	0.62	0.95
Shoulder	412		0.01	0.88
Median	2,871	254	0.07	0.75
Off-site	12,220	3,516	0.36	0.45

Total Area = 1.06 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev = 1396.97 feet
D/S Elev = 1395.74 feet
Length = 458.92 feet 0.087 miles **T_c =** 10.0 minutes
Slope = 0.0027 ft/ft 14.15 ft/mile **Intesity =** 6.60 in/hr
Kb = 0.04
$i_{assumed}$ = 6.6 in/hr **Peak Discharge =** 5 cfs

Catch Basin Station: 232+91.08 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	24,017	11,804	0.82	0.95
Shoulder	4,822	1,475	0.14	0.88
Median	2,818	238	0.07	0.75

Total Area = 1.04 acres
Weighted C = 0.93

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev = 1396.97 feet
D/S Elev = 1395.74 feet
Length = 458.92 feet 0.087 miles **T_c =** 10.0 minutes
Slope = 0.0027 ft/ft 14.15 ft/mile **Intesity =** 6.60 in/hr
Kb = 0.04
$i_{assumed}$ = 6.6 in/hr **Peak Discharge =** 6 cfs

Catch Basin Station: 226+69.50 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	28,789	0.66	0.95
Shoulder		0.00	0.88
Median	853	0.02	0.75
Off-site	11,243	0.26	0.45

Total Area = 0.94 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.96 feet			
D/S Elev =	1394.18 feet			
Length =	471.58 feet	0.089 miles	T_c =	10.0 minutes
Slope =	0.0038 ft/ft	19.93 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Catch Basin Station: 226+69.50 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	17,880	0.41	0.95
Shoulder	3,338	0.08	0.88
Median	853	0.02	0.75

Total Area = 0.51 acres
Weighted C = 0.93

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.96 feet			
D/S Elev =	1394.18 feet			
Length =	471.58 feet	0.089 miles	T_c =	10.0 minutes
Slope =	0.0038 ft/ft	19.93 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 222+20.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	19,857	0.46	0.95
Shoulder	1,025	0.02	0.88
Median	3,906	0.09	0.75
Off-site	11,475	0.26	0.45

Total Area = 0.83 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1394.18 feet			
D/S Elev =	1392.68 feet			
Length =	449.50 feet	0.085 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.62 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 222+20.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	19,778	0.45	0.95
Shoulder	5,520	0.13	0.88
Median	3,875	0.09	0.75

Total Area = 0.67 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1394.18 feet			
D/S Elev =	1392.68 feet			
Length =	449.50 feet	0.085 miles	T_c =	10.0 minutes
Slope =	0.0033 ft/ft	17.62 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 220+33.02 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	8,217	7,215	0.35	0.95
Shoulder	563	494	0.02	0.88
Median	1,496	1,313	0.06	0.75
Off-site	4,719	4172	0.20	0.45

Total Area = 0.65 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1392.68 feet			
D/S Elev =	1392.67 feet			
Length =	186.98 feet	0.035 miles	T_c =	17.7 minutes
Slope =	0.0001 ft/ft	0.28 ft/mile	**Intesity =**	5.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 220+33.02 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	8,217	7,215	0.35	0.95
Shoulder	2,431	2,135	0.10	0.88
Median	1,496	1,313	0.06	0.75

Total Area = 0.52 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1392.68 feet			
D/S Elev =	1391.9 feet			
Length =	186.98 feet	0.035 miles	T_c =	10.0 minutes
Slope =	0.0042 ft/ft	22.03 ft/mile	**Intesity =**	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	3 cfs

Catch Basin Station: 218+68.98 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	19,533	0.45	0.95
Shoulder	1,338	0.03	0.88
Median	3,556	0.08	0.75
Off-site	11,212	0.26	0.45

Total Area = 0.82 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.25 feet			
Length =	443.98 feet	0.084 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.40 ft/mile	**Intesity =**	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	4 cfs

Catch Basin Station: 218+68.98 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	19,533	0.45	0.95
Shoulder	5,780	0.13	0.88
Median	3,555	0.08	0.75

Total Area = 0.66 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.25 feet			
Length =	443.98 feet	0.084 miles	T_c =	10.0 minutes
Slope =	0.0050 ft/ft	26.40 ft/mile	**Intesity =**	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	4 cfs

Catch Basin Station: 208+32.28 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	26,070	0.60	0.95
Shoulder	1,787	0.04	0.88
Median	3,656	0.08	0.75
Off-site	2,214	0.05	0.45

Total Area = 0.77 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.89 feet			
Length =	592.72 feet	0.112 miles	T_c =	10.0 minutes
Slope =	0.0027 ft/ft	14.07 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Catch Basin Station: 208+32.28 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	28,262	0.65	0.95
Shoulder	7,714	0.18	0.88
Median	3,646	0.08	0.75

Total Area = 0.91 acres
Weighted C = 0.92

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1395.47 feet			
D/S Elev =	1393.89 feet			
Length =	592.72 feet	0.112 miles	T_c =	10.0 minutes
Slope =	0.0027 ft/ft	14.07 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	6 cfs

Catch Basin Station: 203+76.28 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	21,781		0.50	0.95
Shoulder	157	1,072	0.03	0.88
Median	1,440	57	0.03	0.75

Total Area = 0.56 acres
Weighted C = 0.93

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1393.89 feet			
D/S Elev =	1390.6 feet			
Length =	456.00 feet	0.086 miles	T_c =	10.0 minutes
Slope =	0.0072 ft/ft	38.09 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 203+76.28 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	23,611		0.54	0.95
Shoulder	5,934		0.14	0.88
Median	59	1,491	0.04	0.75

Total Area = 0.71 acres
Weighted C = 0.93

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1393.89 feet			
D/S Elev =	1391.12 feet			
Length =	456.00 feet	0.086 miles	T_c =	10.0 minutes
Slope =	0.0061 ft/ft	32.07 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 198+67.75 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	24,128			0.55	0.95
Shoulder	82	424	721	0.03	0.88
Median	25	3,263		0.08	0.75

Total Area = 0.66 acres
Weighted C = 0.92

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1390.6 feet				
D/S Elev =	1389.55 feet				
Length =	508.53 feet	0.096 miles		T_c =	10.0 minutes
Slope =	0.0021 ft/ft	10.90 ft/mile		Intesity =	6.60 in/hr
Kb =	0.04				
$i_{assumed}$ =	6.6 in/hr			Peak Discharge =	4 cfs

Catch Basin Station: 198+67.75 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet			Total Subarea acres	Runoff Coefficient
Pavement	23,319			0.54	0.95
Shoulder	6,618			0.15	0.88
Median	25	3,180		0.07	0.75

Total Area = 0.76 acres
Weighted C = 0.92

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1391.12 feet				
D/S Elev =	1389.55 feet				
Length =	508.53 feet	0.096 miles		T_c =	10.0 minutes
Slope =	0.0031 ft/ft	16.30 ft/mile		Intesity =	6.60 in/hr
Kb =	0.04				
$i_{assumed}$ =	6.6 in/hr			Peak Discharge =	5 cfs

Catch Basin Station: 193+75.63 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,644	0.50	0.95
Shoulder	1,483	0.03	0.88
Median	3,939	0.09	0.75

Total Area = 0.62 acres
Weighted C = 0.92

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.55 feet			
D/S Elev =	1389.19 feet			
Length =	492.12 feet	0.093 miles	T_c =	12.8 minutes
Slope =	0.0007 ft/ft	3.86 ft/mile	Intesity =	6.04 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	3 cfs

Catch Basin Station: 193+75.63 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,644	0.50	0.95
Shoulder	6,404	0.15	0.88
Median	3,940	0.09	0.75

Total Area = 0.73 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.55 feet			
D/S Elev =	1389.19 feet			
Length =	492.12 feet	0.093 miles	T_c =	12.7 minutes
Slope =	0.0007 ft/ft	3.86 ft/mile	Intesity =	6.05 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 190+47.46 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	14,421	6,502	0.48	0.95
Shoulder	988	446	0.03	0.88
Median	2,625	1,183	0.09	0.75

Total Area = 0.60 acres
Weighted C = 0.92

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.19 feet			
D/S Elev =	1388.52 feet			
Length =	328.17 feet	0.062 miles	T_c =	10.0 minutes
Slope =	0.0020 ft/ft	10.78 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 190+47.46 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	14,421	6,502	0.48	0.95
Shoulder	4,267	1,924	0.14	0.88
Median	2,625	1,183	0.09	0.75

Total Area = 0.71 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.19 feet			
D/S Elev =	1388 feet			
Length =	328.17 feet	0.062 miles	T_c =	10.0 minutes
Slope =	0.0036 ft/ft	19.15 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 188+99.90 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,453	0.49	0.95
Shoulder	1,469	0.03	0.88
Median	2,753	0.06	0.75

Total Area = 0.59 acres
Weighted C = 0.92

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.07 feet			
D/S Elev =	1388.45 feet			
Length =	491.91 feet	0.093 miles	T_c =	10.8 minutes
Slope =	0.0013 ft/ft	6.65 ft/mile	Intesity =	6.43 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4 cfs

Catch Basin Station: 188+99.90 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	24,292	0.56	0.95
Shoulder	6,393	0.15	0.88
Median	2,737	0.06	0.75

Total Area = 0.77 acres
Weighted C = 0.92

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1389.07 feet			
D/S Elev =	1388.45 feet			
Length =	491.91 feet	0.093 miles	T_c =	10.7 minutes
Slope =	0.0013 ft/ft	6.65 ft/mile	Intesity =	6.45 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/17/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 184+07.99 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	24,183		0.56	0.95
Shoulder	191		0.00	0.88
Median	219	361	0.01	0.75

Total Area = 0.57 acres
Weighted C = 0.94

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1391.66 feet			
D/S Elev =	1389.07 feet			
Length =	482.58 feet	0.091 miles	T_c =	10.0 minutes
Slope =	0.0054 ft/ft	28.34 ft/mile	**Intesity =**	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	4 cfs

Catch Basin Station: 184+07.99 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	28,764		0.66	0.95
Shoulder	4,728		0.11	0.88
Median	233	353	0.01	0.75

Total Area = 0.78 acres
Weighted C = 0.94

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1391.66 feet			
D/S Elev =	1389.07 feet			
Length =	482.58 feet	0.091 miles	T_c =	10.0 minutes
Slope =	0.0054 ft/ft	28.34 ft/mile	**Intesity =**	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		**Peak Discharge =**	5 cfs

Table A-6
Summary of full CIP condition peak discharges along Elliot Road

Catch Basin Station	Drainage Area acres	10-Year Intensity in/hr	10-Year C-value	10-Year Flow cfs	100-Year Intensity in/hr	100-Year C-value	100-Year Flow cfs
36+00.00 R	1.39	4.13	0.69	4.0	6.60	0.81	7.4
36+00.00 L	1.00	4.12	0.82	3.4	6.60	0.91	6.0
32+45.20 R	0.76	4.20	0.80	2.6	6.60	0.92	4.6
32+45.20 L	0.95	4.20	0.83	3.3	6.60	0.92	5.8
28+55.97 R	0.19	4.20	0.83	0.7	6.60	0.93	1.1
28+55.97 L	0.14	4.20	0.83	0.5	6.60	0.93	0.9
20+88.32 R	1.20	4.20	0.81	4.1	6.60	0.91	7.2
20+87.76 L	1.09	4.20	0.81	3.7	6.60	0.91	6.5
16+00.00 R	0.73	4.20	0.80	2.5	6.60	0.90	4.3
16+00.00 L	0.73	4.20	0.80	2.5	6.60	0.90	4.3

Table A-5
Summary of interim CIP condition peak discharges along Elliot Road

Catch Basin Station	Drainage Area acres	10-Year Intensity in/hr	10-Year C-Value	10-Year Flow cfs	100-Year Intensity in/hr	100-Year C-Value	100-Year Flow cfs
36+00.00 0	1.29	4.17	0.65	3.5	6.60	0.79	6.8
36+00.00 0	0.92	4.15	0.73	2.8	6.60	0.89	5.4
32+45.20 R	0.76	4.20	0.78	2.5	6.60	0.91	4.6
32+45.20 L	0.95	4.20	0.79	3.1	6.60	0.91	5.7
28+55.97 R	0.19	4.20	0.83	0.6	6.60	0.83	1.0
28+55.97 L	0.14	4.20	0.80	0.5	6.60	0.89	0.8
20+88.32 R	1.20	4.20	0.80	4.0	6.60	0.90	7.1
20+87.76 L	1.09	4.20	0.77	3.5	6.60	0.85	6.1
16+00.00 R	0.73	4.20	0.79	2.4	6.60	0.89	4.3
16+00.00 L	0.73	4.20	0.76	2.3	6.60	0.85	4.1

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Interim CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 36+00.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	11,865		0.27	0.85
Shoulder	15,444	14,532	0.69	0.70
Median	1,403		0.03	0.70
Off-site	12,000	1,000	0.30	0.35

Total Area = 1.29 acres
Weighted C = 0.65

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.48 feet			
D/S Elev =	1407.46 feet			
Length =	700 feet	0.133 miles	T_c =	10.2 minutes
Slope =	0.0043 ft/ft	22.78 ft/mile	Intensity =	4.17 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.17 in/hr		Peak Discharge =	3.5 cfs

Catch Basin Station: 36+00.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	8,725		0.20	0.85
Shoulder	24,861	4,365	0.67	0.70
Median	2,122		0.05	0.70

Total Area = 0.92 acres
Weighted C = 0.73

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.48 feet			
D/S Elev =	1407.46 feet			
Length =	700 feet	0.133 miles	T_c =	10.3 minutes
Slope =	0.0043 ft/ft	22.78 ft/mile	Intensity =	4.15 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.15 in/hr		Peak Discharge =	2.8 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Interim CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 32+45.20 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	17,004		0.39	0.85
Shoulder	5,969	7,673	0.31	0.70
Median	2,665		0.06	0.70

Total Area = 0.76 acres
Weighted C = 0.78

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1407.46 feet			
D/S Elev =	1403.88 feet			
Length =	354.8 feet	0.067 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.28 ft/mile	Intensity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2.5 cfs

Catch Basin Station: 32+45.20 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	23,529		0.54	0.85
Shoulder	10,818	4,207	0.34	0.70
Median	2,656		0.06	0.70

Total Area = 0.95 acres
Weighted C = 0.79

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1407.46 feet			
D/S Elev =	1403.88 feet			
Length =	354.8 feet	0.067 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.28 ft/mile	Intensity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	3.1 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Interim CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 28+55.97 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	6,880	0.16	0.85
Shoulder	138	0.00	0.70
Median	1,103	0.03	0.70

Total Area = 0.19 acres
Weighted C = 0.83

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1405.83 feet			
D/S Elev =	1404.38 feet			
Length =	150.00 feet	0.028 miles	T_c =	10.0 minutes
Slope =	0.0097 ft/ft	51.04 ft/mile	Intensity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	0.6 cfs

Catch Basin Station: 28+55.97 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	4,305	0.10	0.85
Shoulder	123	0.00	0.70
Median	1,788	0.04	0.70

Total Area = 0.14 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1405.83 feet			
D/S Elev =	1404.53 feet			
Length =	150.00 feet	0.028 miles	T_c =	10.0 minutes
Slope =	0.0087 ft/ft	45.76 ft/mile	Intensity =	4.20 in/hr
Kb =	0.05			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	0.5 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Interim CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 20+88.32 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	35,297	0.81	0.85
Shoulder	5,096	0.12	0.70
Median	12,037	0.28	0.70

Total Area = 1.20 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.38 feet			
D/S Elev =	1397.78 feet			
Length =	767.65 feet	0.145 miles	T_c =	10.0 minutes
Slope =	0.0086 ft/ft	45.40 ft/mile	Intensity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	4.0 cfs

Catch Basin Station: 20+87.76 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,526	0.49	0.85
Shoulder	4,998	0.11	0.70
Median	20,918	0.48	0.70

Total Area = 1.09 acres
Weighted C = 0.77

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.53 feet			
D/S Elev =	1398.01 feet			
Length =	768.21 feet	0.145 miles	T_c =	10.0 minutes
Slope =	0.0085 ft/ft	44.81 ft/mile	Intensity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	3.5 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Interim CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 16+00.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	19,234	0.44	0.85
Shoulder	3,905	0.09	0.70
Median	8,509	0.20	0.70

Total Area = 0.73 acres
Weighted C = 0.79

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1397.76 feet			
D/S Elev =	1395.9 feet			
Length =	488.32 feet	0.092 miles	T_c =	10.0 minutes
Slope =	0.0038 ft/ft	20.11 ft/mile	Intensity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2.4 cfs

Catch Basin Station: 16+00.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	13,693	0.31	0.85
Shoulder	3,904	0.09	0.70
Median	14,144	0.32	0.70

Total Area = 0.73 acres
Weighted C = 0.76

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.01 feet			
D/S Elev =	1396.06 feet			
Length =	487.76 feet	0.092 miles	T_c =	10.0 minutes
Slope =	0.0040 ft/ft	21.11 ft/mile	Intensity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2.3 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Interim CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 36+00.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	11,865		0.27	0.95
Shoulder	15,444	14,532	0.69	0.88
Median	1,403		0.03	0.75
Off-site	12,000	1,000	0.30	0.45

Total Area = 1.29 acres
Weighted C = 0.79

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.48 feet				
D/S Elev =	1407.46 feet				
Length =	700 feet	0.133 miles		T_c =	10.0 minutes
Slope =	0.0043 ft/ft	22.78 ft/mile		Intensity =	6.60 in/hr
Kb =	0.04				
$i_{assumed}$ =	6.6 in/hr			Peak Discharge =	6.8 cfs

Catch Basin Station: 36+00.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	8,725		0.20	0.95
Shoulder	18,566	10,661	0.67	0.88
Median	2,122		0.05	0.75

Total Area = 0.92 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.48 feet				
D/S Elev =	1407.46 feet				
Length =	700 feet	0.133 miles		T_c =	10.0 minutes
Slope =	0.0043 ft/ft	22.78 ft/mile		Intensity =	6.60 in/hr
Kb =	0.04				
$i_{assumed}$ =	6.6 in/hr			Peak Discharge =	5.4 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Interim CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 32+45.2 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	17,004		0.39	0.95
Shoulder	5,969	7,673	0.31	0.88
Median	2,665		0.06	0.75
			0.00	0.45

Total Area = 0.76 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1407.46 feet			
D/S Elev =	1403.88 feet			
Length =	354.8 feet	0.067 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.28 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4.6 cfs

Catch Basin Station: 32+45.2 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	23,529		0.54	0.95
Shoulder	6,089	8,935	0.34	0.88
Median	2,656		0.06	0.75

Total Area = 0.95 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1407.46 feet			
D/S Elev =	1403.88 feet			
Length =	354.8 feet	0.067 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.28 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5.7 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Interim CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 28+55.97 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	6,880	0.16	0.85
Shoulder	138	0.00	0.70
Median	1,103	0.03	0.70

Total Area = 0.19 acres
Weighted C = 0.83

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1405.83 feet			
D/S Elev =	1404.38 feet			
Length =	150.00 feet	0.028 miles	T_c =	10.0 minutes
Slope =	0.0097 ft/ft	51.04 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	1.0 cfs

Catch Basin Station: 28+55.97 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	4,305	0.10	0.95
Shoulder	123	0.00	0.88
Median	1,788	0.04	0.75

Total Area = 0.14 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1405.83 feet			
D/S Elev =	1404.53 feet			
Length =	150.00 feet	0.028 miles	T_c =	10.0 minutes
Slope =	0.0087 ft/ft	45.76 ft/mile	Intensity =	6.60 in/hr
Kb =	0.05			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	0.8 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Interim CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 20+88.32 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	35,297	0.81	0.95
Shoulder	5,096	0.12	0.88
Median	12,037	0.28	0.75

Total Area = 1.20 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.38 feet			
D/S Elev =	1397.78 feet			
Length =	767.65 feet	0.145 miles	T_c =	10.0 minutes
Slope =	0.0086 ft/ft	45.40 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	7.1 cfs

Catch Basin Station: 20+87.76 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,526	0.49	0.95
Shoulder	4,998	0.11	0.88
Median	20,918	0.48	0.75

Total Area = 1.09 acres
Weighted C = 0.85

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.53 feet			
D/S Elev =	1398.01 feet			
Length =	768.21 feet	0.145 miles	T_c =	10.0 minutes
Slope =	0.0085 ft/ft	44.81 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	6.1 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Interim CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 16+00.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	19,234	0.44	0.95
Shoulder	3,905	0.09	0.88
Median	8,509	0.20	0.75

Total Area = 0.73 acres
Weighted C = 0.89

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1397.76 feet			
D/S Elev =	1395.9 feet			
Length =	488.32 feet	0.092 miles	T_c =	10.0 minutes
Slope =	0.0038 ft/ft	20.11 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4.3 cfs

Catch Basin Station: 16+00.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	13,693	0.31	0.95
Shoulder	3,904	0.09	0.88
Median	14,144	0.32	0.75

Total Area = 0.73 acres
Weighted C = 0.85

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.01 feet			
D/S Elev =	1396.06 feet			
Length =	487.76 feet	0.092 miles	T_c =	10.0 minutes
Slope =	0.0040 ft/ft	21.11 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4.1 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Full CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 36+00.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	11,865	15,444	0.63	0.85
Shoulder	14,532		0.33	0.70
Median	5,607		0.13	0.70
Off-site	12,000	1,000	0.30	0.35

Total Area = 1.39 acres
Weighted C = 0.69

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.26 feet			
D/S Elev =	1407.46 feet			
Length =	700 feet	0.133 miles	T_c =	10.5 minutes
Slope =	0.0040 ft/ft	21.12 ft/mile	Intensity =	4.13 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.13 in/hr		Peak Discharge =	4.0 cfs

Catch Basin Station: 36+00.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	8,725	24,861	0.77	0.85
Shoulder	4,365		0.10	0.70
Median	5,607		0.13	0.70

Total Area = 1.00 acres
Weighted C = 0.82

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.26 feet			
D/S Elev =	1407.46 feet			
Length =	700 feet	0.133 miles	T_c =	10.6 minutes
Slope =	0.0040 ft/ft	21.12 ft/mile	Intensity =	4.12 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.12 in/hr		Peak Discharge =	3.4 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Full CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 32+45.2 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	17,004	5,969	0.53	0.85
Shoulder	7,673		0.18	0.70
Median	2,665		0.06	0.70

Total Area = 0.76 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1407.46 feet			
D/S Elev =	1403.88 feet			
Length =	354.8 feet	0.067 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.28 ft/mile	Intensity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2.6 cfs

Catch Basin Station: 32+45.2 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	23,529	10,818	0.79	0.85
Shoulder	4,207		0.10	0.70
Median	2,656		0.06	0.70

Total Area = 0.95 acres
Weighted C = 0.83

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1407.46 feet			
D/S Elev =	1403.88 feet			
Length =	354.8 feet	0.067 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.28 ft/mile	Intensity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	3.3 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Full CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 28+55.97 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	7,255	0.17	0.85
Shoulder	136	0.00	0.70
Median	725	0.02	0.70

Total Area = 0.19 acres
Weighted C = 0.83

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1405.83 feet			
D/S Elev =	1404.38 feet			
Length =	150.00 feet	0.028 miles	T_c =	10.0 minutes
Slope =	0.0097 ft/ft	51.04 ft/mile	Intensity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	0.7 cfs

Catch Basin Station: 28+55.97 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	5,524	0.13	0.85
Shoulder	123	0.00	0.70
Median	569	0.01	0.70

Total Area = 0.14 acres
Weighted C = 0.83

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1405.83 feet			
D/S Elev =	1404.53 feet			
Length =	150.00 feet	0.028 miles	T_c =	10.0 minutes
Slope =	0.0087 ft/ft	45.76 ft/mile	Intensity =	4.20 in/hr
Kb =	0.05			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	0.5 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Full CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 20+88.32 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	38,754	0.89	0.85
Shoulder	5,096	0.12	0.70
Median	8,580	0.20	0.70

Total Area = 1.20 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.38 feet			
D/S Elev =	1397.78 feet			
Length =	767.65 feet	0.145 miles	T_c =	10.0 minutes
Slope =	0.0086 ft/ft	45.40 ft/mile	Intensity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	4.1 cfs

Catch Basin Station: 20+87.76 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	33,817	0.78	0.85
Shoulder	4,998	0.11	0.70
Median	8,627	0.20	0.70

Total Area = 1.09 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.53 feet			
D/S Elev =	1398.01 feet			
Length =	768.21 feet	0.145 miles	T_c =	10.0 minutes
Slope =	0.0085 ft/ft	44.81 ft/mile	Intensity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	3.7 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Full CIP Condition, 10-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 16+00.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,521	0.49	0.85
Shoulder	3,905	0.09	0.70
Median	6,312	0.14	0.70

Total Area = 0.73 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1397.78 feet			
D/S Elev =	1395.9 feet			
Length =	488.32 feet	0.092 miles	T_c =	10.0 minutes
Slope =	0.0038 ft/ft	20.33 ft/mile	Intensity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2.5 cfs

Catch Basin Station: 16+00.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,463	0.49	0.85
Shoulder	3,905	0.09	0.70
Median	6,344	0.15	0.70

Total Area = 0.73 acres
Weighted C = 0.80

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.01 feet			
D/S Elev =	1396.06 feet			
Length =	487.76 feet	0.092 miles	T_c =	10.0 minutes
Slope =	0.0040 ft/ft	21.11 ft/mile	Intensity =	4.20 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.2 in/hr		Peak Discharge =	2.5 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Full CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 36+00.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	11,865	15,444	0.63	0.95
Shoulder	14,532		0.33	0.88
Median	5,607		0.13	0.75
Off-site	12,000	1,000	0.30	0.45

Total Area = 1.39 acres
Weighted C = 0.81

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.26 feet			
D/S Elev =	1407.46 feet			
Length =	700 feet	0.133 miles	T_c =	10.0 minutes
Slope =	0.0040 ft/ft	21.12 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	7.4 cfs

Catch Basin Station: 36+00.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	8,725	18,566	0.63	0.95
Shoulder	10,661		0.24	0.88
Median	5,607		0.13	0.75

Total Area = 1.00 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1410.26 feet			
D/S Elev =	1407.46 feet			
Length =	700 feet	0.133 miles	T_c =	10.0 minutes
Slope =	0.0040 ft/ft	21.12 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	6.0 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Full CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 32+45.2 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	17,004	5,969	0.53	0.95
Shoulder	7,673		0.18	0.88
Median	2,665		0.06	0.75
			0.00	0.45

Total Area = 0.76 acres
Weighted C = 0.92

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1407.46 feet			
D/S Elev =	1403.88 feet			
Length =	354.8 feet	0.067 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.28 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4.6 cfs

Catch Basin Station: 32+45.2 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet		Total Subarea acres	Runoff Coefficient
Pavement	23,529	6,089	0.68	0.95
Shoulder	8,935		0.21	0.88
Median	2,656		0.06	0.75

Total Area = 0.95 acres
Weighted C = 0.92

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1407.46 feet			
D/S Elev =	1403.88 feet			
Length =	354.8 feet	0.067 miles	T_c =	10.0 minutes
Slope =	0.0101 ft/ft	53.28 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	5.8 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Full CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 28+55.97 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	7,255	0.17	0.95
Shoulder	138	0.00	0.88
Median	725	0.02	0.75

Total Area = 0.19 acres
Weighted C = 0.93

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1405.83 feet			
D/S Elev =	1404.38 feet			
Length =	150.00 feet	0.028 miles	T_c =	10.0 minutes
Slope =	0.0097 ft/ft	51.04 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	1.1 cfs

Catch Basin Station: 28+55.97 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	5,524	0.13	0.95
Shoulder	123	0.00	0.88
Median	569	0.01	0.75

Total Area = 0.14 acres
Weighted C = 0.93

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1405.83 feet			
D/S Elev =	1404.53 feet			
Length =	150.00 feet	0.028 miles	T_c =	10.0 minutes
Slope =	0.0087 ft/ft	45.76 ft/mile	Intensity =	6.60 in/hr
Kb =	0.05			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	0.9 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Full CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 20+88.32 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	38,754	0.89	0.95
Shoulder	5,096	0.12	0.88
Median	8,580	0.20	0.75

Total Area = 1.20 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.38 feet			
D/S Elev =	1397.78 feet			
Length =	767.65 feet	0.145 miles	T_c =	10.0 minutes
Slope =	0.0086 ft/ft	45.40 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	7.2 cfs

Catch Basin Station: 20+87.76 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	33,817	0.78	0.95
Shoulder	4,998	0.11	0.88
Median	8,627	0.20	0.75

Total Area = 1.09 acres
Weighted C = 0.91

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1404.53 feet			
D/S Elev =	1398.01 feet			
Length =	768.21 feet	0.145 miles	T_c =	10.0 minutes
Slope =	0.0085 ft/ft	44.81 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	6.5 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Full CIP Condition, 100-Year
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: 16+00.00 R

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,521	0.49	0.95
Shoulder	3,905	0.09	0.88
Median	6,312	0.14	0.75

Total Area = 0.73 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1397.78 feet			
D/S Elev =	1395.9 feet			
Length =	488.32 feet	0.092 miles	T_c =	10.0 minutes
Slope =	0.0038 ft/ft	20.33 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4.3 cfs

Catch Basin Station: 16+00.00 L

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement	21,463	0.49	0.95
Shoulder	3,905	0.09	0.88
Median	6,344	0.15	0.75

Total Area = 0.73 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1398.01 feet			
D/S Elev =	1396.06 feet			
Length =	487.76 feet	0.092 miles	T_c =	10.0 minutes
Slope =	0.0040 ft/ft	21.11 ft/mile	Intensity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	4.3 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 10-Year On-Grade Catch Basin Hydraulics
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/21/04	By:	rjb
Date Revised:		By:	

Mannings n-value =	0.016	
Average cross slope =	0.02	ft/ft
Grate length (COM M-64) =	7	feet
Clogging factor (on-grade) =	40	%
Catch basin grate width =	1.25	feet

Catch Basin Station	Total Flow cfs	Average Longitudinal Slope ft/ft	Spread feet	Maximum Depth inches	Average Velocity fps	Frontal Flow Factor	Side Flow Factor	Grate Flow Ratio	Interception Capacity cfs	By-pass Flow cfs	Comments
312+00.00 R	3.6	0.0101	11.6	2.8	2.7	1.00	0.38	0.26	2.0	1.6	Flow is to the south
312+00.00 L	3.8	0.0101	11.9	2.9	2.7	1.00	0.38	0.26	2.0	1.8	Flow is to the south
307+07.57 R	4.1	0.0035	14.9	3.6	1.9	1.00	0.54	0.21	2.6	1.5	
307+07.57 L	4.2	0.0022	16.4	3.9	1.6	1.00	0.62	0.19	2.9	1.3	
303+13.86 R	3.1	0.0005	19.7	4.7	0.8	1.00	0.84	0.16	2.7	0.4	
303+13.86 L	3.3	0.0020	15.2	3.7	1.4	1.00	0.66	0.20	2.4	0.9	
299+85.77 R	2.1	0.0123	9.1	2.2	2.5	1.00	0.41	0.33	1.2	0.8	
299+75.94 L	2.6	0.0044	12.0	2.9	1.8	1.00	0.56	0.25	1.7	0.8	
291+65.67 R	4.5	0.0011	19.3	4.6	1.2	1.00	0.72	0.16	3.5	1.1	
291+65.67 L	0.8	0.0059	7.5	1.8	1.5	1.00	0.63	0.39	0.7	0.2	
285+52.37 R			**Total flow at catch basin in sump =**						**3.9**		
285+52.37 L			**Total flow at catch basin in sump =**						**3.6**		
280+27.11 R			**Total flow at catch basin in sump =**						**2.7**		
280+17.27 L			**Total flow at catch basin in sump =**						**2.1**		
278+63.07 R	0.8	0.0113	6.6	1.6	1.9	1.00	0.53	0.43	0.6	0.2	Flow is to the north
278+63.07 L	0.8	0.0113	6.5	1.6	1.9	1.00	0.53	0.43	0.6	0.2	Flow is to the north
269+54.28 R	3.9	0.0028	15.2	3.7	1.7	1.00	0.59	0.20	2.6	1.3	Flow is to the south
269+54.28 L	3.5	0.0032	14.3	3.4	1.7	1.00	0.58	0.22	2.3	1.1	Flow is to the south
267+70.55 R	2.8	0.0025	13.7	3.3	1.5	1.00	0.64	0.22	2.0	0.8	
267+70.55 L	2.1	0.0025	12.3	2.9	1.4	1.00	0.67	0.25	1.6	0.5	
264+42.47 R	3.3	0.0025	14.6	3.5	1.5	1.00	0.63	0.21	2.3	1.0	
264+32.53 L	2.2	0.0025	12.6	3.0	1.4	1.00	0.66	0.24	1.7	0.6	

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 10-Year On-Grade Catch Basin Hydraulics
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/21/04	By:	rjb
Date Revised:		By:	

Mannings n-value =	0.016	
Average cross slope =	0.02	ft/ft
Grate length (COM M-64) =	7	feet
Clogging factor (on-grade) =	40	%
Catch basin grate width =	1.25	feet

Catch Basin Station	Total Flow cfs	Average Longitudinal Slope ft/ft	Spread feet	Maximum Depth inches	Average Velocity fps	Frontal Flow Factor	Side Flow Factor	Grate Flow Ratio	Interception Capacity cfs	By-pass Flow cfs	Comments
259+51.64 R	4.6	0.0026	16.5	3.9	1.7	1.00	0.58	0.19	3.0	1.5	
259+43.68 L	3.1	0.0057	12.2	2.9	2.1	1.00	0.50	0.25	1.9	1.2	
254+61.50 R			**Total flow at catch basin in sump =**						**5.2**		
254+61.50 L			**Total flow at catch basin in sump =**						**4.2**		
250+54.67 R	1.0	0.0050	8.2	2.0	1.5	1.00	0.64	0.35	0.8	0.2	Flow is to the south
250+54.67 L	1.0	0.0050	8.1	2.0	1.5	1.00	0.64	0.36	0.8	0.2	Flow is to the south
244+93.75 R	3.2	0.0050	12.7	3.0	2.0	1.00	0.51	0.24	2.0	1.2	
244+93.75 L	3.0	0.0050	12.5	3.0	2.0	1.00	0.52	0.25	1.9	1.1	
243+29.71 R			**Total flow at catch basin in sump =**						**2.9**		
243+29.71 L			**Total flow at catch basin in sump =**						**2.8**		
241+65.57 R	2.2	0.0035	11.8	2.8	1.6	1.00	0.61	0.26	1.6	0.6	Flow is to the south
241+65.57 L	2.1	0.0035	11.6	2.8	1.6	1.00	0.62	0.26	1.5	0.6	Flow is to the south
232+91.08 R			**Total flow at catch basin in sump =**						**3.6**		
232+91.08 L			**Total flow at catch basin in sump =**						**4.2**		
226+69.50 R	2.8	0.0038	12.7	3.1	1.7	1.00	0.57	0.24	1.9	0.9	Flow is to the south
226+69.50 L	1.7	0.0038	10.7	2.6	1.5	1.00	0.63	0.28	1.3	0.5	Flow is to the south
222+20.00 R	3.2	0.0033	13.8	3.3	1.7	1.00	0.58	0.22	2.2	1.1	
222+20.00 L	2.7	0.0033	12.9	3.1	1.6	1.00	0.60	0.24	1.9	0.8	
220+33.02 R			**Total flow at catch basin in sump =**						**3.1**		
220+33.02 L			Total flow at catch basin in sump =						3.3		
218+68.98 R	2.3	0.0050	11.2	2.7	1.8	1.00	0.55	0.27	1.5	0.8	Flow is to the north
218+68.98 L	2.2	0.0050	11.1	2.7	1.8	1.00	0.55	0.27	1.5	0.7	Flow is to the north

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 10-Year On-Grade Catch Basin Hydraulics
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/21/04	By:	rjb
Date Revised:		By:	

Mannings n-value =	0.016
Average cross slope =	0.02 ft/ft
Grate length (COM M-64) =	7 feet
Clogging factor (on-grade) =	40 %
Catch basin grate width =	1.25 feet

Catch Basin Station	Total Flow cfs	Average Longitudinal Slope ft/ft	Spread feet	Maximum Depth inches	Average Velocity fps	Frontal Flow Factor	Side Flow Factor	Grate Flow Ratio	Interception Capacity cfs	By-pass Flow cfs	Comments
208+32.28 R	2.5	0.0027	13.0	3.1	1.5	1.00	0.64	0.24	1.8	0.7	Flow is to the south
208+32.28 L	3.0	0.0027	13.9	3.3	1.5	1.00	0.63	0.22	2.1	0.9	Flow is to the south
203+76.28 R	2.6	0.0072	11.0	2.6	2.2	1.00	0.47	0.27	1.6	1.0	
203+76.28 L	3.3	0.0061	12.4	3.0	2.2	1.00	0.48	0.25	2.0	1.3	
198+67.75 R	3.2	0.0021	15.0	3.6	1.4	1.00	0.66	0.21	2.3	0.9	
198+67.75 L	3.9	0.0031	14.9	3.6	1.7	1.00	0.57	0.21	2.6	1.3	
193+75.63 R	2.7	0.0007	17.0	4.1	0.9	1.00	0.81	0.18	2.3	0.4	
193+75.63 L	3.4	0.0007	18.6	4.5	1.0	1.00	0.79	0.17	2.8	0.6	
190+47.46 R			**Total flow at catch basin in sump =**						**3.0**		
190+47.46 L			**Total flow at catch basin in sump =**						**3.7**		
188+99.90 R	2.6	0.0013	15.2	3.7	1.1	1.00	0.75	0.20	2.1	0.5	Flow is to the north
188+99.90 L	3.3	0.0013	16.7	4.0	1.2	1.00	0.72	0.19	2.6	0.8	Flow is to the north
184+07.99 R	2.0	0.0054	10.6	2.5	1.8	1.00	0.55	0.29	1.4	0.7	Flow is to the north
184+07.99 L	2.7	0.0054	11.8	2.8	2.0	1.00	0.52	0.26	1.7	1.0	Flow is to the north

Maricopa County Department of Transportation
Ellsworth Road Phase 2
Full CIP Condition, 10-Year Sump Catch Basin Hydraulics
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/21/04	By:	rjb
Date Revised:		By:	

Average cross slope =	0.02	ft/ft
Grate length (COM M-64) =	7	feet
Catch basin grate width =	1.25	feet
Clogging factor =	50	%
Perimeter =	9.5	feet
Grate open area =	3.375	sq. feet

Catch Basin Station	Total Flow cfs	Depth Weir feet	Depth Orifice feet	Spread feet	Comments
285+52.37 R	3.9	0.26	0.04	13.2	
285+52.37 L	3.6	0.25	0.03	12.7	
280+27.11 R	2.7	0.21	0.02	10.4	
280+17.27 L	2.1	0.18	0.01	8.9	
254+61.50 R	5.2	0.32	0.07	16.2	
254+61.50 L	4.2	0.28	0.04	13.9	
243+29.71 R	2.9	0.22	0.02	10.9	
243+29.71 L	2.8	0.21	0.02	10.5	
220+33.02 R	3.1	0.23	0.02	11.4	
220+33.02 L	3.3	0.24	0.03	11.9	
190+47.46 R	3.0	0.22	0.02	11.2	
190+47.46 L	3.7	0.26	0.03	12.9	

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Full CIP Condition, 10-Year On-Grade Catch Basin Hydraulics
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Mannings n-value =	0.016
Average cross slope =	0.02 ft/ft
Grate length (COM M-64) =	7 feet
Clogging factor (on-grade) =	40 %
Catch basin grate width =	1.25 feet

Catch Basin Station	Total Flow cfs	Average Longitudinal Slope ft/ft	Spread feet	Maximum Depth inches	Average Velocity fps	Frontal Flow Factor	Side Flow Factor	Grate Flow Ratio	Interception Capacity cfs	By-pass Flow cfs	Comments
32+45.20 R			**Total flow at catch basin in sump =**						**2.6**		
32+45.20 L			**Total flow at catch basin in sump =**						**3.3**		
28+55.97 R	0.7	0.0097	6.2	1.5	1.7	1.00	0.58	0.45	0.5	0.2	
28+55.97 L	0.5	0.0087	5.7	1.4	1.5	1.00	0.63	0.48	0.4	0.1	
20+88.32 R	4.2	0.0086	12.8	3.1	2.6	1.00	0.39	0.24	2.3	2.0	
20+87.76 L	3.8	0.0085	12.2	2.9	2.5	1.00	0.41	0.25	2.1	1.7	
16+00.00 R	4.4	0.0038	15.0	3.6	2.0	1.00	0.52	0.21	2.7	1.7	
16+00.00 L	4.1	0.0040	14.6	3.5	1.9	1.00	0.52	0.21	2.6	1.6	

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Elliot Rd
Full CIP Condition, 10-Year Sump Catch Basin Hydraulics
Stantec Proj. No. 181740111

Date:	11/24/04	By:	jas
Date Checked:	12/20/04	By:	rjb
Date Revised:		By:	

Average cross slope =	0.02	ft/ft
Grate length (COM M-64) =	7	feet
Catch basin grate width =	1.25	feet
Clogging factor (on-grade) =	50	%
Perimeter =	9.5	feet
Grate open area =	3.375	sq. feet

Catch Basin Station	Total Flow cfs	Depth Weir feet	Depth Orifice feet	Spread feet	Comments
32+45.20 R	2.6	0.20	0.02	10.1	
32+45.20 L	3.3	0.24	0.03	11.8	

Table A-7
Summary of 100-year peak discharges on GM property

Catch Basin Station	Drainage Area acres	100-Year Intensity in/hr	C-Value	Flow cfs
GM1	6.70	6.60	0.90	40
GM2A	4.89	6.60	0.90	29
CGM2A	11.59	6.56	0.90	68
GM2B	4.13	6.41	0.90	24
CGM2B	15.72	6.37	0.90	90
GM3A	2.00	6.60	0.75	10
CGM3A	17.72	6.04	0.88	95
GM3B	3.87	4.24	0.75	12
CGM3B	21.59	4.43	0.86	82

Maricopa County Department of Transportation

Ellsworth Road Phase 2
GM Off-site 100-Year
Stantec Proj. No. 181740111

Date:	09/22/04	By:	mcg
Date Checked:	10/22/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: GM1

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement		0.00	0.95
Shoulder		0.00	0.88
Median		0.00	0.75
Off-site	291,852	6.70	0.90

Total Area = 6.70 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1399.5 feet			
D/S Elev =	1391.75 feet			
Length =	1003.2 feet	0.190 miles	T_c =	10.0 minutes
Slope =	0.0077 ft/ft	40.79 ft/mile	Intesity =	6.60 in/hr
Kb =	0.03			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	40 cfs

Catch Basin Station: GM2A

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement		0.00	0.95
Shoulder		0.00	0.88
Median		0.00	0.75
Off-site	213,008	4.89	0.90

Total Area = 4.89 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1394.25 feet			
D/S Elev =	1391 feet			
Length =	750 feet	0.142 miles	T_c =	10.0 minutes
Slope =	0.0043 ft/ft	22.88 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	29 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
GM Off-site 100-Year
Stantec Proj. No. 181740111

Date:	09/22/04	By:	mcg
Date Checked:	10/22/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: CGM2A

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement		0.00	0.95
Shoulder		0.00	0.88
Median		0.00	0.75
Off-site	504,860	11.59	0.90

Total Area = 11.59 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1399.5 feet			
D/S Elev =	1391 feet			
Length =	1425.80 feet	0.270 miles	T_c =	10.2 minutes
Slope =	0.0060 ft/ft	31.48 ft/mile	Intesity =	6.56 in/hr
Kb =	0.03			
$i_{assumed}$ =	6.56 in/hr		Peak Discharge =	68 cfs

Catch Basin Station: GM2B

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement		0.00	0.95
Shoulder		0.00	0.88
Median		0.00	0.75
Off-site	179,903	4.13	0.90

Total Area = 4.13 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1396 feet			
D/S Elev =	1390.44 feet			
Length =	1235.52 feet	0.234 miles	T_c =	10.9 minutes
Slope =	0.0045 ft/ft	23.76 ft/mile	Intesity =	6.41 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.41 in/hr		Peak Discharge =	24 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
GM Off-site 100-Year
Stantec Proj. No. 181740111

Date:	09/22/04	By:	mcg
Date Checked:	10/22/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: CGM2B

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement		0.00	0.95
Shoulder		0.00	0.88
Median		0.00	0.75
Off-site	684,763	15.72	0.90

Total Area = 15.72 acres
Weighted C = 0.90

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1399.5 feet			
D/S Elev =	1390.44 feet			
Length =	1628.70 feet	0.308 miles	T_c =	11.1 minutes
Slope =	0.0056 ft/ft	29.37 ft/mile	Intesity =	6.37 in/hr
Kb =	0.03			
$i_{assumed}$ =	6.37 in/hr		Peak Discharge =	90 cfs

Catch Basin Station: GM3A

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement		0.00	0.95
Shoulder		0.00	0.88
Median		0.00	0.75
Off-site	87,120	2.00	0.75

Total Area = 2.00 acres
Weighted C = 0.75

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1392 feet			
D/S Elev =	1390 feet			
Length =	427.68 feet	0.081 miles	T_c =	10.0 minutes
Slope =	0.0047 ft/ft	24.69 ft/mile	Intesity =	6.60 in/hr
Kb =	0.04			
$i_{assumed}$ =	6.6 in/hr		Peak Discharge =	10 cfs

Maricopa County Department of Transportation
Ellsworth Road Phase 2
GM Off-site 100-Year
Stantec Proj. No. 181740111

Date:	09/22/04	By:	mcg
Date Checked:	10/22/04	By:	rjb
Date Revised:		By:	

Catch Basin Station: CGM3A

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement		0.00	0.95
Shoulder		0.00	0.88
Off-site	87,120	2.00	0.75
Off-site	684,763	15.72	0.90

Total Area = 17.72 acres
Weighted C = 0.88

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1399.5 feet			
D/S Elev =	1390 feet			
Length =	1938.30 feet	0.367 miles	T_c =	12.8 minutes
Slope =	0.0049 ft/ft	25.88 ft/mile	**Intesity =**	6.04 in/hr
Kb =	0.03			
$i_{assumed}$ =	6.04 in/hr		**Peak Discharge =**	95 cfs

Catch Basin Station: GM3B

Runoff Coefficient

Surface Type	Subarea, in sq. feet	Total Subarea acres	Runoff Coefficient
Pavement		0.00	0.95
Shoulder		0.00	0.88
Median		0.00	0.75
Off-site	168,577	3.87	0.75

Total Area = 3.87 acres
Weighted C = 0.75

Time of Concentration

Flood Control District of Maricopa County method

U/S Elev =	1390 feet			
D/S Elev =	1388 feet			
Length =	1953.60 feet	0.370 miles	T_c =	25.4 minutes
Slope =	0.0010 ft/ft	5.41 ft/mile	**Intesity =**	4.24 in/hr
Kb =	0.04			
$i_{assumed}$ =	4.24 in/hr		**Peak Discharge =**	12 cfs

Appendix B
Storm Drain Calculations

Stantec

22 December 2004

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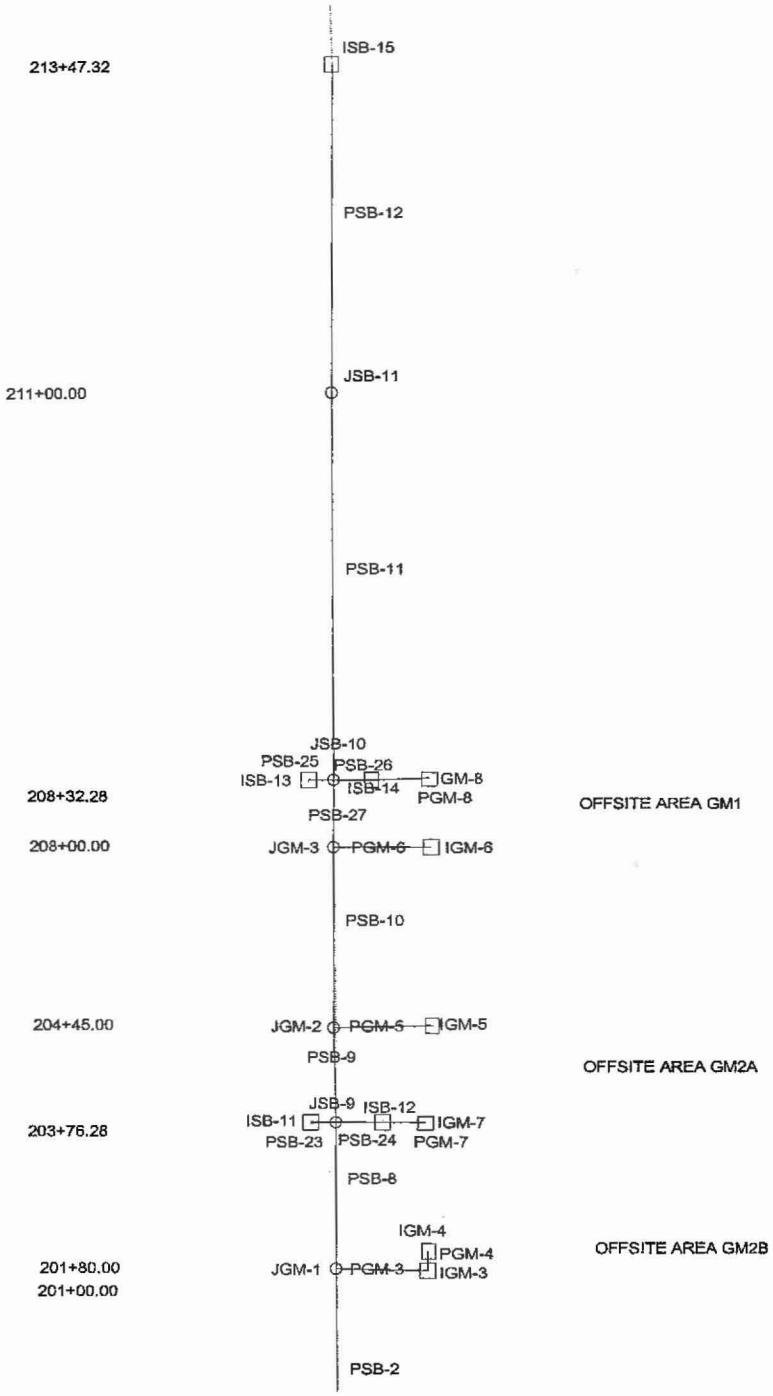
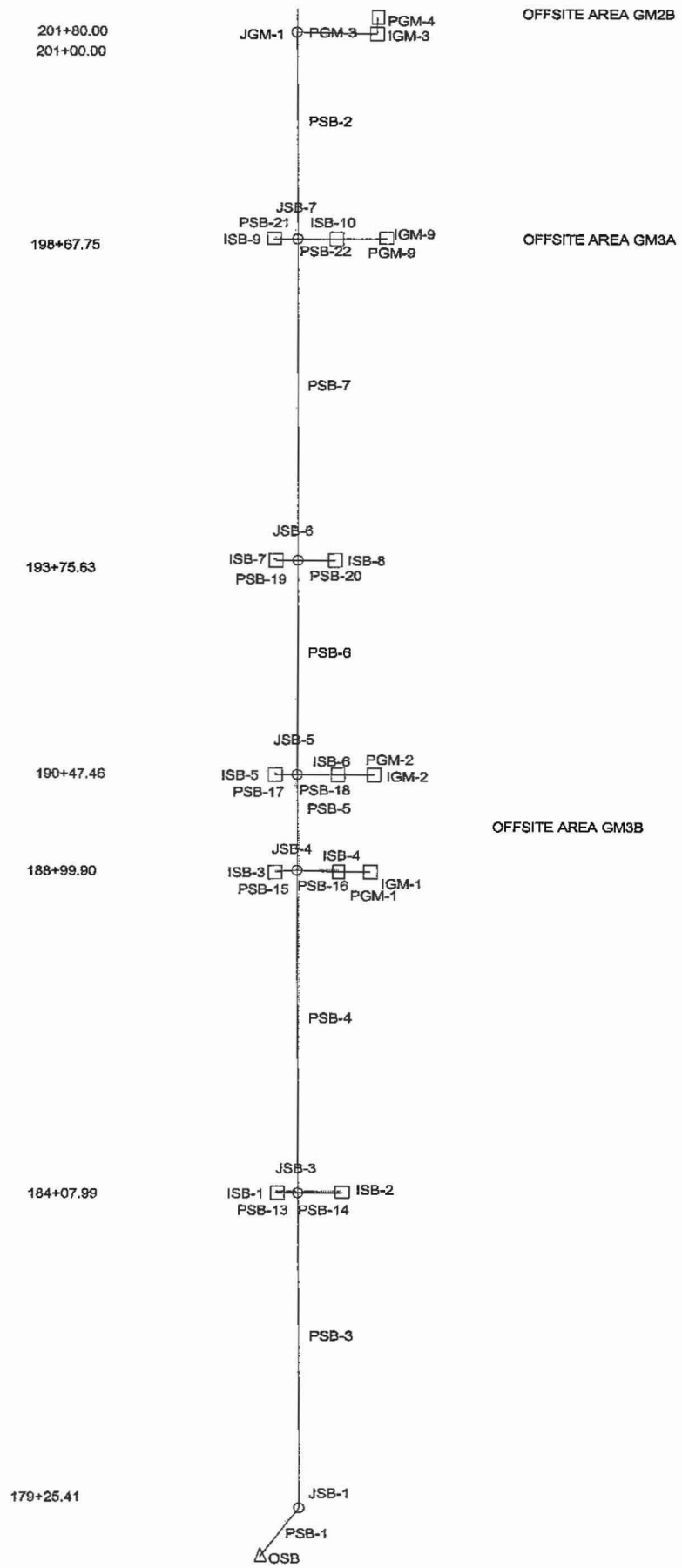
Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Ray Road to Elliot Road, MCDOT Project No. 68927-2
Drainage Design
Stantec Proj. No. 181740111

STORM DRAIN HYDRAULIC ANALYSIS - STORMCAD FILES
INDEX OF STORMCAD MODELS

Filename	Roadway	Approx station limits	Description
GM-el-10.stm	Ellsworth	Sta 181+00 to 213+47	10-year, full buildout, with GM offsite flows
GM-el-100.stm	Ellsworth	Sta 181+00 to 213+47	100-year, full buildout, with GM offsite flows
Ells-sa1.stm	Ellsworth	Sta 213+47 to 259+50	10-year, full buildout
Ells-ma1.stm	Ellsworth	Sta 264+00 to 269+00	10-year, full buildout
Ells-mb1.stm	Ellsworth	Sta 269+00 to 280+00	10-year, full buildout
Ells-na1.stm	Ellsworth	Sta 284+80 to Sta 299+00	10-year, full buildout
Ells-nb1.stm	Ellsworth	Sta 301+00 to Sta 320+00	10-year, full buildout
Ellt-w1.stm	Elliot	Sta 15+35 to 28+55.97 (connects to ADOT)	10-year, full buildout
Ellt-e1.stm	Elliot	Sta 32+45.20	10-year, full buildout
Ellt-e1a.stm	Elliot	Sta 36+00.00	10-year, full buildout
Main-int.stm	Elliot/Ellsworth	Elliot Drain	100-year, interim, Peak flow in mainline
Main-full.stm	Elliot/Ellsworth	Elliot Drain	100-year, full buildout, Peak flow in mainline
Lat-full.stm	Elliot/Ellsworth	Elliot Drain	100-year, full buildout, Peak flow in lateral


ISB-15
213+47.32
PSB-12
JSB-11
211+00.00
PSB-11
JSB-10
PSB-25
PSB-26
ISB-13
ISB-14
GM-8
PGM-8
208+32.28
PSB-27
OFFSITE AREA GM1
208+00.00
JGM-3
PGM-6
IGM-6
PSB-10
204+45.00
JGM-2
PGM-5
IGM-5
PSB-9
OFFSITE AREA GM2A
JSB-9
ISB-12
ISB-11
IGM-7
203+76.28
PSB-23
PSB-24
PGM-7
PSB-8
IGM-4
PGM-4
OFFSITE AREA GM2B
201+80.00
JGM-1
PGM-3
IGM-3
201+00.00
PSB-2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JGM-1
PGM-3
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IGM-3
OFFSITE AREA GM2B
PSB-2
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JSB-7
PSB-21
ISB-9
ISB-10
PSB-22
IGM-9
PGM-9
OFFSITE AREA GM3A
PSB-7
193+75.63
JSB-6
ISB-7
PSB-19
ISB-8
PSB-20
PSB-6
190+47.46
JSB-5
ISB-5
PSB-17
ISB-6
PSB-18
PGM-2
IGM-2
PSB-5
OFFSITE AREA GM3B
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JSB-4
ISB-3
PSB-15
ISB-4
PSB-16
IGM-1
PGM-1
PSB-4
184+07.99
JSB-3
ISB-1
PSB-13
ISB-2
PSB-14
PSB-3
179+25.41
JSB-1
PSB-1
OSB

Storm Drain Hydraulic Analysis

Pipe	Upstream Node	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Node	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Discharge (cfs)
PGM-1	IGM-1	1,385.60	1,387.78	ISB-4	1,385.46	1,387.77	0.008235	24 inch	17.00	4.76
PGM-2	IGM-2	1,385.60	1,387.88	ISB-6	1,385.51	1,387.87	0.005294	24 inch	17.00	4.76
PGM-3	IGM-3	1,384.32	1,388.62	JGM-1	1,383.82	1,388.51	0.006329	30 inch	79.00	15.33
PGM-4	IGM-4	1,384.40	1,388.64	IGM-3	1,384.32	1,388.63	0.008000	24 inch	10.00	7.44
PGM-5	IGM-5	1,384.54	1,388.70	JGM-2	1,384.04	1,388.65	0.006329	30 inch	79.00	11.01
PGM-6	IGM-6	1,385.34	1,388.86	JGM-3	1,384.84	1,388.78	0.006329	30 inch	79.00	12.76
PGM-7	IGM-7	1,388.40	1,389.51	ISB-12	1,388.34	1,389.47	0.003529	24 inch	17.00	7.62
PGM-8	IGM-8	1,388.80	1,390.09	ISB-14	1,388.69	1,390.11	0.006471	24 inch	17.00	12.76
PGM-9	IGM-9	1,387.10	1,388.30	ISB-10	1,387.03	1,388.24	0.004118	18 inch	17.00	6.35
PSB-1	JSB-1	1,381.10	1,386.97	OSB	1,381.00	1,386.91	0.001053	60 inch	94.00	65.89
PSB-2	JGM-1	1,382.90	1,388.48	JSB-7	1,382.65	1,388.32	0.000801	60 inch	312.25	59.39
PSB-3	JSB-3	1,381.49	1,387.35	JSB-1	1,381.10	1,387.01	0.000812	60 inch	482.58	68.56
PSB-4	JSB-4	1,381.88	1,387.69	JSB-3	1,381.49	1,387.35	0.000795	60 inch	491.91	68.97
PSB-5	JSB-5	1,382.00	1,387.81	JSB-4	1,381.88	1,387.71	0.000792	60 inch	147.77	65.53
PSB-6	JSB-6	1,382.26	1,388.01	JSB-5	1,382.00	1,387.82	0.000805	60 inch	327.96	62.99
PSB-7	JSB-7	1,382.65	1,388.30	JSB-6	1,382.26	1,388.01	0.000784	60 inch	492.12	63.13
PSB-8	JSB-9	1,383.06	1,388.59	JGM-1	1,382.90	1,388.51	0.000815	60 inch	196.28	52.86
PSB-9	JGM-2	1,383.12	1,388.64	JSB-9	1,383.06	1,388.61	0.000931	60 inch	68.72	47.21
PSB-10	JGM-3	1,383.40	1,388.74	JGM-2	1,383.12	1,388.65	0.000777	60 inch	355.00	43.15
PSB-11	JSB-11	1,386.00	1,388.90	JSB-10	1,385.74	1,388.79	0.000971	48 inch	267.72	27.72
PSB-12	ISB-15	1,386.24	1,389.03	JSB-11	1,386.00	1,388.91	0.000970	48 inch	247.42	28.42
PSB-13	ISB-1	1,382.70	1,387.37	JSB-3	1,382.39	1,387.35	0.009863	18 inch	31.43	2.66
PSB-14	ISB-2	1,385.91	1,387.37	JSB-3	1,382.39	1,387.35	0.056646	18 inch	62.14	1.99
PSB-15	ISB-3	1,385.64	1,387.73	JSB-4	1,382.80	1,387.71	0.084877	18 inch	33.46	2.61
PSB-16	ISB-4	1,385.46	1,387.77	JSB-4	1,382.80	1,387.71	0.045115	24 inch	58.96	6.73
PSB-17	ISB-5	1,385.59	1,387.84	JSB-5	1,382.92	1,387.82	0.079797	18 inch	33.46	2.40
PSB-18	ISB-6	1,385.51	1,387.87	JSB-5	1,382.92	1,387.82	0.044025	24 inch	58.83	6.81
PSB-19	ISB-7	1,385.82	1,388.03	JSB-6	1,383.61	1,388.01	0.066108	18 inch	33.43	2.47
PSB-20	ISB-8	1,385.87	1,388.03	JSB-6	1,383.61	1,388.01	0.037704	18 inch	59.94	2.14
PSB-21	ISB-9	1,386.96	1,388.34	JSB-7	1,384.79	1,388.32	0.064854	18 inch	33.46	2.59
PSB-22	ISB-10	1,387.03	1,388.23	JSB-7	1,384.79	1,388.32	0.038574	24 inch	58.07	8.58
PSB-23	ISB-11	1,388.31	1,388.90	JSB-9	1,385.29	1,388.61	0.090257	18 inch	33.46	2.43
PSB-24	ISB-12	1,388.34	1,389.45	JSB-9	1,385.29	1,388.61	0.050438	24 inch	60.47	9.57
PSB-25	ISB-13	1,389.62	1,390.28	JSB-10	1,385.74	1,388.79	0.115959	18 inch	33.46	3.02
PSB-26	ISB-14	1,388.69	1,390.08	JSB-10	1,385.74	1,388.79	0.060675	24 inch	48.62	14.81
PSB-27	JSB-10	1,385.74	1,388.73	JGM-3	1,383.40	1,388.78	0.072491	48 inch	32.28	36.68

Storm Drain Hydraulic Analysis

Pipe	Upstream Node	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Node	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Discharge (cfs)
PGM-1	IGM-1	1,385.60	1,389.13	ISB-4	1,385.46	1,389.11	0.008235	24 inch	17.00	7.48
PGM-2	IGM-2	1,385.60	1,389.43	ISB-6	1,385.51	1,389.41	0.005294	24 inch	17.00	7.48
PGM-3	IGM-3	1,384.32	1,391.39	JGM-1	1,383.82	1,391.11	0.006329	30 inch	79.00	24.09
PGM-4	IGM-4	1,384.40	1,391.14	IGM-3	1,384.32	1,391.11	0.008000	24 inch	10.00	11.68
PGM-5	IGM-5	1,384.54	1,391.58	JGM-2	1,384.04	1,391.44	0.006329	30 inch	79.00	17.30
PGM-6	IGM-6	1,385.34	1,391.87	JGM-3	1,384.84	1,391.69	0.006329	30 inch	79.00	20.06
PGM-7	IGM-7	1,388.40	1,391.70	ISB-12	1,388.34	1,391.65	0.003529	24 inch	17.00	11.98
PGM-8	IGM-8	1,388.80	1,392.54	ISB-14	1,388.69	1,392.40	0.006471	24 inch	17.00	20.06
PGM-9	IGM-9	1,387.10	1,390.83	ISB-10	1,387.03	1,390.68	0.004118	18 inch	17.00	9.98
PSB-1	JSB-1	1,381.10	1,387.08	OSB	1,381.00	1,386.91	0.001053	60 inch	94.00	110.17
PSB-2	JGM-1	1,382.90	1,391.10	JSB-7	1,382.65	1,390.68	0.000801	60 inch	312.25	95.12
PSB-3	JSB-3	1,381.49	1,388.10	JSB-1	1,381.10	1,387.20	0.000812	60 inch	482.58	112.21
PSB-4	JSB-4	1,381.88	1,389.01	JSB-3	1,381.49	1,388.12	0.000795	60 inch	491.91	110.93
PSB-5	JSB-5	1,382.00	1,389.35	JSB-4	1,381.88	1,389.11	0.000792	60 inch	147.77	104.87
PSB-6	JSB-6	1,382.26	1,389.90	JSB-5	1,382.00	1,389.41	0.000805	60 inch	327.96	100.46
PSB-7	JSB-7	1,382.65	1,390.67	JSB-6	1,382.26	1,389.92	0.000784	60 inch	492.12	102.15
PSB-8	JSB-9	1,383.06	1,391.32	JGM-1	1,382.90	1,391.11	0.000815	60 inch	196.28	83.88
PSB-9	JGM-2	1,383.12	1,391.42	JSB-9	1,383.06	1,391.37	0.000931	60 inch	68.72	74.80
PSB-10	JGM-3	1,383.40	1,391.68	JGM-2	1,383.12	1,391.44	0.000777	60 inch	355.00	67.79
PSB-11	JSB-11	1,386.00	1,392.09	JSB-10	1,385.74	1,391.85	0.000971	48 inch	267.72	43.56
PSB-12	ISB-15	1,386.24	1,392.34	JSB-11	1,386.00	1,392.10	0.000970	48 inch	247.42	44.68
PSB-13	ISB-1	1,382.70	1,388.17	JSB-3	1,382.39	1,388.12	0.009863	18 inch	31.43	4.18
PSB-14	ISB-2	1,385.91	1,388.17	JSB-3	1,382.39	1,388.12	0.056646	18 inch	62.14	3.12
PSB-15	ISB-3	1,385.64	1,389.16	JSB-4	1,382.80	1,389.11	0.084877	18 inch	33.46	4.09
PSB-16	ISB-4	1,385.46	1,389.24	JSB-4	1,382.80	1,389.11	0.045115	24 inch	58.96	10.57
PSB-17	ISB-5	1,385.59	1,389.45	JSB-5	1,382.92	1,389.41	0.079797	18 inch	33.46	3.78
PSB-18	ISB-6	1,385.51	1,389.54	JSB-5	1,382.92	1,389.41	0.044025	24 inch	58.83	10.72
PSB-19	ISB-7	1,385.82	1,389.96	JSB-6	1,383.61	1,389.92	0.066108	18 inch	33.43	3.87
PSB-20	ISB-8	1,385.87	1,389.98	JSB-6	1,383.61	1,389.92	0.037704	18 inch	59.94	3.36
PSB-21	ISB-9	1,386.96	1,390.73	JSB-7	1,384.79	1,390.68	0.064854	18 inch	33.46	4.06
PSB-22	ISB-10	1,387.03	1,390.89	JSB-7	1,384.79	1,390.68	0.038574	24 inch	58.07	13.47
PSB-23	ISB-11	1,388.31	1,391.41	JSB-9	1,385.29	1,391.37	0.090257	18 inch	33.46	3.83
PSB-24	ISB-12	1,388.34	1,391.63	JSB-9	1,385.29	1,391.37	0.050438	24 inch	60.47	15.04
PSB-25	ISB-13	1,389.62	1,391.92	JSB-10	1,385.74	1,391.85	0.115959	18 inch	33.46	4.74
PSB-26	ISB-14	1,388.69	1,392.36	JSB-10	1,385.74	1,391.85	0.060675	24 inch	48.62	23.25
PSB-27	JSB-10	1,385.74	1,391.74	JGM-3	1,383.40	1,391.69	0.072491	48 inch	32.28	57.60

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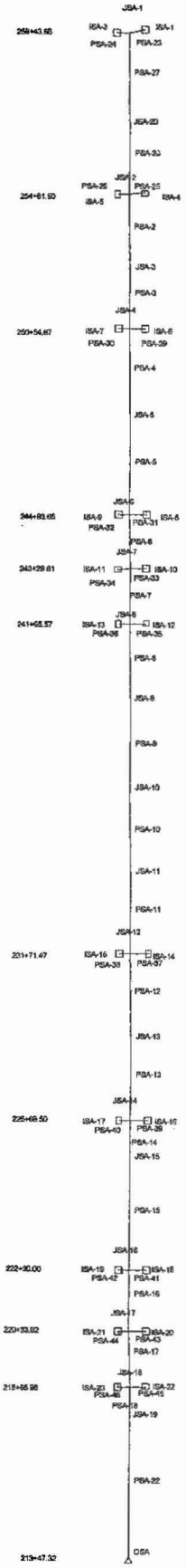
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ISA-3
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PSA-17
JSA-18
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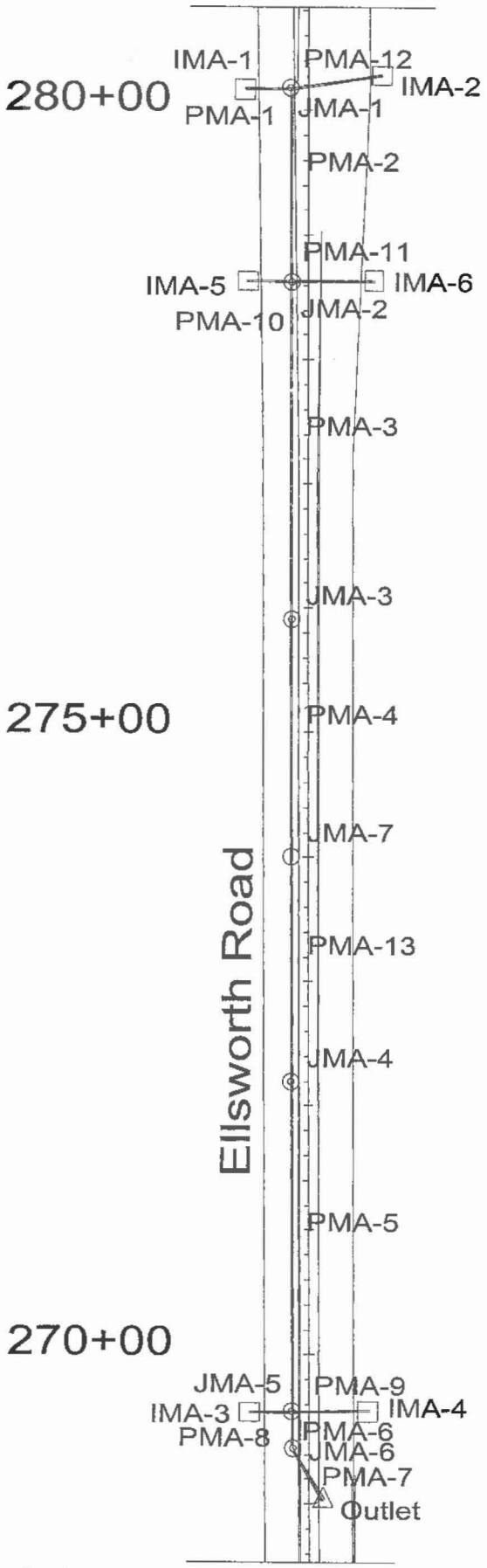
ISA-23
ISA-22
PSA-46
PSA-45
PSA-18
JSA-19
PSA-22
213+47.32
OSA

Storm Drain Hydraulic Analysis

Pipe	Upstream Node	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Node	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Discharge (cfs)
PSA-24	ISA-3	1,395.62	1,396.39	JSA-1	1,395.18	1,396.44	0.014281	18 inch	30.81	2.49
PSA-23	ISA-1	1,395.52	1,396.44	JSA-1	1,395.18	1,396.44	0.007191	18 inch	47.28	3.66
PSA-27	JSA-1	1,395.18	1,396.22	JSA-20	1,394.45	1,395.62	0.002535	24 inch	287.98	6.07
PSA-25	ISA-4	1,394.79	1,395.52	JSA-2	1,393.77	1,395.51	0.020979	18 inch	48.62	3.69
PSA-28	JSA-20	1,394.45	1,395.61	JSA-2	1,393.77	1,395.51	0.003513	24 inch	193.57	5.85
PSA-26	ISA-5	1,394.13	1,395.54	JSA-2	1,393.77	1,395.51	0.010972	18 inch	32.81	3.51
PSA-2	JSA-2	1,393.77	1,395.21	JSA-3	1,392.67	1,394.09	0.003908	24 inch	281.50	12.26
PSA-29	ISA-6	1,393.65	1,394.03	JSA-4	1,392.18	1,393.52	0.030234	18 inch	48.62	1.02
PSA-3	JSA-3	1,392.67	1,394.07	JSA-4	1,392.18	1,393.52	0.003910	24 inch	125.33	11.94
PSA-30	ISA-7	1,393.50	1,393.87	JSA-4	1,392.18	1,393.52	0.042663	18 inch	30.94	0.98
PSA-4	JSA-4	1,392.18	1,393.42	JSA-5	1,390.67	1,392.60	0.005327	30 inch	283.45	13.55
PSA-5	JSA-5	1,390.67	1,392.59	JSA-6	1,390.01	1,392.37	0.002378	30 inch	277.57	13.12
PSA-31	ISA-8	1,391.44	1,392.34	JSA-6	1,390.01	1,392.37	0.030674	18 inch	46.62	2.98
PSA-32	ISA-9	1,391.22	1,392.37	JSA-6	1,390.50	1,392.37	0.021602	18 inch	33.33	2.84
PSA-34	ISA-11	1,390.96	1,392.19	JSA-7	1,389.84	1,392.19	0.033603	18 inch	33.33	1.66
PSA-6	JSA-6	1,390.01	1,392.31	JSA-7	1,389.84	1,392.19	0.001036	36 inch	164.04	17.20
PSA-33	ISA-10	1,391.33	1,392.17	JSA-7	1,389.84	1,392.19	0.030646	18 inch	48.62	1.73
PSA-7	JSA-7	1,389.84	1,392.05	JSA-8	1,389.68	1,391.87	0.000975	36 inch	164.04	19.33
PSA-36	ISA-13	1,391.25	1,391.80	JSA-8	1,389.68	1,391.87	0.046922	18 inch	33.46	2.10
PSA-35	ISA-12	1,390.94	1,391.86	JSA-8	1,389.68	1,391.87	0.027027	18 inch	46.62	2.21
PSA-8	JSA-8	1,389.68	1,391.84	JSA-9	1,389.33	1,391.47	0.001404	36 inch	249.36	22.10
PSA-9	JSA-9	1,389.33	1,391.46	JSA-10	1,388.90	1,391.05	0.001456	36 inch	295.26	21.32
PSA-10	JSA-10	1,388.90	1,391.04	JSA-11	1,388.60	1,390.75	0.001358	36 inch	220.95	20.70
PSA-37	ISA-14	1,391.46	1,392.19	JSA-12	1,388.28	1,390.60	0.060387	18 inch	52.66	3.61
PSA-38	ISA-15	1,391.84	1,392.50	JSA-12	1,388.28	1,390.60	0.106811	18 inch	33.33	3.01
PSA-11	JSA-11	1,388.60	1,390.75	JSA-12	1,388.28	1,390.60	0.001400	42 inch	228.53	20.25
PSA-12	JSA-12	1,388.28	1,390.57	JSA-13	1,387.96	1,390.33	0.001175	42 inch	272.26	24.17
PSA-13	JSA-13	1,387.96	1,390.32	JSA-14	1,387.70	1,390.15	0.001132	42 inch	229.71	23.44
PSA-39	ISA-16	1,390.10	1,390.74	JSA-14	1,387.70	1,390.15	0.046503	18 inch	51.61	2.83
PSA-40	ISA-17	1,390.58	1,391.08	JSA-14	1,387.70	1,390.15	0.086073	18 inch	33.46	1.77
PSA-14	JSA-14	1,387.70	1,390.13	JSA-15	1,387.55	1,390.01	0.001143	42 inch	131.23	25.72
PSA-15	JSA-15	1,387.55	1,390.00	JSA-16	1,387.15	1,389.76	0.001257	42 inch	318.27	25.33
PSA-42	ISA-19	1,389.39	1,389.96	JSA-16	1,387.05	1,389.76	0.074380	18 inch	31.46	2.26
PSA-41	ISA-18	1,389.20	1,389.78	JSA-16	1,387.15	1,389.76	0.042164	18 inch	48.62	2.35
PSA-43	ISA-20	1,389.24	1,389.75	JSA-17	1,386.96	1,389.58	0.046894	18 inch	48.62	1.84
PSA-44	ISA-21	1,389.43	1,389.93	JSA-17	1,386.96	1,389.58	0.073819	18 inch	33.46	1.76
PSA-16	JSA-16	1,387.15	1,389.74	JSA-17	1,386.96	1,389.58	0.001016	42 inch	186.98	27.11
PSA-46	ISA-23	1,389.43	1,389.99	JSA-18	1,387.76	1,389.41	0.049910	18 inch	33.46	2.24
PSA-17	JSA-17	1,386.96	1,389.57	JSA-18	1,386.77	1,389.41	0.001158	42 inch	164.04	28.61
PSA-45	ISA-22	1,389.64	1,390.22	JSA-18	1,386.77	1,389.41	0.059029	18 inch	48.62	2.33
PSA-18	JSA-18	1,386.77	1,389.38	JSA-19	1,386.70	1,389.33	0.001015	48 inch	68.98	30.67
PSA-22	JSA-19	1,386.70	1,389.32	OSA	1,386.24	1,389.03	0.001016	48 inch	452.68	30.39



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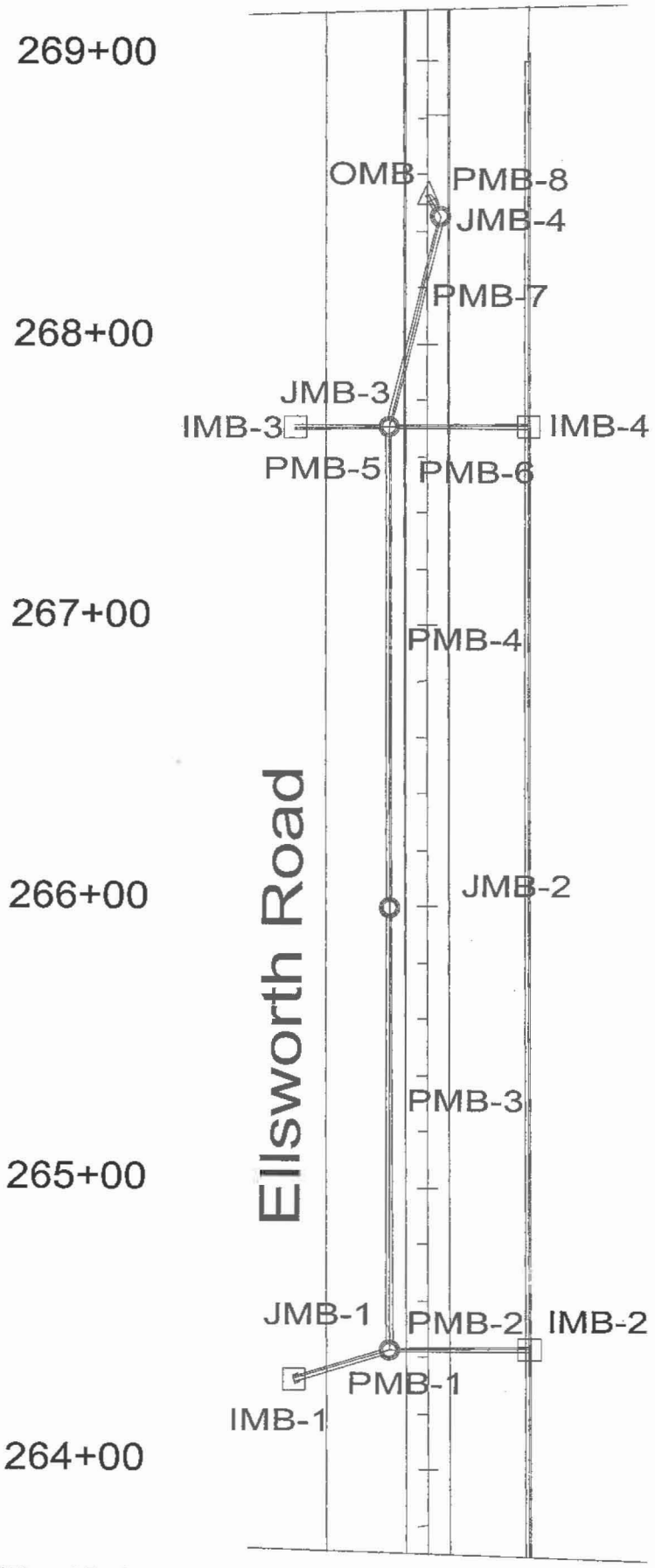
12/22/04 03:53:18 PM © Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Stantec Consulting Inc

Project Engineer: Stantec Consulting Inc
StormCAD v1.5 [158]
Page 1 of 1

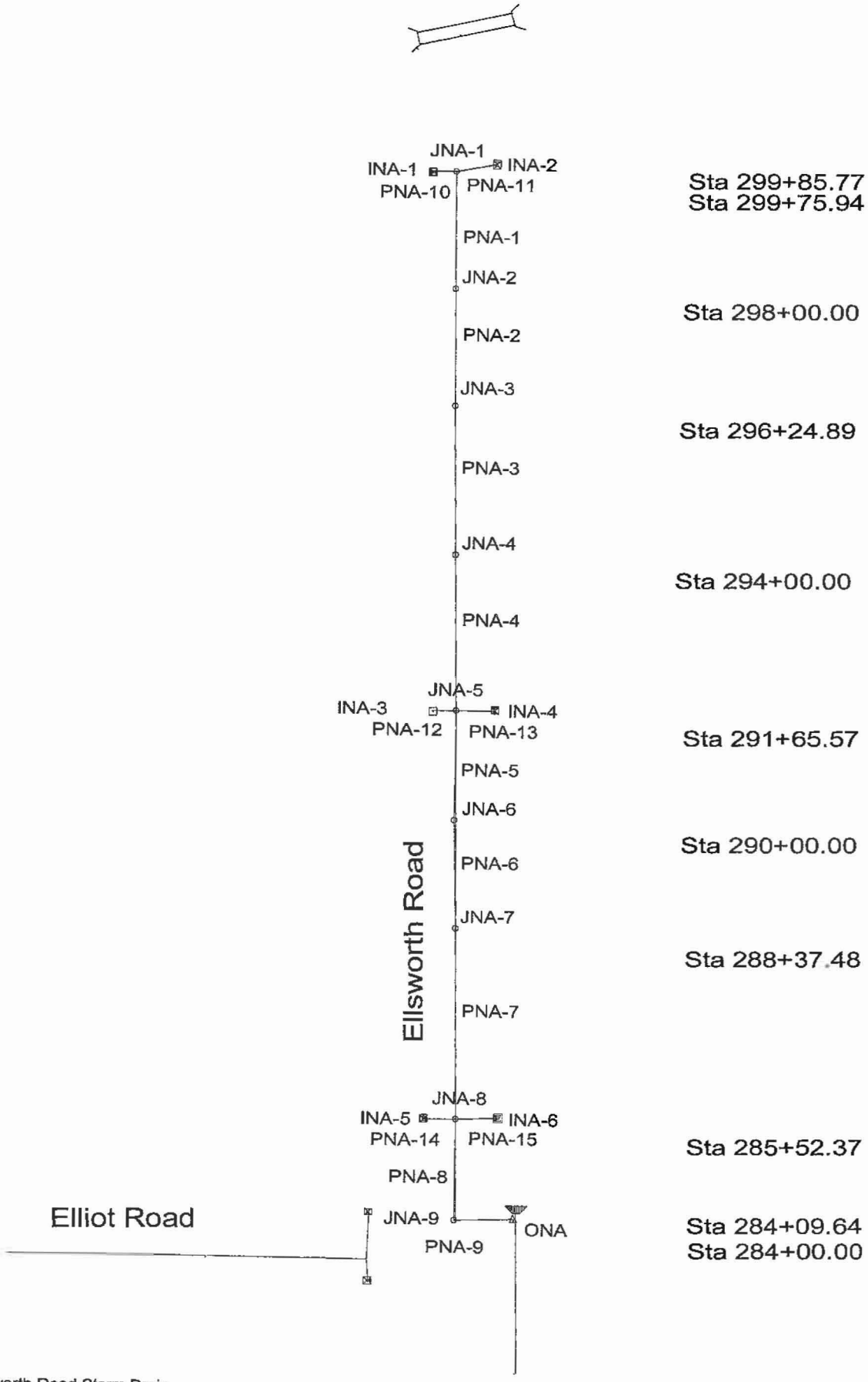
Storm Drain Hydraulic Analysis

Pipe	Upstream Node	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Node	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Discharge (cfs)
PMA-1	IMA-1	1,399.50	1,400.05	JMA-1	1,398.72	1,399.75	0.022388	18 inch	34.84	2.12
PMA-12	IMA-2	1,399.87	1,400.49	JMA-1	1,398.72	1,399.75	0.015503	18 inch	74.18	2.70
PMA-2	JMA-1	1,398.72	1,399.58	JMA-2	1,398.25	1,399.24	0.003048	24 inch	154.20	4.77
PMA-10	IMA-5	1,398.79	1,399.20	JMA-2	1,398.25	1,399.24	0.013592	18 inch	39.73	0.81
PMA-11	IMA-6	1,399.96	1,400.30	JMA-2	1,398.25	1,399.24	0.025968	18 inch	65.85	0.82
PMA-3	JMA-2	1,398.25	1,399.22	JMA-3	1,397.32	1,398.28	0.003415	24 inch	272.31	6.25
PMA-4	JMA-3	1,397.32	1,398.27	JMA-7	1,396.67	1,397.81	0.003434	24 inch	190.76	6.07
PMA-13	JMA-7	1,396.67	1,397.81	JMA-4	1,396.05	1,397.70	0.003421	24 inch	180.00	5.92
PMA-5	JMA-4	1,396.05	1,397.69	JMA-5	1,395.04	1,397.54	0.003798	24 inch	265.72	5.73
PMA-9	IMA-4	1,398.66	1,399.42	JMA-5	1,395.04	1,397.54	0.060495	18 inch	59.84	3.94
PMA-8	IMA-3	1,396.99	1,397.70	JMA-5	1,395.04	1,397.54	0.059199	18 inch	32.94	3.46
PMA-6	JMA-5	1,395.04	1,397.27	JMA-6	1,394.89	1,397.19	0.005080	24 inch	29.53	11.96
PMA-7	JMA-6	1,394.89	1,397.13	Outlet	1,393.64	1,397.00	0.025848	24 inch	48.36	11.91


269+00
OMB
PMB-8
JMB-4
PMB-7
268+00
JMB-3
IMB-3
IMB-4
PMB-5
PMB-6
267+00
PMB-4
Ellsworth Road
266+00
JMB-2
PMB-3
265+00
JMB-1
PMB-2
IMB-2
PMB-1
IMB-1
264+00

Storm Drain Hydraulic Analysis

Pipe	Upstream Node	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Node	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Discharge (cfs)
PMB-1	IMB-1	1,397.05	1,397.79	JMB-1	1,396.77	1,397.80	0.007903	18 inch	35.43	1.73
PMB-2	IMB-2	1,397.05	1,397.80	JMB-1	1,396.77	1,397.80	0.006006	18 inch	46.62	2.51
PMB-3	JMB-1	1,396.77	1,397.72	JMB-2	1,396.51	1,397.47	0.001650	24 inch	157.53	4.20
PMB-5	IMB-3	1,396.73	1,397.19	JMB-3	1,396.23	1,397.22	0.014710	18 inch	33.99	0.91
PMB-6	IMB-4	1,397.74	1,398.20	JMB-3	1,396.23	1,397.22	0.032390	18 inch	46.62	1.51
PMB-4	JMB-2	1,396.51	1,397.46	JMB-3	1,396.23	1,397.22	0.001642	24 inch	170.55	4.09
PMB-7	JMB-3	1,396.23	1,397.11	JMB-4	1,392.94	1,397.02	0.042727	24 inch	77.00	6.25
PMB-8	JMB-4	1,392.94	1,397.00	OMB	1,392.90	1,397.00	0.006667	24 inch	6.00	6.18



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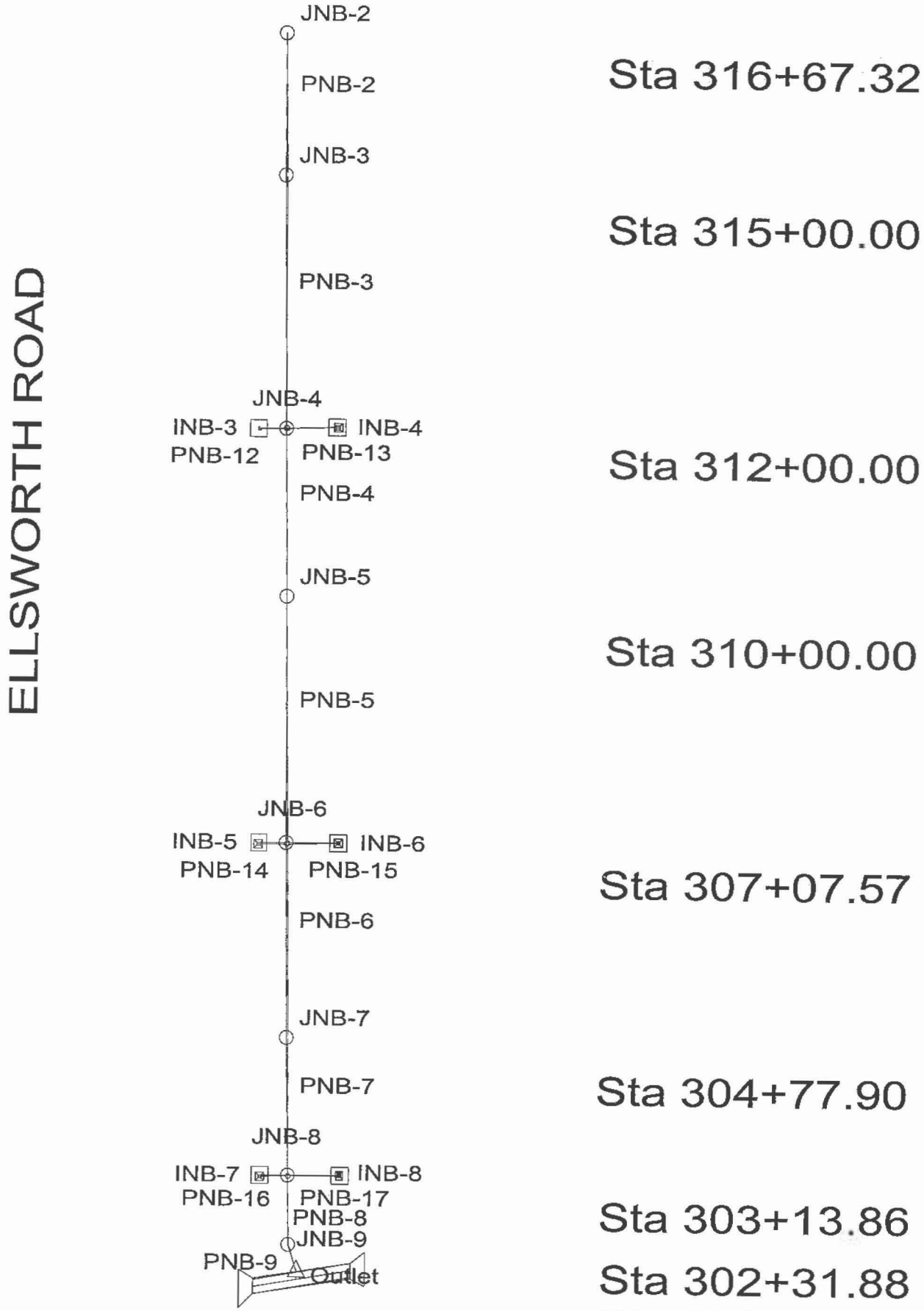
Stantec Consulting Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Project Engineer: Stantec Consulting Inc
StormCAD v1.5 [158]

Storm Drain Hydraulic Analysis

Pipe	Upstream Node	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Node	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Discharge (cfs)
PNA-10	INA-1	1,401.65	1,402.14	JNA-1	1,401.44	1,402.20	0.006787	18 inch	30.94	1.69
PNA-11	INA-2	1,401.71	1,402.23	JNA-1	1,401.44	1,402.20	0.004600	18 inch	58.69	1.76
PNA-1	JNA-1	1,401.44	1,402.16	JNA-2	1,400.91	1,401.63	0.003012	24 inch	175.94	3.42
PNA-2	JNA-2	1,400.91	1,401.62	JNA-3	1,400.38	1,401.09	0.003027	24 inch	175.11	3.34
PNA-3	JNA-3	1,400.38	1,401.08	JNA-4	1,399.71	1,400.45	0.002979	24 inch	224.89	3.26
PNA-4	JNA-4	1,399.71	1,400.45	JNA-5	1,399.01	1,400.32	0.002986	24 inch	234.43	3.15
PNA-12	INA-3	1,400.00	1,400.59	JNA-5	1,399.01	1,400.32	0.033000	18 inch	30.00	2.39
PNA-13	INA-4	1,400.00	1,400.59	JNA-5	1,399.01	1,400.32	0.016500	18 inch	60.00	2.39
PNA-5	JNA-5	1,399.01	1,400.20	JNA-6	1,398.51	1,400.00	0.003020	24 inch	165.57	7.15
PNA-6	JNA-6	1,398.51	1,399.99	JNA-7	1,398.02	1,399.88	0.003015	24 inch	162.52	6.97
PNA-14	INA-5	1,398.50	1,399.85	JNA-8	1,397.39	1,399.81	0.037000	18 inch	30.00	4.05
PNA-7	JNA-7	1,398.02	1,399.87	JNA-8	1,397.39	1,399.81	0.002210	30 inch	285.11	6.73
PNA-15	INA-6	1,398.50	1,399.87	JNA-8	1,397.39	1,399.81	0.018500	18 inch	60.00	3.46
PNA-8	JNA-8	1,397.39	1,399.62	JNA-9	1,397.06	1,399.52	0.002166	30 inch	152.37	12.05
PNA-9	JNA-9	1,397.06	1,399.42	ONA	1,396.86	1,399.36	0.002235	30 inch	89.47	11.78



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Stantec Consulting Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Project Engineer: Stantec Consulting Inc
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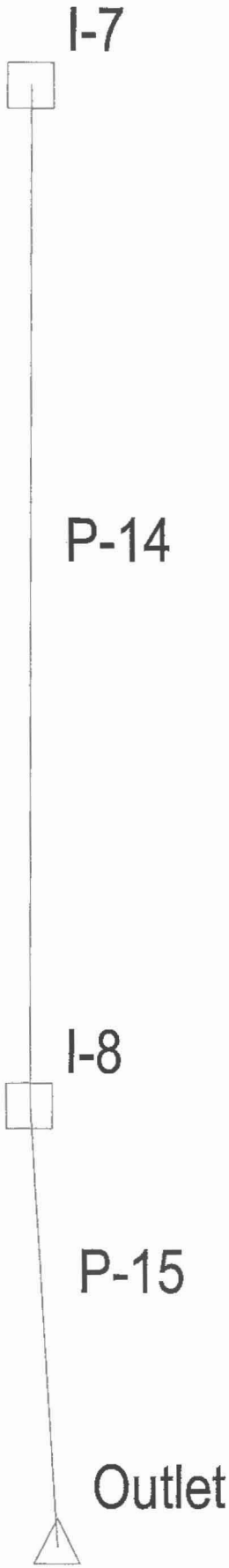
Storm Drain Hydraulic Analysis

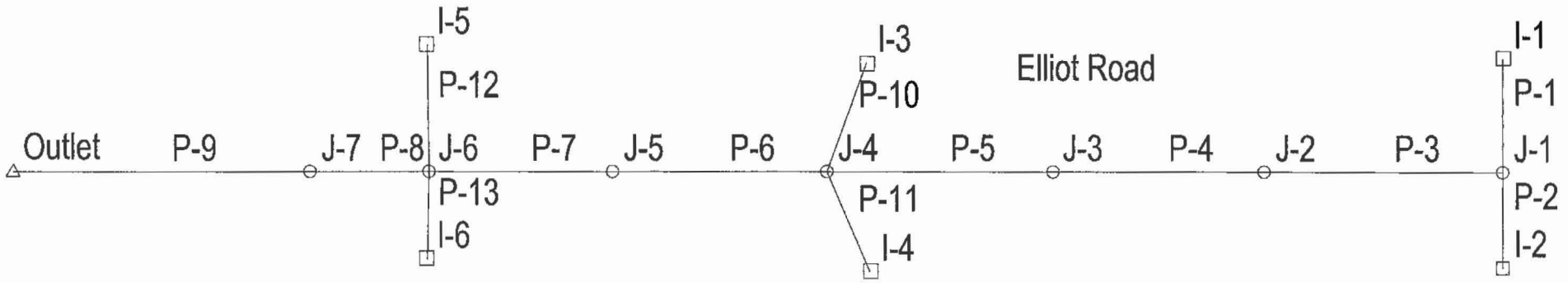
Pipe	Upstream Node	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Node	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Discharge (cfs)
PNB-2	JNB-2	1,411.15	1,411.15	JNB-3	1,409.13	1,409.13	0.012096	24 inch	167.00	0.00
PNB-3	JNB-3	1,409.13	1,409.13	JNB-4	1,407.26	1,408.38	0.006233	24 inch	300.00	0.00
PNB-13	INB-4	1,408.70	1,409.43	JNB-4	1,407.26	1,408.38	0.024036	18 inch	59.91	3.63
PNB-12	INB-3	1,407.89	1,408.64	JNB-4	1,407.26	1,408.38	0.019438	18 inch	32.41	3.84
PNB-4	JNB-4	1,407.26	1,408.23	JNB-5	1,406.06	1,407.32	0.006000	24 inch	200.00	7.42
PNB-14	INB-5	1,406.56	1,407.16	JNB-6	1,404.94	1,407.08	0.048430	18 inch	33.45	2.47
PNB-15	INB-6	1,405.90	1,407.10	JNB-6	1,404.94	1,407.08	0.014645	18 inch	65.55	2.51
PNB-5	JNB-5	1,406.06	1,407.31	JNB-6	1,404.94	1,407.08	0.003830	24 inch	292.43	7.26
PNB-6	JNB-6	1,404.94	1,406.90	JNB-7	1,404.06	1,406.31	0.003832	24 inch	229.67	11.54
PNB-7	JNB-7	1,404.06	1,406.29	JNB-8	1,403.44	1,405.89	0.003780	24 inch	164.04	11.19
PNB-16	INB-7	1,405.79	1,406.32	JNB-8	1,403.44	1,405.89	0.072643	18 inch	32.35	2.00
PNB-17	INB-8	1,405.72	1,406.25	JNB-8	1,403.44	1,405.89	0.038083	18 inch	59.87	2.00
PNB-8	JNB-8	1,403.43	1,405.72	JNB-9	1,403.12	1,405.39	0.003780	24 inch	82.02	14.45
PNB-9	JNB-9	1,403.12	1,405.36	Outlet	1,403.00	1,405.00	0.001341	24 inch	89.47	14.32



32+45 ELLIOT ROAD

Storm Drain Hydraulic Analysis

Pipe	Upstream Node	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Node	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Discharge (cfs)
P-14	I-7	1,399.21	1,399.91	I-8	1,397.09	1,398.30	0.020583	18 inch	103.00	3.37
P-15	I-8	1,397.09	1,398.08	Outlet	1,396.61	1,398.11	0.020426	18 inch	23.50	6.52



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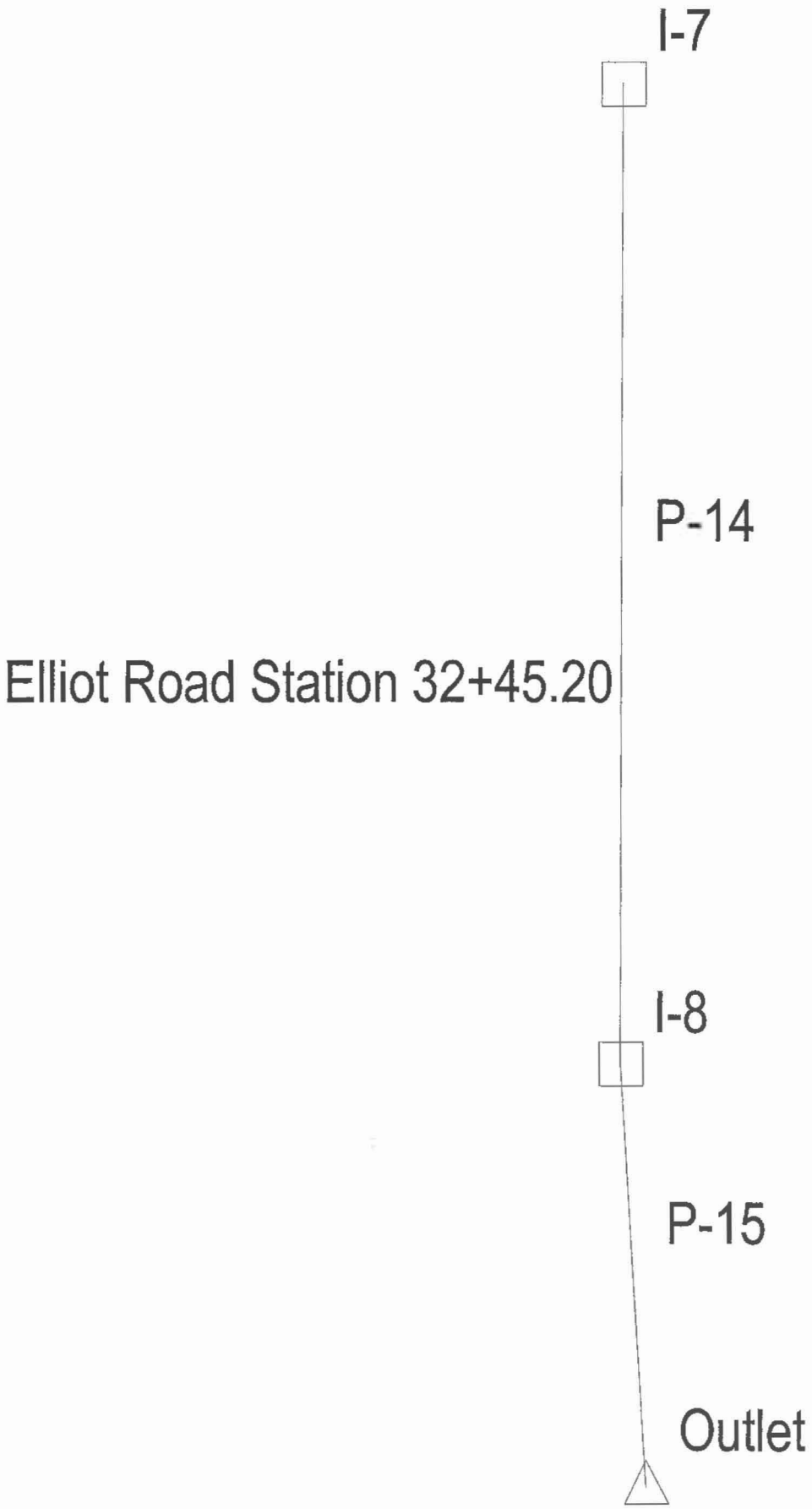
Project Engineer: Stantec Consulting Inc
StormCAD v1.5 [158]

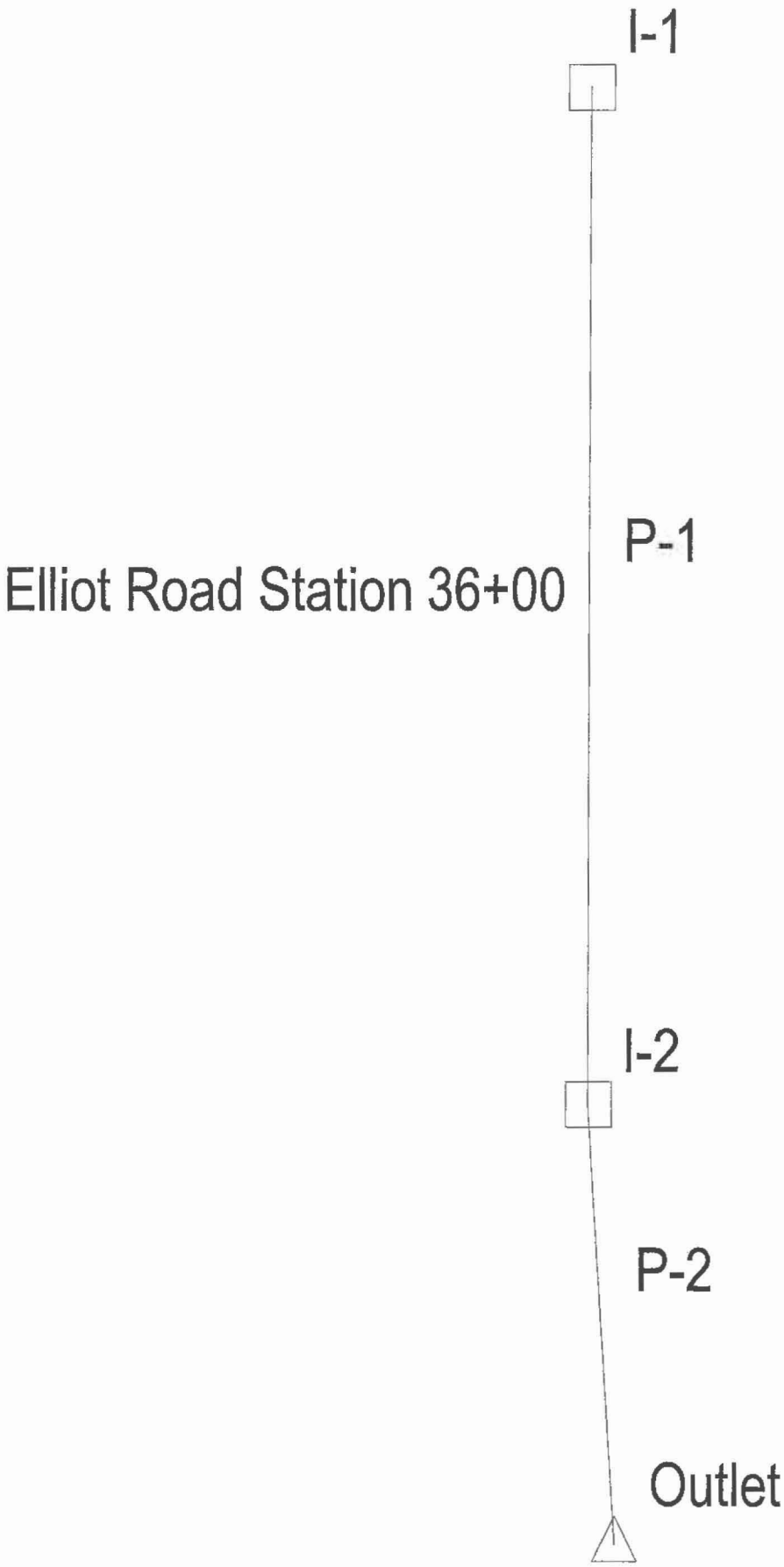
Storm Drain Hydraulic Analysis

Pipe	Upstream Node	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Node	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Discharge (cfs)
P-1	I-1	1,399.85	1,400.08	J-1	1,394.06	1,394.50	0.089050	18 inch	65.02	0.40
P-2	I-2	1,399.70	1,399.96	J-1	1,394.06	1,394.50	0.125389	18 inch	44.98	0.50
P-3	J-1	1,394.06	1,394.38	J-2	1,392.61	1,392.92	0.006003	24 inch	241.55	0.89
P-4	J-2	1,392.61	1,392.93	J-3	1,390.82	1,391.12	0.005994	24 inch	298.63	0.85
P-5	J-3	1,390.82	1,391.13	J-4	1,389.31	1,390.43	0.006135	24 inch	246.13	0.81
P-11	I-4	1,393.10	1,393.67	J-4	1,389.31	1,390.43	0.077648	18 inch	48.81	2.30
P-10	I-3	1,393.33	1,393.88	J-4	1,389.31	1,390.43	0.063079	18 inch	63.73	2.10
P-6	J-4	1,389.31	1,390.31	J-5	1,388.71	1,390.08	0.002007	24 inch	298.93	4.37
P-12	I-5	1,391.38	1,391.99	J-6	1,388.37	1,390.03	0.047238	18 inch	63.72	2.60
P-13	I-6	1,391.22	1,391.84	J-6	1,388.37	1,390.03	0.063361	18 inch	44.98	2.70
P-7	J-5	1,388.71	1,390.08	J-6	1,382.71	1,384.37	0.035080	24 inch	171.04	4.07
P-8	J-6	1,382.71	1,389.86	J-7	1,382.58	1,389.72	0.002000	24 inch	65.00	7.80
P-9	J-7	1,382.71	1,389.85	Outlet	1,381.99	1,389.00	0.000984	24 inch	732.00	7.72


I-7
P-14
Elliot Road Station 32+45.20
I-8
P-15
Outlet

Storm Drain Hydraulic Analysis

Pipe	Upstream Node	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Node	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Discharge (cfs)
P-14	I-7	1,399.21	1,399.92	I-8	1,397.09	1,398.23	0.020583	18 inch	103.00	3.44
P-15	I-8	1,397.09	1,398.03	Outlet	1,396.61	1,398.11	0.020426	18 inch	23.50	5.93


I-1
P-1
Elliot Road Station 36+00
I-2
P-2
Outlet

Storm Drain Hydraulic Analysis

Pipe	Upstream Node	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Node	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Discharge (cfs)
P-1	I-1	1,403.00	1,403.71	I-2	1,399.96	1,401.03	0.029804	18 inch	102.00	3.42
P-2	I-2	1,399.96	1,401.01	Outlet	1,399.58	1,401.08	0.016170	18 inch	23.50	7.31

Summary

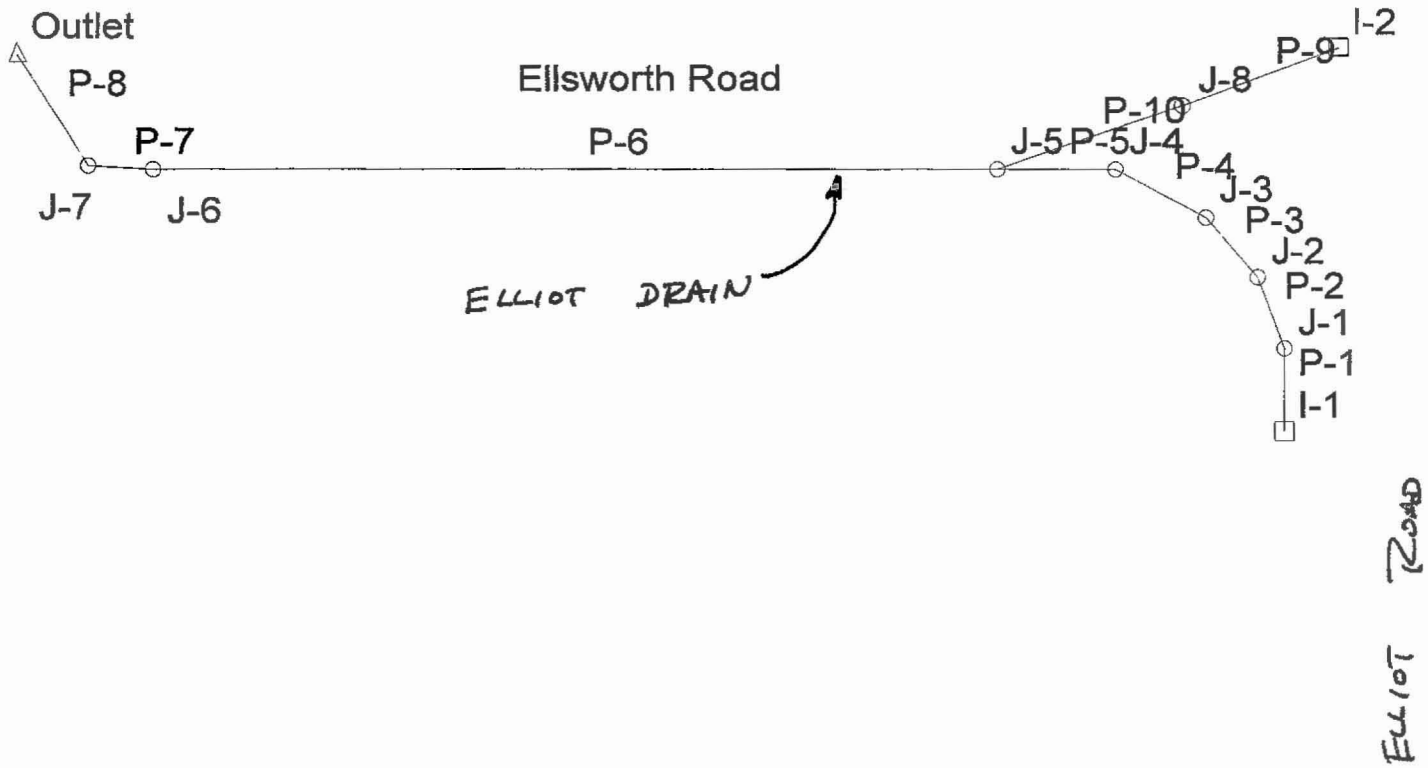
Pipe	Upstream Node	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Node	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Discharge (cfs)
P-1	I-1	1,392.29	1,403.28	J-1	1,392.25	1,403.17	0.001574	114 inch	25.41	967.00
P-2	J-1	1,392.25	1,402.88	J-2	1,392.15	1,402.63	0.001828	114 inch	54.71	967.00
P-3	J-2	1,392.15	1,402.35	J-3	1,392.06	1,402.11	0.001718	114 inch	52.40	967.00
P-4	J-3	1,392.06	1,401.82	J-4	1,391.98	1,401.57	0.001463	114 inch	54.70	967.00
P-9	I-2	1,394.90	1,401.06	J-8	1,392.00	1,401.06	0.011893	90 inch	243.85	16.00
P-5	J-4	1,391.98	1,401.28	J-5	1,391.92	1,401.06	0.001447	114 inch	44.92	967.00
P-10	J-8	1,392.00	1,401.06	J-5	1,391.92	1,401.06	0.001080	90 inch	75.00	16.00
P-6	J-5	1,391.92	1,399.82	J-6	1,390.21	1,397.52	0.001481	102 inch	1,151.00	983.00
P-7	J-6	1,390.21	1,397.52	J-7	1,390.16	1,397.46	0.001429	102 inch	35.00	983.00
P-8	J-7	1,390.16	1,396.59	Outlet	1,389.82	1,395.38	0.001738	102 inch	195.66	983.00

Summary

Pipe	Upstream Node	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Node	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Discharge (cfs)
P-1	I-1	1,392.29	1,404.58	J-1	1,392.25	1,404.47	0.001574	114 inch	25.41	926.00
P-2	J-1	1,392.25	1,404.21	J-2	1,392.15	1,403.98	0.001828	114 inch	54.71	926.00
P-3	J-2	1,392.15	1,403.72	J-3	1,392.06	1,403.50	0.001718	114 inch	52.40	926.00
P-9	I-2	1,394.90	1,402.73	J-8	1,392.00	1,402.60	0.011893	90 inch	243.85	180.00
P-4	J-3	1,392.06	1,403.23	J-4	1,391.98	1,403.01	0.001463	114 inch	54.70	926.00
P-10	J-8	1,392.00	1,402.60	J-5	1,391.92	1,402.56	0.001080	90 inch	75.00	180.00
P-5	J-4	1,391.98	1,402.74	J-5	1,391.92	1,402.56	0.001447	114 inch	44.92	926.00
P-6	J-5	1,391.92	1,401.08	J-6	1,390.21	1,398.09	0.001481	102 inch	1,151.00	1,106.00
P-7	J-6	1,390.21	1,398.09	J-7	1,390.16	1,398.01	0.001429	102 inch	35.00	1,106.00
P-8	J-7	1,390.16	1,397.06	Outlet	1,389.82	1,395.73	0.001738	102 inch	195.66	1,106.00

Summary

Pipe	Upstream Node	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Node	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Discharge (cfs)
P-1	I-1	1,392.29	1,400.02	J-1	1,392.25	1,400.00	0.001574	114 inch	25.41	434.00
P-2	J-1	1,392.25	1,399.93	J-2	1,392.15	1,399.89	0.001828	114 inch	54.71	434.00
P-3	J-2	1,392.15	1,399.81	J-3	1,392.06	1,399.77	0.001718	114 inch	52.40	434.00
P-9	I-2	1,394.90	1,399.74	J-8	1,392.00	1,399.68	0.011893	90 inch	243.85	350.00
P-4	J-3	1,392.06	1,399.69	J-4	1,391.98	1,399.65	0.001463	114 inch	54.70	434.00
P-10	J-8	1,392.00	1,399.68	J-5	1,391.92	1,399.53	0.001080	90 inch	75.00	350.00
P-5	J-4	1,391.98	1,399.57	J-5	1,391.92	1,399.53	0.001447	114 inch	44.92	434.00
P-6	J-5	1,391.92	1,398.43	J-6	1,390.21	1,396.57	0.001481	102 inch	1,151.00	784.00
P-7	J-6	1,390.21	1,396.57	J-7	1,390.16	1,396.53	0.001429	102 inch	35.00	784.00
P-8	J-7	1,390.16	1,395.79	Outlet	1,389.82	1,394.76	0.001738	102 inch	195.66	784.00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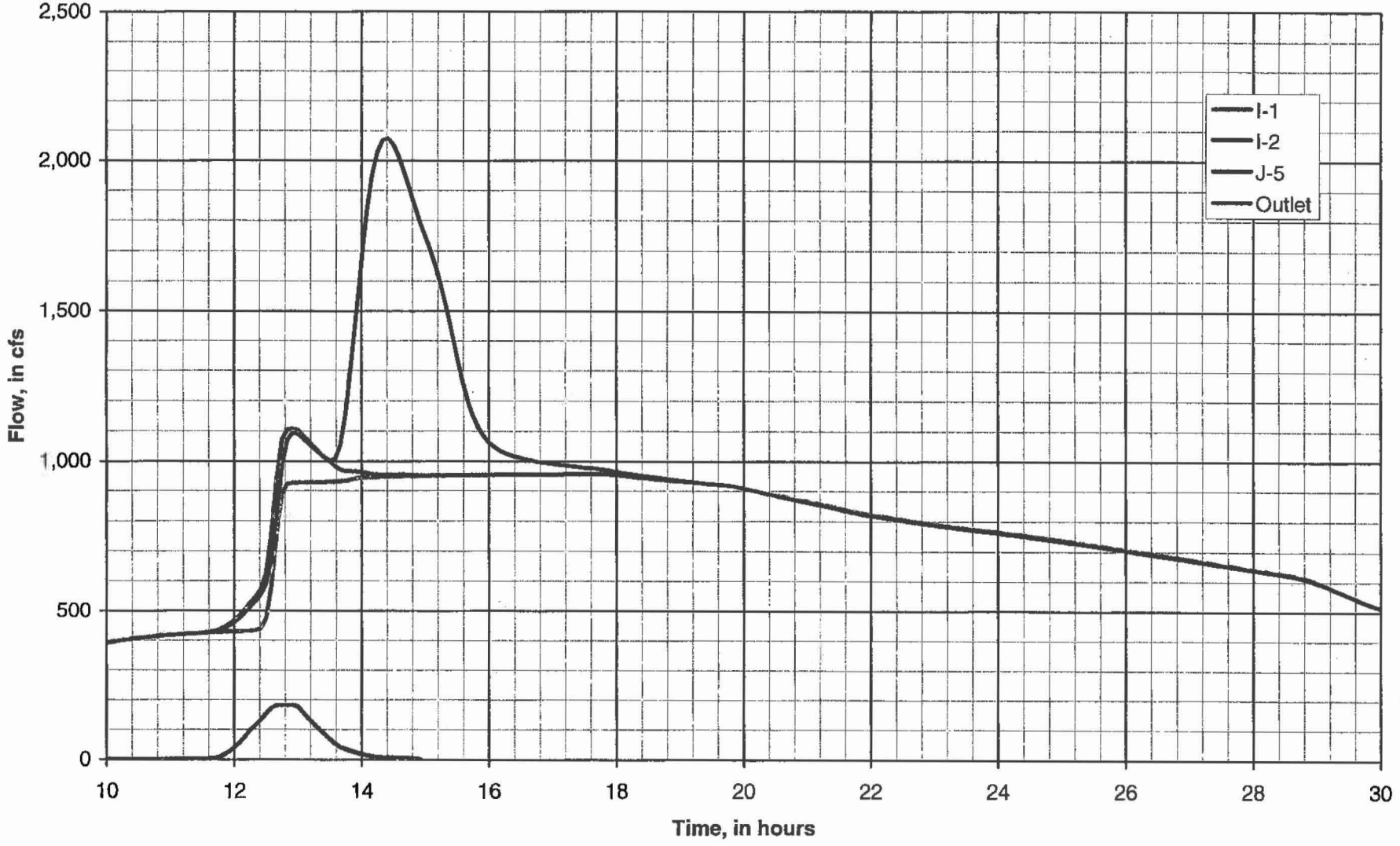
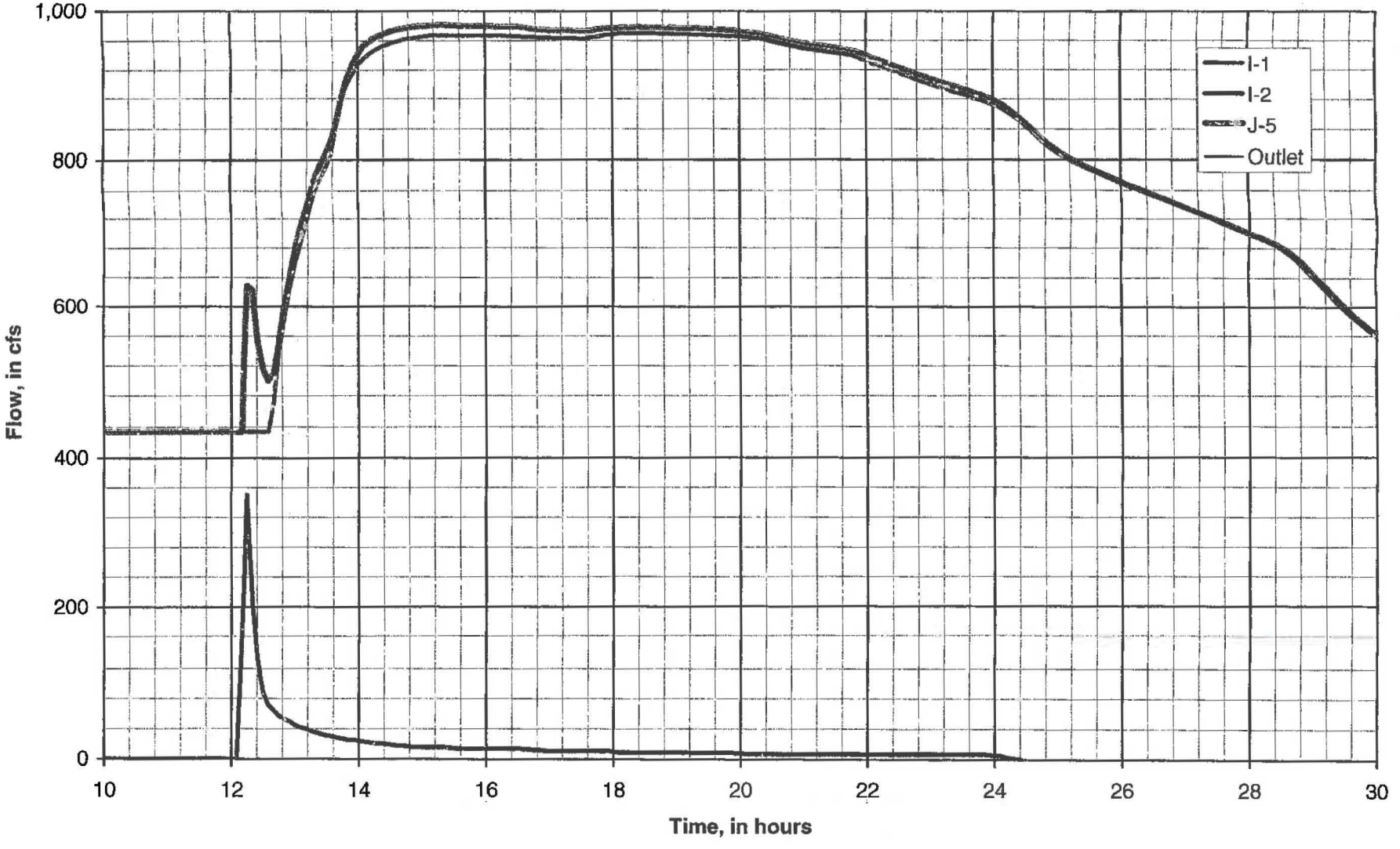
P-8
P-7
J-7
J-6
Ellsworth Road
P-6
ELLIOT DRAIN
J-5
P-5
J-4
P-10
J-8
P-9
I-2
P-4
J-3
P-3
J-2
P-2
J-1
P-1
I-1
ELLIOT ROAD

Elliot Road Storm Drain Hydrographs for Interim CIP Conditions



Elliot Road Storm Drain Hydrographs for Full CIP Conditions



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ELLSWORTH RD DRAINAGE DESIGN

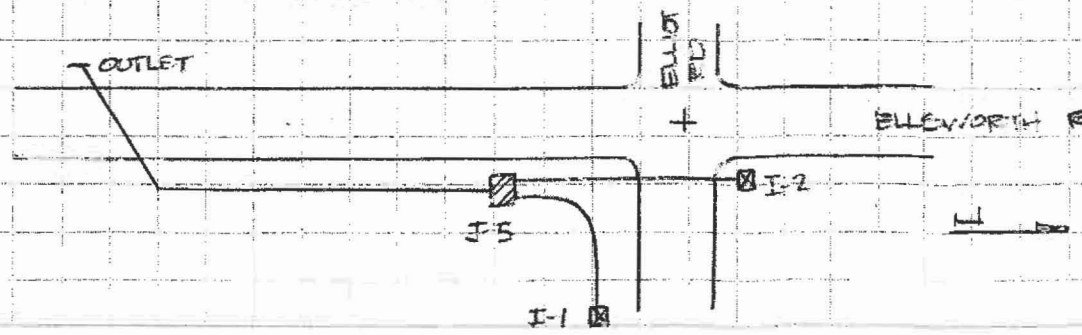
ELLIOT RD STORM DRAIN

1801740111

THE ELLIOT RD STORM DRAIN WAS DESIGNED W/ A 90" STUB-OUT THAT EXTENDS NORTH FROM A JUNCTION BOX APPROXIMATELY 60'. THE STORM DRAIN LATERAL WILL CONNECT TO THE STUB-OUT AND INTERCEPT RUNOFF THAT COLLECTS AT THE NORTHEAST CORNER OF ELLSWORTH AND ELLIOT ROADS.

HYDROLOGY USED FOR THE DESIGN OF THE LATERAL WAS PROVIDED BY THE FCDMC. TWO HEC-1 MODELS WERE PROVIDED, ONE FOR INTERIM CIP CONDITIONS AND ONE FOR FULL CIP CONDITIONS. THE STORM DRAIN WAS DESIGNED FOR THE 100-YR, 24-HOUR STORM. IN ADDITION TO CIP CONDITIONS, HYDROGRAPH TIMING ISSUES MUST ALSO BE CONSIDERED DUE TO THE SIGNIFICANT DIFFERENCES IN DRAINAGE AREA CONTRIBUTING TO THE LATERAL VERSUS THE MAIN LINE. PEAK DISCHARGES AND TIME TO PEAK IN THE MAIN LINE AND AT THE LATERAL ARE AS FOLLOWS

STORM DRAIN ID	HEC-1 ID INTERIM	HEC-1 ID FULL	PEAK DISCHARGE INTERIM CFS	PEAK DISCHARGE FULL CFS	TIME TO PEAK INTERIM HRS	TIME TO PEAK FULL HRS
I-1	CPIPWA	CPFWD	956	967	17.67	18.33
I-2	STUBOI	FWD	180	350	12.67	12.25
I-5	CPPE3	CWD	1,106	952	12.92	15.33
OUTLET	CFLOW	CWVT	2,096	931	14.42	15.33



Designed by: Checked by:

Stantec

THE HYDROGRAPHS AT EACH MODEL LOCATION LISTED IN THE TABLE ARE PROVIDED IN THE ATTACHED FIGURES. AS CAN BE SEEN FROM THE HYDROGRAPHS, TIMING DURING THE FULL CIP CONDITIONS IS MORE SIGNIFICANT THAN FOR INTERIM CIP CONDITIONS. INSPECTION OF THE HYDROGRAPH SHOWS THAT WHEN THE PEAK FLOW AT THE JUNCTION (J-5) OCCURS THE FLOW DURING FULL CIP CONDITIONS FROM THE LATERAL IS ONLY 16 CFS. BECAUSE OF THE HYDROGRAPH TIMING ISSUES, THERE IS THE POSSIBILITY THAT THE CONTROLLING DISCHARGES FOR DESIGN OF THE LATERAL OCCUR AT THE TIME TO PEAK OF THE INFLOW TO THE LATERAL. THIS APPEARS TO BE A REASONABLE CONCERN FOR THE FULL CIP CONDITION. THEREFORE, THREE HYDRAULIC MODELS ARE CREATED AND THE PEAK DISCHARGES INPUT TO THE MODEL ARE AS FOLLOWS

STORM DRAIN ID	MAIN LINE CONT. INTERIM CFS	MAIN LINE CONT. FULL CFS	LATERAL CONTROL CFS
I-1	926	967	421
I-2	180	16	350

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STORM DRAIN DIMENSIONS FOR THE MAIN LINE AND STUB-OUT ARE TAKEN FROM THE "ELLIOT RD DETENTION BASIN AND OUTFALL CHANNEL PHASE I" AS-BUILT PLANS

- ELEVATION FROM THE PLAN SET ARE REFERENCED TO NGVD 29
- THE VERTICAL DATUM FOR THIS PROJECT IS NAVD 88
- THE CONVERSION FROM NGVD 29 TO NAVD 88 IS + 1.864' BASED ON THE MCHD BOCH AT THE INTERSECTION OF ELLSWORTH AND ELLIOT RD.

NGVD 29 : 1402.09
NAVD 88 : 1403.954

TAILWATER CONDITIONS BETWEEN THE INTERIM AND FULL CIP CONDITIONS COULD BE SIGNIFICANTLY DIFFERENT DEPENDING ON THE ASSUMPTION OF WHERE OVERLAND FLOW NOT INTERCEPT BY THE STORM DRAIN UNDER INTERIM CONDITIONS CROSSES ELLSWORTH RD. THE MOST CONSERVATIVE ASSUMPTION IS TO ASSUME ALL OVERLAND FLOW CROSSES ELLSWORTH AT THE SAME LOCATION AS THE STORM DRAIN

TAILWATER ELEVATIONS FOR BOTH INTERIM AND FULL CIP CONDITIONS ARE CALCULATED USING MANNING'S EQN BASED ON THE OUTLET CHANNEL GEOMETRY SHOWN ON THE AS-BUILT PLANS

		Discharge	Depth	WSEL
SHAPE :	TRAPEZOIDAL	CFS	FEET	FEET
BOTTOM WIDTH :	20'			
SIDE SLOPES :	6:1	983	4.02	1393.84
SLOPE :	0.0035 FT/FT	2,074	5.68	1395.50
N-VALUE :	0.045			

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Stantec

HEADLOSS CALCULATIONS

HEADLOSS COEFFICIENTS AND MAGNITUDES ARE DETERMINED FOR THE INFORMATION AND METHODOLOGY CONTAINED IN THE HYDRAULICS MANUAL (FCDMC; DRAFT 2003)

INLETS

I-1 : NO LOSS - INFLOW POINT IS MODELED AT A MANHOLE LOCATED ALONG THE STORM DRAIN

I-2 : $K_e = 0.5$

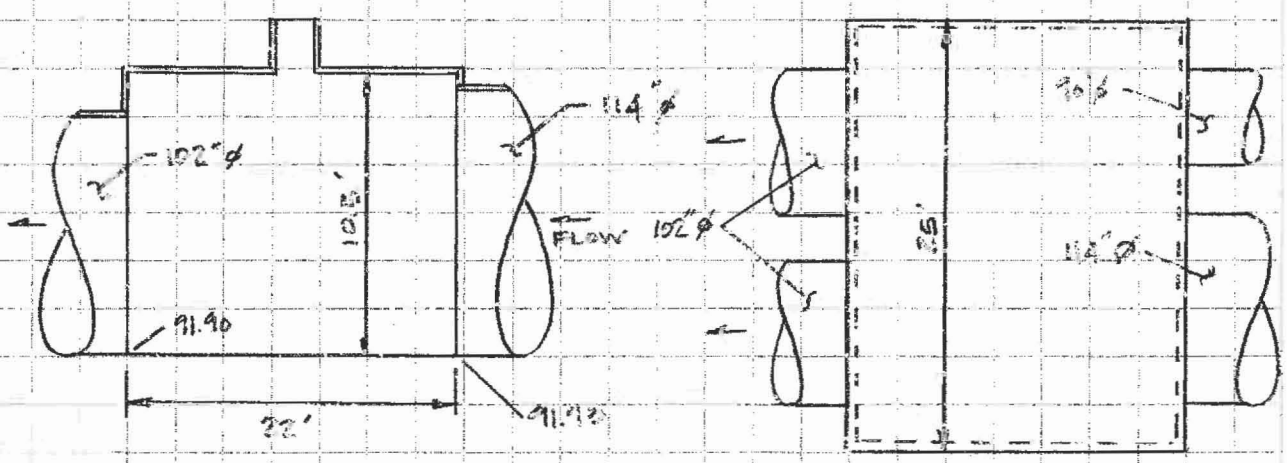
OUTLET : $K_o = 1.0$

BEND (FIG 4.8)

$\alpha = 22.5°$ $K_b = 0.1$ (ASSUME CURVED OR DEFLECTED)

$\alpha = 60°$ $K_b = 0.49$ (ASSUME CURVED OR DEFLECTED)

JUNCTION BOX



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ASSUME JUNCTION FUNCTIONS AS A SUDDEN ENLARGEMENT WITH THE MAJORITY OF FLOW TRANSITIONING FROM 114" PIPE TO TWO 102" PIPES

FOR PRESSURE FLOW CONDITIONS FOR FULL CIP

$K_c \Rightarrow \frac{D_2}{D_1} = \frac{2(102)}{114} = 1.8$

$V = 14.5^{FPS}$ (114" PIPE)

FROM TABLE 4.3??, $K_c = 0.43$

FOR PRESSURE FLOW CONDITIONS FOR INTERIM CIP

$K_c \Rightarrow \frac{D_2}{D_1} = 1.8$ AND $V = 13.1^{FPS}$

$K_c = 0.44$

FOR PRESSURE FLOW CONDITIONS FOR LATERAL CONTROL AND FULL CIP CONDITIONS

$K_c = \frac{D_2}{D_1} = 1.8$ AND $V = 7.6^{FPS}$

$K_c = 0.53$

FOR OPEN CHANNEL FLOW, USE TABLE 4.2*

$\frac{D_2}{D_1} \approx 1.5$

$\theta = 180°$

$K_c = 1.0$

* OPEN CHANNEL CONDITIONS EXIST

Designed by: Checked by:

The loss of head due to friction throughout the length of reach (L) is calculated by:

$$h_f = S_f L \tag{4.6}$$

where: h_f = Friction headloss, ft

L = Reach length, ft

Transition Losses - There are two types of pipe transitions that can occur in a storm drain system that would add headloss to the energy grade line. The transition types are expansion and contraction. Figure 4.6 shows the two types of transitions that can be encountered. The headloss due to the expansion of flow for a storm sewer *flowing under open channel conditions* is expressed as:

$$h_t = k_e\left(\frac{V_1^2}{2g} - \frac{V_2^2}{2g}\right) \tag{4.7}$$

where: h_t = Transition headloss, ft

k_e = Coefficient for transition loss due to expansion

V_1 = Upstream velocity, ft/sec

V_2 = Downstream velocity, ft/sec

g = Acceleration due to gravity, 32.2 ft/sec^2

Note: V_1 is greater than V_2

The values for the transition coefficient, k_e, for enlargements are given in Table 4.2.

The headloss due to the contraction of flow *under open channel flow conditions* is expressed as:

$$h_t = k_c\left(\frac{V_2^2}{2g} - \frac{V_1^2}{2g}\right) \tag{4.8}$$

contraction

where: k_c = Coefficient for transition loss due to construction

V_1 = Upstream velocity, ft/sec

V_2 = Downstream velocity, ft/sec

Note: V_2 is greater than V_1

Values for the transition loss coefficient, k_c, for contractions can also be found in Table 4.2.

FIGURE 4.6
TRANSITION LOSS

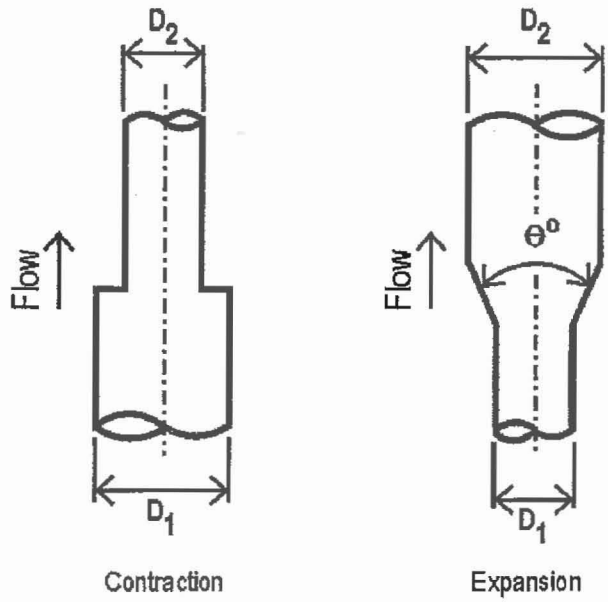


TABLE 4.2
STORM SEWER ENERGY LOSS COEFFICIENTS UNDER OPEN CHANNEL CONDITIONS
(ASCE, 1992)

(a) Contractions (K_c)		(b) Expansion (K_e)		
$\frac{D_2}{D_1}$	K_c	θ	$\frac{D_2}{D_1} = 3$	$\frac{D_2}{D_1} = 1.5$
0	0.5	10	0.17	0.17
0.4	0.4	20	0.40	0.40
0.6	0.3	45	0.86	1.06
0.8	0.1	60	1.02	1.21
1.0	0	90	1.06	1.14
		120	1.04	1.07
		180	1.00	1.00

Under pressure flow conditions, the headloss due to contraction and expansion of flow can be expressed as:

$$h = k\left(\frac{V^2}{2g}\right) \tag{4.9}$$

where: h = Headloss due to a contraction or expansion, ft

k = Coefficient for contraction (k_c) or coefficient for expansion (k_e), see below.

V = Velocity of flow in the smallest diameter pipe, ft/sec

The values for the transition coefficient, k_e, for gradual enlargements are given in Table 4.3a. For sudden enlargements, values for the transition coefficients are listed Table 4.3b. Values for the transition loss coefficient, k_c, for sudden contractions can be found in Table 4.4.

TABLE 4.3A
COEFFICIENT k_e FOR GRADUAL ENLARGEMENT UNDER PRESSURE FLOW CONDITIONS
(AISI, 1990)

	Angle of Cone, degrees													
D_2/D_1	2	4	6	8	10	15	20	25	30	35	40	45	50	60
1.1	.01	.01	.01	.02	.03	.05	.10	.13	.16	.18	.19	.20	.21	.23
1.2	.02	.02	.02	.03	.04	.09	.16	.21	.25	.29	.31	.33	.35	.37
1.4	.02	.03	.03	.04	.06	.12	.23	.30	.36	.41	.44	.47	.50	.53
1.6	.03	.03	.04	.05	.07	.14	.26	.35	.42	.47	.51	.54	.57	.61
1.8	.03	.04	.04	.05	.07	.15	.28	.37	.44	.50	.54	.58	.61	.65
2.0	.03	.04	.04	.05	.07	.16	.29	.38	.46	.52	.56	.60	.63	.68
2.5	.03	.04	.04	.05	.08	.16	.30	.39	.48	.54	.58	.62	.65	.70
3.0	.03	.04	.04	.05	.08	.16	.31	.40	.48	.55	.59	.63	.66	.71
∞	.03	.04	.05	.06	.08	.16	.31	.40	.49	.56	.60	.64	.67	.72

TABLE 4.3B
COEFFICIENT k_e FOR SUDDEN ENLARGEMENT UNDER PRESSURE FLOW CONDITIONS
(AISI, 1990)

	Velocity, V_1, ft/sec												
D_2/D_1	2	3	4	5	6	7	8	10	12	15	20	30	40
1.2	.11	.10	.10	.10	.10	.10	.10	.09	.09	.09	.09	.09	.08
1.4	.26	.26	.25	.24	.24	.24	.24	.23	.23	.22	.22	.21	.20
1.6	.40	.39	.38	.37	.37	.36	.36	.35	.35	.34	.33	.32	.32
1.8	.51	.49	.48	.47	.47	.46	.46	.45	.44	.43	.42	.41	.40
2.0	.60	.58	.56	.55	.55	.54	.53	.52	.52	.51	.50	.48	.47
2.5	.74	.72	.70	.69	.68	.67	.66	.65	.64	.63	.62	.60	.58
3.0	.83	.80	.78	.77	.76	.75	.74	.73	.72	.70	.69	.67	.65
4.0	.92	.89	.87	.85	.84	.83	.82	.80	.79	.78	.76	.74	.72
5.0	.96	.93	.91	.89	.88	.87	.86	.84	.83	.82	.80	.77	.75
10.0	1.00	.99	.96	.95	.93	.92	.91	.89	.88	.86	.84	.82	.80
∞	1.00	1.00	.98	.96	.95	.94	.93	.91	.90	.88	.86	.83	.81

TABLE 4.4
COEFFICIENT k_c FOR SUDDEN CONTRACTION UNDER PRESSURE FLOW CONDITIONS
(AISI, 1990)

	Velocity, V_2, ft/sec												
D_1/D_2	2	3	4	5	6	7	8	10	12	15	20	30	40
1.1	.03	.04	.04	.04	.04	.04	.04	.04	.04	.04	.05	.05	.06
1.2	.07	.07	.07	.07	.07	.07	.07	.08	.08	.08	.09	.10	.11
1.4	.17	.17	.17	.17	.17	.17	.17	.18	.18	.18	.18	.19	.20
1.6	.26	.26	.26	.26	.26	.26	.26	.26	.26	.25	.25	.25	.24
1.8	.34	.34	.34	.34	.34	.34	.33	.33	.32	.32	.31	.29	.27
2.0	.38	.38	.37	.37	.37	.37	.36	.36	.35	.34	.33	.31	.29
2.2	.40	.40	.40	.39	.39	.39	.39	.38	.37	.37	.35	.33	.30
2.5	.42	.42	.42	.41	.41	.41	.40	.40	.39	.38	.37	.34	.31
3.0	.44	.44	.44	.43	.43	.43	.42	.42	.41	.40	.39	.36	.33
4.0	.47	.46	.46	.46	.45	.45	.45	.44	.43	.42	.41	.37	.34
5.0	.48	.48	.47	.47	.47	.46	.46	.45	.45	.44	.42	.38	.35
10.0	.49	.48	.48	.48	.48	.47	.47	.46	.46	.45	.43	.40	.36
∞	.49	.49	.48	.48	.48	.47	.47	.47	.46	.45	.44	.41	.38

Junction Losses - A junction occurs where one or more lateral pipes enter the main storm drain, at a formed junction, prefabricated fitting or at a manhole. Multiple pipes coming together at a junction should flow together smoothly to avoid high headlosses. Figure 4.7A, 4.7B, and 4.7C show typical junctions in plan and profile.

Junction headloss for a single lateral can be determined by applying the Energy Equation and the Thompson Equation (California Department of Transportation, 1985).

The Energy Equation (Equation 4.1) at a junction (as displayed in Figure 4.7A through 4.7C) is expressed as:

$$V_1^2/2g + Y_1 + Z_1 = V_2^2/2g + Y_2 + Z_2 + headlosses \quad (4.1)$$

where:

$headlosses$	=	h_j (junction loss) + h_T (transition loss) + h_F (friction loss)
$V_1^2/2g$	=	Main line velocity head upstream of junction, ft
$V_2^2/2g$	=	Mainline velocity head downstream of junction, ft
Y_1	=	Upstream hydraulic gradient elevation measured from invert, ft
Y_2	=	Downstream hydraulic gradient elevation measured from invert, ft
Z_1	=	Elevation at location Z_1, ft
Z_2	=	Elevation at location Z_2, ft

FIGURE 4.7A
FORMED OR PREFAB STORM DRAIN JUNCTION

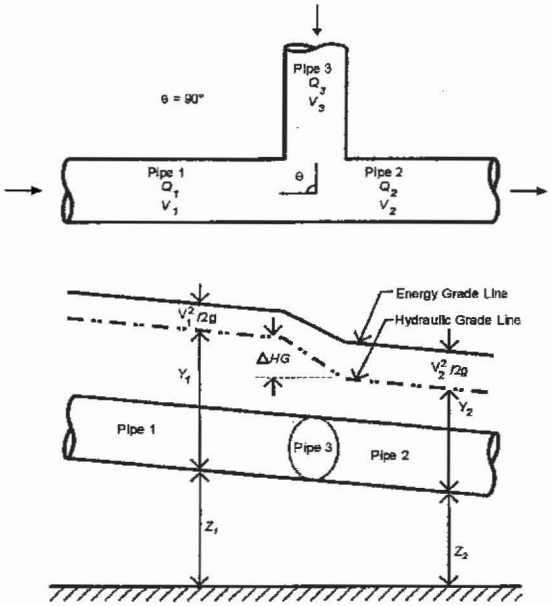


FIGURE 4.7B
STORM DRAIN JUNCTION AT MANHOLE WITH ALIGNED CROWNS UNDER PRESSURE FLOW

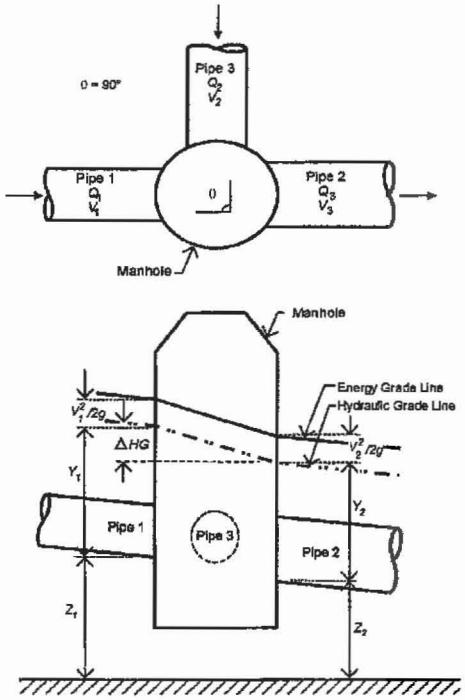
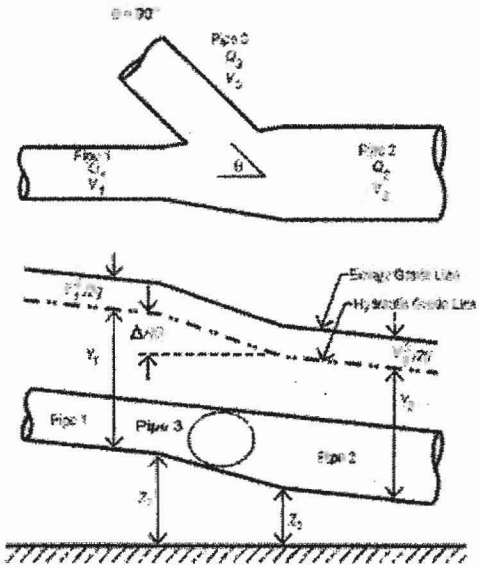


FIGURE 4.7C
FORMED STORM DRAIN JUNCTION WITH ALIGNED CROWNS UNDER PRESSURE FLOW



Equation 4.1 can be rewritten to solve for headlosses

$$V_1^2/2g - V_2^2/2g + Y_1 - Y_2 + Z_1 - Z_2 = headlosses$$

Substitute HG_1 for $Y_1 + Z_1$ and HG_2 for $Y_2 + Z_2$

$$V_1^2/2g - V_2^2/2g + HG_1 - HG_2 = headlosses$$

$$V_1^2/2g - V_2^2/2g + \Delta HG = headlosses$$

The Thompson Equation (Equation 4.10a), a form of the momentum equation, is used to determine the change in flow depth across a junction.

$$\Delta HG \times \frac{A_1 + A_2}{2} = \frac{Q_2 V_2 - Q_1 V_1 - Q_3 V_3 Cos\,\theta}{g} \qquad (4.10a)$$

or

$$\Delta HG = \frac{\left(\dfrac{Q_2 V_2 - Q_1 V_1 - Q_3 V_3 Cos\,\theta}{g}\right)}{\dfrac{A_1 + A_2}{2}}$$

where:

ΔHG	=	Difference in upstream and downstream hydraulic grade line elevations, ft
A_1	=	Upstream flow area, sq ft
A_2	=	Downstream flow area, sq ft
Q_1	=	Upstream flow rate, cfs
Q_2	=	Downstream flow rate, cfs
Q_3	=	Lateral flow rate, cfs
V_1	=	Upstream flow velocity, ft/sec
V_2	=	Downstream flow velocity, ft/sec
V_3	=	Lateral flow velocity, ft/sec
θ	=	Angle between lateral and main line storm drain (See Fig. 4.7), degrees

To determine junction headloss h_j, substitute the Thompson Equation into the rewritten Equation 4.1, assuming transition and friction losses at the junction are negligible.

$$\frac{2(Q_2V_2 - Q_1V_1 - Q_3V_3 Cos\,\theta)}{(A_1 + A_2)g} + V_1^2/2g - V_2^2/2g = h_j \qquad (4.10b)$$

Should friction losses be determined not to be negligible Equation 4.10c should be used.

$$\frac{(Q_2V_2 - Q_1V_1 - Q_3V_3 Cos\,\theta)}{(A_1 + A_2)g} + V_1^2/2g - V_2^2/2g + \left(\frac{S_{f1} + S_{f2}}{2}\right)L = h_j \qquad (4.10c)$$

where:

S_{f1}	=	Upstream friction slope, ft
S_{f2}	=	Downstream friction slope, ft/ft
L	=	Length of transition, ft

Should transition losses be determined not to be negligible but friction losses are negligible, then Equation 4.10d should be used for computing junction loss h_j.

$$h_j = \frac{2(Q_2V_2 - Q_1V_1 - Q_3V_3 Cos\,\theta)}{(A_1 + A_2)g} + V_1^2/2g - V_2^2/2g + k_{je}\left(\frac{V_1^2}{2g} - \frac{V_2^2}{2g}\right) \qquad (4.10d)$$

where:

k_{je} = Coefficient for transition loss due to expansion at a junction.

$k_{je} = 3.50 \times (\text{Tan}\ \theta / 2)^{1.22}$ (California Department of Transportation, 1985).

See Figure 4.7A through 4.7C for location of θ angle.

V_1 = Upstream velocity, ft/sec

V_2 = Downstream velocity, ft/sec

g = Acceleration due to gravity, 32.2 ft/sec^2

In situations where crowns at a junction are not matching, a pressure momentum approach for solving headloss is suggested. A pressure momentum approach is described in Appendix 4-A.

Straight-Through Manhole Losses (no laterals) - In a straight-through manhole where there is no change in pipe size or rate of flow, the loss can be estimated by:

$$h_{mh} = 0.05\left(\frac{V^2}{2g}\right) \tag{4.12}$$

where: h_{mh} = Headloss due to a manhole, ft

V = Velocity, ft/sec

Bend Losses at Manholes (no laterals) - The bend loss at a manhole is determined using Equation 4.11. The bend loss coefficient, k_b, can be determined using Figure 4.8.

$$h_{mh} = k_b\left(\frac{V^2}{2g}\right) \tag{4.11}$$

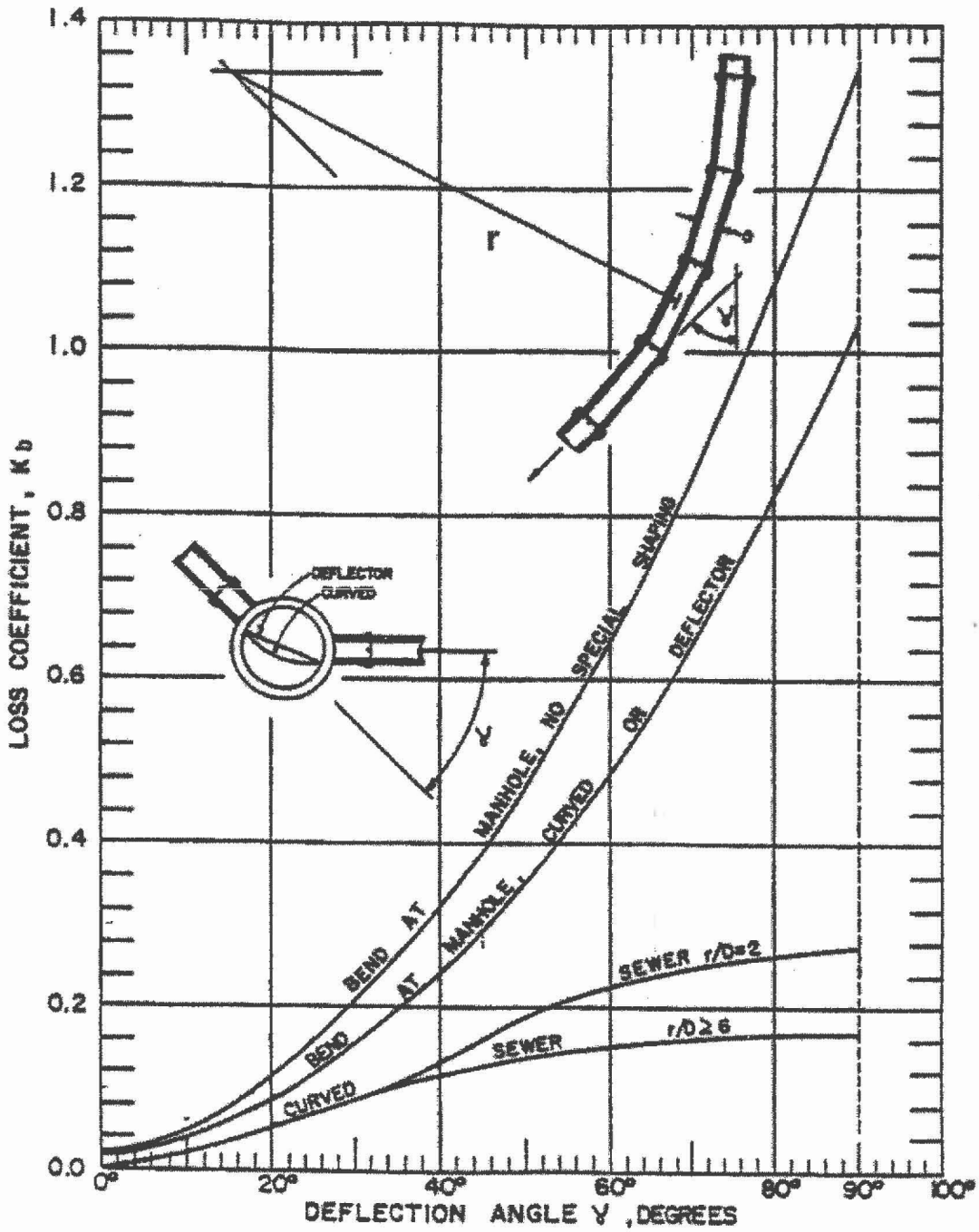
where: h_{mh} = Headloss due to a manhole, ft

k_b = Bend loss coefficient

V = Velocity, ft/sec

g = Acceleration due to gravity, 32.2 ft/sec^2

FIGURE 4.8
BEND LOSS COEFFICIENT
(AISI, 1990)



Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Ray Road to Elliot Road, MCDOT Project No. 68927-2
Drainage Design

Stantec Proj. No. 181740111

Date: 10/27/04 By: cvg
Date Checked: By: ~~cvg~~
Date Revised: ~~By:~~

Inlet capacity - drop inlet at station 284+09.64

based on modified mag 501-3 drop inlet headwall
assume weir flow Q = C L H ^1.5

Design Q (100-year-24 hour peak)	490	cfs
Clogging factor	50%	
Weir Coefficient "C"	3.00	

Roadway Elevation (approx)		
Ellsworth Road	1406.20	OK
Elliot Road	1405.49	OK
Water Surface Elevation	1404.53	

Headwall	Elev	1404.00	Length	10.00	Head	0.53	Flow	12	cfs	
Frontwall	Elev	1401.00	Length	34.00	Head	3.53	Flow	676	cfs	
Wingwalls	Avg Elev	1402.50	Length	34.00	Head	2.03	Flow	295	cfs	
							Total Flow	983	cfs	
							Clogged capacity	492	cfs	OK

Appendix C

Elliot Wash Culvert Calculations

Stantec

22 December 2004

HEC-RAS River: Elliot Wash Reach: Ellsworth Rd

Reach	River Sta	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Ellsworth Rd	2369.904	Ful-CIP	645	1410.00	1411.98		1412.07	0.015750	2.84	282.45	745.92	0.66
Ellsworth Rd	2369.904	Pre-CIP	1169	1410.00	1412.34	1412.04	1412.40	0.006211	2.46	589.30	946.12	0.45
Ellsworth Rd	2184.731	Ful-CIP	645	1409.50	1411.07	1410.61	1411.09	0.002506	1.11	553.96	980.41	0.26
Ellsworth Rd	2184.731	Pre-CIP	1169	1409.50	1411.10	1410.78	1411.16	0.007036	1.93	578.81	934.61	0.45
Ellsworth Rd	1938.622	Ful-CIP	645	1408.00	1409.71	1409.62	1409.85	0.016799	2.41	218.38	1006.32	0.65
Ellsworth Rd	1938.622	Pre-CIP	1169	1408.00	1410.02	1409.54	1410.07	0.003226	1.52	660.27	1178.81	0.31
Ellsworth Rd	1809.252	Ful-CIP	645	1407.00	1408.58	1408.52	1408.63	0.004763	1.34	381.81	689.27	0.35
Ellsworth Rd	1752.72	Ful-CIP	645	1402.51	1408.57	1405.60	1408.58	0.000222	1.02	909.67	852.21	0.14
Ellsworth Rd	1752.72	Pre-CIP	1169	1406.39	1408.32	1408.32	1408.60	0.027094	4.54	294.34	809.14	0.92
Ellsworth Rd	1672.385		Culvert									
Ellsworth Rd	1672.385	Pre-CIP	1169	1405.82	1407.36		1407.46	0.000722	2.83	474.32	529.59	0.45
Ellsworth Rd	1599.542	Ful-CIP	645	1402.43	1407.06	1405.51	1407.74	0.003834	6.63	97.22	696.70	0.54
Ellsworth Rd	1599.542	Pre-CIP	1169	1404.34	1407.29	1406.78	1407.35	0.003624	2.13	596.12	795.43	0.36
Ellsworth Rd	1415.562	Ful-CIP	645	1402.34	1406.13	1406.13	1406.56	0.007982	5.29	121.95	808.35	1.00
Ellsworth Rd	1415.562	Pre-CIP	1169	1404.32	1406.50	1406.12	1406.59	0.005372	1.50	536.44	1005.35	0.38
Ellsworth Rd	1205.355	Ful-CIP	645	1402.24	1405.00	1405.00	1405.06	0.003770	2.74	384.07	911.13	0.56
Ellsworth Rd	1205.355	Pre-CIP	1169	1403.00	1405.36	1405.05	1405.43	0.005963	1.56	599.86	1127.98	0.40
Ellsworth Rd	992.58	Ful-CIP	645	1401.00	1403.67	1403.60	1403.72	0.007276	2.22	371.86	905.15	0.50
Ellsworth Rd	992.58	Pre-CIP	1169	1401.00	1403.91	1403.60	1403.98	0.007624	2.29	592.62	1168.89	0.48
Ellsworth Rd	790.597	Ful-CIP	645	1401.00	1402.53	1402.30	1402.56	0.004609	1.74	504.71	1260.33	0.37
Ellsworth Rd	790.597	Pre-CIP	1169	1401.00	1402.72	1402.42	1402.76	0.004750	1.97	733.06	1374.06	0.39
Ellsworth Rd	584.278	Ful-CIP	645	1399.90	1401.14		1401.20	0.009717	1.94	328.38	848.59	0.50
Ellsworth Rd	584.278	Pre-CIP	1169	1399.90	1401.36		1401.44	0.008857	2.18	565.13	1144.89	0.50
Ellsworth Rd	347.123	Ful-CIP	645	1398.65	1399.69	1399.35	1399.74	0.004007	1.81	403.97	659.24	0.36
Ellsworth Rd	347.123	Pre-CIP	1169	1398.65	1399.98	1399.53	1400.04	0.004007	2.22	605.36	739.99	0.37

Appendix D

Miscellaneous Calculations

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Appendix D-1

Riprap

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22 December 2004

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Stantec

Ellsworth Rd – Ray Rd to Portobello Ave
181740111 task 102
Riprap Design – Elliot Wash Culvert Outlet

Proposed Culvert Data

Location: Ellsworth Sta 301+90.00 +/- (Ellsworth ~ 1/4 mi N of Elliot)
Type: 2-10'x5' CBC
Design Q: 645 cfs (100-yr, 6-hr)
WSEL @ outlet: 1407.06 (< existing WSEL @ dip is 1407.72)
Channel velocity: 6.6 fps @ HEC-RAS River Sta 1599.542 just d/s
Average velocity:
Flow depth: 4.63' (WSEL - invert of 1402.43)
Average flow depth:
Apron area: 6371.16 ft² (per AutoCAD delineation)
(~6400 ft²)

Riprap Design Data

- Method 1 – Section 6.6.3 (Riprap Lined Channels) from the "Drainage Design Manual for Maricopa County – Hydraulics," September 2003 (Draft)

Equations for Riprap Size (HEC-11 method):

$$d_{50} = \frac{0.001 V_a^3}{d_{avg}^{0.5} K_1^{1.5}} \quad \text{(Equation 6.33)}$$

Where: d_{50} = median rock size (feet);
V_a = average velocity in main channel (fps);
d_{avg} = average flow depth in main channel (feet); and
K_1 = bank angle correction factor.

$$K_1 = \left[1 - \frac{\sin^2\theta}{\sin^2\phi}\right]^{0.5} \quad \text{(Equation 6.34)}$$

Designed by: JAS 11-17-04 Checked by: RJB 12-17-04

Stantec

Ellsworth Rd
Elliot Wash Culvert Outlet
Riprap Design (continued)

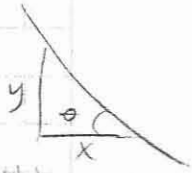
where: θ = bank angle with the horizontal; and
ϕ = riprap material's angle of repose.

* Alternatively, Figures 6.13 and 6.14 can be to determine K_1 and ϕ, respectively.

Using Figure 6.14 (see attached), the following ϕ value was determined:

for $D_{50} = 18'$ (1.5'), Angular Riprap,
$\phi = 41.3°$

Since Figure 6.13 (see attached) does not give K_1 values for slopes (θ) flatter than 3.5:1, Equation 6.34 was used to determine the following value for K_1:



Given: $\theta = 14.04°$ (4:1) or $9.46°$ (6:1) $= \tan^{-1}\left(\frac{y}{x}\right) * \frac{360}{2\pi}$
$\phi = 41.3°$

$$K_1 = \left[1 - \frac{\sin^2(14.04)}{\sin^2(41.3)}\right]^{0.5} \cong ?$$

∴ Assume worst-case? $\phi = 0.2$ → $d_{50} = 1.49$ (17.93")

Therefore, the resulting d_{50} is:

$$d_{50} = \frac{0.001(6.6)^3}{(4.63)^{0.5}(0.90)^{1.5}} \cong 0.16' \ (1.9")$$

☆ • Method 2 -- USBR EM25, Figure 165 (see attached)

Designed by: JAS 11-17-04 Checked by: RJR

Stantec

Ellsworth Rd – Ray Rd to Portobello Ave
181740111 task 102
Riprap Design – GM Channel Culverts

Proposed Culvert Data

Sta	Culvert Type	Design Q cfs	Velocity fps	Flow Depth (ft) Outlet/Inlet	Side Slopes (H:V)
179+00	2-42" RCP	95	4.94	3.50/5.34	4:1
182+50	2-42" RCP	95	4.94	3.50/5.57	4:1
201+10	2-42" RCP	95	6.54	2.47/3.50	4:1
203+20	2-42" RCP	90	5.13	3.01/3.58	4:1
207+60	2-42" RCP	68	5.93	2.02/2.84	4:1

Riprap Design

Evaluate for worst-case scenario of culverts.

★ • Method 1 – US Bureau of Reclamation EM-25: "Hydraulic Design of Stilling Basins and Energy Dissipators" – Section 11, Riprap Sizing

Using Figure 165 (see attached), for

$V_{max} \cong 6.5$ fps $\longrightarrow$ D_{50} (curve) $\geq$ 6"

• Method 2 – Flood Control District of Maricopa County "Drainage Design Manual – Hydraulics" – Equation 6.33

$$d_{50} = \frac{0.001\,(6.5)^3}{2.02^{0.5}\,(0.90)^{1.5}} \cong 0.23' \ (2.7")$$

V_{max} (.3746); d_{min} (1.421); (.8538)

Designed by: JAS 11-17-04 Checked by: RJB 12-17-04

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Ellsworth Rd
181740111 task 102
Riprap Design – Alternative method

Problem: Determine riprap size required downstream of Elliot Wash culvert

Method: US Army Corps of Engineers Engineer Manual
EM 1110-2-1601 (30 Jun 94) "Hydraulic
Design of Flood Control Channels"
(per recommendation in Section 6 of FCDMC manual)

Solution: Equation 3-2

$$D_{30} = S_f C_s C_v C_T d \left[\left(\frac{\gamma_w}{\gamma_s - \gamma_w} \right)^{1/2} \frac{V}{\sqrt{K_1 g d}} \right]^{2.5}$$

where S_f = safety factor = 1.1 (minimum);
C_s = stability coefficient for incipient failure
= 0.30 for angular rock;
C_v = vertical velocity distribution coefficient
= 1.25 downstream of circular channels;
C_T = thickness coefficient = 1.0
d = local depth of flow = 4.63' (from HEC-RAS)
γ_w / γ_s = unit weight of water/stone = 62.5 pcf / 135 pcf
V = local depth-averaged velocity = 7.74 ft/s (from HEC-RAS)
K_1 = side slope correction factor =
g = gravitational constant = 32.2 ft/s^2
D_{30} = riprap size of which 30 percent is finer by weight (ft)

$$\therefore D_{30} = (1.1)(0.30)(1.25)(1.0)(4.63) \left[\left(\frac{62.5}{135 - 62.5} \right)^{1/2} \frac{7.74}{\sqrt{(0.9)(32.2)(4.63)}} \right]^{2.5}$$

$$\cong 1.91 \left[(0.93) \frac{7.74}{11.58} \right]^{2.5}$$

$$\cong 0.58' \ (6.7")$$

Designed by: JAS 11-24-04 Checked by: RB 12-17-04

Stantec

Ellsworth Rd

Riprap Design (continued)

$D_{50} = D_{30} (D_{85}/D_{15})^{1/3}$

$\cong 0.58 (\quad)^{1/3}$

$\cong \quad (\quad ") \longrightarrow$ use $D_{50} =$

& thickness =

Or, using Plate B-29 "Stone Stability - Velocity vs Stone Diameter":

for $V = 7.14$ ft/s (low turbulence, $\gamma_s = 135$ pcf)

$V = C\left[2g\left(\frac{\gamma_s - \gamma_w}{\gamma_w}\right)\right]^{1/2} (D_{50})^{1/2}$

$7.14 = 1.20\left[2(32.2)\left(\frac{135-62.5}{62.5}\right)\right]^{1/2} (D_{50})^{1/2}$

$D_{50} \cong \left(\frac{7.14}{10.37}\right)^2$

$\cong 0.56'$ (6.7") $\longrightarrow$ use $D_{50} = 9"$

& thickness = 18"

Designed by: JAC 11-21-01 Checked by: DJP

Maricopa County Department of Transportation
Ellsworth Road Phase 2 - Ray Road to Elliot Road, MCDOT Project No. 68927-2
Drainage Design
Stantec Proj. No. 181740111

Date: 10/27/04 By: cvg
Date Checked: 11/17/04 By: JAS
Date Revised: By:

Inlet capacity - drop inlet at station 284+09.64

based on modified mag 501-3 drop inlet headwall
assume weir flow Q = C L H ^1.5

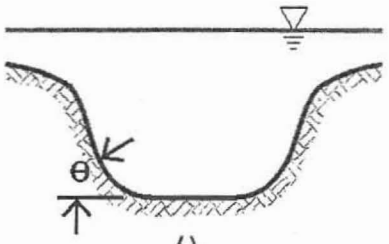
Design Q (100-year-24 hour peak)	490 cfs	→ Full CIP Condition
Clogging factor	50%	
Weir Coefficient "C"	3.00	

Roadway Elevation (approx)		
Ellsworth Road	1406.20	OK
Elliot Road	1405.49	OK
Water Surface Elevation	1404.53	

Headwall	Elev 1404.00	Length 10.00	* Head	0.53 = A	Q = Flow	12	cfs	→ V ≅ 2.264	
Frontwall	Elev 1401.00	Length 34.00	* Head	3.53 = A	Q = Flow	676	cfs	→ V ≅ 5.63 ft/s	
Wingwalls	Avg Elev 1402.50	Length 34.00	* Head	2.03 = A	Q = Flow	295	cfs	→ V ≅ 4.27	
					Total Flow	983	cfs		
					Clogged capacity (50%)	492	cfs	OK	

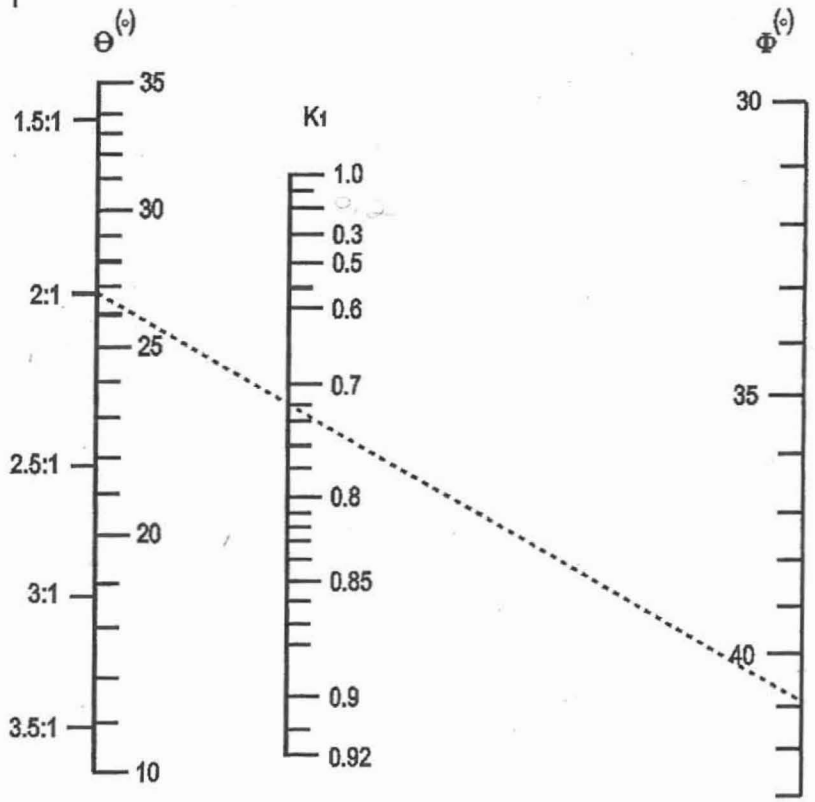
Side slopes (θ) = 4:1 (14.04°)
Flow depth = 1404.53 − 1401.00 ≅ 3.53 ft
Velocity = $\frac{Q}{A}$ =
↓
flow area = weir length * flow depth

FIGURE 6.13
BANK ANGLE CORRECTION FACTOR, K_1
(USDOT, FHWA, HEC-11, 1989)



$$K_1 = \left[1 - \frac{\sin^2\theta}{\sin^2\Phi}\right]^{0.5}$$

Θ = Bank Angle with Horizontal
Φ = Material Angle of Repose



Example

Given:	Find:	Solution:
θ = 2:1	K_1	K_1 = 0.73
Very angular		
Φ = 41°		

$\tan\theta = \frac{1}{2}$

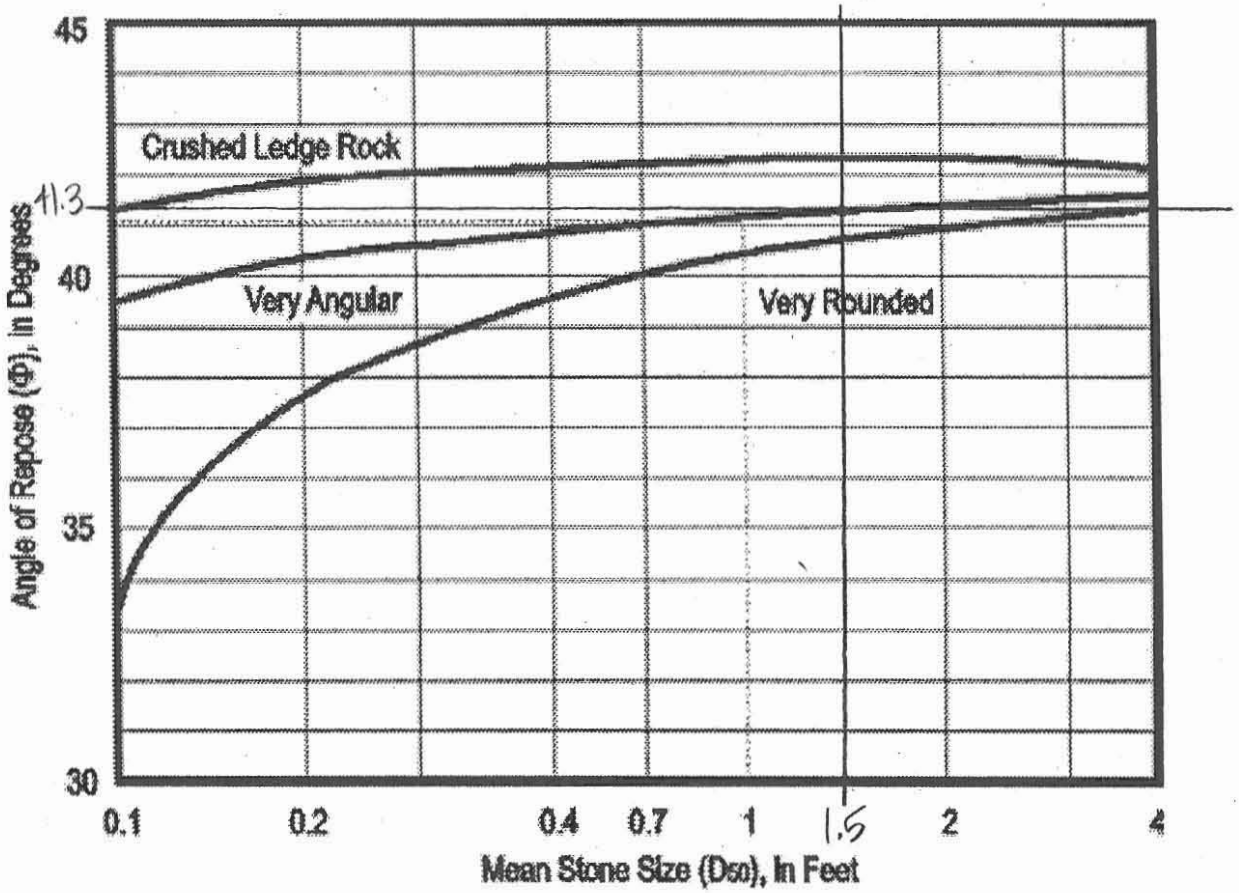
$\theta = \tan^{-1}(0.5)$

$\theta = 0.464\,rad \cdot \frac{360°}{2\pi\,rad} = 26.57°$

FIGURE 6.14

ANGLE OF REPOSE OF RIPRAP IN TERMS OF MEAN SIZE AND SHAPE OF STONE

(USDOT, FHWA, HEC-11, 1989)



Example D_{50}=1.0 ft., Angular Riprap
$\Phi = 41^{\circ}$

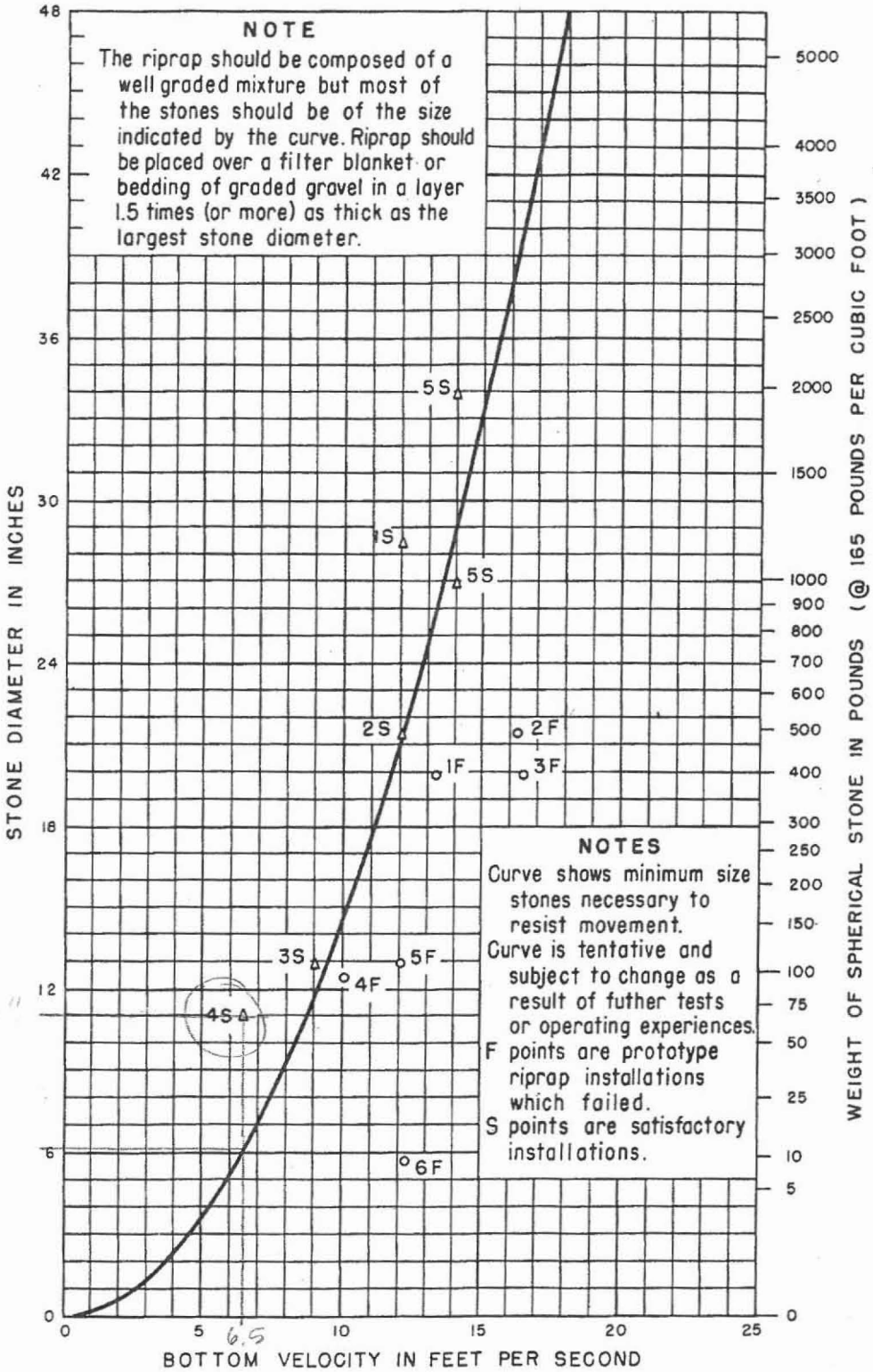
HEC-RAS output

Downstream

River Station feet	Discharge cfs	Minimum Channel Invert feet	Water Surface Elevation feet	Critical WSEL feet	Energy Gradeline Elevation feet	Energy Gradeline Slope feet/foot	Channel Velocity fps	Flow Area sq. feet	Top Width feet	Channel Froude Number
2369.904	645	1410.00	1411.98		1412.07	0.0158	2.8	282	746	0.66
2184.731	645	1409.50	1411.07	1410.61	1411.09	0.0025	1.1	554	980	0.26
1938.622	645	1408.00	1409.71	1409.62	1409.86	0.0168	2.4	218	1006	0.65
1809.252	645	1407.00	1408.58	1408.52	1408.63	0.0048	1.3	382	689	0.35
1752.720	645	1402.51	1408.57	1405.60	1408.58	0.0002	1.0	910	852	0.14
1672.385	**Culvert**	1.63 ft					7.74			
1599.542	645	1402.43	1407.06	1405.51	1407.74	0.0038	6.6	97	697	0.54
1415.562	645	1402.34	1406.13	1406.13	1406.56	0.0080	5.3	122	808	1.00
1205.355	645	1402.24	1405.00	1405.00	1405.06	0.0038	2.7	384	911	0.56
992.580	645	1401.00	1403.67	1403.60	1403.72	0.0073	2.2	372	905	0.50
790.597	645	1401.00	1402.53	1402.30	1402.56	0.0046	1.7	505	1260	0.37
584.278	645	1399.90	1401.14		1401.21	0.0097	1.9	328	849	0.50
347.123	645	1398.65	1399.69	1399.35	1399.74	0.0040	1.8	404	659	0.36

11-17-04

from USBR LM 03 (1709)



use 12"

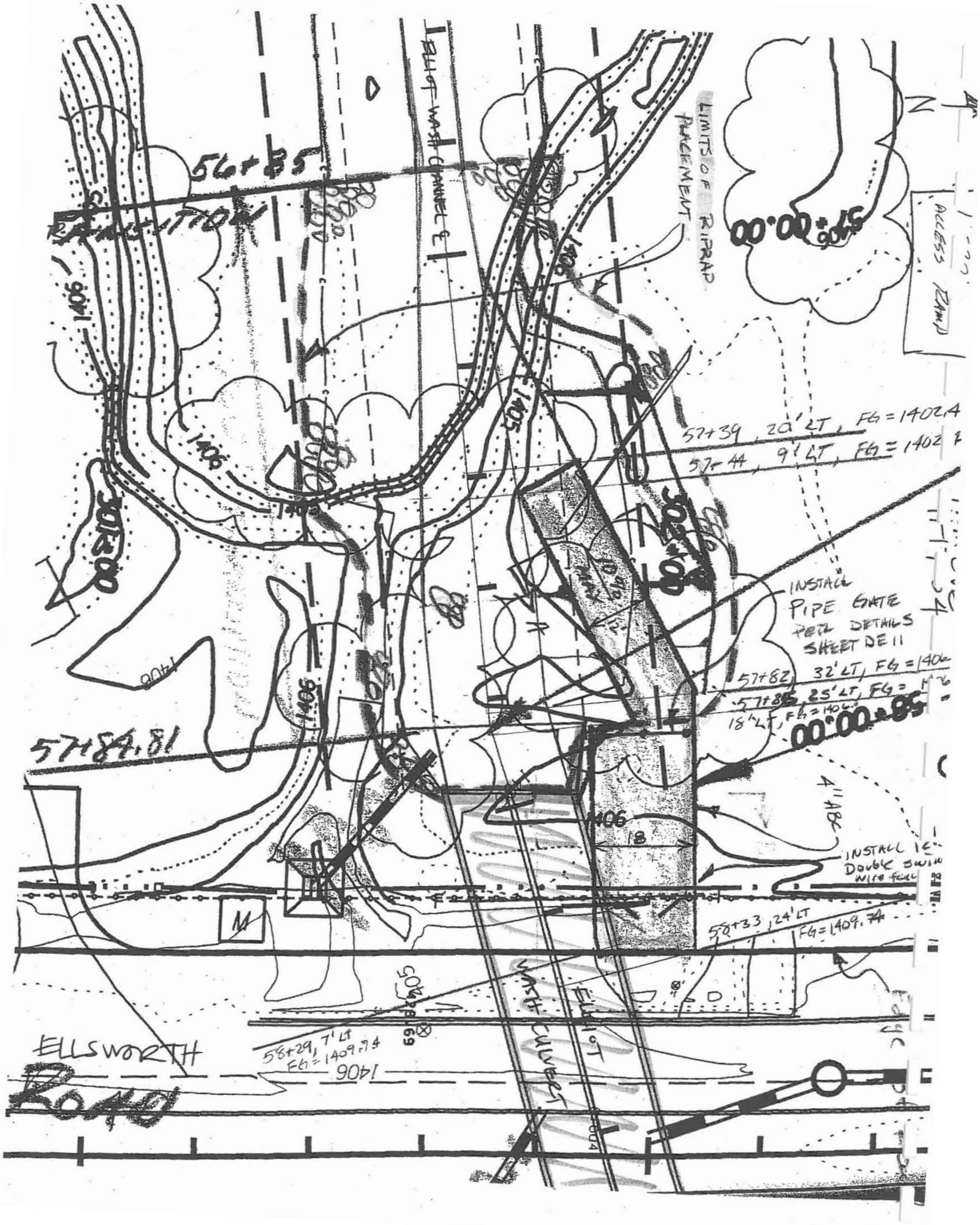
FIGURE 165.—*Curve to determine maximum stone size in riprap mixture.*

① ELLIOT WASH CULVERT OUTLET (& INLET) : $V \cong 6.6$ ft/s → $D_{50} \geq 6''$

② ELLIOT DRAIN 90" STUBOUT INLET : $V_{max} \cong 5.6$ ft/s → $D_{50} \geq 4.5''$

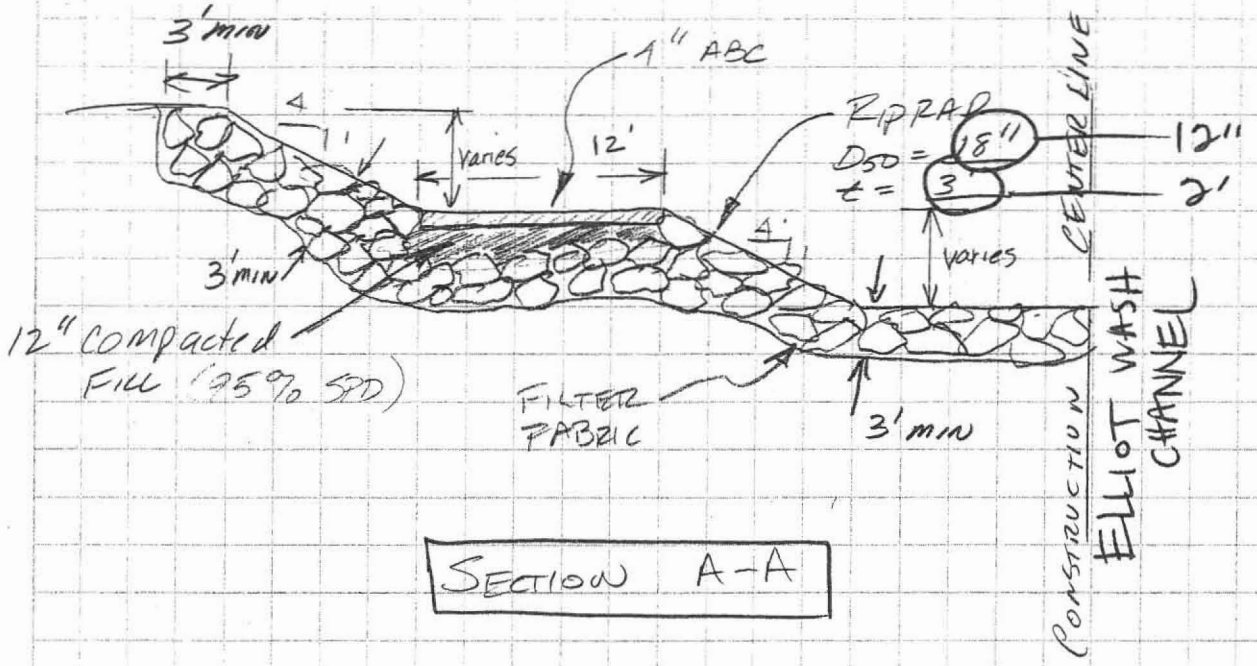
③ 6M CHANNEL CULVERTS (INLET & OUTLET): $V_{max} \cong 6.5$ ft/s → $D_{50} \geq 6''$

④


56+85
LIMITS OF RIPRAP PLACEMENT
ACCESS RAMP
57+39, 20' LT, FG = 1402.4
57+44, 9' LT, FG = 1402
INSTALL PIPE GATE PER DETAILS SHEET DE 11
57+82, 32' LT, FG = 1406
57+85, 25' LT, FG = 1406
18' LT, FG = 1406
57+84.81
4" ABC
INSTALL 16' DOUBLE SWING WIRE FENCE
58+33, 24' LT
FG = 1409.74
58+29, 7' LT
FG = 1409.74
ELLSWORTH ROAD
WASH CULVERT
1406

Stantec

Access Ramp Section
Elliot Wash Culvert / Channel
Ellsworth Rd 181740111 task 102



SECTION A-A

Designed by: CVG 11-17-04 Checked by: JAS ✓

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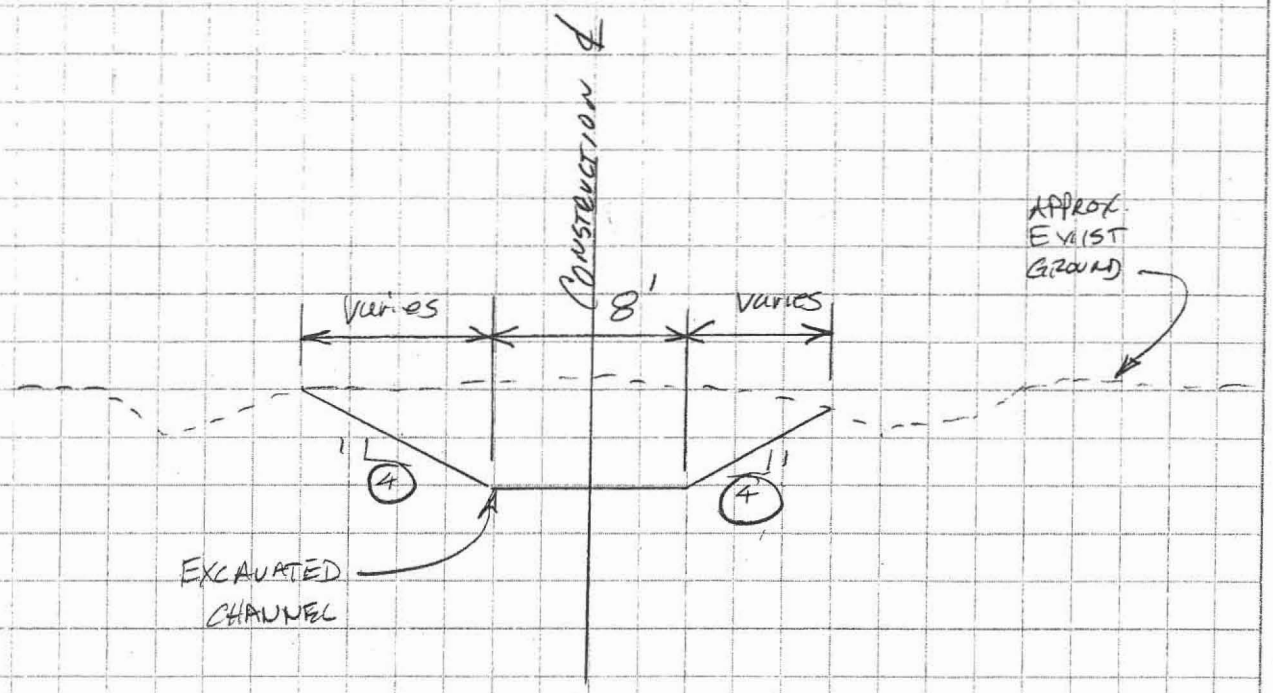
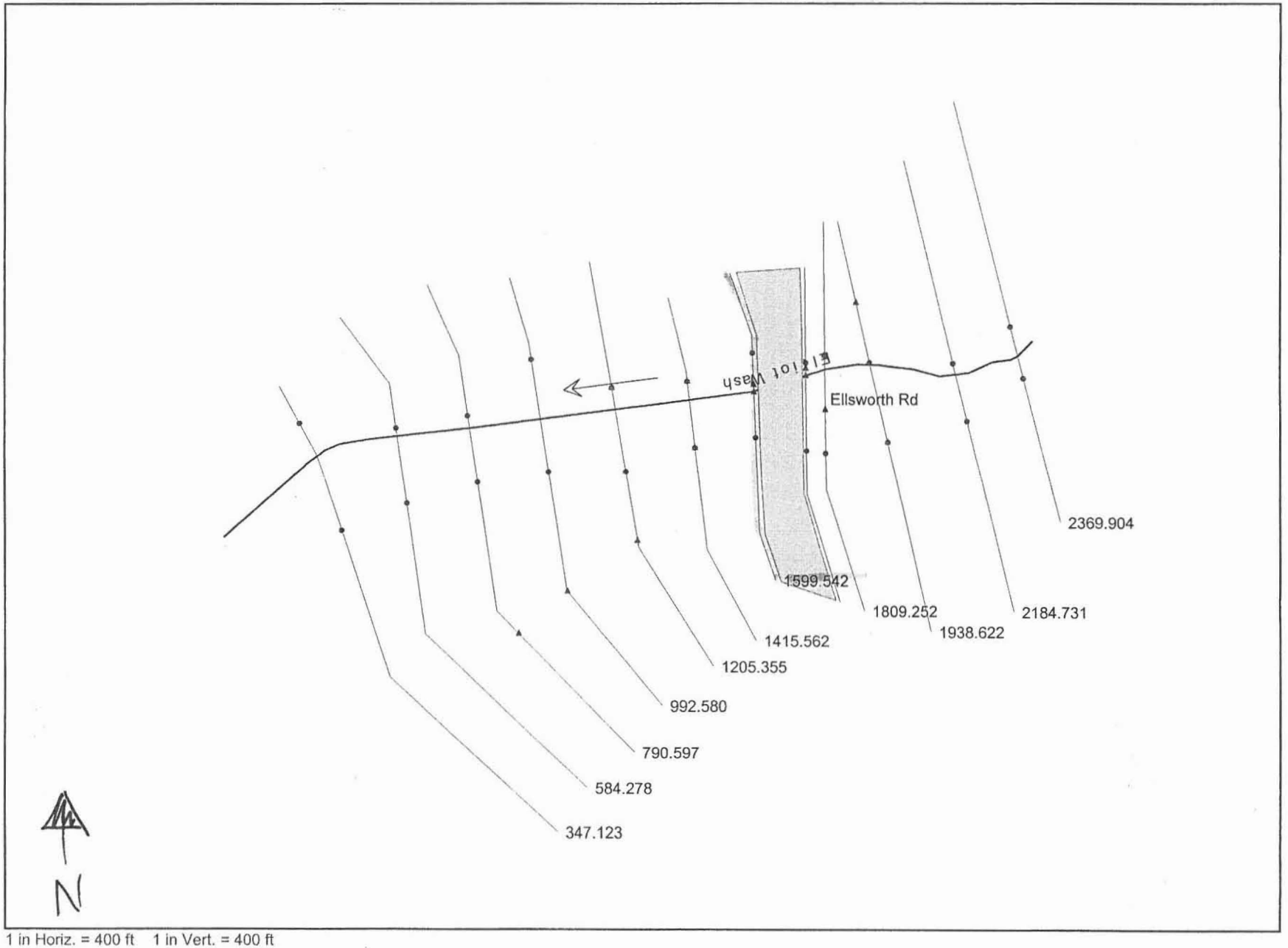
Channel Section
Elliot Wash Channel (d/s of culvert)
Ellsworth Rd 181740111 task 102



ELLIOT WASH CHANNEL
TYPICAL SECTION

Designed by: CVG 11-17-04 Checked by: JAS ✓



1 in Horiz. = 400 ft 1 in Vert. = 400 ft

Appendix D-2

Reinforced Concrete Pipe D-Loads

Stantec

22 December 2004

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PIPE D-LOAD CALCULATIONS

Assumptions		
Type 2 standard installation used in trench	Class I	D = 800
soil type is sandy silt - USCS type SM	Class II	D = 1000
earth load is 120 pcf granular backfill	Class III	D = 1350
ACPA Design Data 40 and Concrete Pipe Design Manual are used	Class IV	D = 2000
Assume wall "A"	Class V	D = 3000

$$B_{fv} = \frac{(B_{fe} - B_{f0})(B_d - B_c)}{(B_{dt} - B_c)}$$

$$D_{0.01} = \left[\frac{W_e}{B_{fv}} + \frac{W_L}{B_{fLL}}\right] x \left(\frac{FS}{D}\right)$$

$$W_E = C_d w B_d^2$$

W_E = Earth Load
W_L = Live Load (AASHTO HS20)
B_{fe} = Bedding Factor - Embankment (Table 4)
B_{dt} = Bedding Factor - Transition (width at top of pipe trench), ft
B_c = Pipe outside diameter, ft
B_{f0} = Bedding Factor - Minimum (Table 6)
C_d = Load Coefficient (Figure 4.4)
H = Depth of cover, ft

B_{fv} = Bedding Factor - Variable (calculated)
B_{fll} = Bedding Factor - Live Load (Table 7)
FS = Factor of Safety = 1.0
D = Pipe inside diameter, ft
$D_{0.01}$ = D-Load for 0.01" crack (calculated)
B_d = Trench width at top of pipe, ft
w = Unit weight of backfill = 120 pcf

Table references refer to those in Design Data 40. Figure references come from Concrete Pipe Design Manual. Figures and AASHTO HS20 Load table attached.

PIPE D-LOAD CALCULATIONS
Ellsworth Road Mainline

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
181+00.00	60	5.00	5.4	0.55	5053	900	2.90	8.00	5.83	2.00	8.75	1.21	2.20	1.00	5.00	916	II
184+00.00	60	5.00	4.3	0.45	4134	1118	2.90	7.83	5.83	2.00	8.75	1.31	2.20	1.00	5.00	732	I
189+00.00	60	5.00	2.6	0.32	2940	1904	2.90	7.83	5.83	2.00	8.75	1.31	2.20	1.00	5.00	621	I
190+47.46	60	5.00	2.2	0.29	2664	2134	2.90	7.83	5.83	2.00	8.75	1.31	2.00	1.00	5.00	619	I
195+75.63	60	5.00	2.8	0.33	3032	1792	2.90	7.83	5.83	2.00	8.75	1.31	2.20	1.00	5.00	625	I
198+67.75	60	5.00	3.7	0.41	3767	1316	2.90	7.83	5.83	2.00	8.75	1.31	2.20	1.00	5.00	694	I
203+76.28	60	5.00	4.6	0.49	4502	1046	2.90	7.83	5.83	2.00	8.75	1.31	2.20	1.00	5.00	781	I
208+00.00	60	5.00	5.4	0.55	5053	900	2.90	8.00	5.83	2.00	8.75	1.21	2.20	1.00	5.00	916	II
208+00.00	48	4.00	6.5	0.80	4704	625	2.90	8.00	4.67	2.00	7.00	0.63	2.20	1.00	4.00	1938	IV
208+32.28	48	4.00	4.1	0.55	3234	1018	2.90	6.67	4.67	2.00	7.00	1.05	2.20	1.00	4.00	887	II
213+47.32	48	4.00	5.0	0.65	3822	820	2.90	6.67	4.67	2.00	7.00	1.05	2.20	1.00	4.00	1005	II
218+68.98	48	4.00	2.5	0.35	2058	1990	2.90	6.67	4.67	2.00	7.00	1.05	2.20	1.00	4.00	717	I
218+68.98	42	3.50	3.0	0.45	2026	1360	2.90	6.08	4.08	2.00	6.13	0.92	2.20	1.00	3.50	806	I
220+33.02	42	3.50	2.3	0.36	1621	2272	2.90	6.08	4.08	2.00	6.13	0.92	2.20	1.00	3.50	798	I
222+20.00	42	3.50	2.5	0.38	1711	1840	2.90	6.08	4.08	2.00	6.13	0.92	2.20	1.00	3.50	770	I
226+69.50	42	3.50	3.0	0.45	2026	1360	2.90	6.08	4.08	2.00	6.13	0.92	2.20	1.00	3.50	806	I
228+99.21	42	3.50	3.4	0.51	2296	1278	2.90	6.08	4.08	2.00	6.13	0.92	2.20	1.00	3.50	879	II
232+91.08	42	3.50	4.0	0.61	2746	950	2.90	6.08	4.08	2.00	6.13	0.92	2.20	1.00	3.50	976	II

PIPE D-LOAD CALCULATIONS
Ellsworth Road Mainline

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
232+91.08	36	3.00	4.5	0.74	2448	765	2.90	5.58	3.50	2.00	5.25	0.76	2.20	1.00	3.00	1193	III
236+20.95	36	3.00	4.8	0.79	2613	708	2.90	5.58	3.50	2.00	5.25	0.76	2.20	1.00	3.00	1258	III
239+16.21	36	3.00	4.1	0.67	2216	842	2.90	5.58	3.50	2.00	5.25	0.76	2.20	1.00	3.00	1103	III
241+65.57	36	3.00	3.0	0.54	1786	1230	2.90	5.58	3.50	2.00	5.25	0.76	2.20	1.00	3.00	973	II
243+29.61	36	3.00	2.2	0.41	1356	2066	2.90	5.58	3.50	2.00	5.25	0.76	2.20	1.00	3.00	910	II
244+93.65	36	3.00	2.8	0.49	1621	1406	2.90	5.58	3.50	2.00	5.25	0.76	2.20	1.00	3.00	926	II
244+93.65	30	2.75	2.8	0.56	1323	1240	2.90	5.00	2.96	2.00	4.44	0.65	2.20	1.00	2.50	1037	III
247+71.22	30	2.75	3.5	0.70	1654	890	2.90	5.00	2.96	2.00	4.44	0.65	2.20	1.00	2.50	1177	III
250+54.67	30	2.75	4.0	0.78	1843	750	2.90	5.00	2.96	2.00	4.44	0.65	2.20	1.00	2.50	1267	III
250+54.67	24	2.50	4.0	0.88	1388	640	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1244	III
254+61.50	24	2.50	3.5	0.81	1277	760	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1184	III
259+43.68	24	2.50	3.1	0.75	1183	896	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1140	III
262+42.45	24	2.50	3.0	0.73	1151	930	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1123	III
267+70.55	24	2.50	4.2	0.93	1466	612	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1300	III
268+45.00	24	2.50	7.6	1.36	2145	300	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1766	IV
268+52.70	24	2.50	7.6	1.36	2145	300	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1766	IV
268+88.13	24	2.50	7.0	1.28	2018	330	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1673	IV
269+24.75	24	2.50	6.0	1.20	1892	400	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1589	IV
269+54.28	24	2.50	6.0	1.20	1892	400	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1589	IV
274+00.00	24	2.50	5.0	1.08	1703	500	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1462	IV
278+63.07	24	2.50	4.0	0.88	1388	640	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1244	III

PIPE D-LOAD CALCULATIONS
Ellsworth Road Mainline

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
280+17.27	24	2.50	3.0	0.73	1151	930	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1123	III
284+00.00	30	2.75	6.0	1.05	2481	480	2.90	5.00	2.96	2.00	4.44	0.65	2.20	1.00	2.50	1609	IV
284+00.00	30	2.75	6.0	1.05	2481	480	2.90	5.00	2.96	2.00	4.44	0.65	2.20	1.00	2.50	1609	IV
285+52.37	30	2.75	6.0	1.05	2481	480	2.90	5.00	2.96	2.00	4.44	0.65	2.20	1.00	2.50	1609	IV
288+37.48	30	2.75	6.0	1.05	2481	480	2.90	5.00	2.96	2.00	4.44	0.65	2.20	1.00	2.50	1609	IV
288+37.48	24	2.50	6.0	1.20	1892	400	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1589	IV
291+65.57	24	2.50	6.0	1.20	1892	400	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1589	IV
296+24.89	24	2.50	5.5	1.15	1813	450	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1538	IV
299+75.94	24	2.50	3.5	0.81	1277	760	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1184	III
302+00.00	24	2.50	5.0	1.08	1703	500	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1462	IV
302+31.84	24	2.50	4.9	1.06	1671	514	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1440	IV
303+13.86	24	2.50	4.8	1.02	1608	528	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1393	IV
304+77.91	24	2.50	4.6	1.00	1577	556	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1375	IV
307+00.00	24	2.50	4.2	0.91	1435	612	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1275	III
307+07.57	24	2.50	4.2	0.92	1451	612	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1288	III
310+00.00	24	2.50	3.9	0.86	1356	664	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1225	III
312+00.00	24	2.50	4.0	0.88	1388	640	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1244	III
315+00.00	24	2.50	4.2	0.91	1435	612	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1275	III
316+67.32	24	2.50	3.2	0.77	1214	862	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1157	III

PIPE D-LOAD CALCULATIONS
Elliot Road Mainline

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
15+35.00	24	2.50	11.5	1.78	2807	240	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	2277	V
16+00.00	24	2.50	11.5	1.78	2807	240	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	2277	V
16+00.00	24	2.50	6.0	1.20	1892	400	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1589	IV
20+69.37	24	2.50	7.0	1.29	2034	330	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1686	IV
23+14.36	24	2.50	7.0	1.27	2003	330	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1661	IV
26+13.00	24	2.50	8.5	1.48	2334	260	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1907	IV
28+55.98	24	2.50	8.5	1.48	2334	260	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1907	IV

PIPE D-LOAD CALCULATIONS
Elliot Road Connector Pipes and Cross Road Pipes

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
Left side connector pipe																	
16+00.00	18	2.00	3.5	0.96	871	620	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1148	III
16+00.00	18	2.00	7.0	1.50	1361	260	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1579	IV
right side connector pipe																	
16+00.00	18	2.00	3.5	0.96	871	620	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1148	III
16+00.00	18	2.00	7.0	1.50	1361	260	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1579	IV
Left side connector pipe																	
20+69.37	18	2.00	3.0	0.85	771	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1077	III
20+69.37	18	2.00	6.5	1.50	1361	290	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1588	IV
right side connector pipe																	
20+69.37	18	2.00	3.0	0.85	771	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1077	III
20+69.37	18	2.00	6.5	1.50	1361	290	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1588	IV
Left side connector pipe																	
28+55.98	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
28+55.98	18	2.00	8.6	1.75	1588	202	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1811	IV
right side connector pipe																	
28+55.98	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
28+55.98	18	2.00	8.6	1.75	1588	202	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1811	IV

PIPE D-LOAD CALCULATIONS
Elliot Road Connector Pipes and Cross Road Pipes

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
left side																	
32+45.20	18	2.00	4.0	1.10	998	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1258	III
center of road																	
32+45.20	18	2.00	4.0	1.10	998	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1258	III
right side																	
32+45.20	18	2.00	5.0	1.24	1125	400	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1361	III
left side																	
36+00.00	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
center of road																	
36+00.00	18	2.00	5.0	1.24	1125	400	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1361	III
right side																	
36+00.00	18	2.00	5.0	1.24	1125	400	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1361	III
90 inch lateral to Elliot Drain																	
281+74.00	90	7.50	4.0	0.33	6822	1310	2.90	10.75	8.75	2.00	13.13	1.97	2.20	1.00	7.50	541	I
283+20.00	90	7.50	3.2	0.28	5788	1434	2.90	10.75	8.75	2.00	13.13	1.97	2.20	1.00	7.50	479	I
283+90.00	90	7.50	2.0	0.18	3721	2330	2.90	10.75	8.75	2.00	13.13	1.97	2.20	1.00	7.50	393	I

PIPE D-LOAD CALCULATIONS
Ellsworth Road Connector Pipes

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
Left side connector pipe																	
184+07.99	18	2.00	6.0	1.40	1271	320	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1497	IV
184+07.99	18	2.00	7.0	1.55	1407	260	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1629	IV
right side connector pipe																	
184+07.99	18	2.00	7.0	1.55	1407	260	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1629	IV
184+07.99	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
Left side connector pipe																	
188+99.90	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
188+99.90	18	2.00	4.0	1.11	1007	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1268	III
right side connector pipe																	
188+99.90	18	2.00	3.5	1.00	908	620	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1188	III
188+99.90	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
Left side connector pipe																	
190+47.46	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
190+47.46	18	2.00	4.5	1.19	1080	460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1329	III
right side connector pipe																	
190+47.46	24	2.50	3.5	0.82	1293	760	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1196	III
190+47.46	24	2.50	1.0	0.32	505	3010	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1084	III

PIPE D-LOAD CALCULATIONS
Ellsworth Road Connector Pipes

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
Left side connector pipe																	
193+75.63	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
193+75.63	18	2.00	3.5	1.00	908	620	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1188	III
right side connector pipe																	
193+75.63	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
193+75.63	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
Left side connector pipe																	
198+67.75	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
198+67.75	18	2.00	4.0	1.11	1007	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1268	III
right side connector pipe																	
198+67.75	18	2.00	4.0	1.11	1007	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1268	III
198+67.75	18	2.00	2.5	0.79	717	1030	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
Left side connector pipe																	
203+76.28	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
203+76.28	18	2.00	4.5	1.19	1080	460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1329	III
right side connector pipe																	
203+76.28	24	2.50	4.5	1.19	1876	570	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1615	IV
203+76.28	24	2.50	2.0	0.50	788	1780	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1029	III

PIPE D-LOAD CALCULATIONS
Ellsworth Road Connector Pipes

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
Left side connector pipe																	
208+32.28	18	2.00	2.5	0.79	717	1030	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
208+32.28	18	2.00	5.5	1.32	1198	360	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1429	IV
right side connector pipe																	
208+32.28	24	2.50	5.0	1.08	1703	500	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1462	IV
208+32.28	24	2.50	3.0	0.73	1151	930	3.00	4.33	2.42	2.00	3.63	0.63	2.20	1.00	2.00	1123	III
Left side connector pipe																	
218+68.98	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
218+68.98	18	2.00	4.0	1.11	1007	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1268	III
right side connector pipe																	
218+68.98	18	2.00	4.0	1.11	1007	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1268	III
218+68.98	18	2.00	2.5	0.79	717	1030	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
Left side connector pipe																	
220+33.02	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
220+33.02	18	2.00	3.5	1.00	908	620	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1188	III
right side connector pipe																	
220+33.02	18	2.00	3.5	1.00	908	620	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1188	III
220+33.02	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III

PIPE D-LOAD CALCULATIONS
Ellsworth Road Connector Pipes

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
Left side connector pipe																	
222+20.00	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
222+20.00	18	2.00	4.5	1.19	1080	460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1329	III
right side connector pipe																	
222+20.00	18	2.00	4.0	1.11	1007	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1268	III
222+20.00	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
Left side connector pipe																	
226+69.50	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
226+69.50	18	2.00	4.0	1.11	1007	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1268	III
right side connector pipe																	
226+69.50	18	2.00	5.0	1.25	1134	400	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1371	IV
226+69.50	18	2.00	2.5	0.79	717	1030	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
Left side connector pipe																	
232+91.08	18	2.00	2.5	0.79	717	1030	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
232+91.08	18	2.00	5.0	1.25	1134	400	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1371	IV
right side connector pipe																	
232+91.08	18	2.00	5.0	1.25	1134	400	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1371	IV
232+91.08	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III

PIPE D-LOAD CALCULATIONS
Ellsworth Road Connector Pipes

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
Left side connector pipe																	
241+65.57	18	2.00	2.5	0.79	717	1030	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
241+65.57	18	2.00	4.0	1.11	1007	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1268	III
right side connector pipe																	
241+65.57	18	2.00	4.5	1.19	1080	460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1329	III
241+65.57	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
Left side connector pipe																	
243+29.61	18	2.00	2.5	0.79	717	1030	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
243+29.61	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
right side connector pipe																	
243+29.61	18	2.00	3.5	1.00	908	620	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1188	III
243+29.61	18	2.00	2.5	0.79	717	1030	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
Left side connector pipe																	
244+93.65	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
244+93.65	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
right side connector pipe																	
244+93.65	18	2.00	4.0	1.11	1007	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1268	III
244+93.65	18	2.00	2.5	0.79	717	1030	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III

PIPE D-LOAD CALCULATIONS
Ellsworth Road Connector Pipes

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
Left side connector pipe																	
250+54.67	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
250+54.67	18	2.00	5.0	1.25	1134	400	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1371	IV
right side connector pipe																	
250+54.67	18	2.00	5.0	1.25	1134	400	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1371	IV
250+54.67	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
Left side connector pipe																	
254+61.50	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
254+61.50	18	2.00	3.5	1.00	908	620	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1188	III
right side connector pipe																	
254+61.50	18	2.00	4.0	1.11	1007	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1268	III
254+61.50	18	2.00	2.5	0.79	717	1030	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
Left side connector pipe																	
259+43.68	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
259+43.68	18	2.00	3.5	1.00	908	620	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1188	III
right side connector pipe																	
259+43.68	18	2.00	4.0	1.11	1007	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1268	III
259+43.68	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III

PIPE D-LOAD CALCULATIONS
Ellsworth Road Connector Pipes

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
Left side connector pipe																	
264+42.45	18	2.00	2.5	0.79	717	1030	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
264+42.45	18	2.00	3.5	1.00	908	620	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1188	III
right side connector pipe																	
264+42.45	18	2.00	3.5	1.00	908	620	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1188	III
264+42.45	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
Left side connector pipe																	
267+70.55	18	2.00	3.5	1.00	908	620	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1188	III
267+70.55	18	2.00	4.5	1.19	1080	460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1329	III
right side connector pipe																	
267+70.55	18	2.00	5.0	1.25	1134	400	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1371	IV
267+70.55	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
Left side connector pipe																	
269+54.28	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
269+54.28	18	2.00	6.0	1.40	1271	320	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1497	IV
right side connector pipe																	
269+54.28	18	2.00	6.0	1.40	1271	320	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1497	IV
269+54.28	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III

PIPE D-LOAD CALCULATIONS
Ellsworth Road Connector Pipes

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
Left side connector pipe																	
278+63.07	18	2.00	3.5	1.00	908	620	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1188	III
278+63.07	18	2.00	4.0	1.11	1007	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1268	III
right side connector pipe																	
278+63.07	18	2.00	4.5	1.19	1080	460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1329	III
278+63.07	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
Left side connector pipe																	
280+17.27	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
280+17.27	18	2.00	3.5	1.00	908	620	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1188	III
right side connector pipe																	
280+17.27	18	2.00	4.0	1.11	1007	520	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1268	III
280+17.27	18	2.00	2.0	0.66	599	1460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III
Left side connector pipe																	
285+52.37	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
285+52.37	18	2.00	6.0	1.40	1271	320	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1497	IV
right side connector pipe																	
285+52.37	18	2.00	6.5	1.48	1343	290	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1568	IV
285+52.37	18	2.00	2.5	0.79	717	1030	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III

PIPE D-LOAD CALCULATIONS
Ellsworth Road Connector Pipes

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
Left side connector pipe																	
291+65.57	18	2.00	4.5	1.19	1080	460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1329	III
291+65.57	18	2.00	6.5	1.48	1343	290	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1568	IV
right side connector pipe																	
291+65.57	18	2.00	6.5	1.48	1343	290	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1568	IV
291+65.57	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
Left side connector pipe																	
299+75.94	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
299+75.94	18	2.00	6.5	1.48	1343	290	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1568	IV
right side connector pipe																	
299+75.94	18	2.00	6.5	1.48	1343	290	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1568	IV
299+75.94	18	2.00	5.0	1.25	1134	400	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1371	IV
Left side connector pipe																	
303+13.86	18	2.00	2.4	0.77	699	1150	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1118	III
303+13.86	18	2.00	5.1	1.27	1153	392	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1389	IV
right side connector pipe																	
303+13.86	18	2.00	5.1	1.27	1153	392	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1389	IV
303+13.86	18	2.00	2.5	0.79	717	1030	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III

PIPE D-LOAD CALCULATIONS
Ellsworth Road Connector Pipes

Station	Pipe Size	Wall Thick.	Depth of Cover	C_d	W_E	W_L	B_{fe}	B_{dt}	B_c	B_{f0}	B_d	B_{fv}	B_{fll}	FS	D	$D_{0.01}$	Min. Class
Left side connector pipe																	
307+07.57	18	2.00	2.3	0.73	662	1202	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1094	III
307+07.57	18	2.00	4.5	1.19	1080	460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1329	III
right side connector pipe																	
307+07.57	18	2.00	4.5	1.19	1080	460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1329	III
307+07.57	18	2.00	2.9	0.87	790	806	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1114	III
Left side connector pipe																	
312+00.00	18	2.00	3.0	0.88	799	750	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1107	III
312+00.00	18	2.00	4.5	1.19	1080	460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1329	III
right side connector pipe																	
312+00.00	18	2.00	4.5	1.19	1080	460	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1329	III
312+00.00	18	2.00	2.5	0.79	717	1030	3.10	3.50	1.83	2.00	2.75	0.61	2.20	1.00	1.50	1102	III

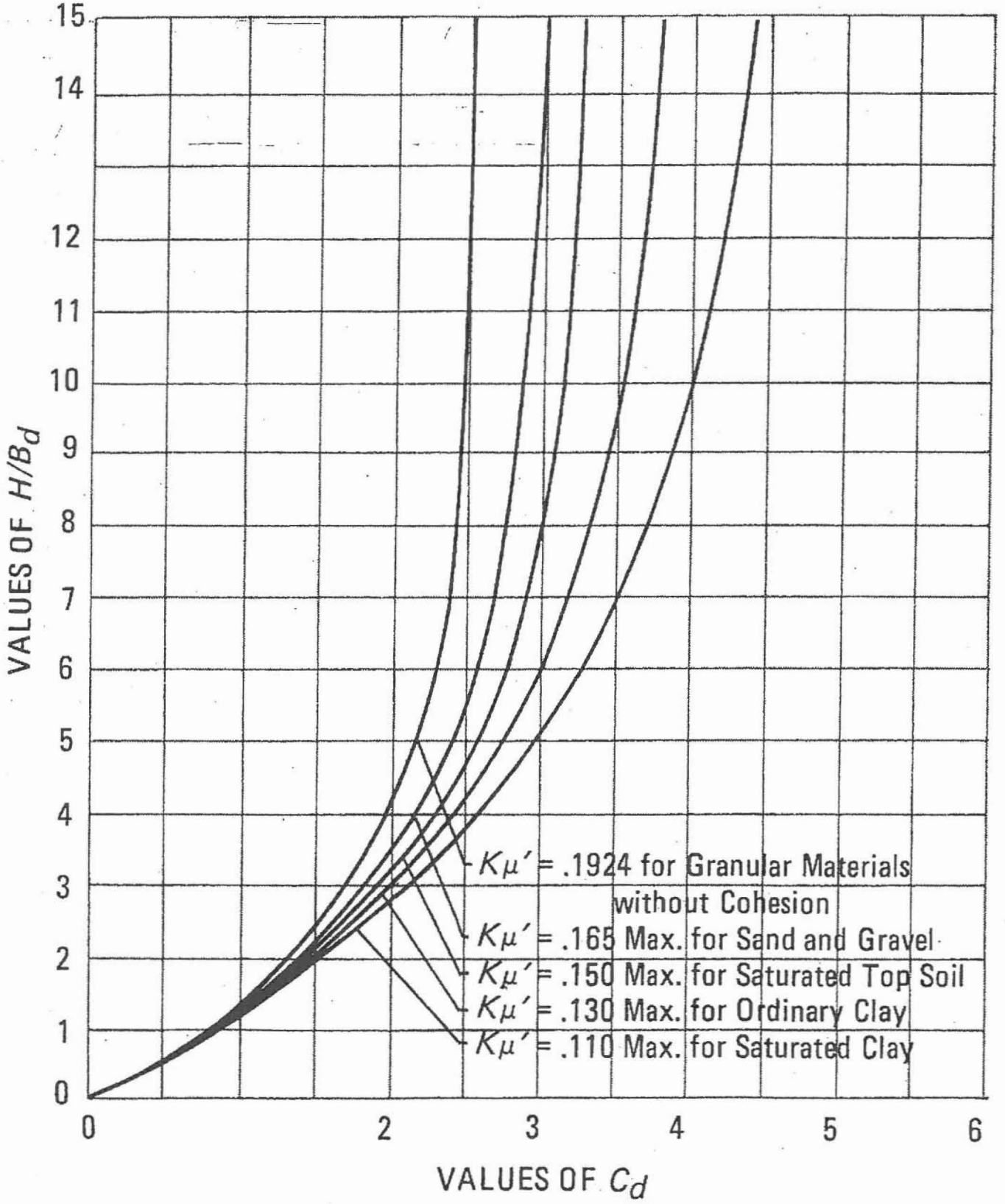

Figure 4.4. Load Coefficient for Trench Installations.

HIGHWAY LOADS ON CIRCULAR PIPE

POUNDS PER LINEAR FOOT

PIPE SIZE D IN INCHES	B_c (ft.)	HEIGHT OF FILL H ABOVE TOP OF PIPE IN FEET													
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0	7.0	8.0	9.0	
12	1.33	3780	2080	1470	1080	760	550	450	380	290	230	190	160	130	12
15	1.63	4240	2360	1740	1280	900	660	540	450	350	280	230	190	160	15
18	1.92	4110	2610	1970	1460	1030	750	620	520	400	320	260	220	190	18
21	2.21	3920	2820	2190	1620	1150	840	690	580	450	360	300	250	210	21
24	2.50	4100	3010	2400	1780	1270	930	760	640	500	400	330	280	240	24
27	2.79	3880	2940	2590	1930	1380	1010	830	700	560	440	360	300	260	27
30	3.08	3620	2830	2770	2070	1480	1080	890	750	590	480	390	330	280	30
33	3.38	3390	2930	2950	2200	1580	1160	960	810	630	510	420	360	300	33
36	3.67	3190	2810	2930	2330	1670	1230	1020	860	670	550	450	380	330	36
39	3.96	3010	2670	2850	2440	1760	1290	1070	910	710	580	480	410	350	39
42	4.25	2860	2550	2770	2560	1840	1360	1130	950	750	610	510	430	370	42
48	4.83	2590	2330	2620	2480	1990	1470	1230	1040	820	670	560	470	410	48
54	5.42	2360	2150	2490	2360	2050	1580	1320	1120	890	730	610	520	440	54
60	6.00	2170	1990	2450	2250	1960	1680	1400	1190	950	780	650	560	480	60
66	6.58	2010	1850	2520	2160	1880	1640	1480	1260	1010	830	700	590	510	66
72	7.17	1870	1730	2580	2190	1810	1570	1510	1330	1060	880	740	630	540	72
78	7.75	1750	1630	2630	2240	1770	1520	1460	1390	1110	920	780	660	570	78
84	8.33	1650	1540	2730	2290	1810	1460	1410	1360	1160	960	810	690	600	84
90	8.92	1550	1460	2530	2330	1850	1470	1360	1310	1210	1000	850	720	630	90
96	9.50	1470	1380	2410	2290	1880	1500	1330	1270	1250	1040	880	750	650	96
102	10.08	1390	1320	2300	2190	1910	1530	1350	1240	1290	1070	910	780	680	102
108	10.67	1320	1260	2200	2090	1830	1560	1380	1230	1330	1110	940	810	700	108
114	11.25	1260	1200	2110	2010	1760	1540	1410	1260	1362	1140	970	830	730	114
120	11.83	1210	1150	2020	1930	1700	1480	1420	1280	1400	1170	990	860	750	120
126	12.42	1160	1100	1940	1860	1640	1430	1380	1300	1430	1200	1020	880	770	126
132	13.00	1110	1060	1870	1800	1580	1380	1330	1290	1460	1220	1040	900	790	132
138	13.58	1070	1020	1800	1730	1530	1340	1290	1250	1490	1250	1070	920	810	138
144	14.17	1020	980	1740	1670	1480	1300	1250	1210	1470	1280	1090	940	830	144

Appendix E
Digital Files

Stantec

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