ATKINS

City of Chula Vista

Telegraph Canyon Channel Nexus Study (DR203)

November 24, 2015

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City of Chula Vista

Telegraph Canyon Channel Nexus Study

DR 203

November 24, 2015

Prepared for:
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Abbreviations

AF	acre-feet
cfs	cubic feet per second
CIP	Capital Improvements Program
DIF	Drainage Basin Development Impact Fee
FIS	Flood Insurance Study
HEC-HMS	HEC-Hydrology Modeling System
HEC-RAS	US Army Corps Hydrologic Engineering Center's River Analysis System
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Services
PDS	Partial Duration Series
PF	precipitation frequency
PZN	Precipitation Zone Number
SDCHM	San Diego County Hydrology Manual
TRWE	Tory R Walker Engineering

1.0 Executive Summary

The Telegraph Canyon Drainage Basin Development Impact Fee (DIF) was established to fund the construction of the required drainage facilities within the Telegraph Canyon Basin to accommodate the surface and storm water runoff resulting from development of properties within the basin. The Telegraph Canyon Nexus Study (Study) identifies flood control projects that will alleviate flooding and establishes the reasonable relationship between the use of the DIF for construction of the planned drainage facilities and the development of the property within the DIF Study areas.

Hydrology and preliminary hydraulic analysis was performed for the Telegraph Canyon Basin. Analysis identified the Telegraph Canyon channel in the vicinity of the intersection of Third Avenue and L Street and the reach from Country Club Drive/K Street to Hilltop Park deficient because the reaches do not efficiently convey the 100-year peak flows. The Rick Engineering Telegraph Canyon Channel Erosion and Assessment West of Paseo Ladera dated June 2015 and July 2015 identified the area around the Paseo Ladera crossing as having scour potential.

The Study recommends drainage facilities needed to transport the storm water runoff and address the deficiencies. The additional facilities are known as Third Avenue and L Street, First Avenue and Country Club Drive, and Hilltop Park. High velocities and scour along the south bank downstream of the Paseo Ladera crossing have been addressed with the construction of the Secant Wall or Telegraph Canyon Channel Erosion Project. This section of the channel was deemed deficient per the Rick Engineering study dated June 2015 and July 2015 and as reviewed by Atkins.

The Secant Wall was completed in September 2015. The final cost is $1,678,118. The Study confirms the reasonable relationship between the use of the fee for the construction of the Secant Wall and the development of properties within the basin. Planning level cost estimates have been established for the DIF facilities recommended that have not been constructed. The DIF facilities at 3rd and L are estimated at $5.7 million, 1st & Country Club area at $2.2 million, and Hilltop Park at $1.4 million.

Based on the findings of the technical analysis and planning level cost estimates, future appropriations from the Telegraph Canyon DIF Fund and other funding sources will be needed to fund all Capital Improvement Programs (CIP) projects identified in this study. The available funds of approximately $5.2 million in the Telegraph Canyon Drainage Basin DIF will be used to cover the costs of the most critical identified DIF facilities. Due to the limited number of acres remaining to pay into the DIF, it is anticipated that other funding sources (Gas Tax, Transnet, grants, etc) will be needed to complete all CIP projects identified in this study.

2.0 Introduction

This Study is a hydrology and hydraulic engineering evaluation that identifies potential improvements within the Telegraph Canyon Channel that will contribute to the Telegraph Canyon Drainage Basin Development Impact Fee (DIF). The Telegraph Canyon Drainage Basin DIF was established on July 17, 1990, by Ordinance No. 2384 to fund the construction of the required drainage facilities within the Telegraph Canyon Basin. These improvements were necessary to accommodate the surface and storm water runoff resulting from development of properties within the basin. The DIF benefit area consists of Rancho Del Rey Specific Plan, Otay Ranch, and a portion of Rolling Hills and Eastlake, all of which are nearly built out.

The Study is for the Telegraph Canyon Channel located within the City of Chula Vista within the Telegraph Canyon basin, see Figure 1. The Telegraph Canyon Drainage Basin is defined as the area served by the Telegraph Canyon Channel, an 8-mile drainage channel that begins just east of State Route 125 and ultimately ties into a Trapezoidal Drainage Channel just west of Interstate 5 near L Street. The Telegraph Canyon Channel consists of natural channels and manmade drainage facilities.

The Study identifies flood control projects to alleviate flooding issues in two specific locations of the Telegraph Canyon Channel. The first Study area, DIF Study East, is for the stretch of the Telegraph Canyon Channel between Apache Drive upstream and Paseo Ladera downstream, see Figure 2. The second Study Area, DIF Study West, is for the stretch of the Telegraph Canyon Channel between east of Hilltop Drive, south of Telegraph Canyon Road upstream and east of Fourth Avenue downstream, see Figure 3.

This Study serves as an asset management document that establishes the reasonable relationship between the use of the DIF funds for the construction of the planned drainage facilities and the development of the property within the DIF Study Areas. A supplemental Study will be provided that is based on refinements of the preliminary hydraulics and that will assess environmental considerations as a result of resource agency interactions.

This Study is organized to provide an overview of the technical analysis performed to identify deficiencies and present facility recommendations and associated costs.

3.0 Precipitation Technical Analysis

Tory R Walker Engineering, TRWE, as a sub-consultant to Atkins North America, Inc., conducted a precipitation technical analysis to determine the most appropriate methodology to evaluate the Telegraph Canyon watershed. The analysis consisted of three precipitation distribution methods: the San Diego County Hydrology Manual (SDCHM) Method, the TRWE Method, and the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Method. Other methods considered, but not evaluated further, included the older NRCS Type 1 and the County Type B distributions.

The results of the precipitations technical analysis were reviewed in consultation with the City of Chula Vista and concurrence was made that the NOAA Atlas 14 method provides intermediate results in comparison with the SDCHM and San Diego precipitation gauges and improves upon current estimates based upon the SDCHM. The technical memorandum that provides the results of the precipitation technical analysis is included as Appendix A.

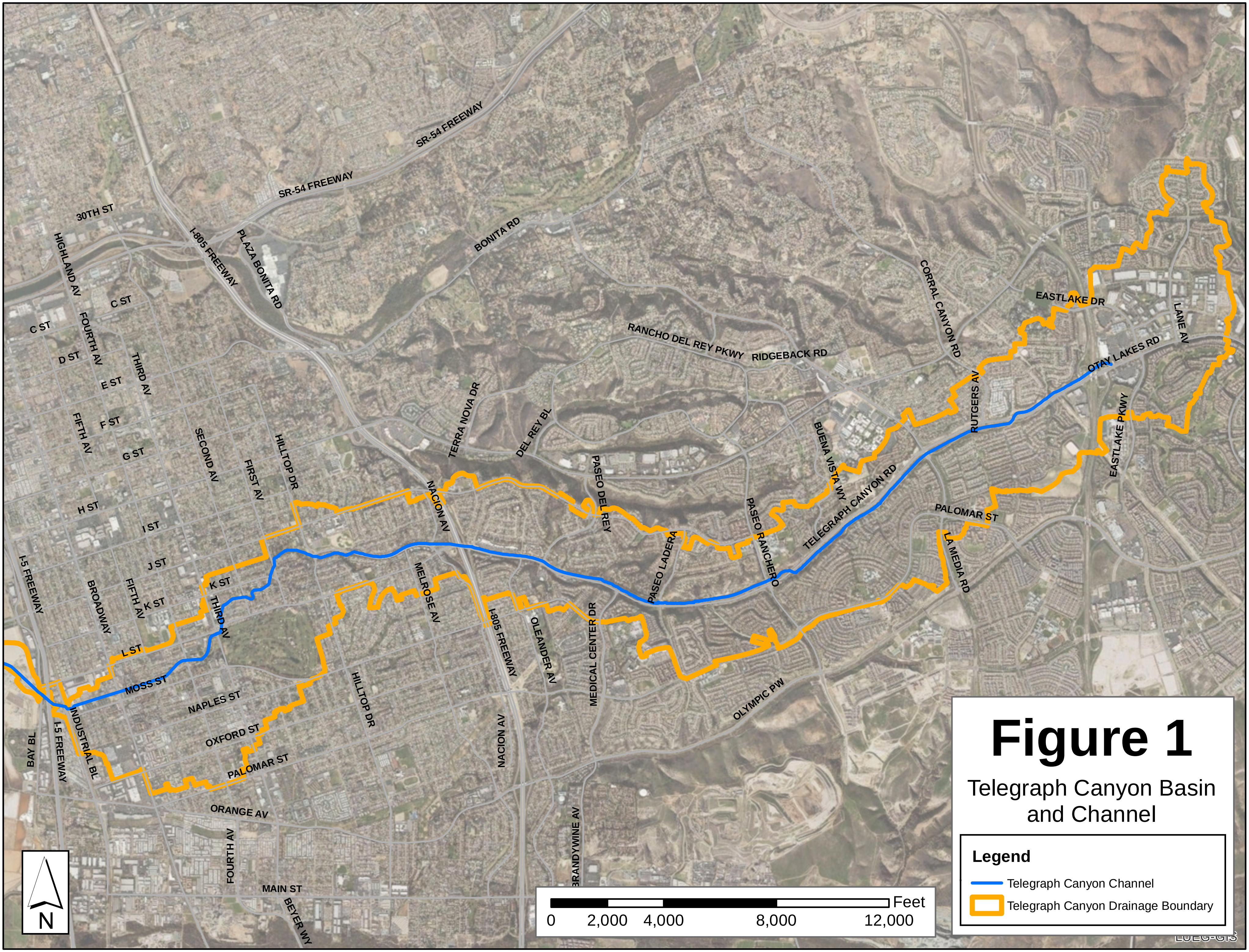

Figure 1

Telegraph Canyon Basin and Channel

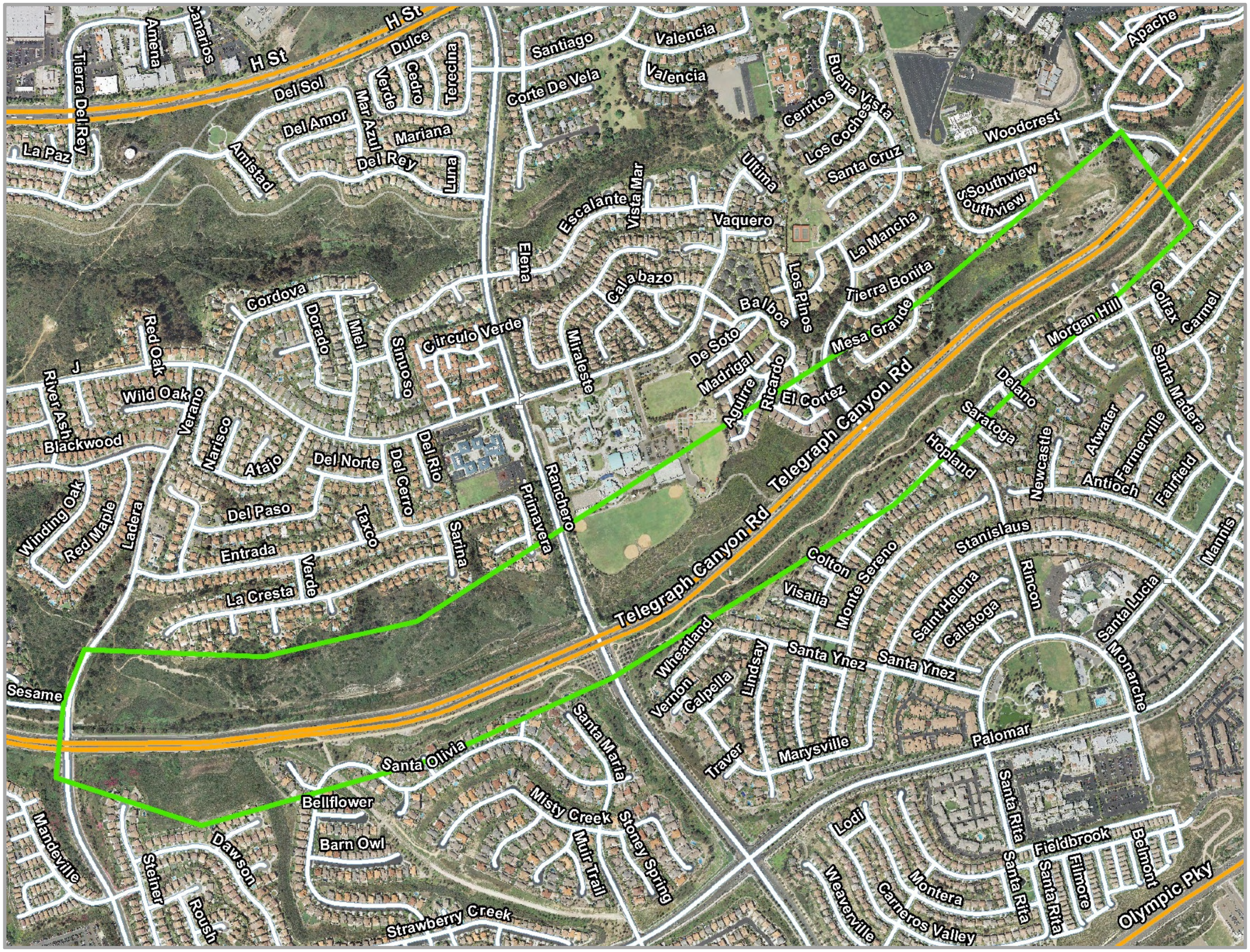

Figure 2. DIF Study East

Figure 3. DIF Study West

4.0 Hydrologic Analysis

Hydrologic analysis was completed using the HEC-Hydrology Modeling System (HEC-HMS), Version 4.1, for Telegraph Canyon. Peak flows and hydrographs were developed at eight locations (four in DIF Study East and four in DIF Study west, see Figure 4): La Media, Telegraph Canyon Road, Paseo Ranchero, Paseo Ladera, Hilltop Drive, First Avenue, L Street and Third Avenue, and Fourth Avenue. The Natural Resources Conservation Services (NRCS) hydrologic method was used because the drainage areas exceed one square mile. The input parameters were derived from the City of Chula Vista 2004 Drainage Master Plan. Since several of the alternatives did not significantly alleviate flooding from the 100-year event, the 2-, 5-, 10-, 25-, and 50-year peak flows were computed as well. The input parameters and results are presented in the sections below.

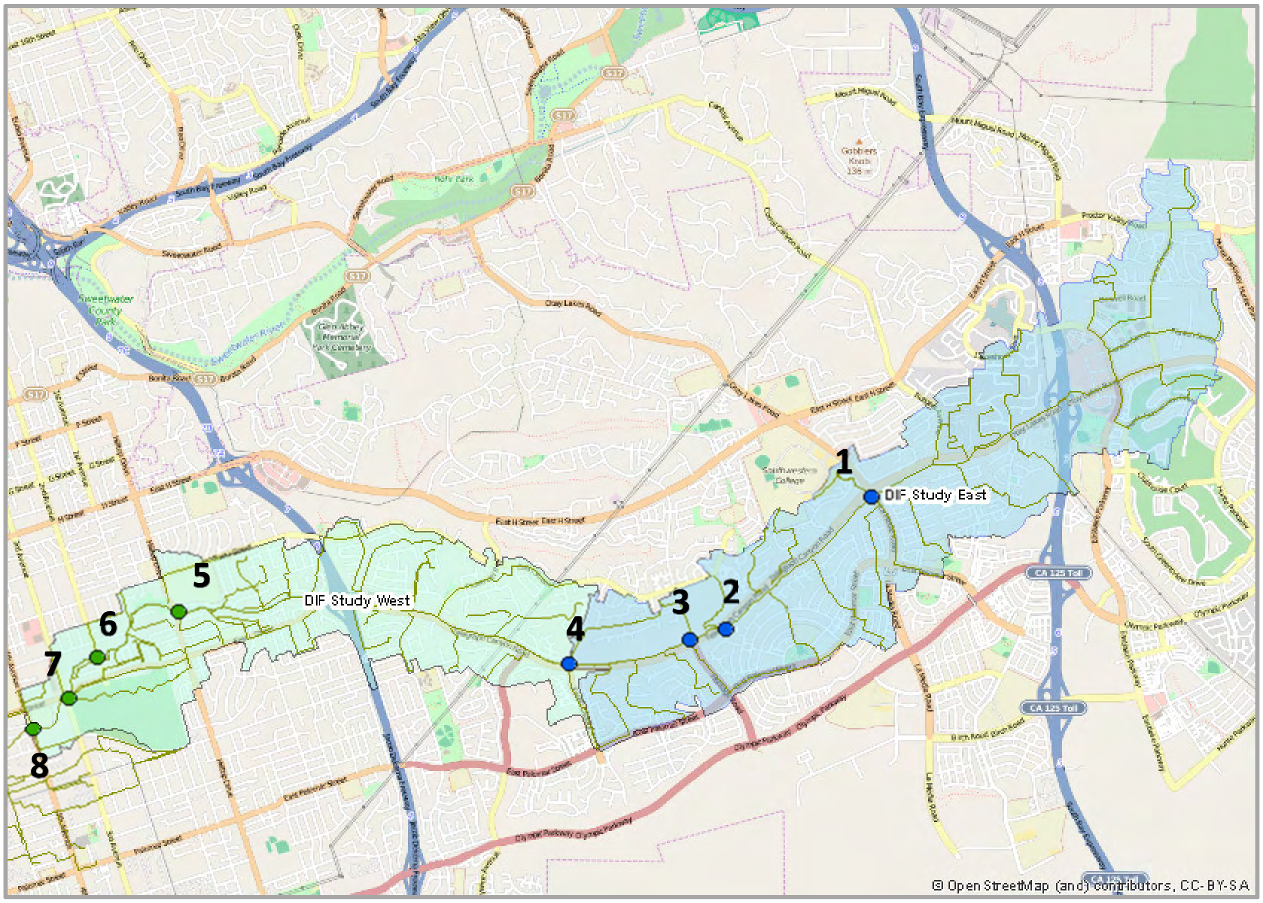

Figure 4. Hydrologic Basins and Analysis Points (with Node numbers)

4.1 Precipitation

The NOAA Atlas 14 Partial Duration Series (PDS) precipitation frequency (PF) estimates for the mid 90 percent confidence interval for each of the 2- through 100-year events were used to develop a six-hour frequency storms in HEC-HMS with five-minute intervals and a (2/3, 1/3) distribution.

4.2 Input Parameters

The input parameters for the NRCS method were derived from the City of Chula Vista 2004 Drainage Master Plan. These included the drainage basins and area, curve numbers, and USACE lag times. The input parameters are assumed to be the same as in 2004 because the land use and development in the Telegraph Canyon watershed has not noticeably changed. Soil Group D was used everywhere with a Precipitation Zone Number (PZN) of 1.3. For use in HEC-HMS, the USACE lag time was converted to the NRCS lag time using Equation 4-21 in the San Diego County Hydrology Manual (June 2003). The input parameters for each eight node locations are listed below in Table 1.

Table 1. Hydrologic Input Parameters – NRCS Method

Node	Drainage Area (acres)	Drainage Area (sq mi)	Curve Number	USACE Lag (min)	NRCS lag (min)
DIF East					
1. La Media	1527	2.4	90	24.6	23.7
2. Telegraph Canyon Road	1970	3.1	90	35.4	33.0
3. Paseo Ranchero	2147	3.4	90	39.0	36.1
4. Paseo Ladera	2524	3.9	90	43.8	40.3
DIF West					
5. Hilltop Drive	3444	5.4	91	54.0	49.0
6. First Avenue	3669	5.7	91	56.4	51.1
7. L Street and Third Avenue	3941	6.2	89	58.8	53.2
8. Fourth Avenue	4013	6.3	89	60.6	54.7

4.3 Detention Basins

The reduction in flows from existing detention basins would be on the order of several hundred cubic feet per second (cfs), which would not significantly affect the 100-year water surface elevations. For hydraulic modeling purposes, as a conservative assumption flows were not reduced at detention basins.

4.4 Results

The peak flows at each of the nodes for the 2- through 100-year events are reported in Table 2 below. In the DIF West Study area, the computed flows from HEC-HMS decreased downstream of First Avenue because the basin curve number decreased. However, to be conservative in the hydraulic modeling and computation of water surface elevations, the peak flow was not allowed to decrease in the downstream direction. Therefore, the First Avenue flows are used at L Street and Third Avenue as well as at Fourth Avenue.

Table 2. Computed Peak Flow Discharges in cfs

Location	2-year	5-year	10-year	25-year	50-year	100-year
DIF East						
1. La Media	355	571	760	1,030	1,249	1,480
2. Telegraph Canyon Road	383	617	823	1,116	1,354	1,605
3. Paseo Ranchero	396	637	849	1,155	1,404	1,666
4. Paseo Ladera	437	703	938	1,275	1,550	1,839
DIF West						
5. Hilltop Drive	598	935	1,229	1,648	1,986	2,340
6. First Avenue	606	947	1,243	1,666	2,007	2,364
7. L Street and Third Avenue	*606*	*947*	*1,243*	*1,666*	*2,007*	*2,364*
8. Fourth Avenue	*606*	*947*	*1,243*	*1,666*	*2,007*	*2,364*

4.5 Comparison with Other Studies

The computed 100-year peak discharge from this Study (NOAA Atlas 14) is compared to the peak flows from the City of Chula Vista 2004 Drainage Master Plan and the 2012 FEMA Flood Insurance Study (FIS) in Table 3 below. The peak flows in this Study are approximately 50 percent less than the flows reported in the 2004 Drainage Master Plan. The significant reduction can be attributed to the use of the NOAA Atlas 14 method rather than the nested storm method presented in the San Diego County Hydrology Manual. The peak flows are slightly larger (by 6 to 24 percent) than the flows used in the 2012 FEMA FIS study. Since the differences are small, the use of the NOAA Atlas 14 flows is defensible while being slightly conservative.

Table 3. Comparison of Peak Flow Discharges

Location	Peak Flow (cfs)
DIF East	
2004 Drainage Master Plan	4340
2012 FEMA FIS	2200
NOAA Atlas 14	2340
DIF West	
2004 Drainage Master Plan (Paseo Ladera)	3600
NOAA Atlas 14 (Paseo Ladera)	1839
2012 FEMA FIS (Upstream La Media)	1197
NOAA Atlas 14 (La Media)	1480

5.0 Hydraulic Analysis

Hydraulic analysis of Telegraph Canyon Channel was conducted for two separate segments. These two segments are shown below in Figure 5.

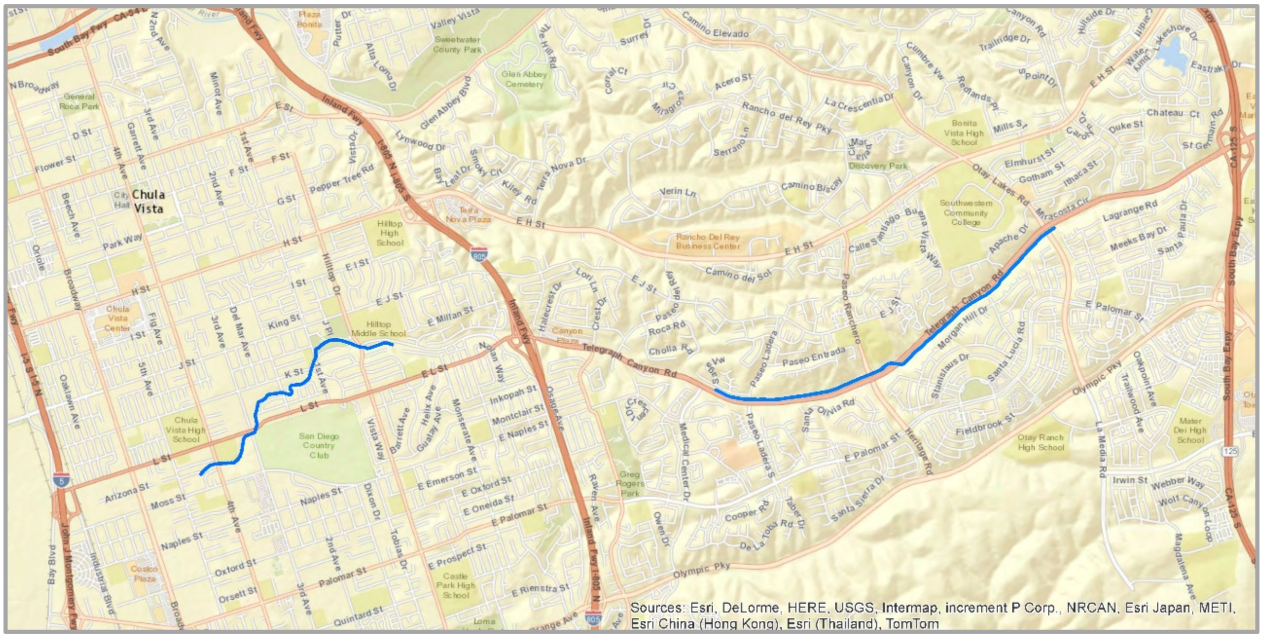

Figure 5. Location Map of DIF West and DIF East Study Reaches

Flow in the channel is from East to West. The downstream reach corresponds with the DIF West, while the upstream reach corresponds with the DIF East. Hydraulic modeling was performed using the US Army Corps Hydrologic Engineering Center's River Analysis System (HEC-RAS) computer program, version 4.1. Models in both the DIF East and DIF West areas were constructed using the ArcGIS extension HEC-GeoRAS. This tool allows for the import of topographic and hydraulic information from ArcGIS into HEC-RAS. Topographic information for hydraulic models was supplied as 2-foot contours created based on aerial survey from 1999. City personnel conducted survey within the channel for portions of the reaches being studied in September 2015 to supplement the base topographic data.

5.1 DIF East

The channel in the DIF East section runs parallel to Telegraph Canyon Road for the entire Study reach, approximately two miles. The channel generally flows through open space without directly adjacent development. Hydraulic analysis was conducted from La Media Road at the upstream end to approximately 1,000 feet downstream of Paseo Ladera. The channel in this area was improved in 1989 to be an earthen trapezoidal channel with rip-rap drop structures located along the reach for stabilization, and with enhancements to culverts at Paseo Ladera, Paseo Ranchero, and under Telegraph Canyon Road.

Since the channel improvements were constructed, heavy vegetation has established itself in the channel and along its banks for the entire reach, including willows and small trees. The heavy vegetation was reflected in the hydraulic model with Manning n values in the channel of 0.045 to 0.05. Sensitivity analyses using varying Manning n values between 0.035 and 0.05 was conducted. The computed water surface elevation average change was less than 0.5 feet and did not change significantly impact floodplain extents or the ability of existing facilities to efficiently convey flow as a result of these changes in Manning n values.

Under current conditions, facilities in the DIF East reach are able to convey the 100-year flow without causing flooding beyond the channel extents. The only potential flooding risk identified would be related to excessive debris accumulation from the vegetation causing blockage of culverts. Previous studies such as the Rick Engineering Telegraph Canyon Channel Erosion and Assessment West of Paseo Ladera dated June 2015 and July 2015 identified the area around the Paseo Ladera crossing as having scour potential. Hydraulic model results show high channel velocities in this area, however little evidence of scour was seen upstream of Paseo Ladera during field reconnaissance. High velocities and scour along the south bank downstream of the Paseo Ladera crossing have been addressed with the construction of the Secant Wall or Telegraph Canyon Channel Erosion Project.

Additional proposed projects such as clearing the vegetation from the channel are not being advanced because of the potential adverse impacts downstream from any clearing or channel armoring through installation of rip rap as well as the potential environmental impacts.

5.2 DIF West

The channel in the DIF West area is a much more diverse channel geometry flowing through a densely urbanized portion of the City of Chula Vista and has undergone a number of channel improvements to alleviate flooding in recent history. The reach has been channelized at least partially in concrete for most of the 7,500 feet that are analyzed as part of this Study.

The upstream limit of the Study reach is located at the culvert under Hilltop Drive. The flow then enters a low flow concrete channel for about 1,400 feet through Hilltop Park. The existing low flow concrete channel can convey only the daily normal flow, however beyond the limits of the concrete, the park is graded to provide a larger channel with grass side slopes. The grading through the park does not appear to be engineered with specific dimensions but generally appears to be approximately 20 feet wide and three to four feet deep and capable of conveying approximately the 5-year peak flow. Through the park, the Manning n value was set to 0.03 in the channel and 0.04 in overbank areas. High velocities within the park, even for low flow events, have resulted in considerable scour adjacent to the concrete low flow channel and in some cases have undermined the channel considerably.

Downstream of Hilltop Park the channel has an engineered section with grouted riprap side slopes (2H:1V) and a concrete bottom approximately 10 feet wide that extends for about 400 feet as the channel makes a 90 degree turn to the South before turning again, about 30 degrees to the West, as it enters an 8 foot by 8 foot concrete box culvert under First Avenue. The culvert under First Avenue is only capable of conveying the 5-year peak flow and overtops during the 10-year peak flow event. The segment of the channel directly upstream of the First Avenue culvert has vegetation growing in the channel and standing water was observed in this area during field investigation. Manning n value of 0.04 was assigned to the channel in this area and 0.045 in the overbanks to account for the brush and bushes growing there.

The channel between First Avenue and Country Club Drive/ K Street appears to be a grouted riprap channel with a concrete bottom, there are cracks and displaced portions of the concrete side slopes that can be seen. In addition heavy vegetation, including large palm trees, is growing in the bottom of the channel. Manning n value for the channel in this section was set at 0.04. The flow then leaves this open channel and travels under Country Club Drive/K Street in another 8 foot by 8 foot concrete box culvert. The channel geometry is capable of conveying a larger flow, however the backwater caused by the culvert under Country Club Drive dominates the reach upstream to First Avenue. The culvert under Country Club can convey the 2-year peak flow but overtops in the 5-year peak flow event.

Downstream of Country Club Drive/K Street, the channel is a rectangular concrete channel 21 feet wide and approximately 10 feet deep, although it varies in height along its 2,400 foot length. This channel improvement was constructed in 1994 and includes a double 13 foot by 8 foot concrete box culvert under

Second Avenue. The channel then transitions to a trapezoidal concrete channel for approximately 400 feet until about 100 feet downstream of Sierra. Throughout this stretch of concrete channel, Manning n value of 0.015 was used. These sections are subject to supercritical flow because of the slope, channel geometry, and Manning n value. Models were run in the subcritical regime to produce the most conservative water surface elevation and defaulted to critical depth for most of the reach. Under the subcritical regime, the channel is still capable of conveying the 100-year peak flow discharge.

In the vicinity of the intersection of Third Avenue and L Street, the open channel has not been improved and is in a mostly natural condition. This includes three open channel segments: approximately 350 feet upstream of L Street, 100 feet downstream of L Street and upstream of Third Avenue, and a 1,000 foot long stretch downstream of the outlet of culverts under Third Avenue. These portions of the reach are heavily vegetated and contained standing water upstream of Third Avenue during field investigation. Manning n values were set at 0.045. Under L Street is an existing double 9 foot by 4 foot concrete box culvert. Under Third Avenue is an arch culvert 10 feet wide and 5.5 feet tall with an elevated 60” reinforced concrete pipe. These two culverts enter a junction box and connect downstream to a double 4 foot by 10 foot concrete box culvert that carry the flow underneath a gas station located on the southwest corner of the intersection of Third Avenue and L Street. The culverts under both L Street and Third Avenue can convey the 2-year peak flow but overtop during the 5-year event.

The flow from the 1000 foot section of open channel, downstream of the outlet of the culverts under Third Avenue enters a rectangular concrete channel that continues until exiting the DIF West Study area. In this region, the rectangular channel transitions from approximately 50 feet wide at the upstream end to 20 feet wide at Fourth Avenue. In this reach, the Manning n value was set at 0.015 and the channel can convey the 100-year peak flow.

6.0 Identification of Deficiencies

Preliminary hydraulic analysis of existing facilities has identified two locations within the DIF West area that do not efficiently convey the 100-year peak flow within the Telegraph Canyon channel without resulting in potential flood damage or hazard to adjacent properties. These two areas of interest are: (1) in the vicinity of the intersection of Third Avenue and L Street and (2) the reach from Country Club Drive/ K Street to Hilltop Park. In the DIF East area, current facilities are able to effectively convey the 100-year peak flow and present no immediate flooding hazard with the exception of the flooding and bank erosion previously identified and addressed through the construction of the Secant Wall Improvement Project.

Near the intersection of Third Avenue and L Street, culverts are undersized and are only able to convey the 2-year peak flow. During the 5-year peak flow, the culverts are overtopped and flow will enter the intersection as it follows the topography before rejoining the channel downstream of the culvert outlets under Third Avenue and the adjacent gas station.

The existing channel from the culvert under Country Club Drive upstream through Hilltop Park contains undersized culverts and engineered open channels in poor condition that can result in flooding of property even in small or moderate frequency flow events such as the 5-year event. Additionally, some facilities may be subject to damage from scour from small events that could result in channel failure.

Preliminary hydraulic computations are currently being performed to determine the effectiveness of various design alternatives that may alleviate completely or reduce the flooding impacts in these problematic areas during flood events.

7.0 Facility Recommendations

Based on the findings of the technical analysis, future appropriations from the Telegraph Canyon Drainage DIF Fund and other funding sources will be needed to fund CIP projects identified in this study. The available funds of approximately $5.2 million in the Telegraph Canyon Drainage DIF Fund will be used to cover the costs of the most critical identified DIF facilities. Due to the limited number of acres remaining to pay into the DIF, it is anticipated that other funding sources (Gas Tax, Transnet, grants, etc) will be needed to complete all CIP projects identified in this Study.

The Study recommends drainage facilities needed to transport the storm water runoff and address the deficiencies identified in the previous section. The additional facilities are known as Hilltop Park, First Avenue and Country Club Drive and Third Avenue and L Street. The locations at which the Facilities will be constructed are shown on Figure 6 and Figure 7, for the downstream and upstream portions of the DIF Study West, respectively. The hydrology and hydraulic analysis confirms the reasonable relationship between the use of the fee for the construction of the Telegraph Canyon Erosion Repair project and the development of properties within the basin. The Telegraph Canyon Erosion Repair project addresses the erosion and flooding concern within the DIF Study East area and was completed in September 2015.

The area surrounding the intersection of Third Avenue and L Street currently consists of heavily vegetated natural channel sections bounded upstream and downstream with engineered concrete channels. The culverts under Third Avenue and L Street are undersized to convey more than small flood events. Furthermore, downstream of Third Avenue there is significant scour along the North bank that needs to be addressed. The most complete option would be to replace the natural channel sections and connect the upstream and downstream concrete channels with a concrete channel with similar design and increase culvert capacity to reduce the frequency of flooding beyond the extents of the channel. During preliminary hydraulic analysis it is not yet clear as to a viable geometry that would completely eliminate the flooding of the intersection of Third Avenue and L Street because of the geometric restrictions on the channel design of the channel slope, roadway elevations, and horizontal limits of the project. Additional options being evaluated would include increasing capacity and possibly alignment of existing culverts without construction of a concrete channel and installation of bank protection measures along the northwest bank of the channel downstream of Third Avenue to protect existing infrastructure. Detention alternatives were considered at the golf course and in areas adjacent to the channel. Detention was eliminated as a facility recommendation due to the significant amount of land required to attenuate flows.

In the vicinity of First Avenue and Country Club Drive, the recommendations for facility improvements are to replace existing open channel sections that are in poor condition and add capacity to the culverts to reduce flooding caused by the backup of water at the culvert openings. The primary design solution would come from extension of the rectangular concrete channel that exists downstream of Country Club Drive through the channel section between Country Club Drive and First Avenue and then again upstream of First Avenue for approximately 380 feet to the western end of Hilltop Park. The culverts under Country Club Drive and First Avenue would be increased to a similar size as the proposed channel to allow the flow to continue without impingement. These improvements could allow for a reduction of the effective 100-year floodplain, particularly the West bank downstream of Country Club Drive as the flooding would then be contained within the improved channel footprint for this reach. Lesser improvements such as increasing capacity to the culverts with the addition of pipe culverts would reduce the frequency of potential flooding but would not result in significant changes to the 100-year floodplain.

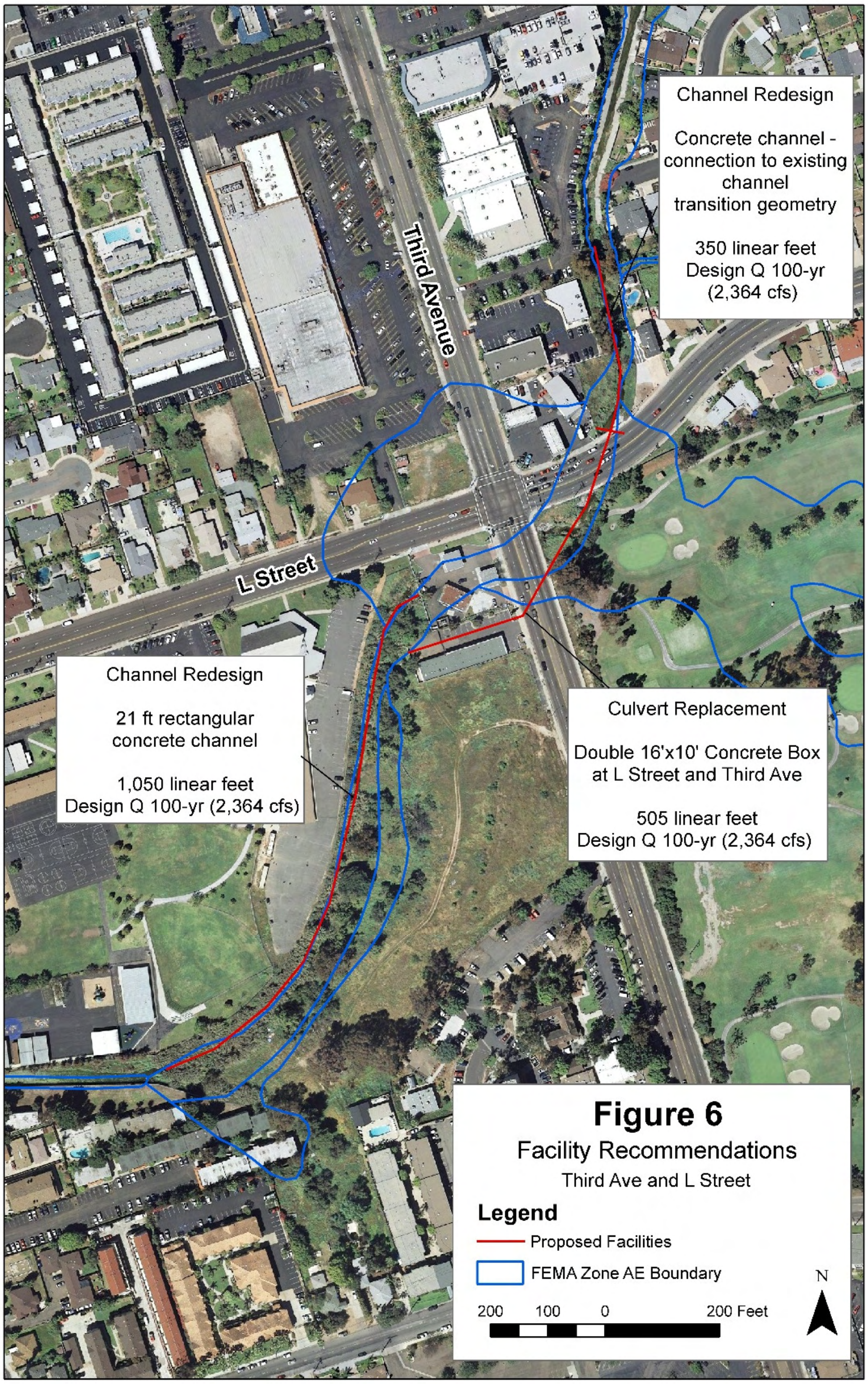

Figure 6. Facility Recommendation Locations – Third Avenue and L Street

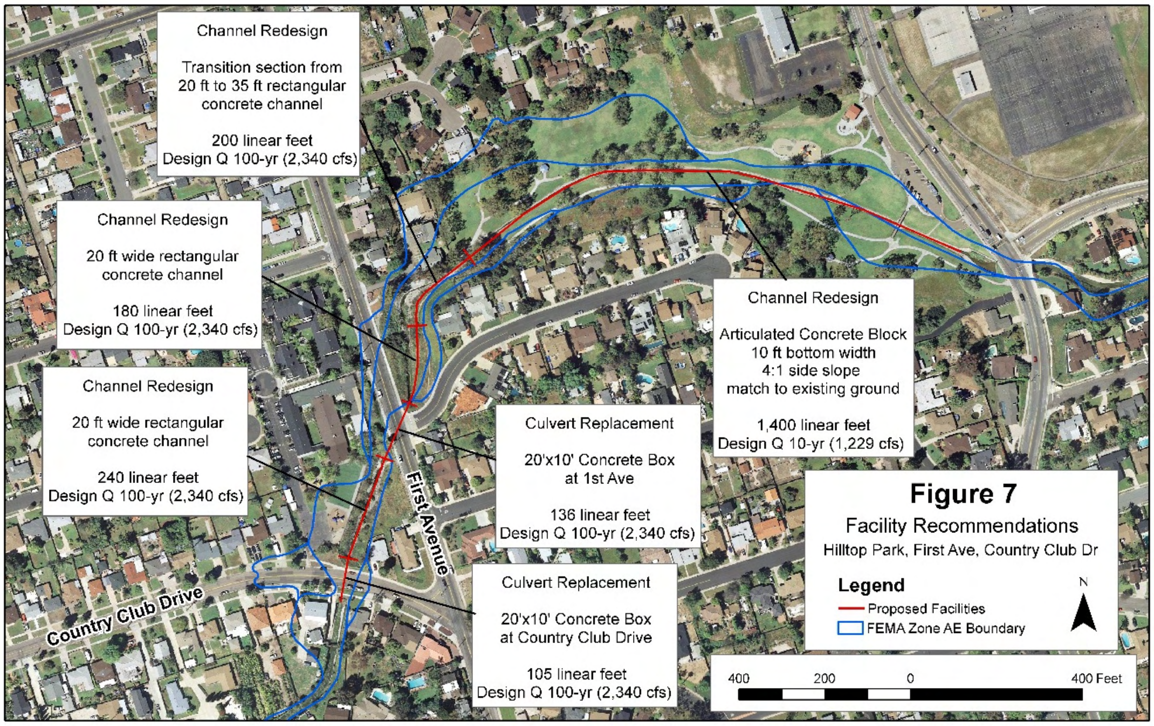

Figure 7. Facility Recommendation Locations – Hilltop Park, First Avenue, and Country Club Drive

These improvements continue moving in the upstream direction through Hilltop Park with the recommended installation of a larger engineered channel lined with articulated concrete blocks. These blocks would allow for vegetation to grow through but provide protection from scour and allow for the construction of a channel that would convey flows of approximately the magnitude of the 10-year peak flow event. Through the park, larger flooding events such as the 100-year event would still be contained almost entirely to the park itself, this may allow for the removal of some structures from the 100-year floodplain.

Table 4 lists the existing facilities in place and improvement recommendations, the hydraulic capacity that each hold and the existing or resultant impact on the associated flood hazard.

Annual routine maintenance will be required after completion of the identified DIF facilities.

Preliminary hydraulics have been performed at this time and the alternatives will be further analyzed after more information becomes available from the resource agencies and consideration of other benefits that will be provided as a supplemental materials to the Study.

Table 4. DIF West Facilities Inventory and Recommended Improvements

Location	Scenario	Facility	Capacity (event - cfs)	Flood Hazard
Third Avenue and L Street area				
L Street	Existing	Double 9' x 4' concrete box culvert	2-year peak – 606 cfs	Flooding of 3rd and L Street intersection
	Option 1	Replace existing culverts with double 16' x 10' concrete box culverts through Third Ave. - ~505 linear feet (L&Third)	100-year peak – 2,364 cfs	Eliminate flooding of 3rd and L Street intersection
Third Avenue	Existing	10' x 5.5' Arch and 60" RCP	2-year peak – 606 cfs	Flooding of 3rd and L Street intersection
	Option 1	Replace existing culverts with double 16' x 10' concrete box culverts – 505 linear feet (L&Third)	100-year peak – 2,364 cfs	Eliminate flooding of 3rd and L Street intersection
Channel upstream of L Street and downstream of Third Avenue	Existing	natural channel	100-year peak – 2,364 cfs	Heavy vegetation contributes to flooding issues at 3rd and L intersection. Scour problems on Northwest bank
	Option 1	Replace existing natural channel with 21' x 10' rectangular concrete channel – 1400 linear feet	100-year peak – 2,364 cfs	Reduction in frequency of flooding events
	Option 2	Bank Protection added to the Northwest bank – 1400 linear feet	100-year peak – 2,364 cfs	Eliminate scour along Northwest bank
Country Club Drive, First Avenue, Hilltop Park				
First Avenue and Country Club Drive Crossings	Existing	8' x 8' concrete box culverts in both locations First Ave – 136 linear ft Country Club – 105 linear ft	2-year peak – 598 cfs	Properties subject to flooding in west Hilltop Park and on South side of Country Club Drive
	Option 1	Replace existing culverts with 20' x 10' concrete box culverts in both locations First Ave – 136 linear ft Country Club – 105 linear ft	100-year peak – 2,340 cfs	Reduction in FEMA Zone AE, including removal of homes from floodplain
	Option 2	Add double 60" RCP to existing concrete box culverts in both locations First Ave – 136 linear ft Country Club – 105 linear ft	10-year peak – 1,229 cfs	Reduction in frequency of flooding events
Channel from Country Club Drive to Hilltop Park	Existing	Trapezoidal grouted riprap channel 620 linear feet total	5-year peak – 935 cfs	Properties subject to flooding in west Hilltop Park and on South side of Country Club Drive
	Option 1	Channel redesign to 20' x 10' rectangular concrete channel 620 linear feet total	100-year peak – 2,340 cfs	Reduction in FEMA Zone AE, including removal of homes from floodplain

Table 4. DIF West Facilities Inventory and Recommended Improvements

Location	Scenario	Facility	Capacity (event - cfs)	Flood Hazard
Country Club Drive, First Avenue, Hilltop Park				
Channel through Hilltop Park	Existing	Low flow concrete channel 1,400 linear feet	Less than 2-year peak – 598 cfs	100-year flooding almost entirely limited to Hilltop Park; scour issues around low flow channel
	Option 1	Channel redesign to 10' bottom width, 4H:1V side slopes Articulated Concrete Block (ACB) - 6" thickness 1,400 linear feet	10-year peak – 1,229 cfs	100-year flooding almost entirely limited to Hilltop Park, reduction in FEMA Zone AE near First Avenue
	Option 2	Channel redesign to 10' bottom width, 4H:1V side slopes Articulated Concrete Block (ACB) - 4" thickness 1,400 linear feet	10-year peak – 1,229 cfs	100-year flooding almost entirely limited to Hilltop Park, reduction in FEMA Zone AE near First Avenue

8.0 Facility Cost Estimates

Planning level cost estimates have been established for the facilities recommended. The City previously determined that the DIF was an eligible funding source for the Secant Wall Telegraph Canyon Erosion Repair project (Secant Wall). Council adopted Resolution 2015-106 authorizing the use of $1.8 million in Telegraph Canyon Drainage DIF Funds for the construction of the Secant Wall. The Secant Wall was completed in September 2015. The final cost is $1,678,118. The Study confirms the reasonable relationship between the use of the fee for the construction of the Secant Wall and the development of properties within the basin. The project close-out memorandum for the Secant Wall project is included as Appendix B. The location map showing the Secant Wall from the Rick Engineering Drainage Study is shown as Figure 8.

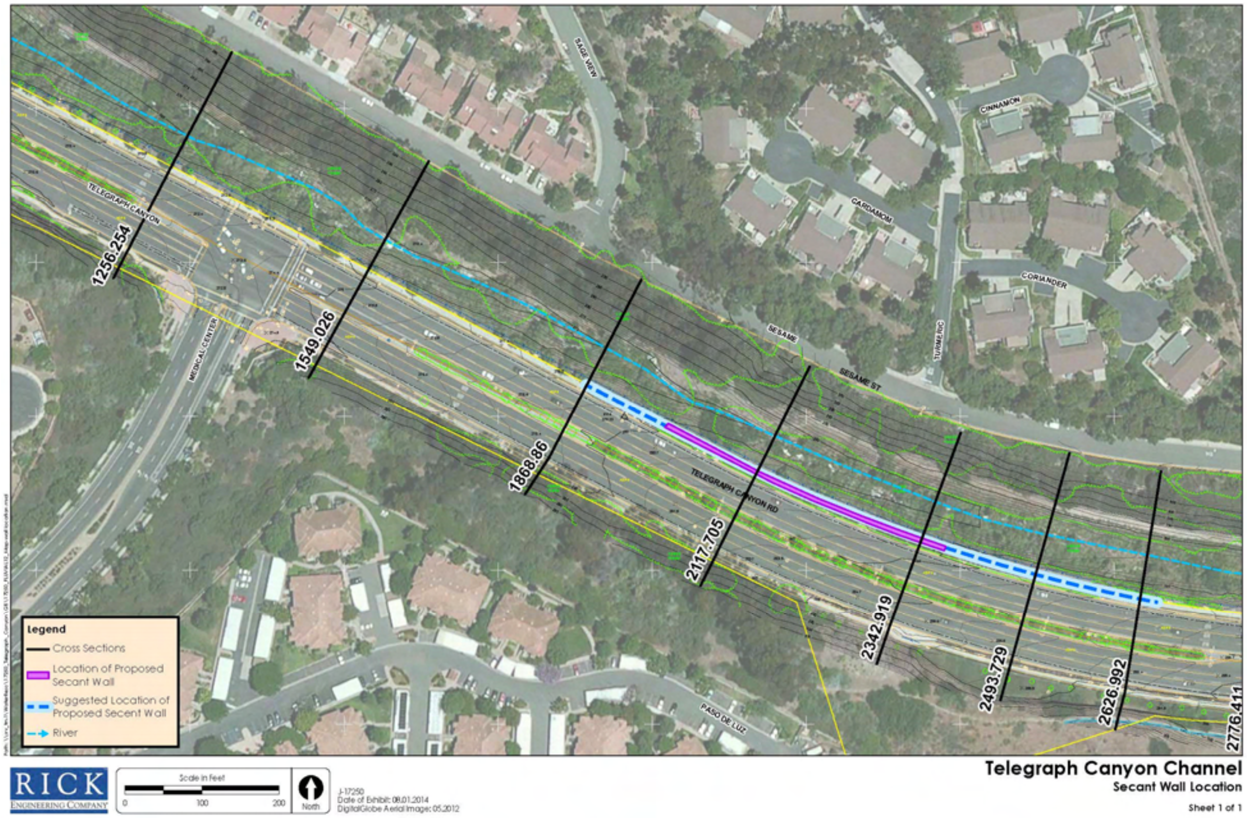

Figure 8. Secant Wall Location Map

Planning level cost estimates have been established for the facilities recommended to provide benefit to the properties within the Telegraph Canyon basin. Hydraulic structure costs have been prepared using other recently constructed drainage facility improvements and compared to the County of San Diego Department of Public Works Land Development Division Unit Price List. Environmental and mitigation costs were based upon assumed mitigation requirements and permitting complexity. Traffic control, staging, erosion, insurance and bonds costs were based upon actual costs from the Secant Wall project. A 30% contingency cost was applied because the costs are estimated at a planning level ahead of preliminary plans and specifications and utility locations. City input was provided to support the estimate for staff costs. The ballpark costs are presented in Table 5 below. The total estimated costs for projects is estimated at $9.3 million.

The available funds of approximately $5.2 million in the Telegraph Canyon Drainage DIF Fund will be used to cover the costs of the most critical identified DIF facilities. The City will prioritize and recommend the remaining DIF facilities identified in this Study to the annual CIP. Once DIF funds are expended, other funding sources (Gas Tax, Transnet, grants, etc.) will be used to complete the projects.

Table 5. Planning Level Facility Cost Estimates

Facility	Linear Feet	Planning Level Cost Estimate – Future Project Needs	Constructed Cost – Previously Funded	Total Costs – Future and Funded
Telegraph Cyn Erosion Repair	700	N/A	$1,678,118	$1,678,118
3rd Ave & L Street	1,905	$5,700,000	N/A	$5,700,000
1st Ave & Country Club Dr	861	$2,200,000	N/A	$2,200,000
Hilltop Park	1,400	$1,400,000	N/A	$1,400,000
Totals	4,866	$9,300,000	$1,678,118	$10,978,118

The estimate for costs for the planned facility improvements follow.

City of Chula Vista
PUBLIC WORKS DEPARTMENT \ DESIGN
COST ESTIMATE

Project Number:	
DATE:	November 24, 2015
PREPARED BY:	Ann Bechtel
CHECKED BY:	Luis Pelayo

Project Title:
Telegraph Canyon Nexus Study - 3rd Ave & L St
Planning Level Estimate

No.	Description	Quantity	Unit	Unit Price	Amount
1	21'w x 10'h Concrete Rectangular Open Channel	1400	LF	$805.00	$1,127,000.00
2	Double 16'w x 10'h Box Culvert	505	LF	$2,977.00	$1,503,385.00
2	Environmental & Mitigation (consultant)	1	Each	$500,000.00	$500,000.00
3	Staging	1	Each	$17,000.00	$17,000.00
4	CLOMR/LOMR	1	Each	$20,000.00	$20,000.00
5	Erosion	1	Each	$34,000.00	$34,000.00
6	Traffic	1	Each	$75,000.00	$75,000.00
7	Insurance & Bonds	1	Each	$24,000.00	$24,000.00
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
				Subtotal:	$3,300,385.00
	Contingencies	30.0	%	$3,300,385.00	$990,120.00
	Construction Inspection (staff costs)	10.0	%	$3,300,385.00	$330,040.00
	Design (staff costs)	10.0	%	$3,300,385.00	$330,040.00
	Survey Work (staff costs)	3.0	%	$3,300,385.00	$99,010.00
	Right-of-Way Acquisition and Staff Costs (includes 50% markup)	1.0	ls	$352,500.00	$352,500.00
	Planning/Environmental (staff costs)	2.0	%	$3,300,385.00	$66,010.00
	Public Works (staff costs)	2.0	%	$3,300,385.00	$66,010.00
	Other including water utilities	5.0	%	$3,300,385.00	$165,020.00
				Subtotal:	$2,398,750.00
				TOTAL:	$5,699,135.00

City of Chula Vista
PUBLIC WORKS DEPARTMENT \ DESIGN
COST ESTIMATE

		Project Number:	
Project Title:		DATE:	November 24, 2015
	Telegraph Canyon Nexus Study - 1st Ave & Country Club Dr	PREPARED BY:	Ann Bechtel
	Planning Level Estimate	CHECKED BY:	Luis Pelayo

No.	Description	Quantity	Unit	Unit Price	Amount
1	Remove & Upsize 1st St Culvert (20'w x 10'h)	136	LF	$1,917.00	$260,712.00
2	Remove & Upsize Country Club Culvert (20'w x 10'h)	105	LF	$2,009.00	$210,945.00
3	Concrete Rectangular Open Channel (20'w x 10'h)	620	LF	$797.00	$494,140.00
4	Environmental & Mitigation (consultant)	1	Each	$100,000.00	$100,000.00
5	Staging	1	Each	$17,000.00	$17,000.00
6	CLOMR/LOMR	1	Each	$20,000.00	$20,000.00
7	Erosion	1	Each	$34,000.00	$34,000.00
8	Traffic	1	Each	$75,000.00	$75,000.00
9	Insurance & Bonds	1	Each	$24,000.00	$24,000.00
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

			Subtotal:	$1,235,797.00
Contingencies	30.0	%	$1,235,797.00	$370,740.00
Construction Inspection (staff costs)	10.0	%	$1,235,797.00	$123,580.00
Design (staff costs)	10.0	%	$1,235,797.00	$123,580.00
Survey Work (staff costs)	3.0	%	$1,235,797.00	$37,070.00
Right-of-Way and Staff Augmentation (includes 50% markup)	1.0	ls	$202,500.00	$202,500.00
Planning/Environmental (staff costs)	2.0	%	$1,235,797.00	$24,720.00
Public Works (staff costs)	2.0	%	$1,235,797.00	$24,720.00
Other including water utilities	5.0	%	$1,235,797.00	$61,790.00
			Subtotal:	$968,700.00
			TOTAL:	$2,204,497.00

City of Chula Vista
PUBLIC WORKS DEPARTMENT \ DESIGN
COST ESTIMATE

		Project Number:	
Project Title:		DATE:	November 24, 2015
	Telegraph Canyon Nexus Study - Hilltop Park	PREPARED BY:	Ann Bechtel
	Planning Level Estimate	CHECKED BY:	Luis Pelayo

No.	Description	Quantity	Unit	Unit Price	Amount
1	6" thick EnviroFlex articulated concrete block (1400 LF @50'w)	70000	SF	$9.50	$665,000.00
2	Environmental & Mitigation (consultant)	1	Each	$30,000.00	$30,000.00
3	Staging	1	Each	$17,000.00	$17,000.00
4	Irrigation & Landscaping	1	Each	$50,000.00	$50,000.00
5	CLOMR/LOMR	1	Each	$20,000.00	$20,000.00
6	Erosion	1	Each	$34,000.00	$34,000.00
7	Insurance & Bonds	1	Each	$24,000.00	$24,000.00
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
				Subtotal:	$840,000.00
	Contingencies	30.0	%	$840,000.00	$252,000.00
	Construction Inspection (staff costs)	10.0	%	$840,000.00	$84,000.00
	Design (staff costs)	10.0	%	$840,000.00	$84,000.00
	Survey Work (staff costs)	3.0	%	$840,000.00	$25,200.00
	Right-of-Way Acquisition and Staff Costs	1.0	ls	$0.00	$-
	Planning/Environmental (staff costs)	2.0	%	$840,000.00	$16,800.00
	Public Works (staff costs)	2.0	%	$840,000.00	$16,800.00
	Other	5.0	%	$840,000.00	$42,000.00
				Subtotal:	$520,800.00
				TOTAL:	$1,360,800.00

Appendix A

Technical Memorandum – Precipitation Analysis

TECHNICAL MEMORANDUM

TO: Ann Bechtel, PE, CFM

FROM: Tory Walker, PE, CFM, LEED GA

DATE: December 4, 2015

RE: Precipitation Technical Analysis for the City of Chula Vista Telegraph Canyon Nexus Study.

INTRODUCTION

TRWE has conducted a precipitation analysis to determine the most appropriate methodology with which to evaluate the Telegraph Canyon watershed. The analysis consisted of three precipitation distribution methods: the San Diego County Hydrology Manual (SDCHM) Method, the TRWE Method, and the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Method. Other methods considered, but not evaluated further, included the older NRCS Type 1 and the County Type B distributions.

METHODOLOGY

Method 1: San Diego County Hydrology Manual

Since its inception in 2003, the San Diego County Hydrology Manual (SDCHM) has been the guide followed by most engineers and designers to estimate extreme precipitation events in San Diego County. The SDCHM focuses on the use of the 6-hour storm event (P_6) at a given period of return for a specific location, as provided by the County-wide isopluvial maps. As long as P_6 is between 45% to 65% of the 24 hour precipitation event P_{24}, a condition that always occurs within the limits of the Telegraph Canyon watershed (mathematically $0.45 \cdot P_{24} < P_6 < 0.65 \cdot P_{24}$) there is no need to apply any correction to the 6-hour precipitation value. The maximum intensity is then obtained with the power-law equation:

$$I_T = 7.44 \cdot P_{6,T} \cdot t^{-0.645} \qquad (1)$$

In the previous equation, I_T (in inches per hour) is the intensity at a given return period T, with duration of t minutes, as a function of the 6 hour storm event with a return period T.

In order to estimate the precipitation distribution, the previous equation is used in 5 or 10 minute intervals, and the maximum intensity is calculated with the nested-storm procedure, assuming that the peak of precipitation occurs after 2/3 of the storm has passed (in other words, the highest 5 minute intensity in a 6-hour storm analysis starting at 12:00 pm, occurs between 4:00 pm to 4:05 pm; while the highest 5 minute intensity in a 24-hour storm analysis starting at 12:00 am, occurs also between 4:00 pm and 4:05 pm).

In this work, modification of the nested storm procedure has not been attempted. In other words, the peak flow will occur at the beginning of the 4th hour in a 6 hour-storm analysis, and the remaining intensities would be positioned as explained in the SDCHM. However, there have been significant discrepancies in terms of the adequacy of the intensity equation, as the values of intensity for short durations (which are the most commonly analyzed storms) have been shown to be unrealistically large. For this reason, two additional methods were conducted within this study: first, analysis of the Oceanside hourly precipitation time series (as published by Project Clean Water) as used for continuous simulation modeling in hydromodification studies (henceforth referred to as the TRWE Method); second, Point Precipitation Frequency (PF) Estimates as assigned by NOAA Atlas 14 as a function of the location (henceforth referred to as the NOAA Method).

Method 2: TRWE Method

TRWE analyzed existing hourly precipitation series data from local San Diego County precipitation gauges to determine a more realistic rainfall intensity-duration-frequency (IDF) curve based upon precipitation gauge measurements. Based on our analysis of these gauges, we determined the Oceanside station data to be a more reliable (and representative) data source than the Bonita station, because the Bonita station data has only 37 years of record and has been substantially disaggregated data from outside sources. Of the precipitation data supplanted by outside sources, nearly 30% is disaggregated (compare with 0% for Oceanside's 57-year time series). Due to the similar P_6 through P_{24} depths between the Telegraph Canyon and Oceanside (as projected by the SDCHM isopluvial maps) and the corresponding similarities between climate and orthography, the TRWE Method (as developed by the repaired Oceanside rainfall data) is more representative and is therefore an appropriate application for the purposes of this study.

TRWE studied in detail Oceanside's "n, d" largest extreme events, with "n" being the number of years where data was properly obtained, and "d" the duration value selected (1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 18, 21, and 24 hours). Those events were analyzed at different durations in order to properly extrapolate the intensity at shorter time intervals, and generate an adequate intensity-duration curve.

It is our opinion the analysis performed on the original Oceanside-specific precipitation data prepared by TRWE is the most accurate procedure for the determination of the intensity equation. There are four main reasons to consider the TRWE Method as the most accurate: first, it is based on the selection of the 57 most extreme intensity events, regardless of the occurrence of the event (meaning that the 57 highest events are randomly distributed in time, and not assigned as one event per year); second, it is based on fitting the data to the general intensity equation (from which both the power-law SDCHM Method and the NOAA Tables are particular cases); third, the precipitation data fits the statistical distribution selected by satisfying advanced statistical tests (such as the Anderson-Darling test of normality); and fourth, the TRWE Method does not generate unreasonably large intensities that have not been observed in any 15 minute or 60 minute measurements available for Oceanside.

The following are the TRWE Method intensity equations used to describe the rainfall intensity distribution for storm durations 6 hours or less:

$$B = 0.407 + 0.027[\log(T-1)]^2 - 0.0067[\log(T-1)] \quad (2)$$

$$I = \frac{P_6}{6}\left(\frac{6+B}{t+B}\right)^{0.675} \quad (3)$$

Where:

I is the storm intensity (inches/hour)
T is the return period (years)
t is the storm duration (hours)

The only shortcomings of the TRWE Method are that: first, it has not been peer-reviewed by statisticians and hydrologists and therefore is not a method proposed by a nationally recognized weather organization (such as NOAA) or by a large public agency (such as the County); second, a single rainfall station was used to determine the intensity equations (as opposed to a regional set of rainfall station data) due to lack of quality rainfall data within the region, making the equations only applicable to areas with a climatic and orthographic setting similar to Oceanside; and third, the equations are limited to storm durations of 6 hours or less.

Method 3: NOAA Method

The final intensity distribution performed is the analysis of the California NOAA Atlas 14 PF Estimates. The NOAA Method is an improvement over the SDCHM Methodology, and it is based on the NOAA Precipitation Frequency Data Server (PFDS), which is shown in Attachment 1. The NOAA Atlas 14 estimates are provided with 90% confidence intervals where the probability that precipitation frequency estimates for a given duration and average recurrence interval will be greater than the upper bound (or less than the lower bound) is 5%.

The NOAA Atlas 14 PF Estimates have the downside that the frequency analysis is based on annual maximum series (AMS), and not on independent maxima, which is not a very precise approach for dry to Mediterranean climates. In other words, if an extreme event happens to be the second largest of a wet year, and it is actually wetter than the extreme event of many dry years, it is not considered in the analysis even if belonging to the largest “n” events in “n” years. However, frequencies based on independent maxima are offered in a pseudo-partial duration series (PDS) format, which are AMS-based values converted by a scaling factor. The PDS PF Estimates were used in our analysis.

COMPARISON OF RESULTS

Figure 1 illustrates the distribution of a 6-hour, 100-year storm event in 10-minute intervals using the SDCHM Method, the TRWE Method, and the NOAA Atlas 14 Method at the Telegraph Canyon watershed centroid. It is clear that the SDCHM produces the highest intensity, followed by NOAA Atlas 14, and then by the TRWE Method. The SDCHM Method calculates a maximum intensity of 4.82 in/hour. This is due to the extremely conservative nature of the mathematical power-law equation recommended in the SDCHM ($I = k/t^n$). As the time of duration approaches zero, the intensity becomes infinitely large, as exhibited in Figure 1. The NOAA Method produced the second highest rainfall intensity, reaching an intensity of 2.87 in/hour. This intensity is based upon the NOAA Atlas 14, Volume 6, Version 2 PDS-based point precipitation frequency estimates with 90% confidence intervals. When the upper and lower confidence limits were considered, intensities of 3.81 and 2.19 inches/hour were estimated, respectively. The lower confidence limit produces a liberal intensity value that is less than any intensity rendered by a published depth-area reduction factor for a small (>50 mi^2) watershed, whereas the upper confidence limit produces an overly-conservative value (that still remains less than the SDCHM Method intensity). The TRWE Method produced the lowest rainfall intensity at 2.21 in/hour. The TRWE Method improves upon the SDCHM Method because the mathematical power-law equation is improved to produce a finite maximum value, even for a time of duration equal to 0 minutes.

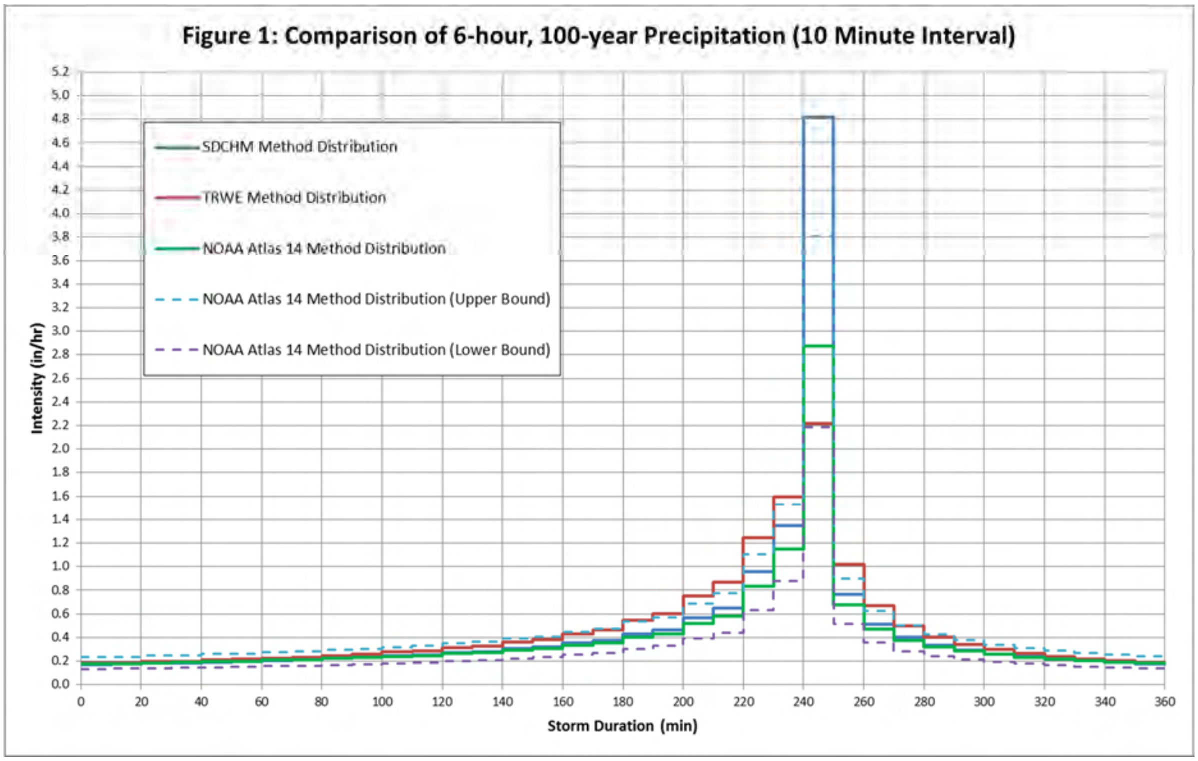
Figure 1: Comparison of 6-hour, 100-year Precipitation (10 Minute Interval)
SDCHM Method Distribution
TRWE Method Distribution
NOAA Atlas 14 Method Distribution
NOAA Atlas 14 Method Distribution (Upper Bound)
NOAA Atlas 14 Method Distribution (Lower Bound)
Intensity (in/hr)
Storm Duration (min)

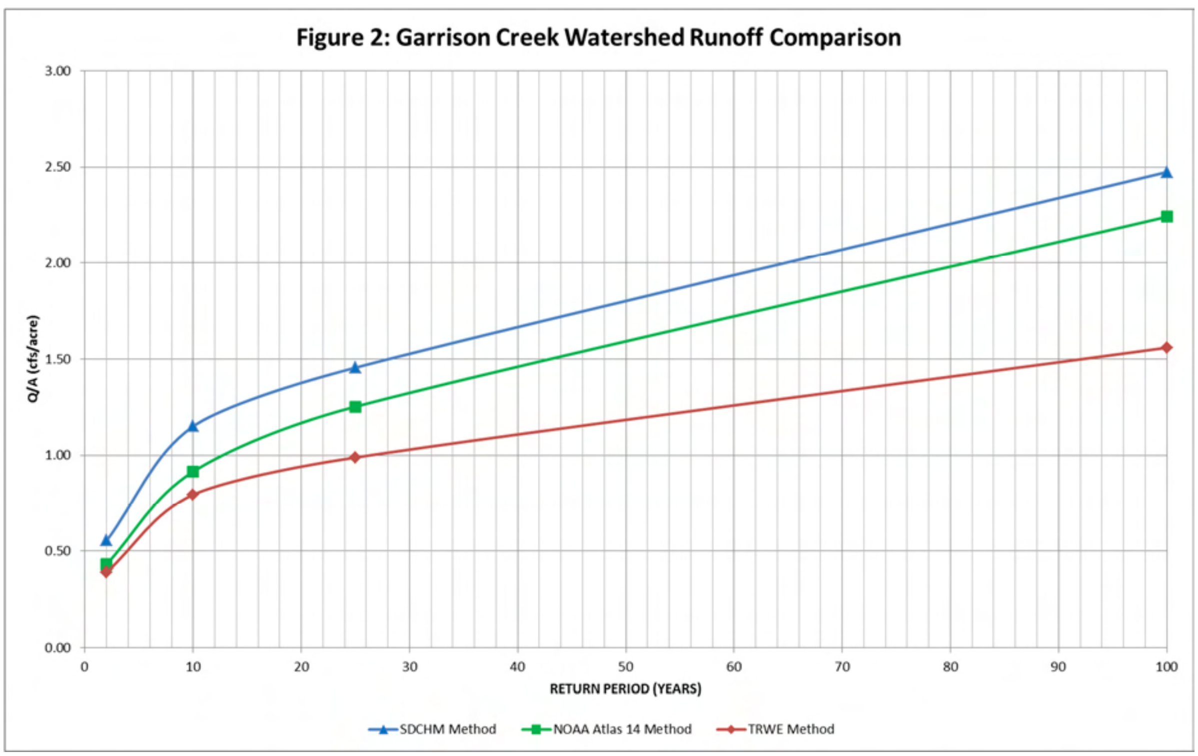
Figure 2: Garrison Creek Watershed Runoff Comparison
Q/A (cfs/acre)
RETURN PERIOD (YEARS)
SDCHM Method
NOAA Atlas 14 Method
TRWE Method

A case study performed on the Garrison Creek Watershed in Oceanside demonstrated that the NOAA values were closer to TRWE values than to SDHM values for return periods smaller than 25 years and closer to SDHM values than to TRWE values for return period equal or larger than 25 years (Figure 2). This result was expected, as the annual maxima series behind the NOAA analysis has a tendency to overestimate the standard deviation of the data for large return periods, and therefore generate a larger intensity than the more site-specific storm maxima performed by TRWE. In any case, it is clear that the SDCHM results are extremely conservative.

CONCLUSION

In order to avoid potential technical and time consuming challenges that may arise if the TRWE Method is selected, we recommend the City of Chula Vista make the policy decision to use NOAA information, which generates intermediate results, and improves on the current estimates obtained with the SDCHM. We determined that the older Type B and Type I SCS distributions should not be considered, as a significant amount of new precipitation data has become available since those distributions were developed. Based upon the findings of the preliminary analysis, TRWE recommends using the NOAA Atlas 14 Method.

Attachment 1

NOAA Method Reference Materials

TRWE recommends the City of Chula Vista select NOAA Atlas 14 PF Estimates, as detailed in "*NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, Volume 6 Version 2.1: California*." This document provides information on the underlying data and functioning of the Precipitation Frequency Data Server (PFDS).

Data is available on NOAA's PFDS, which is described as:

> "*The Precipitation Frequency Data Server (PFDS) is a point-and-click interface developed to deliver NOAA Atlas 14 precipitation frequency estimates and associated information. Upon clicking a state on the map above or selecting a state name from the drop-down menu, an interactive map of that state will be displayed. From there, a user can identify a location for which precipitation frequency estimates are needed.*
>
> *"Estimates and their confidence intervals can be displayed directly as tables or graphs via separate tabs. Links to supplementary information (such as ASCII grids of estimates, associated temporal distributions of heavy rainfall, time series data at observation sites, cartographic maps, etc.) can also be found"*

The following procedure may be used for obtaining NOAA Atlas 14 rainfall data:

- Visit the PFDS at:

  http://hdsc.nws.noaa.gov/hdsc/pfds/

- Select California from the drop down menu or from the figure
- Navigate to your desired location by entering latitude and longitude, selecting a rain gage station, or by zooming and double clicking on the map
- After selecting a point location on the map, Point Precipitation Frequency (PF) Estimates will be displayed in tabular format for the selected point (PF tabular). Use the default data type, units, and time series type (precipitation depth; English; partial duration). The data may be printed, exported as a .csv, or downloaded in GIS format.
- Use an Excel workbook to create an intensity duration frequency (IDF) analytical equation for a storm of any given duration and recurrence interval. The PF estimates will need to be converted into an hourly rainfall intensity (in/hr) and plotted on a log-log scale (with a power trendline and both the equation and R^2 value displayed). The R^2 value will need to be maximized (as close to 1 as possible) by shifting the plotted duration values (x-axis; independent variable) by some constant. When this is achieved, use the slope equation to estimate hourly rainfall intensities for a desired time step (5 or 10 minutes). Plotting this data will produce durations graphs like the one provided in this memo.

Appendix B

Project Close-Out Memorandum for Secant Wall Telegraph Canyon Erosion Project

MEMO

CITY OF CHULA VISTA

Public Works Department

DATE: November 2, 2015

TO: Bill Valle, Assistant Director of Engineering/City Engineer
Jose Gomez, Principal Civil Engineer

FROM: Silvester Evetovich, Principal Civil Engineer

SUBJECT: PROJECT CLOSE-OUT MEMORANDUM
SECANT PILE WALL FOR TELEGRAPH CANYON ROAD: MEDICAL CENTER ROAD AND PASEO LADERA IN THE CITY OF CHULA VISTA (DR-199)

The purpose of this memo is to provide final construction costs associated with this project. Attached is the breakdown of costs for this project. Summaries of these costs are as follows:

Original construction contract amount	$1,643,323.32
Increase/decrease in line item quantities	$ (6,500)
Additional costs approved via change order	$ 41,295.09
Project Total	$1,678,118.41

The project commenced on April 16, 2015 and ended on September 25, 2015 The Notice of Completion was recorded on September 30, 2015.

This is a Design Build project with agreement approved by Council Resolution 2015-060.
Construction Inspection and Storm Water staff charged $59,128.00 since the April 16, 2015 project start date.

Cc: Kalani Camacho, Senior Public Works Inspector
Dave White, Public Works Inspector II
Patrick Moneda, Senior Civil Engineer
Beth Chopp, Senior Civil Engineer
Roberto Yano, Senior Civil Engineer
Claudia Block, Administrative Analyst II
Frank Rivera, Principal Civil Engineer
Ramon Quicho, Engineering Technician
Tim Ripley, Public Works Manager
Dave McRoberts, Wastewater Collections Manager
Boushra Salem, Senior Civil Engineer

Attachments: J:\Inspect\CIP\DR199\MEMO

SECANT PILE WALL FOR TELEGRAPH CANYON ROAD (DR-199)
FINAL QUANTITY AND COST ADJUSTMENTS

A. Line items with no quantity adjustments

Bid Item	Description	Original Quantity	Final Quantity	Unit Type	Unit Price		Final Cost
1	EROSION CONTROLS	1.0	1.00	LS	$34,026.25	$34,026.25	$34,026.25
2	TRAFFIC CONTROL	1.0	1.00	LS	$76,704.00	$76,704.00	$76,704.00
3	TEMPORARY WATER FACILITIES	1.0	1.00	LS	$7,146.00	$7,146.00	$7,146.00
4	DEMOLITION	1.0	1.00	LS	$19,664.40	$19,664.40	$19,664.40
5	EARTH MOVING/GRADING	1.0	1.00	LS	$24,132.88	$24,132.88	$24,132.88
6	SIDEWALK	1.0	1.00	LS	$30,900.00	$30,900.00	$30,900.00
7	FENCING	1.0	1.00	LS	$6,349.04	$6,349.04	$6,349.04
8	SECANT PILE WALL	1.0	1.00	LS	$1,022,978.00	$1,022,978.00	$1,022,978.00
9	IRRIGATION	1.0	1.00	LS	$28,020.00	$28,020.00	$28,020.00
10	LANDSCAPING	1.0	1.00	LS	$21,701.00	$21,701.00	$21,701.00
11	WATER UTILITIES	1.0	1.00	LS	$4,800.00	$4,800.00	$4,800.00
12	STORM DRAIN UTILITIES	1.0	1.00	LS	$15,067.75	$15,067.75	$15,067.75
14	ADMINISTRATIVE REQUIREMENTS	1.0	1.00	LS	$141,860.00	$141,860.00	$141,860.00
15	QUALITITY REQUIREMENTS	1.0	1.00	LS	$4,100.00	$4,100.00	$4,100.00
16	TEMPORARY FACILITIES	1.0	1.00	LS	$17,000.00	$17,000.00	$17,000.00
17	EXECUTION AND CLOSEOUT	1.0	1.00	LS	$4,000.00	$4,000.00	$4,000.00
18	FIXED FEE	1.0	1.00	LS	$82,500.00	$82,500.00	$82,500.00
19	INSURANCE	1.0	1.00	LS	$9,000.00	$9,000.00	$9,000.00
20	BONDS	1.0	1.00	LS	$13,500.00	$13,500.00	$13,500.00
22	DESIGN PHASE	1.0	1.00	LS	$73,374.00	$73,374.00	$73,374.00
				SUBTOTAL NO ADJUSTMENTS			**$1,636,823.32**

B. Increase and decrease in line item quantities without a change order

Bid Item	Description	Original Quantity	Final Quantity	Unit Type	Unit Price	Original Cost	Final Cost	Total Increase/(Decrease)
13	OTAY WATER FEES/COUNTY FEES	1.0	1.00	LS	$6,500.00	$6,500.00	$0.00	($6,500.00)
				SUBTOTAL AMOUNT OF INCREASE				**($6,500.00)**

$0.00

C. Increase and decrease in quantities through a change order

New Item	Description	Final Quantity	Unit Type	Unit Price	Total Increase
1	SDGE ELECTRICAL CONDUIT BULKHEAD	1	LS	19,290.07	19,290.07
2	GRIND AND OVERLAY	1	LS	$22,005.02	$22,005.02
			SUBTOTAL AMOUNT OF INCREASE		**$41,295.09**

D. Increase and decrease in working days through a change order

Description	Additional Quantity	Final Quantity
NO ADDITIONAL DAYS WERE REQUIRED FOR CHANGE ORDER WORK	0	50

ORIGINAL PROJECT AMOUNT	**$1,643,323.32**
PROJECT QUANTITY ADJUSTMENTS	**$34,795.09**
TOTAL CONSTRUCTION AMOUNT	**$1,678,118.41**

KALANI CAMACHO
SENIOR PW INSPECTOR

SILVESTER EVETOVICH
PRINCIPAL CIVIL ENGINEER

C: SILVESTER EVETOVICH, PRINCIPAL CIVIL ENGINEER
BILL VALLE, ASSISTANT DIRECTOR OF ENGINEERING
KALANI CAMACHO, SENIOR PW INSPECTOR

J:\INSPECT\CIP\DR199\FINALQTYCLOSEOUT

RESO# 2015-060
PROJECT # DR-199

RECORDING REQUESTED BY

WHEN RECORDED MAIL TO:

City of Chula Vista
City Clerk
276 Fourth Avenue
Chula Vista, CA 91910

1OP

DOC# 2015-0514363

Sep 30, 2015 11:12 AM
OFFICIAL RECORDS
Ernest J. Dronenburg, Jr.,
SAN DIEGO COUNTY RECORDER
FEES: $0.00

PAGES: 2

SPACE ABOVE THIS LINE FOR RECORDER'S USE

NOTICE OF COMPLETION

NOTICE IS HEREBY GIVEN THAT:

1. The undersigned is OWNER or agent of the OWNER of the interest or estate stated below in the property hereinafter described.
2. The FULL NAME of the OWNER is City of Chula Vista
3. The FULL ADDRESSS of the OWNER is 276 Fourth Avenue, Chula Vista, CA 91910
4. The NATURE OF THE INTEREST or ESTATE of the undersigned is: In fee.

   'IN FEE'

   (If other than fee, strike "in fee" and insert, for example, "purchaser under contract of purchase," or "lessee.")
5. The FULL NAMES and FULL ADDRESSES of ALL PERSONS, if any, WHO HOLD SUCH INTEREST or ESTATE with the undersigned as JOINT TENANTS or as TENANTS IN COMMON are:

   NAMES ADDRESSES

   NONE
6. The full names and full addresses of the predecessors in interest of the undersigned if the property was transferred subsequent to the commencement of the work of improvement herein referred to:

   NAMES ADDRESSES

   NONE
7. A work of improvement on the property hereinafter described was COMPLETED September 18, 2015.
8. The work of improvement completed is described as follows: Telegraph Canyon Road Erosion Repair / Secant Pile Wall in the City of Chula Vista, California.
9. The NAME OF THE ORIGINAL CONTRACTOR, if any, for such work of improvement is West Coast General Corporation / Condon-Johnson & Associates: A Joint Venture
10. The street address of said property is: Between Medical Center Drive and Paseo Ladera Road in the City of Chula Vista, California.
11. The property on which said work of improvement was completed is in the City of Chula Vista, County of San Diego, State of California.

(continued on reverse side)