Flood Documentation Report

June 12, 2015 Flood Event
Cherry Hills Village, Colorado

This report summarizes the natural events leading up to, during, and following the heavy precipitation and resulting flooding of Cherry Hills Village on June 12, 2015.

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June 12, 2015 Flood Event
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Summary

The flooding experienced in Cherry Hills Village on June 12, 2015 is a natural phenomenon for the downstream sub-basins of the overall Little Dry Creek watershed. Higher than normal precipitation in the days preceding the flood event saturated soils in the watershed, increased water levels in some ponds and reservoirs, and generally decreased the capacity of the watershed to slowly release rain water runoff. The impact was obvious to many residents, employees, visitors, and travellers in Cherry Hills Village on Friday morning. This report, more study and watershed coordination will decrease the future risk of flooding in Cherry Hills Village.

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Introduction

The June 12 flood event in Cherry Hills Village is a natural phenomenon in the downstream sub-basins of the larger Little Dry Creek watershed. The compounding effects of days of higher than normal precipitation preceding the event are evidenced in rainfall and runoff data and corroborated with witness accounts of the ponds within the watershed. The rainfall early in the morning of Friday June 12 exceeded the watershed's capacity to detain stormwater and the lower basins flooded as the flows exceeded the conveyance capacity at several road and irrigation ditch crossings.

There are many interesting and unique elements to the Little Dry Creek watershed, particularly as it relates to the June 12 flood event and the dynamics of the flooding in Cherry Hills Village (CHV). The entire contributing watershed to Cherry Hills Village is over 20 square miles. The headwaters at the natural bluffs south of Lone Tree all the way down through Centennial and Greenwood Village into Cherry Hills Village.

The natural stream channels are the obvious first element in the natural conveyance in the watershed. Little Dry Creek and Greenwood Gulch are the predominant natural channels along the downstream, west end, of CHV. Blackmer and Quincy Gulch take northern sub-basins and drain them west to a confluence with Greenwood Gulch. Little Dry Creek conveys flows through the remaining southwest quadrant of CHV.

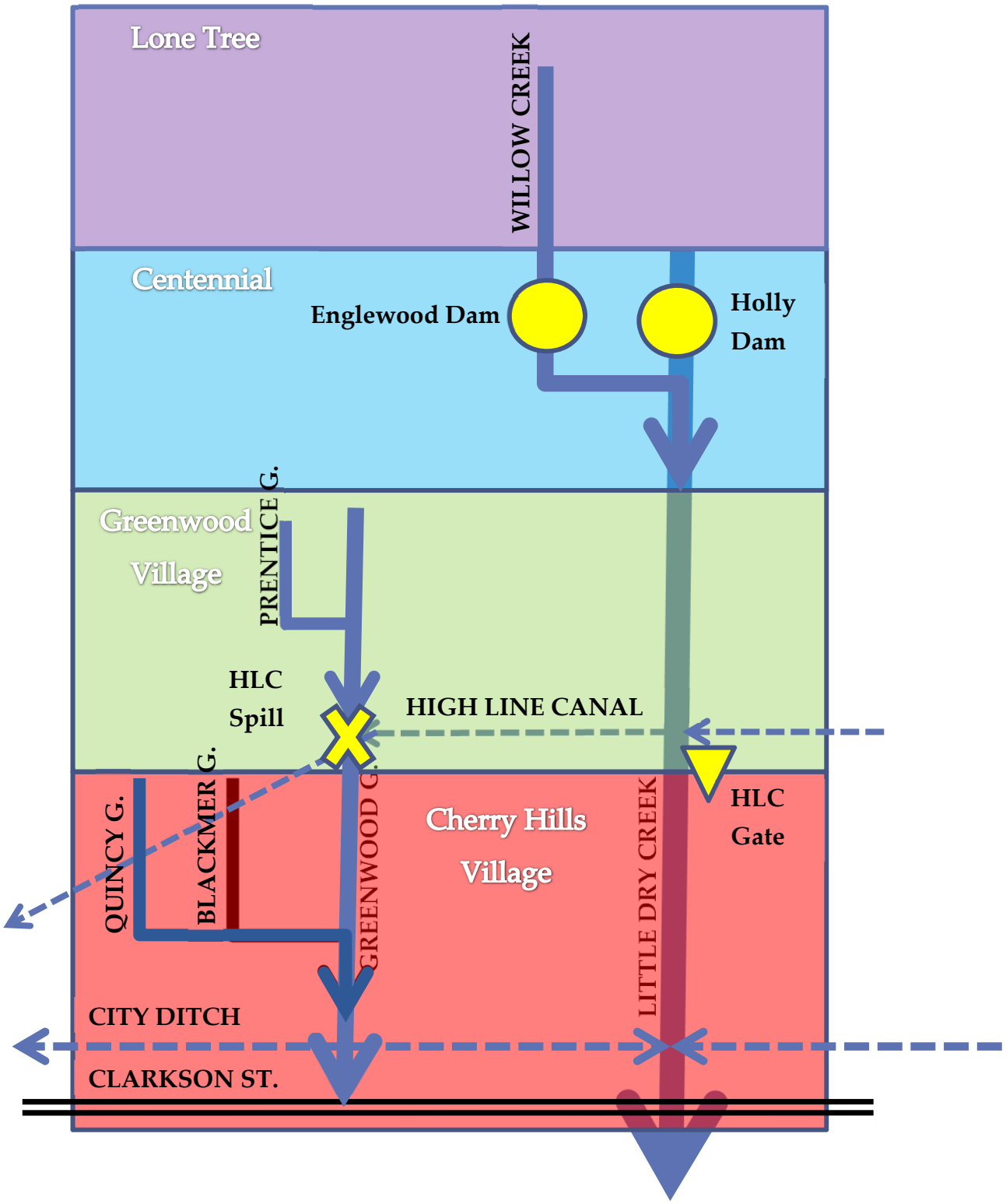
Irrigation ditches play a major role in the stormwater flows through CHV. The City Ditch intersects Little Dry Creek and Greenwood Gulch near Clarkson Street. The High Line Canal intersects Quincy and Blackmer Gulches within the City, but also intersects Greenwood Gulch and Little Dry Creek in Greenwood Village. The intersection of the ditches is a significant factor in the dynamics of major storm flows through the watershed.

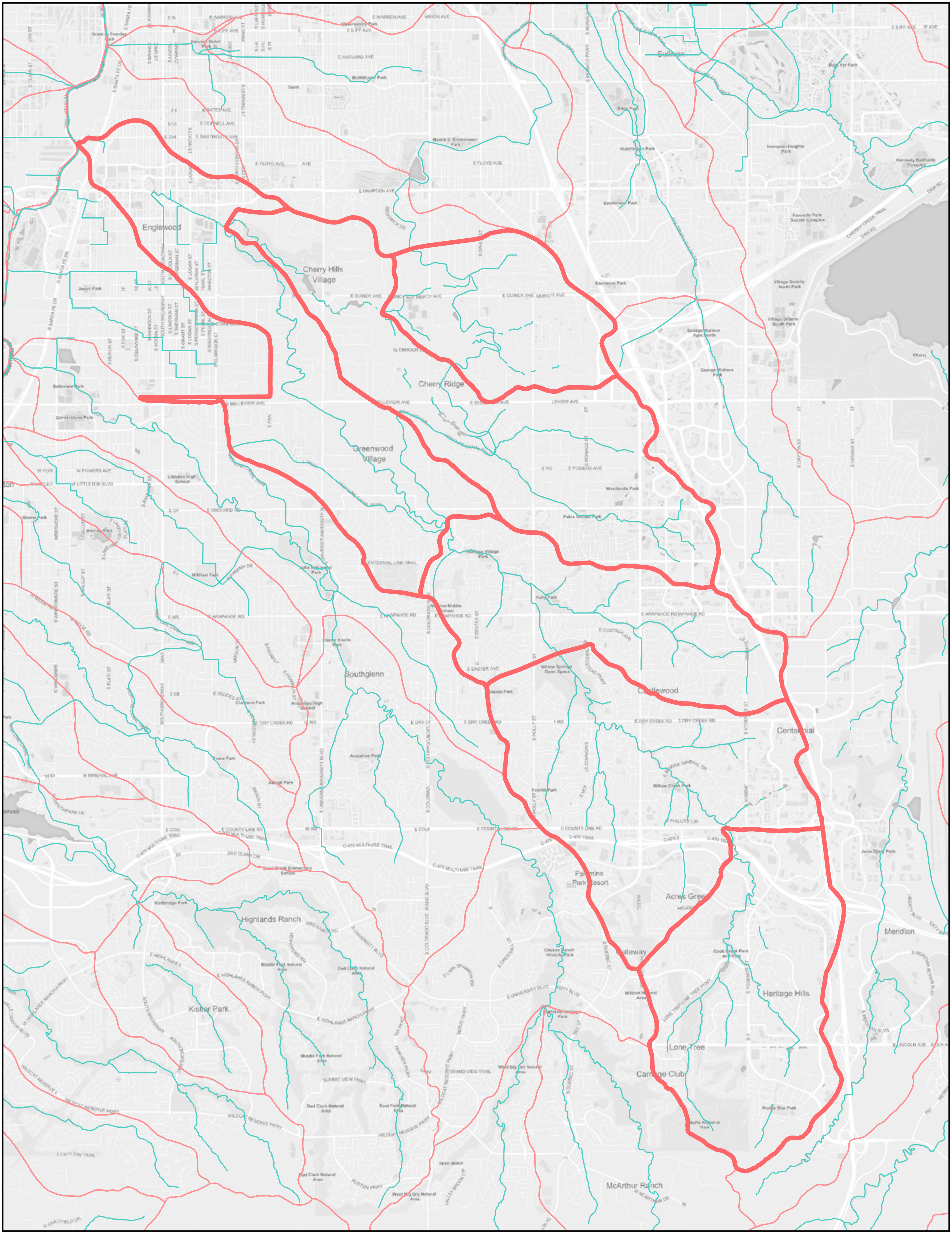
Reservoirs and regulatory dams are also significant in the Little Dry Creek watershed. The Blackmer Reservoir on the Kent Denver campus was built in the 1930s and still serves an important role in the control and release of minor and major storm flows. Further upstream in the City of Centennial, Holly Dam and Englewood Dam play a significant role as well. The controlled releases from each of these structures protected public and private property from further damages during this flood event. Without these reservoirs, there would have been more severe damage in a broader expanse of Cherry Hills Village and adjacent communities.

Additional elements such as the bridges, culverts, local drainage systems, private detention ponds, and roadways all played a part in conveying floodwaters through the basin on June 12th.

Elements

A graphic representation of the Little Dry Creek watershed as it relates to the key stormwater infrastructure elements that functioned during the June 12 flooding.




Englewood
Cherry Hills Village
Cherry Ridge
Greenwood Village
Southglenn
Castlewood
Centennial
Palomino Park Resort
Acres Green
Gateway
Highlands Ranch
Kistler Park
Heritage Hills
Lone Tree
Carriage Club
Meridian
McArthur Ranch
Sullivan
E HAMPDEN AVE
E QUINCY AVE
E BELLEVIEW AVE
E ARAPAHOE RD
E DRY CREEK RD
E COUNTY LINE RD
C-470 MULTI-USE TRAIL
S UNIVERSITY BLVD
S COLORADO BLVD
E FLOYD AVE

Purpose of Report

This report is to gather information on a specific flood event in Cherry Hills Village on June 12, 2015 and present that information to interested parties in a manner that can be easily understood by non-technical audiences but easily scaled to support highly technical future analyses of various aspects of this storm. This report will inform citizens, government officials, and other interested parties on the effects and damage that floods can cause. Then this information can be used to leverage funding and priorities for structural (channel improvements, culvert upsizing, etc) and non-structural (procedures, policies, etc.) improvements identified by future detailed studies. Through the information in the report and future flood hazard mitigation activities, the ability of the community to withstand future flood events measured by reduced flood damages – the resiliency of the community should increase.

Authority and Acknowledgments

The report was authorized by the City of Cherry Hills Village with support from the Colorado Water Conservation Board.

There are a number of residents, staff, and community officials that contributed to the information contained in this report and associated technical appendices. In particular, the following agencies contributed to this report:

City of Englewood, City Ditch
Cherry Hills Country Club
Glenmoor Country Club
Denver Water Board, High Line Canal
Kent Denver School
City of Cherry Hills Village staff
Greenwood Village staff
City of Centennial, SEMSWA staff
City of Lone Tree staff
Urban Drainage and Flood Control District
Colorado State Engineer, Dam Safety Branch
FEMA Region VIII staff

Flooded Area Description

The flooded area can be generally described as the lower lands surrounding Little Dry Creek and Greenwood Gulch within the City of Cherry Hills Village from Clarkson upstream to approximately Colorado Boulevard. More specifically, there are distinct areas that experienced more severe flooding with higher depths or velocities and corresponding damages to public and private property.

The church located at 3600 S. Clarkson is one of the main areas where flood waters ponded for several days, impacting several private structures, roadways, and other basic utilities in the adjacent neighborhoods. Ponding reached depths of 9 feet deep according to contour mapping of the flooded area. The City Ditch was the discharge point for Greenwood Gulch flows and it could not handle the excessive volume of water coming down the morning of June 12th. Greenwood Gulch overtopped the City Ditch in the yard of 3701 S. Corona Street, flowed overland and down Kenyon Avenue, impacting several private homes, garages, and outbuildings, and ultimately ponding in the church lot, inundating the lower level of the church building. Ponding continued until floodwaters reached the elevation of the City Ditch culvert passing under Hampden Avenue. The gentle slope and size of the City Ditch culvert, as well as the perched elevation relative to the terrain on the church lot, limited the ability of the City Ditch to drain the floodwaters. Mechanical pumps were required to pump approximately 6 to 8 million gallons of water out of the church property.

The flooding also impacted travel on State Highway 177, South University Boulevard. Greenwood Gulch flows exceeded the capacity of the culverts under Quincy and University Blvd. The overtopping flows were approximately 2 feet deep in the travel lanes of University and closure was a prudent measure to ensure the safety of the travelling public. Flows on Quincy were less than 1 foot deep and spread in a broader weir flow condition. Meade Lane overtopped and flood flows were conveyed down the street from the Hutto Commons property much like was represented on the FEMA flood insurance rate map for the area.

Additional roadway flooding and private property damage occurred on the upper reaches of Greenwood, Blackmer and Quincy Gulches. A driveway was washed out at 8 Random Road. Channel erosion and scour was prevalent for nearly all properties along Random Road abutting Blackmer or Greenwood Gulch. Quincy Gulch overtopped the small channels along Quincy and Colorado, but was not adversely impacting roadways or travel lanes.

The High Line Canal was not running irrigation water at the time of the flood event according to reports by Denver Water Board personnel. However, the canal was observed by Village residents and public works staff to be within 6 to 9-inches of the top of the canal embankment in several locations. There are no reports of the canal overtopping within Cherry Hills Village. It is important to note the canal crosses both Little Dry Creek and Greenwood Gulch upstream in Greenwood Village.

Storm Characteristics and Rainfall Information

There are highly sophisticated hydrologic and hydraulic models that can be developed to recreate flood events. Highly detailed survey information, gage adjusted radar rainfall, and a broad range of assumptions on land cover, soil moisture, and other variables are input. The output can identify the routing of the storm over the watershed and resulting peaks in each modeled drainageway. These models are usually prioritized and funded for flood events affecting massive watersheds such as the Missouri River basin in the Dakotas or Mississippi River flooding in Louisiana. In most cases, such as the June 12 flood event, rainfall gages and stream gages are interpolated across a watershed and qualitative conclusions are drawn from the data based on known characteristics of the watershed during past flood events. In short, this storm, in this basin, with gage data and supported radar rainfall information can be reviewed and relied upon. But there is not enough time to develop a model and determine specific flow peaks at multiple specific locations in the watershed.

This flood event is directly linked to a storm cell that passed slowly through the lower reaches of the Little Dry Creek Basin in Cherry Hills Village between 5:00 and 10:00am on Friday June 12 (red arrows in figure below). However, the more intense rainfall in the basin late on the evening of June 11, from approximately 6:30 to 11:00pm (yellow arrows below) is just as important in understanding the hydraulic reaction of the watershed and sub-basins in Cherry Hills Village.

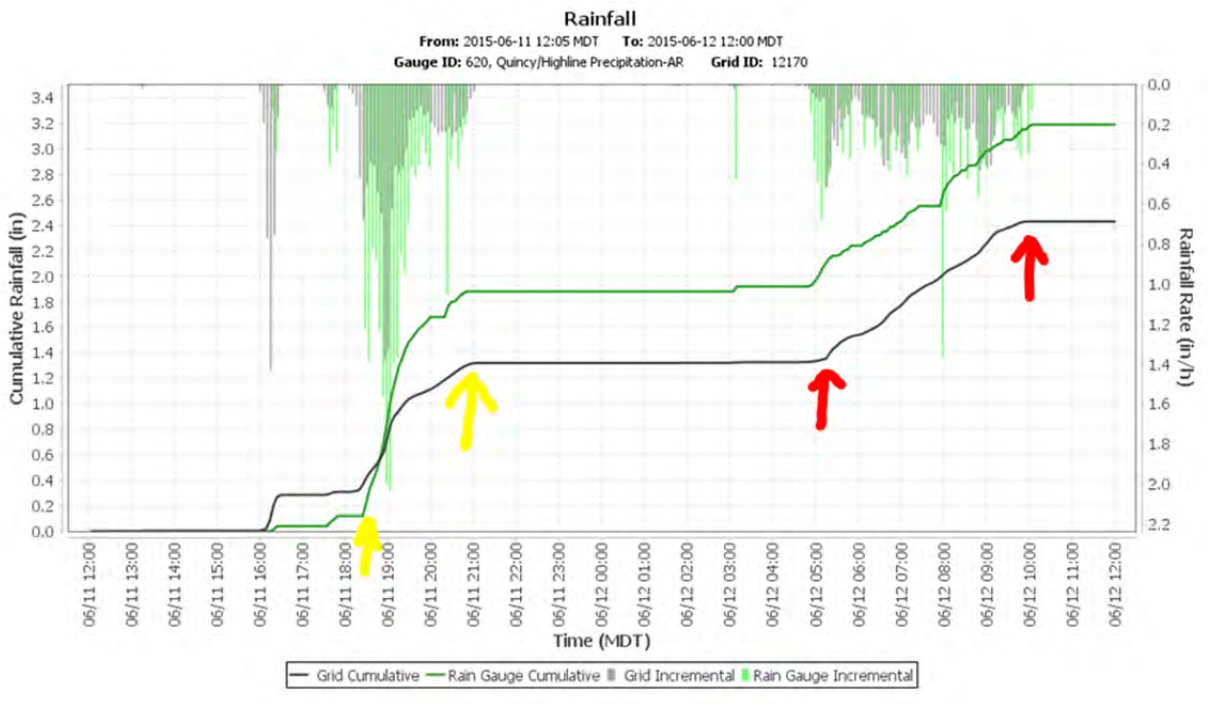


Figure: Rainfall accumulation at the gage at Quincy Avenue and the High Line Canal

Equally important is the storm cell that passed over the headwaters of Little Dry Creek in the same timeframe and contributed flows to Englewood Dam.

The National Weather Service radar covering the Denver Metro Area is a valuable dataset in the forensic analysis of a flood event. The Urban Drainage and Flood Control District (UDFCD) has funded and managed the Flash Flood Prediction Program (F2P2). This program combines the actual reports from automated gages through the UDFCD and compiles the corresponding radar data from that time period. The radar returns can estimate rainfall, scientists correlate the radar estimate with the point data from the gages, and create a Gage Adjusted Radar Rainfall (GARR) estimate. This is the information that provides another key point in the analysis of the storms on June 11 and 12th.

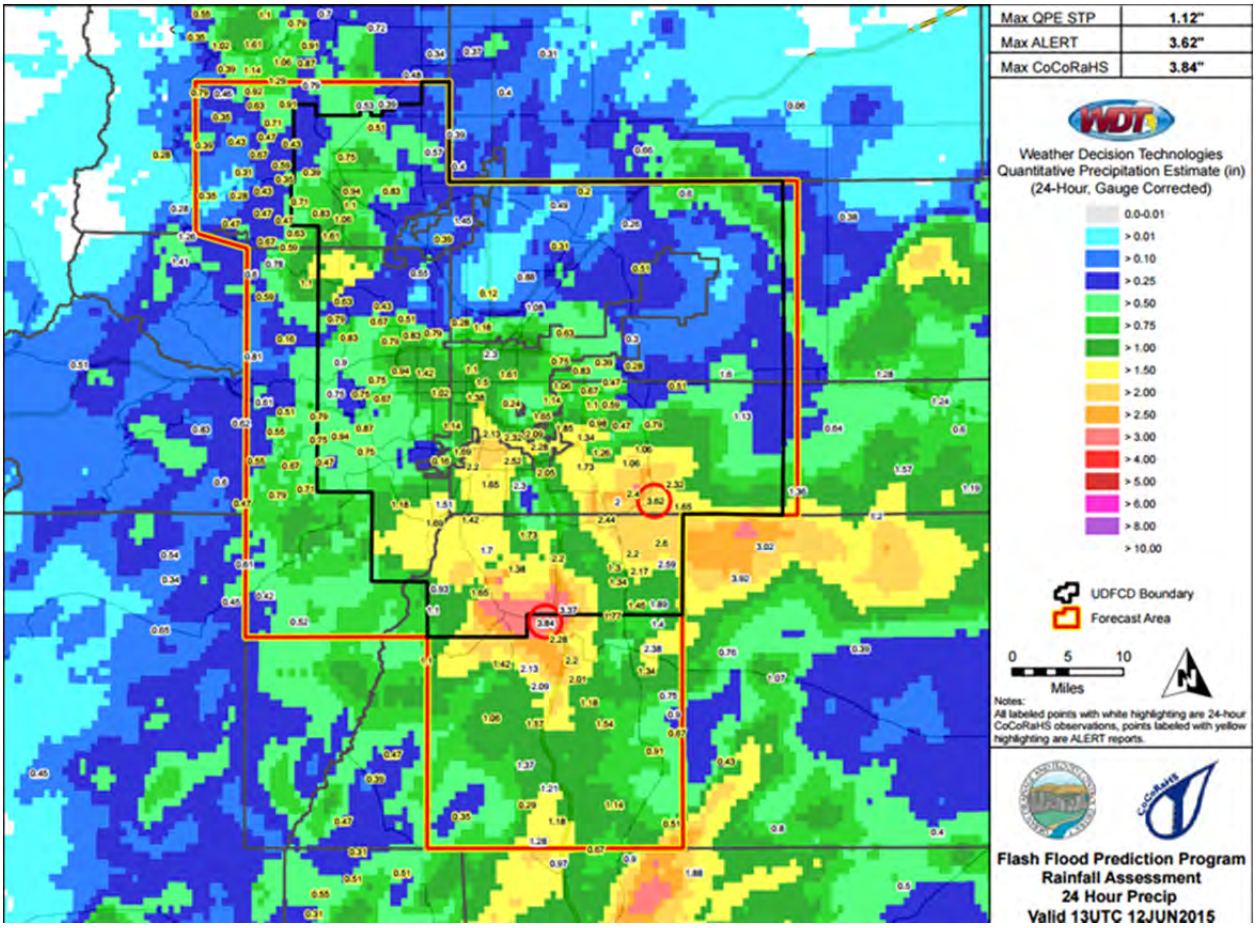


Figure: A 24-hour snapshot of rainfall accumulated through 1pm June 12th.

The rainfall totals exceeding 3-inches within Cherry Hills Village are important to note. However, just as important is the rainfall totals to the south, near the headwaters of Little Dry Creek in southern Lone Tree. These flows accumulated in the upper reaches of the basin late Thursday and early Friday morning. Englewood dam captured the peak from that southern cell. Reports and gage records show Englewood Dam filling 12 to 14-feet in the period from June 10 to June 12. Englewood Dam then

released approximately 200 cfs into Little Dry Creek for several hours. That flow ultimately combined with the rainfall in the lower basin and contributed to the longer duration of flows on Little Dry Creek.

Greenwood Gulch did not have the same level of reservoir attenuation; the resulting peak occurred faster and higher and receeded faster the as the volume of water moved through the Village.

There is another factor that develops as historic gage data is queried. As shown in the figures below, the 'wet spring' is recorded in the 2015 rainfall totals at Englewood Dam and Quincy at Highline for April and May. This correlates with anecdotal reports of saturated soil conditions throughout the Little Dry Creek basin in the weeks preceding the June 12th storm event.

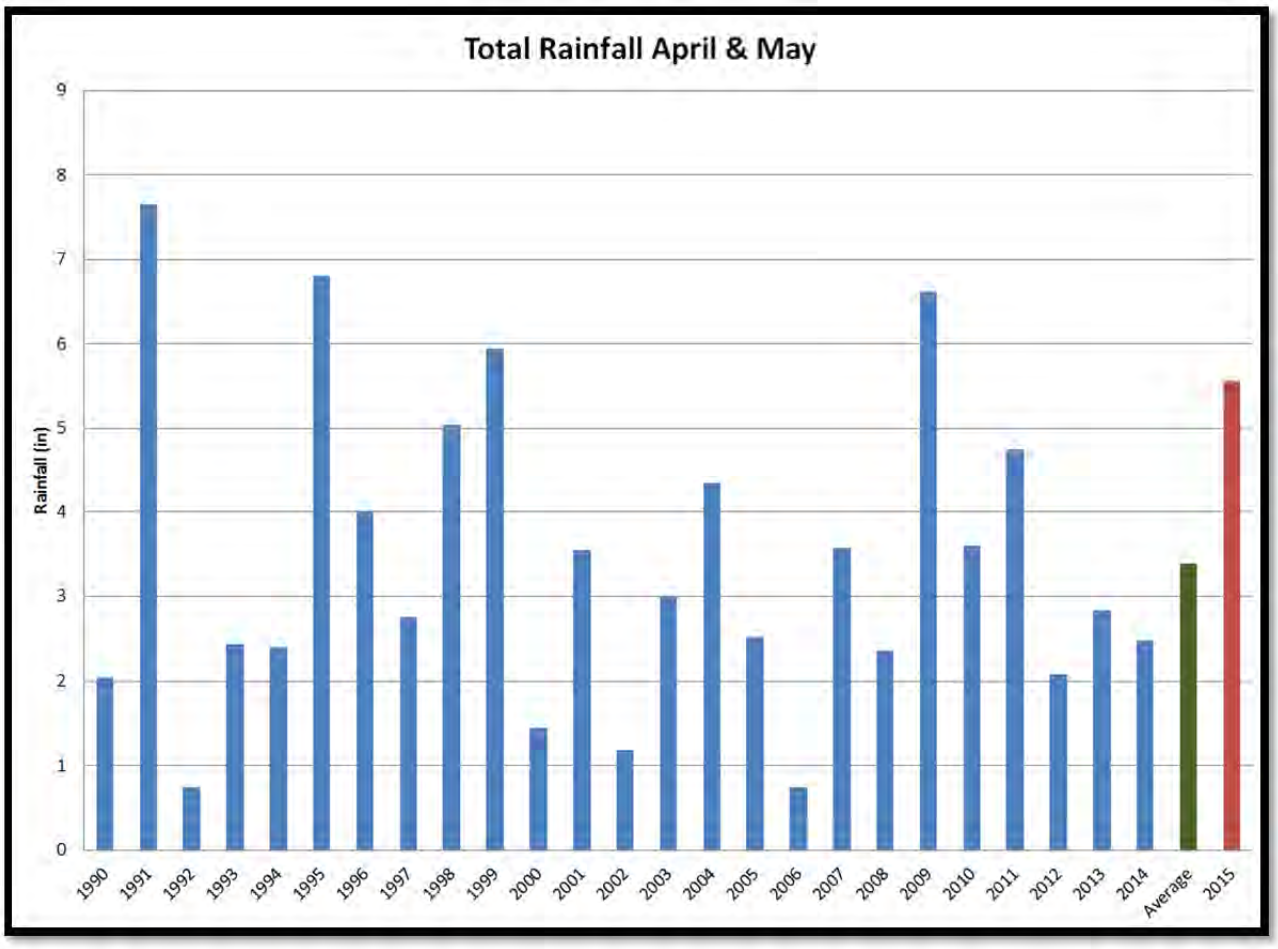


Figure: "Wet Spring" data from Englewood Dam

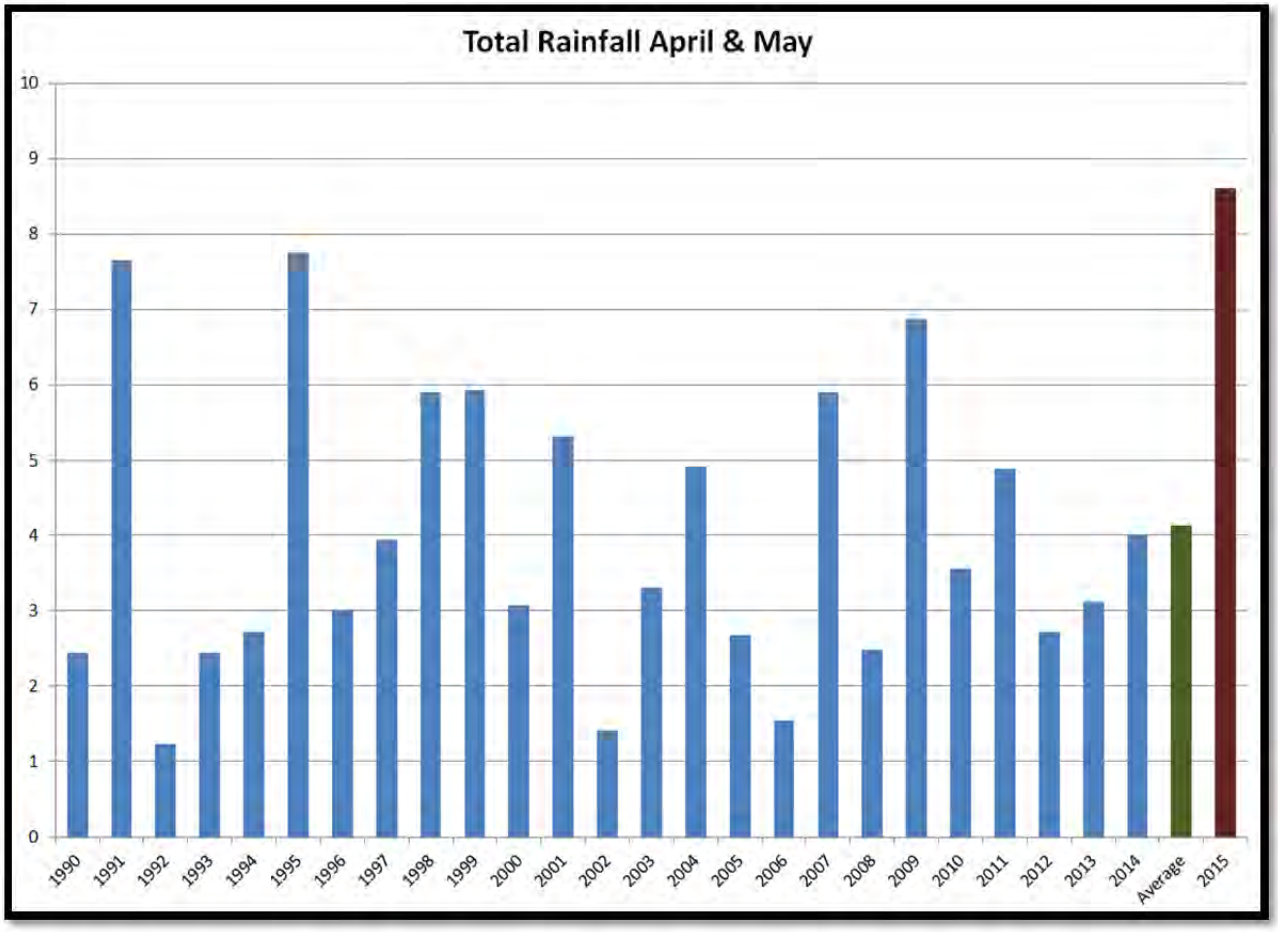


Figure: "Wet Spring" data from High Line Canal at Quincy Avenue

The gage data for Englewood Dam represents the moisture conditions in the upper Little Dry Creek basin. The gage data at Quincy High Line is representative of the soil conditions within the lower Little Dry Creek basin – within the jurisdiction of Cherry Hills Village. The above average 2015 moisture condition in both gage locations is suggestive of a basin-wide antecedent moisture condition that limits the infiltration capacity of the pervious soils across the watershed and within the ponds and impoundments. This leads to more runoff travelling through the watershed than in drier past years.

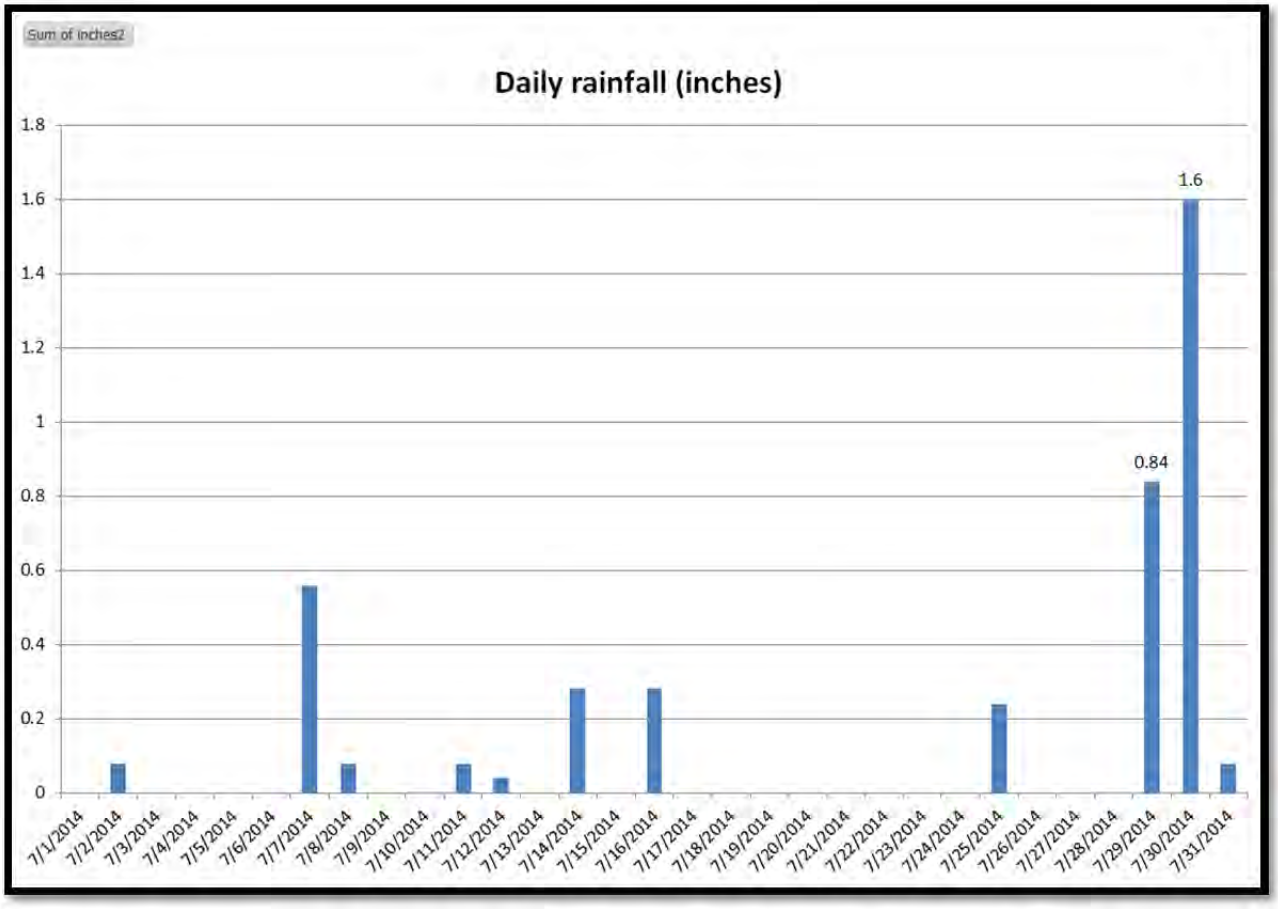


Figure: Quincy High Line daily rainfall data from July 2014

Further detailed analysis could confirm the specifics, but it appears from a cursory review that previous daily rainfall totals in July 2014 were similar to the June storm event. What are not immediately clear or confirmed are the other watershed conditions that existed at the time of the larger daily rainfalls. For example, the July 30, 2014 daily rainfall total of about 1.6 inches preceeded by approximately 0.8 inches of rain appears in both the Quincy and Englewood Dam gage data. See figure above. However, it is not matched with a 'wet spring' as documented in 2015 gage data.

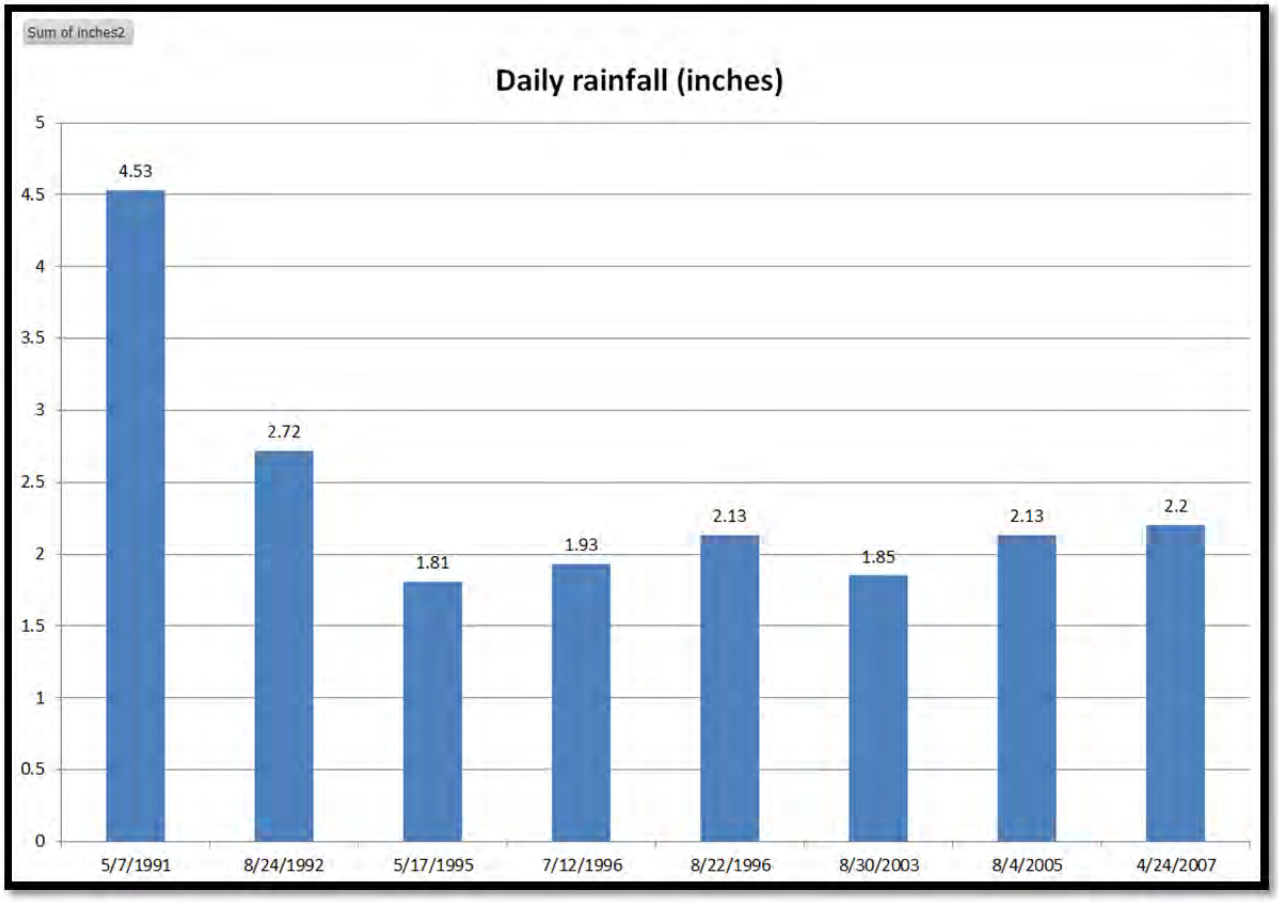
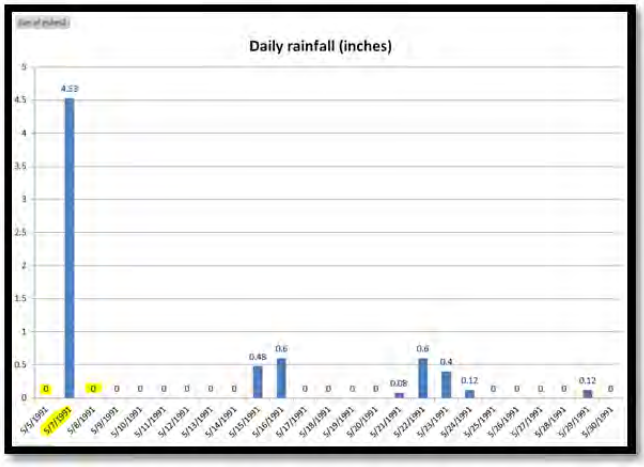
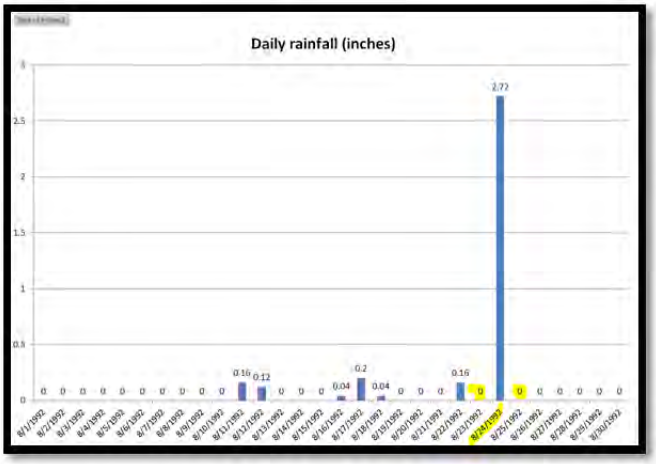


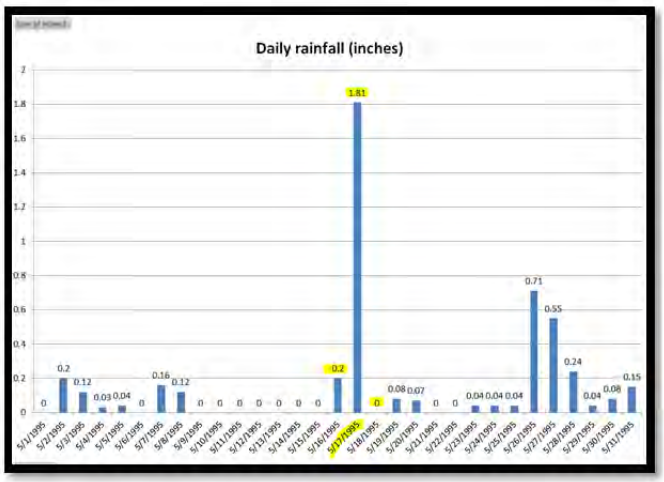
Figure: Quincy High Line daily rainfall over 1.75 inches

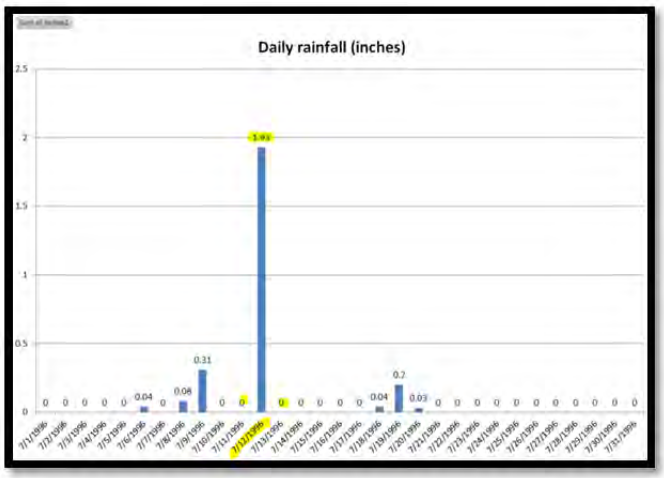
It has been noted that there are other rainfall events in the Village that have exceeded the rainfall totals experienced on June 12th, 2015. The maximum precipitation at the Quincy gage is approximately 1.75 inches on the evening of June 11th. There have been eight (8) storm events recorded by the Quincy gage since 1990 that exceeded 1.75 inches. Subsequent detailed analysis could investigate the rainfall events before and after each of these peak rainfall events. A snapshot of gage data before and after the peak events is shown in the figures below.



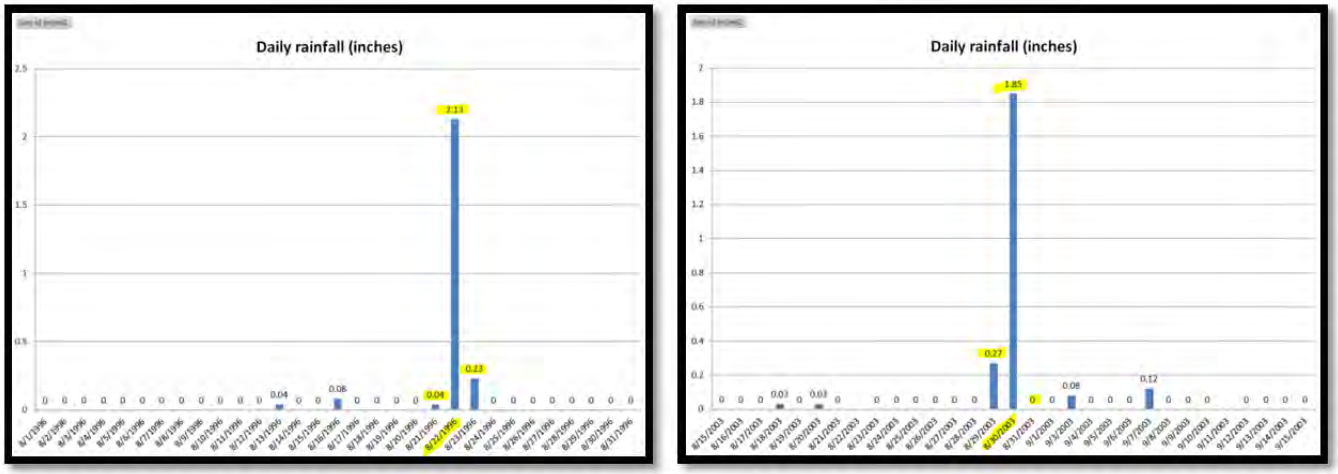


Figures: May 7, 1991 and August 24, 1992 storm event with zero precipitation days before and after

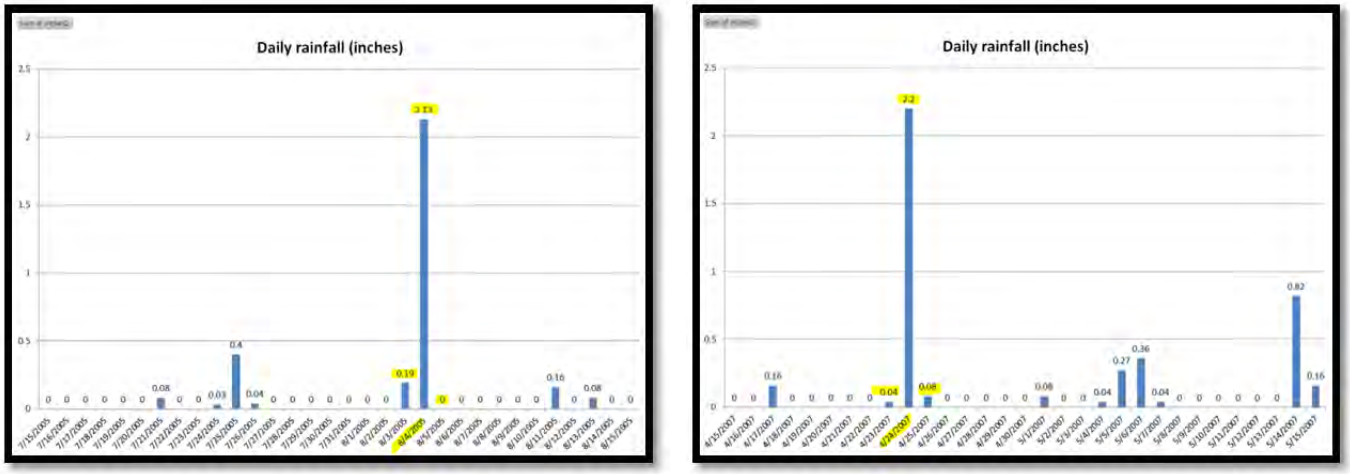




Figures: May 17, 1995 and July 12, 1996 storm event with 0 to 0.2" precipitation days before and after



Figures: August 22, 1996 and August 30, 2003 storm events with near zero precipitation days before and after



Figures: August 4, 2005 and April 24, 2007 storm events with zero and near zero precipitation days before and after

The June 12th storm characteristics are unique. This conclusion is supported by an initial investigation of the rainfall data for the Quincy High Line gage. Other storms have had higher peak rainfall. Other storms have had back to back rainfall. Other storms have followed wet spring conditions. However, it does not appear that there has been a storm since 1990 that has had as saturated of a watershed, with back to back rainfall events, with a total rainfall of approximately 3 inches within Cherry Hills Village. Additional investigation of the Englewood Dam gage data may support this same conclusion for the upper basin of the Little Dry Creek watershed.

Hydrologic and Hydraulic Investigations

No specific hydrologic or hydraulic investigations were completed for this report. However, hydrologic data is preserved through the UDFCD gage data. Previous Flood Hazard Area Delineation (FHAD) studies are also available for reference. Hydraulic information on flow rates in Little Dry Creek are available from the USGS.

Previous studies indicated the peak flows for each stream within the Little Dry Creek watershed. A snapshot of the UDFCD sponsored FHAD study is shown below.

Table III - 3
FHAD for Little Dry Creek (ARAPCO) and Tributaries
Peak Flow Comparison

Flooding Source and Location	Current FEMA Adopted Flow Rate* (cfs)				1986 McLaughlin Study	2002 WRC Engineering FHAD Study** (cfs)			
	10-Year	50-Year	100-Year	500-Year	100-Year	10-Year	50-Year	100-Year	500-Year
Blackmer Gulch									
At Confluence with Greenwood Gulch	1390	1850	1950	2330	1587	644	1307	1587	2442
At Confluence with Quincy Gulch	780	1040	1100	1330	985	389	794	985	1523
Little Dry Creek									
Clarkson Street	2275	3750	4580	5970	4581	1845	3633	4581	6855
Prentice Gulch									
At Mouth	640	870	920	1030	811	377	712	811	1163
Quincy Gulch									
At Confluence with Blackmer Gulch	610	810	850	1000	642	280	538	642	986
Greenwood Gulch									
At Bellview Road	1800	2550	2750	3200	2640	1156	2191	2640	3959
At Confluence with Prentice Creek	1700	2300	2450	2800	2112	1058	1842	2112	3225

* From the Arapahoe County FIS dated August 16, 1995
** Estimated Utilizing the 1986 McLaughlin hydrologic models.

Figure: UDFCD study flow rates for the Little Dry Creek Watershed

The USGS direct flow measurement at Little Dry Creek at Clarkson peaked at around 600 cfs, far less than the 4580 cfs, 100 year flow rate adopted by FEMA. This roughly correlates with the areal extent of the flooding on Little Dry Creek. The Little Dry Creek flows were largely contained within the channel and did not replicate the FEMA 100-year flood hazard area through Cherry Hills Village.

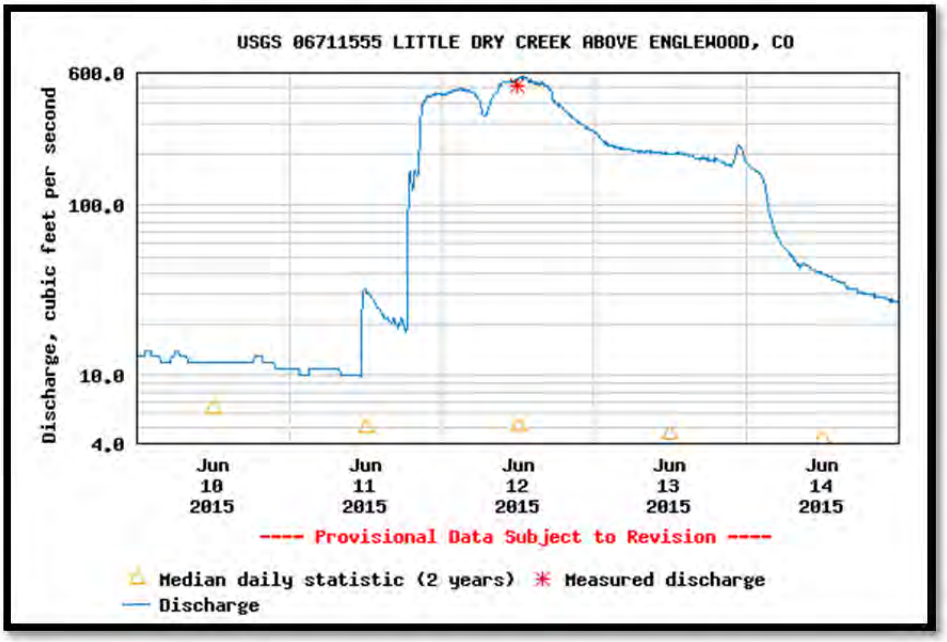


Figure: Little Dry Creek flow rates at Clarkson from June 10 to June 14th.

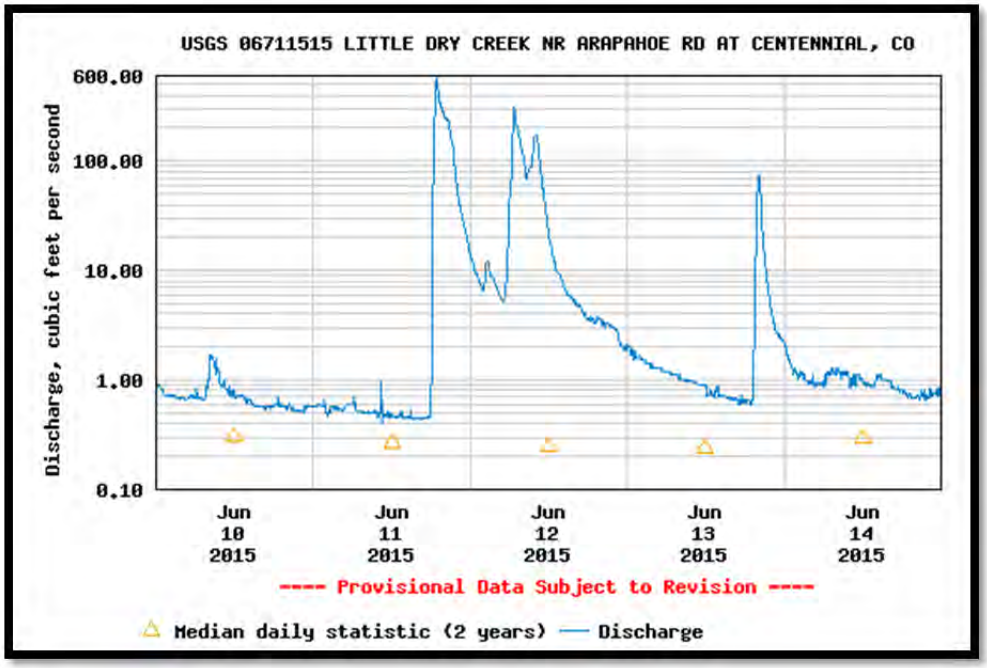


Figure: Little Dry Creek flow rates at Arapahoe Road from June 10 to June 14th.

The differences in gage data between Clarkson Street and Arapahoe Road on Little Dry Creek show the effects of other sub-basins in the watershed. The Clarkson gage stayed high for several days, while the gage further upstream was more variable.

Greenwood Gulch is a different story. Unfortunately, flow data is not available. But, the lateral extent of the flooding largely followed the delineation and depths shown on the FEMA Flood Insurance Rate Map (FIRM). There are differences, but those are attributable to the variables considered in the FEMA mapping. Free flow conditions are assumed in the FEMA floodplain analyses, debris accumulation on structures and other floatable debris impacts are not accounted in the modeling. However, every flood has some level of debris accumulated in the flood flows.

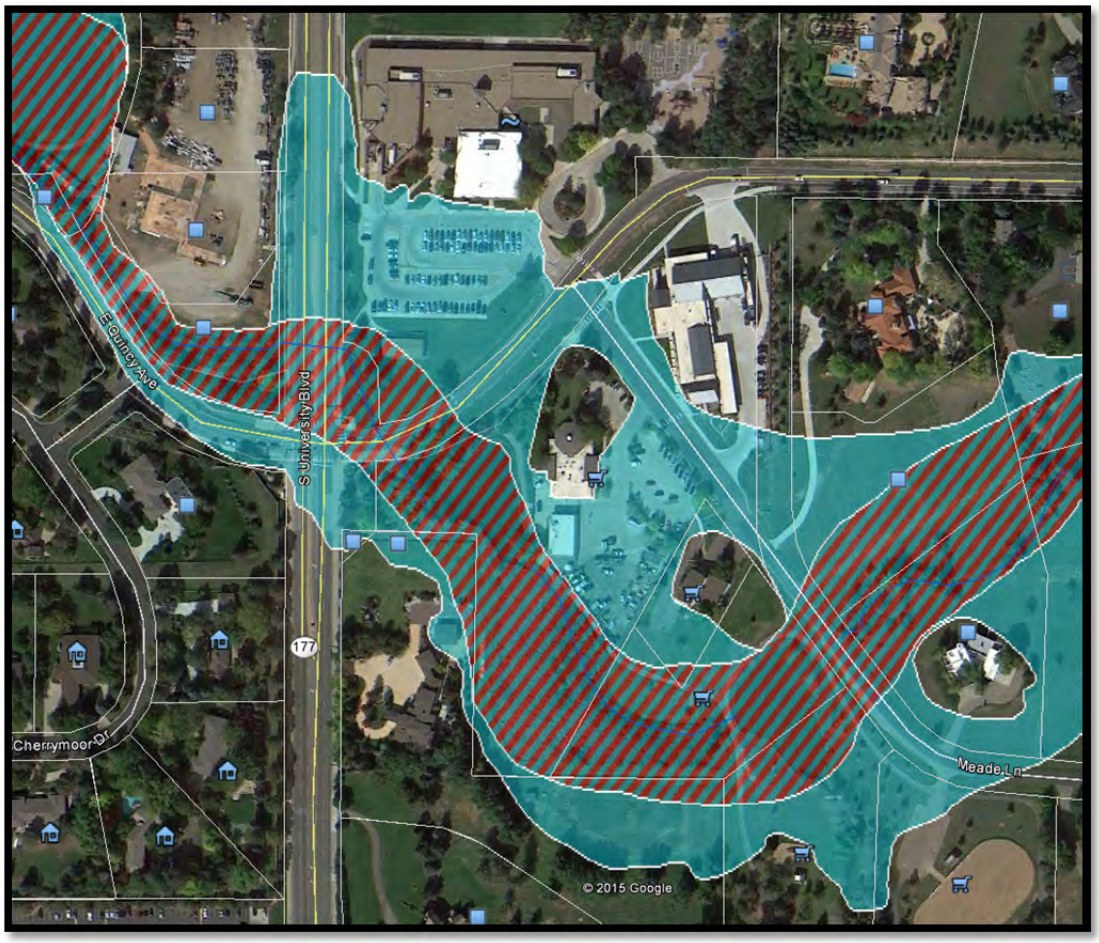


Figure: The Greenwood Gulch flood event was similar to the flood hazard area map

The flood flows during this storm event are similar to most other flood events along the Front Range of Colorado. There are variations from the 100-year flood flows published in the FEMA Flood Insurance Study. Little Dry Creek was much less than the 100 year flood flow based on actual USGS flow measurements and flood extents. Greenwood Gulch was likely much closer to the 100 year flow based on areal extent of the flooding. However, there is no correlating flow gage data to confirm the actual flow rates.

Estimated Flood Damages

There is no estimate on flood damages available at the time of this report. A summary of public and private property damages can be compiled with the assistance of affected residents and city staff. Damages may be compiled across the city, but detailed information on the source of the flooding, impacts to various levels of each structure (basement, first floor, etc) become valuable to the flood forensics. Strict dollar totals of damage are useful to the overall magnitude of the damages and can be used in future studies and grant applications for flood hazard mitigation.

Special Factors Affecting the Flood

There are several unique factors related to this flood event. The following key map roughly locates these areas by letter.

A. Greenwood Gulch at City Ditch. Greenwood Gulch is intercepted by City Ditch, the downstream capacity of City Ditch is not sufficient to safely convey major storm events north through City Ditch or south to Little Dry Creek. The City Ditch and its staff did everything possible with the limited gravity system in place at City Ditch. The upstream flows in City Ditch were released at the siphon under Little Dry Creek. This allowed the excess Greenwood Gulch flows to 'flow backward' or south into Little Dry Creek. The remainder of flow continued in City Ditch down to the culvert under Hampden. The excess overtopped the ditch and flowed down Kenyon Avenue to the church property.

B. Multiple day rainfall. Preceding rain fall in the basin, saturated soils and minimized available reservoir capacity. Previous rainfall events have contributed 2 inches of rain to the watershed, but there is no record of this many days of precipitation with accumulated totals over 3 inches in 24 hours.

C. High Line was dry. The High Line Canal was not flowing irrigation water at the time of the rainfall and subsequent flood event. This likely saved many structures from additional damage. If the canal had been running irrigation water, the excess flood waters would have had to continue downstream through Cherry Hills Village.

D. Greenwood Gulch intercepted by the High Line Canal in Greenwood Village. The Glenmoor Country Club receives surface water from Greenwood Gulch. However, Greenwood Gulch is intercepted by the High Line Canal in Greenwood Village, approximately ¾ mile upstream of Glenmoor (just northwest of "The Center" pool and tennis courts at the Preserve). This is likely what contributed most to the filling of the High Line Canal downstream through Cherry Hills Village.

E. Little Dry Creek at the High Line. Unlike Greenwood, Little Dry Creek passes over the High Line Canal. A siphon project was installed many years ago at the intersection of Little Dry Creek and the High Line Canal. The siphon conveys High Line flows under Little Dry Creek. The siphon structure also allows Denver Water to safely release excess stormwater captured in the upstream canal into

Little Dry Creek. This 'dump gate' function at Little Dry Creek is very valuable to protecting the canal from a breach condition south of that location. This dump gate does not provide any direct protection for Cherry Hills Village. In fact, the interception of Greenwood Gulch flows at the High Line supersede any backflow the Little Dry Creek dump gate may provide in that reach of the canal.

F. Blackmer Gulch at the High Line. Blackmer Gulch does not have a substantial conveyance under the High Line canal. The flows from upper Blackmer were at least ponded upstream of the canal. There are no reports or forensic data to determine if Blackmer flows overtopped the High Line canal and continued downstream to the reservoir. This is also true for the minor tributary to the south of Blackmer across the east of the property at 4750 S. Dahlia. Additional information from the homeowners along the High Line Canal near Blackmer would be useful in understanding how Blackmer drains at the High Line.

G. Blackmer Reservoir. The State Engineer had visited Blackmer Reservoir in May for a routine inspection of the structure that was originally constructed in the 1930s. The reservoir passed inspection with minor recommendations for maintenance of saturated soil conditions on the downstream end of the outlet structure. The dam was reclassified as a critical structure based on the downstream development and potential impact in the event of a full dam failure. After a site visit to the reservoir and review of the original construction drawings, the reservoir likely operated as designed. There is no manual operation of the dam outlet structure, no valve or other mechanism to release flows. Additional information on the outlet flume and hydraulics of the dam is available from the State Engineer.

H. Greenwood Gulch at Cherry Hills Country Club. The Cherry Hills Country Club (CHCC) has a long history with Greenwood Gulch and the grounds crew is very knowledgeable about the operation of the gulch in wet and dry conditions. Most notably, the CHCC has for many, many decades operated a piped diversion from Greenwood Gulch at the southeast corner of the club, along Quincy, and ultimately discharging into Little Dry Creek downstream of the Quincy bridge over Little Dry Creek. This approximately 18-inch diameter piped diversion structure relieved some of the flood flows on Greenwood Gulch, bypassing them directly to Little Dry Creek. Additional investigation of this diversion and potential to upsize this pipe could lead to reduced storm flows on Greenwood Gulch at City Ditch.

I. The UDFCD Flash Flood Prediction Program (F2P2) issued an alert for Arapahoe County the morning of Thursday June 11th calling for a high probability of heavy precipitation in the area for the next 24 hours.

J. City Ditch Breach. At some point during flood recovery operations, a hand dug trench was made in the south bank of City Ditch, approximately 100 feet upstream of the culvert under Hampden. The City Ditch staff identified this as a potential weak point in the city ditch embankment from this point forward and will require particular repairs to be done in that vicinity. The hand dug trench is relatively minor, but it exposes the fact that plans should be put in place to ensure emergency operations are planned in advance.

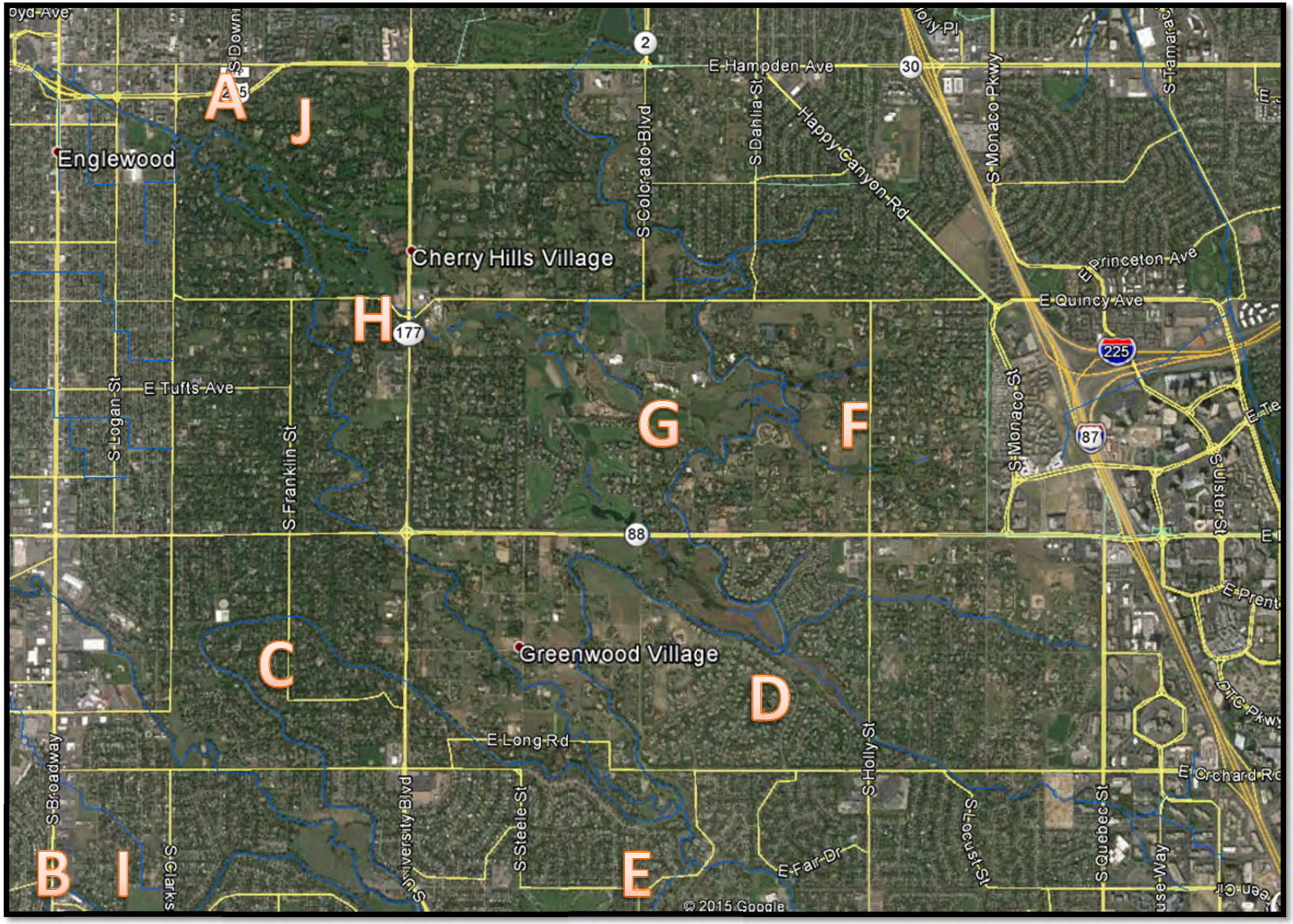


Figure: Key Issue general location map

Flood Hazard Mitigation

This report is not intended to provide a comprehensive look at projects or policies that can mitigate future flood damages resulting from floods as the June 12th flood event. However, a few notable projects have been previously identified by the Urban Drainage and Flood Control District (UDFCD) in the Little Dry Creek masterplan. And, another project has been identified in the course of flood recovery efforts at the church property.

Culverts at University.

The masterplan calls for additional culvert capacity under University Blvd and Quincy Ave. The proposed culverts are significantly larger than the multiple 30-inch diameter metal culverts that were superseded by the June 12th flood flows. The proposed mitigation work calls for triple 14-foot wide by 5 –foot tall concrete box culverts under University and the same under Quincy Avenue.

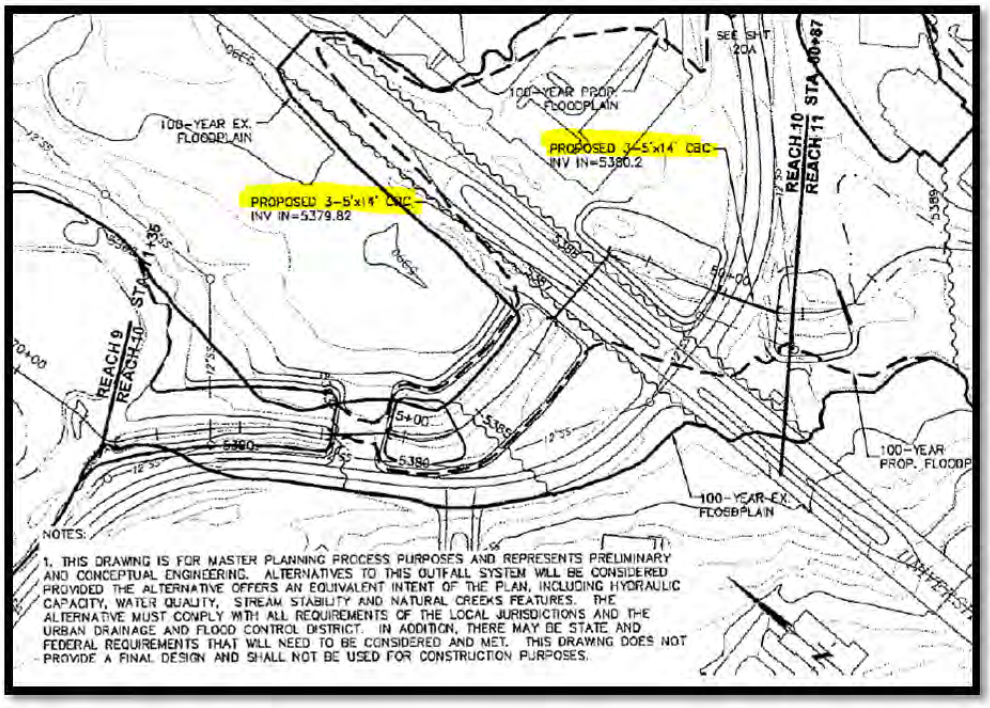


Figure: UDFCD Little Dry Creek Masterplan Improvements on Greenwood Gulch

Inlets at Clarkson

There are two existing storm sewer inlets in the east gutter of Clarkson Avenue. The storm inlets collect street runoff, convey stormwater through 18" +/- reinforced concrete pipes, and discharge into Little Dry Creek near the Clarkson Bridge. A 150-LF storm sewer extension into the church property could gravity drain the ponding to approximately the elevation of the church basement. Additional storm sewer capacity, decreased drain time during ponding, could be accomplished with replacement of the existing 350-LF of storm sewer from the Little Dry Creek outfall to the street inlet on the

northeast corner of Kenyon and Clarkson. Design and construction of this improvement would range from $90,000 to $300,000, or approximately $600/LF of storm sewer.

The drain would leave a residual ponding in the church property. To completely eliminate ponding during large storm events, the lowest grades of the property could be filled. A floodplain development permit would be required to prove the fill has no adverse impact on adjacent properties and insurable structures. Alternatively, a much deeper storm sewer could be connected through the lowest contours of the church property. To get this deep pipe to drain to Little Dry Creek, a tremendously deep excavation crossing dozens of existing utilities in and around Clarkson Street, would be required to drain into Little Dry Creek. A trenchless installation using underground boring and tunneling techniques would likely be more feasible, but just as expensive.

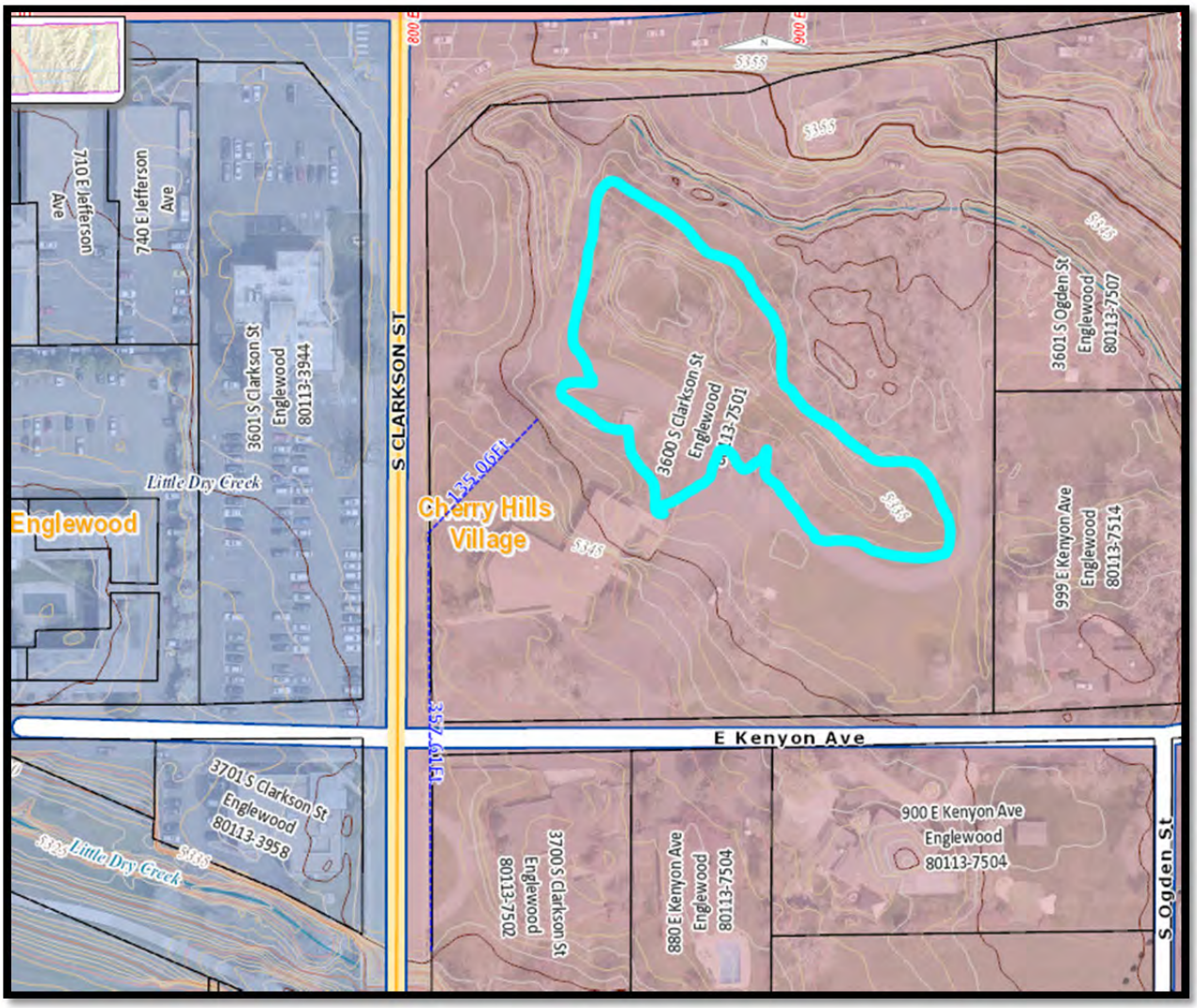


Figure: Potential 150 LF storm sewer extension and residual ponding at 3600 S. Clarkson

There are many factors that can affect the viability of this solution; existing dry utilities are the most notable obstacle to any retrofit gravity flow storm sewer installation. If existing utilities have already occupied the right-of-way or adjacent private property, the proposed storm sewer extension would have to avoid the conflicting utilities or pay for their relocation. However, if the proposed storm sewer can follow the existing storm sewer alignment with a slight upsizing of the pipe diameter, the solution may be reasonably straight forward storm sewer installation work.

Conceptual Storm Sewer Extension	
Clarkson Street Elevation	5342
Existing Storm Inlet depth	-5
Future Storm Drain elevation	5337
Approximate church basement elevation	*5337*
Existing City Ditch outlet elevation	*5338*

Figure: Approximate elevations at the church property tying into existing storm inlets

Conclusion

The June 12 flood event is a rare event, a fact supported by nearly every personal account of the storm: "I've never seen anything like this". The rainfall data supports that conclusion – there is no apparent record of a spring season of prolonged precipitation across the watershed, culminating in two storms dropping more than 1-inch of rainfall within a 12 hour period. The City of Cherry Hills Village and its residents experienced some horrible damages to personal property during this event. Extraordinary statistical markers are no consolation for the impacts of flood damages to personal keepsakes and irreplaceable heirlooms. Those distinct impacts from this flood event combined with the effects on regional travel, access to the Village Center, and other flood damage reports across the City lead to a need for additional study, prioritization of mitigation policies and procedures, and continued coordination with other agencies in the Little Dry Creek watershed.

Additional Information

Digital photos, videos, and other documentation is available in the City files.