

**FOURMILE CANYON CREEK
AND
WONDERLAND CREEK
MAJOR DRAINAGEWAY PLANNING**

**PHASE A REPORT
ALTERNATIVES ANALYSIS**

**URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
CITY OF BOULDER**



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2.6 GREENWAYS

Much of the Fourmile Canyon Creek and Wonderland Creek corridors have been included in the City of Boulder Greenways Program. Sections of the Fourmile Canyon channel west of Broadway and between 26th and 47th Streets have existing trails that parallel the channel and multi-use pedestrian underpasses currently exist at Broadway, 28th Street, 30th Street, 47th Street and the Boulder-Longmont Diagonal (SH119). Trail systems have also been created along Wonderland Creek through various reaches and additional reaches of trails are proposed for future construction as funds are available and rights-of-way obtained. Additional information on the Greenways Program can be found in the City of Boulder's Greenways Master Plan.



2.7 ENVIRONMENTAL

A complete description of environmental issues is included in Chapter 7, "Environmental Assessment and Opportunities." This section of this master plan report has been updated including the original Fourmile Canyon Creek environmental report and excerpts from the City's Greenway Master Plan provides environmental information on Wonderland Creek. No independent research or information was gathered for this restudy.

2.8 HISTORIC FLOODING

Flooding in Boulder County is primarily due to snowmelt combined with heavy rainfall, although heavy rainfall, especially in the form of cloudbursts, is alone capable of causing flooding. Floods caused by rainstorms can peak within a few hours of the rainfall, leaving little time for evacuation. Fourmile Canyon Creek has flooded occasionally, with notable events occurring in 1916, 1941, and 1951. In 1916 and 1941, railroad bridges were washed out as reported in the 10/4/2002 Flood Insurance Study for Boulder County. Investigations and a partial summary of known flood events along Fourmile Canyon Creek was also prepared by Elizabeth J. Black and presented at a Public Meeting during the previous Major Drainageway Planning study. A copy of the meeting minutes from this Public Meeting, held on September 13, 1999, is included in Appendix G. The history of flooding on Wonderland Creek has been

somewhat similar to Fourmile Canyon Creek with shallow flooding occurring on few occasions in the first half of the 20th Century but sparse documentation was found to verify this information.

2.9 FLOODPLAIN REGULATIONS

All development within the Fourmile Canyon Creek and Wonderland Creeks floodplains is currently regulated by the FEMA. In addition, all development within the City of Boulder is regulated by the City's Floodplain Development Permit process and all development within Boulder County is regulated by the County's Floodplain Development process.

2.10 PREVIOUS STUDIES

A listing of some of the previous floodplain studies completed for Fourmile Canyon Creek and Wonderland Creek are listed below.

Major Drainageway Planning, Boulder and Adjacent County Drainageways, Phase 'B', Greenhorne and O'Mara, Inc., May 1987.

Flood Insurance Study, Boulder County and Incorporated Areas, Volumes 1 through 5, Federal Emergency Management Agency, Revised June 2, 1995 and updated October 4, 2002.

Fourmile Canyon Creek Major Drainageway Planning – Phase A Report Alternatives Analysis, Love & Associates, Inc., June, 2000.

Technical Memorandum Alternative Analysis Fourmile Canyon Creek Major Drainageway Planning SH 119 to Boulder Creek Confluence, Love & Associates, Inc., January, 2002.

Floodplain Mitigation Alternatives Report for Wonderland Creek (Foothills Parkway to Wonderland Lake), Boyle Engineering Corporation, February, 2002.

Hydrology Report for Wonderland Creek, Love & Associates, Inc., April, 2005.

Wonderland Creek Damage Analysis, Love & Associates, Inc., February, 2006.

Fourmile Canyon Creek and Wonderland Creek Flooproofing Analysis, Love & Associates, Inc., February, 2006.

Fourmile Canyon Creek and Wonderland Creek Floodplain Study and Letter of Map Revision, Love & Associates, Inc., March, 2006.

HISTORY OF FLOODING IN BOULDER COUNTY

The following flood dates are mostly from Sherry Oaks, Floods in Boulder County. Where I have found additional information that was not in her study, I have simply added it. NO RESEARCH DONE YET refers to the fact that I have not looked up anecdotal accounts of this particular flood in the Daily Camera to see if there are more specific facts about local damage. Items in **bold** refer more specifically to Four Mile Canyon Creek in North Boulder (not to be confused with Four Mile canyon or Four Mile Creek which flows into Boulder creek from Sunset, Wall Street and Salina).

Elizabeth J. Black (303) 449-7532
4340 N. 13th
Boulder, CO 80304

- 1844 NO RESEARCH DONE YET
- 1864, June 9 NO RESEARCH DONE YET This flood is reputed to be of approximately the same size (100 year) as the 1894 flood. Floods in Boulder County, by Sherry Oaks
- 1876, May 22 NO RESEARCH DONE YET
- 1890, August 4 NO RESEARCH DONE YET
- 1891 NO RESEARCH DONE YET
- 1892 NO RESEARCH DONE YET
- 1894, May 31 - June 2 **Major area-wide storm (C-DUMP) 100 year event. I have been unable to find any information specific to Four-Mile Canyon Creek or Wonderland Creek pertaining to this flood. There were so many disasters in towns that relatively uninhabited places like these two drainages would not have been discussed in news accounts.**

Estimated cfs on Boulder Creek at 4th Street : 11,000 to 13,500 cfs

" The 1894 event was a result of several meteorological conditions generally recognized as fundamental to a disastrous flood occurrence: a heavy and constant spring rain at fairly low elevations was stalled against the mountain by an upslope wind condition, contributing to added streamflows in creeks already swollen by snowmelt runoff. The ground was saturated because of days of previous rain.....
 "The area just east of the Continental Divide above Boulder was pummeled by sixty hours of constant rain from a thunderstorm held against the mountains by a wind blowing from the east. Precipitation amounts recorded at rain gauges measured 5.00 to 8.54 inches during that period. The storm hovered near the upper portions of St. Vrain, Left-hand and Boulder (and probably South Boulder) Creek basins, forcing those waterways and their tributaries to reach flood stage during the night and early morning hours of May 31, 1894.....
 "(In the Left-hand Creek basin to the north of Four Mile Canyon Creek), the mountain towns, mining camps and upstream canyons of the area were perhaps the most severely affected by the 1894 flood. Most were virtually wiped off the map.....Left-hand Canyon areas sustained heavy damages. All bridges were washed out and roads obliterated. Sheriff Dyer stated that Left-hand Creek was over a half mile

wide in places and that the farms along that creek were piled knee high with debris and sand....8.54 inches of rain from May 30 through June 1 was reported in Ward..... Floods in Boulder County, by Sherry Oaks

"May 29 - June 2. Heavy rains fell over the mountains extending from the Colorado-Wyoming border southward into the Republican and Arkansas river basins. Rainfall over the Boulder and South Boulder Creek basins was particularly heavy. Rainfall records for a 96 hour period ending at 3 AM on June 1894 show that the mountain drainage area received from 4.5 to 6 inches of precipitation. Rainfall amounts over the high plains gradually decreased from west to east varying from 5 inches at Boulder to approximately 2.5 inches at the mouth of Boulder Creek. The mountain rainfall, combined with the snowmelt runoff to produce the greatest flood known at Boulder, which came roaring down the valley during the night of 30 May 1894. Buildings, bridges, and even long sections of roads and railroads were washed away. Although damages were extensive, a dollar amount was not estimated at that time." From US Army Corps of Engineers, August 1969 Floodplain Mapping of Boulder Creek.

- 1895, June 3, July 31 NO RESEARCH DONE YET
- 1896, June 1, August 19 NO RESEARCH DONE YET
- 1897, June 10, July 6-7 NO RESEARCH DONE YET
- 1900, May 9 NO RESEARCH DONE YET
- 1904, May 12 Major area-wide storm (C-DUMP)
NO RESEARCH DONE YET
- 1906, July 8 NO RESEARCH DONE YET
- 1909, June 20, July 5, 23, August 18 Major area-wide storm (C-DUMP)
NO RESEARCH DONE YET
- 1913, Sept. 7 Jamestown flood
NO RESEARCH DONE YET
- 1914, May 24, June 1,2 NO RESEARCH DONE YET
Major area-wide storm (C-DUMP)
"Rains in the mountains combined with runoff from an exceptionally heavy snowpack produced, what newspaper accounts called, "the worst flood on Boulder Creek following the 1894 flood" Boulder's water supply system and the Boulder County farm were severely damaged. Numerous roads and bridges in the mountains were also damaged or destroyed." From US Army Corps of Engineers, August 1969 Floodplain Mapping of Boulder Creek.
- 1916, July 31 **SWALLEY WITH A BANDANA THAT WAS RED WENT AND SAVED A BAD WRECK IN FLOOD.**
"Floods from a cloudburst in Four Mile canon, sometimes called Two Mile Canon, swept down the creek at 8 o'clock yesterday morning, laving the farms north of

Boulder, washing out Colorado and Southern tracks (*located just east of the Diagonal*), east of Pleasant View school and damaging roads, bridges and irrigation ditches. The flood came and went in less than five minutes, but left several thousand dollars damage behind. No train reached Boulder from the north for 10 hours.

"One of the worst train wrecks in the history of the West was averted by the presence of mind of G. D. Swalley, whose red bandana kerchief stopped an 11 coach Burlington train.... When the deluge flooded Mr. Swalley's four acres of land, unmindful of his own property, he stationed himself on the tracks a few yards from the flood at the curve in the road, which is one of the most dangerous places on the line....

"A train wrecking crew arrived from Denver at 9 with cinders and ties.... For a distance of 38 feet every tie and particle of dirt had been washed from under the track. They worked in water up to their necks, never stopping from their task for food or from pouring rain....

"Pioneer farmers say that the Four Mile gulch carried more water Sunday than any time since the fatal flood, 17 years ago. The flood water spread for 200 feet over the McKenzie (*stretching from Palo Park to 55th, along the creek*), William Terry (*now the Elks property and part of Palo Park*) and Swalley farms. Surfacing on 12th Street (*now Broadway*), North 26th (*Folsom*), and Pleasantview (*probably 47th St.*) roads was washed away. The monster flume for the Farmers ditch (*now located on the Elks property*) on the Terry ranch was washed away by flood water. Though the 26th street bridge crossing (*now Folsom Street*) was covered with three feet of water it was not damaged by the flood. The flood water was from 10 to 12 feet deep on the Terry ranch. Green corn that stands 5 feet high was buried in water. Many thousands of dollars' damage was saved by the fact that the Beasley ditch (*now Boulder and Whiterock ditch*) that runs just east of the C. and S. tracks caught the flood water of Four Mile creek after it had washed away the railroad track. Persons who saw the deluge say that all the damage was done in less than 30 minutes. Like a monster wave, the flood burst out of the canon from the cloudburst one half mile up in the mountains and carried all before it." Daily Camera, July 31, 1916.

At the same time that the Daily Camera reported this destructive flood, they also reported happily on the rain that this particular storm brought to the County. It appears that this storm was somewhat localized :

"A SPLENDID GROWING RAIN MADE EVERYBODY HAPPY. A dry spell of practically 10 weeks' duration was broken Saturday and Sunday by the participation of 1.25 inches of rain. The last rain storm of any consequence was on High School Day last May. On the 7th of June .53 of an inch of precipitation was registered by the government instrument at the University. The total precipitation for June was .56 of an inch. June and July and the last two weeks in May were "drier" than any similar period in years....Saturday and Sunday's rain precipitated 2.91 inches at Greeley and practically a like amount in the dry farming district around that city, where many Boulderites are interested," Daily Camera August 2, 1916

Ms. Virgie Aragon who lives at 417 Lee Hill Drive (442-4170, 440-3767) was able to provide more oral history. Her father, Mr. A. M. Parsons bought the Wineglass Ranch on the north side of Lee Hill in 1943 from the original owners. Since that time, she reports that she does not know of any flood on Four Mile Canyon that went out of the creek's banks on the alluvial fan between the canyon mouth and Broadway.

However, she did report that the original owner told her father that there had been a real big flood that had changed the path of the creek and had taken out some hay fields. She believes the original owner of the Wineglass Ranch bought the place around 1890.

Ms. Aragon also reports that Four Mile Canyon Creek used to flow year-round, and that there was a ditch that went south from the mouth of the canyon. This ditch which carried Four Mile water south filled Wonderland Lake. (Remnants of this ditch, which is called the Mesa Park Ditch on the 1926 Drumm Map of Boulder County, can still be seen along the open-space trail.) Ms. Aragon said that there used to be three ponds in the northerly creek channel along Lee Hill, which used water from 4 Mile Canyon Creek. The ponds did not hold water since she could remember. She says that when the developer of Pine Brook Hills drilled wells for that development some time in the 60's, he hit the springs that supply Four Mile and the Creek has since dried up. She also stated that there is now a lot more mud and sand coming down the creek than in past years. She believes this is due to the new houses and road-cuts up the canyon.

1918, August 3

NO RESEARCH DONE YET

Peak discharge at Orodell (located 1 mile upstream from Four Mile Creek and 3 miles southwest of the courthouse in Boulder) : 1300cfs. From US Army Corps of Engineers, August 1969 Floodplain Mapping of Boulder Creek.

1919, July 30-31, August 1

NO RESEARCH DONE YET

1921, June 3, 6, 7 Although the main news at this time was a terrible flood in Pueblo that was thought to have killed hundreds (actual death toll 47), Boulder County had its share of flooding also. Erie, Lafayette, Marshall, Louisville, Longmont and Broomfield were also heavily damaged. There was a tornado in North Boulder and a flash flood on Six Mile canyon creek. Boulder was cut off from train service for several days.

"In the district immediately north of Boulder there were both a terrific cloudburst and a cyclone. The cyclone did the most damage to the ranches of Alfred C Wetterberg and C. W. Carpenter, where several buildings were wrecked and several of the fields swept clean. (*This is in the area of the Six-Mile Drainage just to the west of Boulder Reservoir and Six-Mile Reservoir.*) Mr. Wetterberg stated this morning that he and a friend were seated in the shelter of a shed watching the clouds form when they noticed a peculiar funnel-shaped cloud approaching. It did not occur to either of them that it would be dangerous until they noticed as it approached that it was picking up things, whereupon they started for the house. The cyclone struck before they reached the house and they were forced to crawl the remaining distance on their hands and knees. The next instant they saw the garage lifted from off its foundations and moved bodily several yards, leaving a Ford car that was inside the garage standing unharmed on the ground underneath. The cow barn was the next to go and was raised thirty feet in the air and dashed to pieces, parts of it being scattered across the field for nearly a mile, while a flock of 200 chickens in the barnyard were whisked away like straws. The bodies of some were later found in the field. At the L. W. Carpenter place one of two large trees were snapped off and the roof of the granary lifted off and dashed to pieces. At the same time one mile west of the Wetterberg ranch there was a terrific cloudburst which

caused water to flow down thru the arroyos on the Six Mile farm (this was probably somewhere around the Eagle Bike trail under the Foothills Highway) to a depth of 16 feet. Several head of cattle were caught in the flood and could be seen bobbing up and down like corks as they were swirled along in the water. Most of them, however, finally escaped alive and were rounded up later badly bruised, but otherwise unhurt. Daily Camera, June 4 1921

"Boulder creek is flowing over the closed headgate of the Silver Lake ditch in Boulder canon, according to Dudley Degge, the superintendent. The ditch has been opened in several places to allow water to escape. Two Mile and Four Mile canons north of Boulder are doing no damage though carrying heavy loads of water." Daily Camera, June 6, 1921

Major area-wide storm (C-DUMP)

"Little is known of this flood except that it produced the highest peak discharge ever recorded at the Orodell gage. A discharge of 2500 cfs was recorded on 6 June. Rainfall totaled 3.36 inches at Boulder through a period 2-7 June." From US Army Corps of Engineers, August 1969 Floodplain Mapping of Boulder Creek.

"June 2 - 6, 1921. This storm produced general rains over the South Platte basin with the greatest amounts along the foothills. It covered an area of approximately 520 square miles and lasted 5 days. The maximum recorded rainfall was 5.29 inches and the greatest recorded rainfall intensity was 4.3 inches in 6 hours at Longmont. This flood was produced by a combination of rainfall and snowmelt. Although this storm caused overbank flooding neither discharges nor damages were recorded." Flood Plain Map for Left Hand Canyon Creek, Corps of Engineers, 1969

From Daily Camera, June 4, 1921 "BROOMFIELD CHURCH USED FOR LODGING BOULDERITES IN STORM. W. A. Wright, of this city, was driving his auto homeward from Denver. As the car left the north and south road and started toward Broomfield and has gone west about a half mile, he struck water 3 feet deep and 200 feet wide - overflow of Coal Creek due, probably to spilling out of Marshall dam and the concurrent cloudburst. Hail stood 6 feet high, over some of the fenceposts. There were fifty cars stalled in that vicinity. 18 people were taken in by Clarence Graves, a farmer near Broomfield, and given shelter that night with meals and sleeping accommodations....The Broomfield church was opened up for the stalled parties who slept there all night. Mr. Wright said that the storm broke at 3:30 Friday afternoon.

"Crops were destroyed; Lafayette badly washed. Crops in the region of Broomfield were wiped out by the storm according to Commissioner Hill who made an automobile trip this morning to Marshall, Superior, Broomfield, Louisville and back to Boulder by the Arapahoe Road. Coal Creek was reported to be running high and Mr. Hill was told by George Miller of Lafayette that several houses had been washed away by this stream in Lafayette. South Boulder creek is reported to be behaving nicely. Mr. Hill stated that no damage had been done in the mountains by high water. Over near Hygiene and Longmont, many bridges across irrigating ditches were so badly weakened by the storm and the heavy flow of water in the streams that they will have to be rebuilt. A number of irrigation ditches broke their banks and flooded fields. This was true in the Broomfield district also. The ditches had been carrying unusually heavy flows of water which the storm naturally increased. Mr. Hill stated that it would be impossible to estimate the

damage to Boulder county, on roads and bridges, for several days. Boulder creek is running high but no more than usual after a heavy storm.

"MARSHALL DAM HOLDS AND DANGER IS PAST IS WORD GIVEN OUT:

Thomas Hilton, superintendent of the Gorham mine, said today that he did not think there was danger of the Marshall dam breaking. It is true, he said, that it has settled two to three feet, but this is due largely to the top having been raised creating a great overhead without increasing the size of the base. But there has been no crack or lateral movement, and there is no crevice from which water flows. All day long reports were on the streets that the Marshall dam had broken. It is to be hoped and is expected that it will hold. The big spill of water to relieve the dam was what added to the heavy rain, causing inundation of the coal towns and Broomfield and as far east as Erie. Some light and power lines were out of commission there due to a large part of the towns being underwater.

"TRAIN SERVICE IS DEAD, PROBABLY TILL MONDAY OWING TO THE FLOOD... The interurban line between Boulder and Denver is reported to be in worse condition than the C&S track....The track between Superior and Longmont is said to be in fair condition...The last train into Boulder from Denver was Friday morning. That train was late having been routed thru Louisville because of the threatened danger of a break in the Marshall reservoir.....The C&S train due in Boulder at 3:40 on Friday is at Louisville Junction. It has nearly 200 passengers. These passengers are being fed by farmers and out of Broomfield. Because of the shortage of supplies they have been placed on rations....Joe Markley, a reporter for the Denver News made a trip as far as Louisville Junction. He told the Camera this afternoon that 400 people who had been stranded were being fed out of Broomfield rations. He reports three bridges on the C&S line between Louisville Junction and Denver washed out. Forty feet of track is washed out at the Federal Boulevard crossing. Three feet of water ran over the section from Broomfield to Westminster for seven hours last night. This was caused by the storm, the breaking of the Churches' Lake, and of several irrigating ditches. A gulch near Burns Junction was said by Mr. Markley to be covered with hail for a depth of five feet and for 200 feet in width. Some 50 automobiles are reported to be deserted at points on the road.

" A survey of conditions in the district around Erie and Lafayette was made by Charles F. Snow this morning and he has brought back the most authentic reports so far. Mr. Snow left Boulder early this morning.... He stated that the flooded area in that district varied from a few hundred feet in width to a half a mile or more. In Lafayette three houses had been washed from their foundations near the Standard mine, bridge had been washed out and a coating of mud plastered over everything. In Erie, which was put almost completely under four feet of water, the flood poured thru the street like a mill race, carrying away houses, buildings, livestock and every moveable article. One man reported the loss of 26 head of cattle and several hogs and chickens. Another man had just purchased a brand new piano and moved it into his home. After the flood not a trace of the house or the piano could be found anywhere, and many miners who were living in the low-lands along the creek have nothing but their land left. In the town of Erie itself several houses have been moved out in the street and about 300 feet of railroad was picked up bodily and moved several feet until it was stopped by a row of trees.

"In Longmont from 3 o'clock yesterday afternoon until this morning a steady stream of water two feet deep poured down 5th and 6th Avenues and Pratt, Kimbark, Emery and Collier streets. The flood in this case was caused by overflow from several big irrigation ditches north and west of the city and especially from the Right and Ready ditch and the Oligarthy Supply ditch. The race track was turned into a lake and the new city auditorium was flooded to a depth of several feet, and the opera chairs are floating around loose on the surface of the water. The water came so swiftly that damage resulted to many

buildings, especially to the Empson Packing company factories. The foundation of the Christian church is said to have sunk 15 feet in places. The St. Vrain was converted from a small stream into a torrent a mile wide and several bridges have been reported as washed out.

"In the district east of Longmont the flood was even worse in places and at Fredrick the Evans mine was flooded and ground above the mine is sinking and cracking. All roads in that district are impassable. At Greeley the flood did not do so much damage but the city has been without power of any kind for several hours because of a breakdown in the Northern Colorado Power line in which some 15 poles washed away.

"In the district immediately north of Boulder there were both a terrific cloudburst and a cyclone. The cyclone did the most damage to the ranches of Alfred C. Wetterberg and C. W. Carpenter, where several buildings were wrecked and several of the fields swept clean. (*This is in the area of the Six-Mile Drainage just to the west of Boulder Reservoir and Six-Mile Reservoir.*) Mr. Wetterberg stated this morning that he and a friend were seated in the shelter of a shed watching the clouds form when they noticed a peculiar funnel-shaped cloud approaching. It did not occur to either of them that it would be dangerous until they noticed as it approached that it was picking up things, whereupon they started for the house. The cyclone struck before they reached the house and they were forced to crawl the remaining distance on their hands and knees. The next instant they saw the garage lifted from off its foundations and moved bodily several yards, leaving a Ford car that was inside the garage standing unharmed on the ground underneath. The cow barn was the next to go and was raised thirty feet in the air and dashed to pieces, parts of it being scattered across the field for nearly a mile, while a flock of 200 chickens in the barnyard were whisked away like straws. The bodies of some were later found in the field. At the L. W. Carpenter place one of two large trees were snapped off and the roof of the granary lifted off and dashed to pieces. At the same time one mile west of the Wetterberg ranch there was a terrific cloudburst which caused water to flow down thru the arroyos on the Six Mile farm (*this was probably somewhere around the Eagle Bike trail under the Foothills Highway*) to a depth of 16 feet. Several head of cattle were caught in the flood and could be seen bobbing up and down like corks as they were swirled along in the water. Most of them, however, finally escaped alive and were rounded up later badly bruised, but otherwise unhurt.

"The mountain towns reported that the storm did not do much damage. At Nederland there was a bad hail storm with hail as big as hen's eggs according to some reports but the roads were not hurt." Daily Camera, June 4, 1921

Peak discharge at Orodell (located 1 mile upstream from Fourmile Creek and 3 miles southwest of the courthouse in Boulder) : **2500cfs**. From US Army Corps of Engineers, August 1969 Floodplain Mapping of Boulder Creek.

1923, June 7 NO RESEARCH DONE YET

Major area-wide storm (C-DUMP)

"This storm centered over the high plains east of the mountains. Rainfall at Boulder totaled **3.84 inches** through a period of 3-10 June with **2.39 inches** of the total precipitation falling on 9 June. Combined flows from Boulder, South Boulder, and Bear Canyon Creeks produced flooding downstream of Valmont." From US Army Corps of Engineers, August 1969 Floodplain Mapping of Boulder Creek.

1924, June 14 NO RESEARCH DONE YET

1929, July 28 The following is a report from the Boulder Daily Camera from August 5, 1955.

"CLOUDBURST CAUSED GREAT DAMAGE IN BOULDER AREA 36 YEARS AGO. Thirty six years ago Boulder and much of northern Colorado was recovering from a cloudburst that struck first at Lyons the afternoon of July 30, then Boulder the following afternoon and night. The "Switzerland Trail" railroad bed in Four Mile canon was so badly damaged that the railroad, which was seeking permission to discontinue, never ran again. 'Both Boulder creek and its south tributary overflowed their banks in places', said the Camera of August 1. 'Water in Boulder Creek reached the height of the retaining walls at the 12th St. bridge. Dry gulches, noticeably that of Gregory and its tributaries, became raging torrents. Water ran in streams down Boulder streets and across University hill lawns and sidewalks.'

"Rain fell throughout the night. The storm in Boulder broke at 5:30 and grew in intensity until 7 o'clock when it became a veritable cloudburst which continued until 9. The rain continued to fall practically all night. The heaviest rain fell in the front foothills. Mr. Ford of the Denver-Boulder and Western railroad was told there was very little rain above the Gold Run mine in Four Mile canon. Bummer Gulch was the storm center. The wall of the new road up that gulch from Boulder canon was washed out. The article said **4.8 inches** of rain fell. Three hundred feet of interurban track was washed out across South Boulder, two miles east of Boulder. A Colorado and Southern freight train's engine tender and seven coaches were wrecked near Marshall.

"Streets and Lawns Badly Damaged. City Engineer Salter placed an estimate of \$4000 on the damage to roads, bridges and culverts in Boulder. Principal damage was on 10th St. from the Chatauqua to University avenue; 12th street from University avenue to Arapahoe. A large section of the Armstrong bridge in Gregory canon was washed out and 150 feet of Baseline in front of the Chatauqua golf course was covered with rock and gravel. Cement sidewalk across Gregory ditch on Marine was washed out. 'Reports of the flood attracted large crowds to all parts of the affected district' the Camera reported. 'The most interesting place from a spectacular standpoint was at 9th and Arapahoe. The water filled the cement ditch that runs through Highland school lawn and made an inspiring appearance as it sprayed up over the artistic bridge recently constructed for Riverside Drive. The bridge diverted the water across the new lawn, that has been the object of much admiration, onto 9th St., badly damaging the road.'" Daily Camera, August 5, 1955, referring to Daily Camera article of August 1, 1929

1930, August 10 NO RESEARCH DONE YET

1933, July 8, Sept. 8 Two Mile Creek floods in September (C-DUMP)
NO RESEARCH DONE YET

1935, May 26-28, June 15 NO RESEARCH DONE YET
Peak discharge at Orodell (located 1 mile upstream from Fourmile Creek and 3 miles southwest of the courthouse in Boulder) : **1060cfs**. From US Army Corps of Engineers, August 1969 Floodplain Mapping of Boulder Creek.

1938, August 31 - Sept. 4 NO RESEARCH DONE YET

Dry Creek floods, Floods in Boulder County, by Sherry Oaks

Flood of record for South Boulder Creek, Floods in Boulder County, by Sherry Oaks

"September 3 - During this storm, showers were general over the Left Hand Creek basin accompanied by isolated cloudbursts along the foothills and the lower elevations. A maximum peak discharge of **812 cfs** was recorded at the US Highway 287 gaging station near Longmont. This gaging station was not in operation during the 1949 and 1951 floods." Flood Plain Map for Left Hand Canyon Creek, Corps of Engineers, an 1969

"This storm produced general rains over all of eastern Colorado. The largest amounts of precipitation occurred in the mountains where over 6 inches was reported west of Eldorado Springs. Boulder reported **3.62 inches of precipitation** from 31 August to 4 September with **2.32 inches** falling during 2 September. Eldorado Springs had **4.42 inches** of rainfall. Approximately 80 % of the total precipitation falling in the South Boulder Creek basin fell in the late afternoon and evening of 2 September. The resulting flood, with a peak discharge of **7390 CFS** arrived at Eldorado Springs at 10PM on 2 September. The peak gradually subsided as the flood moved downstream. A maximum discharge of **4410 cfs** occurred near the mouth of Boulder Creek at noon on 3 September. Several buildings in Eldorado Springs were destroyed as a result of the flood eroding away their foundations. Numerous bridges were destroyed and the valley from Eldorado Springs to Boulder Creek and down Boulder Creek to the St. Vrain Creek was in shambles. This flood is the highest recorded flood on South Boulder Creek." From US Army Corps of Engineers, August 1969 Floodplain Mapping of Boulder Creek.

1939 NO RESEARCH DONE YET

1941, June 22 This storm was centered on both Sugar Loaf mountain and the South St. Vrain. However, sections of North Boulder were also damaged.

"Two-Mile canon north of Boulder sent a large head of water down into Newlands addition, washing roads and some farms, filling ditches with sand. The sand was so deep two or three places on the Broadway oil surfacing in the county home district that a grader was necessary to remove it. Homes, lawns and gardens in the north part of Boulder suffered relatively little damage in comparison with other areas and in comparison with damage caused by overflows of Two-Mile gulch in previous years.

"Water went out of the banks of another gulch four miles north of Boulder, near the Euler ranch (*the Wineglass Ranch on the north side of Lee Hill just before it enters Four-Mile Canyon Creek canyon*), but that ranch was reported undamaged. The flow went across the foothills highway (*Broadway*) and damaged railroad track about three and a half miles northeast of Boulder. A railroad bridge had to be repaired there. (*This is the bridge that keeps getting washed out, just to the east of the Diagonal.*) In the same vicinity, Bert Andrus' garden was damaged. (*Bert Andrus owned 45 acres north of the confluence of Four-Mile and Boulder Creeks, in the vicinity of North 61st and North 63rd.*) Daily Camera, June 23, 1941

Two Mile Creek floods (C-DUMP)

Peak discharge at Orodell (located 1 mile upstream from Fourmile Creek and 3 miles southwest of the courthouse in Boulder) : **1120cfs**. From US Army Corps of Engineers, August 1969 Floodplain Mapping of Boulder Creek.

"FLOODS SWEEP LONGMONT MAN TO DEATH AND SPREAD WIDE DAMAGE"

"Flash floods in Boulder County Saturday night and early Sunday swept a Longmont man from the arms of his wife and to his death, crumpled canon homes and carried others away intact, sent an automobile hurtling over a 150-foot embankment an instant after to car's only occupant had alighted, ravaged roads and bridges, and caused thousands of dollars of damage not yet officially estimated. The city of Boulder escaped almost entirely, except for minor flooding of a small area in the north part. Rain measured **1.04 inches** here. Accompanied by a lightening storm of blinding intensity, downpours starting about 10:30p.m. Saturday sent already swollen streams raging over their banks and turned normally-dry gulches into furious torrents.

"Traffic was almost back to normal this morning except in South St. Vrain canon, 15 miles north of here, and on the Sugar Loaf road, directly west of here. The latter was expected to be restored for travel by tonight; the former will be closed several days. Water chewed great slices from outer edges of the North St. Vrain road but it was never rendered impassable and is perfectly safe for travel to Estes Park. Four-Mile canon was blocked by debris and temporarily impenetrable gullies but it was reopened Sunday afternoon. The Boulder canon highway was damaged less extensively and was closed to traffic only momentarily, while Left Hand canon, midway between to areas of the most severe rains was affected comparatively little."

"Sugarloaf mountain was the center of the week-end storm in the district immediately west of Boulder. Two large culverts were washed out; the road caved in at several points, and at others was covered with rock and debris. The road was closed early Sunday morning and Commissioner Elmer Hetzer and Road Supervisor C. C. Edwards hope to have it open by tonight. Most of the road damage was on the Boulder side of the canon - the road being open from Sugar Loaf west. Boulder canon paving was undermined for a hundred feet at Bummer Gulch, the point where water from the Sugar Loaf district drains into Boulder Canon. The large culvert constructed across Boulder canon at this point, two years ago, did not have sufficient carrying power for the great head of water that came down the gulch, carrying debris. A channel four feet deep was cut along the paving.

"At Eagle Rock just west of where the paving ends, great amounts of sand and dirt were carried into the road. The highway was not closed for any considerable time however, because Commissioner Hetzer and Superintendent Edwards had a force of men working long before daylight and sent graders and bulldozers to the section. Magnolia Hill road had several bad washouts and one slide, but the road remained open. Keystone gulch which enters Boulder Creek at El Vado carried 100% more water than at any time in the 17 years J. E. Tinsley has been living there he said. It washed out the road to his cabins, covered the tennis court and lawn with sand and other debris. Twelve feet of sand piled up against the side of one of the other cabins but did no other damage.

"Four Mile canon was badly washed and covered with debris - particularly the section lying along the creek beds. Ernest Meyring, road foreman for this district, said that the section between Boulder canon junction and the Poorman mine; from Crisman to Salina, suffered great damage. Above Salina on the Gold Hill road, all of the dump of the Ingram mine - a property being worked by Harrison Cobb, was washed down into the road to a depth of four feet and was not cleared for traffic until late Sunday afternoon. Four Mile canon in the Wall-street - Sunshine district suffered damage, but how much Mr. Meyring did not know because he had not been over the road... The road from

Wallstreet to Salina was badly washed but is still passable. Debris carried by the water caved in the rear of the home of Mrs. Bob Parsons. Other homes were somewhat damaged by water. Trees in the water channel were uprooted. The Sunshine canon-Gold Hill route suffered only one bad place but is safe and travelable and may be the best route to Gold Hill for the next few days, though Four Mile canon route through Gold Hill is open.

"Two-Mile canon north of Boulder sent a large head of water down into Newlands addition, washing roads and some farms, filling ditches with sand. The sand was so deep two or three places on the Broadway oil surfacing in the county home district that a grader was necessary to remove it. Homes, lawns and gardens in the north part of Boulder suffered relatively little damage in comparison with other areas and in comparison with damage caused by overflows of Two-Mile gulch in previous years.

"Water went out of the banks of another gulch four miles north of Boulder, near the Euler ranch (*the Wineglass Ranch on the north side of Lee Hill just before it enters Four-Mile Canyon Creek canyon*), but that ranch was reported undamaged. The flow went across the foothills highway (*Broadway*) and damaged railroad track about three and a half miles northeast of Boulder. A railroad bridge had to be repaired there. (This is the bridge that keeps getting washed out, just to the east of the Diagonal.) In the same vicinity, Bert Andrus' garden was damaged. (*Bert Andrus owned 45 acres north of the confluence of Four-Mile and Boulder Creeks, in the vicinity of North 61st and North 63rd.*)

"Six-mile gulch, still further north of Boulder, did not overflow the North Broadway road. So called Dry creek, which enters Left-Hand creek about 3 miles south of Longmont washed out a bridge a quarter mile south of Niwot. Two footbridges at the Mountain View golf course, 24th and Arapahoe, were washed out. Middle Boulder creek overflowed its channel in the lowlands east of Boulder, but did no great damage. Water covered the main Denver-Boulder highway at several points, particularly at a corner at the north edge of Lafayette where it was several inches deep, but it did not impede traffic seriously."

"STORM TRIPLES FLOW OF WATER IN BOULDER CREEK Water Commissioner Thomas L. Platt was called out at 11:30pm Saturday to shut off the head-gates of the Anderson ditch, which takes water at Canon Park, and the Farmers ditch, which gets water from Boulder creek a little nearer Boulder....Had the ditches not been turned off they would have overflowed with the water they picked up through the city. Flow in Middle Boulder creek, which goes through Boulder, increased from 400 second-feet - the highest point reached Friday night - to **1200 feet at the hydro power plant** in Boulder canon, Commissioner Platt said. The flow down Four Mile canon, usually very little at this time of year, was an estimated **400 second-feet**, making a total of **1800** through Boulder.

"South Boulder region got very little water, and went up but a few feet. It was carrying **277 second-feet** Friday. All water had to be allowed to go down the valley because all the reservoirs in this region - except Baseline- are full. If South Boulder had carried a large flow some of it could have been stored in Baseline.

"The storm extended about 9 miles east of Boulder and was dry from there east, Mr. Platt said. Rainfall at Commissioner Platt's home, 2236 Mapleton, measured **1.73 inches** in the course of a three and a half hour storm. Though **1.33 inches** of rain fell at Eldorado Springs, it had no effect on the creek and did not cause bad wash-outs then. The measuring weir at the hydro plant in Boulder canon gave the flow in Boulder creek at **450 second-feet** this morning, slightly above Friday's flow." Daily Camera, June 23, 1941

1942, April 5 NO RESEARCH DONE YET

1946, July 18 NO RESEARCH DONE YET

1947, June 12, 21-23 NO RESEARCH DONE YET

Peak discharge at Orodell (located 1 mile upstream from Fourmile Creek and 3 miles southwest of the courthouse in Boulder) : **1290cfs.** From US Army Corps of Engineers, August 1969 Floodplain Mapping of Boulder Creek.

1949, June 4, 6, 9 Since both Two-Mile and Left Hand Creeks flooded during this event, Four Mile Canyon Creek probably did too, although NO RESEARCH DONE YET

Two Mile Creek floods (C-DUMP)

"June 4 - The Left Hand Creek had overbank flooding as a result of heavy and prolonged rainfall during late May and early June and the runoff from an unusually heavy snow blanket. The prolonged high flow on Left Hand Creek caused minor damages to irrigation headworks, bridges, and farmlands. The gaging station near Boulder recorded a peak discharge of **1140 cfs** during the flood period." Flood Plain Map for Left Hand Canyon Creek, Corps of Engineers, an 1969

1951, June 10, August 3, 31 On August 3, 1951, the C. and S. Railroad crossing washes out again, purportedly at Four Mile Canyon Creek.

"Between Longmont and Boulder, several sections of the C. and S. Railroad tracks were washed out. The biggest stretch was about 500 feet of track southeast of Niwot. Another section of C. and S. track just north of the crossing on the Valmont road a short distance east of Boulder was badly damaged..... An unofficial measurement of 3.27 inches of rain was made in North Boulder by District Water Commissioner T. Platt at his home in the 3000 block on 11th St." Daily Camera, August 4, 1951

The Silver Lake ditch was washed out at the Four Mile Canyon Creek crossing, near the current Foothills Housing site. Silver Lake ditch records, Katharine Long Gates

"A peak discharge of **5,700 cfs** was estimated for Dry Creek No. 2 (*the drainage immediately to the North of Four Mile Canyon Creek*) on August 3, 1951. A severe storm with unofficial estimates of **six inches of rain** fell near Niwot. It damaged crops, buildings, equipment, bridges, and railroad track. That flood was reportedly one quarter of a mile wide and caused the evacuation of fifty people. Floods in Boulder County, by Sherry Oaks

"During the afternoon and night of 3 August, a heavy rainstorm occurred over the frontal range and foothills east of the Continental Divide from the vicinity of Boulder to near Fort Collins, Colorado, a distance of approximately 50 miles. One of the storm centers was in the Left-Hand Creek near the town of Niwot. At this storm center, total precipitation was unofficially reported to have been **over 6 inches**. The runoff from this

storm caused flooding on St. Vrain Creek and on its tributaries, Dry Creek and Left Hand Creek. Overbank flows occurred along most of the length of Left Hand Creek. Bridges, roads, crops and irrigation structures were damaged." Flood Plain Map for Left Hand Canyon Creek, Corps of Engineers, Jan 1969

Peak discharge at Orodell (located 1 mile upstream from Fourmile Creek and 3 miles southwest of the courthouse in Boulder) : 1220cfs. From US Army Corps of Engineers, August 1969 Floodplain Mapping of Boulder Creek.

1952, June 4, 7

NO RESEARCH DONE YET

Peak discharge at Orodell (located 1 mile upstream from Fourmile Creek and 3 miles southwest of the courthouse in Boulder) : 1180cfs. From US Army Corps of Engineers, August 1969 Floodplain Mapping of Boulder Creek.

1954, July 15

NO RESEARCH DONE YET

Goose Creek floods (C-DUMP)

1955, August 5

This flood in North Boulder is well documented with photos in the Carnegie collection.

"North Boulder and areas north of the city were flooded by a cloudburst which broke over the area Friday afternoon. Streams and irrigation ditches in the area were unable to handle the heavy flow of rainwater which washed down streets, across lawns and into many basements in a wide area. The downtown area was also soaked by a brief heavy rain but comparatively light showers were reported from University Hill areas. The official Weather Bureau rain gauge in downtown Boulder measured a total of .41 inches for all rains Friday, including a second storm, lighter, during the night. Immediately following the heavy rainfall Friday afternoon, however, the gauge showed .35 inches.

"Much more rain fell in the North Boulder area. E. C. Collart of 3826 Broadway near the Boulder County General Hospital reported that his homemade rain gauge overflowed during the storm. The capacity of that gauge is three inches. Water from the rain poured down Two-Mile canon in north Boulder, Four-Mile creek further north and James creek through Jamestown and Left-Hand creek into which James Creek flows. Flooding in the Jamestown area was reported in Friday's Daily Camera.

"The entire North Boulder area was drenched by the rain. Lakes formed in North Boulder Park, around the dike built to protect the Community Hospital from flooding, and in other low-lying spots all over the area. "Rivers" of rain flowed down and across streets all over the area, badly washing dirt roads and streets. The rivers were not confined to streets. Many flowed across lawns and gardens and some into basements. Property in the Two-Mile canon area suffered possibly the greatest damage in the immediate Boulder area. Water coming down this canon near the Maxwell reservoir continued to flow long after the storm. Starting near 4th and Kalmia, it flooded all streets extending to Broadway and continued to flood properties across Broadway. Much of the water drained into a channel which flows to Broadway and Iris where it flowed out of the channel and across and down Broadway." Daily Camera, August 6, 1955

1957, May 9-10, June 29

NO RESEARCH DONE YET

Peak discharge at Orodell (located 1 mile upstream from Fourmile Creek and 3 miles southwest of the courthouse in Boulder) : 1010 cfs From US Army Corps of Engineers, August 1969 Floodplain Mapping of Boulder Creek.

1958, May

NO RESEARCH DONE YET

1961, June 3

NO RESEARCH DONE YET

1963, June 16

NO RESEARCH DONE YET

1965, June 24, August 19

NO RESEARCH DONE YET

Two Mile floods August 19 (C-DUMP)

Peak discharge at Orodell (located 1 mile upstream from Fourmile Creek and 3 miles southwest of the courthouse in Boulder) : 1190cfs. From US Army Corps of engineers, August 1969 Floodplain Mapping of Boulder Creek.

1966

NO RESEARCH DONE YET

1967, April 14

NO RESEARCH DONE YET

1969, May 4, 8

Both Two Mile Creek and Left Hand Creek experienced major flooding, so it is safe to assume that Four Mile Canyon Creek did as well during this storm. Flood waters from raging Left Hand Canyon Creek swept thru the small mountain community of Jamestown, washing away 8 houses and isolating some 100 inhabitants. US 36 between Boulder and Lyons was closed because of washouts.

Mrs. Reed, who was elderly at the time, told her neighbor Ann McRoberts (442-3783) that though the '69 flood in Four Mile Canyon Creek was big, she had seen much bigger ones previously. She said that the little side canyon (Lion's Point) where Mrs. McRoberts lived had been filled "side to side" with water.

Mrs. McRoberts reports that the 1969 flood cut Wagon Wheel Gap road in several places, cutting the road 10 feet deep in places. Residents could not drive out for 5 - 10 days. Going up canyon from the intersection of Lee Hill and Wagon Wheel Gap Road to the second place that the creek crosses the road, Mrs. McRoberts reports that there was a 10 foot deep trench in the road. Bow Mountain Road was also cut off. (Interview, August 1999, Elizabeth Black)

Bear, Skunk and Two Mile flood (C-DUMP)

Dry Creek floods, Floods in Boulder County, by Sherry Oaks

The May 8th flood was estimated to be a 25 year flood by Public Works Director Andy Briscoe. The tracks of the Colorado and Southern railway were again washed out in the Boulder area.

Peak discharge at Orodell (located 1 mile upstream from Fourmile Creek and 3 miles southwest of the courthouse in Boulder) : 1150cfs. From US Army Corps of engineers, August 1969 Floodplain Mapping of Boulder Creek.

"This was also a flood of long duration general storm. Precipitation was heaviest in the mountains; part of it being snow. In the Boulder and South Boulder Creek basins the rainfall continued at a moderate rate for nearly four days. Total precipitation for the storm amounted to **7.6 inches** at Boulder and **9.34 inches** at the Boulder Hydroelectric Plant located about 3 miles up the canyon from Boulder. Precipitation amounts totaled **8.11 inches** at Eldorado Springs and **10.05 inches** at Gross Reservoir on South Boulder Creek. Peak flooding occurred on the 7th of May at Boulder and Eldorado Springs. Preliminary estimates based on the gaging records, indicate a peak discharge of **1150 cfs** occurred on Boulder Creek. Flooding extended over large portions of the flood plain starting at the junction of the two streams near Valmont Road and extending downstream through the remainder of the Boulder Creek study reach. Evidence of two bridge failures is illustrated in this report.

"The gaging records show that floods the size of the May 1969 flood occur on an average of about **once every 5 years** on Boulder Creek and about **once every 7 years** on South Boulder Creek." From US Army Corps of Engineers, August 1969 Floodplain Mapping of Boulder Creek.

1973, May 5

NO RESEARCH DONE YET

Dry Creek floods, Floods in Boulder County, by Sherry Oaks

Fourmile Canyon Creek

Public Meeting No. 1

Held: August 2, 1999

No meeting minutes were kept at this first meeting.

Discussion items were:

Bob Harberg from the City of Boulder Utilities Department gave an overview of how the evening presentations would be given and gave an introduction of staff present and their roles.

Alan Taylor, Floodplain and Wetlands Coordinator for the City of Boulder gave a presentation on "Floodplain 101" explaining the City's regulatory process and the concern for flash flooding in Boulder.

David Love of Love & Associates, Inc. gave an overview of the recently completed floodplain restudy and Nancy Love of Love & Associates, Inc. gave a short presentation on the format of the scope of services for the Fourmile Canyon Drainageway Master Plan, the processes that would occur throughout the planning process and the results of the master plan project.

FOURMILE CANYON CREEK PUBLIC MASTER PLAN PUBLIC MEETING

Boulder Meadow Club House
September 13, 1999 - 7:00 p.m.

The meeting was facilitated by **Molly Tayer** and begun at 7:00 p.m. There were three presentations scheduled on the Agenda.

Bob Harberg, Project Manager of the study, was introduced. He explained how the issues being presented tonight bear on the decision-making process as the Fourmile Canyon Creek Master Plan Update is developed.

TOPIC 1 - HYDROLOGY AND HYDRAULICS - Dave Love

Dave Love explained the hydrologic cycle using diagrams that showed how floods occur. He referred to the specifics that define the runoff: type of rainfall event; water shed or catchment depends on the size and shape and slope of the land as well as the imperviousness of the land (i.e. what is the infiltration rate regarding how the water soaks in.) Other factors to consider include the roughness of the land (pavement, grass, forest); flowpath length (how long it takes to flow down to the floodplain; internal storage within the catchment area; how basins are all interconnected as water flows down the floodplain; and finally, the geometry of the stream. Dave referred to the map showing the catchment areas.

Dave explained how they came up with 1999 corrected hydrology. (Fact Sheet 1) He said that the new floodplain study was developed using 1993 aerial mapping topography. The floodplain was increased by about 65 acres.

He referred to Fact Sheet 5 in explaining that they were able to develop new hydrology based on the spill conditions. Using the corrected spill hydrology they redefined the flood plain. Dave pointed out the redelineation on the map. The red line showed the decrease in the flood plain.

There is a separate study being conducted now by Boyle Engineering Corporation to determine how the spill changes the Wonderland Creek flood plain. Dave said that the study has just started and there are no results as of this date.

Bob stated that the hydrology that considers the spill into Wonderland Creek will be the baseline condition. This is what will be considered the corrected hydrology for the Master Plan. He feels that we need to acknowledge there is a spill condition occurring and it will have ramifications on Wonderland Creek. There is a lot of development in that area that never took into consideration the magnitude of that flow. The spill coming off of Fourmile Creek more than doubles the spill into Wonderland Creek.

Q. Why do you think your model is better than FEMA's model?

The original mapping from FEMA was done in the early 1980s. There has been a lot of development activity since then.

Q. Why do you think your data is better?

A. We found when we looked at the old study that there were a lot of discrepancies in information. We don't necessarily think our model is better. However it is the underlying data on which it is based that is better. (the 1993 aerial photography)

Q. What is the City doing to manage development?

A. Regulations are still premised on the original FEMA mapping study. Therefore the City is not doing anything as yet with respect to this new information. The reason we are having these meetings is to determine if it is valid information.

Q. You said this overflow would double the flood flow in Wonderland Creek - what does that mean?

A. The spill flow we estimate is about 1800 CFS. Originally FEMA assumed 400 CFS spilling from Fourmile to Wonderland.

Q. Last time I thought this was happening because we had an air wall. Are we changing parameters of the original data? Had you run this data when you gave the first presentation?

A. Dave stated that they are not changing parameters. This is a new way of looking at what was given to us previously.

Dave explained the term "airwall." In the FEMA regulatory flood study, they show on the south bank about one foot of water that overtops the bank. The study assumed that the water did not go past the banks. The "airwall" was part of the hydraulics; it assumed containment which was not accurate. This was one of the errors we saw in the FEMA hydrolics. It was an imaginary extension of the ground that somehow held the water back. This was one of the reasons we relooked at the FEMA studies.

TOPIC 2 - ALLUVIAL FAN FLOODPLAIN - Elizabeth Black

Elizabeth explained the term "alluvial fan" and why it is important. She emphasized that creeks that are in valleys behave differently than those that are on an alluvial fan. Water has an uncertain flow in the latter. It carries with it a lot of debris. She described how to determine if the flow is on an alluvial fan.

Elizabeth had posted old aerial photos that showed the Fourmile Creek being in pretty much the same place as it is today; not really showing an uncertain flow path. She then looked at old maps

(1880, 1888, 1902, 1926) which showed different flow paths.

She described other changes that she observed through looking at these maps, reviewing old newspaper clippings about floods in Boulder, and referred to the USGS survey of 1902. She is not certain about the accuracy of the maps.

She described the 1916 flood and the far reaching damage it did to Boulder.

Elizabeth presented her hypothesis. In 1880s the Creek went to the south into Wonderland around the neighborhood of Broadway. In 1894 the 100 year flood occurred. That flood was huge, particularly in Lefthand canyon and most likely also on Fourmile Creek. It is possible that it brought enough debris down to change the course of the Creek. Looking at the 1902 map it makes sense that the Creek may have shifted. She showed lines on the map indicating shifts.

Gilbert White made some general observations based on Elizabeth's research. He stated that there can be intense and very infrequent floods in this area. Just talking about the 1 per cent flood doesn't mean you are talking about all of the other floods. If you just look at the 1 per cent flood as calculated under the HEC model, it doesn't mean that you are going to find what would be the full areas subject to flood. It is misleading to assume that because there has been a HEC computation it will be the same the next time in Fourmile Canyon.

Therefore, the computation that has been shown for the upper part of the Creek can be misleading. We should not have a sense of confidence from the delineation of that floodplain. We know that intense rainfall occurs up and down the Front Range and that is not the kind of flooding that is designated for the upper part of Fourmile Creek.

Dave explained that the HEC 2 floodplain computer model has been standardized in most parts of the country where there are well defined channels.

Dave stated that the Master Plan needs to take the alluvial fan into consideration.

Gilbert said that he feels we need to do more careful work on the sediment deposits up there.

Elizabeth agrees and said what is lacking is field inspection.

Q. You said (Gilbert) that the HEC 2 model is not valid. Do we know this for certain?

Gilbert: The HEC 2 model was designed for stream courses where you have a v shaped cross section. It is not good for an alluvial fan model.

Q. So basically the study David used to develop the map is not valid for the alluvial flood plain.

Gilbert: It has problems.

Q. Did FEMA's program include the 1983 flood plain?

Gilbert: FEMA would not recommend the HEC 2 program for this section of the channel. It would be better to try to find another computer model. Also FEMA is considering the whole basis on which they have been estimating studies for flood insurance purposes. They are beginning to wonder if using the 1 percent flood calculated in a certain way is having beneficial effects around country. This has been questioned.

Q. Along same lines – you said you would investigate the area around the Crestview School and other areas such as Northbriar.. But in no case do you have any water going there. Did you investigate?

Dave: We have not yet investigated Crestview. The 1985 map shows a creek in Northbriar which was shown as a secondary flow path. They went through a process with FEMA where they blocked off the flowpath. Basically there is a dam there now. No waterflow.

Dave concluded that Northbriar was a historic meander and the stream will not go there again with the 100 year event.

Donna Scott was not available to present on the issue of water quality. Refer to Fact Sheet.

TOPIC 3 - WILDLIFE HABITAT - Bev Johnson

Bev described the wildlife habitat issues and her studies in and along Fourmile Creek. See Fact Sheet.

She has done a comprehensive assessment of habitats along tributaries in the City. She explained why this was important. She shared some of the general results as well as the impacts of development.

She pointed out on several maps areas that really stand out as relatively unimpacted. She is putting together a report that will list the species in all of these areas and ranking them. It will be available in a few weeks. She hopes to find out what are the conditions of the habitats; how we would rank them relative to one another; what areas do we want to preserve.

TOPIC 4 - NORTH BOULDER SUBCOMMUNITY PLAN - Ruth McHeyser

See Fact Sheet

Ruth showed the boundaries for the Plan (U.S. 36 on east – and City limits on west; Iris on south and City limits on north.) It was adopted in 1995 by City Council and Planning Board to provide basis for long term decisions about development in North Boulder.

The Plan is the basis for capital improvements in North Boulder (bicycle paths, pedestrian paths, etc.) and the basis for project review. She referred to the three most pertinent maps The Plan establishes the type of development and redevelopment in area.

There were comments from the audience regarding the changes in flood plain areas and how it affects property values. There was a request to address these issues at a future meeting.

Following the general meeting the individuals attending were invited to stay and speak with staff.

(Meeting notes prepared by Linda Mitzner)