Flatirons, Inc.

Surveying, Engineering & Geomatics

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January 23, 2014

Centennial Trail HOA
c/o Dorthy Jackson
5265 Centennial Trail
Boulder, CO 80303

RE: Post-Flood Memorandum of Recommendations for Centennial Trails Subdivision, Boulder, Colorado (Located in the NE1/4 of Sect 33, T1N, R70W, City of Boulder, Boulder County, Colorado))

Dear Dot:

Thank you for asking me to meet with you and other members of your Home Owners Association on November 12, 2013 to observe and discuss the impacts from the September, 2013 Colorado Flood event. This letter serves as the follow-up Memorandum of Recommendation written opinion letter regarding post-flood remedial and/or mitigation work.

As you know, the City of Boulder experienced substantial flooding that resulted from unprecedented rainfall during the period from September 11 through September 18, 2013. Between those dates Boulder received more than 17 inches of precipitation, or 85 percent of its annual average. The National Weather Service has described the storm event that impacted the region as a 1,000-year precipitation event (an event that has a 1 in 1,000 chance of happening in any given year), however initial indications are that flow rates and inundation extents may have ranged from as little as a predicted 10-year event (10 percent chance each year) to impacts that correlate with a 500-year event (0.2 percent chance each year).

In addition to creek flooding, which is primarily attributable to rainfall upstream of the city, the amount and duration of rain that fell within the city boundaries resulted in significant local drainage issues, including a dramatic increase in local shallow water tables. A significant majority of the 5,800 households that experienced damage to their homes as a result of the flooding were a result of elevated groundwater levels causing subsurface water and back-upped sewage entry into basements and crawl spaces.

As a result of the flooding and the lessons learned, the City of Boulder has initiated a process of examining policies and procedures associated with providing flood protection to a higher. These considerations involve potential trade-offs, private property interests and flood mitigation strategies. This on-going work is intended to build on the information gathered after the flood, and provide a foundation for discussions to follow in January, 2014 as the City Council reflects on its vision for the community, establishes goals to support the vision in the context of resiliency and sustainability, and provides direction on a work plan for implementation in 2014.

3825 Iris Avenue, Ste 395
Boulder, CO 80301
Phone: (303) 443-7001
Fax: (303) 443-9830

655 Fourth Avenue
Longmont, CO 80501
Phone: (303) 776-1733
Fax: (303) 776-4355

3660 Downing, Unit E
Denver, CO 80205
Phone: (303) 936-6997
Fax: (303)443-9830

The Centennial Trail Neighborhood

Based on discussions and observations that took place during my November site visit, it is my understanding that although most homes along Centennial Trail with either a basement, lower level or crawlspace encountered groundwater problems of varying degrees during the flood event, no flood damage was directly attributable to surface flood flows. Significant ponding of storm water occurred in the Centennial Trail roadway and extended into some front yard areas, along with ponding in back yard drainage swales and other low lying areas. This is verified by the City of Boulder mapping of Preliminary Urban Flooding Extents, September 2013 Flood which shows the extent of ponding in Centennial Trail and 55th Street, and is consistent with flood damage reports from other residence in this area.

Although the ponded waters contributed to the high groundwater levels in the neighborhood, it appears based on preliminary post flood data that the unprecedented amount of rainfall resulted in elevated subsurface groundwater levels throughout the city, and in the South Boulder Creek floodplain in particular (high ground water levels have historically been a problem in several of the neighborhoods located in this area). The extensive area of high groundwater levels appears to have been created by the intense and prolonged storm event, and was not necessarily created by a single source of flows such as a overflowing creek, irrigation ditch, or storm drainage conveyance (although those items certainly contributed to the high ground water tables). The nature of the high water table (essentially an underground lake) makes it very difficult to mitigate on an area-wide basis by installing below ground cut-off or interceptor drain systems (commonly called French drains).

It is also likely that specific conditions at each house may have created or exacerbated the elevated groundwater table in locations adjacent to individual homes. Several factors could create over saturated soil conditions adjacent to home foundations including lack of proper grading allowing water to pond next to foundations, discharge of downspouts adjacent to foundations, poorly maintained roof gutter systems, or discharge of sump pumps too close to foundations. In some cases where homes are relatively close together, these conditions may also create problems on adjacent homes, and in some cases may have prevented a problem at the source home but created a problem on the adjacent property.

As we discussed and observed during my November site visit, the Centennial Trail subdivision was designed with a master grading and drainage plan for the neighborhood that assumed the front half of lots would drain into the Centennial Trail roadway curb and gutter, and the back half of lots would drain to a back lot drainage easement with both the street and back lot easements flowing east to the detention ponding area at 55th Street. During our neighborhood tour we observed several locations in back yards where installed landscaping, fences, etc. appear to be an impediment for the free flow of surface drainage. Based on our conversations, significant ponding occurred along the 20-foot drainage easement that is located along the north boundary of the lots on the north side of Centennial Trail. It is my opinion that although this ponding might have exacerbated groundwater conditions in some locations, I do not believe that the ponding at the rear of the lots was the cause of the overall elevated groundwater table.

Please note that I did not tour or observe any of the backyard conditions for the homes south of Centennial Drive, however based on our conversations I have assumed that conditions with respect to no surface flooding but high groundwater levels existed during the flood for these homes similar to the homes on the north side of Centennial Trail.

As discussed above, the flooding issues in the Centennial Trail neighborhood were identical with the majority of flooding throughout Boulder, created by a combination of the local stormwater collection system being overwhelmed by the amount and duration of rainfall, along with significantly elevated groundwater levels leading to flooded basements and crawl spaces. While the City of Boulder is expected to review and develop new policies and procedures based on lessons learned, the unusual and yet to be clearly evaluated September storm and flood event has resulted in a delay in that process while data collection and evaluations continue.

Of special importance to your neighborhood will be expected policy and regulation changes regarding maintenance and enforcement of publically dedicated drainageways, along with refinement of policies regarding sump pump discharges. The city does not currently regulate the discharge or diversion of water from one private property onto another. The city does however regulate the discharge or diversion of water onto public property under the Boulder Revised Code Chapter 8-2-8: Discharging Water Prohibited. Property owners that are using a sump pump to discharge groundwater onto any sidewalk, street, alley, or other public right-of-way are in violation of the city code and subject to possible fines.

The Boulder City Council and department staffs are expected to discuss and provide guidance for development of post-flood policies and procedures during the annual City Council retreat in January, 2014.

Recommendations:

Based on our discussions and observations during my site visit, and based on the data and findings that are available to date regarding the 2013 Colorado Flood event, I would make the following recommendations:

1. The Centennial Trails HOA should contact and educate owners and residents regarding the importance of maintaining the back yard drainage easements to allow the free flow of surface water through the neighborhood. While minor ponding should be expected during large storm events, major obstruction to flow should be removed or modified to allow the free flow of stormwater.

2. Homeowners should inspect, maintain and/or modify sump pump discharge points, downspouts, landscaping, etc. so as to not only prevent saturation of soils adjacent to their foundations, but also to prevent adverse discharge conditions onto adjacent neighbor properties. An excellent guideline for preventing moisture problems is available from the U.S. Department of Housing and Urban Development, *Moisture Resistant Homes – A Best Practice Guide and Plan Review Tool for Builders and Designers, with a Supplemental Guide for Homeowners* (copy attached to this memo) to help provide guidance in evaluating and making changes.

3. Homeowners can obtain excellent post flood guidance and flood recovery updates from both City of Boulder (https://bouldercolorado.gov/water/boulder-flood-info) and Boulder County (http://www.bouldercounty.org/flood/pages/default.aspx) web sites.

4. If not already obtained, homeowners should pursue purchase of flood insurance available from the National Flood Insurance Program (NFIP). Although many homes in the neighborhood are located in a 100-year floodplain (South Boulder Creek), Flatirons, Inc. has assisted several homes in this area obtain a Letter of Map Amendment (LOMA) from FEMA that removes individual homes from the floodplain based on a detailed elevation surveys. A simple, low cost LOMA is available for individual single family homes (MT-EZ).

Please feel free to contact me if you have any questions or concerns regarding this memo and recommendations.

Sincerely,

Curt Parker, P.E.
Colorado Registered Professional Engineer #30598