

WATER RESOURCES ADVISORY BOARD MEETING

MEETING DATE: Monday, 16 March 2015

MEETING TIME: 7:00 p.m.

MEETING LOCATION: Municipal Services Center, 5050 Pearl St., Boulder, CO 80301

Agenda Highlights:

1. Call to Order (7:00 p.m.)
2. Approval of 23 February Meeting Minutes (7:01 p.m.)
3. *Public comment (7:05 p.m.)
4. *Public Hearing and Consideration of a Recommendation to City Council regarding the Upper Goose Creek and Twomile Canyon Creek Floodplain Mapping Update (7:20 p.m.)
5. Matters from Board (8:35 p.m.)
6. Matters from Staff (8:45 p.m.)
7. Discussion of Future Schedule (8:55 p.m.)
8. Adjournment (9:00 p.m.)

* Public Comment Item

Agenda item times are approximate.

Information:

- Please contact the WRAB Secretary email group at:
WRABSecretary@bouldercolorado.gov
- Packets are available on-line at: <http://www.bouldercolorado.gov> – [A to Z, Water Resources Advisory Board \(WRAB\), Next Water Resources Advisory Board Meeting](#)

**CITY OF BOULDER, COLORADO
BOARDS AND COMMISSIONS MEETING MINUTES**

Name of Board / Commission: Water Resources Advisory Board	
Date of Meeting: 23 February 2015	
Contact Information of Person Preparing Minutes: Andrea Flanagan 303.413.7372	
Board Members Present: Vicki Scharnhorst, Mark Squillace, Dan Johnson, Lesley Smith, Ed Clancy Board Members Absent: None	
Staff Present: Jeff Arthur, Director of Public Works for Utilities Bob Harberg, Principal Engineer-Utilities Annie Nobel, Flood and Greenways Engineering Program Coordinator Bret Linenfelser, Water Quality and Environmental Services Manager Kurt Bauer, Engineering Project Manager Russ Sands, Watershed Sustainability and Outreach Supervisor MaryAnn Nason, Water Conservation Outreach Coordinator Heidi Hansen, Floodplain and Wetlands Administrator/ Civil Engineer Edward Stafford, Development Review Manager Andrea Flanagan, Board Secretary	
Cooperating Agencies Present: Monica Bortolini, Consultant with Leonard Rice Engineers, Inc.	
Meeting Type: Regular	
Agenda Item 1 – Call to Order	[7:05 p.m.]
Agenda Item 2 – Approval of the 26 January 2015 Meeting Minutes:	[7:06 p.m.]
Motion to approve minutes as amended from January 26 as presented. Moved by: Johnson; Seconded by: Squillace Vote: 4:0 (Ed Clancy abstaining)	
Agenda Item 3 – Public Participation and Comment	[7:10 p.m.]
Public Comment:	
Patrick McAteer Chief Financial Officer at Frasier Meadows Retirement Community. Campus severely impacted by 2013 floods, lost about 40% of operating capacity, only half-way returned to normalcy. Requesting advocacy for Frasier Meadows, which is in its 55 th year assisting seniors in Boulder. Lost entire bottom level of skilled nursing and entire assisted living wing, and much more infrastructure, including independent living structures, approximately \$7.5 to 10 million in loss. Here for long-term needs for seniors in Boulder community. They are coming out of the flood and recreating what the organization will provide in the long run. Would appreciate continued advocacy of the Board.	
Chuck Howe Emphasized how severe the effects of the flood were on Frasier Meadows and is here to ask Board to promote maximum flood control off Highway 36 and any other alternatives. Qualla Drive area was badly impacted with 100 damaged homes, as well as Frasier Meadows. On the basis of FEMA's first ruling, Frasier Meadows would be out of the floodplain if they built a retaining wall around its campus. FEMA recently reversed their decision, saying that they would still fall in the floodplain due to two structures being out of compliance with construction regulations. All residents would then be subject to flood insurance, with current rates quoted, causing a tremendous impact to residents. Feels that adequate storage around Hwy. 36 would protect the Qualla Drive area and would give grounds for appealing FEMA ruling, which has severe implications for Frasier. Hopes Board will consider the alternative, which would provide a legitimate argument to FEMA to have them reconsider their decision. Final recommendation is to consider other alternatives on the other side of Highway 36.	
Tom LeMire President HOA of 100-unit, 5 building complex, which is about 15 years old, north of Frasier Meadows Manner. As with Frasier, their building was under water during flood, small fraction of loss compared to what Frasier endured. \$42,000 worth of electrical damage to meters, with biggest issue being with settlement with insurance company. In their 80-page umbrella insurance document, they didn't see	

<p>exemption that insurance company found, which stated that they should not be covered for upgrading electric meters even though City of Boulder says that meters should be upgraded, per the 2011 code. The insurance company does not cover upgrading, which is a catch-22.</p> <p>There were so much mechanical repairs and now years of frustrating efforts that require very expensive insurance policy. Experienced 3 feet of water that probably came from Bear Creek/ NCAR area. Asks that Board please work with CU to open South Campus for natural retention in large low-lying areas around CU.</p> <p>Rick Mahan Member South Boulder Creek Action Group. Wants to reemphasize that the group's main priority is to stop the overtopping of US36 during floods.</p>	
<p>Agenda Item 4 - Matters From Staff:</p> <ul style="list-style-type: none"> a) Update on South Boulder Creek Mitigation Study b) Update on National Flood Insurance Program – Community Rating System c) 2015 Flood Outreach Program d) Water Conservation Program 	<p>[7:21 p.m.]</p>
<p>Agenda Item 5 – Matters from the Board:</p> <p>Board Member Smith brought up the below matter(s):</p> <ul style="list-style-type: none"> • Attended Watershed Forum, which was fantastic and thought-provoking. • Feels that the more our public can be educated about water use and average per-capita consumption, and the more information people have, the more they may realize that it is a critical resource. <p>Board Member Johnson brought up the below matter(s):</p> <ul style="list-style-type: none"> • Thanked Board Secretary for receiving the meeting packet in one succinct package this month, as opposed to separate documents and attachments. • Stated that he will miss April meeting and questioned whether date could be changed? • Questioned status of snowpack in the watershed? <p>Board Member Clancy brought up the below matter(s):</p> <ul style="list-style-type: none"> • Discussed email that was sent to Board about study regarding “submarines” that were sent through collection systems and that it would be nice to see this subject revisited by city staff. • Questioned if we are going to be doubling our existing collection system rehabilitation efforts. • Questions about flow meters that were put in sewage lines and what current infiltration rate is? • Questioned if Frasier Meadows is an area that would be metered to determine flows? • Questioned conditioning monitors and the status of the “big pipes” in the city’s sewer mains. • Questioned if the problem with Casey Middle School is related to sewer main issues? 	<p>[8:55 p.m.]</p>
<p>Agenda Item 6 – Future Schedule</p> <p>Several board members expressed interest in rescheduling future meetings due to conflicts. Staff will follow up.</p>	<p>[9:05 p.m.]</p>
<p>Adjournment</p> <p>There being no further business to come before the Board at this time, by motion regularly adopted, the meeting was adjourned at 9:07 p.m.</p> <p>Motion to adjourn by: Johnson; Seconded by: Squillace</p> <p>Motion Passes 5:0</p>	<p>[9:07 p.m.]</p>
<p>Date, Time, and Location of Next Meeting: The next WRAB meeting will be Monday, 16 March 2015 at 7:00 p.m., at the City's Municipal Services Center, 5050 Pearl St., Boulder, CO 80301</p>	

APPROVED BY:

Board Chair

ATTESTED BY:

Board Secretary

Date

Date

An audio recording of the full meeting for which these minutes are a summary, is available on the Water Resources Advisory Board web page.

<https://bouldercolorado.gov/boards-commissions/water-resources-advisory-board-next-meeting-agenda-and-packet>

DRAFT

**CITY OF BOULDER
WATER RESOURCES ADVISORY BOARD
AGENDA ITEM**

MEETING DATE: March 16, 2015

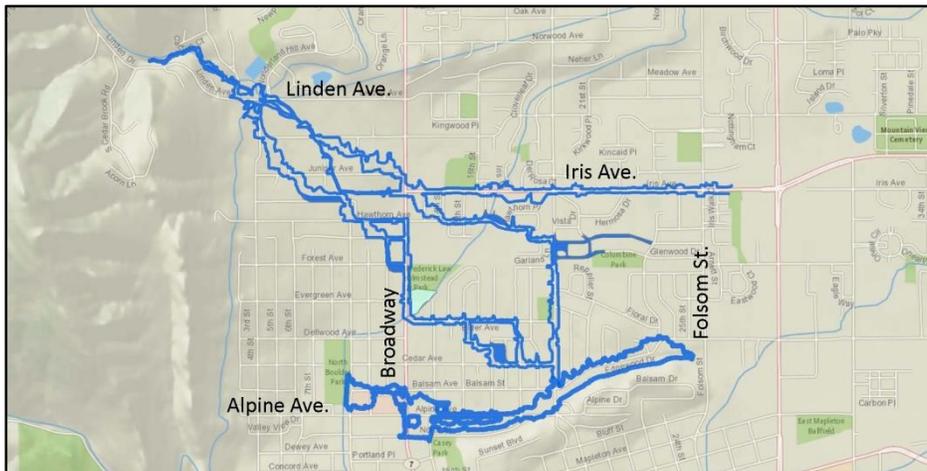
AGENDA TITLE: Public hearing and consideration of a recommendation to City Council regarding the Upper Goose Creek and Twomile Canyon Creek Floodplain Mapping Update.

PRESENTER/S:

Jeff Arthur, Director of Public Works for Utilities
Annie Noble, Acting Principal Engineer for Flood and Greenways
Kurt Bauer, Engineering Project Manager

EXECUTIVE SUMMARY:

The purpose of this memorandum is to provide a brief summary of the history and revised results of the Upper Goose Creek and Twomile Canyon Creek floodplain remapping study and request a motion from the WRAB to recommend to City Council to adopt the mapping. The study includes the area located west of Folsom Street to the city limits as shown by the blue areas in the figure below:



The Upper Goose Creek and Twomile Canyon Creek floodplain mapping update began in 2011. The initial draft revised mapping was presented to WRAB in May 2013. Based on a WRAB recommendation, the mapping was remodeled using the new city LiDAR topographic mapping information and presented to WRAB on November 17, 2014. The maps have been further revisited and revised to address issues raised by the public and the WRAB including changes to the High Hazard Zone, Conveyance Zone and limited

changes to the 100-year floodplain. As a result of these changes, no structures would be located in the revised draft High Hazard Zone, 13 structures would no longer be added to the Conveyance Zone and 15 structures would no longer be added to the 100-year floodplain. The proposed Upper Goose Creek and Twomile Canyon Creek floodplain mapping would result in a net:

- Decrease of 130 structures identified in the 100-year floodplain;
- Decrease of 97 structures identified in the Conveyance Zone and;
- Decrease of 64 structures identified in the High Hazard Zone.

The WRAB review of the floodplain mapping update does not require board members to verify the analysis and calculations, but accepts the overall mapping study process and that results are reasonable and acceptable. The WRAB is being asked to make a recommendation to City Council on whether to adopt the mapping update and forward it for consideration by FEMA.

STAFF RECOMMENDATION:

Staff requests Water Resources Advisory Board consideration of this matter and action in the form of the following motion:

Motion to recommend that City Council adopt the Upper Goose Creek and Twomile Canyon Creek floodplain mapping update.

BOARD AND COMMISSION FEEDBACK:

The initial draft revised mapping was presented to WRAB in May 2013. As a separate effort, in 2012 the city initiated collection of new topographic mapping using LiDAR to provide more accurate city-wide base mapping. During the May 2013 meeting, the Board and public voiced concern over the dramatic differences between the existing 1994 single-flow-path floodplain and the proposed split-flow-condition floodplain. Based on Board and public feedback, the floodplain mapping update was delayed until the new LiDAR topographic information was available and could be used to verify or update the study hydraulic models.

The WRAB made the following motion (4-0) at the May 20, 2013 meeting:

Move to table recommendation of adoption of Upper Goose Creek and Twomile Canyon Creek floodplain remapping study to Council, pending further information, evaluation of the study and additional public process with an emphasis on differences between current and prior studies.

The revised mapping was remodeled using the new city LiDAR topographic mapping information and presented to WRAB on November 17, 2014. The WRAB was not asked to make a motion at that meeting, but issues were raised by the Board and public concerning some of the draft High Hazard Zone, Conveyance Zone, shallow flooding and

100-year delineations. The mapping was revisited and revised to address the issues and concerns.

PUBLIC FEEDBACK:

The following provides a summary of the public process and corresponding feedback:

- The initial remapping results were presented at a public open house on March 20, 2013. Sixty people attended the initial open house and the city received 11 written comments;
- City and consultant staff conducted an extensive site visit of the study area following the 2013 flood event and conducted a post-flood open house to collect post-flood information; and
- Revised mapping that incorporated the new LiDAR data was presented to the public at an open house on November 13, 2014 and at the November 17, 2014 WRAB meeting. Issues were raised by the Board and public concerning some of the draft High Hazard Zone, Conveyance Zone, shallow flooding and 100-year delineations at these meetings.

In addition, the public will have opportunities to provide comments at the March 16, 2015 WRAB meeting, the City Council meetings and during the FEMA 90-day public comment period. Following map adoption by FEMA, the public can also submit a request to be removed from the floodplain based on site specific survey information using the FEMA Letter of Map Amendment (LOMA) process.

BACKGROUND:

Floodplain maps (Flood Insurance Rate Maps (FIRMs)) provide the basis for flood management by identifying the areas subject to the greatest risk of flooding. This information is essential for determining areas where life safety is threatened and property damage is likely, and forms the basis for floodplain regulations and FEMA's National Flood Insurance Program. Once adopted by FEMA, the FIRMs are the official maps used to determine flood insurance requirements and therefore the methodology to develop these maps is prescribed by FEMA. In addition, these maps are used to implement the city's land development regulations and help the city identify and prioritize opportunities for flood mitigation projects.

This mapping study area includes Upper Goose Creek and Twomile Canyon Creek west of Folsom Street to the city limits. The existing regulatory floodplain maps date back to 1994 and were based on analysis conducted in 1987. The 1994 floodplain maps show one major flow path along Twomile Canyon Creek. The original modeling was based on two-foot contour interval topographic mapping and 1-dimensional hydraulic models. One-dimensional models simulate flow in only one direction and therefore make it difficult to accurately define spill flow conditions (areas where stormwater overtops the main creek channel and flows downstream along one or more flow paths) along creek systems. While the land use has not changed significantly in the nearly 25 years since the original mapping, hydrologic and hydraulic modeling capabilities and topographic mapping technologies have changed dramatically.

In 2011, the city hired ICON Engineering to conduct an updated study. The study, co-funded by the Urban Drainage and Flood Control District (UDFCD), was conducted in the following three phases:

1. Hydrologic analysis
2. Field survey and investigation
3. Hydraulic analysis

As a separate project, the city in 2012 initiated collection of new topographic mapping using state-of-the-art Light Detection and Ranging (LiDAR) technology to provide more accurate city-wide base mapping. The initial floodplain remapping results were presented to the public and WRAB in early 2013. Based on Board and public feedback, the floodplain mapping was revised using the new LiDAR mapping.

In September 2013, major flooding occurred along Twomile Canyon Creek. The flood resulted in overtopping of the creek and spilled similar to what was shown in the draft floodplain mapping presented in May 2013. City and consultant staff conducted an extensive field investigation of the project area following the flood to document flow paths, flood limits and collect information from residents.

Following the flood, the city also contracted with Wright Water Engineers to estimate how the 2013 storm correlates with the theoretical design storm used to develop the regulatory FEMA floodplains for all of the city's 15 major drainageways. The 2013 storm was a long-duration storm that did not have very high rainfall intensities. FEMA floodplain mapping is based on prescribed design storm characteristics that reflect a short-duration, high intensity theoretical thunderstorm. For this reason, Wright Water Engineers estimates that many of the city's major drainageways did not see peak flows from the 2013 storm as great as the theoretical 100-year design storm. One exception is the Twomile Canyon Creek system that had received close to or even slightly higher estimated peak flows in 2013 than the 100-year design storm. This information was compared to the draft floodplain mapping to identify areas requiring additional analysis. It should be noted, however, that no two storm events are exactly the same and therefore the refined results will still differ slightly from the 2013 flood event.

Anderson Consulting Engineers was hired to perform a peer review of ICON Engineers work. The peer review was conducted on the initial model parameters, hydrologic analysis, hydraulic modeling and proposed mapping delineations in November 2012. Anderson Engineering then conducted a second peer review in October 2014 of the revised modeling. Both sets of review comments were addressed by ICON Engineering and approved by the city and UDFCD.

The revised floodplain mapping using the LiDAR information was then presented to the public and WRAB in November 2014. The mapping has since been refined based on comments from WRAB and the public. These changes and the methodology for making these changes are described below in the Analysis Section. Information about the city's

floodplain management program, floodplain regulations and flood insurance can be found at: [Flood Management Program Overview](#).

ANALYSIS:

ICON Engineers has revisited the revised draft floodplain mapping presented to WRAB and the public in November 2014 based on issues raised concerning some of the draft High Hazard Zone, Conveyance Zone, shallow flooding and 100-year delineations. The following provides a summary of the changes that have been made by issue.

Attachment A shows the areas of change from the mapping presented in 2014.

High Hazard Zone Delineations

Due to the potential for spill flows to occur along Twomile Canyon Creek, it was decided to develop both a 1-dimensional and 2-dimensional hydraulic model for this floodplain remapping study. A 2-dimensional model (FLO-2D) was developed for Twomile Canyon Creek to better define spill flow conditions and corresponding flow paths. A traditional 1-dimensional hydraulic model (HEC-RAS) which will be used for regulatory purposes, was then developed for the entire creek system (both Twomile Canyon Creek and Upper Goose Creek) with channel alignments mimicking the major flow paths identified by the 2-dimensional model.

Draft delineations of the High Hazard Zone (HHZ) were initially defined based solely on the 1-dimensional model results, an approach typically used in previous studies. The initial draft delineations resulted in very small and isolated HHZ areas along Twomile Canyon Creek. Review of the 2-dimensional model results indicate that other isolated areas of HHZ would exist due to the model detail. To eliminate isolated pockets of HHZ that do not likely reflect a significant risk to life and safety, it was therefore decided to revise the mapping to delineate High Hazard Zones only in areas where results from both the 2-dimensional and 1-dimensional models indicate HHZ are coincident. As a result, no structures are shown to fall within the HHZ in the revised mapping.

Conveyance Zone Delineations

The Conveyance Zone is synonymous with FEMA's Floodway and is defined as the areas in the floodplain that are reserved for the main passage of the entire 100-year flood flow when the 100-year floodplain is artificially narrowed until a maximum six-inch increase in flood water depth is created. This zone is delineated to allow development in areas of the floodplain and still provide passage of 100-year storm flows.

The 2014 draft floodplain maps showed 15 structures falling just inside the proposed Conveyance Zone. The Conveyance Zone was delineated based on interpolating model results between cross sections. Each of these 15 structures were revisited and additional model cross-sections and/or split flow paths added. As a result of adding more modeling detail, 13 of the 15 structures are no longer located in the revised draft Conveyance Zone.

Shallow Flooding and 100-year Delineations

Comments were received during the 2014 public process regarding: 1) how the draft mapping showed flood risk at Foothills Elementary School; 2) structures falling just inside the revised 100-year floodplain; and 3) some areas in the floodplain showing sharp bends at certain street intersections. The following summarizes how each of these issues have been addressed.

1) Foothills Elementary School

The 2014 draft floodplain mapping only showed shallow flooding (Zone X) at the Foothills Elementary School site. This was based on averaged flood depths over the entire school site. The 2015 revised draft now shows areas of shallow flooding (Zone AO 1') in addition to the Zone X shallow flooding. This change was based on information from the 2-dimensional hydraulic model. Unlike the Zone X shallow flooding zone that is regulated by the city under the recent Critical Facilities Ordinance, the Zone AO 1' would be regulated as 100-year floodplain by FEMA.

2) 100-Year Floodplain Delineations

Numerous structures located along 19th Street between Evergreen Avenue and Cedar Avenue and along 17th Street between Elder Avenue and Cedar Avenue were shown in the 2014 draft as falling just inside the revised 100-year floodplain. Model refinements in these areas included defining additional split flows in the model at Broadway and 13th Street and along 19th Street at Grape Avenue, Glenwood Drive, Floral Drive, and Evergreen Avenue. The added model detail resulted in 11 structures no longer shown to be touched by the 100-year floodplain.

3) Bends in Floodplain Delineations

The draft floodplain mapping shows 100-year floodplain delineations taking sharp turns at several intersections within the modeled area. These turns were questioned during the public process, particularly the one shown at the intersection of Broadway and Elder. **Attachment B** shows detailed information at Broadway and Elder and why the revised 100-year floodplain is shown to take a sharp bend at this intersection. At this location, the 100-year discharge splits between flow continuing south on Broadway and that continuing east on Elder and is based on the percentage of discharge originating west and east of the Broadway roadway crown and gradient changes through the intersection. The flow distribution was further supported by the 1-dimensional HEC-RAS model update. Other areas showing sharp turns have been similarly confirmed with by the LiDAR topographic and modeling information.

Summary of Results

The Twomile Canyon Creek watershed is an alluvial floodplain with sections where no channel exists. During major storm events the creek overtops its banks and spills south and east along many flow paths through the watershed. While the proposed mapping is based on criteria established by FEMA for a design storm, the level of detail to model spill flows is not prescribed. The proposed revisions to the draft floodplain mapping along Twomile Canyon Creek differ in the level of modeling detail from what has been done in the past for city floodplain remapping studies. Typically only large spill flows are

modeled within a watershed. The inclusion of the LiDAR topographic mapping and 2-dimensional modeling has allowed us to define smaller spill flows (down to 50 cfs) within the Twomile Canyon Creek watershed. The revised Twomile Canyon Creek floodplain remapping study also differs from previous studies in the method used to define the High Hazard Zone. Typically the High Hazard Zone is delineated from the 1-dimensional model only. The High Hazard Zone for this revision was delineated in areas only where it was identified in both the 1- and 2-dimensional models.

These changes in modeling approach have resulted in narrower flood zone delineations and correspondingly fewer structures identified in the flood zones. While these changes result in fewer properties being burdened with regulatory restrictions and flood insurance requirements, this more detailed modeling approach has potential implications. The less conservative delineation (narrower) of flood zones may lead residents and visitors to believe there is a more limited flood risk. No two storms are alike and an individual major storm event will likely not manifest itself in exactly the way depicted by the flood zones defined by the FEMA theoretical design storm. Human intervention, sediment and debris can also greatly impact flow paths and result in flooding outside of mapped zones. In addition, floodplain mapping provides the basis for the city's flood mitigation studies. As a result, this less conservative mapping approach might affect future mitigation planning alternatives and priorities. Considering these potential implications, staff still recommends the revised mapping approach due to the more detailed topographic mapping using LiDAR and the thorough evaluation using both the 1- and 2-dimensional modeling. It should, however be understood that ultimately FEMA will be reviewing the mapping and may not concur with this less conservative modeling approach.

In summary, if adopted, the 2015 revised Upper Goose Creek and Twomile Canyon Creek floodplain mapping would result in the following net changes from the current FEMA regulatory floodplains:

- Decrease of 130 structures identified in the 100-year floodplain;
- Decrease of 97 structures identified in the Conveyance Zone and;
- Decrease of 64 structures identified in the High Hazard Zone.

Additional background information for this study can be found on the project web site: [Upper Goose Creek and Twomile Canyon Creek Floodplain Mapping Update](#). The following attachments present the revised 2015 floodplain maps for Twomile Canyon Creek and Upper Goose Creek:

- **Attachment A** - Areas of change from mapping presented in 2014.
- **Attachment B** - Detailed information at Broadway and Elder showing reasons for sharp bend in 100-year floodplain
- **Attachment C, D and E** - Revised (2015) 100-year floodplains, Conveyance Zones and High Hazard Zones respectively for both creeks in comparison to the existing regulatory FEMA floodplain. Each of these figures show the structures (including summary numbers) that would be identified to be in the revised flood zones, those that would remain in the flood zones and those that would be removed should this revised mapping be approved. All of the map attachments

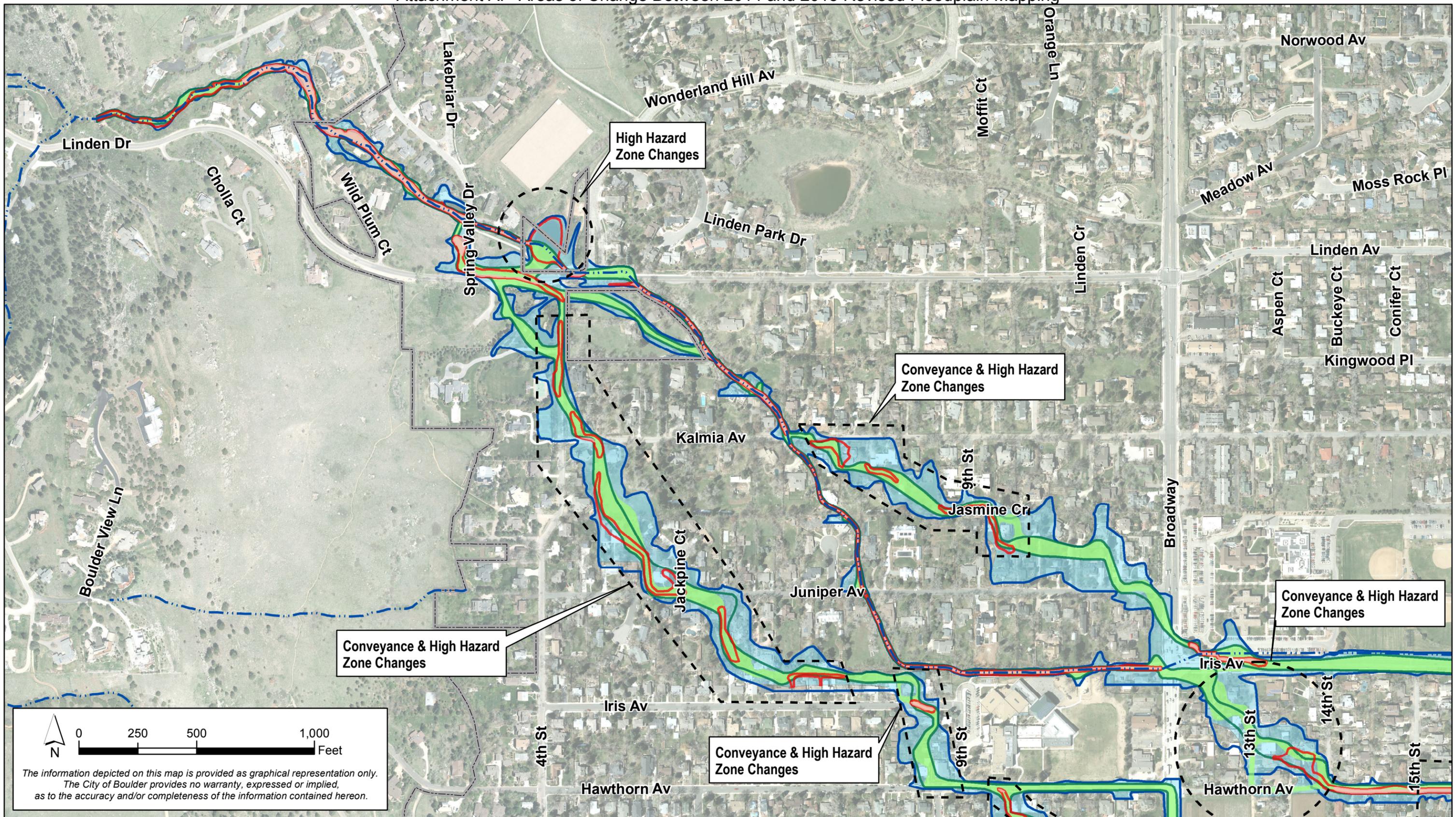
can be accessed on the project website and via the hyperlinks below for better viewing capabilities.

NEXT STEPS:

Following a formal recommendation from WRAB, the mapping study will be presented to City Council in early 2015. If City Council adopts the study, the city will forward the mapping to FEMA for review. The FEMA adoption process includes a 90-day appeal process. During the FEMA review and approval process (which can take from six months to four years to complete), it is recommended that the more restrictive of the existing and proposed mapping be used for regulatory purposes. This means that development within newly identified flood zones would be subject to the city's floodplain regulations. In order to comply with FEMA requirements, development within areas that are being removed from the floodplain would still be subject to the city's floodplain regulations until FEMA officially adopts the new floodplain mapping. Following formal adoption by FEMA, the city would regulate solely based on the new mapping.

ATTACHMENTS:

- A. [Areas of Change Between 2014 and 2015 Revised Floodplain Mapping](#)
- B. [Existing FEMA and Revised \(2015\) Proposed 100-Year Floodplain](#)
- C. [Existing FEMA and Revised \(2015\) Proposed Conveyance Zone](#)
- D. [Existing FEMA and Revised \(2015\) Proposed High Hazard Zone](#)



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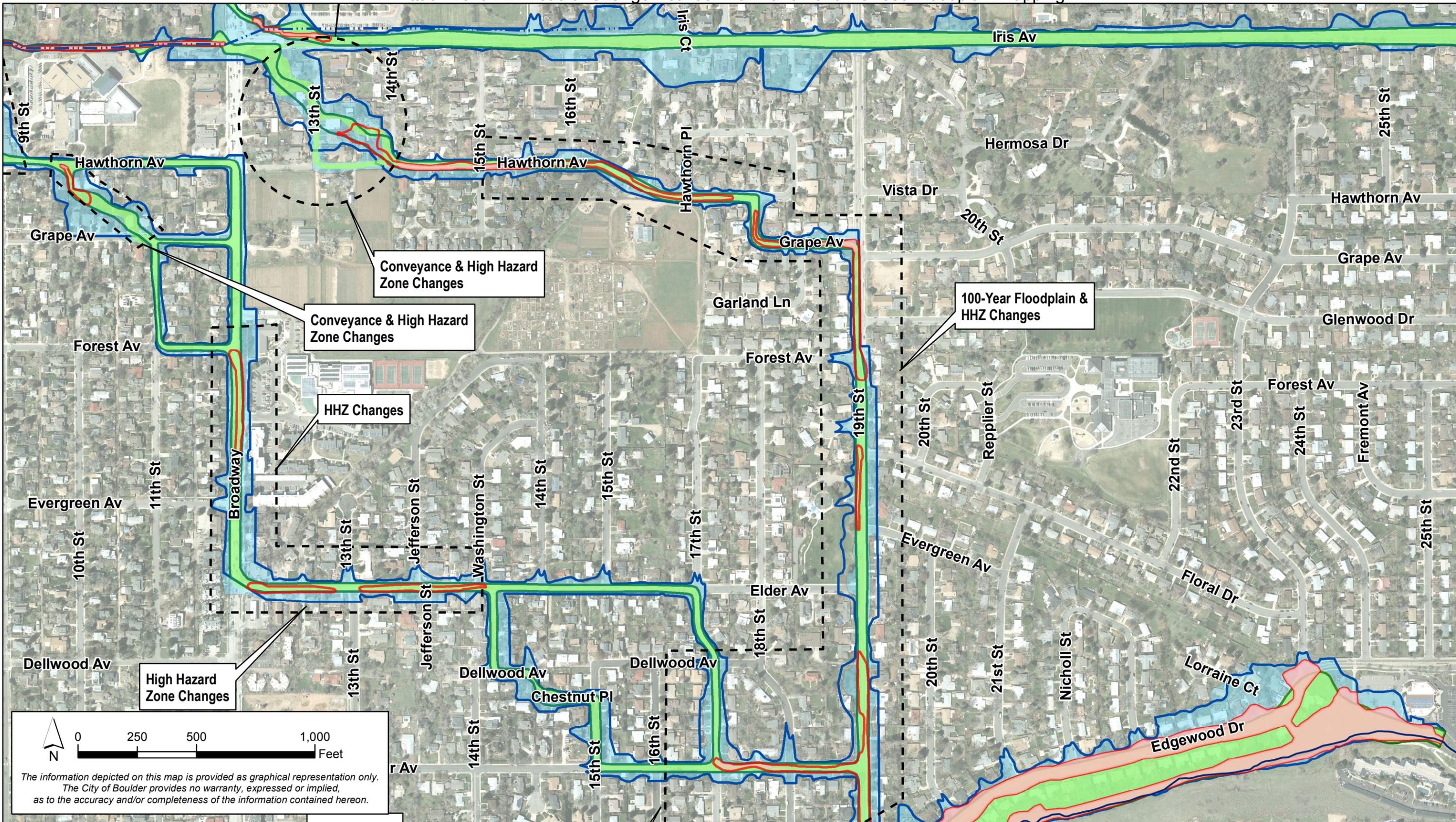
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Legend		Draft Proposed (2014) 100 Year Floodplain		Draft Proposed (2014) Conveyance Zone		Draft Proposed (2014) High Hazard Zone		Areas of Significant Change From 2014 to 2015 Proposed Mapping
		Proposed (2015) 100 Year Floodplain		Proposed (2015) Conveyance Zone		Proposed (2015) High Hazard Zone		City Limits

Twomile Canyon & Upper Goose Creek

Areas of Significant Changes
From 2014 to 2015 Proposed Mapping

Rev: 3/3/2015



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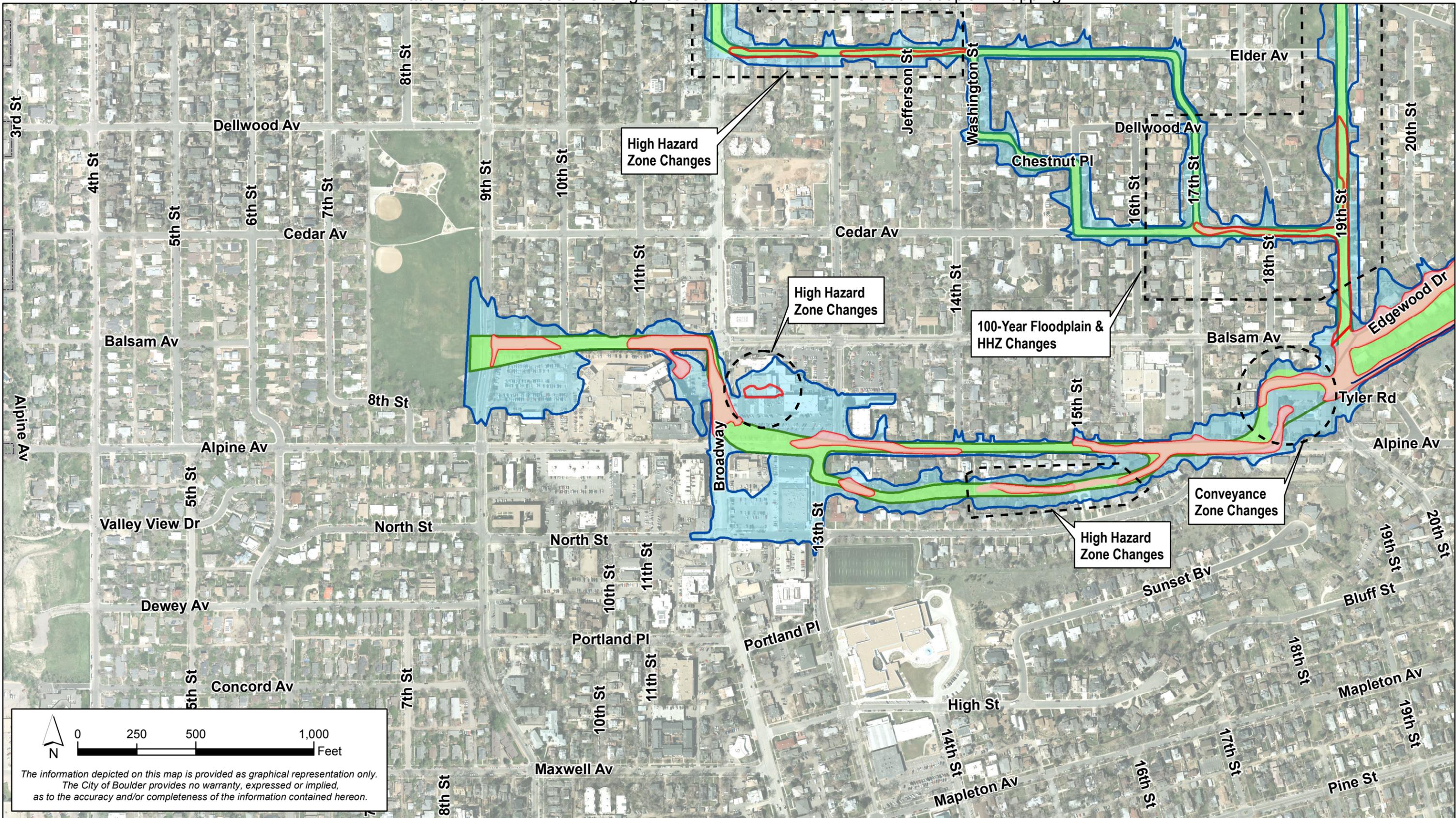
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Twomile Canyon & Upper Goose Creek

Areas of Significant Changes
From 2014 to 2015 Proposed Mapping

Rev: 3/3/2015



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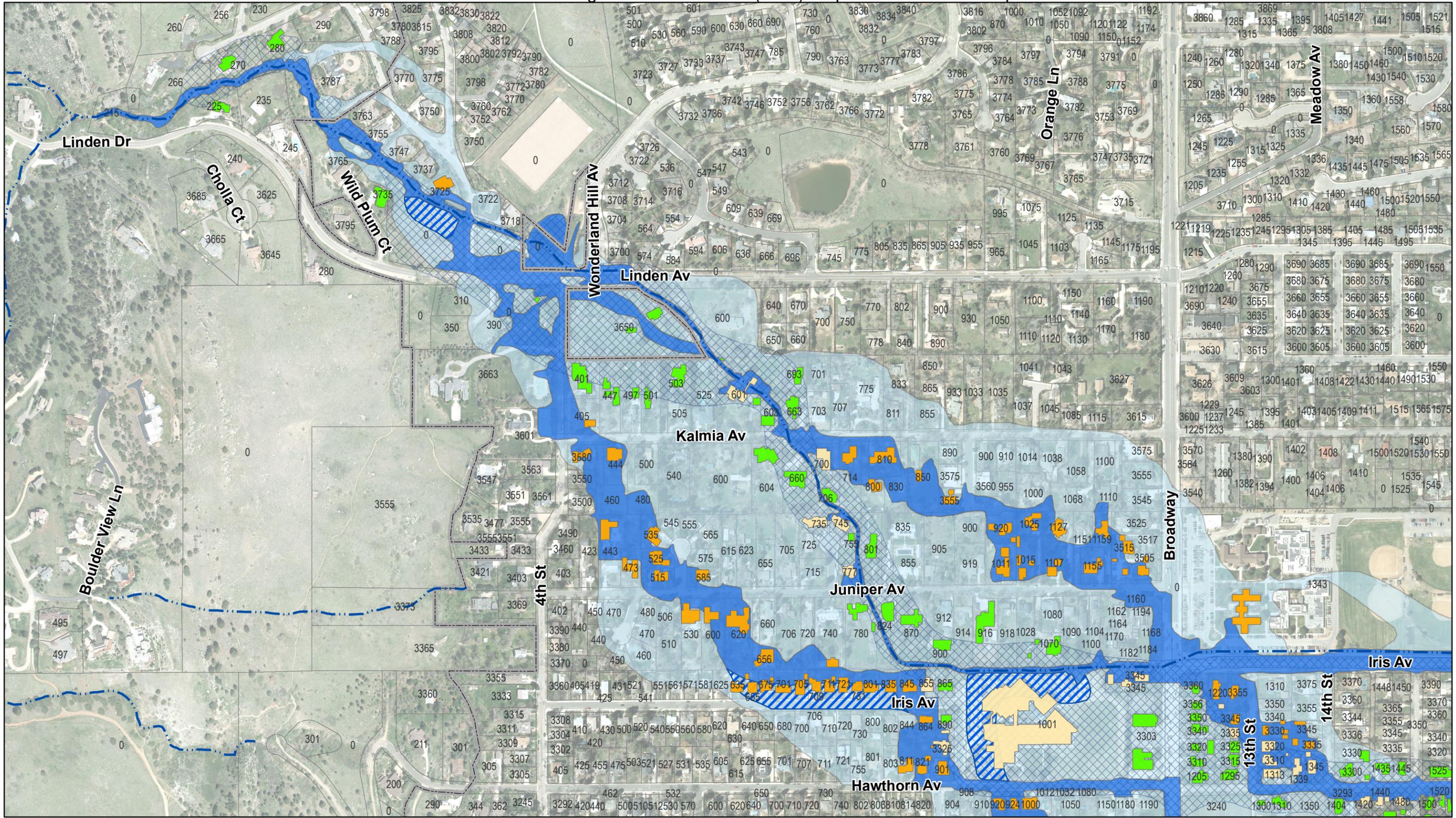
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Twomile Canyon & Upper Goose Creek

Areas of Significant Changes
From 2014 to 2015 Proposed Mapping

Rev: 3/3/2015



Legend

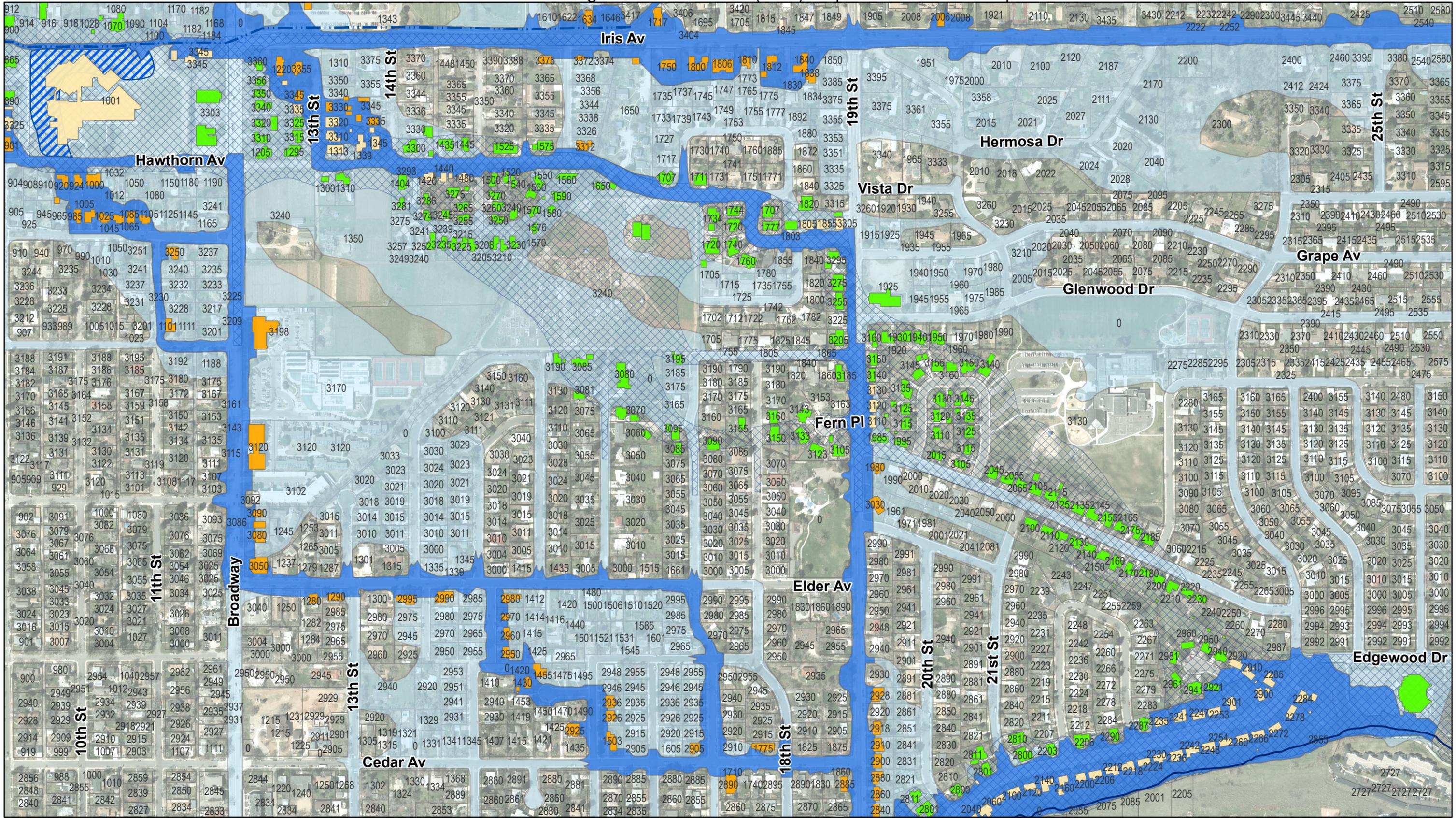
- Proposed (2015) 100 Year Floodplain
- Proposed (2015) Shallow Flooding (unregulated)
- Buildings Added to the 100 Year Floodplain (145)
- Buildings Remaining in the 100 Year Floodplain (133)
- Buildings Removed from the 100 Year Floodplain (275)
- FEMA Effective 100 Year Floodplain
- City Limits

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Twomile Canyon & Upper Goose Creek
Structures Affected by Proposed Mapping Compared to Existing FEMA 100-Year Floodplain

Rev: 3/3/2015

Attachment B. Existing FEMA and Revised (2015) Proposed 100-Year Floodplain



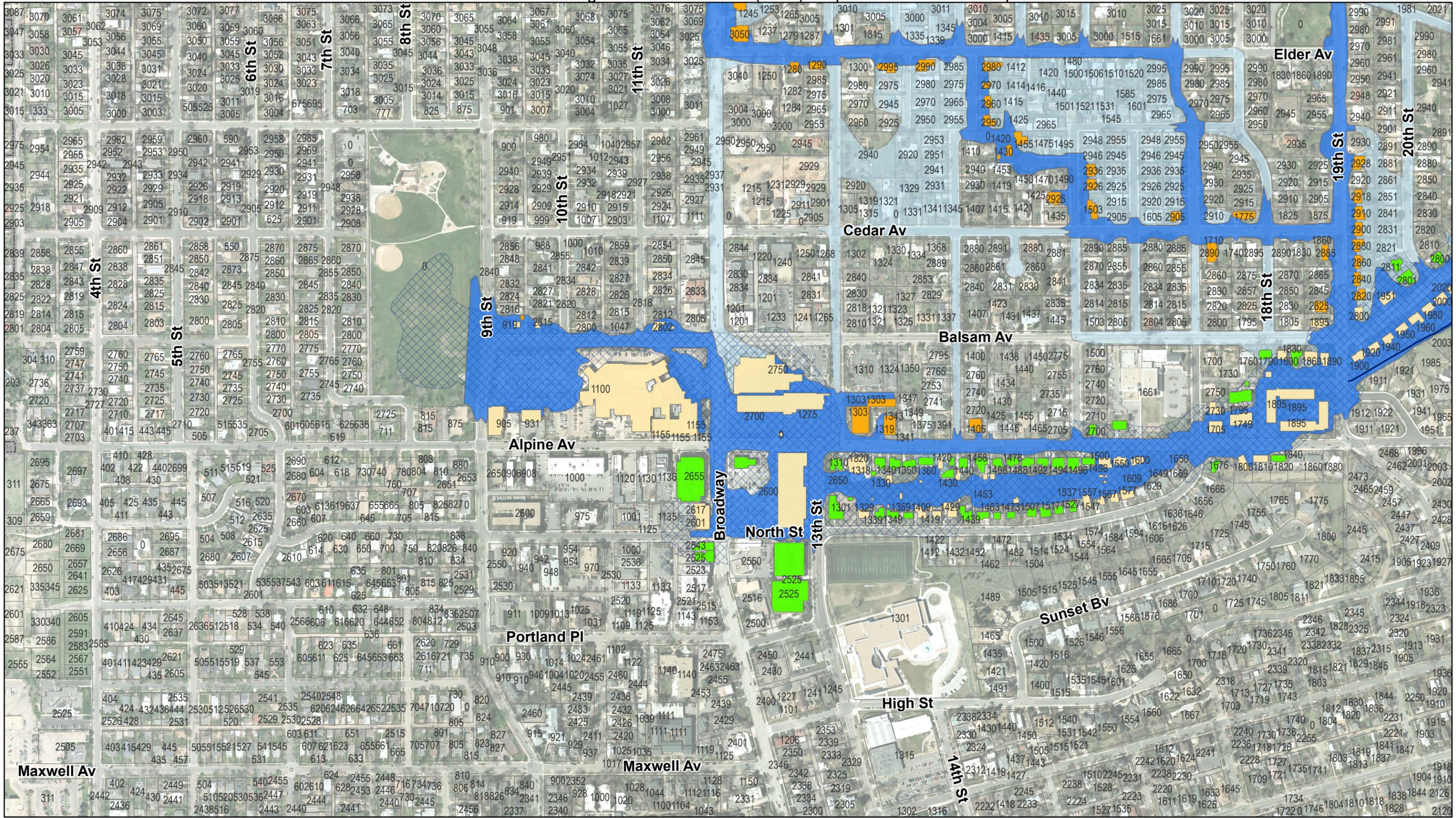
Legend

- Proposed (2015) 100 Year Floodplain
- Proposed (2015) 100 Year Floodplain (Zone AO) Flood Depth 1' to 2'
- Proposed (2015) Shallow Flooding (unregulated)
- FEMA Effective 100 Year Floodplain
- City Limits
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Twomile Canyon & Upper Goose Creek
Structures Affected by Proposed Mapping Compared to Existing FEMA 100-Year Floodplain
 Rev: 3/3/2015
MAP 2 OF 3

Attachment B. Existing FEMA and Revised (2015) Proposed 100-Year Floodplain



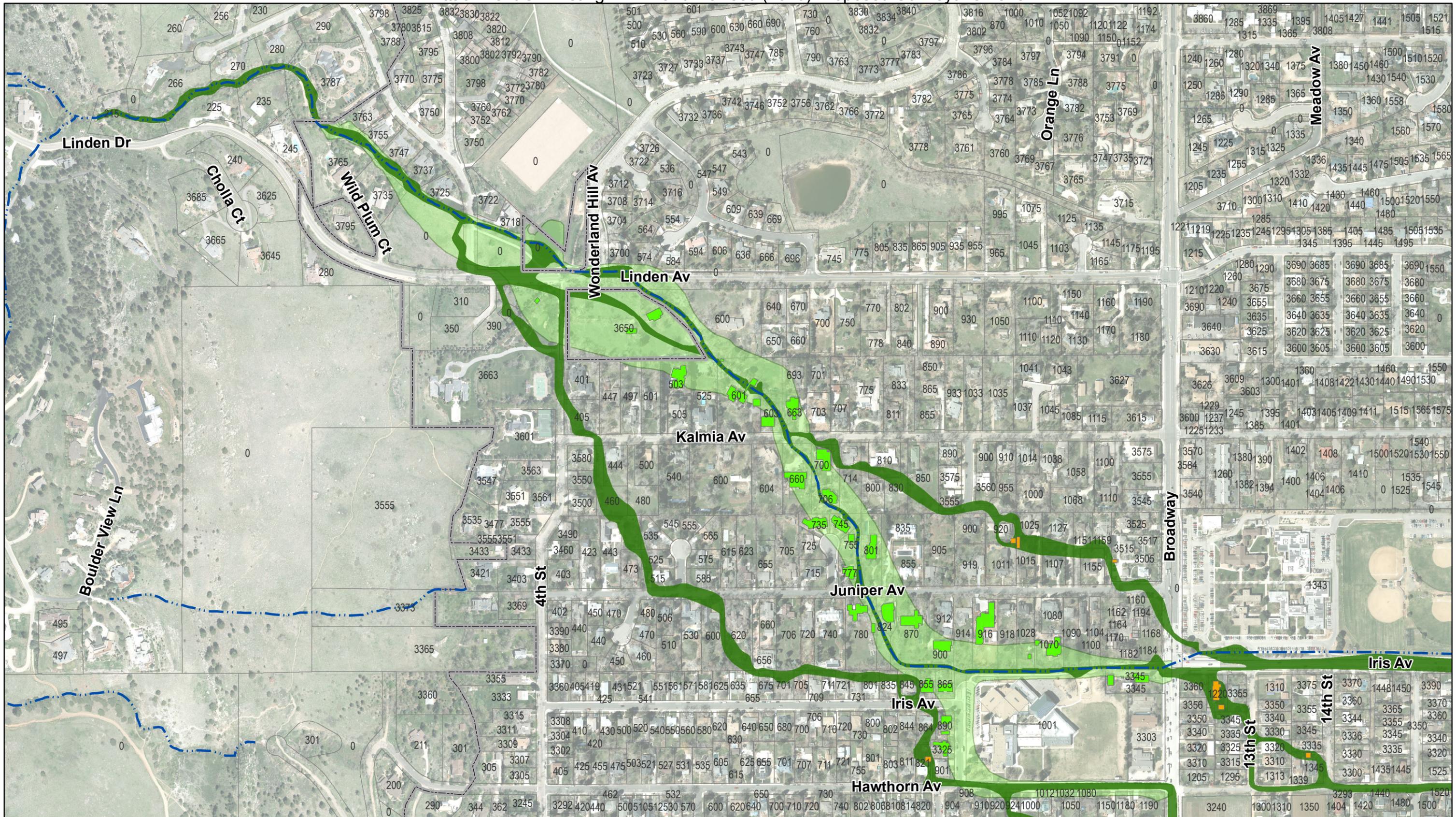
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Twomile Canyon & Upper Goose Creek
 Structures Affected by Proposed Mapping Compared to Existing FEMA 100-Year Floodplain

Rev: 3/3/2015



Legend

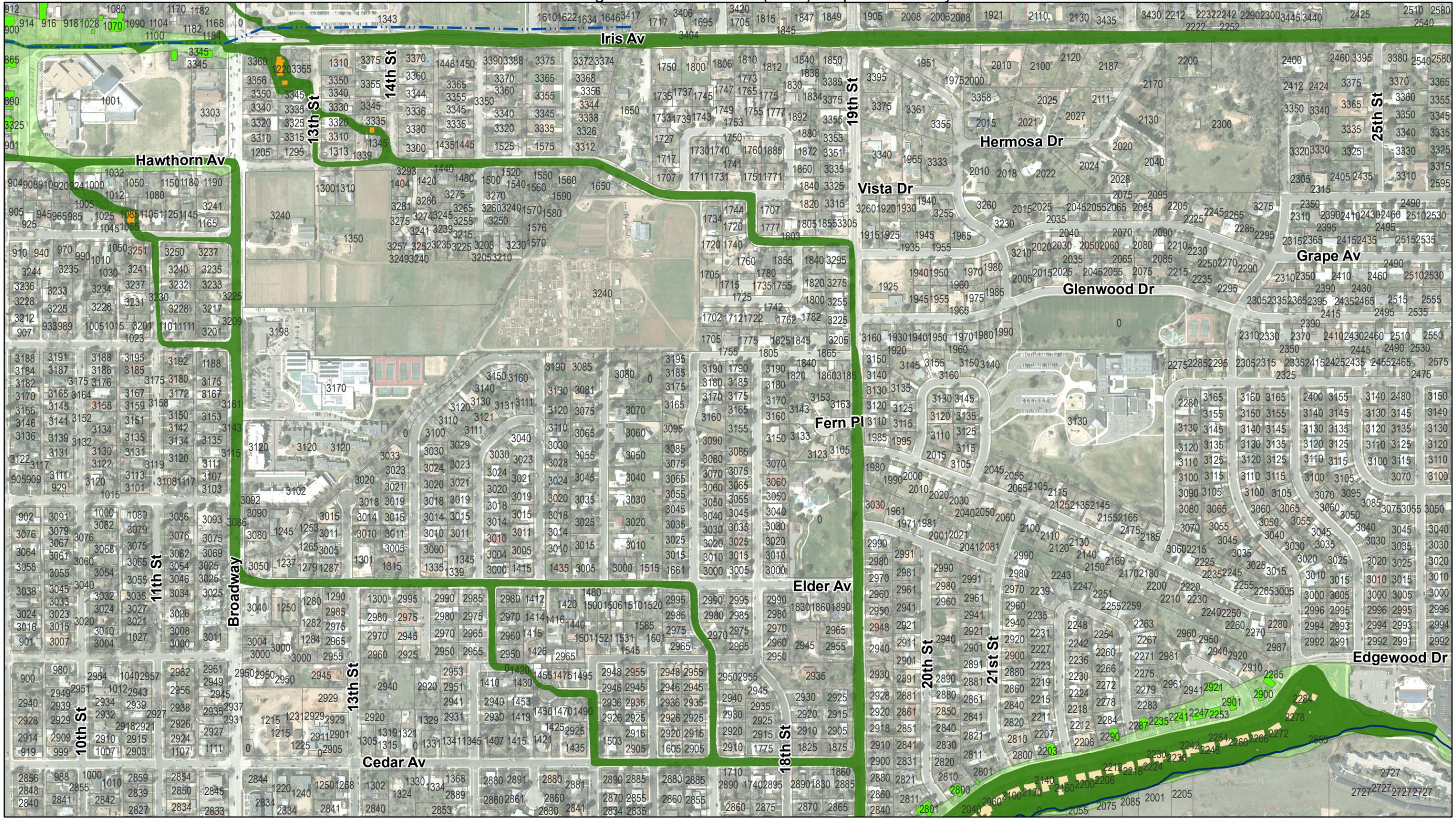
- Proposed (2015) Conveyance Zone
- FEMA Effective Conveyance Zone
- City Limits
- Buildings Added to the Conveyance Zone (9)
- Buildings Remaining in the Conveyance Zone (42)
- Buildings Removed from the Conveyance Zone (107)

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Twomile Canyon & Upper Goose Creek
Structures Affected by Proposed Mapping Compared to Existing FEMA Conveyance Zone

Rev: 3/3/2015

Attachment C. Existing FEMA and Revised (2015) Proposed Conveyance Zone



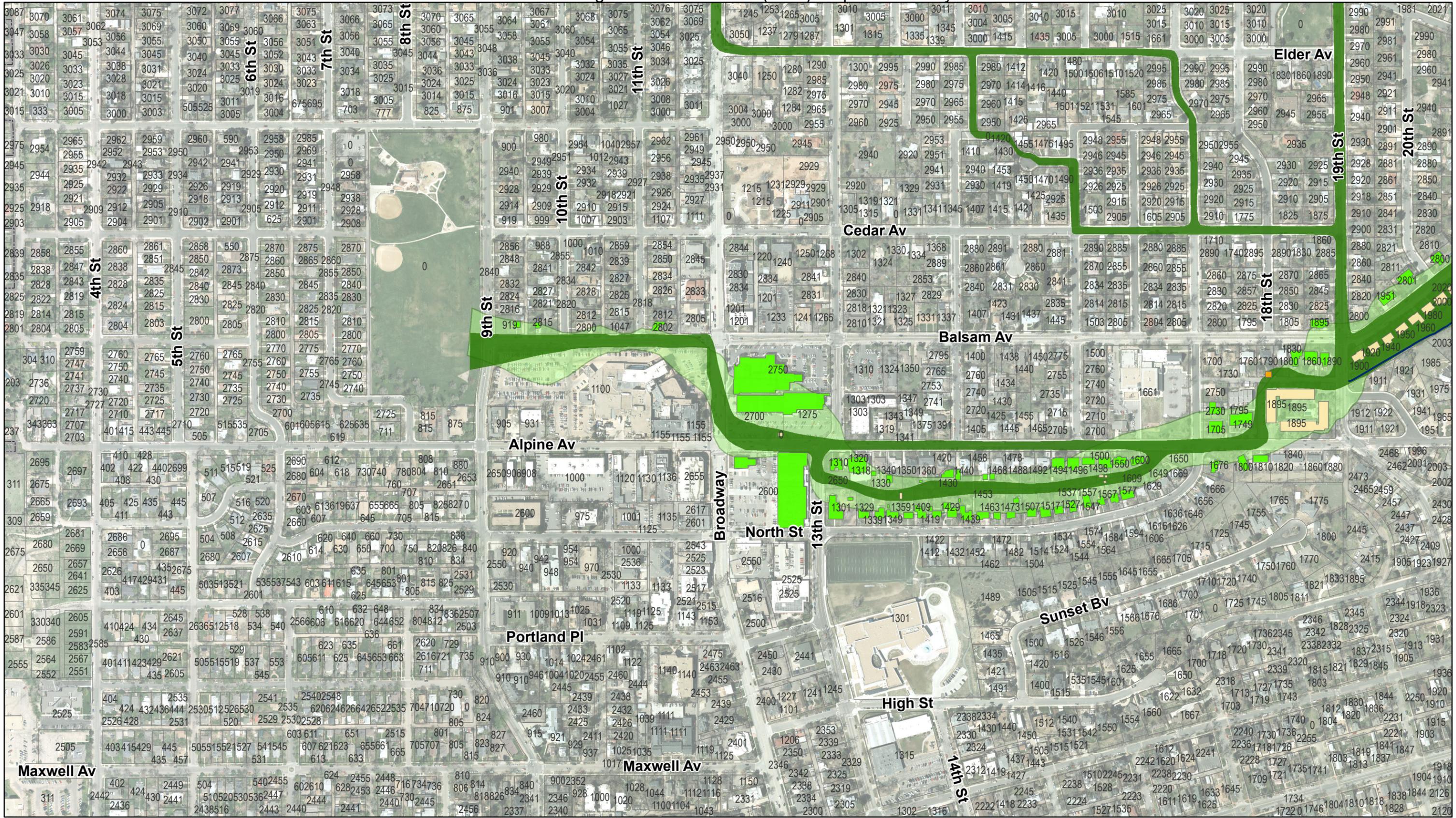
Legend

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Twomile Canyon & Upper Goose Creek
 Structures Affected by Proposed Mapping Compared to
 Existing FEMA Conveyance Zone
 Rev: 3/3/2015 **MAP 2 OF 3**

Attachment C. Existing FEMA and Revised (2015) Proposed Conveyance Zone



Legend

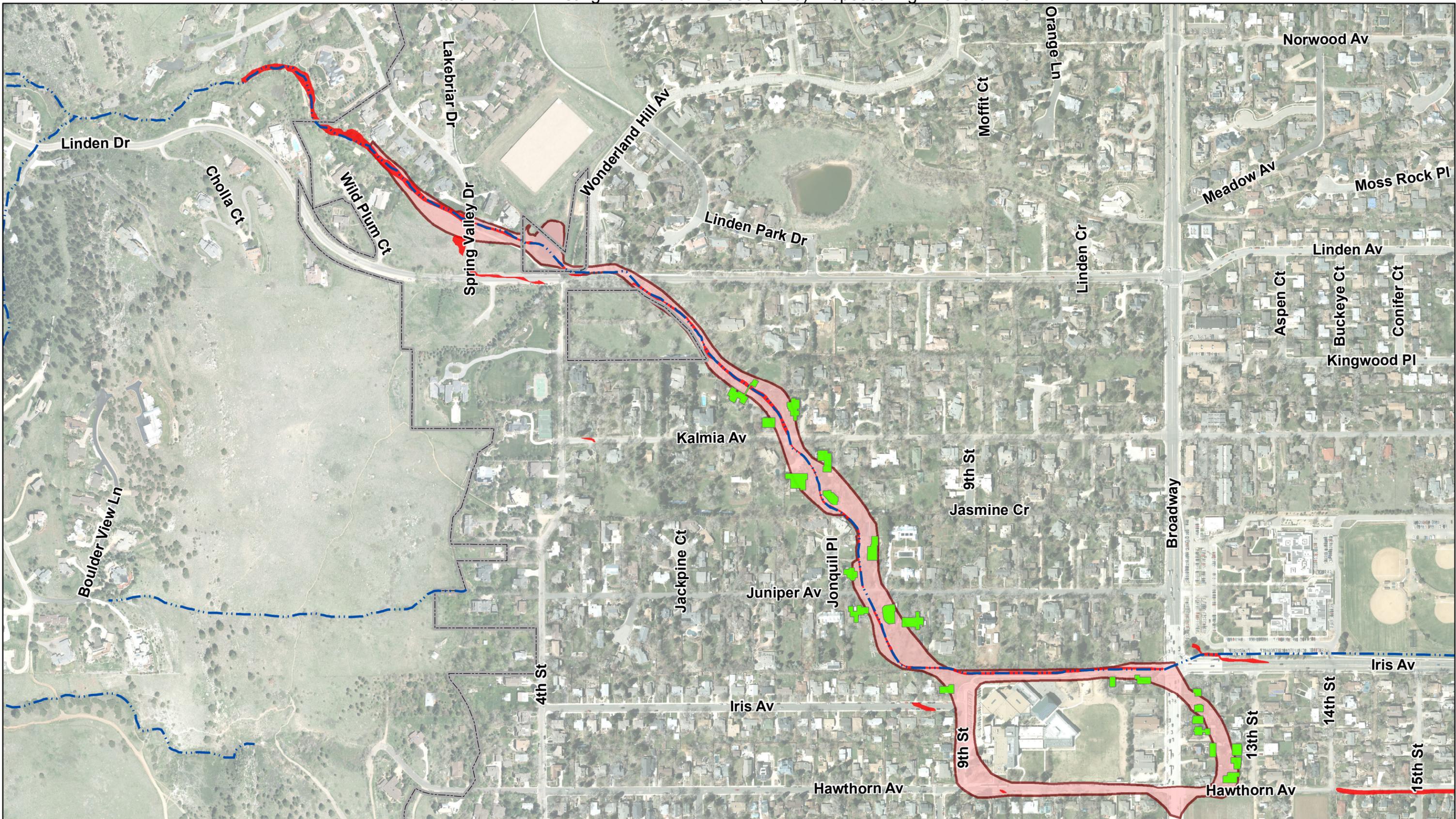
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0 250 500 1,000 Feet

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 Structures Affected by Proposed Mapping Compared to Existing FEMA Conveyance Zone

Rev: 3/3/2015



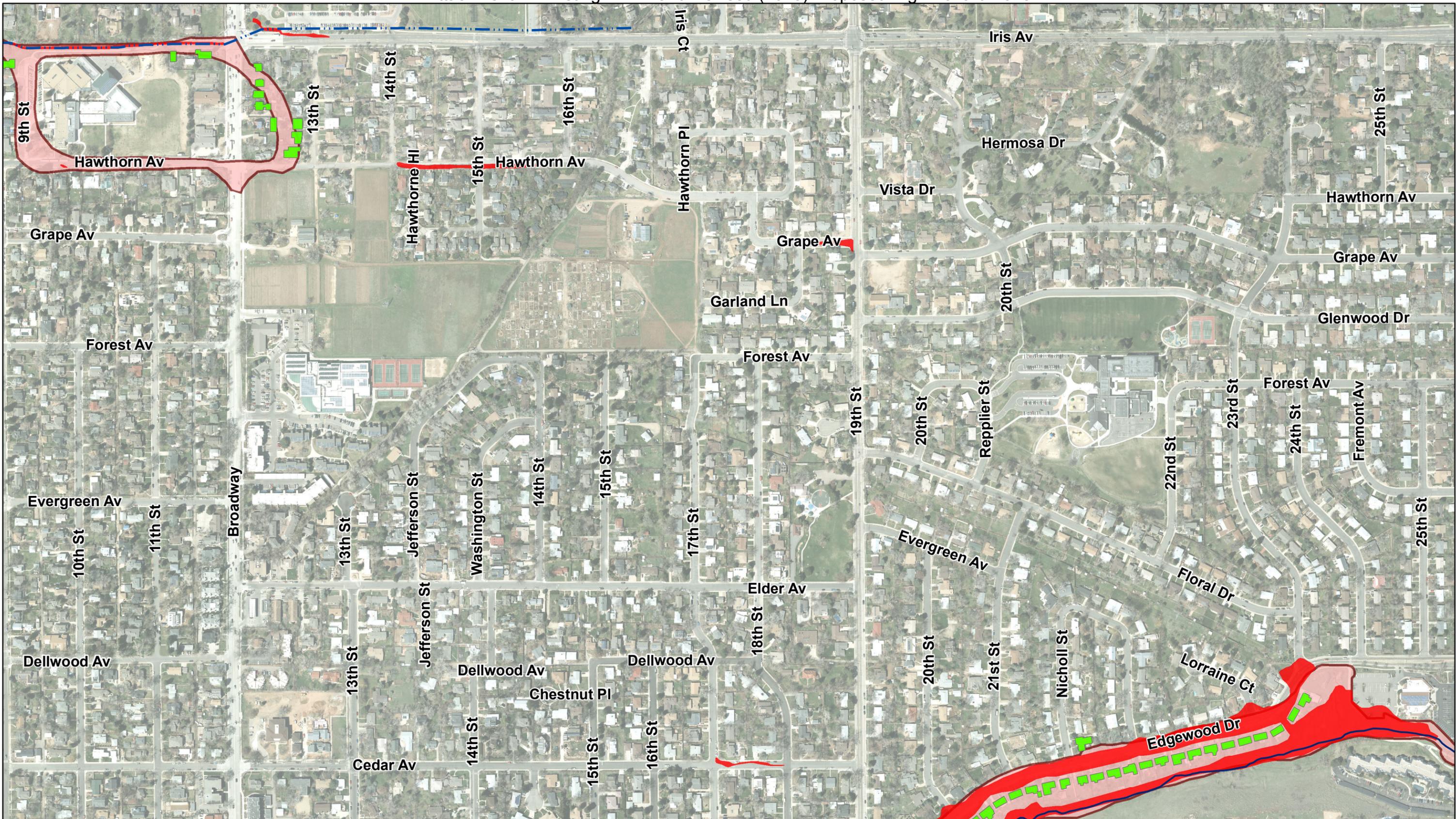
Legend

-  Proposed (2015) High Hazard Zone
-  Effective High Hazard Zone
-  City Limits
-  Buildings Added to the High Hazard Zone (0)
-  Buildings Remaining in the High Hazard Zone (0)
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Twomile Canyon & Upper Goose Creek
Structures Affected by Proposed Mapping Compared to Existing High Hazard Zone



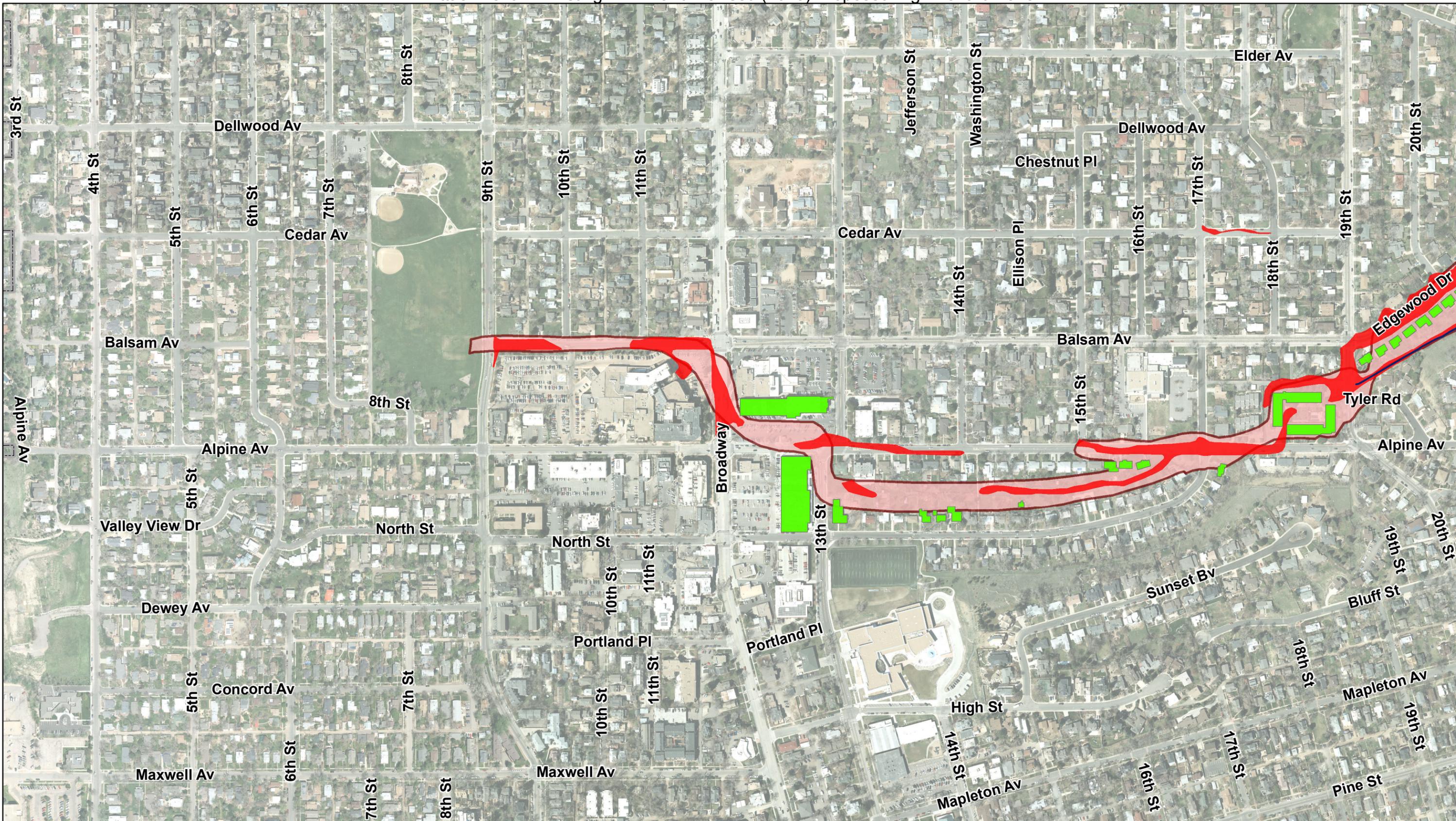
Legend

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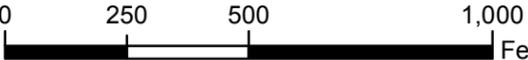

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Twomile Canyon & Upper Goose Creek
Structures Affected by Proposed Mapping Compared to Existing High Hazard Zone



Legend

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Twomile Canyon & Upper Goose Creek
Structures Affected by Proposed Mapping Compared to Existing High Hazard Zone

**CITY OF BOULDER
WATER RESOURCES ADVISORY BOARD
INFORMATION PACKET MEMORANDUM**

To: Water Resources Advisory Board

From: Jeff Arthur, Director of Public Works for Utilities
Joe Taddeucci, Water Resources Manager
Bret Linenfelser, Water Quality Environmental Services Manager
Ken Baird, Utilities Financial Manager
Russ Sands, Watershed Sustainability and Outreach Supervisor
Joanna Bloom, Source Water Administrator
Bronwyn Weygandt, Billing Services Supervisor
Annie Noble, Acting Principal Engineer for Flood and Greenways
Eric M. Ameigh, Public Works Projects Coordinator

Date: March 16, 2015

**Subject: Information Item: Background Information for Utility Rate Study –
Stormwater and Flood Management**

I. PURPOSE

The purpose of this memo is to provide the board with background information on the current structure for stormwater and flood management fees as well as an overview of issues that have arisen that support a review of the fee structure. This information will help inform the WRAB's recommendation of key questions and guiding principles for the rate study at its meeting on May 18, 2015. This memo covers stormwater and flood management fees. A previous memo, included in the packet for the Feb. 23, 2015 meeting, provided the background for water and wastewater fees. During the upcoming public engagement process, staff will ask stakeholders for input on guiding principles for the purpose of analyzing the rate structure. Input from the public and WRAB will help determine whether there is a single set of guiding principles across all utilities or whether each utility has a different set of principles.

II. STORMWATER AND FLOOD MANAGEMENT FEES

Fees are calculated based on the principle that stormwater impacts from individual properties are influenced by the property's area and amount of impervious surface. Therefore, a larger parcel would theoretically have more stormwater runoff than a smaller parcel and a parcel with more impervious surface will have more stormwater runoff than a parcel with less impervious surface.

Stormwater and Flood Management Utility Fees are used to pay for a number of activities within the Utility. Approximately 40 percent of ongoing revenues go toward the operating budget, which includes in-house system maintenance, stormwater quality and education programs, planning and project management, and administrative costs. The other 60 percent funds the

Capital Improvement Program (CIP) and debt service. The CIP is comprised of major drainageway projects (about 75% of CIP spending) and localized drainage improvements (about 25% of CIP spending). Major projects in the current CIP include Wonderland Creek, South Boulder Creek, and Four Mile Canyon Creek.

Single Family Residential

The single family residential fee varies on the basis of parcel size as follows:

The fee for single family residential properties with lot sizes of 15,000 square feet or less is \$13.46 per month. Properties between 15,000 and 30,000 square feet pay \$16.82 per month. Properties larger than 30,000 square feet pay \$20.20.

Parcel Size	Monthly Fee
0- 15,000 square feet	\$13.46
15,000-30,000 square feet	\$16.82
30,000 or more square feet	\$20.20

All Other Properties

The fees for all properties that are not single family residential are individually calculated. The formula is constructed to be in proportion to the base rate assessed to single-family dwellings. The owners of all other parcels in the city on which any improvement has been constructed pay a stormwater and flood management fee based on the monthly rate of \$13.46 multiplied by the ratio of the runoff coefficient of the parcel to a coefficient of 0.43 and by the ratio of the area of the parcel in square feet to a 7,000 square foot parcel. 0.43 is the runoff coefficient for a typical single family lot of 7,000 square feet and is included in the calculation in order to maintain proportionality between single family residential properties and all other types of properties. The fee is equal to the following:

$$\frac{(\text{Total Site Area in square feet})(\text{Runoff Coefficient})(\text{Base Rate})}{(7,000 \text{ square feet})(0.43)}$$

A property's runoff coefficient, for the purposes of the fee, is equal to the following:

$$\frac{(\text{Total Impervious Area in square feet})(0.9) + (\text{Total Pervious Area in square feet})(0.2)}{\text{Total Area}}$$

For example, a commercial property with an area of 40,000 square feet, of which 20,000 are impervious and 20,000 are pervious, would have a runoff coefficient of 0.55 and would pay \$98.38 per month, calculated as follows:

$$\frac{(40,000 \text{ square feet})(0.55)(\$13.46)}{(7,000 \text{ square feet})(0.43)} = \$98.38$$

The 0.55 runoff coefficient is calculated as follows:

$$\frac{(20,000 \text{ square feet impervious area})(0.9) + (20,000 \text{ square feet pervious area})(0.2)}{(40,000 \text{ square feet total area})} = 0.55$$

Plant Investment Fees

A plant investment fee (PIF) is a one-time fee collected when a property is annexed, developed or redeveloped. A stormwater/flood plant investment fee (PIF) is charged for properties that increase the amount of impervious area on the property (Boulder Revised Code section 11-5-9). The stormwater/flood PIF is used toward the construction, operation, maintenance and replacement of the stormwater and flood management system. (PIFs are also charged for the water and wastewater utilities.)

History

The Stormwater/Flood Management Utility was created in 1973 to pay for the construction of storm drainage and flood control facilities (for a timeline of flooding and related events from 1858 – 2013, see Attachment A). In that year, monthly user fees were introduced. These fees were intended to cover operations, maintenance and replacements costs of the existing system and construction of new storm drainage and flood management facilities. In the early years, since the total collected was not adequate to serve all these purposes, the revenues generated were reserved for new construction and General Fund revenues were used for routine maintenance. Boulder's stormwater and flood management fee remained at the base rate of \$1.00 per month from 1973 through 1981 and was increased periodically in the ensuing years.

In 1990, the current stormwater fee methodology was introduced to commercial, industrial, and multifamily accounts. In June 2009, external auditors recommended that the city reevaluate square footage of commercial, industrial, and multifamily accounts and update the information within the utility billing system accordingly. Using aerial photography, the commercial and industrial accounts were remapped and customer letters were sent in June 2011. The letters notified customers of new stormwater measurements that would become effective on Jan. 1, 2012 and included a form so the customer could appeal the measurements shown on their letter. At the same time, the [stormwater area map](#) was released to the public so customers could check the total area and impervious area assigned to each account. On Jan. 1, 2013, the multifamily stormwater audit was completed and the new measurements were updated in the utility billing system.

Stormwater and Flood Management Fees Issues

2015 increases in stormwater and flood management fees provide an opportunity to analyze the impact of fees and current fee calculation methodology. The methodology is applied equitably across customer classes but the impacts may be felt differently. The availability of new data over time, increased customer feedback as a result of the rate increases, and the related effort to analyze water and wastewater rates make this a good time to re-examine the fee structure. The upcoming public process will identify specific areas of focus for the analysis.

III. TRADITIONAL RATE STUDY PROCESS

Understanding the impact of stormwater and flood management fees and identifying options for potential changes to the way they are calculated is likely a multifaceted effort. More than one

type of study could be recommended, depending on public input and the guidance of WRAB and City Council. One part of the analysis may be a traditional rate study.

A traditional rate study is divided into three general areas of inquiry. The first deals with determining the utility's Revenue Requirement. This involves understanding all the costs related to operating the utility, including operating, capital, debt service, and maintaining appropriate reserve levels. The amount of revenue needed from rates is then calculated by taking the utility costs and subtracting other anticipated revenue, such as plant investment fees and interest income, among other factors.

Once the revenue requirement is determined, the second step is to perform a cost of service analysis. This study seeks to equitably allocate the revenue requirement between the various customer classes of service. For a major rate study the cost of service analysis is often performed by consultants. The model can then be updated by staff in other years.

The third area of inquiry, called rate design, has to do with how the rate structure and the setting of rates help to meet revenue requirements and also other goals, such as economic development, ecological sustainability, or local ideas of equity amongst customers.

IV. NEXT STEPS

March 16, 2015 WRAB Meeting – Staff will be available to answer questions about the information contained in this memo and receive input on additional information that could help the Board in providing input into the rate study. There will be no staff presentation of the material at this meeting. Staff will also provide a verbal update on the planned stakeholder engagement process.

May 18, 2015 WRAB Meeting – Staff will be requesting a WRAB recommendation on key questions and guiding principles for the rate study project.

June 2015 – Staff request City Council feedback on WRAB's recommended key questions and guiding principles. These questions and guiding principles will inform scoping of rate structure analyses.

Attachment A

Timeline of Flooding and Related Events: 1858 - 2013

