

Appendix F

Hydrology and Water Quality Letter Report



January 16, 2019

Revised: February 5, 2019

Mr. Jay Eastman, AICP
City of Riverside
3900 Main Street
Riverside, California 92522

**SUBJECT: HYDROLOGY AND WATER QUALITY LETTER REPORT (QUALITATIVE ANALYSIS) IN SUPPORT OF THE PROGRAM ENVIRONMENTAL IMPACT REPORT FOR NORTHSIDE SPECIFIC PLAN, CITY OF RIVERSIDE, RIVERSIDE COUNTY, CALIFORNIA
(RICK ENGINEERING COMPANY JOB NUMBER 17964)**

Dear Mr. Eastman:

This letter report is prepared to address drainage and storm water quality for the purposes of developing a Specific Plan for the Northside Neighborhood and Pellissier Ranch Inter-Jurisdictional Specific Plan (Northside Specific Plan) and Program Environmental Impact Report (PEIR) in Riverside, California. The project study area includes approximately 1,423 acres of land within the City of Riverside, City of Colton, and County of Riverside and is generally bound by the Pellissier Ranch to the north (and other locations in the City of Colton), State Route 60 (SR-60) and portions of Main Street in Downtown Riverside to the south, Interstate 215 (I-215) and the Hunter Industrial Park to the east and the Santa Ana River to the west. See Attachment A for the Northside Specific Plan Study Area Map.

In general, storm water runoff from the majority of the Northside community drains in a southwesterly direction to the Santa Ana River and ultimately flows through Orange County before discharging into the Pacific Ocean. Within the Northside Specific Plan Study Area, there are three main local drainage systems which collect and convey runoff towards the Santa Ana River, including Highgrove Channel, Springbrook Wash (also referred to as Springbrook Arroyo), and the University Wash. This report will discuss the existing and proposed condition drainage and storm water quality conditions and design criteria and standards for future development within the study area.

Existing Drainage and Water Quality Conditions

The Santa Ana River flows in a southwesterly direction along the western border of the Northside Specific Plan Study Area and collects drainage from approximately 800 sq. miles (roughly one-third of the overall watershed) at the study area of which roughly two-thirds of the drainage area is within the valley and contains mostly developed land and remaining one-third is undeveloped steep mountainous terrain at the headwaters. The Santa Ana River is a significant

drainage system that is regulated by the Federal Emergency Management Agency (FEMA) for flood control. In regards to the local drainage and storm water requirements, the Northside Neighborhood and Pellissier Ranch areas are regulated by Riverside County Hydrology Manual (1978) for drainage and the Santa Ana Regional Water Quality Control Board (RWQCB) - Region 8 for water quality, among various other agencies. The following includes descriptions of each of the major drainage systems as well as the storm water quality in its existing condition.

Floodplains

The Santa Ana River, along with each of the three major local drainage systems are described below:

Santa Ana River/Riverside 2 Levee System: The Santa Ana River is located along the project study area within a FEMA Zone AE which means that detailed hydraulic analysis has been prepared and is currently included on the FEMA Flood Insurance Rate Maps (FIRM). In 2005, construction of the Seven Oaks Dam located at the base of the San Bernardino Mountains was completed as part of various Santa Ana River Mainstem projects which aim to provide the flood protection for the millions of residents downstream within San Bernardino, Riverside, and Orange Counties. As a result of this improvement, the Riverside County Flood Control and Water Conservation District (RCFC&WCD) is currently processing a Physical Map Revision (PMR) through FEMA to update both the hydrologic and hydraulic analysis for the Santa Ana River to reflect changes related to the construction of the Seven Oaks Dam upstream.

The Northside community is protected by the Riverside 2 Levee System, located along the eastern bank of the Santa Ana River, which is currently a provisionally accredited levee pursuant to the current FEMA FIRM. This levee system may become certified once the PMR has been approved by FEMA. Based on our correspondence with the RCFC&WCD, FEMA has requested that a detailed hydraulic study be performed on the tributaries within the Northside Specific Plan Study Area, specifically Highgrove Channel, to verify the 100-year floodplain limits.

Highgrove Channel: This channel is located within both the City of Colton and portion of the City of Riverside and conveys drainage in a westerly direction before discharging into the Santa Ana River. The drainage area tributary to Highgrove Channel is primarily from the City of Grand Terrace to the east. Within the project study area, Highgrove Channel is a concrete trapezoidal channel from S. Old Pellissier Road/Orange Street down to the Santa Ana River and this reach is maintained by RCFC&WCD. Upstream from the study area, the channel is earthen.

Highgrove Channel is currently mapped within a FEMA Zone X, which is an area protected from a 100-year flood by a provisionally accredited levee (Riverside Levee 2) based on the tailwater influence from the Santa Ana River. No detailed hydraulic modeling has been prepared and approved by FEMA for the reach within the study area; however, a detailed study has been prepared upstream of the study area.

Based on recent correspondence with RCFC&WCD, the district is in the process of preparing a detailed hydraulic modeling of Highgrove Channel using the effective FEMA hydrology, 100-year peak flow rate of 2,000 cfs. Their preliminary findings indicate that the concrete channel does not have sufficient capacity to convey 2,000 cfs and that there exists a split flow condition at the transition from an earthen channel to concrete channel at S. Old Pellissier Road/Orange Street where approximately 1,000 cfs overflows and is redirected in a southerly direction towards the Springbrook Wash during larger storm events which the runoff exceeds the capacity of Highgrove Channel. This secondary flow path is herein referred to as the Highgrove Overflow Channel. Since the topography of the study area is flat and there exists no defined channel system, the overflows spread widely between Highgrove Channel and various confluence locations with Springbrook Wash along Garner Road between the AB Brown Soccer Complex and Orange Street. As a result of the wide floodplain, a substantial amount of flow attenuation is provided within the AB Brown Sports Complex and adjacent mostly undeveloped land north of Garner Road prior to confluenting with Springbrook Wash, thereby reducing the peak flow rate. Despite the flow attenuation helping to reduce the peak flow rate, there is still a substantial amount of runoff flowing towards Springbrook Wash which is not accounted for in the current FEMA FIRMs. This has negative flooding impacts on the downstream reach of the Springbrook Wash through the length of the study area.

Refer to Attachment B for an existing condition floodplain exhibit, including preliminary floodplain hydraulic analysis prepared by RCFC&WCD.

Springbrook Wash (Springbrook Arroyo): This channel serves as the main conveyance system for the majority of the study area and drains an off-site area east of I-215. Within the entire Study Area limits, this channel is a Federal Emergency Management Agency (FEMA) mapped Zone AE drainage system which conveys a 100-year peak flow rate of 1,000 cfs. At the upstream limit within the study area, Springbrook Wash is a narrow, soft-bottom channel which meanders through an existing residential community between I-215 and Orange Street. Once the wash crosses beneath Orange Street, it becomes an engineered earthen channel flowing parallel to Garner Road on the north side of the street, before turning in a southerly direction and flowing along the west end of the Old Golf Course. The existing trapezoidal earthen channel between Orange Street and Main Street has an average dimension of 10-ft bottom width and 3:1 side slopes and is only capable of conveying roughly 100 cfs which means that the channel overtops frequently even during smaller storm events, thereby flooding into adjacent developments. Since Garner Road is elevated, the flows from Springbrook Wash and the Highgrove Overflow Channel are both held back and detained; thereby further widening the 100-year inundation area north of Garner Road. This large inundation area provides some flow attenuation prior to confluenting with the Springbrook Wash.

According to the RCFC&WCD's preliminary hydraulic analysis, the confluent 100-year peak flow rate in Springbrook Wash south of Garner Road is approximately 1,500 cfs, which is roughly a 50% increase from the FEMA's peak flow rate of 1,000 cfs. This significantly exceeds the capacity of the existing Springbrook Wash channel and creates two flow paths through the Old Golf Course, one flowing along the western limit of the Old Golf Course and the second meandering through the middle of the Old Golf Course. The two flow paths confluence at the

southwest corner of the Old Golf Course before crossing beneath Main Street and discharging into concrete trapezoidal channels downstream. Since the existing downstream drainage facilities do not have capacity for the additional runoff, RCFC&WCD's preliminary analysis shows that there is an increase in flooding within local streets. Many of these flooded areas are not currently mapped as being within the FEMA 100-year floodplain. As a result, the additional runoff exacerbates the flooding conditions adjacent to the Old Golf Course and along Main Street.

As Springbrook Wash continues downstream, it confluences with the University Wash before crossing State Route 60 (SR-60) and discharging into Lake Evans outside of the Northside Specific Plan Study Area. The preliminary hydraulic analysis from RCFC&WCD does not extend downstream from the confluence with University Wash, thus, the floodplain mapping is not available at this time. It is anticipated that the remainder of Springbrook Wash leading up Lake Evans may not have sufficient capacity for the additional runoff and will have similar flooding issues.

Once RCFC&WCD completes and processes the detailed hydraulic modeling of Highgrove Channel and Springbrook Wash through FEMA and obtains approvals, then the new effective floodplain mapping will negatively impact existing property owners who will now be mapped within the 100-year floodplain. Subsequently, these property owners, if they have a federally-backed loan, will be required to pay for flood insurance.

Refer to Attachment B for an existing condition floodplain exhibit, including preliminary floodplain hydraulic analysis prepared by RCFC&WCD.

University Wash: This wash is a FEMA Zone AE drainage system which is conveyed into the Study Area through a culvert underneath the I-215 and SR-60 interchange. Drainage from this wash daylights into an open channel before transitioning into a culvert at Orange Street, until it daylights again into an open channel and confluences with Springbrook Wash. Based on the FEMA FIRM, it appears that the 100-year event is contained within the channels and culverts, with the exception of the transition from open channel to culvert near Orange Street where there is a wide FEMA mapped 100-year floodplain.

Since the preliminary hydraulic analysis prepared by RCFC&WCD does not extend to University Wash, it is anticipated that University Wash will be subject to a higher tailwater condition a Springbrook Wash and this may cause the wash to overtop. This will need to be verified once RCFC&WCD completes their hydraulic analysis and processes it through FEMA.

Local Drainage

Within the Northside Specific Plan Study area, there is a general lack of local storm drain infrastructure on the northern half of the study area; therefore, runoff is primarily conveyed along streets until it reaches a defined drainage channel. Most of these areas drain towards Main Street and the runoff is conveyed along Main Street before discharging into the Springbrook Wash.

Local Storm Water Quality

Much of the existing development within the Northside Specific Plan Study Area predates the storm water quality treatment requirements currently in effect today for new development and redevelopment projects. Also, there are not any regional basins located within the study area which could potentially be used for storm water quality treatment. Thus, it is anticipated that the majority of the study area does not currently have any storm water quality treatment.

Receiving Waters

According to the “Water Quality Control Plans for the Santa Ana Region Basin (8),” dated January 24, 1995 and updated February 2016 (herein referred to as the “Basin Plan”), the receiving waters for the study area is the Santa Ana River. The study area is located in the following hydrologic basin planning areas.

- Regional Board: Santa Ana (8)
- Hydrologic Region: South Coast
- Hydrologic Unit: Santa Ana River (801)
- Hydrologic Area: Middle Santa Ana River (.2)
- Hydrologic Sub-area: Riverside (.27)

Beneficial Uses of Receiving Waters

Beneficial uses are the uses of water necessary for the survival or wellbeing of humans, plants and wildlife. These uses of water serve to promote the tangible and intangible economic, social, and environmental goals of humankind. Water quality objectives and beneficial uses can be found in the Basin Plan.

Beneficial Uses for Drainage Tributary to the Santa Ana River

Based on the Basin Plan, the Riverside Hydrologic Sub-area 801.27 contains the following existing or potential beneficial uses for inland surface waters: Groundwater Recharge (GWR), Water Contract Recreation (REC1), Non-contact Water Recreation (REC2), Warm Freshwater Habitat (WARM), Wildlife Habitat (WILD), Rare, Threatened or Endangered Species (RARE), and Spawning, Reproduction and Development (SPWM).

Based on the Basin Plan, the study area is located with the ‘Riverside-B’ Groundwater Management Zone which is listed as having the following existing or potential beneficial uses for groundwater: Municipal or Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), and Industrial Process Supply (PROC).

Proposed Drainage and Water Quality Conditions

Floodplain

In the proposed condition, no change is proposed to existing concrete-lined drainage systems to minimize impacts and costs, including: Highgrove Channel, a portion of Springbrook Wash downstream from Main Street, and University Wash. To address the existing flooding issues, several defined local drainage systems will need to be upsized or constructed, including: Highgrove Overflow Channel and a portion of the Springbrook Wash from Orange Street to Main Street. Proposed housing will be located outside of the 100-year floodplain or at a minimum with finished floors elevated above the 100-year floodplain. Options for proposed improvements are narratively described below.

Highgrove Overflow Channel: During larger storm events where the peak flow rate in Highgrove Channel exceeds approximately 1,000 cfs, then overflows will need to be conveyed through the Highgrove Overflow Channel. It is anticipated that the inflows into the Highgrove Overflow Channel will be elevated from Highgrove Channel so as to only redirect overflows when needed for these larger storm events. Since the channel overtopping and split flow location is in the vicinity of proposed Spanish Town, light industrial, and transitional business and multi-family residential land uses along Center Street, it is anticipated that Highgrove Overflow Channel will begin with a subsurface conveyance system such as a reinforced concrete box (RCB) culvert to reduce surface flooding. Once flows are collected and conveyed across Center Street, then Highgrove Overflow Channel can continue downstream as a trapezoidal earthen channel following the existing floodplain limits as closely as practical with consideration of both existing developed lands, and proposed land uses while honoring land ownership. The earthen channel will help provide incidental infiltration into the groundwater aquifers. As the overflow channel approaches the AB Brown Sports Complex, the side slope of the channel on the sport field side will need to be flattened out to allow flows to spread out and provide the needed flow attenuation to meet or exceed the flow attenuation benefit currently modeled in the existing condition. This is imperative to preserving the same peak flow rate or less discharging into Springbrook Wash to minimize the downstream flooding impacts in existing developed areas. Given the flat topography this channel alignment is not anticipated to result in either substantial erosion or siltation. It is anticipated that any proposed channel alignments may require processing detailed hydraulic analyses through FEMA.

Refer to Attachment C for schematic channel cross-sections and Attachment D for the proposed condition land uses and floodplain mapping and channel alignment.

An alternate overflow channel alignment was considered along Orange Street from Highgrove Channel to the confluence with Springbrook Wash; however, it was ultimately determined to be impractical based on various considerations. Based on the large peak flow rate, flat topography, and limited right-of-way width, it was determined to be infeasible to add an earthen channel along the street in addition to the proposed street section. Additionally, this would require re-routing the overflows to an area previously not impacted and this may not be acceptable to the property owners along Orange Street. Also, the proposed land uses along Orange Street are not

suitable for spreading flows out to provide flow attenuation, thus the peak flow rate after confluencing with Springbrook Wash is anticipated to be greater than 1,500 cfs. Thus, this would not only impact Springbrook Wash through the proposed open space, but also the reach of Springbrook Wash along Garner Road. Based on these considerations, it was determined that the more practical Highgrove Overflow Channel be maintained as described above.

The City of Riverside and RCFC&WCD will need to further evaluate the most suitable course of action to address the overflows from Highgrove Channel in the future.

Springbrook Wash (between Orange Street and Main Street): As mentioned previously, FEMA's 100-year peak flow rate for Springbrook Wash is 1,000 cfs from the upstream limit of the study area down to University Wash; however, based on more recent preliminary hydraulic analysis performed by RCFC&WCD, the 100-year peak flow rate increases to 1,500 cfs after confluencing with the Highgrove Overflow Channel. Since the existing Springbrook Wash alignment on the western boundary of the Old Golf Course does not have sufficient capacity and the proposed redevelopment utilizes the land as open space, park & trail, the Springbrook Wash can be realigned to flow within the open space, farther away from proposed development. This realignment could help restore the historical arroyo that existed within this community and will help serve as a significant community benefit while mitigating for areas experiencing the worst flooding within the study area. To minimize impacts, the existing Springbrook Wash alignment could remain while a larger channel is constructed through the open space area. A few potential channel configurations could include: a single trapezoidal channel, a trapezoidal channel with a trail along one side set within the floodplain, or a wider trapezoidal channel with a meandering low flow stream. Since a trail is proposed to cross through this open space area, it would be practical to combine the trail and channel together to maximize the recreational and aesthetic benefits.

The portion of Springbrook Wash upstream from the confluence with Highgrove Overflow Channel to Orange Street does not have sufficient conveyance capacity in the existing condition and would need to be widened with the future development on the adjacent properties. The 100-year FEMA peak flow rate for this reach is 1,000 cfs. It is anticipated that any proposed channel alignments may require processing detailed hydraulic analyses through FEMA.

Refer to Attachment C for schematic channel cross-sections and Attachment D for the proposed condition land uses and floodplain mapping and channel alignment.

Based on the location of the study area, inundation by seiche is unlikely since there are no large water bodies within or directly adjacent to the study area, inundation by a tsunami is infeasible based on the inland location, and mudflows are unlikely since there are no known areas of significant land disturbance upstream.

Local Drainage

To mitigate for local drainage flooding in the proposed condition, additional storm drains are proposed within the northern half of the study area since there are very few storm drain systems in the existing condition. In particular, extending a backbone storm drain up Main Street from Springbrook Wash will help to address the local flooding issues. For the proposed light industrial and high-tech business park area within the City of Colton, a storm drain system should be added to safely collect and convey the runoff into Highgrove Channel. For the transitional business/multi-family residential and medium density residential proposed along Center Street, a proposed storm drain system should be added to collect flows into the proposed Highgrove Overflow Channel. Proposed local drainage improvements will be designed per the 1978 Riverside County Flood Control and Water Conservation District Hydrology Manual.

Furthermore, for proposed new developments within the study area, each project must provide flood control detention to pre-project conditions for all design storms required by RCFC&WCD. This will provide mitigation for any flooding potential in the proposed condition.

Local Storm Water Quality

New developments will be subject to latest Santa Ana Regional Water Quality Control Board - Region 8 Municipal Separate Storm Sewer System (MS4) permit requirements and will be required to mitigate for water quality and hydromodification management. The construction of new projects within the study area will incrementally provide improvements to water quality which will benefit the downstream receiving waters.

Impact Analysis

Proposed developments within the Northside Specific Plan Study Area will be required to prepare water resources design reports, including: hydrologic and hydraulic design reports, water quality management plans, and FEMA floodplain studies (if the development is located with the 100-year FEMA mapped floodplain) to satisfy local development standards. These reports are required to be prepared in concert with the construction documents to comply with the local development standards, which will allow proposed developments to be mitigated to the “Less Than Significant Impact” level.

The accreditation of the Riverside Levee 2 is pending RCFC&WCD’s processing of a Physical Map Revision (PMR) through FEMA and the accreditation may have a “Potential Significant Impact” for the portion of the project protected from the 100-year FEMA floodplain from the Santa Ana River (within FEMA Zone X).

Mr. Jay Eastman
February 5, 2019
Page 9 of 9

Please feel free to contact Sharon Lumbreras or myself if you have any questions and/or concerns at (619) 291-0707.

Sincerely,

RICK ENGINEERING COMPANY



Brendan Hastie
RCE #65809, Exp. 09/19
Associate Principal

BH:SLL:es:k/files/report/17964.002

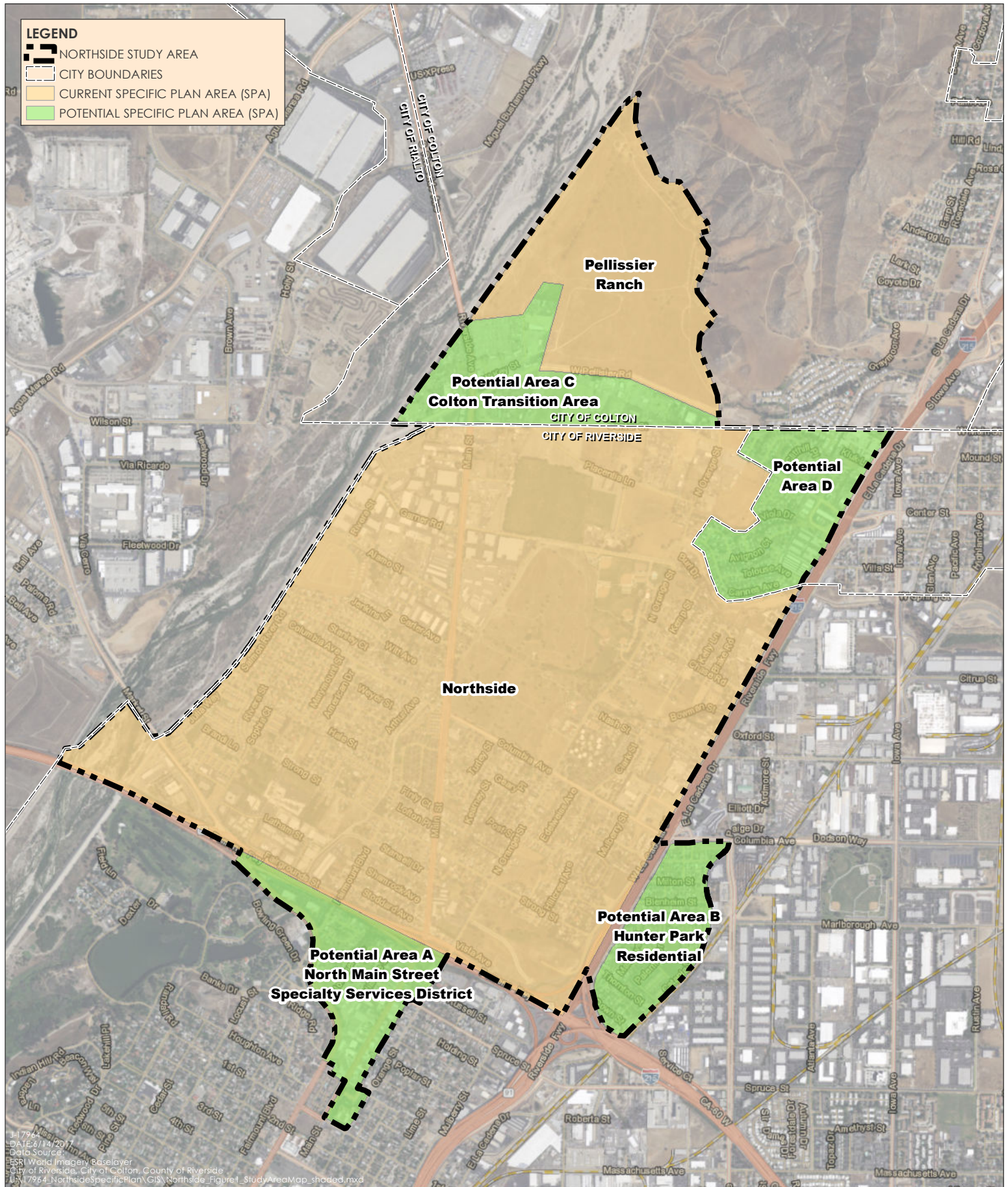


Enclosure

cc: Mr. Kyle Gallup, Riverside County Flood Control and Water Conservation District
Mr. Brian Mooney, Rick Engineering Company

ATTACHMENT A

Northside Specific Plan Study Area Map



Study Area Map

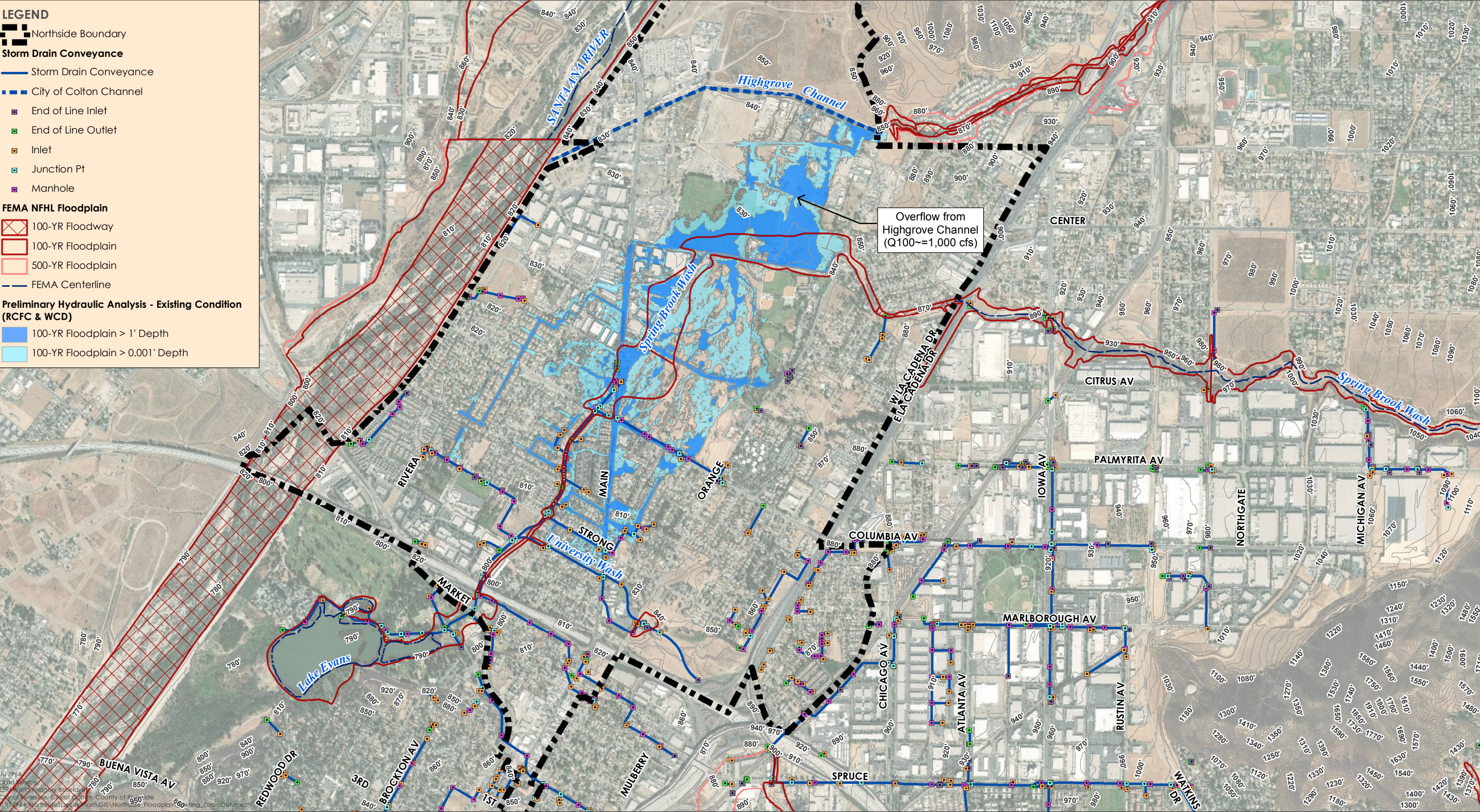
NORTHSIDE SPECIFIC PLAN

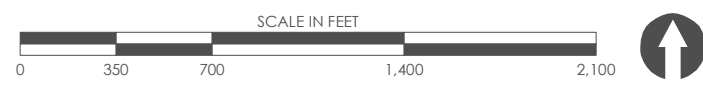
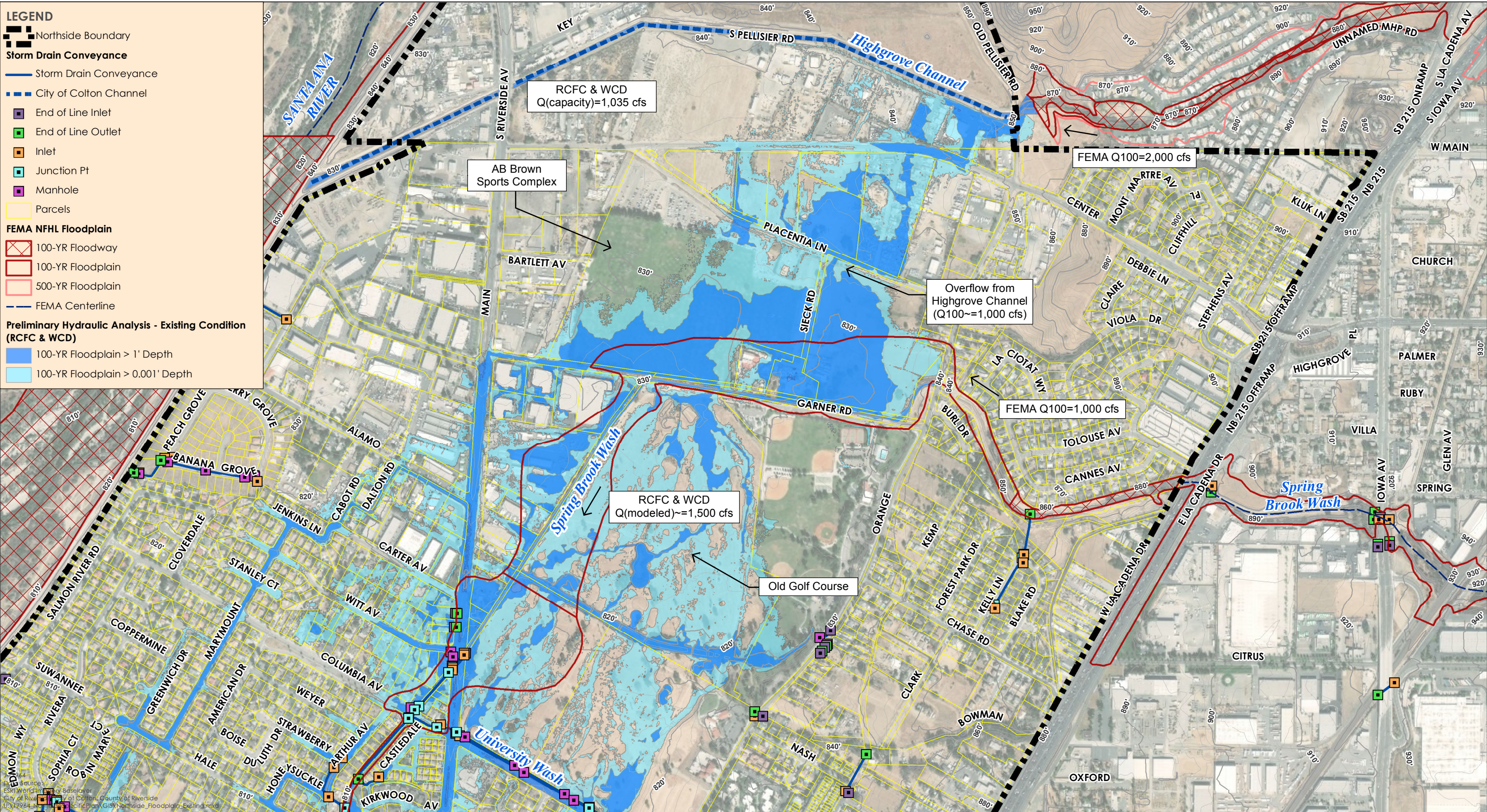
ATTACHMENT B

Existing Condition 100-year Floodplain Exhibit

(Note: The floodplain mapping provided on this exhibit is based on preliminary hydraulic analysis prepared by the Riverside County Flood Control and Water Conservation District; therefore, it is subject to change once it has been processed through FEMA for approval. For the final floodplain mapping, refer to the final revised FEMA Flood Insurance Rate Map (FIRM).)

LEGEND
 Northside Boundary
Storm Drain Conveyance
 Storm Drain Conveyance
 City of Colton Channel
 End of Line Inlet
 End of Line Outlet
 Inlet
 Junction Pt
 Manhole
FEMA NFHL Floodplain
 100-YR Floodway
 100-YR Floodplain
 500-YR Floodplain
 FEMA Centerline
Preliminary Hydraulic Analysis - Existing Condition (RCFC & WCD)
 100-YR Floodplain > 1' Depth
 100-YR Floodplain > 0.001' Depth





Northside Specific Plan

Preliminary Existing Conditions Floodplain

Date: 1/16/2019

ATTACHMENT C

Conceptual Proposed Condition Channel Cross-section Schematics

- Highgrove Channel (Overflow Channel) between S. Old Pellisier Road/Orange Street and its confluence with Springbrook Wash along Garner Road; and
- Springbrook Wash between Garner Road and Main Street

Northside
Specific Plan
proposed condition
capacity calcs

Date

Job No.

Page

Done By

Checked By

1/2/19

17964

1 of 4

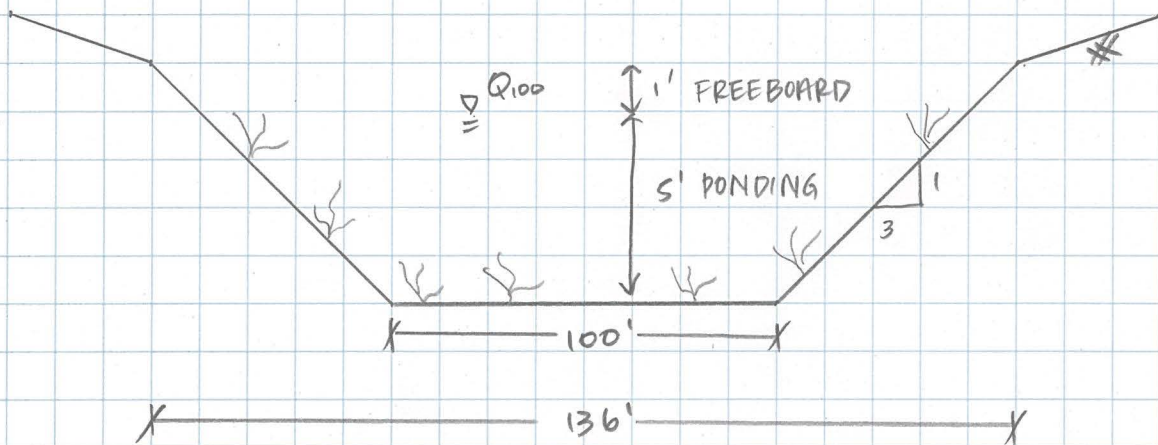
SLL

HIGH GROVE OVERFLOW CHANNEL
(between Center Street
& Placentia Lane)

- CHANNEL LENGTH \approx 850-ft; SLOPE \approx 0.37%
- HYDROLOGY BASED ON PRELIMINARY
RCE&WCD FLOODPLAIN HYDRAULIC ANALYSIS

$Q_{100} \approx 1,000$ cfs

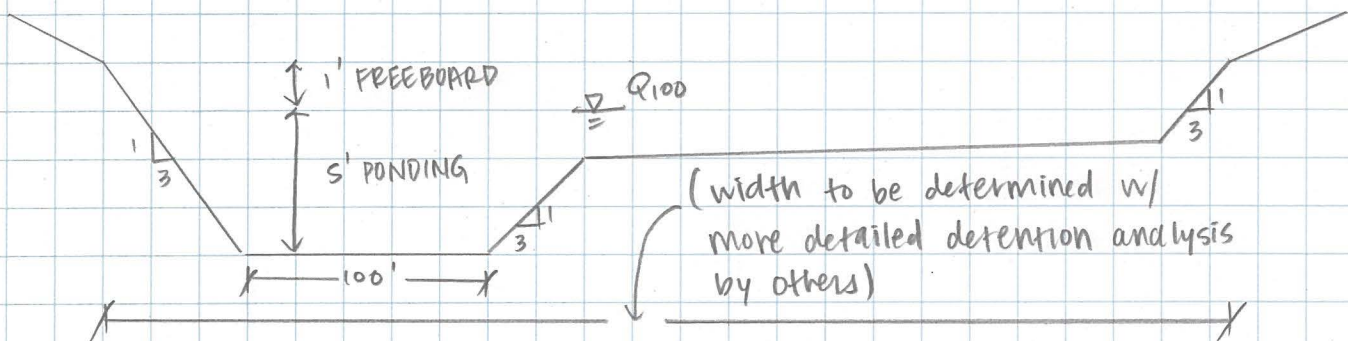
Single-defined channel



HIGH GROVE OVERFLOW CHANNEL
(between Gamer Road
& Placentia Lane)

- CHANNEL LENGTH \approx 1,650-ft
SLOPE \approx 0.37%
- $Q_{100} = 1,000$ cfs (same as above)

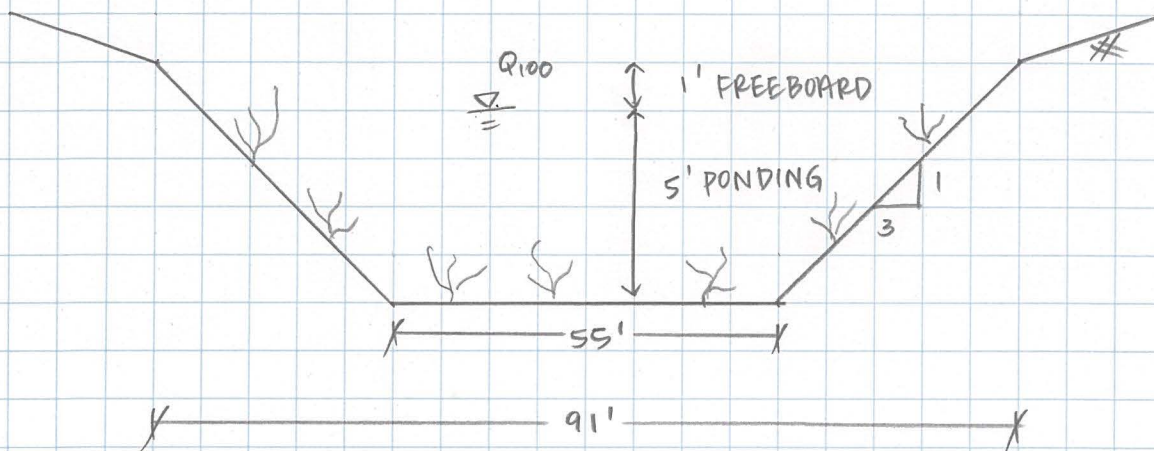
Defined channel w/ wide Floodplain for Detention/Flow Attenuation
that matches existing condition
attenuation



SPRING BROOK WASH
(between Gamel Road
& Orange Street)

- CHANNEL LENGTH $\approx 1,900$ -ft ; SLOPE $\approx 0.45\%$
- HYDROLOGY BASED ON FEMA FLOOD INSURANCE STUDY (FIS)
 $Q_{100} \approx 1,000$ cfs

Single defined channel

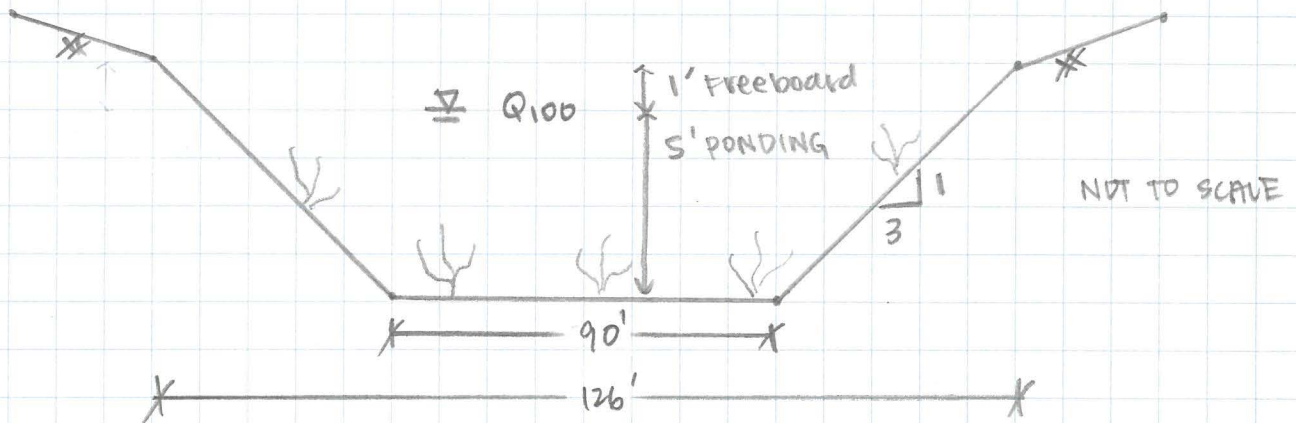


**SPRINGBROOK WASH - POTENTIAL CHANNEL
(between main street
& Gamer Road)**

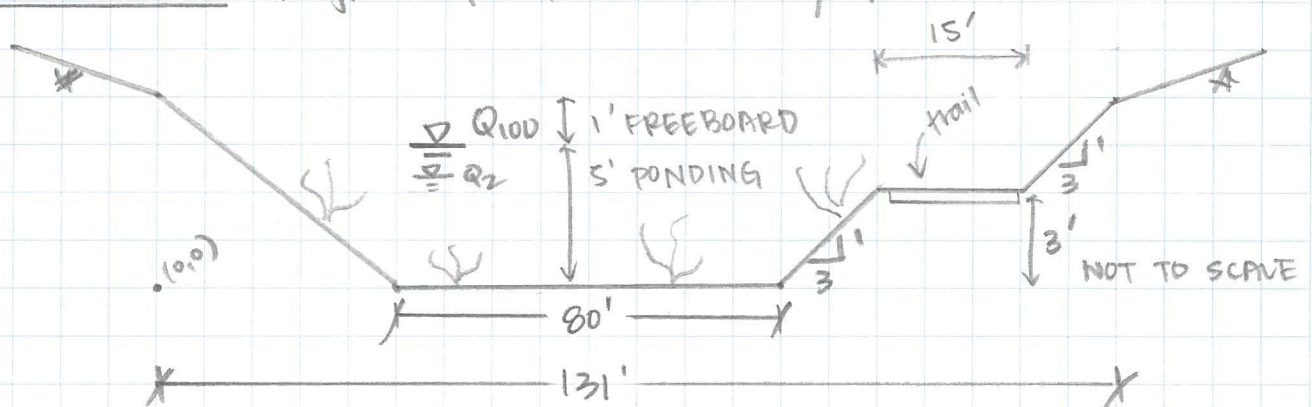
**REALIGNMENT ALTERNATIVE
CROSS-SECTIONS WITHIN GOLF COURSE**

- CHANNEL LENGTH $\approx 3,400$ -ft ; SLOPE $\approx 0.45\%$
 - HYDROLOGY BASED ON PRELIMINARY
RCFC&WCD FLOODPLAIN HYDRAULIC ANALYSIS
- $Q_{100} \approx 1500$ cfs
→ assume $Q_2 \approx \frac{1}{2} Q_{100}$
 ≈ 750 cfs

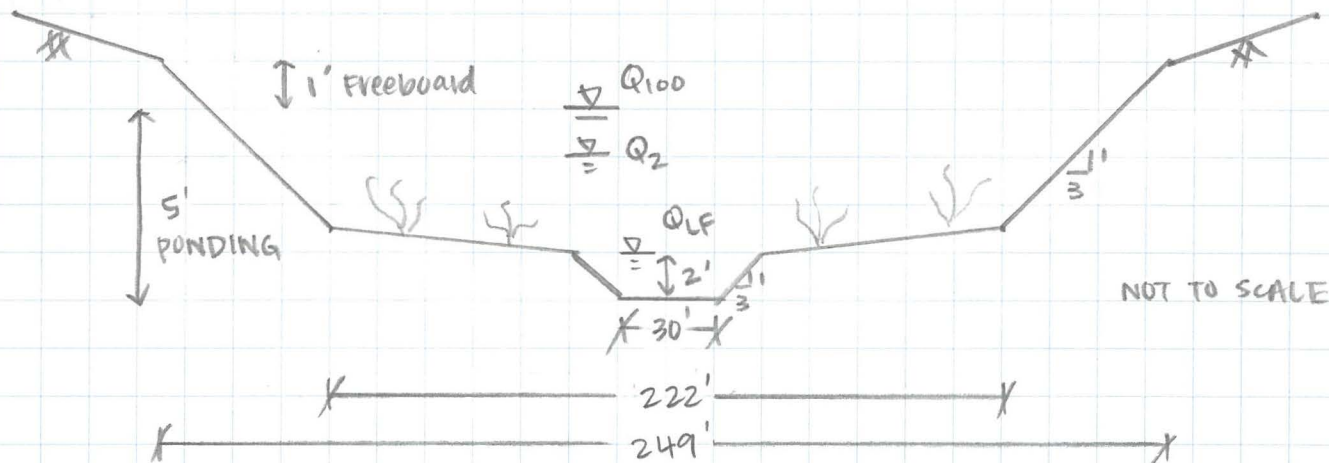
*** ALTERNATIVE 1: single defined channel**



*** ALTERNATIVE 2: single defined channel w/ trail**



* ALTERNATIVE 3: small low flow channel w/ wide 100-year floodplain



→ Area WITHIN 100-YEAR FLOODPLAIN

<u>ALTERNATIVE #</u>	<u>WIDTH OF 100-YR FLOODPLAIN (FT)</u>	<u>100-YR INUNDATION/ AREA (AC.)</u>
1	126'	10
2	131'	10
3	249'	19

→ NOTES: FOR ALL CHANNEL CALCULATIONS

- manning's n

0.10
0.075
0.035

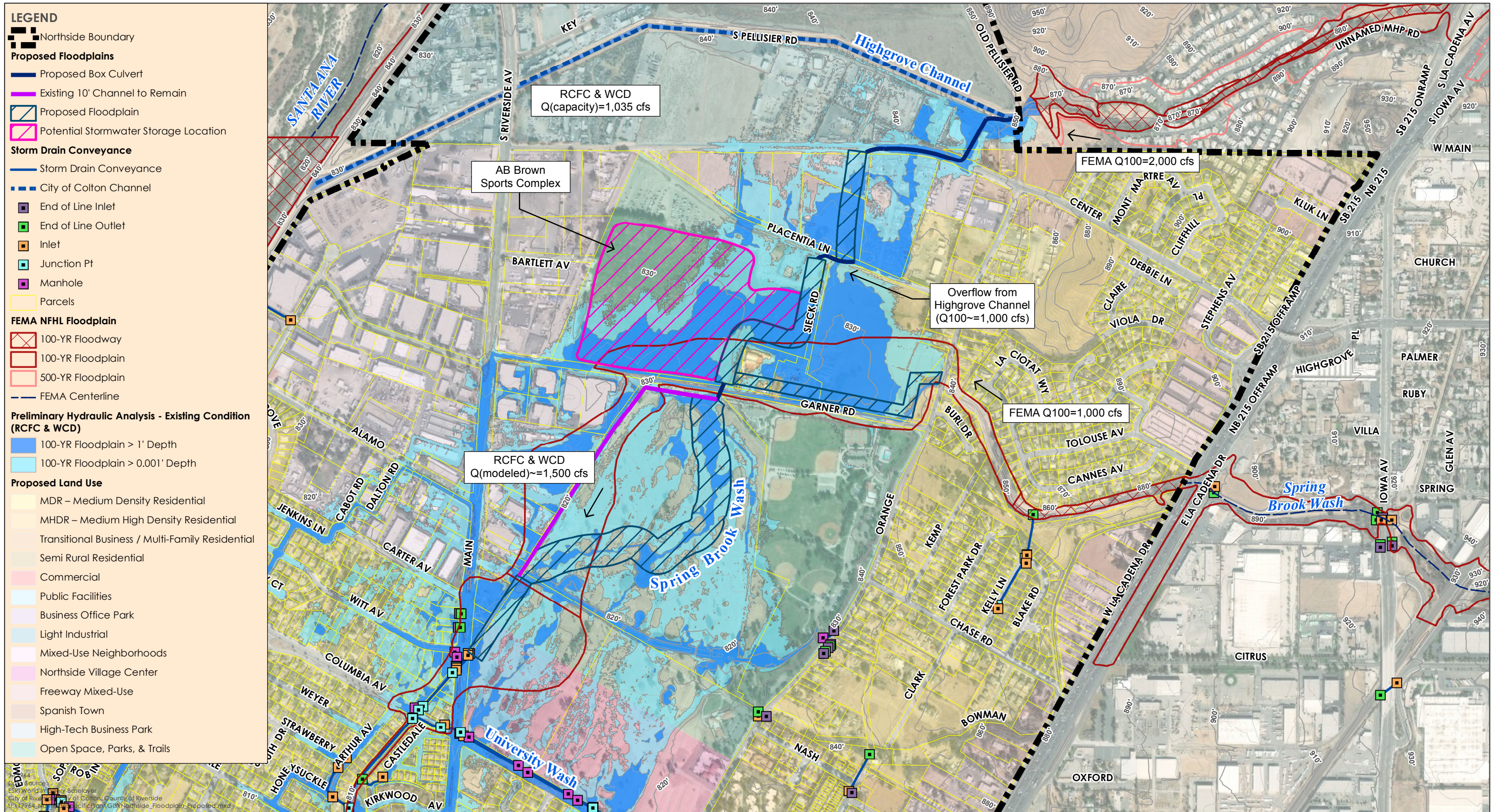
surface material

channel bottom
side slopes
trail

} capacity calculation

ATTACHMENT D

**Conceptual Proposed Condition Land Use
and
100-year Floodplain Overview Exhibit**



Northside Specific Plan

Existing Floodplain with Proposed Land Uses
and Conceptual Channel Improvements

Date: 2/7/2019

