
APPENDIX F

GILROY SPORTS PARK MASTER PLAN
UPDATE FLOODPLAIN IMPACT ANALYSIS

CITY OF GILROY

Gilroy Sports Park Master Plan Update

S&W Project No. BCLP.01.19

FLOODPLAIN IMPACT ANALYSIS

11/15/2019



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Version History

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CERTIFICATION

This report has been prepared under the direct supervision of the undersigned, who hereby certifies that she is a Registered Professional Engineer in the State of California.



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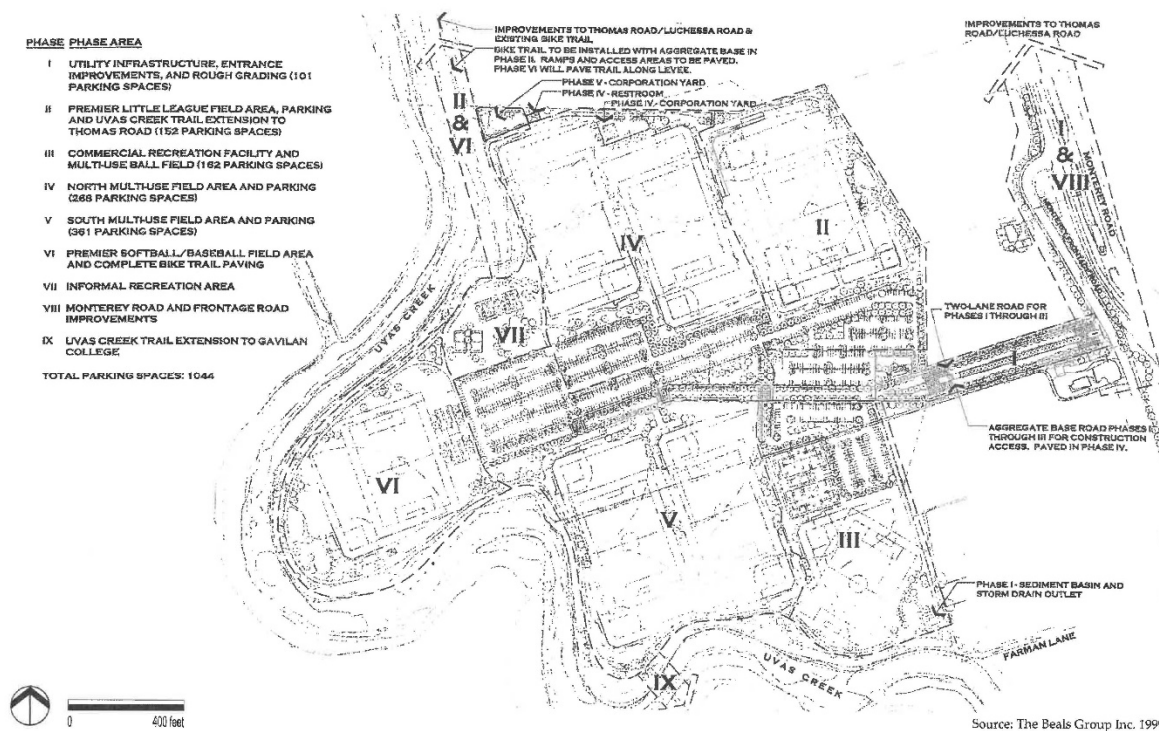


Figure 1-2. Master Plan Phasing (Source: Gilroy Sports Park Master Plan, 1999)

The Project is to be located within Phase III and represents an update to what was originally approved in the Master Plan. While the Master Plan included a non-permanent tent-like structure, multi-use ball field, and related parking, the Project proposes a permanent building including two National Hockey League (NHL) sized ice rinks and related parking. The two-story ADA-accessible facility would have a total building area of approximately 100,000 square feet, roughly 30 feet in height, with a footprint of approximately 70,000 square feet. The facility would offer year-round ice programs to the public, including ice hockey, figure skating, ice dancing, perhaps ice Quidditch; and host various corporate and private events. The proposed Project would also include 387 parking spaces in a surface lot south of the Sports Park entrance road. Access to an existing drainage basin in the southeast corner of the Master Plan area would be slightly realigned. Since the Project represents a change to the Master Plan, the City is required to provide CEQA documentation for the Project.

The Project is located within a floodplain and a portion of the site is within a Valley Water flood easement that allows for the safe passage of spill from Uvas Creek in a 100-year discharge event. Project improvements must be protected from flood damage without causing a significant change to local flood hazards; and in particular, interfere with the Valley Water flood easement.

This report establishes the base flood elevation at the building site, evaluates the impact to flood flows and flood elevations within the vicinity, and evaluates the potential for changes to how Uvas Creek would behave during a 100-year discharge event.

2 PROJECT WATERSHED AND FLOOD HAZARDS

2.1 UVAS CREEK WATERSHED

The Project is located within the Uvas Creek watershed, south of Uvas Reservoir. In fact, Uvas Creek forms the western and southern boundary for the Gilroy Sports Park. The Project occupies a relatively flat area on the north bank of Uvas Creek and ground generally slopes away from the creek bank from south to north and west to east toward Monterey Frontage Road. Due to the perched nature of Uvas Creek, local site runoff does not generally enter the creek; instead Uvas Creek discharges that exceed bank-full capacities of the creek flow away from the creek and do not re-enter the creek.

2.2 FLOOD HAZARDS

The Gilroy Sports Park, including the Project site, is prone to flooding during extreme storm water runoff events, particularly when flow in Uvas Creek exceeds its bank-full capacity. The currently effective Flood Insurance Study (FIS) for the Project site is the Santa Clara County FIS dated May 18, 2019. Flood hazards for the portion of the Gilroy Sports Park that includes the Project study area are shown on Flood Insurance Ramp Map (FIRM) Panel 06085C0752H; flood hazards for the remainder of the Gilroy Sports Park are shown on FIRM Panel 06085C0756. As shown in Figure 2-1, the extent of grading for the Project is within several types of Federal Emergency Management Agency (FEMA) 100-year floodplains; these floodplains include Zone AE, Zone AO, Zone AH, and Zone X floodplains. The Project's building is anticipated to be within the FEMA 100-year Zone AH (elevation 195 feet NAVD) and Zone X (shaded). There are no regulatory floodways located on the Project site. Table 2-1 briefly describes the characteristics of FEMA flood zone types on-site.

Table 2-1: FEMA Flood Zones on Site

FEMA FLOOD ZONE	DESCRIPTION
AE	The base (100-year) floodplain where base flood (100-year) elevations are provided.
AO	River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. Average flood depths derived from detailed analyses are shown within these zones.
AH	Areas with a 1% or greater annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
X (shaded)	Areas of moderate flood hazard, such as areas protected by levees from the 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile.
X	Area of minimal flood hazard; usually above the 500-year flood level.

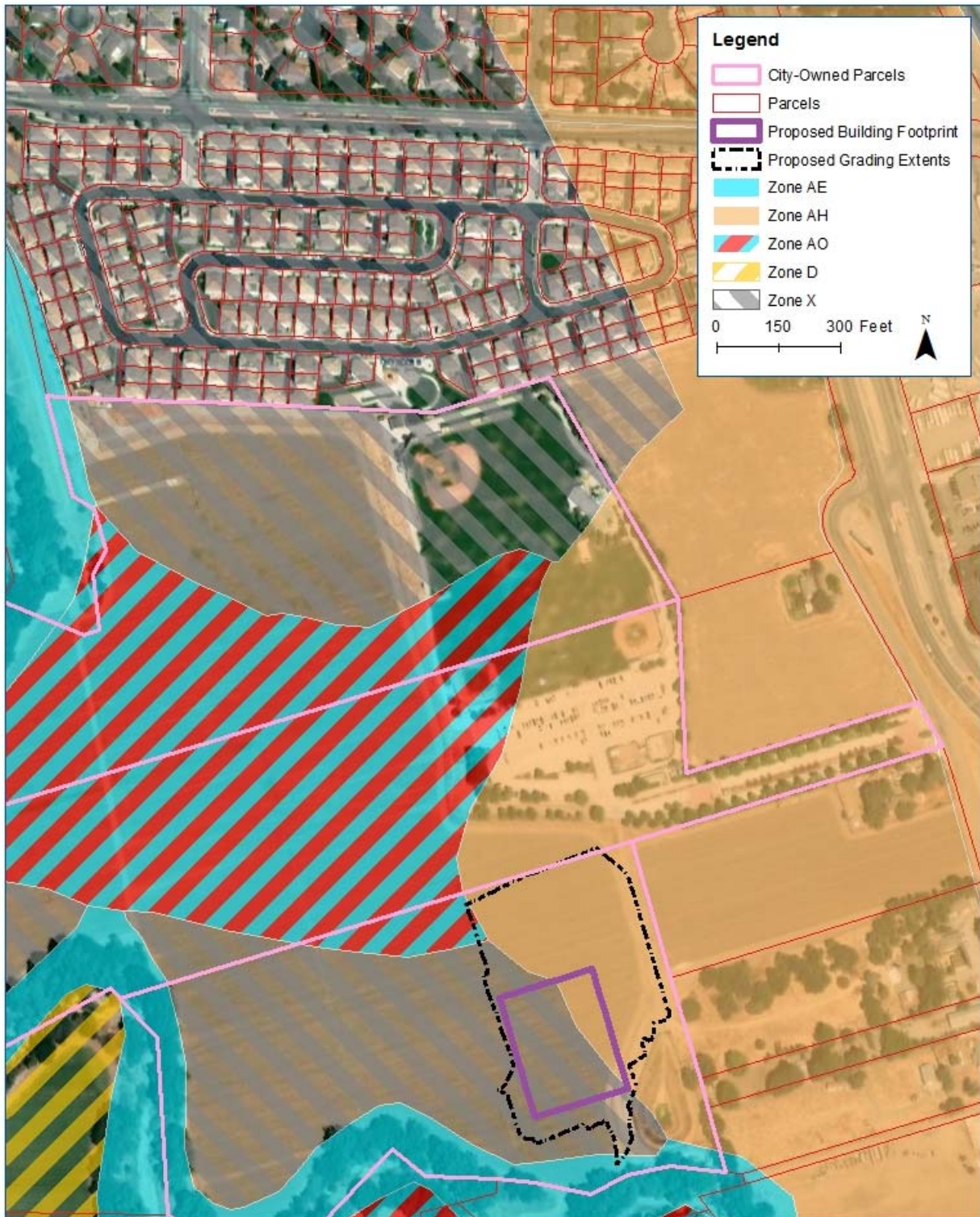


Figure 2-1. FEMA Flood Hazard Areas

3 UVAS CREEK MODEL DEVELOPMENT

Detailed hydraulic analyses are required to evaluate the potential impact of Project implementation on site flooding, Valley Water's flow easement, and possible changes to FEMA flood zone designations. Pre-project 100-year flood conditions are modeled, post-project 100-year flood conditions are modeled; and the difference in results are compared to evaluate Project impact.

The model used to complete these analyses is based on the HEC-RAS (version 5.03) model developed by Schaaf & Wheeler for the FEMA Letter of Map Revision (LOMR) 16-09-2429P dated January 8, 2018 for Christopher Ranch. This model includes the one-dimensional flow in the Uvas Creek channel and two-dimensional flow in adjacent overbanks, which includes the Project site. Prior to the LOMR, Uvas Creek had previously been studied in detail between Uvas Reservoir and the Union Pacific Railroad (UPRR) tracks that are located immediately west of Christopher Ranch. The LOMR study expanded the effective model of Uvas Creek downstream from the railroad through to Bloomfield Avenue and downstream from there to a location that ensures backwater does not affect the hydraulic analysis of creek spill and overflow through Christopher Ranch. The LOMR HEC-RAS model uses the FEMA effective Flood Insurance Study hydrology, specifically discharge values along Uvas Creek, but revises the routing through Uvas Reservoir to reflect the storage-discharge curve developed by Valley Water in 2003.

3.1 PRE-PROJECT CONDITIONS

For this analysis, the LOMR HEC-RAS model has been further updated to reflect worst-case levee failures (or lack thereof) and cumulative development conditions within the detailed area of study as a pre-Project condition. The detailed area of study is roughly bound by Luchessa Drive to the north, the UPRR tracks to the east, and Uvas Creek to the west and south. Development within this detailed study area is expected to have the greatest impact to flows through and around the Gilroy Sports Park. Updates to the model include changes to the ground surface terrain and Manning's roughness coefficients, as described in the sections below.

3.1.1 Pre-Project Levee Updates

For FEMA analyses, base flood elevations are determined using the worst case flooding scenario. If there is an unaccredited levee near a site of interest, base flood elevations must be analyzed with the levee in place and without the levee (i.e. levee failure) to determine which case governs. In the LOMR model, the UPRR railroad tracks between Uvas Creek and State Highway 25 are removed from the ground surface since levee failure in this particular segment results in the worst-case flooding at Christopher Ranch. For the current analysis, however, this levee is added back to the model as its failure does not significantly impact base flood elevations near the Gilroy Sports Park.

The UPRR railroad tracks, however, do form the boundary of the detailed study area and failure must be considered. Failure of the UPRR railroad was previously analyzed for an adjacent study area in the *City of Gilroy – Uvas Creek Overflows Floodplain Management Study*, dated November 13, 1995. In the 1995 Floodplain Management Study, the study area is bounded by the UPRR tracks on the west, 10th Street and State Highway 152 on the north, Llagas Creek on the east, and Gilroy's wastewater treatment ponds on the south.

The 1995 Floodplain Study evaluates complete and partial failure of the UPRR levee and the impacts on its study area. Partial failure results in the worst case water surface elevation conditions for areas between the UPRR tracks and US Highway 101 as water is restricted from flowing under US Highway 101. This restriction causes a backwater effect which pushes much of the flow into the area upstream of US Highway 101 between the UPRR and 10th Street.

Because the UPRR tracks create a backwater effect pushing water west and north from the UPRR tracks, maintaining the UPRR levee throughout this analysis's detailed study area would result in the worst case flooding for the Project.

3.1.2 Pre-Project Cumulative Development Updates

Blockages may be added to ground surface terrains, usually in a relatively small area, to more accurately model flow around houses, buildings, and other permanent structures. These blockages can constrain and redirect flow and therefore may affect flooding extents. The terrain for the overbank areas in the Christopher Ranch LOMR model is based on ground surface elevation information from the 2006 Light Detection and Ranging (LiDAR) point cloud from Valley Water and more precise information about the location of Christopher Ranch buildings. With the exception of the Christopher Ranch buildings, blockages for existing buildings and structures are not included in the Uvas Creek floodplain as part of the LOMR model.

For this analysis, the footprints of existing buildings based on aerial photographs within the detailed study area have been added as blockages to the terrain. Additionally, the terrain is updated to reflect ground elevations and blockages within the Oak Place housing development to the north of the Gilroy Sports Park since the development was constructed after LiDAR was flown.

While Phases I and II of the Gilroy Sports Park were not complete until 2007, the data collected for the 2006 LiDAR point cloud closely resemble the grading in record drawings provided by Harris & Associates. Because the LiDAR ground information is not significantly different from the record drawings, the grading within the Gilroy Sports Park has not been refined using the record drawings.

3.1.3 Pre-Project Roughness Value Updates

Roughness coefficients are used to represent the friction applied to flow by a channel or other ground surface. In the LOMR model, the Manning's roughness coefficient used for the east overbank area is 0.040, which is representative of normal ground roughness. However, within the detailed study area, there exists an RV park (Gilroy Farm RV Park) and an RV dealership (Happy Daze RV). While RVs are not generally considered blockages in the way houses or other permanent structures are, they can slow or redirect flow. One way to model this effect is to adjust the Manning's roughness coefficient for overbanks areas within the bounds of the RV park and dealership.

For both the RV park and the RV dealership, the Manning's roughness coefficients are adjusted using the Hejl method. The Hejl method provides an estimate of Manning's roughness coefficient in urban areas characterized by an open street network with blockages created by buildings, or, in this case, RVs. Figure 3-1 graphically shows the application of this method, which uses an empirical equation to adjust the "raw" Manning's coefficient to model the impact of blockage.

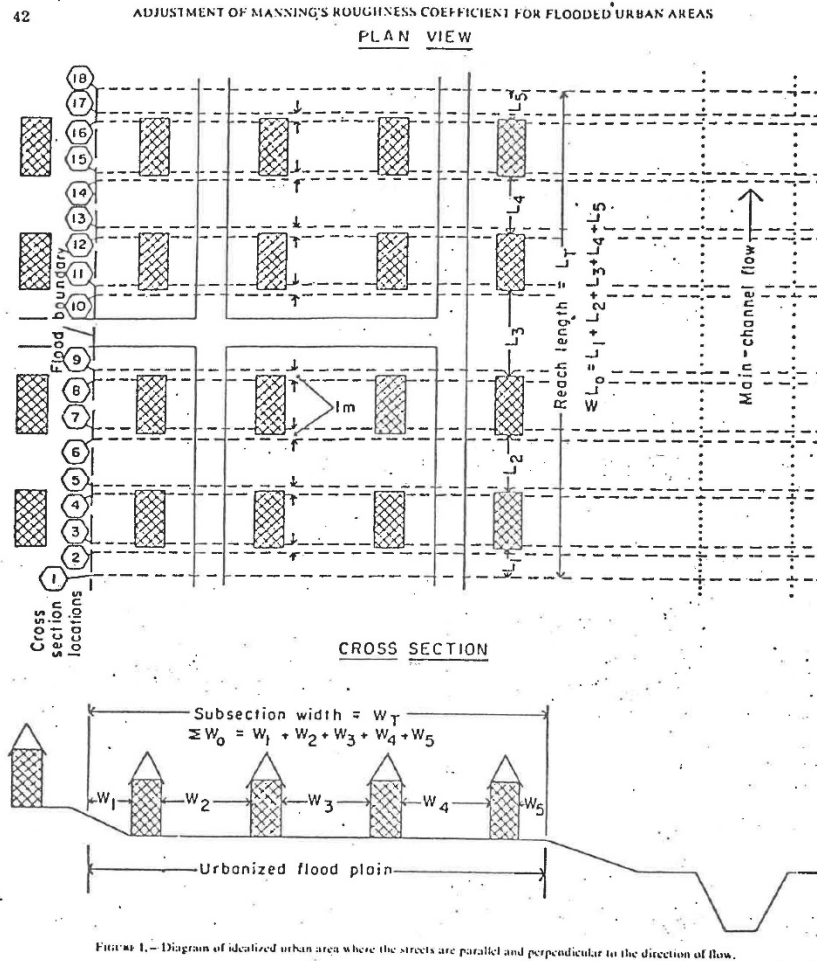


Figure 3-1. Hejl Method for Floodplain Roughness

The urban roughness coefficient adjustment is:

$$n_u = n_o \left[\frac{3}{2} \left(\frac{W_T}{\sum W_o} \right) + \left(1 - \frac{W_T}{\sum W_o} \right) \left(\frac{\sum L_o}{L_T} \right) - \frac{1}{2} \right]$$

where:

n_u = adjusted Manning's roughness value

n_o = original Manning's roughness value

W and L are defined in Figure 3-1

For both the RV park and the RV dealership, the cross sections to establish “L” and “W” are taken at conservative locations where RVs would potentially block the most flow. Figure 3-2 and Figure 3-3 show the locations of these cross section lines and the blockage locations assumed for the analysis of roughness coefficients within RV dealership and park, respectively. While there are streets or empty areas through which water would preferentially travel, choosing sections with the most blockages creates the worst flooding case outside of the RV area (i.e. in areas like the Gilroy Sports Park). Table 3-1 and Table 3-2 detail the Hejl adjustments to the RV dealership and park areas, respectively, and Figure 3-4 shows where these adjusted values have been applied in the model.



Figure 3-2. Hejl Method Lines for RV Dealership



Figure 3-3. Hejl Method Lines for RV Park

Table 3-1. Hejl Adjustments to RV dealership floodplain roughness coefficient

FLOW CONDITION	N_0	W_T	L_T	ΣW_0	ΣL_0	N_U/N_0	N_U
Along Line 1	0.040	115	489	61	225	1.90	0.076
Along Line 2	0.040	489	115	225	61	2.14	0.085
Average Condition for HEC-RAS							0.080

Table 3-2. Hejl Adjustments to RV park floodplain roughness coefficient

FLOW CONDITION	N_0	W_T	L_T	ΣW_0	ΣL_0	N_U/N_0	N_U
Along Line 3	0.040	777	546	304	247	2.63	0.105
Along Line 4	0.040	546	777	247	304	2.34	0.096
Average Condition for HEC-RAS							0.100



Figure 3-4. Hejl Method Adjustment Areas

3.2 POST-PROJECT TERRAIN DEVELOPMENT

For the post-Project condition, the terrain is updated from the pre-Project condition model to reflect the proposed building and grading on-site. All other updates described in the sections immediately below also apply to the post-Project condition model, so that the only difference in hydraulic models is the Project grading and building footprint.

The model terrain is updated using grading drawings provided by Harris & Associates, which included the location of the building and grading through the parking lot area. Elevation contours provided by Harris & Associates appear to be on the NGVD vertical datum, whereas the pre-Project condition model 2D terrain is on the NAVD vertical datum. For the site, the Vertcon conversion of NGVD to NAVD is approximately +2.74 ft. As such, the elevations provided by Harris & Associates are adjusted to the NAVD datum before adding the resulting topography to the pre-Project model terrain. The building itself is added as a blockage to the terrain so water would have to flow around the building; the footprint of the building in Harris & Associates' design is 71,000 square feet. The pre- and post-Project terrain within the Project's grading extents are shown in Figure 3-5.

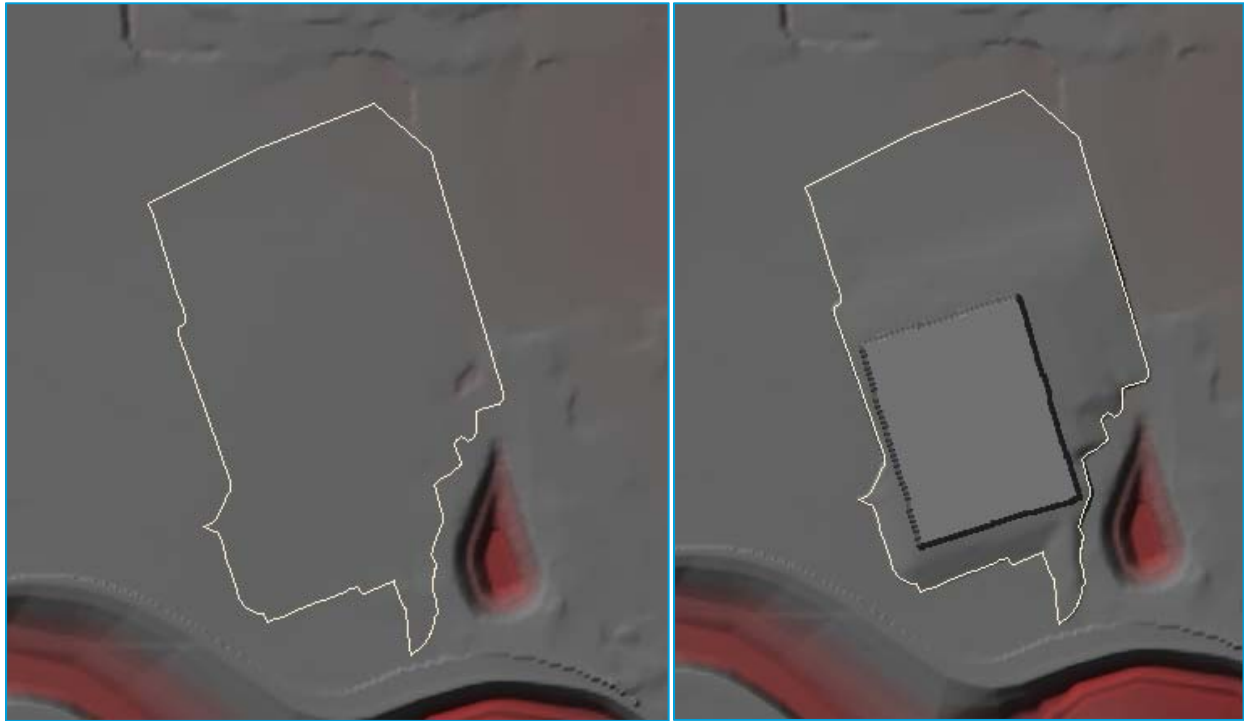


Figure 3-5. Pre- and Post-Project Terrain within Grading Extents

4 ANALYTICAL RESULTS AND PROJECT IMPACTS

4.1 WATER SURFACE ELEVATION CHANGES

Water surface elevations under the pre-Project condition vary from approximately 194 to 197 feet NAVD across the Project's grading extents, as shown in Figure 4-1. Based on the proposed location of the Project's building, the pre-Project base flood elevation (BFE) is approximately 196 feet NAVD.

With the Project, water is diverted around the raised ground and building, as shown on Figure 4-2. Base flood elevations still range from approximately 194 to 197 feet NAVD, although though the floodplain extents are slightly larger with the Project.

Figure 4-3 shows the difference in water surface elevations between post-Project and pre-Project conditions. A positive change means that flood elevations would be higher after the Project is constructed; a negative change means that flood elevations would be lower. Water surface elevations increase in the areas immediately west and north of the Project, as shown in Figure 4-3, as water is redirected around the raised ground and building. The raised area also creates a "hydraulic shadow" wherein water surface areas to the immediate east and south of the Project decrease. Graded areas for the building and some of the surrounding parking would be raised above the base flood elevation, so that footprint demonstrates itself as decreased flooding relative to the pre-Project condition.

As mentioned previously, the floodplain extents are slightly larger with the Project. Areas that would not be inundated by 100-year spills from Uvas Creek but for the Project are shown in red on Figure 4-3; depths within these newly inundated areas are up to 0.2 foot.

4.2 POST-PROJECT BASE FLOOD ELEVATION

With proposed Project grading completed, the highest base flood elevation adjacent to the building pad would be 197 feet NAVD. The proposed grading plan would elevate the building above this base flood elevation and comply with FEMA requirements to obtain a Conditional Letter of Map Revision Based on Fill (CLOMR-F) if so desired.

4.3 PROJECT IMPACTS TO UVAS CREEK AND VALLEY WATER FLOW EASEMENT

The 100-year water surface profiles for Uvas Creek in the modeled pre-Project and post-Project conditions are also compared to each other. In two isolated locations away from the Project reach the comparative water surface profiles are 0.01 foot apart. This is considered to be an artifact of the numerical modeling, since modeled 100-year spill from the creek is unchanged in the post-Project condition. A figure showing the comparative water surface profiles is not presented, because there is no difference in the profiles.

Also, overbank areas between the east bank of Uvas Creek and areas with changed flood elevations are devoid of any change in flooding (Figure 4-3). The one sliver of area not inundated in the pre-Project condition does not reach back to the creek bank. Flow from the east bank of Uvas Creek to the east toward Monterey Road is not impeded by proposed Project grading. There are no changes to Uvas Creek spills during a 100-year discharge event. There are no changes to 100-year flood conditions other than those depicted on Figure 4-3.



Figure 4-1. 100-year Pre-Project Water Surface Elevations (feet NAVD)



Figure 4-2. 100-year Post-Project Water Surface Elevations (feet NAVD)

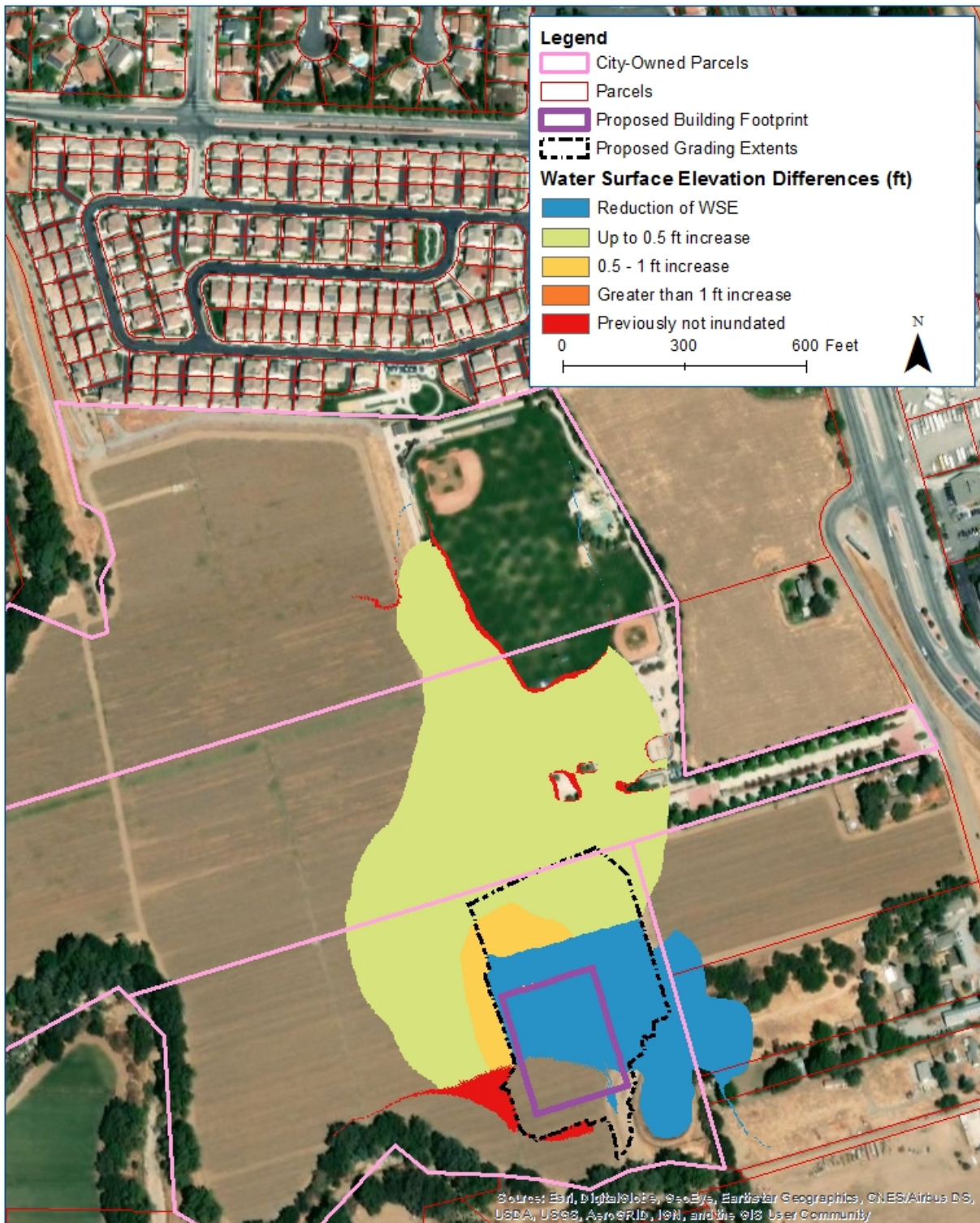


Figure 4-3. Project Impact to 100-year Water Surface Elevations

4.4 FEMA SPECIAL FLOOD HAZARD AREAS

To remove a structure from the special flood hazard area, the lowest grade adjacent to the structure must be greater than the base flood elevation. As currently mapped, the FEMA BFE is 195 feet NAVD (Figure 2-1). Based on the updated detailed modeling, the base flood elevation for the proposed building is 196 feet NAVD based on the pre-Project model. Based on the proposed grading plan by Harris & Associates, the proposed lowest adjacent grade is 197 feet NAVD. Therefore, the new building could be removed from the special flood hazard area using a CLOMR-F as its lowest adjacent grade is greater than both the FEMA mapped BFE and the pre-Project BFE.

4.5 SIGNIFICANCE OF FLOODPLAIN IMPACTS

Water surface elevations increase by no more than one foot in the areas west and north of the Project, as shown in Figure 4-3, as water is redirected around the raised ground and building. Per Section C12-813(1)(d) of the Santa Clara County Code of Ordinances, water surface elevations must not increase by more than one foot when considering the cumulative effect of the proposed development when combined with all other existing and anticipated development. The Project would meet this administrative requirement.

Most of the increases in water surface elevations, and all of the newly inundated areas would occur entirely within City-owned parcels that are reserved for park use. However, the northwest corner of one privately owned parcel would experience base flood elevation increases between up to 0.2 foot relative to pre-Project conditions (Figure 4-3). From the regulatory and practical perspectives, this impact is not considered significant. At worst, base flood elevations would increase from approximately 194.8 to 195.0 feet NAVD, both of which would be mapped as 195 feet NAVD. Both pre- and post-Project water surface elevations are therefore consistent with the current FEMA mapped base flood elevation of 195 feet NAVD for this parcel and would not trigger a change in the regulatory status of the parcel, the use of that parcel, or the development potential of that parcel.

4.6 FLOW VELOCITY CHANGES

The hydraulic model also produces gridded flow velocities, which can be mapped as shown on Figure 4-4. Maximum flow velocities generally remain below 4 feet per second (fps) in the pre-Project Condition. The greatest flow velocities occur at the northern end of the Project grading extents as water flows across the site. With the Project development, velocities are higher immediately north of the Project site, as shown in Figure 4-5, as flow moves around the raised grading area. The flow velocity map is very similar to the pre-Project condition map, noting that near Uvas Creek, flow velocities are identical. At the same northwest corner of the privately owned parcel, flow velocity increases by one foot per second, changing from 3.6 fps to 4.6 fps.

The concern with increased flow velocity is the potential for increased erosion. The USDA generally characterizes site and adjacent soil as Yolo Loam, which is moderately erosive. According to guidelines published by the U.S. Bureau of Reclamation,¹ the flow velocity threshold of concern for moderately erosive soil is between 2 and 4 feet per second, depending on land cover and condition. With or without the project, there remains the potential for some overbank soil erosion during 100-year spills from Uvas Creek.

¹ U.S. Bureau of Reclamation, 2015. Bank Stabilization Design Guidelines. Table 4-2, pg. 35

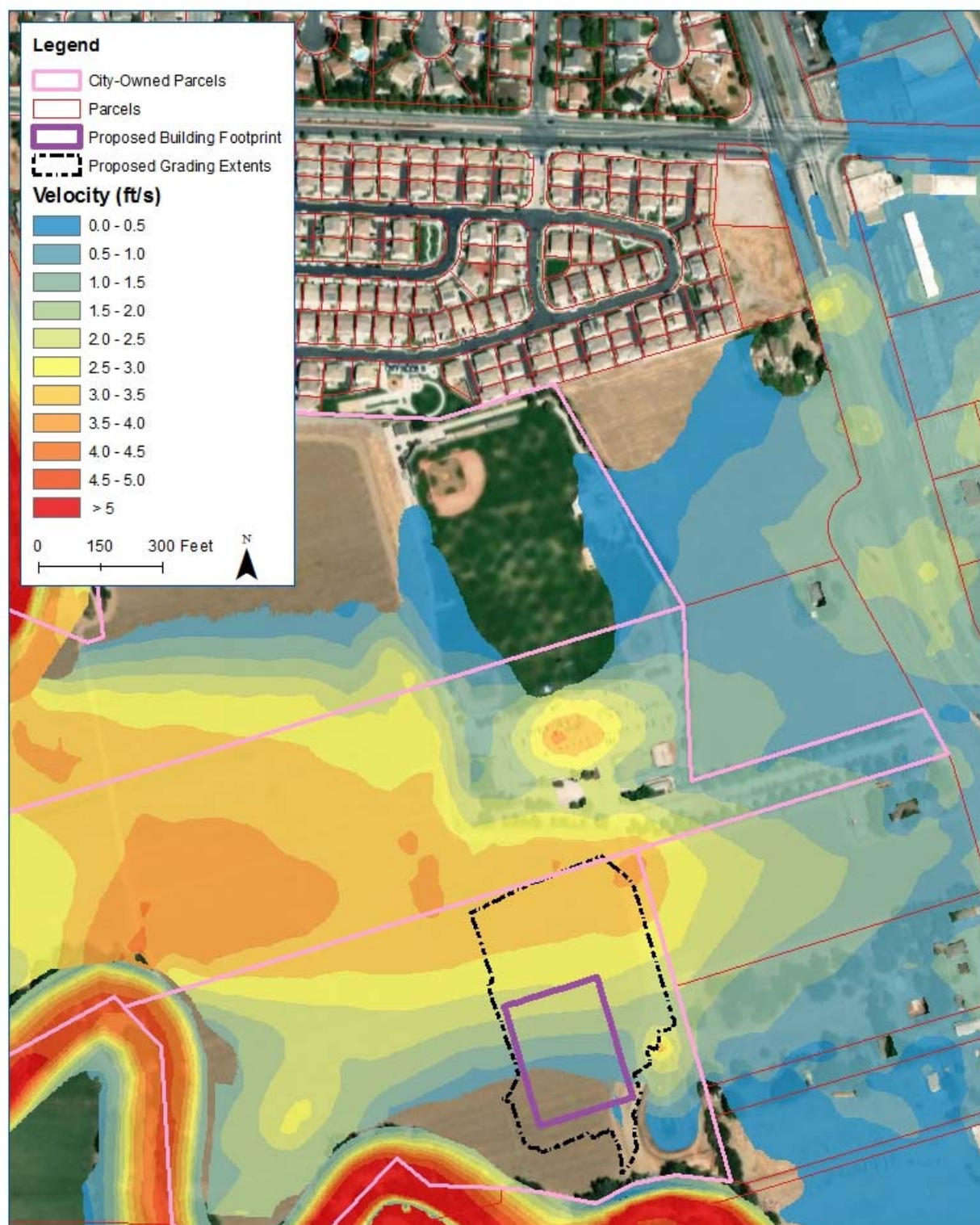


Figure 4-4. Pre-Project Flow Velocities with 100-year Spills from Uvas Creek

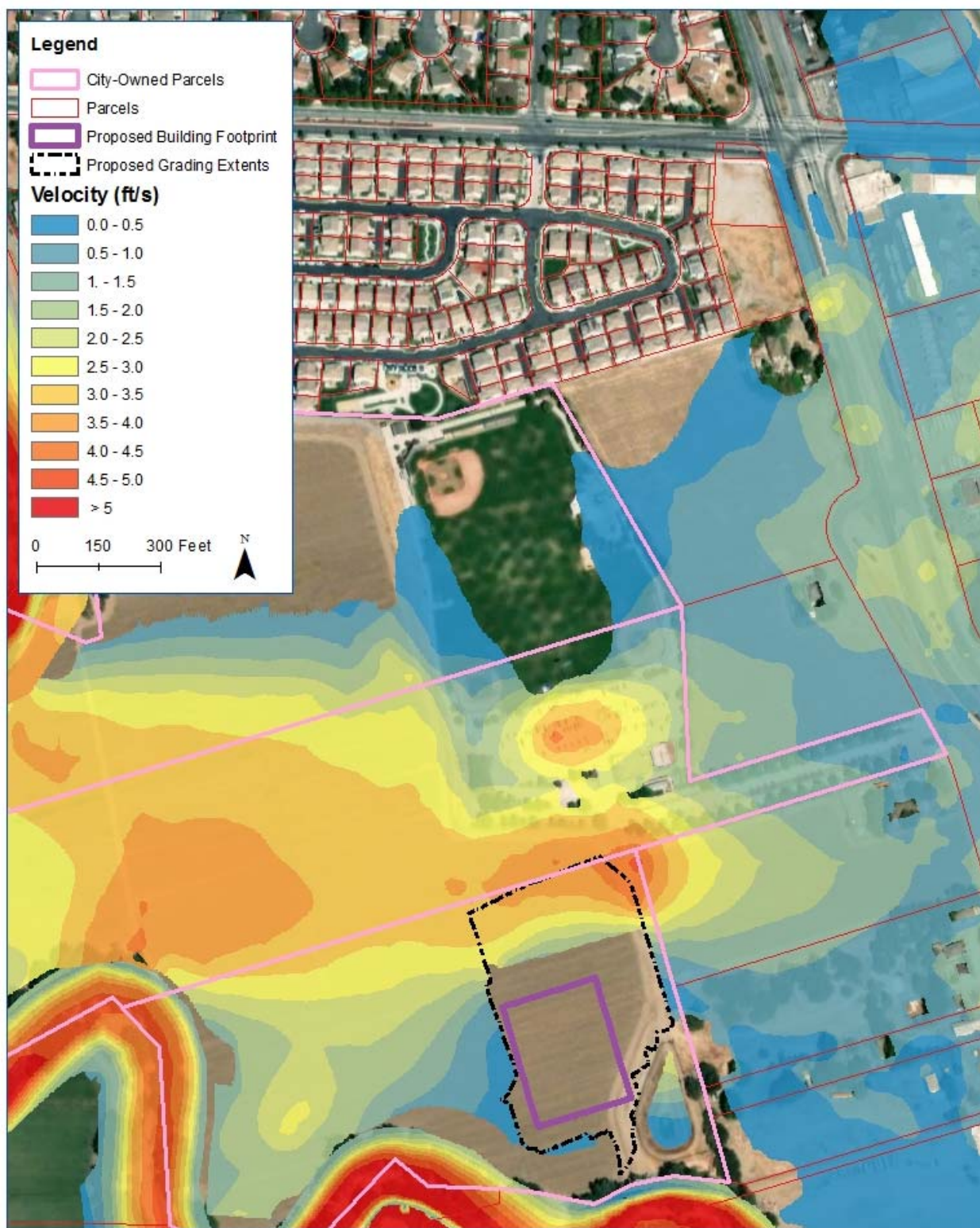


Figure 4-5. Post-Project Flow Velocities with 100-year Spills from Uvas Creek

5 CEQA THRESHOLDS OF SIGNIFICANCE

Thresholds for evaluating project impacts are listed in the 2019 *CEQA Statute and Guidelines*.² Initial environmental checklists are provided as Appendix G of the referenced document. Water quality and hydrology issues are described in Section X of Appendix G. Checklist items related to potential floodplain impacts (X.c and X.d) are summarized herein.

c. Would the project substantially alter the existing drainage pattern of the site or area, including through the alternation of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

i. Result in substantial erosion or siltation on- or off-site?

The site and off-site areas to the north and east are subject to overflow from Uvas Creek during extreme runoff events. Overflowing water has the potential to erode soils and deposit sediment. Rates of erosion and deposition depend upon the sediment transport capacity of the flowing water, soil characteristics, and land cover conditions at the time of overflow. Sediment transport capacity is further impacted by the amount of suspended sediments entrained in Uvas Creek flows at the time of flood. Both erosion and siltation are anticipated on and off-site during flood events with existing conditions.

The Project would not cause a change in how Uvas Creek flows or spills during an extreme runoff event, as modeled for the 100-year discharge. Therefore the project would not impact how silty Uvas Creek overflow would be during a given flood event. In addition to the sediment concentration of overflowing water, the flow velocity of those overflows as they traverse the site and adjacent areas could impact rates of erosion or sedimentation. Generally higher velocity flow indicates a higher potential for erosion while lower velocity flow indicates a higher potential for siltation. Siltation in areas of lower relative flow velocity immediately downstream from areas of higher relative flow velocity can be common during flood events, as the higher velocity flows are able to erode and carry sediments downstream where the sediment transport capacity is lower. Overburdened by sediment the water can no longer move, the deposition of sediments and silt can occur.

The Project would alter the flow of spilled water from Uvas Creek within the overbank, increasing flow velocities in some areas and decreasing flow velocities in others; although the decrease in flow velocities are not as pronounced as the localized increase in flow velocities. Based on the type of soil and land cover present, however, the localized changes in flow velocities is not expected to significantly change the potential for some erosion and some siltation to be experienced within the overbank of Uvas Creek. After the cessation of 100-year flooding, small topographic changes to the terrain within the Gilroy Sports Park and within adjacent floodplain areas are likely, whether the Project is completed or not.

The impact of the Project on the potential for erosion and siltation on- or off-site is considered to be ***less than significant***.

² Association of Environmental Professionals, California Environmental Quality Act Statute & Guidelines, 2019.

- ii. *Substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or offsite?*

Flooding on- and off-site during a 100-year discharge event is caused by overflow from Uvas Creek. The Project does not increase the rate or amount of overflow from Uvas Creek, or the rate or amount of flow to the east toward Monterey Road. The redirection of flood flows around the Project site results in localized effects that include changes to flood depths and a negligible increase to the area of 100-year flood inundation on-site. The maximum on-site increase in flood depth is less than one foot, and is limited to an area reserved for the Gilroy Sports Park. This increase in flood depth does not meet the criterion for significance, either in the federal code of regulations or in the local municipal code.

The Project would have ***less than significant*** impact on the rate or amount of surface runoff that would result in flooding on- or offsite.

- iii. *Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?*

Mitigation is provided through site project design that ensures runoff would not exceed the capacity of existing or planned receiving drainage systems; the latter of which could be necessary if the additional runoff derived from the building or paved parking lots exceeds the existing drainage capacity. Substantial additional sources of polluted runoff are mitigated through site project design conforming to NPDES discharge requirements as more fully described subsequently as the mitigation for potential floodplain impact X.d.

The Project impact would be ***less than significant with mitigation incorporated***.

- d. *Would the project in flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?*

The Project is located within a flood hazard zone. The construction of a building and paved parking area could pose a risk of generating additional pollutants. Site design would provide for storm drainage and stormwater treatment that meets Central Coast Regional Water Quality Control Board requirements as outlined in the National Pollutant Discharge Elimination System (NPDES) General Permit for Waste Discharge Requirements for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (MS4s).³ Stormwater treatment systems are designed to handle the first flush of runoff from storms, which is the period in which the risk of pollutant transport is highest. After this first flush is treated, those treated surfaces are considered to be clean, so that during an extreme overflow event, the risk of pollutant release from surfaces that are flooded is considered minimal.

The Project impact would be ***less than significant with mitigation incorporated***.

Also, as discussed in the Water Surface Elevations section, the Project results in less than one foot of cumulative impact in the floodplain due to blockage and raised grading. The Project results in a no

³ Water Quality Order 2013-0001-DWQ NPDES No. CAS000004, as amended.

change to water surface elevations in Uvas Creek. The Project would meet Santa Clara County and Valley Water regulatory requirements.