Contra Costa County Flood Control & Water Conservation District

Flood Stage Report

April 9, 025

Walnut Creek @ Ygnacio

The Contra Costa County Flood Control and Water Conservation District (FC District) received a grant from the State of California Department of Water Resources. The grant program was the Statewide Flood Emergency Response (FER) Grant Round 3 Under, Proposition 84: "The Safe Drinking Water, Water Quality & Supply, Flood Control, River & Coastal Bond Act of 2006 Et Seq." The purpose of the grant awarded to the FC District was to fund a project that would determine flood stage elevations at 12 of the FC District's stream gauges and outreach to agencies and the public about the findings and use of those flood stages. This report documents the flood stage determination for Walnut Creek using the stage at the stream gauge upstream of Ygnacio and upstream of a bridge supporting parking over the channel in Walnut Creek.

RESULTS AND HOW TO USE THEM:

Model analysis of the creek shows there could be several flood stage locations along Walnut Creek. Table 1 lists the stream gauge stages along with locations where the associated flooding could occur. A map showing the locations in Table 1 can be found at the end of this document. The creek stage and flood stage can be read from a plot on the FC District's **RainMap** at www.ccflood.us/rainmap.

Table 1: Walnut Creek @ Ygnacio Gauge Stage and Flooding Location List

Flooding Order	Guage Stage	Flooding Location
3rd	16.8	Civic Park West Side
2nd	16.3	Civic Drive | Civic Park-East Side
1st	12.2	Arroyo Way

Note: The gauge stage listed is the height of water above the sensor at the gauge. It is not the depth of water in the creek because the sensor is not set at the low point of the creek. The elevation of the water can be calculated by adding 102.87 feet. In the future we will likely provide both stage and elevation in our flood stage information.

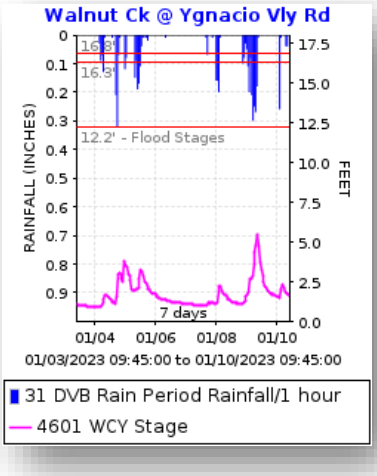
Observing Flood Stage

Anyone with web access can use the FC District's RainMap (www.ccflood.us) to observe the stage at the stream gauge. To view the stream gauge stage, go to RainMap. On RainMap, click the "**Datasets**" button in the upper left. A menu will drop down. Click on "**Water Level**" and the map will show all the points for the stream gauges the FC District operates. Then pan and zoom on the map until you find the location of the stream gauge you are interested in. Click on the point at the stream gauge location and a window for the stream gauge will pop up. The popup will have the name of the stream gauge, a table with the latest stage, and a plot of the stage for the last 7 days. The popup will also have links associated with the gauge (see example below).

Flood Stage Lines

On the plot you see flood stage line(s) matching those in the table above. Not all of the flood stage lines will be shown. Other flood stage lines may be added if it is found they will help communicate the potential flooding better. If you click the plot, it will open another webpage that has the same 7-day plot you see in the popup and a wider plot of the gauge you choose

with data for the last day. That page also has plots of all of the FC District stream gauges with their respective flood stage lines they have been determined.



Flood Stage Information
Above the graph on the popup is a link that says, "Flood Stage Information". Clicking this link will go to a webpage with information about the flood stage. That page has a link which can be clicked to email feedback about when and where flooding from the creek was observed. This feedback is critical for confirming and correcting the flood stage.

HOW THE FLOOD STAGES WERE DETERMINED:
The FC District engineering personnel (staff) started the development of the model by searching for existing models, creek flow data, terrain data, and engineering drawings. These were used to build the initial model. The following explains how each component that went into the model was developed.

Model Limits
The limits of the model for Walnut Creek were from 600 feet downstream of Ygnacio Valley Road to reaches of several creeks including Las Trampas Creek and San Ramon Creek.San Ramon Creek is modeled to just downstream of Newell Ave.

At the confluence of Las Trampas Creek and San Ramon Creek, the named "Walnut Creek" portion ends. The creeks are covered in long reaches and go under several developments. Las Trampas Creek is modeled to just downstream of I-680 daylighting upstream of South Main Street. San Ramon Creek is modeled to just downstream of Newell Ave.

Hydraulic Model
For this study, a new hydraulic model was created using LiDAR data from Contra Costa County records. Geometric data was organized in the ArcMap program and processed by the HEC-GeoRAS application to be tested under flood circumstances in the HEC-RAS program. From there, modifications were made to bank stations and bridges in order to create a working model. The steady flow hydrology for the 100-year used flows from a 1992 DSS file for Walnut Creek and boundary conditions were channel slopes from LiDAR data. The simulation was run for the single recurrence interval known, and then again for a flow less than any flood stage. For each simulation the water surface elevation (WSE) at the location of the stream gauge was measured. Depth of flow was calculated by subtracting the minimum channel elevation at the stream gauge (101.6 ft NAVD 88) from each of the WSE values.

The downstream boundary condition for each flow file uses a normal depth slope of 0.00826 ft/ft and the upstream boundary condition uses a normal depth slope of 0.0059 ft/ft. Normal depth slopes were determined through analysis of the creek channel geometry in profile.

Hydrology
The FC District had an older hydraulic model with flows at sevaral points along Walnut, San Ramon and Las Trampas Creeks. The flow scenarios were for the 10Yr, 25yr, 50yr, and 100yr design storms. When the flooding appeared to start between any of these flowrates, others flow scenarios were added between and mad the average of the flow above and below the flow that was added. In this simplistic way we were able to refine the flow rates and get to flow rates when the flooding began ad different ponits. In the end, we inserted 6 flows between the 50yr and 100yr flows.

FLOOD STAGE ANALYSIS:
The HEC-RAS model was reviewed and adjusted to meet the project needs while staying within the project schedule and budget. Flow depths were analyzed using RAS Mapper, which overlays floodwater depth on the terrain, making it easy to identify when water levels exceed creek banks. By reviewing each model run, staff could observe where flooding occurred and document the flood flow scenarios and locations. If the results appeared inaccurate, the model was further reviewed and adjusted. Additional flow scenarios may have been incorporated as discussed above.

SUMMARY AND CONCLUSON:
The flood stages presented in this report are intended to increase awareness of potential flooding. However, since these stages have not been validated by actual storm events, they should be used with caution.

Individuals using these flood stages for situational awareness during storms are encouraged to report observations to the FC District at hydro@pw.cccounty.us. Please include the location, time of flooding, and any other relevant details. If the water level rises above the flood stage line without causing flooding, or if flooding occurs before the water reaches the flood stage line, the FC District needs to be informed.

DISCLAIMER:
The flood stages in this report are based on models with inherent limitations and assumptions that may change over time. Use them with caution, as conditions in the creek channel and at bridge crossings can change seasonally and during storms due to debris blockages, bank failures, or fallen trees. Sediment buildup, vegetation growth, and human activities can alter the creek's capacity over time, reducing the accuracy of these models. Such changes may obstruct flow and lead to flooding at lower storm levels than predicted. Also, associated maps and websites may have errors or inconsistencies and real-time data is reliant on power and internet connections which can fail to operate and provide data in a timely manner. During stormy weather power and communications are more prone to fail. Use this information with caution and do not rely solely on this information and associated data when making decisions related to emergency situations.

This report may be revised and updated as needed based on feedback regarding flood stages.

TERMS AND ABBREVIATIONS (not all terms used in this report)**:**

ArcMap is a GIS program (see below) that can be augmented with other installed tools such as HEC-GeoRAS (see below). It is used extensively and is the most widely used GIS software and is created by Esri, Inc.

Geometric data is data representing the geometrical aspects of the creek including elevations, locations of cross section, spacing between cross sections, and bridge geometry information. It also includes values related to hydraulic aspects of the creek including roughness, obstructions, expansion and contraction coefficients.

Graphical Information System (GIS) is a type of mapping software used to storm, map, and analyze geographic data in point, line, polygon, raster and database formats.

HEC-GeoRAS and **HEC-RAS** are software developed by the US Army Corps of Engineers, Hydrologic Engineering Center (HEC) who developed the River Analysis System (RAS) software. RAS Mapper works inside HEC-RAS.

LiDAR stands for **Li**ght **D**etection and **R**anging and is a remote sensing technology that uses lasers to measure distances and create 3D maps. The data used was collected by LiDAR equipment mounted in an airplane.

File path: G:\fldctl\Hydrology\Streamflow\Flood Stage Reports\Final Flood Stage Reports\Walnut Creek @ Ygnacio.docx

Attachment: Map

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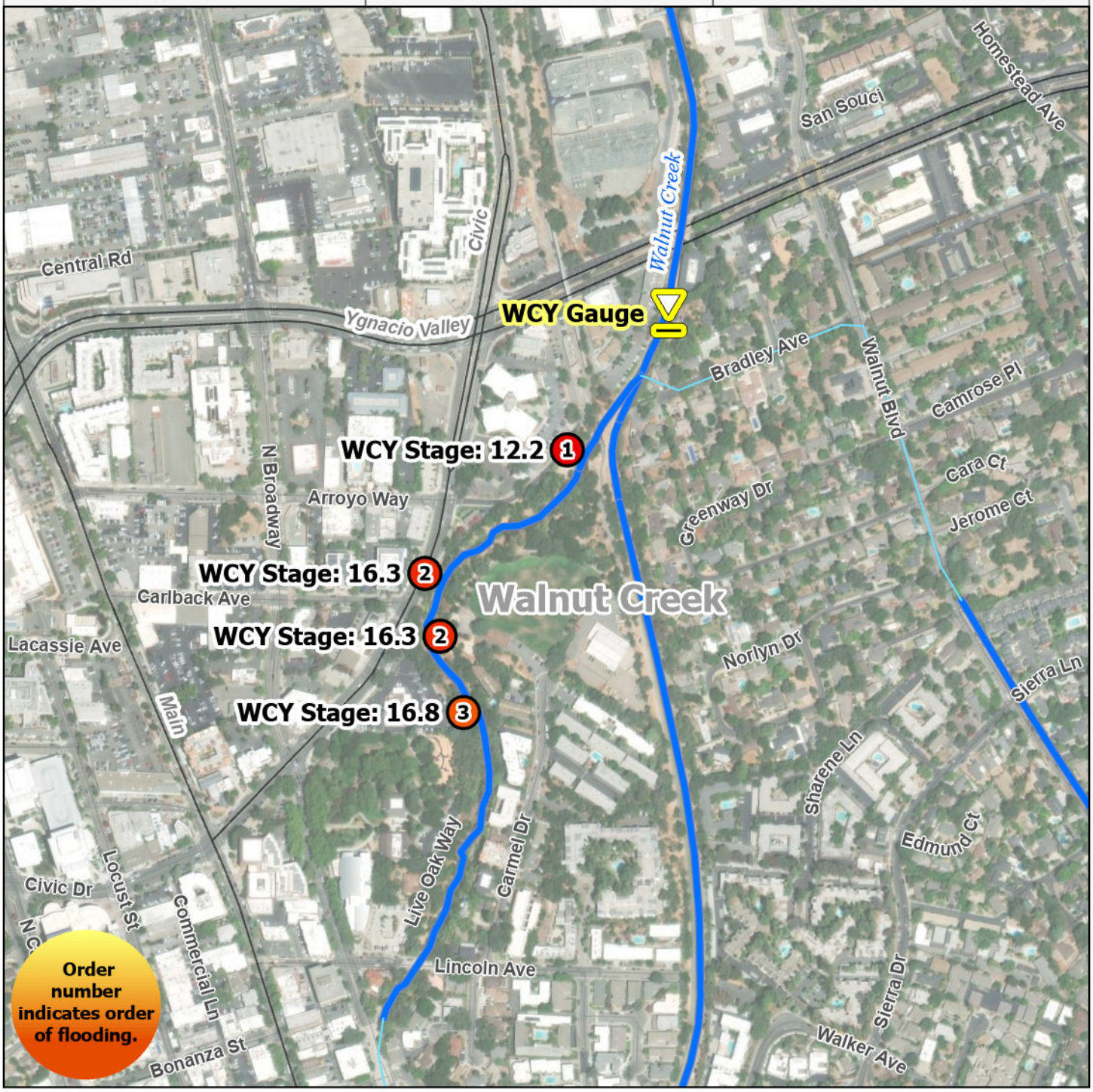
Flood Stages

Walnut Creek @ Ygnacio (WCY)



MODELING DISCLAIMER
The flood stages on this map are based on models with inherent limitations. Use with caution, as creek and bridge conditions may change before and during storms due to debris blockages, bank failures, or fallen trees, potentially causing flooding at lower levels than indicated.

Legend

- 1 — Flood Location and Order
- Stream Gages
- 9 / 1 — Order of Flood Stage
- Creeks
  - Creeks
  - Underground Creeks

1:6000

0 305 610

Feet

N

Pg 1 of 1 WCY

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5/1/2025 by: A Torres and M. Boucher