

APPENDIX H

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December 12, 2016

Mr. Charles Swimley
Director of Public Works
City of Lodi

Subject: Flood Hazard Analysis
Proposition 84 – Pond Expansion project
White Slough, Lodi, California

Dear Mr. Swimley:

Please find below our flood impact analysis for the Proposition 84 Pond Expansion project for your review, and inclusion in our ongoing CEQA Initial Study/Mitigated Negative Declaration.

INTRODUCTION

The City of Lodi Proposition 84 Expansion Pond Project involves the construction of a 70+ acre tertiary treated waters storage pond in Lodi, California. Dredger Cut and the Peripheral Canal are the closest levee related water bodies and are considered to be legal waters of the San Joaquin Delta. The nearest large river or creek capable of causing major flooding during a 100 year flood event is the Calaveras River to the South and the Mokelumne River to the North. Bear Creek is the nearest smaller waterway and would be a potential cause of flooding during a 100 year flood event.

This document represents an update to technical studies prepared in 2014 and 2015 as input to a Draft Initial Study for the Project in accordance with the California Environmental Quality Act (CEQA). Specifically, this study analyzes the potential for flooding at the Project site and indicates how the Project will address potential flooding. In particular, with respect to potential flooding, this study details the following:

- Existing conditions of the project site;
- The regulatory setting affecting flooding at the project site;
- Flood impacts related to currently proposed project development; and
- Recommended mitigation for estimated impacts.

Flood impact assessments of the proposed project contained in this study are based upon (a) published floodplain information in the immediate area; (b) technical information previously developed by West Yost Associates, Baumbach and Piazza Engineering, and Petralogix Engineering; (c) site observations, and (d) the conceptual site plan prepared by West Yost Engineering.

EXISTING CONDITIONS

The site has historically been used for quasi-public wastewater treatment, and associated agricultural crops and farming. Surrounding areas include large farming tracts and undeveloped riparian corridors. The nearest residential or commercial development is located approximately 1.4 miles to the northeast. Elevations of this residential/commercial development here are roughly 4 to 5 feet higher in elevation than the site and studied flood plain area. The nearest agricultural development is located approximately 0.60 miles to the east (a dairy farm) and is roughly 8 to 9 feet higher in elevation than the site and studied flood plain area. The onsite existing wastewater treatment facility, associated ponds, mosquito abatement facilities, and energy development plant are all to the east of the proposed pond. These facilities are roughly 6 to 7 feet higher in elevation than the site and studied flood plain area.

According to the Flood Insurance Rate Map (FIRM) Map #¹ 06077C0295F the Base Flood Elevation at the pond site is 10 feet (msl) NAVD 88. Review of the average ground surface elevation (GSE) on Google Earth, local survey maps, and pond detailed topographic surveys all indicate that the proposed pond area has an approximate average GSE of 7 above feet msl. Based on the review of this information the projected 100-year flood depth is approximately 3 feet. The height of the levees that would surround the proposed pond are 8 feet². The freeboard on the inside walls is 2 feet below the levee top. The relative height of the other delta levees around the site is 9 feet above ground surface³⁴.

REGULATORY SETTING

Applicable federal laws that regulate development that affects flooding include the National Flood Insurance Program (NFIP) of the Federal Emergency Management Agency (FEMA), established by Title 44, Code of Federal Regulations (CFR) and administered through FEMA. One other local agency, the City of Lodi, has jurisdiction over development on the project site.

National Flood Insurance Program

FEMA publishes Flood Insurance Rate Maps (FIRMs) that identify special flood hazards. A study has been developed that was based on the City of Lodi and County of San Joaquin FIRMs (published October 16, 2009). That FIRM established a Zone AE which describes the area of the project site. All areas to the east of the site are established as a Zone X. Zone AE and X are described as follows:

- Zone AE = Area subject to 1% annual chance (100-year) flood; Base Flood Elevations determined; flood depths generally greater than 3 feet.
- Zone X = Areas of 0.2% annual chance (500-year) flood; or areas of 1% annual chance (100-year) flood with average depths of less than 1 foot or with drainage areas less than 1 square mile.

¹ San Joaquin County Community Development Geographic Information Systems, San Joaquin County Flood Zone Viewer, Accessed December 2016.

² West Yost Associates, 2016, Draft - Technical Memorandum, Preliminary Design of the White Slough Water Pollution Control Facility Storage Expansion and Surface, Agricultural, and Groundwater Supply Improvement Project.

³ U.S. Army Corps of Engineers, Design Height PL-84-99.

⁴ GoogleEarth, 2015



Because the site sits within the Zone AE floodplain designation this assessment has carefully reviewed site specific flood elevation details to determine 100-year flood depths and elevations. As currently shown on the FIRM map, the entire project site is located within the AE Zone. As such, development on the site will have to comply with NFIP regulations, including:

- Flood Insurance requirements for any structures within the floodplain (unless adjacent grade has been elevated to above the base flood elevation);
- Conditional Letter of Map Revision (CLOMR) applications for any structures within the floodplain that are desired to be removed from the Flood Insurance requirements, and/or for any on-site projects which impact the flood boundary.

To confirm and clarify, the project meets these requirements. All associated mechanical structures are above the 100-year flood elevation, and all walls and levees are planned to be elevated above the 100-year flood elevation, with a total of more than 3 feet of freeboard above that level specific level.

Local Agencies/Entities

The City of Lodi is the locally responsible floodplain manager and administers all ordinances related to development within identified floodplains. Development on the project site must consider impacts to potential flooding that may occur on this and adjacent properties.

FLOODING IMPACTS

Approach to Analysis

The impact evaluation identifies potentially significant flood-related impacts to and from the proposed project. The project site plan was evaluated with respect to anticipated flooding using technical analyses previously developed by Petralogix Engineering, including generally accepted principles for geological flood-hazard evaluation. The analysis has been modified to reflect the impact of proposed construction at the project site as previously described and as shown in detail in West Yost Associates Technical Memo.

Thresholds of Significance

Appendix G of the CEQA Guidelines and the Regulatory Setting requirements considers the proposed project to have a significant environmental impact with regard to flooding if it would:

1. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;
2. Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map; or
3. Place within a 100-year flood hazard area structures that would impede or redirect flood flows;
4. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam.

Impacts would be considered significant if the project would cause a flood hazard or exacerbate an existing flood hazard.



Proposed Project Conditions

The current project design proposes the construction of a 70-acre Expansion Pond and associated conveyance infrastructure at the City-owned White Slough WPCF (Project). The Expansion Pond will be used exclusively to store disinfected, tertiary-treated effluent produced by the WPCF for use as irrigation water on the 886.67 acres of agricultural land that surrounds the WPCF. The purpose of the Project is to provide additional WPCF effluent supplies for agricultural irrigation on these properties and to offset groundwater pumping. Studies have demonstrated that the storage provided by this project will significantly offset groundwater pumping⁵⁶.

Project Impacts and Mitigation Measures Impact FLOOD-1 - Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site.

The local drainage pattern will not substantially change as a result of development. Flood flows will continue to move through the site toward the south and west, with flows returning to the Delta via Bear Creek or Dredger Cut. The course of the Mokelumne River or Bear Creek will not be altered. Proposed development does not increase the amount of impervious surface on the site to the point where flows at these drainages would be significantly impacted. Site development would have **less than significant impact** on existing drainage patterns and no mitigation is required.

Impact FLOOD-2 Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map.

Project development would not place housing within a 100-year special flood hazard area. However, it would place some structures (pumps, SCADA systems, etc.) within estimated flood depths up to 3 feet in depth. Therefore, this would have a **significant impact**, if no additional mitigations were taken. The following mitigation measure would reduce Impact FLOOD-2 to a less-than-significant level:

Mitigation Measure FLOOD-2

The applicant shall place all structural pads so that the lowest adjacent grade to each structure is above the base flood elevation.

Impact FLOOD-3 Place within a 100-year flood hazard area structures that would impede or redirect flood flows.

Placing fill or other structures in such a way as to block existing drainage paths could result in increased onsite or offsite flooding, particularly if there is significant offsite drainage that flows through the site. This potential exists for 100-year spills resulting from the regulatory levee failure scenario. Upstream spills

⁵ West Yost Associates, 2014, Technical Memorandum, Land Application Area Expansion Study for the City of Lodi White Slough Water Pollution Control Facility.

⁶ West Yost Associates, 2015, Draft-City of Lodi, White Slough, Water Pollution Control Facility, Best Practice Treatment Control (BPTC) Evaluation Report).



from Bear Creek flow through the project site and either return to the Bear Creek channel or to Dredger Cut.

The project would not change the bank configurations of any of the creeks, rivers, or levees that surround the site. Therefore, impact to flooding conditions are considered to be limited. The effective base flood profile within the project site is based on our review of FEMA elevations, the engineering design sheets for the project, aerial and topographic site review, and detailed topographic surveying provided by Baumbach and Piazza Engineering.

From this data, a detailed analysis of the site was performed to evaluate increased flood water elevations during the 100-year event. We reviewed three scenarios. They are detailed below:

1. Full pond failure added to existing flood elevation.
2. Reduced available acreage for existing flood waters due to ponds presence.
3. Pond failure waters combined with reduced acreage.

Scenario 1 was reviewed to determine the overall increase in flood water elevations if the ponds were at capacity and were to fail. The general pond size was evaluated for the estimated holding capacity for the ponds plus a factor of safety. The general volume analyzed was for a full release of 160,000,000 gallons of water. This would assume an overfull pond volume (above freeboard), and a levee failure of the ponds, allowing for a large release of water to the floodplain. Table 1. Below shows our evaluation:

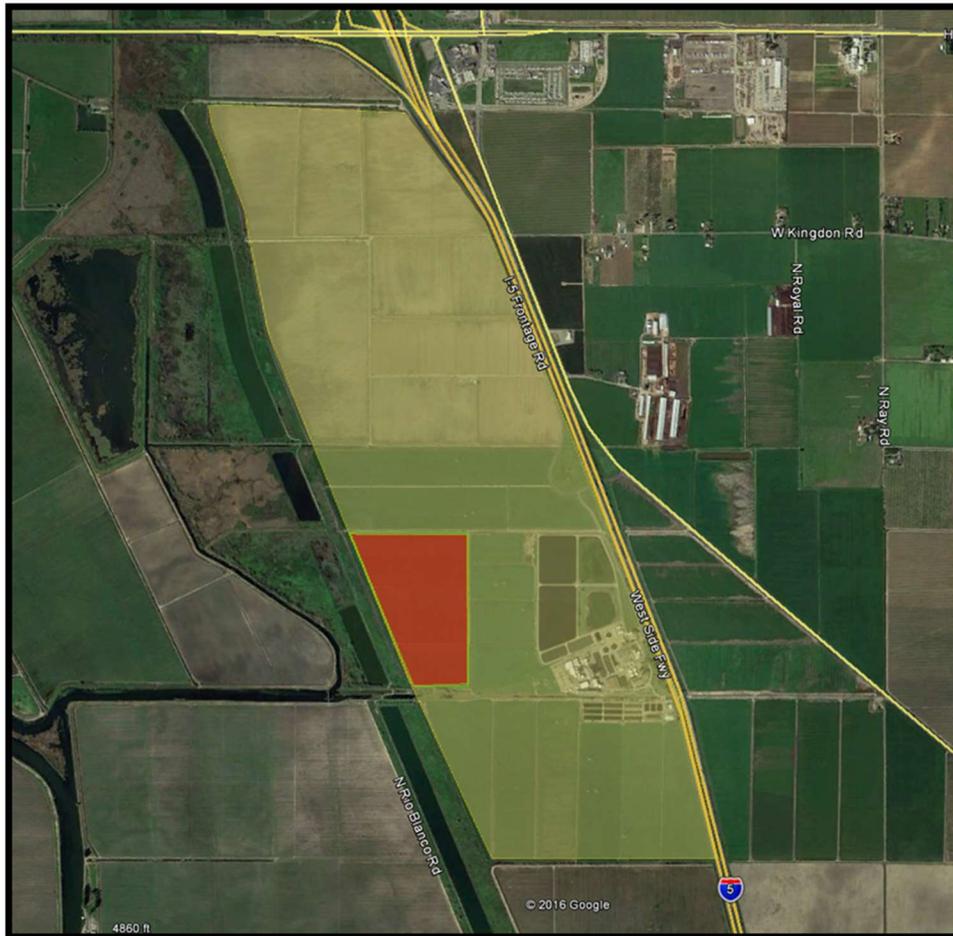
Table 1. - Full pond failure added to existing flood elevation.

General Area of Influence - Modified						
Area	General Width (feet)	General Length (feet)	Total Area (ft²)	Total Acreage	Average Flood Depth (feet)	Acre Feet 100 Year Flood
Overall	4,000	12,750	51,000,000	1,171	3.42	4,003
Change (feet)						0.42
Change (inches)						5.03

This scenario provides an assessment for the “overall” area, which we included to be an area of roughly 1,171 acres in size. The area is shown below (Figure 1 – Area of Influence) for review and was assessed based on aerial photo-review and topographic review or a likely area of influence.



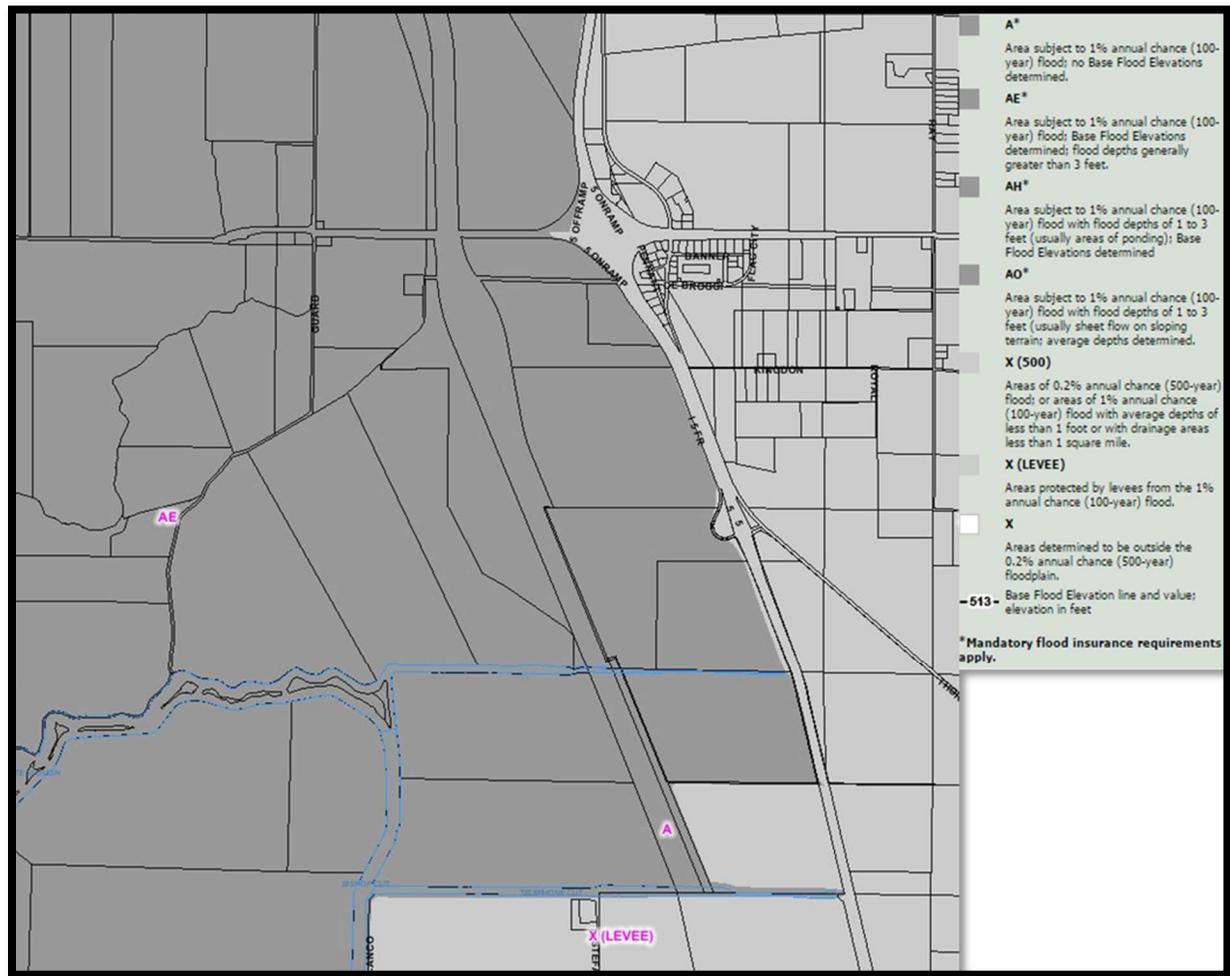
Figure 1. – Area of influence and proposed pond layout.



This area of influence was picked because it was the area of 100-year flooding (as mapped by FEMA), and was bordered by control points of flow to the west by the Peripheral Canal, to the south by Dredger Cut, and to the north by an unnamed slough. Each of these control points were considered viable because of their associated levees which were 5 to 6 feet above the 100-year flood elevation. To the east the area is mapped as a 500-year flood plain and is protected from intrusive flood flows by a quick elevation rise of more than 7 feet just east of Interstate-5. Additional flood zone information is provided below for review in Figure 2.



Figure 2. – Flood zone designations.



As shown in Table 1, the calculated change in elevation of flood waters from a catastrophic failure of the pond walls could result in a total increase of about 0.42 feet (or 5.03 inches). This would raise the elevation of the 100-year flood from 3.00 to 3.42 feet. This is considered to be minimal when compared to the control levee points which are roughly 4.5 to 5.0 feet above this level. In addition, this is a highly unlikely scenario. Not only is pond levee failure unlikely, but the design is that of a 4-chamber pond, so for all flow to be released each chamber would have to fail. Therefore, this is considered to be a **less than significant impact**.

Scenario 2 was reviewed as the reduced available acreage for existing flood waters due to the ponds presence. This analysis was considered to address space that would otherwise be available for flood storage capacity, which would be taken away by the ponds' presence. See Table 2 for more details below:



Table 2. - Reduced available acreage for existing flood waters due to the ponds presence.

General Area of Influence - Modified						
Area	General Width	General Length	Total Area	Total Acreage	Average Flood Depth (feet)	Acre Feet 100 Year Flood
Overall	3,858	12,250	47,260,500	1,085	3.24	3,512
Change (feet)					0.24	
Change (inches)					2.84	

As shown in Table 2, the calculated change in elevation of floodwaters from the ponds' presence could result in a total increase of about 0.24 feet (or 2.84 inches). This would raise the elevation of the 100-year flood from 3.00 to 3.24 feet. This is considered to be minimal when compared to the control levee points which are roughly 4.5 to 5.0 feet above this level. Therefore, this is considered to be a **less than significant impact**.

Scenario 3 was the combination of Scenarios 1 and 2 (pond failure waters combined with reduced acreage). This analysis was considered to address space that would otherwise be available for flood storage capacity, which would be taken away by the ponds presence, as well as the pond failure event. See Table 3 for more details below:

Table 3. - Pond failure waters combined with reduced acreage.

Scenario 3 - Full ponds failure and reduced acreage analysis combined.	
General Area of Influence - Modified	
Change (feet)	0.66
Change (inches)	7.88

As shown in Table 3, the calculated change in elevation of flood waters from the ponds' presence could result in a total increase of about 0.66 feet (or 7.88 inches). This would raise the elevation of the 100-year flood from 3.00 to 3.88 feet. This is considered to be minimal when compared to the control levee points which are roughly 4.5 to 5.0 feet above this level. Therefore, this is considered to be a **less than significant impact**.

Overall, the potential increase of less than 2/3 of a foot in flood elevations within this area are considered to be a **less than significant impact**. This is especially true since it would be very improbable for the ponds four distinct and separate chambers to all fail at once. Therefore, the real potential to 100-year flood water increases is much closer to the Scenario 2 value of 2.84 inches. All structures within the area and around the potential area of impact are well above this level, and all levees and water containment structures are as well.

Impact FLOOD-4 Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam.



As indicated above, the levees at the site (around the entire region) are well above the level of the projected 100-year flood elevation. No significant hazard increase is projected from our analysis of the ponds that could affect these structures (levees and dams). All of these are built to withstand influence or impact from the 100-year flood event, along with a factor of safety that is well established. Levees typically do not fail from water on the toe side of the levee, but rather from under flow (boiling) or extreme pressures. The pressure exerted on the backside of the respective levees from the ponded 100-year flood waters would not generally be considered a hazard. Therefore, this is considered to be a **less than significant impact**.

Conclusions

Based on our overall analysis of flood hazards at the site, we conclude that no perceivable impact is observed in regards to the construction and placement of the proposed pond project at the site, and as designed.



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