Affordable Residential Community

Winter Design Review 2020

PROJECT DESCRIPTION

ALKMR Engineering and Stantec Consulting Services partnered up in developing a Design-Bid-Build (DBB) which involves transforming a small and triangular shaped 5.3 acre property into residential homes to provide more housing supply. This community will be designed with the first time home buyer in mind, including attractive amenities, cost effective duplex homes, and a community-like environment. The surrounding includes a major highway to the East, a large part to the West, a senior housing community to the North, and future commercial development to the South.

Design Constraints & Parameters

Since the project includes different aspects, there are varying constraints for the following sections:

Storm Drain
For this site development, our team decided to use a gravity drainage system which will utilize gravity to drain the storm water runoff. The drainage system will consist of curbs and gutters, catch basins, and several laterals. There are several constraints related to this site development. One of them is to determine where the rainwater runoff will drain; whether to the existing Storm Drain inlet or to Caltrans channel. Since storm drain is a gravity line, it was decided to allow majority of the rainwater drain to Caltrans channel and let the rest of the runoff flow to the existing storm drain inlet. The storm water runoff will go through bioswales and water quality control first before it drains to the Caltrans channel.

Grading
Existing conditions are the biggest constraint for most grading designs. For this particular site, the major constraint was the shallow IRWD channel in the West. The site needed to be able to drain into the IRWD channel. The project's elevation must be high enough to connect the storm drain pipes into the channel, but low enough that a huge retaining wall is not necessary. In addition, the irregular shape and elevations of this site made it difficult to drain the water. As always, the cut and fill of the whole site must be reduced to keep the project cost efficient.

Domestic Water & Sewer
One of the design constraints with the sewer and wet utilities was the distance apart they had to be from one another, as well as, the distance from the properties. For sewer, since it is a gravity line, it was placed at an elevation that was optimal with facilitating sewage to travel out of the project site. Another constraint included the placement of fire hydrants and manholes. This included a requirement by OCFA regarding fire hydrants within 300 ft from another and consideration for the curvature greater than 280° of the project to accommodate fire trucks. For manholes, they are required at each change in direction in pipes.

Winter Quarter Milestones

Preliminary Project Site Completed (40%)
Initial Grading AutoCAD Drawing
Proposed Storm drain Pipe System AutoCAD Drawing
Proposed Sewer and Domestic Water System AutoCAD Drawing
Site Plan: Placing of duplexes, streets, parking, and amenities

Table 1. Winter Quarter Milestones

Design Approach

Physical, regulatory, and economical constraints will be considered for the design process. Site planning, mapping, grading design, street design, and wet utility design are design components that will be examined for this residential site. During the initial stages, project constraints were taken into consideration when laying out the site plan. Since this project is multi-faceted as well as an iterative process, many of the components will be adjusted according to each part throughout the project especially in accordance to the grading. The street design for the emerging residential community is based on the most current grading design. Based on the City of Irvine Standard Plan, the entrance of the community will be a local collector street and the rest will be private streets. One of goals is to maintain a low impact development in the area to minimize water runoff and to keep the site from pollution. To ensure that the development is environmentally-friendly, ALKMR will be designing a bioswale which will connect the inlets to the water treatment system.

Preliminary Design Results

Primary
There were one alternative that was considered upon grading the project site and placing water lines. One of the constraints was that the one side border of the site is Caltrans Right of Way which would mean that an encroachment permit would need to be granted for the storm drain to run into the basin. One of the biggest considerations is that the site is sloped so that would naturally drain into the basin. To have the storm drain flow against the grade would have to require additional soil to be brought in which could be costly. So after careful consideration, obtaining the permits would prove to be more cost-efficient despite it being a tedious process.

Secondary
The site layout, which includes the duplex, parking, curb placements, as shown in Figure 1. Each duplex will be laid out as shown in Figure 2.

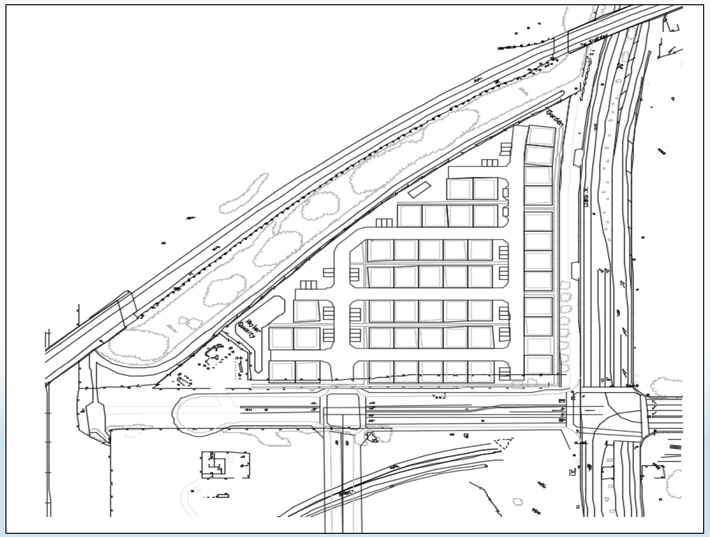


Figure 1. Site Layout with Proposed Housing

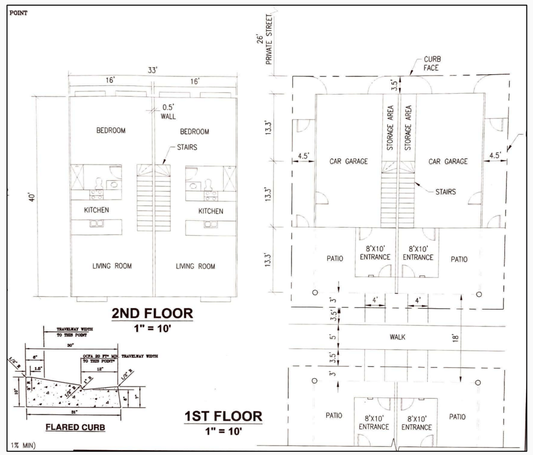
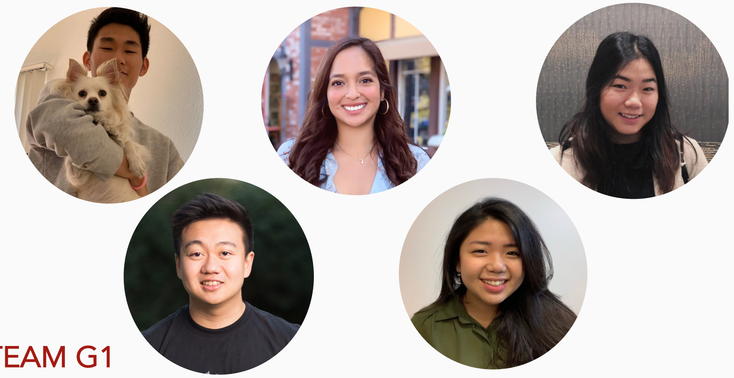


Figure 2. Duplex Layout with Curb Detail



TEAM G1

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Spring 2020 Task

Finalize Grading
Install Street
Proposed Storm drain Pipe System AutoCAD Drawing
Proposed Sewer and Domestic Water System AutoCAD Drawing
Site Plan: Placing of duplexes, streets, parking, and amenities

Table 2. Spring Quarter Tasks