

Project Understanding
Duncan, Arizona Floodplain Analysis- Highway and Levee Alignment Alternatives
CENE 476: Capstone-Prep

**NORTHERN
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UNIVERSITY**



*College of
Engineering, Forestry
& Natural Sciences*

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Abdullah Alhusaini
Ashley Charlton
Morty Jim
Leslie Sorensen

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1 PROJECT UNDERSTANDING

The ‘Duncan, Arizona Highway and Levee Alignment Alternatives’ project will be understood through the project purpose, project background, technical considerations, potential challenges, and stakeholders.

1.1 Project Purpose

The purpose of the project is to aid Duncan, Arizona in a highway and levee alignment alternatives. The town of Duncan, Arizona has seen a fair share of floods in the past which caused a slowdown in both the town’s economy and traffic. Duncan resides in a floodplain, which has made the town vulnerable to rain upstream. To prevent Duncan from flooding, building a levee would restrict the river from flowing into the town and keep the town safe during a heavy precipitation. By having an additional highway added to the levee would most likely result in a reduction in traffic along the main street, Railroad Ave.

1.2 Project Background

The project location is in Duncan, along the Southeast border of Arizona (Figure 1). Duncan, AZ has been experiencing a lot of issues with flooding of The Gila River, which runs through the town, which is an issue during peak rainfall (Figure 2). Most of their rainfall occurs from the months of July to August [7]. Currently, there are dikes in place around the river, but they are not adequate to support the volumes of water they are experiencing (Figure 3) [9]. This is a huge problem for the City of Duncan. When they experience this much flooding, everyone is affected. This influx of water causes damage to people’s homes and some are unable to work due to temporary closure of businesses. Along with this, the roads are shut down which impacts traffic passing through the town. The worst flooding they had caused the city to be underwater ranging from two to twelve feet deep [8].



Figure 1: Project location: Duncan, Arizona [15]

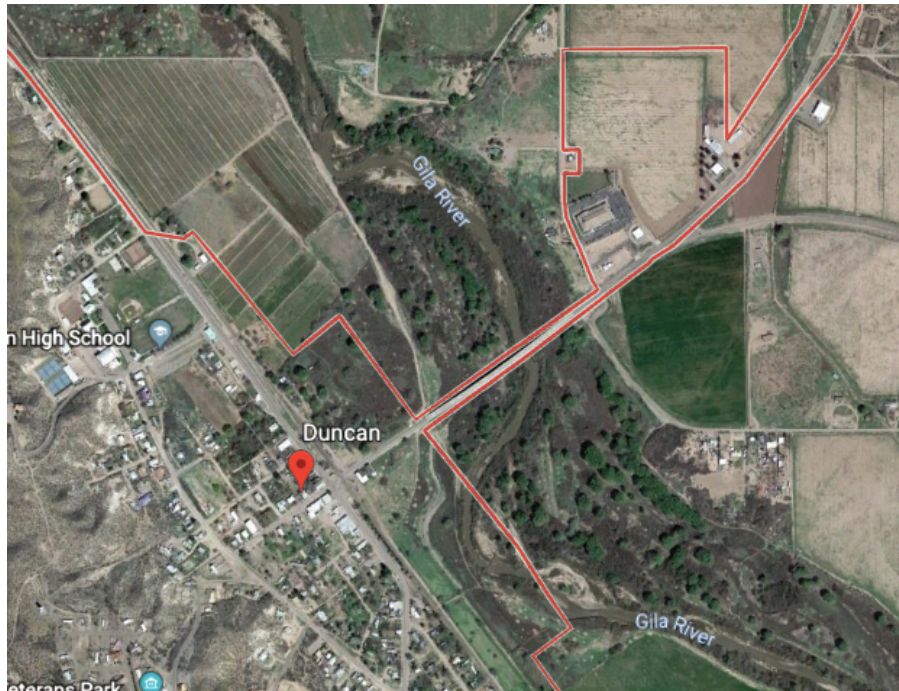


Figure 2: Gila River running through Duncan, Arizona [15]



Figure 3: Current dikes in place. [16]

1.3 Technical Considerations

The technical considerations for this project are the addition of a levee and raising of intersections to meet the new highway levee height. The height of the elevated intersection will depend on the additional height of a levee, therefore possibly affecting the proper location of the intersection. Per AASHTO requirements, a traffic study may be considered to determine if the intersection will be a signalized. Both the roadways and highways will have horizontal and vertical alignments of curves.. Alignments standards are given by AASHTO methods [1]. Alignments will include the levee design [4]. Due to needing to add elevation to the project, surveying and topographic

mapping of a location will be required. A possible borrow study will be performed to reach the desired road elevation and is searching for areas where soil can be removed to be placed at the levee location [4]. A maximum recorded depth of the flood will determine the height of the levee, a watershed analysis could be used if no data is available. Other possible considerations include riprap in design, to increase longevity of levee [5]. All highway and roadway design projects are required to follow set standards that will be followed to complete the technical considerations of the project. These standards include Arizona Department of Transportation Roadway Design Guidelines [17], AASHTO (American Association of State Highway and Transportation) [10], AASHTO Green Book [1], and HCM (Highway Capacity Manual) [2]. AASHTO are a set of standards set by specifications, test protocols, and guidelines, which are used in all highway design and construction throughout the United States [10]. AASHTO Green Book is a policy on geometric design of highways and streets [1]. HCM is a manual for engineers and planners use to assess the traffic and environmental effects of highway projects [2].

1.4 Potential Challenges

Potential challenges of this project include acquiring property, budget, aesthetically pleasing, and elevation not so high that it is above the buildings. Acquiring property from residents of the community of Duncan can be a potential challenge as land has monetary value that people will not easily let go. This will take away valuable property value for the citizens of the community. Another potential problem can be the budget given by the client to fit the appropriate design solution. There are times when the most sustainable solution is most expensive, so the need is to create and find the most viable solution until a more permanent, less costly option is found. The highway and levee will need to be aesthetically pleasing, in that residents of the community do not want ugly looking roads, which can be hard to do when it is elevated. Lastly, in order to accommodate such a high flood height, the elevation could be so high that it would be in line with the roofs. This can cause residents to disapprove with what is being put into place and potentially reject the project.

1.5 Stakeholders

The primary stakeholders in this project include the technical advisor Brendan Russo, ADOT, and Greenlee County. Brendan Russo is a stakeholder because he is responsible for giving guidance for the teams success. How well the team does will reflect on his competence as an advisor. ADOT is also a stakeholder because their code will be used for the design of this highway. The final stakeholder is Greenlee County. The engineers on this project are putting their names on the design and taking accountability for any errors there may be. The citizens of Greenlee county are also stakeholders, their homes and businesses could be negatively affected if this project were to fail.

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