SENIOR CAPSTONE 2021-2022

CALIFORNIA STATE UNIVERSITY, LOS ANGELES
DEPARTMENT OF CIVIL ENGINEERING

Advisors: Dr. John Shamma, Dr. Howard Lum, Dr. Jason Song

Team 3: Jonathan Alvarado, German Alvarez, Ricardo Cervantes, Sergio Chavez, Alexander Cividanis, Matthew Espinoza, Jian Eusebio, Breanna Flores, Moises Gallardo, Benjamin Gonzalez, Semih Kayas, Firmin Luong, Carlos Lupercio Jr., Cesar Ortiz, Dominic Oshana, Jesus Padilla, Beatriz Perez-Varela, Walter Pineda, Alexxis Nicole Quidilla, Jennifer Ramirez, Adolfo Retana, Cesar Rodas, Alex Ta

CAJALCO CREEK SUSTAINABLE WATER DELIVERY SYSTEM

CIVIL ENGINEERING DESIGN PROCESS: | 1. DEFINE THE PROBLEM | 2. BACKGROUND RESEARCH | 3. IDENTIFY CONSTRAINTS | 4. BRAINSTORM SOLUTIONS | 5. IDENTIFY ALTERNATIVES | 6. SELECT BEST ALTERNATIVE | 7. MEET ALL REQUIREMENTS | 8. COMMUNICATE RESULTS

PROJECT OVERVIEW

PROBLEM

- Mining companies based in Corona, California request the design and construction of a water system
- Current water supplier is unable to supply water demand needed for daily operations
- Primary water source provides more than enough water needed
- Regulations and requirements of the jurisdictional and regulating agencies must be met

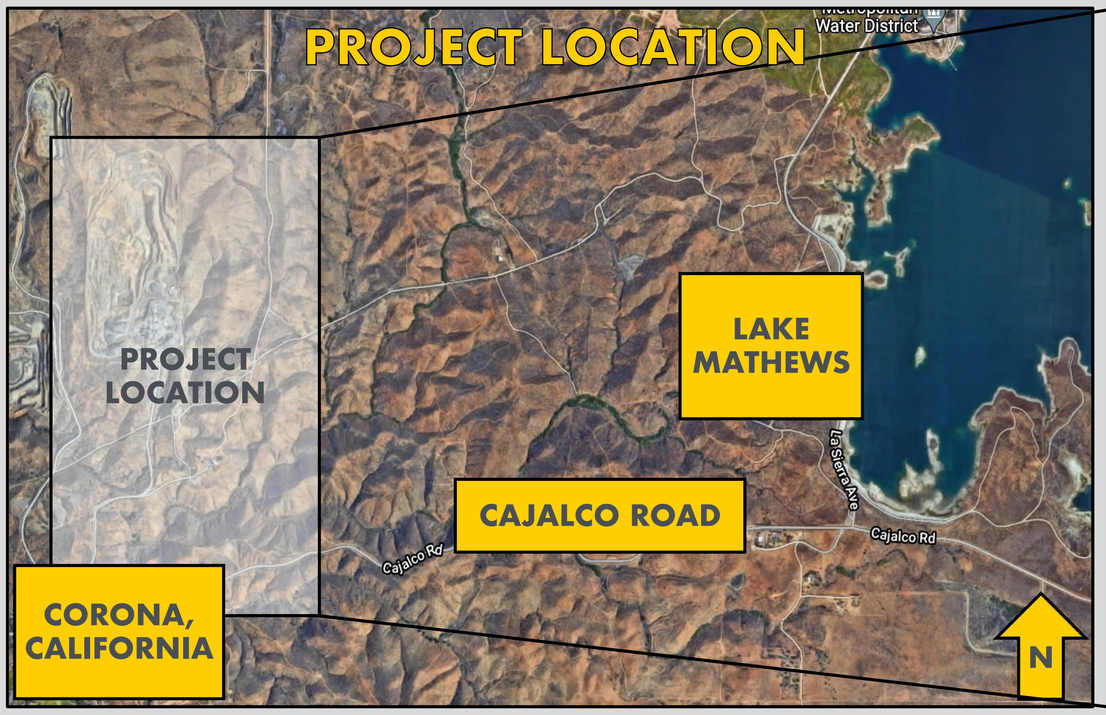
GOALS

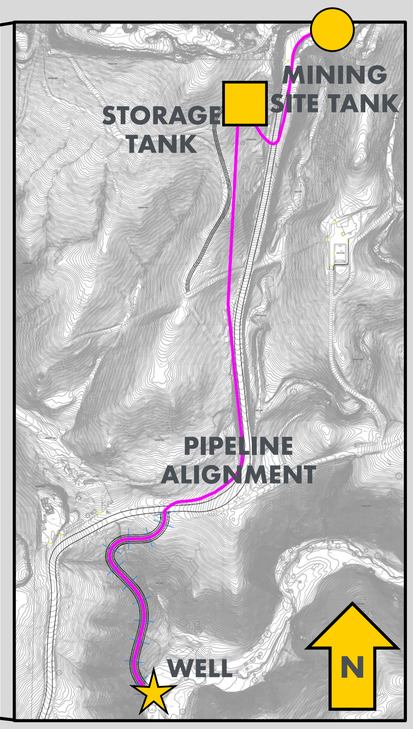
- Design a well, pump, water storage, and pipeline system with an accompanying access road that transports and stores water into a tank before being utilized
- Use a multidisciplinary approach that encompasses all aspects of civil engineering
- Follow the Civil Engineering Design Process to complete project
- Apply sustainable design principles

OUTCOME

- A well, pump, water storage, and pipeline system with an accompanying access road
- Design that is sustainable, environmentally friendly, cost-effective, and integrated into the environment with minimal interference with existing utility roads and structures
- Client is now able to control water supply before use

PROJECT LOCATION





THE MULTIDISCIPLINARY APPROACH

ENVIRONMENTAL

- NEPA/CEQA checklist
- Mitigation requirements

WATER RESOURCES

- Pump and well design
- Groundwater flow
- Hydraulics
- Tank capacity

STRUCTURAL

- Analysis of large-diameter water tanks
- Design of retaining walls
- Anchor Design

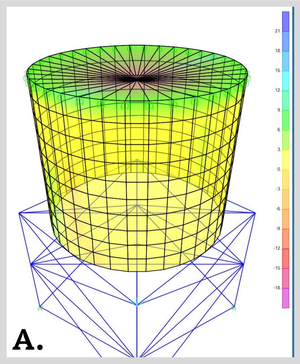
GEOTECHNICAL

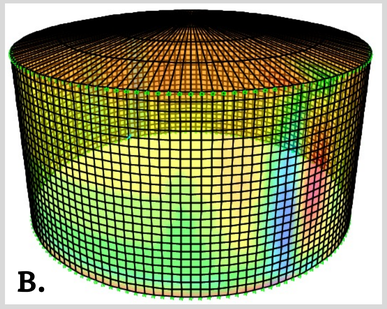
- Analyze properties of soil
- Size foundation for water tanks
- Integrate design of roadway and retaining walls

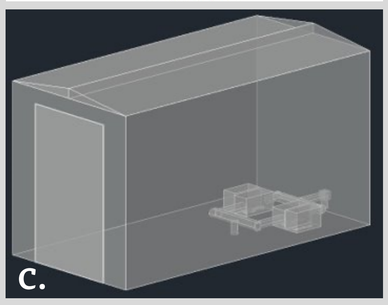
TRANSPORTATION

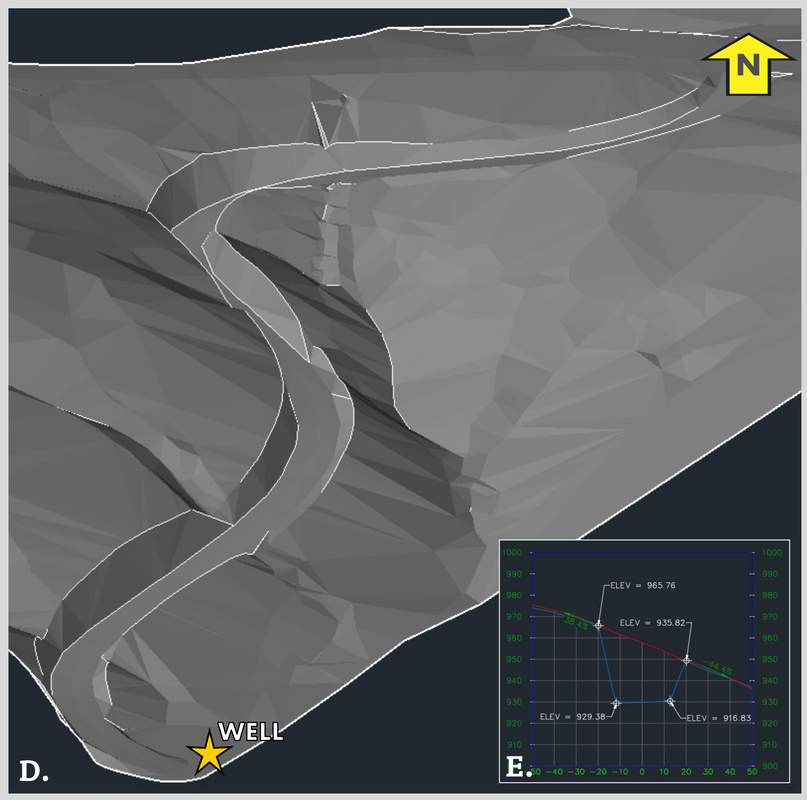
- Develop, compare, and recommend alignment for pipeline and access road
- Road design, cost and materials

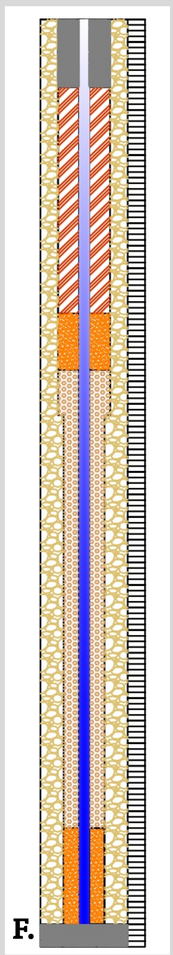
FINAL DESIGNS











A. Mining Site Tank
B. Storage Tank
C. Pump house
D. Well Access Road
E. Road cross section
F. Well design

COST ESTIMATE

$26.82M
(IN MILLIONS)

SKILLS AND KNOWLEDGE GAINED

PROFESSIONAL

- Project and time management
- Encouraging leadership
- Multidisciplinary teamwork
- Client interactions

COMMUNICATION

- Writing professional proposals, reports, and emails
- Developing PowerPoint presentations
- Presenting project to clients

TECHNICAL

- Applying coursework to resolve problems
- Creating drawings and models on AutoCAD, Civil 3D, and SAP 2000
- Producing cost estimates

ENVIRONMENTAL IMPACTS AND MITIGATIONS

AESTHETICS

- Minimize earthwork to conserve environment
- Visually screening of water tanks
- Minimal scarring of hillside due to access road (visually pleasing)

AIR QUALITY

- Dust control measures during construction and landscaping post-construction

BIOLOGICAL RESOURCES

- Protect endangered species in work area
- Preserve top-soil with seeds for reuse
- Reintroduce flora and fauna to the area after construction

GREENHOUSE GAS EMISSIONS

- Use of Tier-4 equipment
- Minimize emissions through scheduling

PROJECT TIMELINE: | AUGUST 2021: RESEARCH INITIATED | SEPTEMBER 2021: CONSTRAINTS IDENTIFIED | OCTOBER 2021: MULTIPLE SOLUTIONS CREATED | NOVEMBER 2021: ALTERNATIVE SELECTED | JANUARY 2022: START OF DESIGN PHASE | APRIL 2022: DESIGN COMPLETE | MAY 2022: PRESENT TO CLIENT