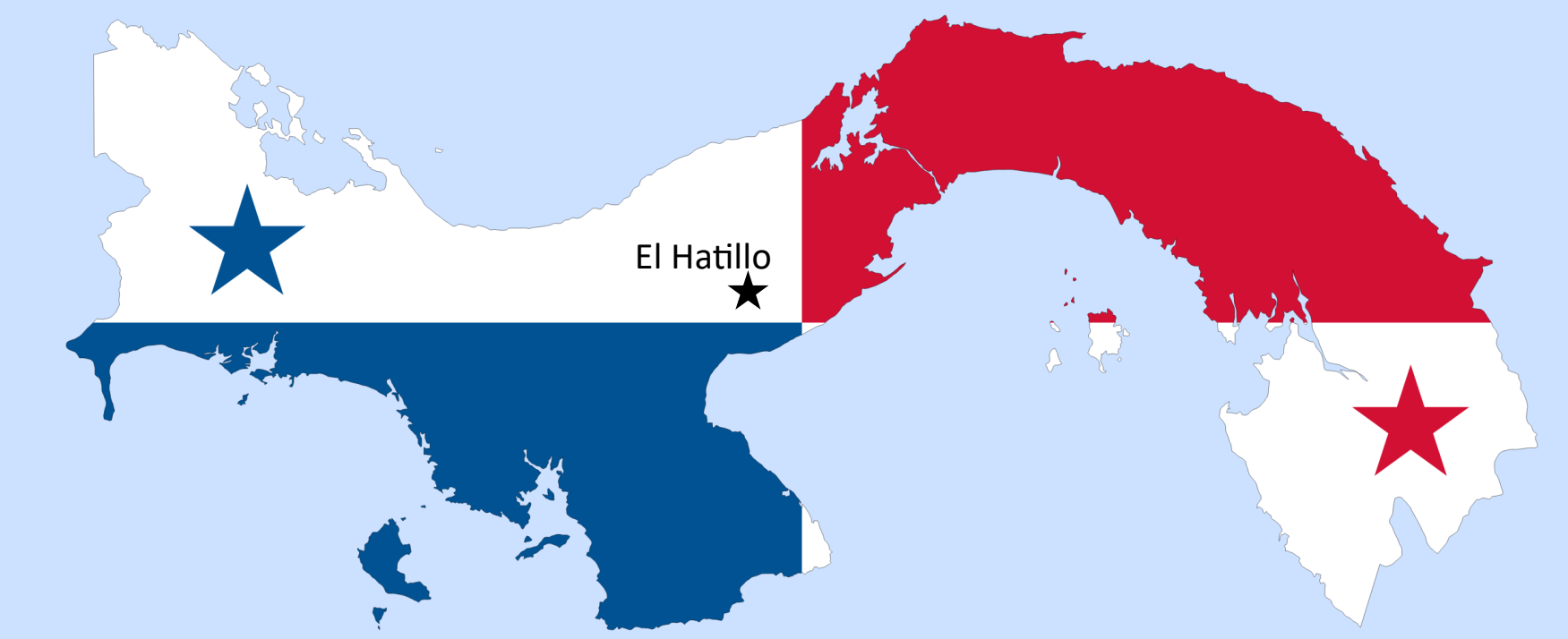




Rio Cabuya River Crossing Pedestrian Suspension Bridge

El Hatillo, Coclé Province, Panama



Problem

Problem Statement: The community of El Hatillo needs reliable access to surrounding communities during heavy flooding events.

- River floods to a level 20ft above low water level making it impassable
- Residents of El Hatillo can be stranded for days a few times a year
- El Hatillo needs to have access to neighboring community of Caimital for work, education, and supplies
- Large trees can wash down the river threatening structures like bridges
- Wet climate contributes to deterioration of bridge components, part of design constraints
- Project needs to be low cost to be financially feasible
- Government funding may be possible, but could slow down the process



Solution

- Build a suspension bridge over the Rio Cabuya
- Guarantees access between Caimital and El Hatillo
- Design bridge to last in a harsh climate with appropriate materials
- Make sure bridge is repairable using hand tools and minimal training
- Assure safety and structural soundness of bridge through accurate calculations



Figure 1. Satellite Map

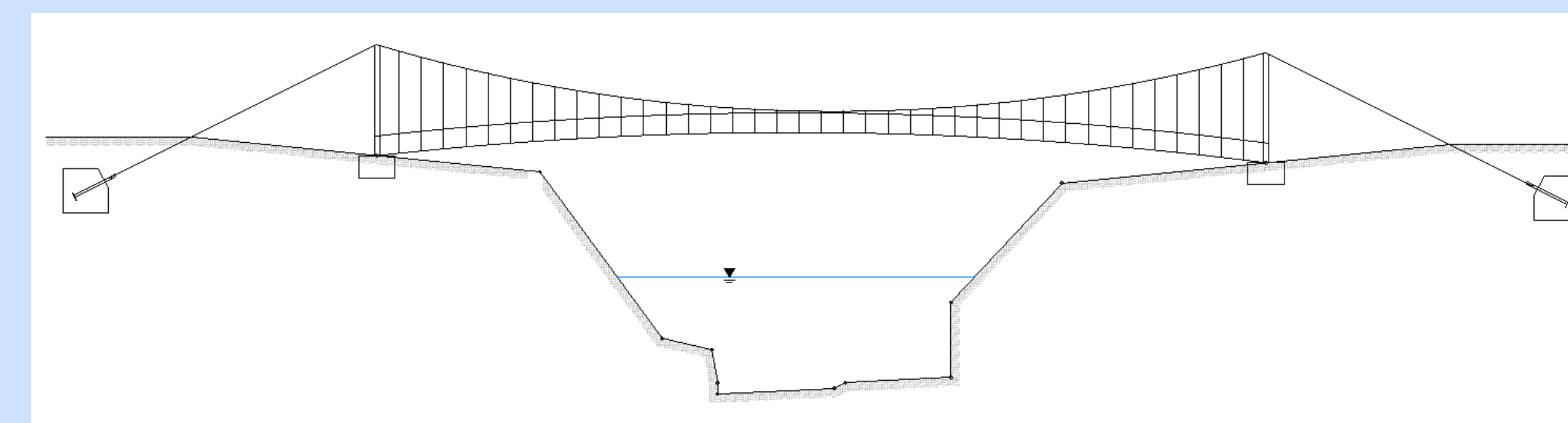


Figure 2. Bridge Profile View

Community Background

- El Hatillo is home to 27 permanent residents
- Located in the Coclé province of Panama
- Largest surrounding city is Penonome, a truck ride away from Caimital
- Caimital is a neighboring village of about 100 residents and is also the nearest source of running water and electricity
- Community members wade across the river and walk along banks to reach Caimital
- Transportation, family, and education opportunities are all in Caimital
- Most families have farms for food but also have part time jobs to buy extra food and other supplies



Data Collection and Analysis

- Four possible sites were surveyed
- Initial determination of bridge sites was done by analyzing width of river crossing and stability of banks
- Pros and cons of each location were listed to choose the best one
- Abney level and digital rangefinder were used to survey cross sections
- Soil analysis was performed with an improvised hydrometer to measure gravel and fines content
- Meetings and interviews allowed the community to voice opinions and provide data on river and surrounding area characteristics
- Watershed analysis predicted the maximum water depth during a major rain event

Design Details and Components

- 160' span with a 3' wide wooden deck
- Main cable diameter of 1 5/8" with a suspender cable diameter of 3/8"
- Galvanized components used wherever possible to resist corrosion
- 26' freeboard allows room for large debris floating downstream
- Safety fence attached to OSHA standard height cable on either side of deck
- Back to back 4"x4"x1/2" angles as deck supports allow for easier installation and replacement

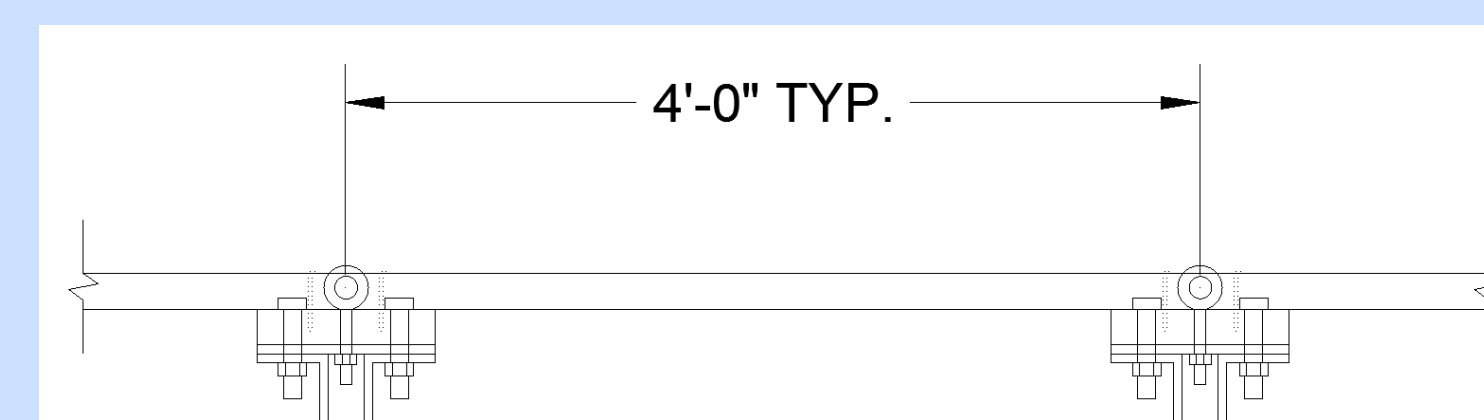


Figure 3. Bridge Deck Longitudinal Section

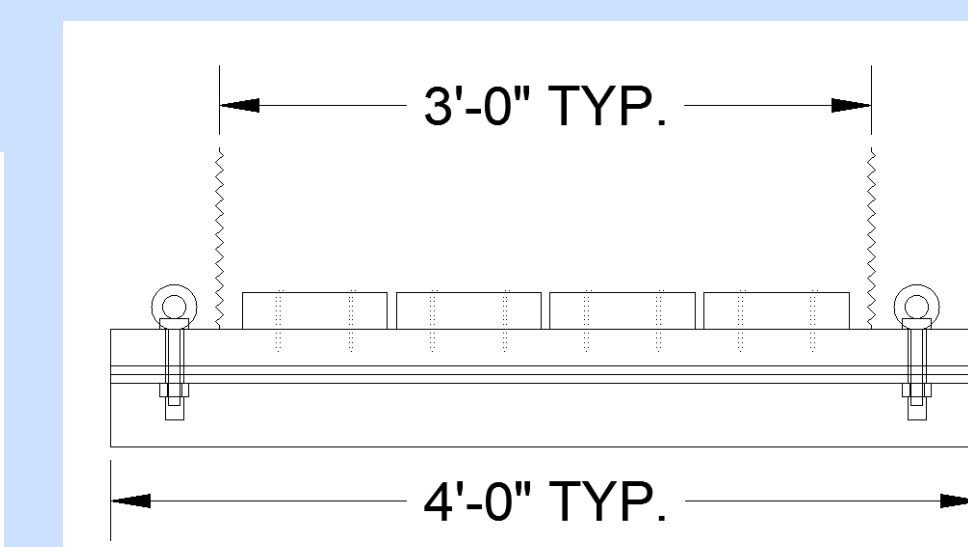


Figure 4. Bridge Deck Cross Section

Cost Estimate and Schedule

- Prices for material were estimated using various suppliers within the continental US
- Labor was estimated using MDOT and RSMeans values
- Community willing to donate time to reduce labor costs
- Cable donation would also significantly reduce cost
- Schedule is estimated to be 40 working days starting at the end of the wet season and into the dry season

Price Breakdown

Walkway	\$8,000
Anchors	\$10,000
Cables	\$20,000
Towers	\$9,000
Labor	\$39,000
Equipment	\$4,000
Total	\$90,000

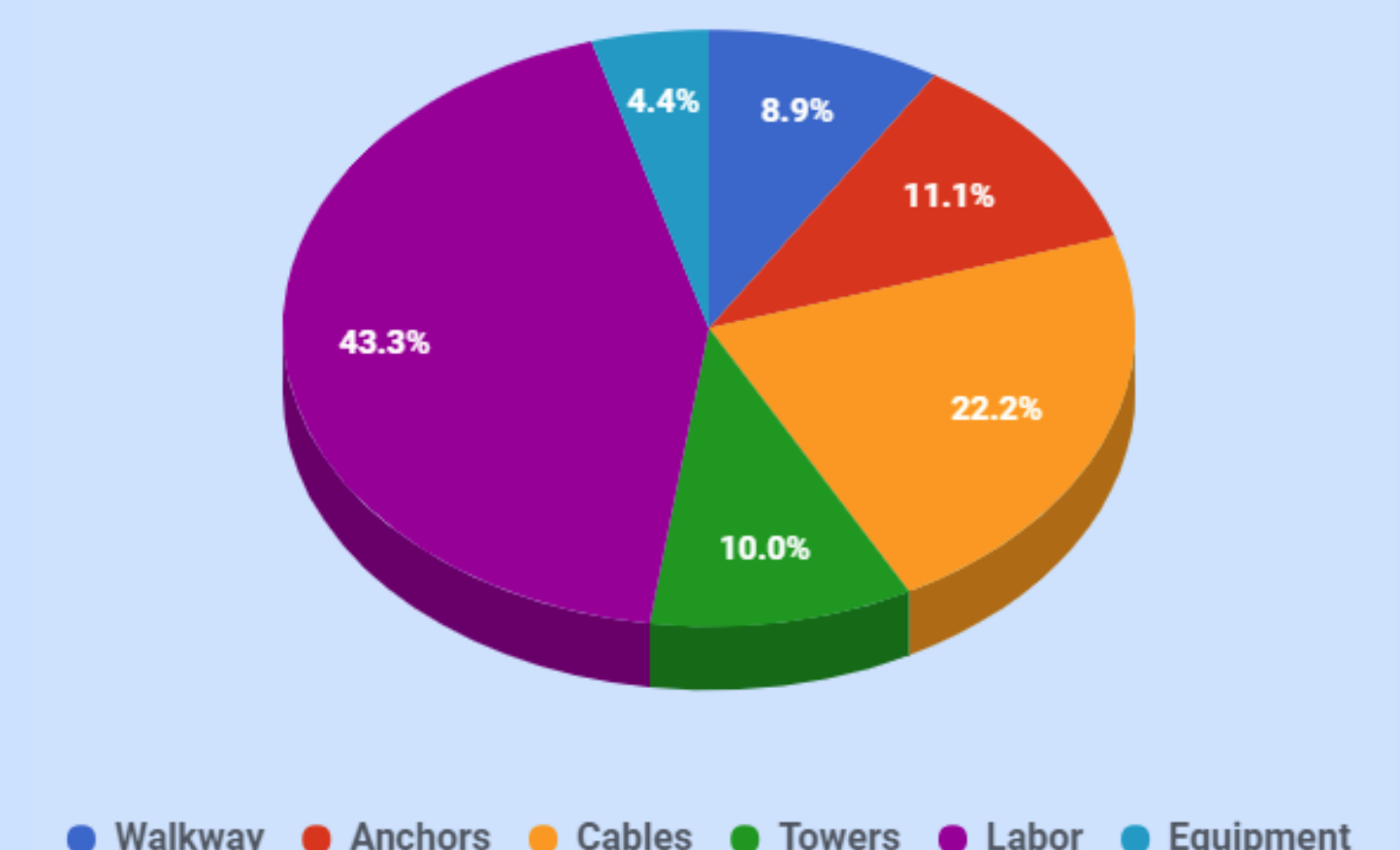


Figure 5. Cost Breakdown Chart



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