



REQUEST FOR PROPOSAL
RFP #: HK – F3.H3

TITLE: HURRICANE READINESS PROJECT – PHASE 3
CLOSING DATE AND TIME: NOVEMBER 19, 2020 @ 5:00 PM

Hurricane Readiness Project – Phase 3: HK – F3.H3

Purpose

By responding to this Request for Proposal (RFP), the Proposer agrees that s/he has read and understood all documents within this RFP package.

Submission Details

Responders to this RFP should supply:

- A business report **up to 5 pages** (not including cover page, table of contents, or any needed appendix), including any supporting plots and tables.
- The commented code used to produce the results in separate file(s).

The report should address **all points described in the “Objective” section** below.

The report should be returned in the following way:

- Electronic – Moodle submission on AA502 website

Background

Several hurricanes struck the gulf area and resulted in severe casualty and property damage. One of the major defenses is to maintain and coordinate the pump operations during a critical 48 hour period (or over 4 high tides). The Steering Committee of the Center for Risk Management (hereafter the “Committee”) is conducting an analysis for the pump stations in the gulf coast area to help better prepare for future hurricanes.

Pumps may or may not fail during a hurricane. If they fail, flood waters begin to rise too quickly which leads to catastrophic damage to homes and businesses in the area and severe loss of life. Pumps can fail for a variety of reasons during a hurricane. The four currently tracked by the Committee are the following:

1. Flood – overflow or accumulation of an expanse of water that submerges the pump station.
2. Motor – mechanical failure of the pump motor.
3. Surge – onshore gush of water usually associated with levee or structural failure.
4. Jammed – accumulation of trash or landslide materials which leads to water not getting to the pump.

For further information on how New Orleans specifically has adjusted since hurricane Katrina with the upgrades of such pumps please see the following article from the Wall Street Journal:

<https://www.wsj.com/articles/how-new-orleans-fortified-itself-against-water-11562981176>

The project will be broken down into 3 phases:

- Phase 1 – Data Understanding Around Pumps and Failures
- Phase 2 – Upgrade Analysis for Predicted Flood Failures
- Phase 3 – Model Motor Failures in Pumps

Objective

The scope of services in this third phase includes the following:

- For this phase use **the entire** data set.
- Based on your recommendation from the first RFP, the Committee kept all failure groups separate for their analyses.
- The Army Corp of Engineers and the Committee are interested in finding out if motor failure is more likely if the motor is constantly running for 12 hours before the motor has failed.
 - Build a model that doesn't focus on predicting time until failure, but instead what factors drive differences in failure time between groups.
 - Use the information provided in the variables H1 through H48 to help determine this information.
 - Feel free to use only a main effects model.
 - The Committee currently uses a significance level of **0.03** and backward selection.
 - Feel free to use a different significance level and different selection technique as long as you defend your reason.
 - List a table of significant variables ranked by their p-value.
 - Interpret the effects of the most significant variable.
 - Make sure to test any needed assumptions you may have for this model and report these findings.
 - (HINT: You will want to use the H1-H48 variables to build a time-dependent variable to analyze the constant running of the motor. There will be some assumptions you have to make for this to occur since there is missing data in the H1-H48 variables. Make sure to state these assumptions!)

Data Provided

The following data set is provided for the proposal:

- The data set **hurricane** contains 770 observations and 59 variables.
 - All of the pumps have a reason for failure in the variable **reason**:
 - 0 – no failure
 - 1 – flood failure
 - 2 – motor failure
 - 3 – surge failure
 - 4 – jammed failure
 - There are 56 variables describing the pump's factors that potentially influence the survivability of the pump stations (not all pumps have each characteristic, but some characteristics are available through upgrade or maintenance).
- (HINT: If you are using R, use the **haven** package and the **read_sas()** function to open the .sas7bdat files.

<i>Name</i>	<i>Model Role</i>	<i>Description</i>
<i>AGE</i>	Input	Difference between the installation and the current date
<i>BACKUP</i>	Input	Redundant system used to protect the station from flooding when the main pump is not operating (UPGRADE AVAILABLE – \$100K)
<i>BRIDGECRANE</i>	Input	Allow vertical access to equipment and protecting materials (UPGRADE AVAILABLE – \$50K)
<i>ELEVATION</i>	Input	Elevation of the pump station that can be altered by 1 foot by maintenance (MAINTANENCE AVAILABLE – \$10K/FT)
<i>GEAR</i>	Input	Gear box used to make the pumps stronger and faster (UPGRADE AVAILABLE – \$75K)
<i>H1 – H48</i>	Input	Pumping status during a 48 hour emergency reported by pump stations – accuracy of pump status not guaranteed to be error free
<i>HOURL</i>	Target	Hour that the pump failed or was censored
<i>REASON</i>	Strata	Reason for pump failure (recorded as 0, 1, 2, 3, or 4)
<i>SERVO</i>	Input	Servomechanism is used to provide control of a desired operation through the Supervisory control and data acquisition (SCADA) system (UPGRADE AVAILABLE – \$150K)
<i>SLOPE</i>	Input	Surrounding ravine slope of the pump station
<i>SURVIVE</i>	Target	If the pump survived the hurricane without failure
<i>TRASHRACK</i>	Input	Used for protecting hydraulic structures against the inlet of debris, of vegetation, urban or industrial trash (UPGRADE AVAILABLE – \$80K)