Simple Water Elevation Transit System

Preliminary Requirements Notes

January 6, 2025

Water Elevation Transit System (WETS) Requirements

Overall Plan

- STEP 1: Consider a manual, single lock WETS to clarify:
  - vocabulary, basic operations, operational policies (KISS)

- STEP 2: Consider a manual, multi lock WETS to further clarify:
  - vocabulary, operations, operational policies (KISS)

- STEP 3: Consider devices to automate a WETS operation (e.g., hydraulic gates, flow meters, water level meters, etc.) and define logical interfaces (e.g., commands, responses, behavior, etc.) to these devices. This assumes there will be a separate Process I/O domain dealing with the lower level communication protocols and presenting the desired behavior.

- STEP 4: Produce a final requirements summary for an automated, multi lock WETS (KISS)

A Few Basic Terms

- In its simplest form, a water elevation transit system consists a sloped waterway with two gates which can be opened and closed to allow the water level between them to be manipulated up and down in order to allow vessels to move up and down the waterway.

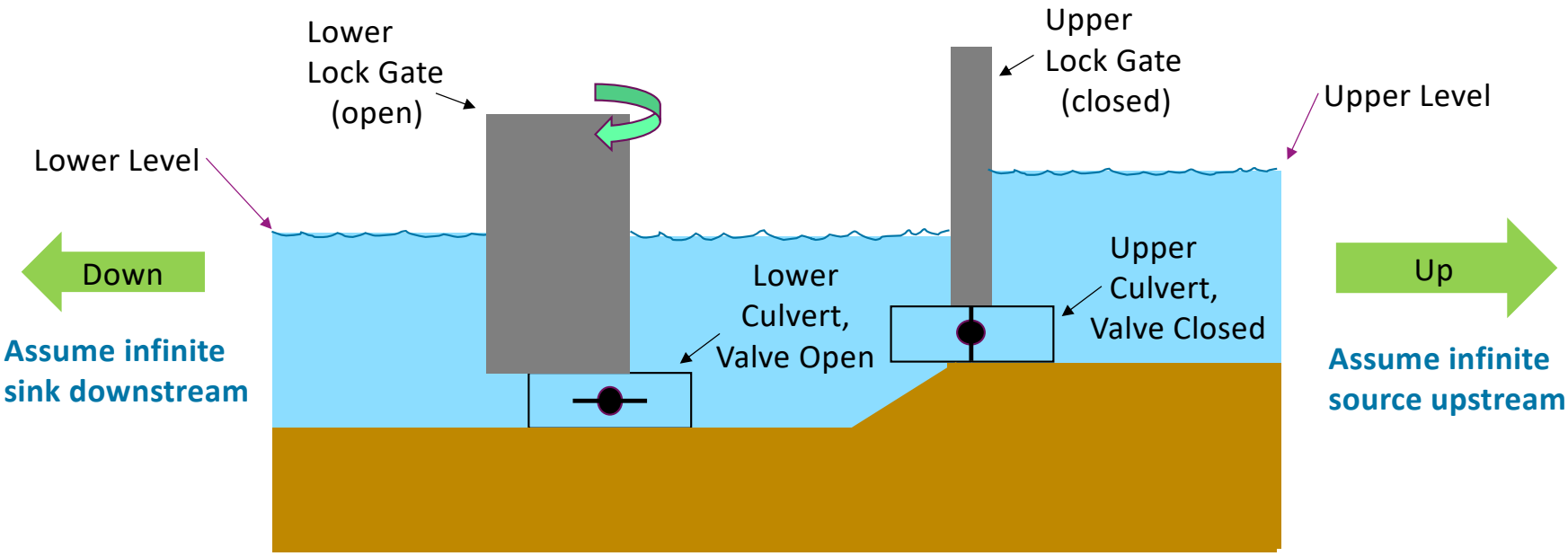
- This set of two gates is commonly called a lock. When both gates are closed the space between them where the water level is manipulated is called a chamber.

- The movement of a vessel is through the gates is referred to as a transfer.

- The water level in a chamber is manipulated by controlling the water flow through culverts at each gate.

- There are valves in each culvert that can be opened and closed to control the flow of water through the culvert.

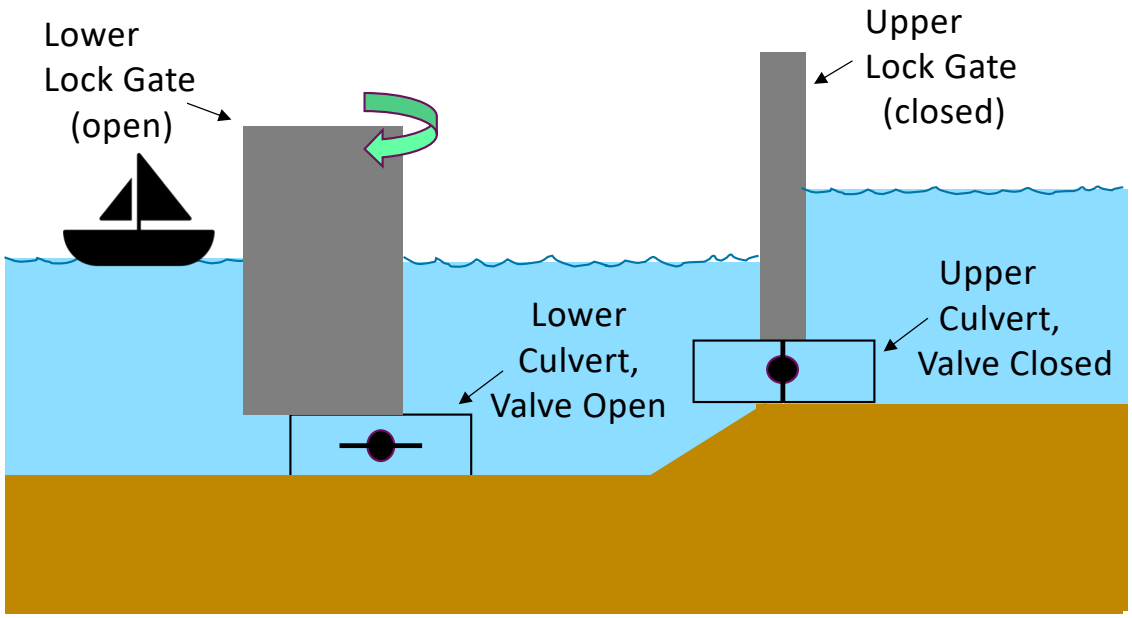
Low Gate Open



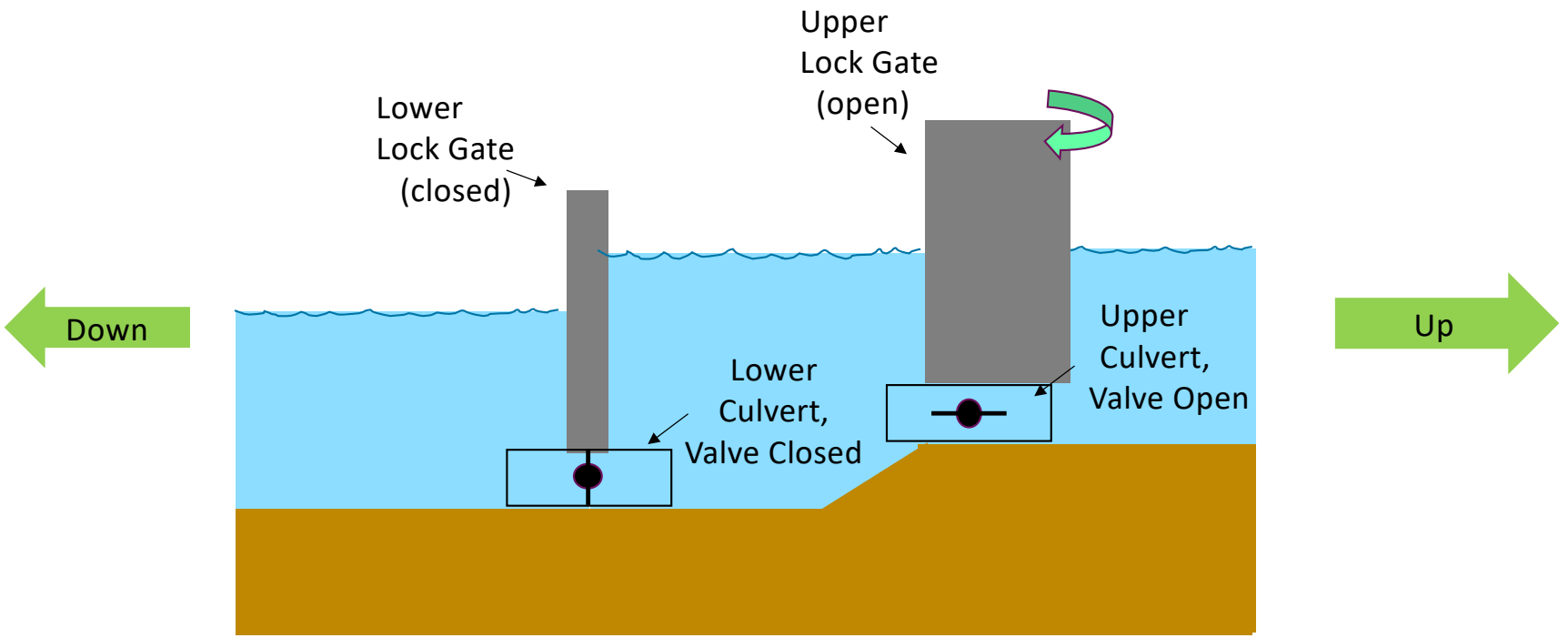
Low Gate Open + Transfer Up

Transfer Up

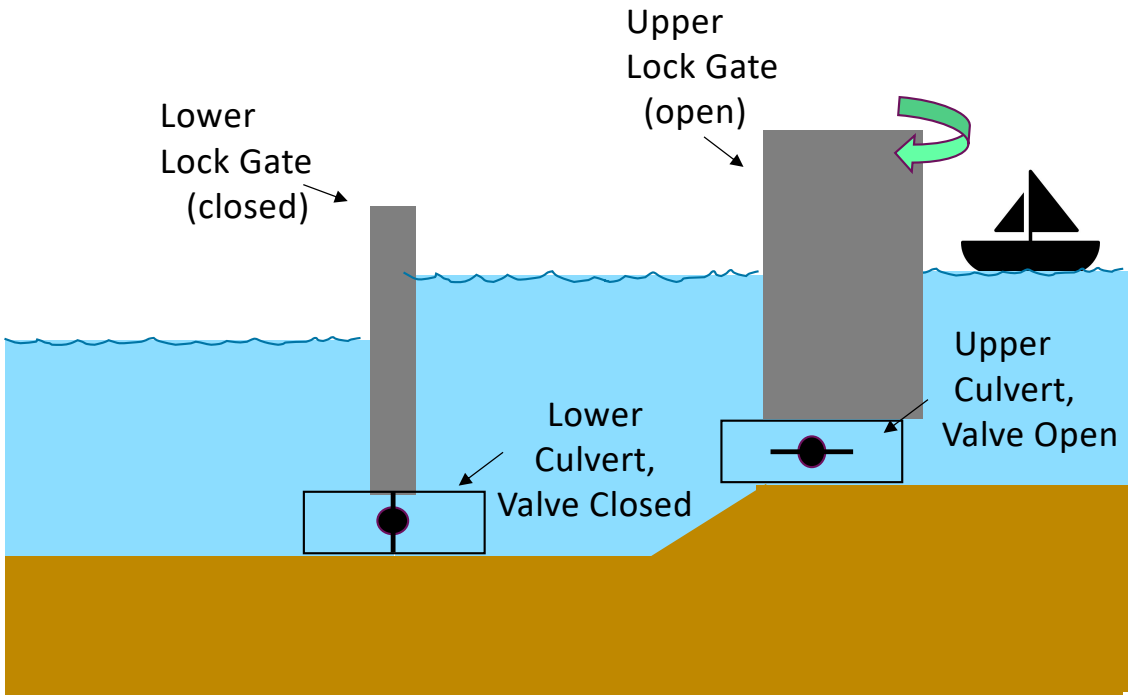
- Move vessel into lock
- Close lower lock gate
- Close lower culvert valve
- Open upper culvert valve
- When chamber level equals upper level
  - Open upper gate
  - Move vessel out of lock



High Gate Open



High Gate Open + Transfer Down

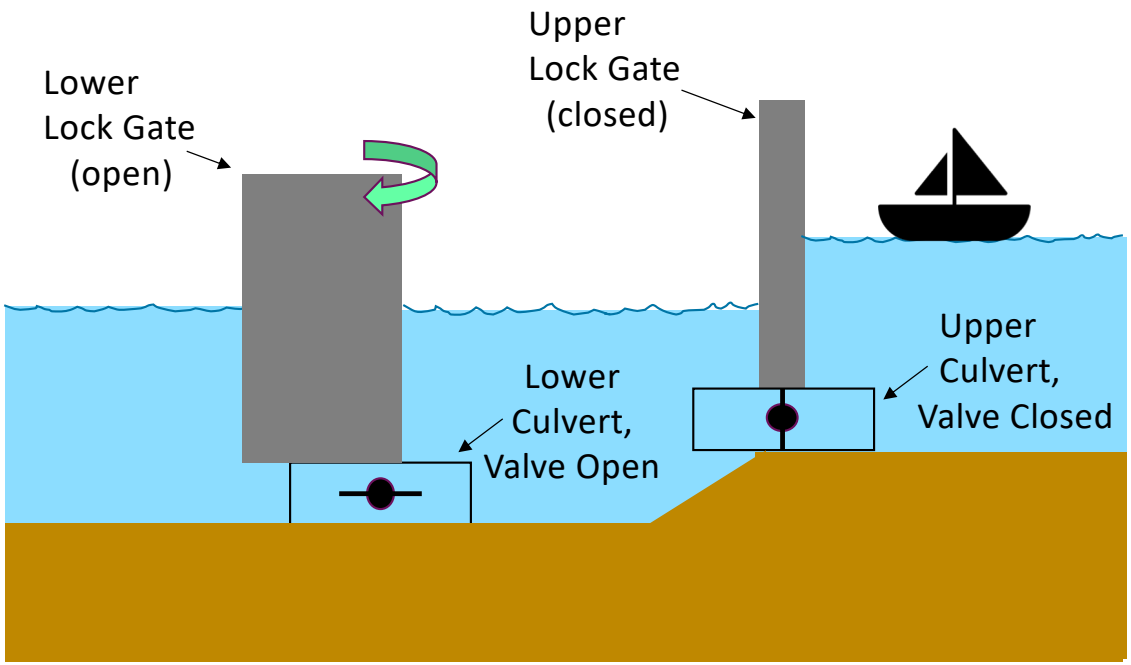


Down

Transfer Down

- Move vessel into lock
- Close upper lock gate
- Close upper culvert valve
- Open lower culvert valve
- When chamber level equals lower level
  - Open lower gate
  - Move vessel out of lock

Low Gate Open + Transfer Down



Down

Raise Lock Water Level

- Close lower gate
- Close lower culvert valve
- Open upper culvert valve
- When chamber level equals upper level
  - Open upper gate

Transfer Down

- Like before…

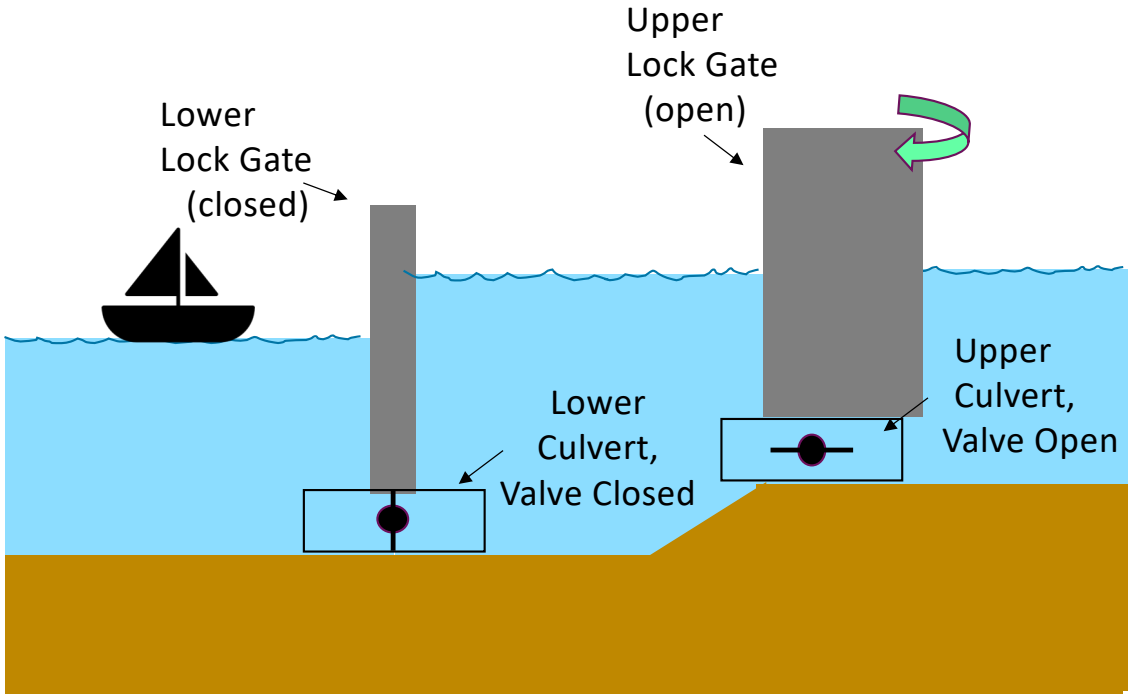
High Gate Open +Transfer Up

Lower Lock Water Level

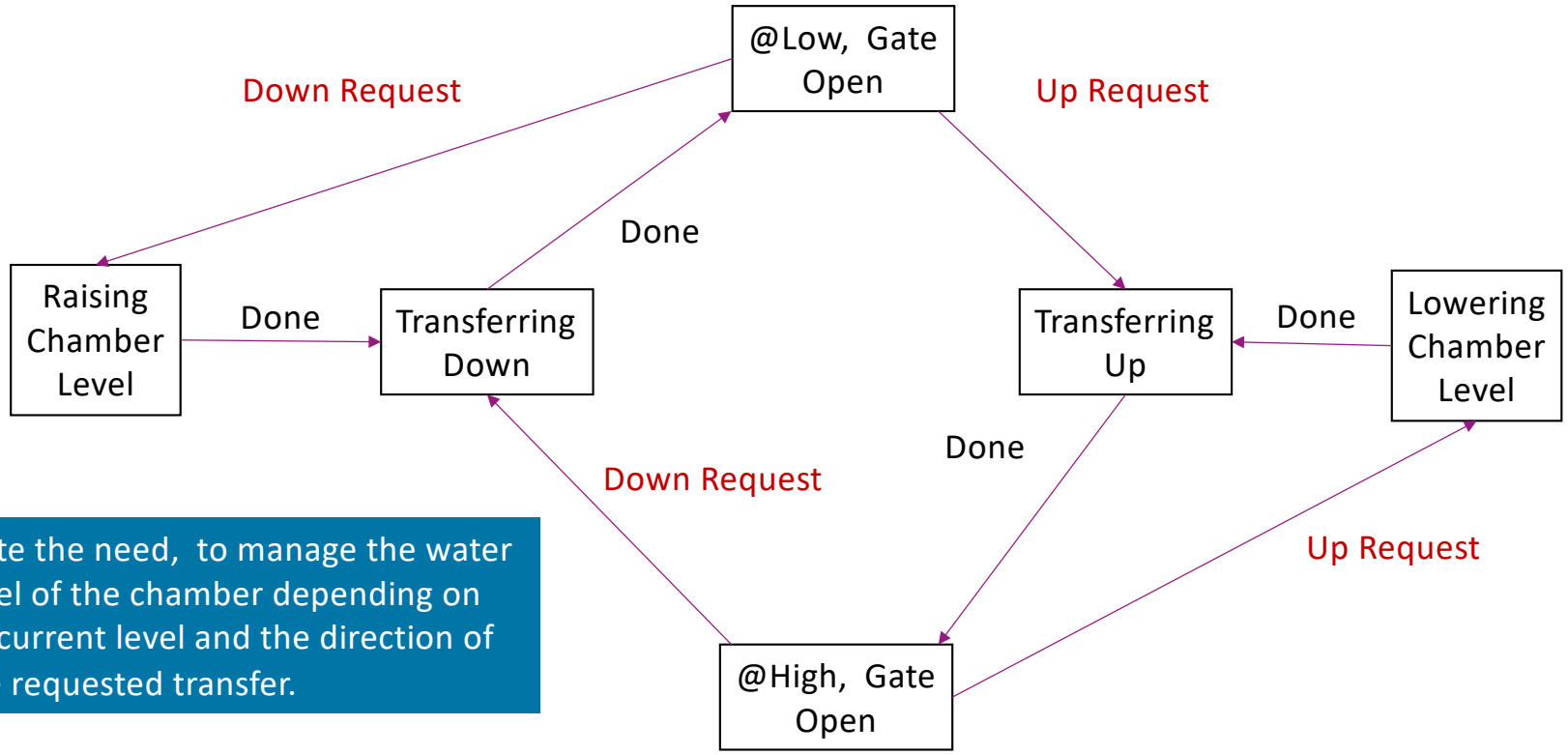
- Close upper gate
- Close upper culvert valve
- Open lower culvert valve
- When lock level equals lower level
  - Open lower gate

Transfer Up

- Like before…



Simple Behavior of a Single Chamber WETS

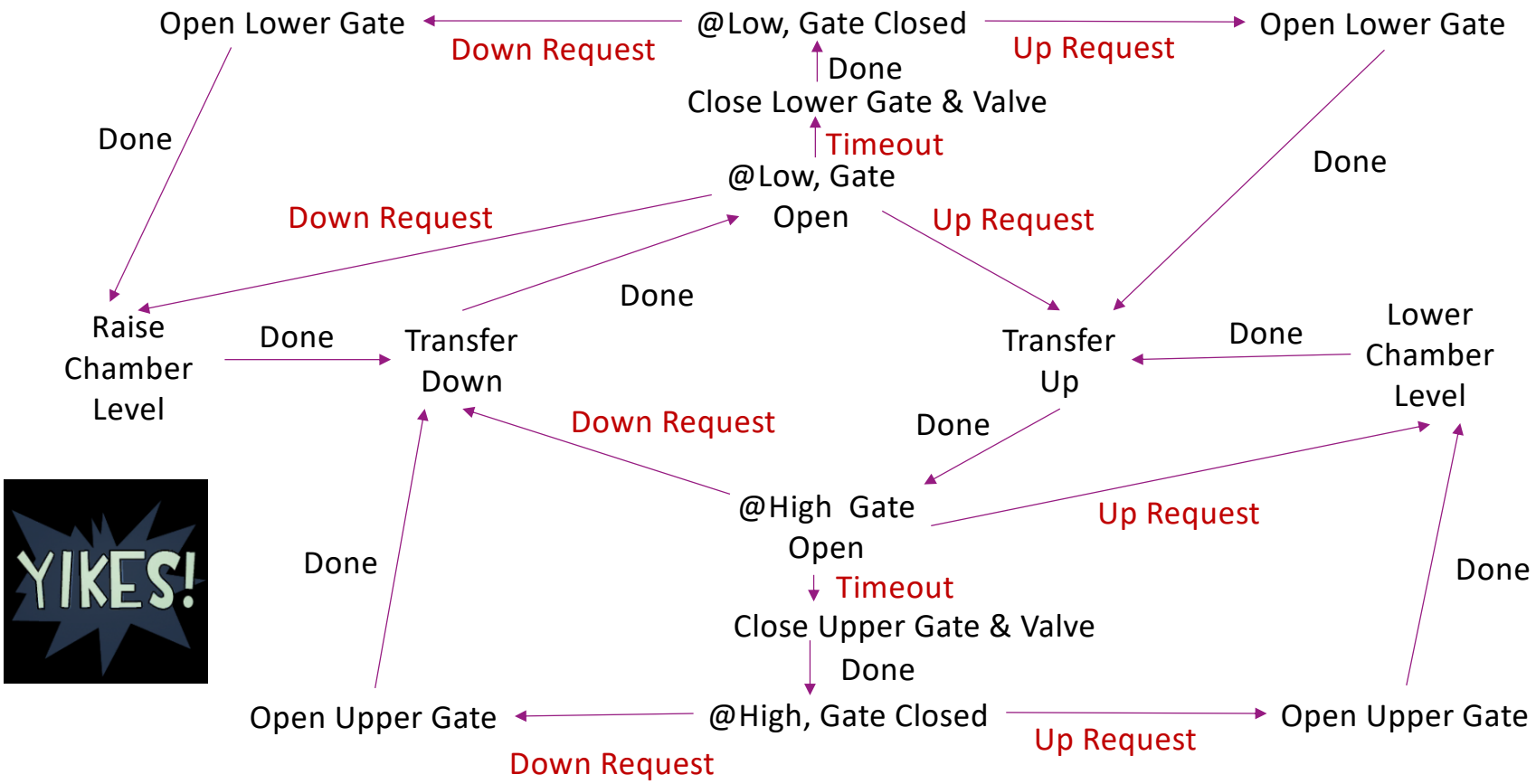


Note the need, to manage the water level of the chamber depending on its current level and the direction of the requested transfer.

Potential Additional Requirement

- **If there is no transfer to do for X minutes after completing a transfer, close the open gate and culvert valve ➔ Safety.**

(Not) Simple Behavior of a Single Chamber Lock WETS



Questions? Comments?? Suggestions???