

# The Galveston District Transition from Mean Low Tide (MLT) to Mean Lower Low Water (MLLW)

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# MLLW Transition

## Presentation outline -

- What datum is now being used and why?
- What is MLLW and why use it?
- Why the transition to MLLW?
- How will the transition be implemented?



# MLLW Transition

## Mean Low Tide (MLT)

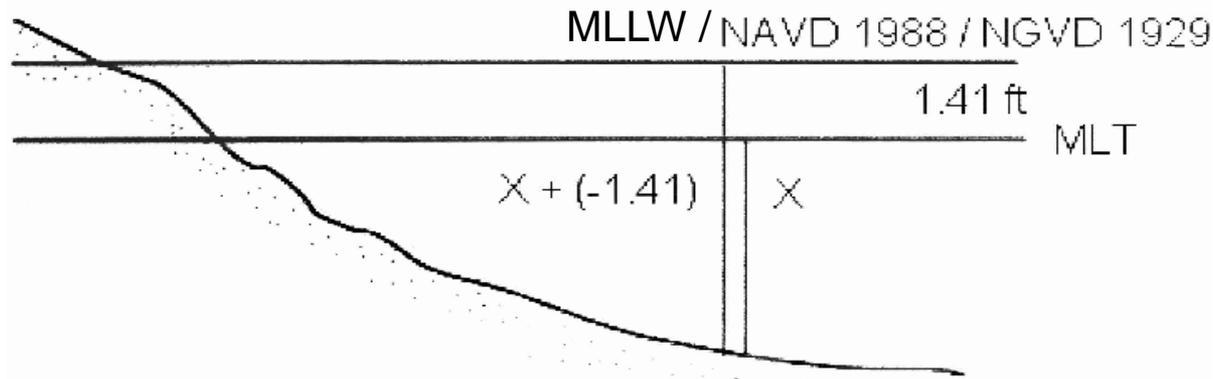
- Galveston District using Mean Low Tide (MLT) as vertical datum control for navigation projects
- MLT in the context of District projects is a legacy datum dating from the 1960's and is **geodetically** tied to terrestrial benchmarks (NGVD 29, NAVD 88)
- At inception, MLT was **empirically** derived and represented the lowest expected water level including **both** astronomical and meteorological forcing.

## Mean Lower Low Water (MLLW)

- The arithmetic mean of the lower low water (MLLW) heights of the tide observed over a specific 19-year Metonic cycle (the NTDE). Only the lower low water of each pair of low waters of a tidal day is included in the mean.
- It is the depth (sounding) datum used on NOAA nautical charts
- It is the **average** minimum **tidal** depth likely to be encountered by maritime operators.



# MLT, MLLW, and NAVD88 Relations



Galveston: MLT is 1.41 ft below NAVD 1988.  
Therefore, all points on a profile referenced to MLT  
are 1.41 ft lower than if ref. to NAVD88. Need to add  
-1.41 ft to all elevations on MLT-referenced data  
(e.g., -10.0 MLT = -11.41 NAVD88)

***For NOS Pier 21 tide station, MLLW is exactly zero elevation NAVD88  
Primary reference monument is USACE benchmark 7.151***

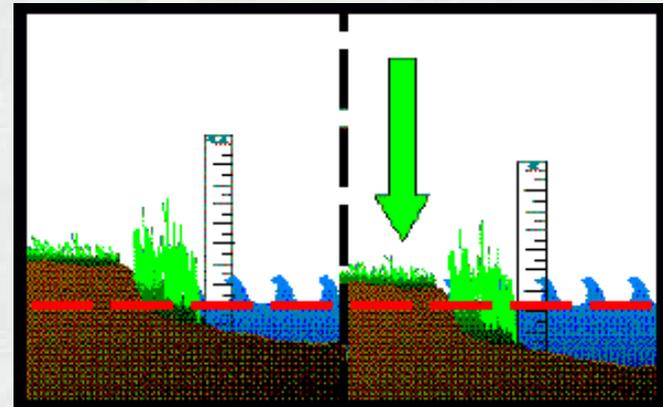


# MLLW Transition

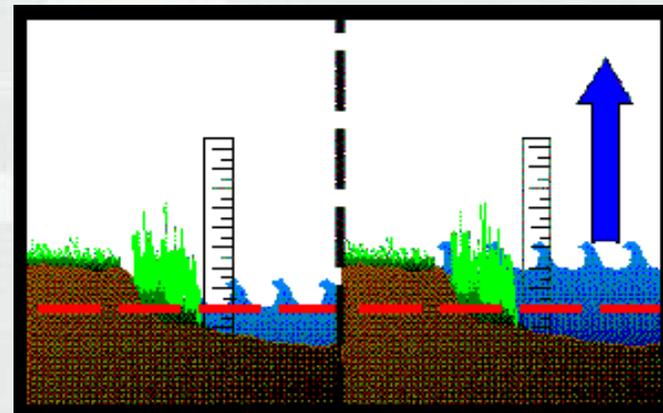
## MLT Datum timeline -

- 1960's – MLT defined by SWG and related to terrestrial monuments
- Subsequent local land subsidence takes terrestrial monumentation downward
- SWG project authorization documents specify MLT datum be used
- Over time, effective project depth increases because of MLT tie to terrestrial monument subsidence
- 2009 USACE-HQ mandates all navigation projects be referenced to NOAA MLLW

Local Land Subsidence



Sea Level Rise

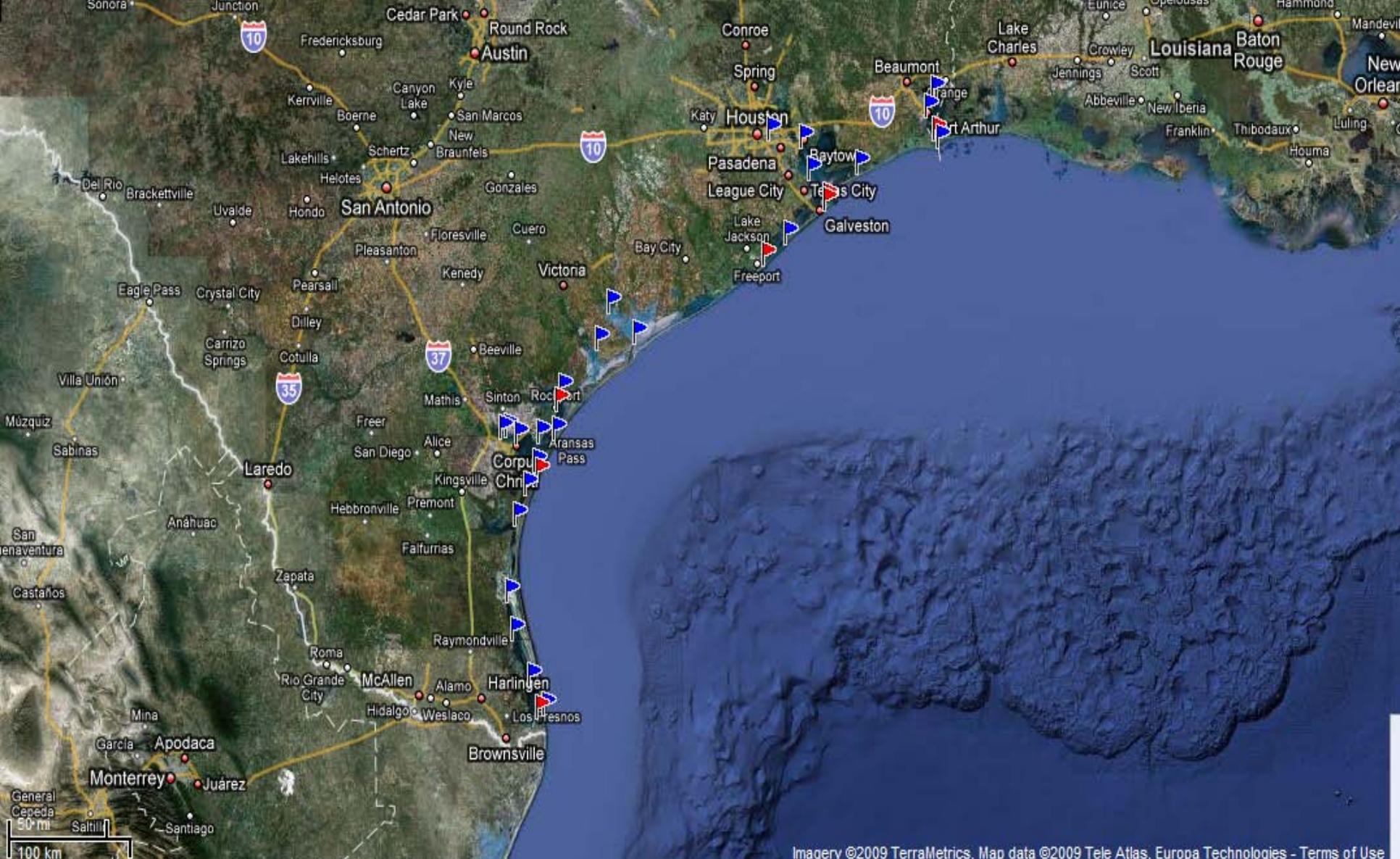


# MLLW Transition

## How will the transition be implemented?

- Phase 1: Reoccupy monuments associated with active/inactive gages
- Phase 2: Determine MLLW in selected coastal reaches
- Phase 3: Perform physical changes to project controls, including updating/establishing new staff gages
- Phase 4: Internal/external communications

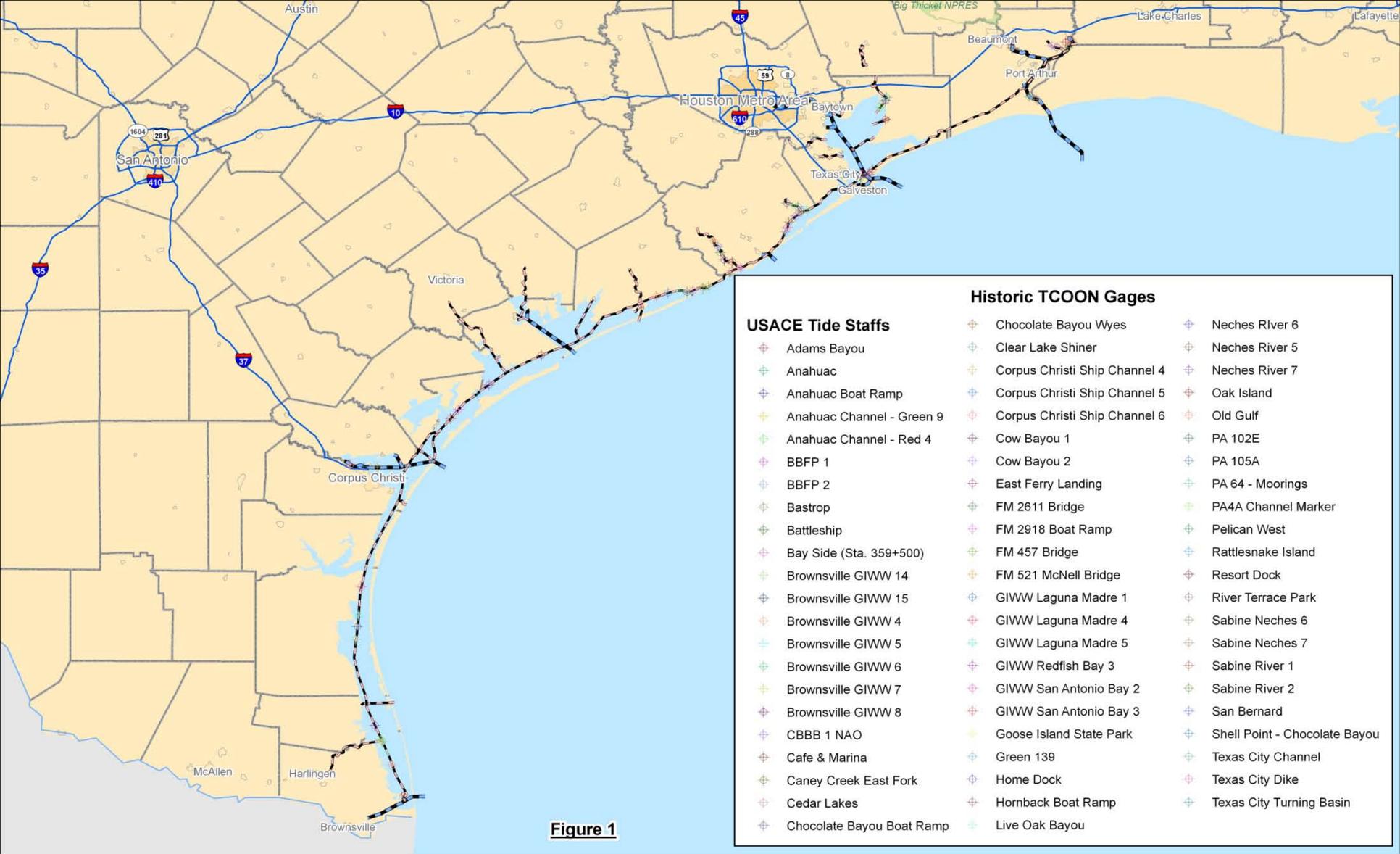




Phase 1: Occupy Monuments with Active TCOON/NOAA  
Gages for upload to NSRS.



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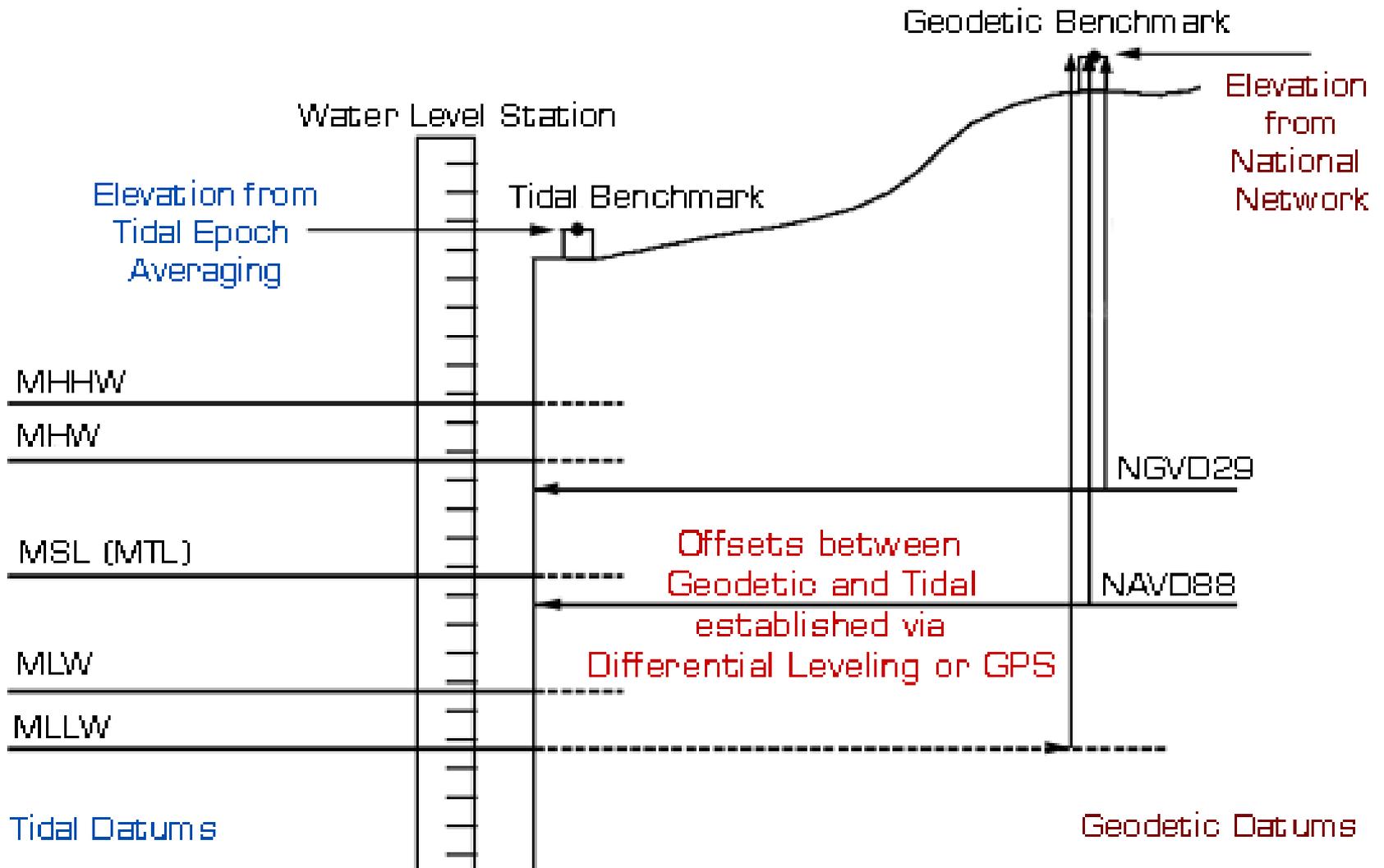


**Figure 1**

Phase 1: Occupy Monuments with Historic TCOON Gages for upload to NSRS.



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**Figure 2**

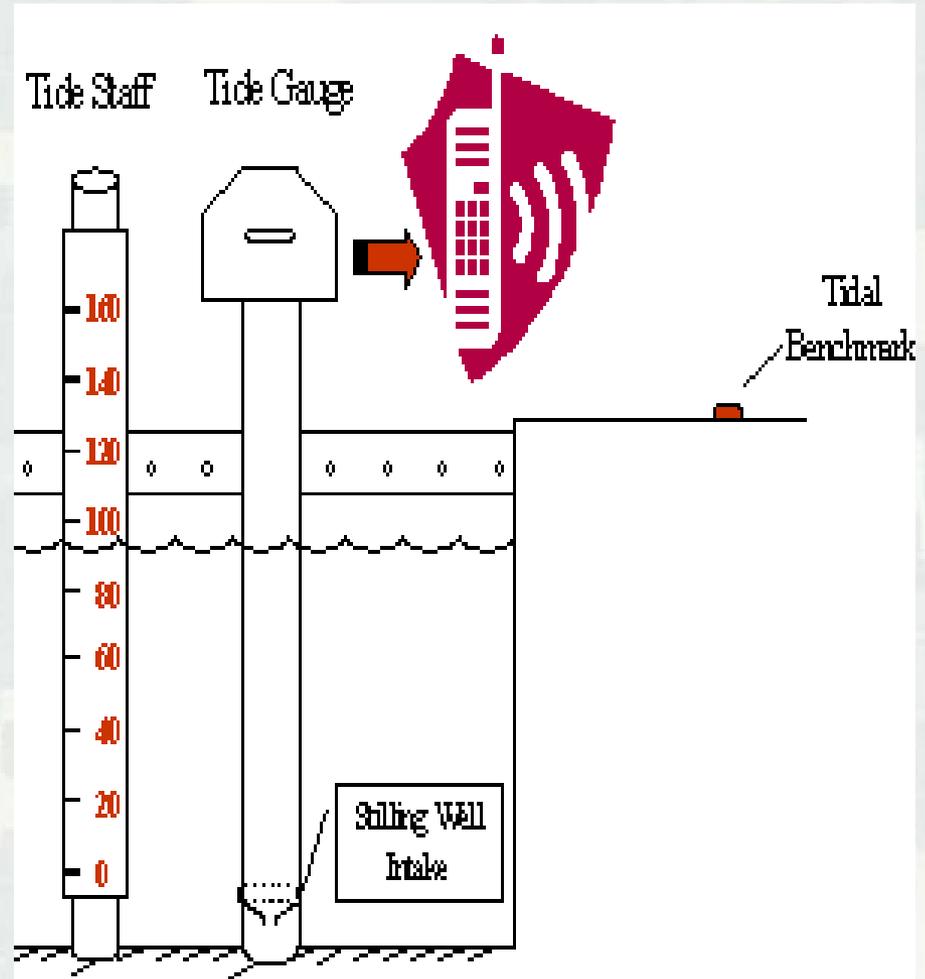
Phase 2: Install and Monitor Temporary and Permanent Gages<sup>®</sup> for MLLW determination.



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# MLLW Transition

- Phase 2: Install Temporary (17) or Permanent (5) Tide Gages
- Phase 3: Install Tide Staffs at MLLW datum
  - ▶ Replace at Existing sites
  - ▶ Add New due to local datum variability



# *MLLW Transition*

## Questions?

