BURNS McDONNELL

Thermal Infrastructure Planning, Rehabilitation and Expansion at University of South Alabama

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CampusEnergy2020
THE POWER TO CHANGE
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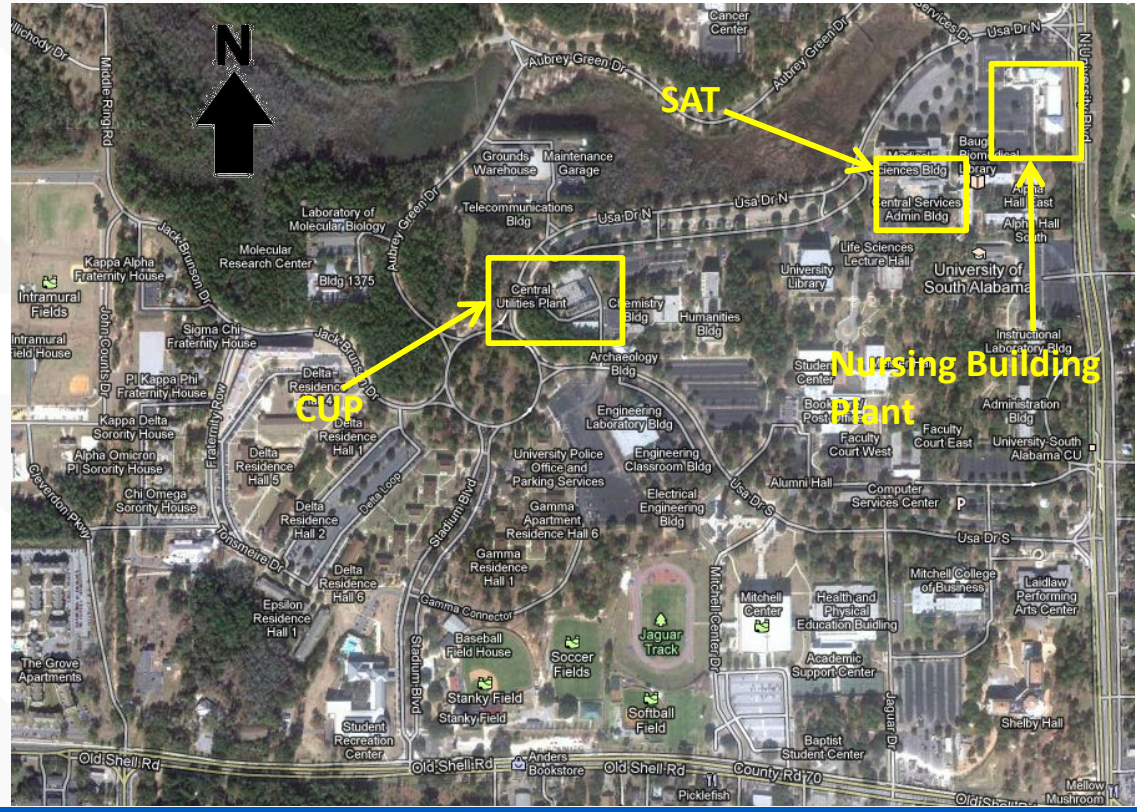
UNIVERSITY OVERVIEW

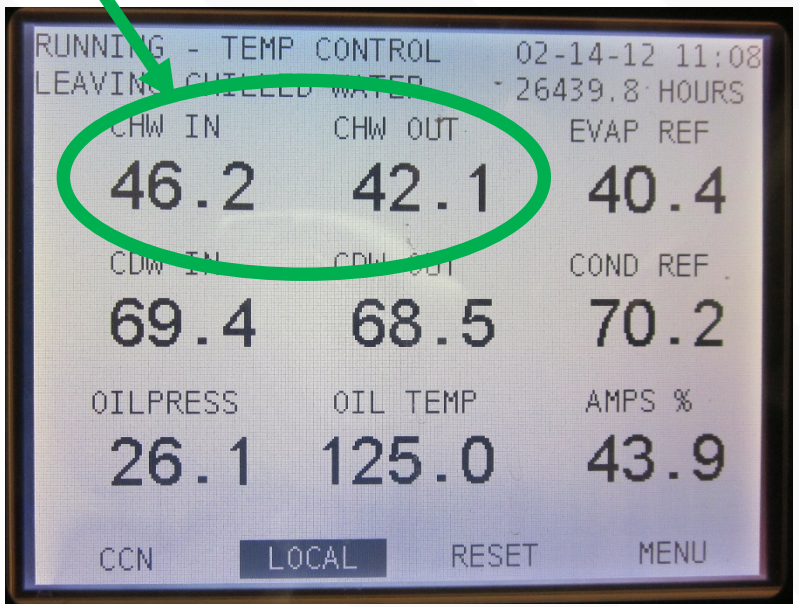
- Located in Mobile, Alabama
- University of South Alabama was established in 1963
- Approximately 15,000 students
- Commuter campus transitioning to residential campus
- Three (3) Chilled Water Plants and One (1) Boiler Plant

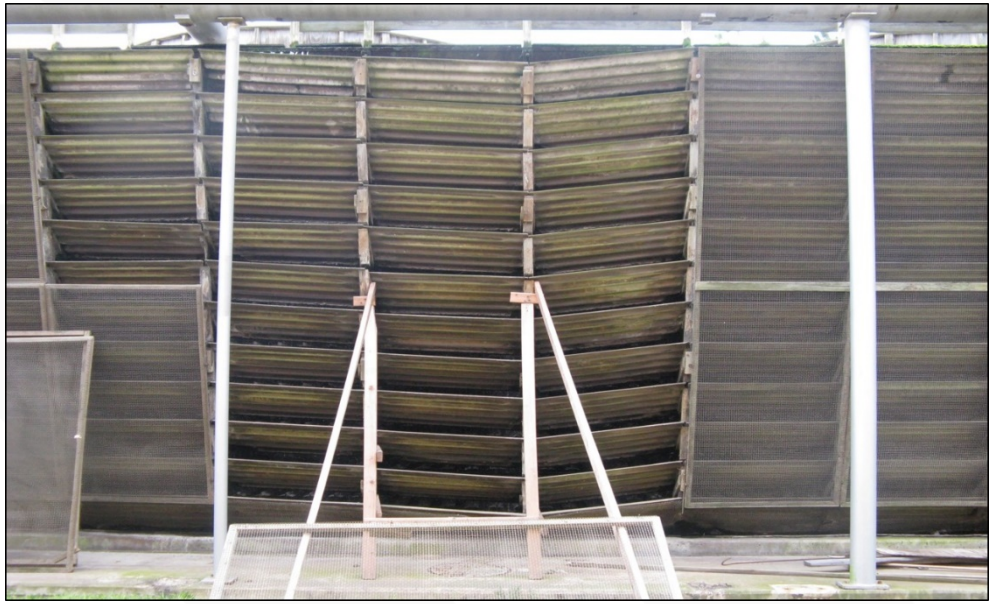
UNIVERSITY OF SOUTH ALABAMA



AGING INFRASTRUCTURE – AS OF 2011

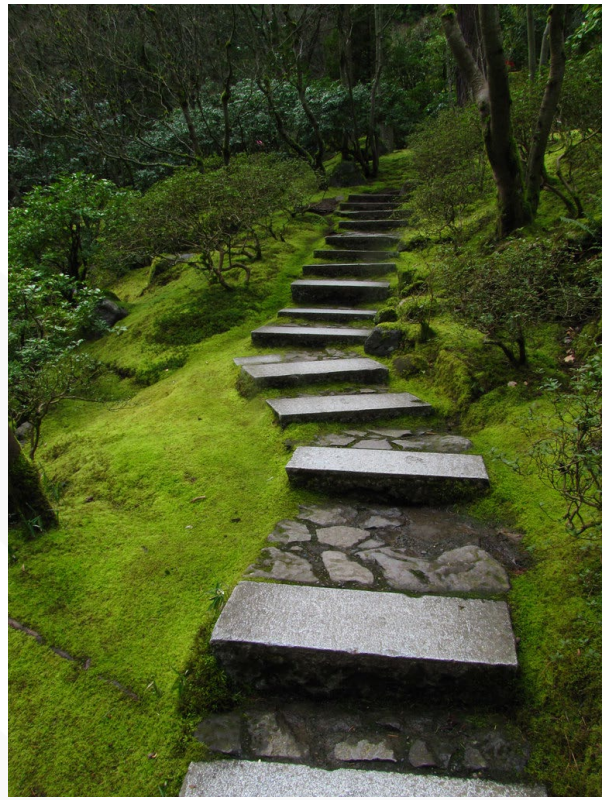
- Cooling towers constructed in the 1960s
- Chillers 13 to 27 years old
- Hot water distribution piping with insulation problems
- Majority of chilled water piping transite
- Low delta T on campus





PLAN FORWARD

- Attack the Challenge in Steps
- Manageable Pieces
- Demonstrate Success Along the Way
- **Generates Increased Support and Confidence**



UTILITY PLANNING/SOLUTIONS - 2011

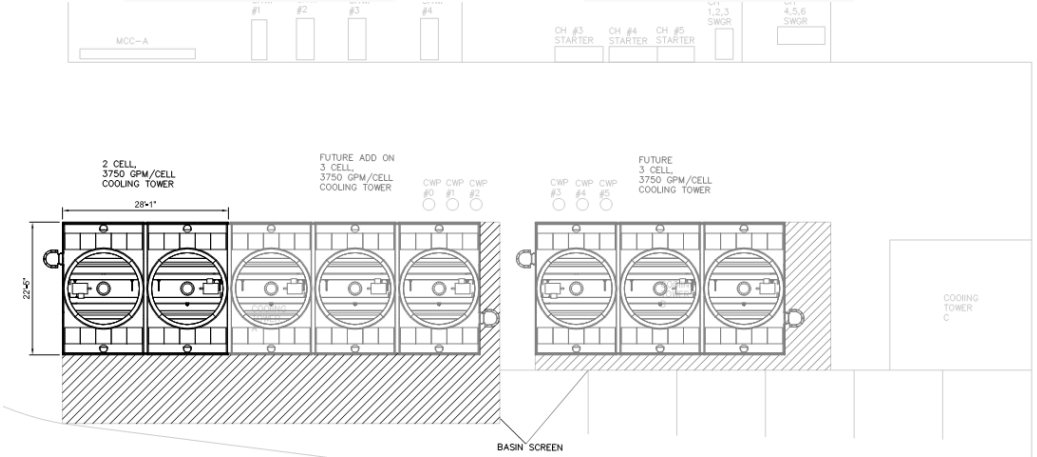
- Building Interconnection Study
  - Started from the outside and worked in
    - Fix pumping and delta T issues
  - Developed hydraulic models for chilled and hot water systems
  - Investigation found:
    - 3-way valves not functioning properly
    - Full line size building bypasses
    - Oversized constant speed pumping in buildings
    - Pumping connections installed backwards

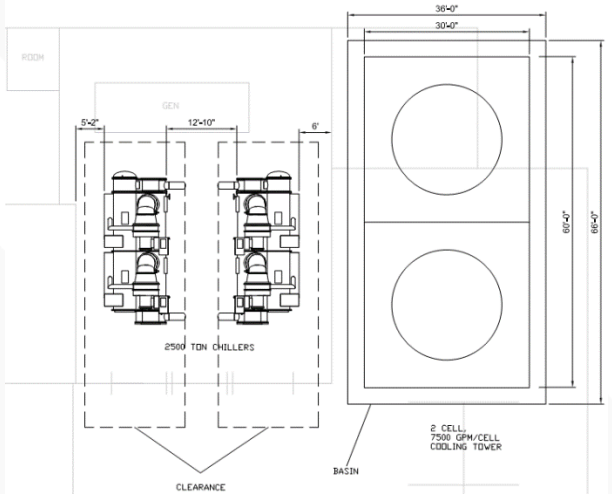
UTILITY PLANNING/SOLUTIONS - 2011

- Building Interconnection Study
  - Recommended:
    - Removing 3-ways valves and bypasses
    - Installing VFDs on building pumps
    - Fix pumping connections
  - The University self-performed work
  - Saw increased delta T at their plants
    - During the summer, reduced the number of chillers used from 5 to 3
  - Saw savings in the range of $500,000 after first year
  - Gained support from administration

UTILITY PLANNING/SOLUTIONS - 2012

- Cooling Tower and Chilled Water Capacity Expansion Study
  - Cooling tower replacements were going to be needed soon
  - Replacements would need to allow for easy continued expansion
  - Planning for expansion without interruption to existing service
  - The study allowed our teams to agree on a path forward
    - Assumed plant build out to 10,000 tons, from 5,500 tons
- Plant Controls Study
  - Reviewed and updated existing controls sequences in preparation of new equipment/capacity.





UTILITY PLANNING/SOLUTIONS – 2013/2014

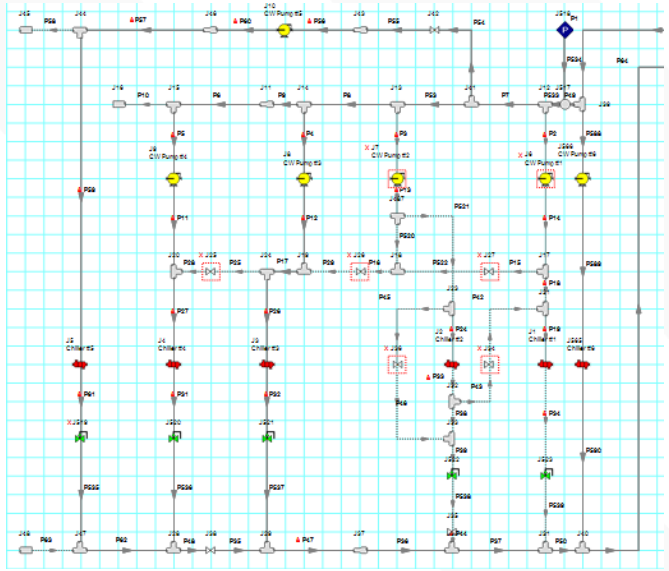
- New Equipment Installations
  - With administrative support the facilities group received funding to replace aging plant equipment
  - The 1960's towers were replaced, in two phases, with seven packaged towers
    - 8,750 tons of capacity
    - Towers were also headered and valved so that the new planned chillers could operate independently of existing chillers
  - A new 2,500 ton chiller was installed

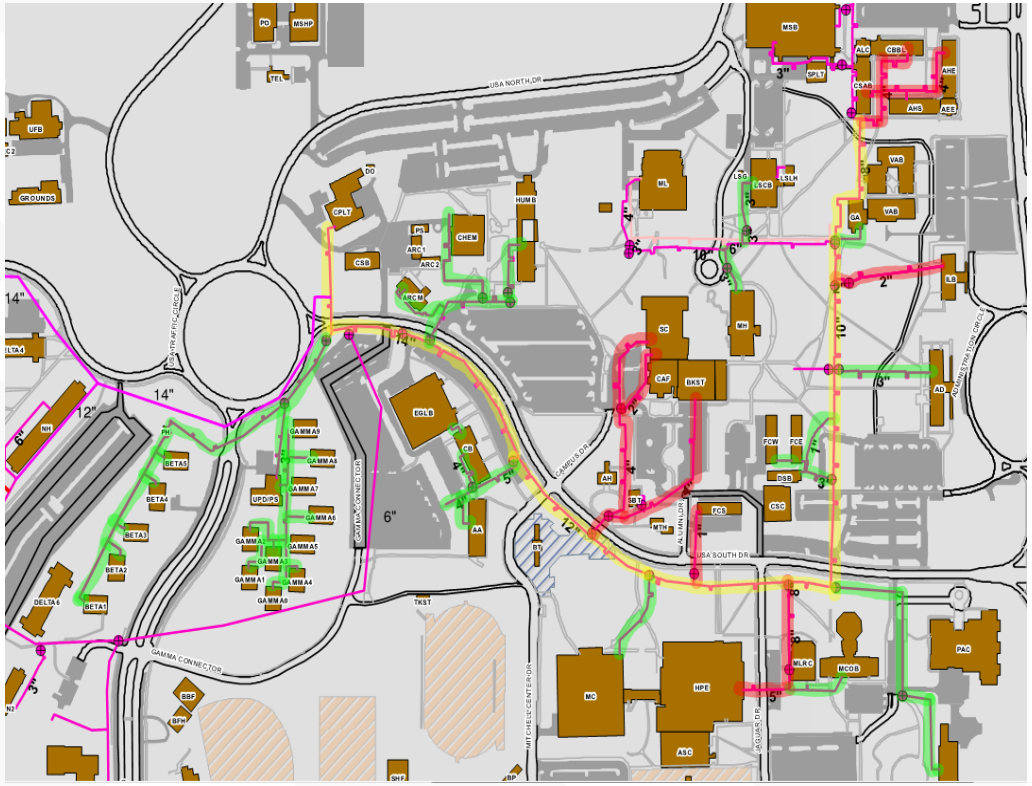
UTILITY PLANNING/SOLUTIONS – 2013/2014

- Underground Distribution Piping Replacements
  - Due to:
    - Failing underground hot water piping
    - New loads coming online
  - Large hot and chilled water distribution project was performed
    - Discussions with the University determined it would be best to oversize new pipes for future capacity needs
      - This would payoff four years down the road (stay tuned)

UTILITY PLANNING/SOLUTIONS – 2015

- Utilities Master Plan
  - Repairs and fixes to most vulnerable systems were now complete
    - Provided time to step back and think big picture
  - Near and long-term campus loads were studied
  - Hydraulic models updated
    - Adding new buildings and piping
  - Underground distribution piping replacement plan



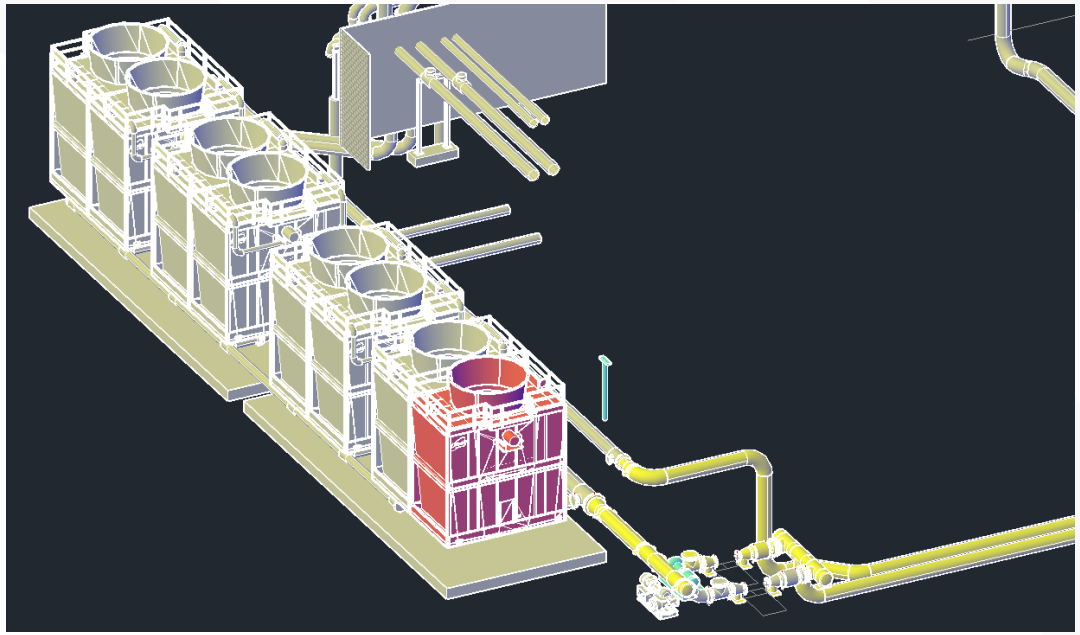


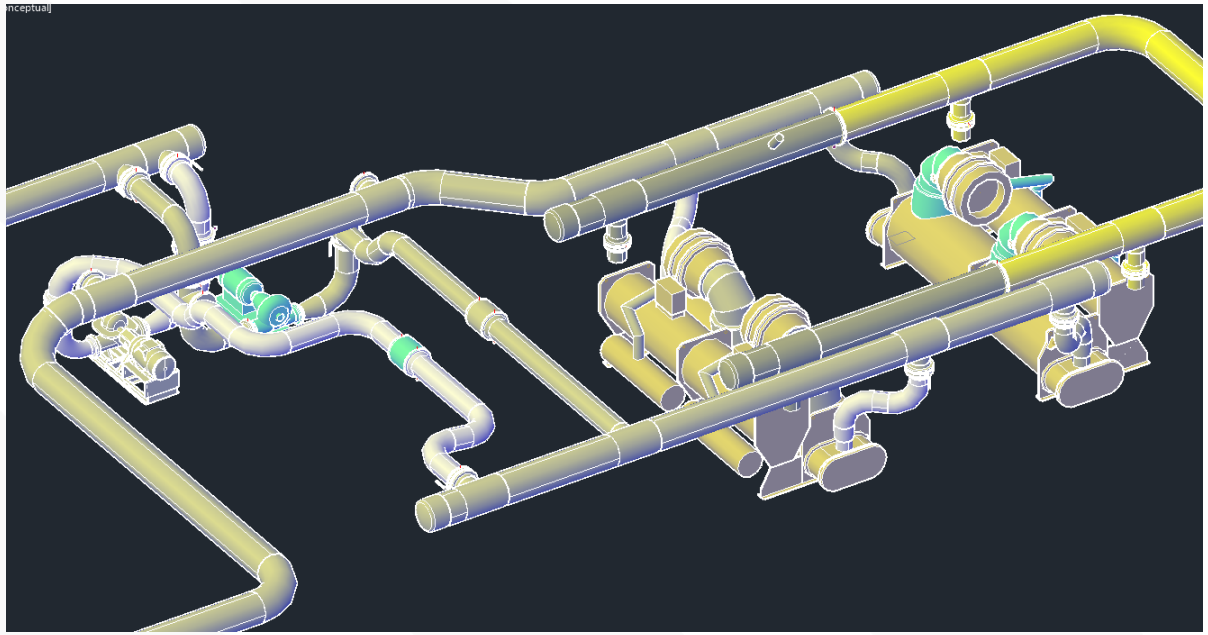
UTILITY PLANNING/SOLUTIONS – 2017

- New Boiler Plant
  - To meet increased hot water loads, a new boiler plant was designed and constructed
  - The new 700hp boiler provided the University with N+1 redundancy
  - Plant was designed to double capacity of initial installation

UTILITY PLANNING/SOLUTIONS – 2019 AND ON

- New Chiller Installation
  - To meet increased chilled water loads and maintain N+1 redundancy, a new 2,500 ton chiller and cooling tower are currently being installed.
  - This meets the build out discussed in the 2012 study.





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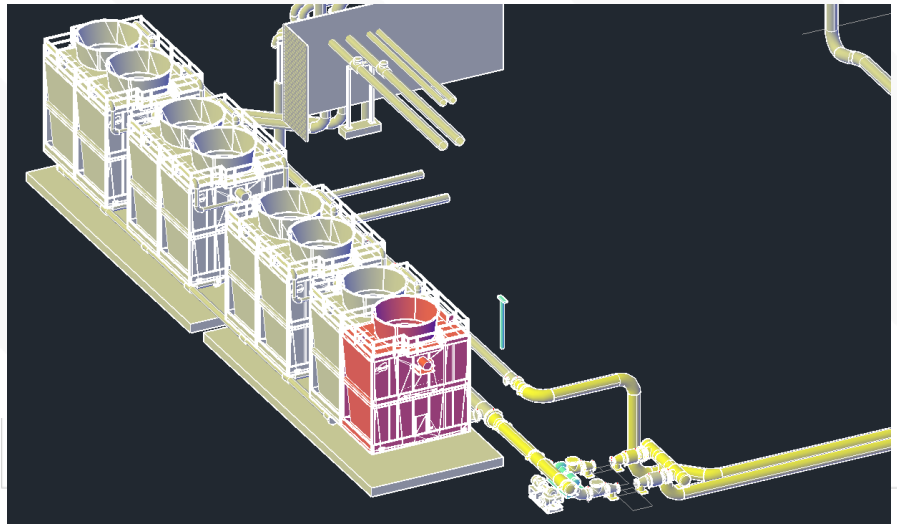
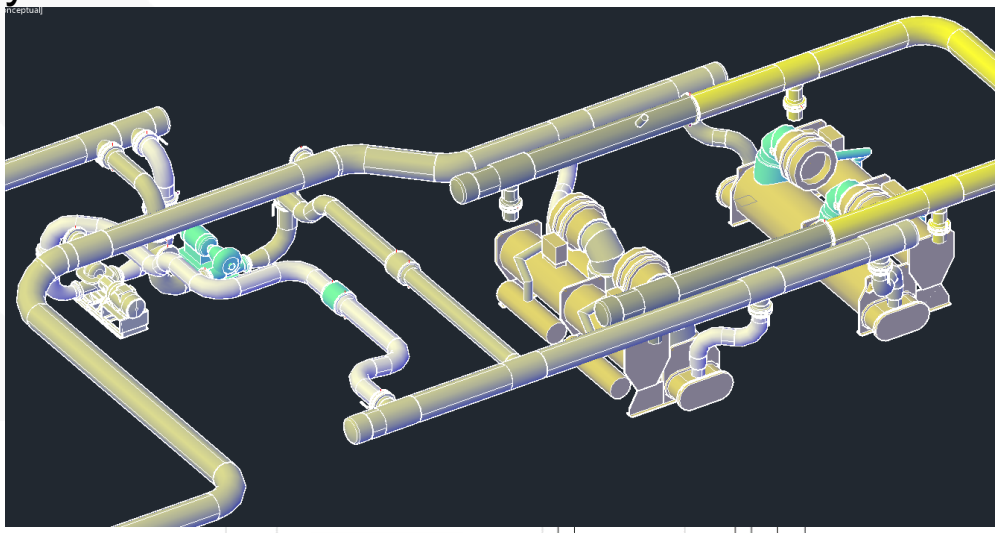
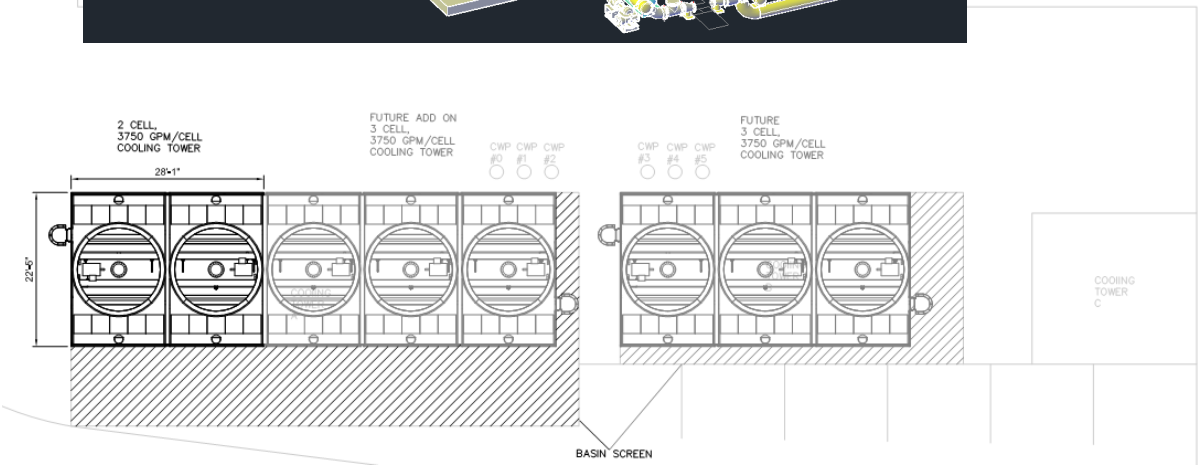
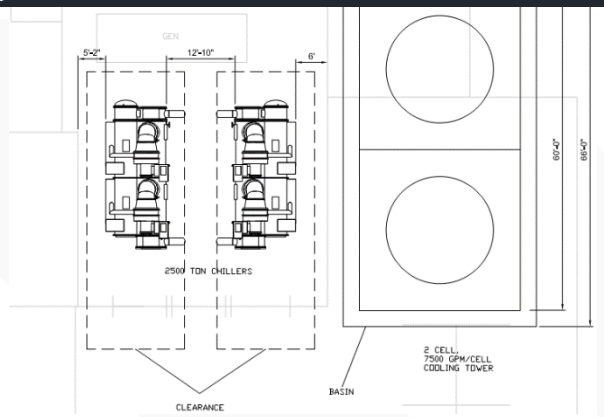
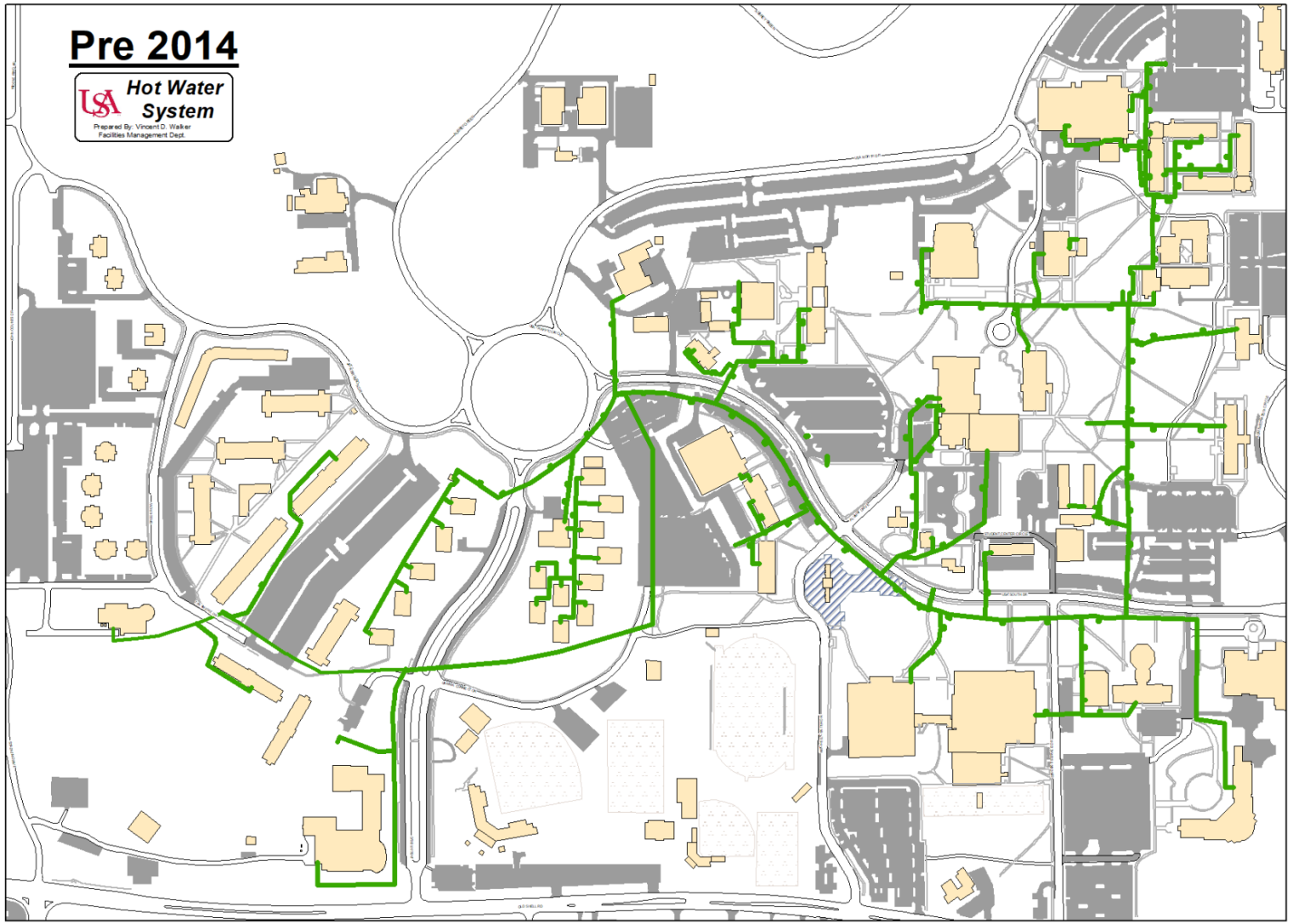








HOT WATER DISTRIBUTION PROJECTS



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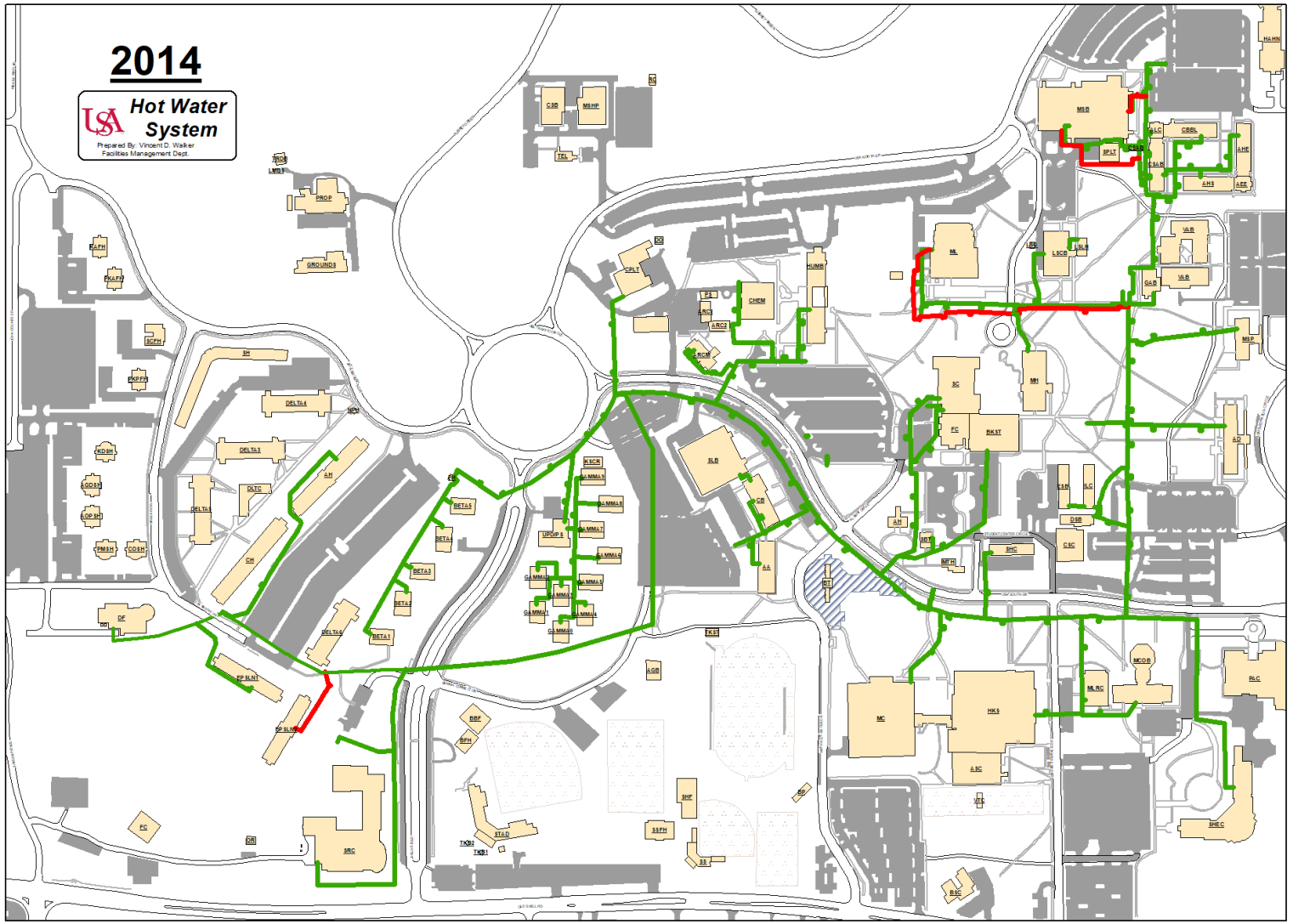

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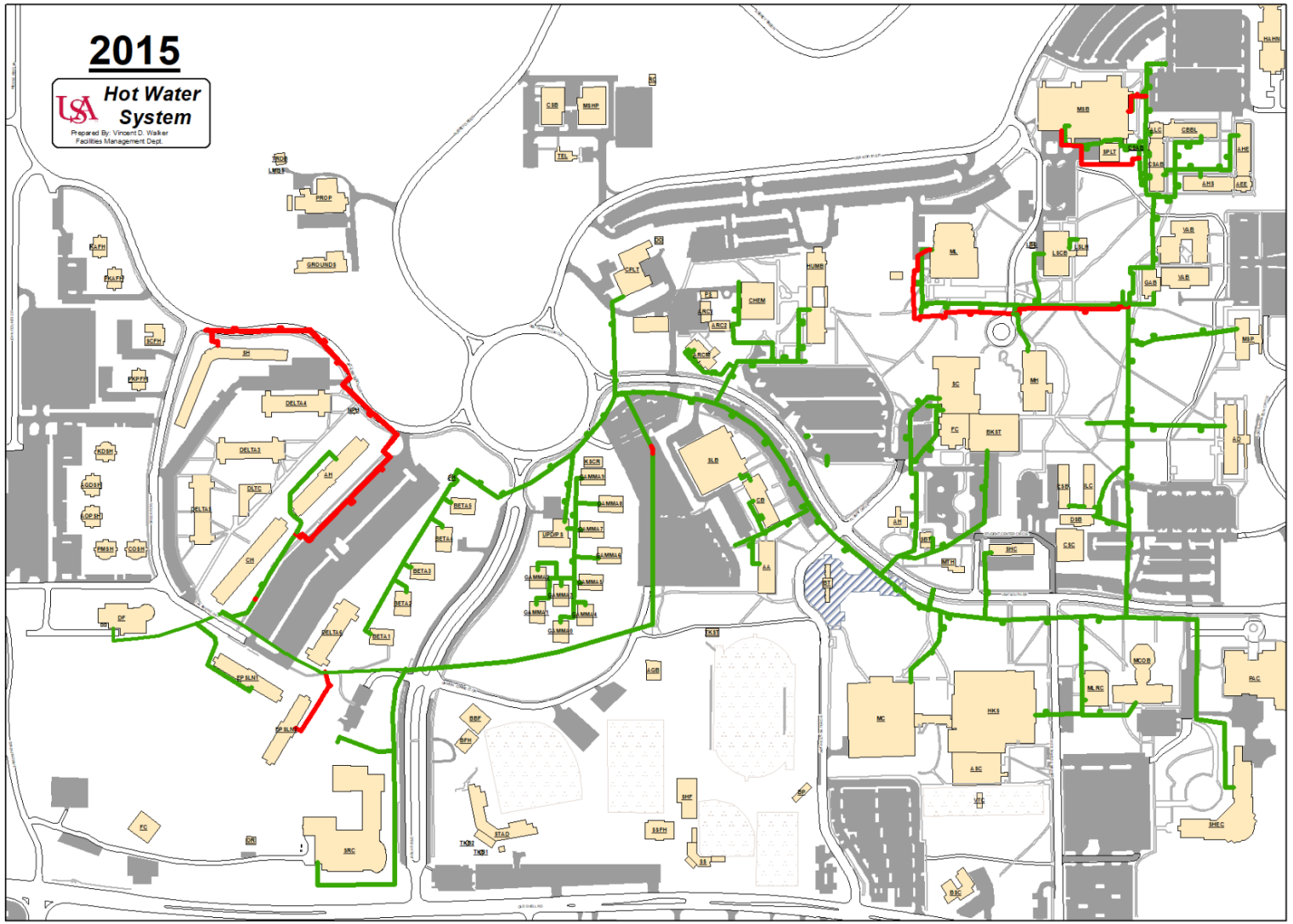

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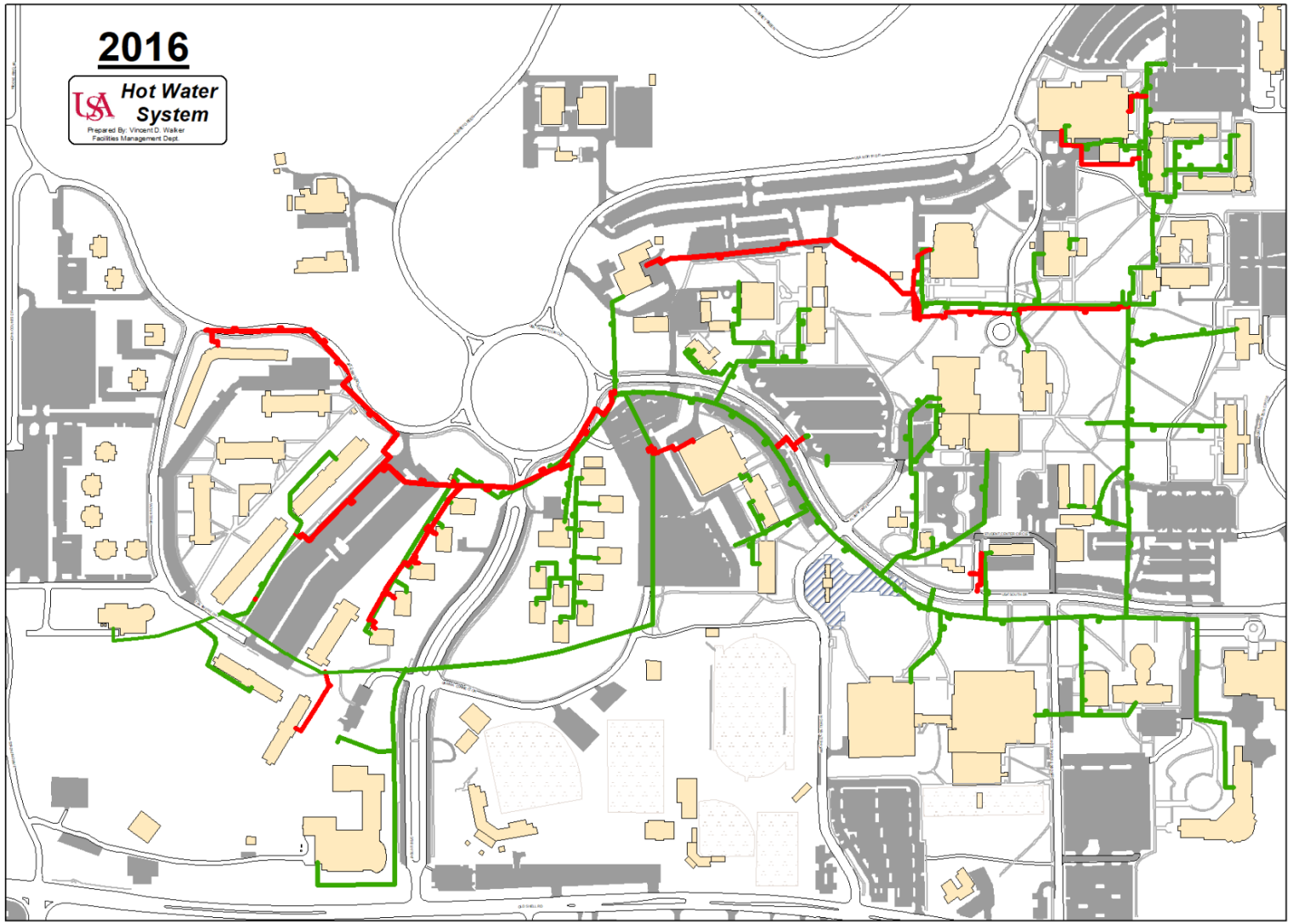

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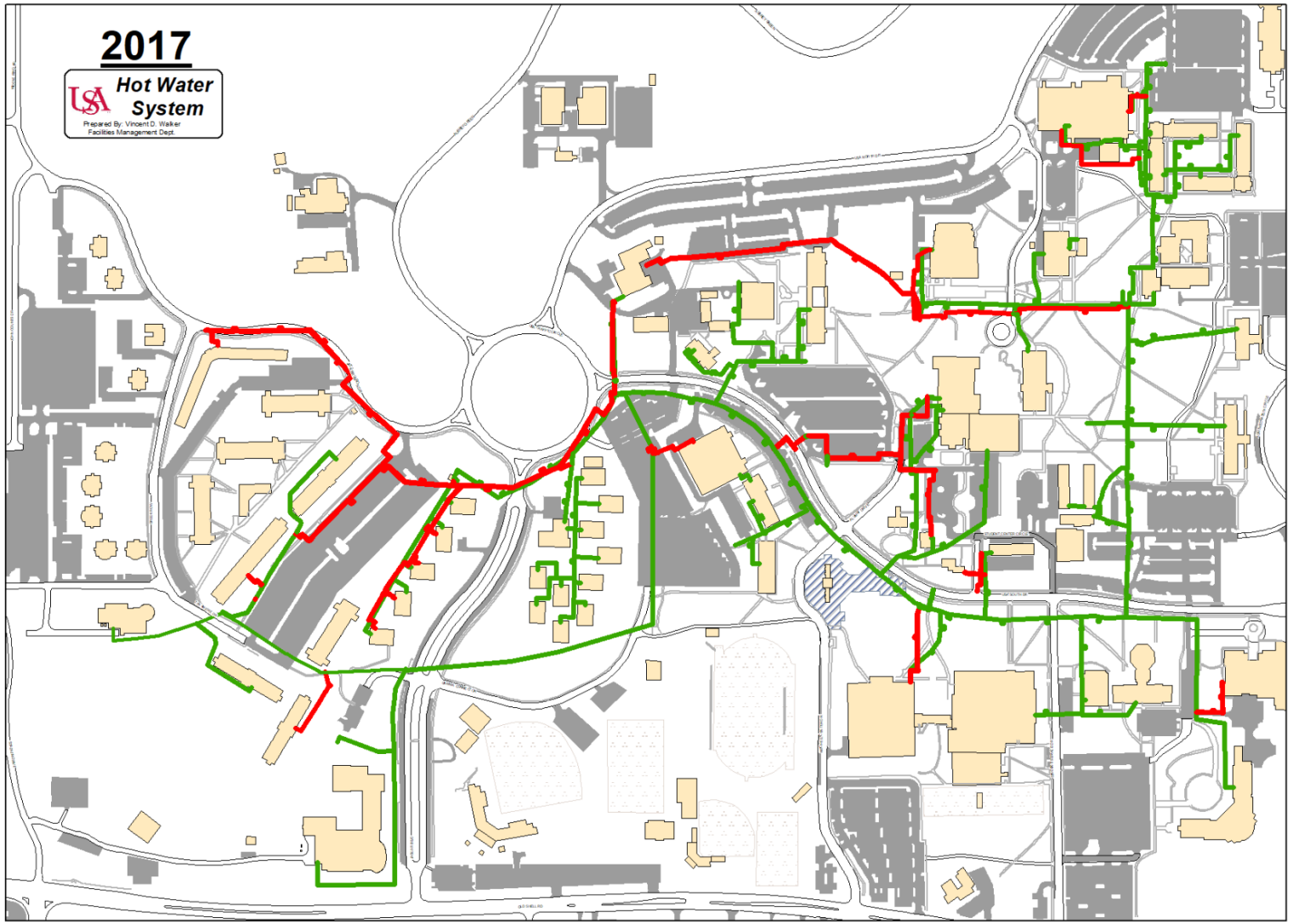

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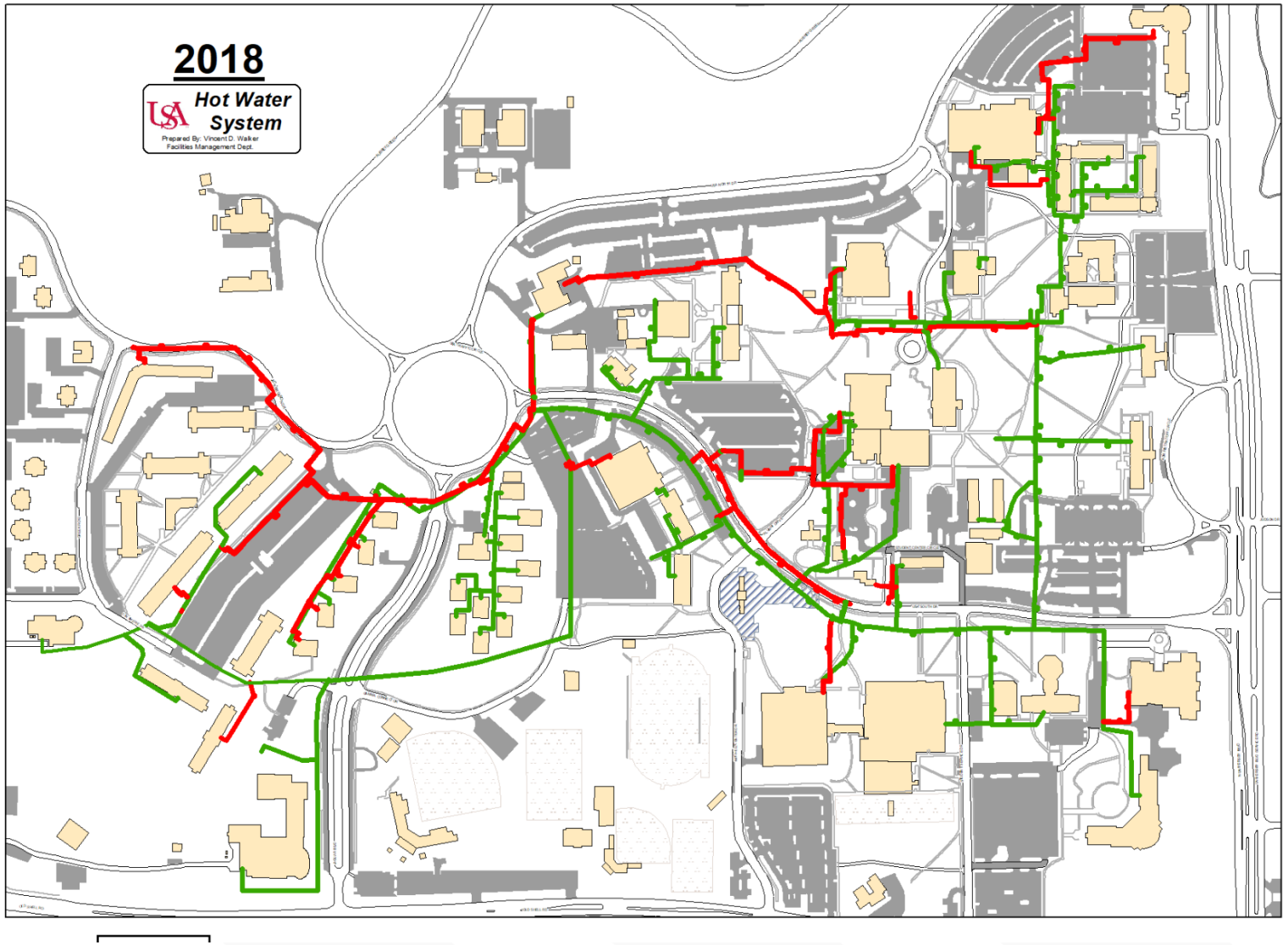

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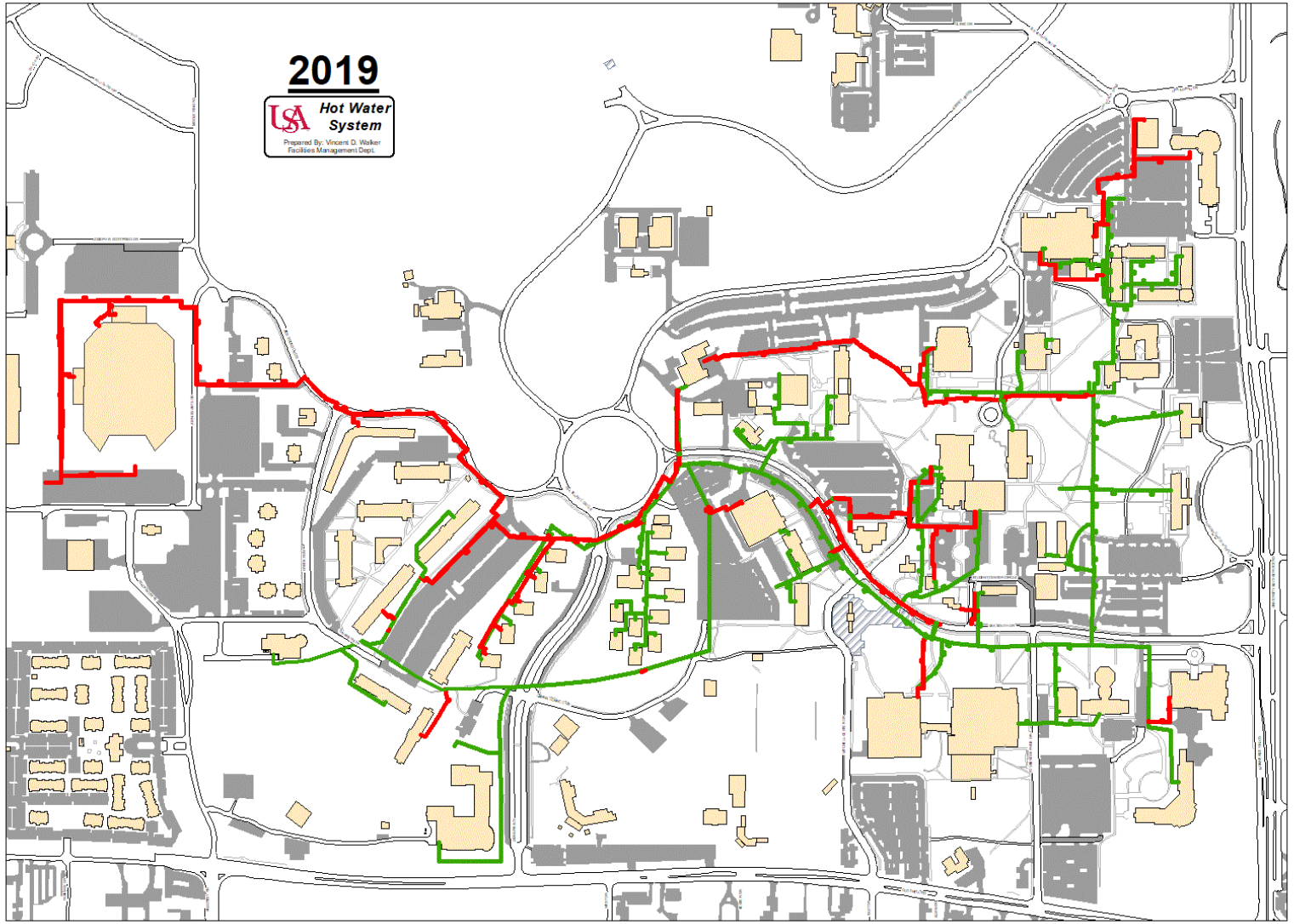

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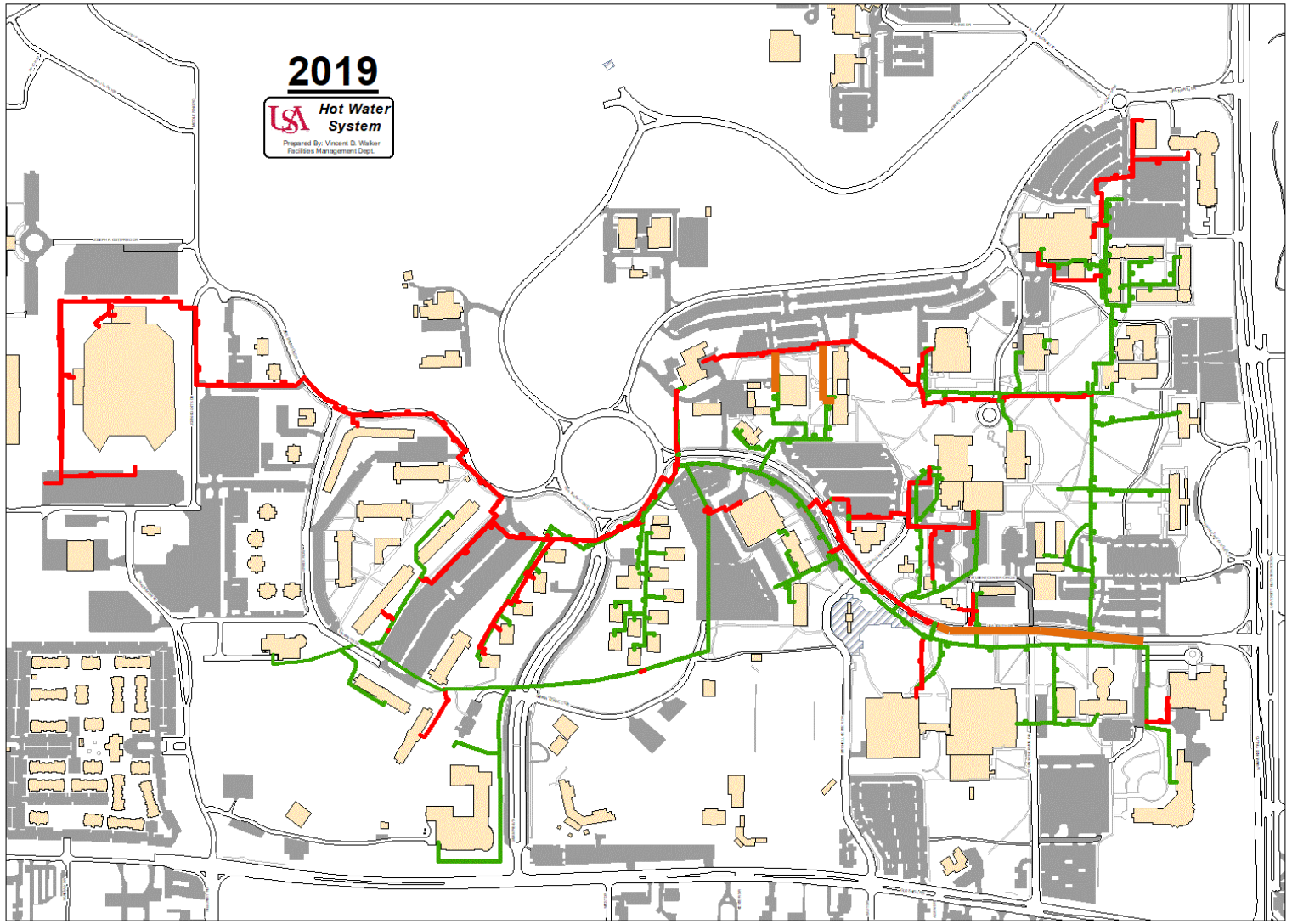

PROJECTS RECAP

- To date over 25 thermal utility repair and upgrade projects
- Increased chilled water plant efficiencies by:
  - Installing **2 x 2,500 ton** chillers with VFDs
  - **8 x 1,250** cooling tower with VFDs
  - Updated controls system/sequencing
- Installed **700 hp** hot water boiler
- Replaced or installed approximately **12,000 TF** of new hot water distribution piping
- Replaced of installed approximately **5,000 TF** of new chilled water distribution piping

Questions?

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