

# Campus Wide Utility Replacement at UMass Boston

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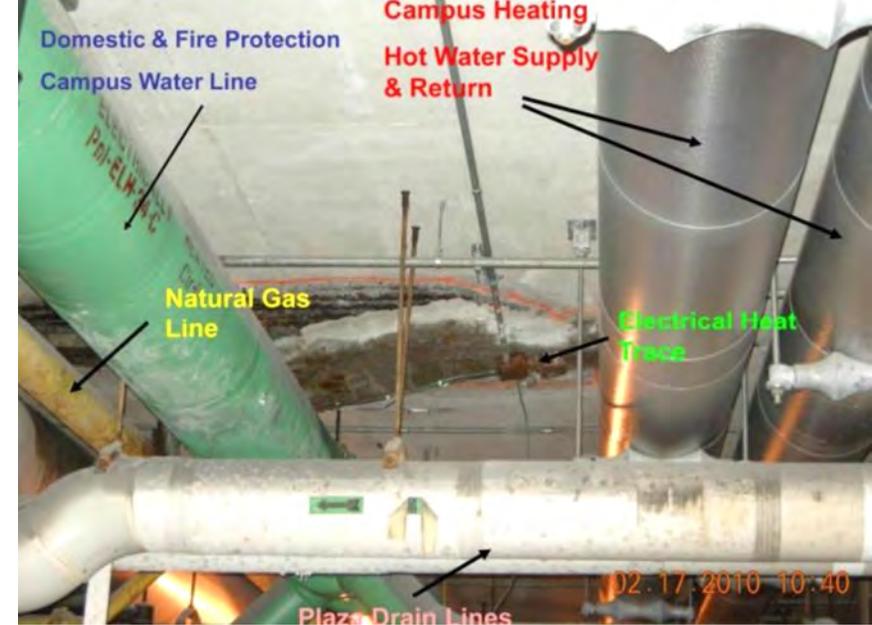


**INTERNATIONAL  
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# ENGINEERING/DESIGN CHALLENGE

## What Started it All

- Warnings in Substructure
- The Precipitating Event
- Interim Stabilization
- Safe Access/Egress
- Keep Campus Up & Running



# ENGINEERING/DESIGN CHALLENGE

## The Vision of a Transformed Campus

- UMB Task Force: Strategic Plan & Goals
- Living Documents: Master Plan & 25-Year Framework

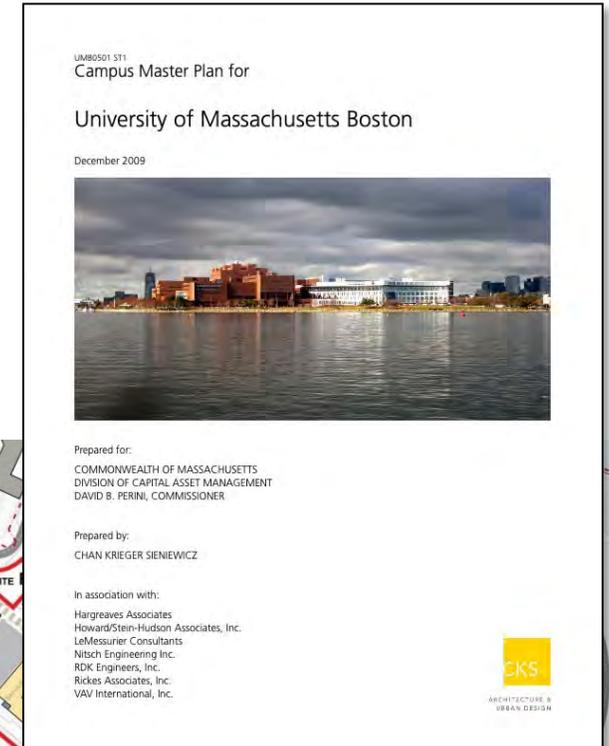
### Strategic Plan

Goal 1: Increase student access, engagement, and success

Goal 2: Attract, develop, and sustain highly effective faculty

Goal 3: Create a physical environment that supports teaching, learning, and research

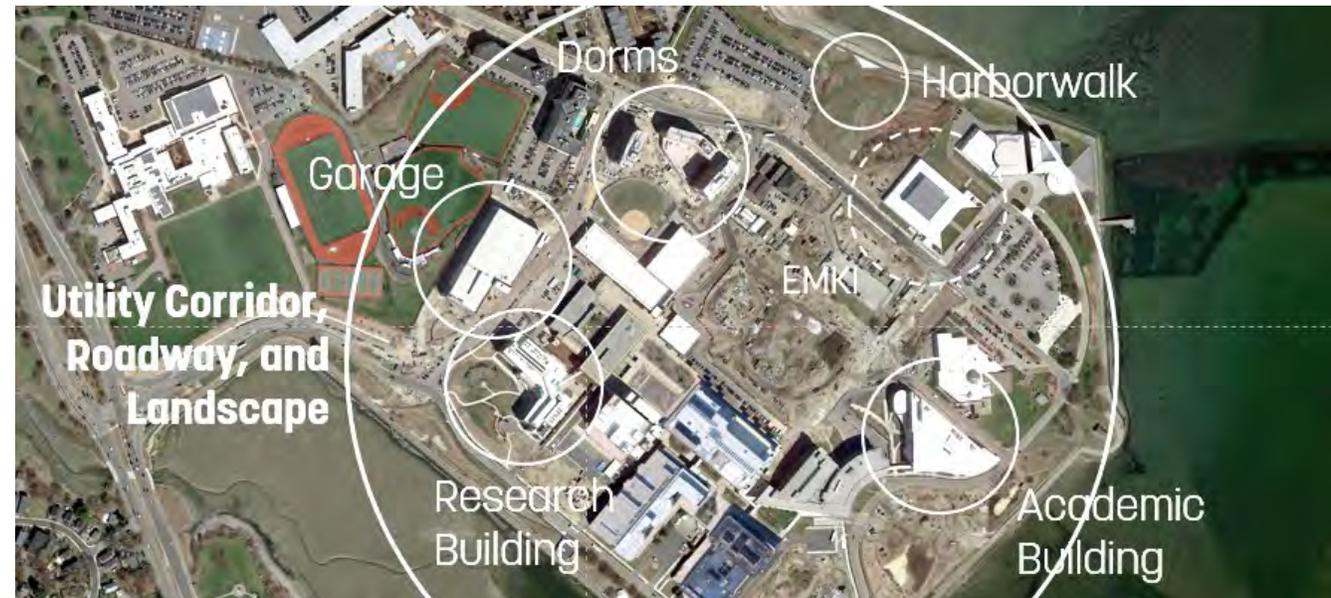
Goal 4: Enhance campus-community engagement through improved organizational structures



# ENGINEERING/DESIGN CHALLENGE

## Key Design Challenges

- Complexity
- Implementing the Master Plan
- Designing for a 77-Acre, Occupied Campus
- Underground Information, Site Contamination & Soil Management
- Connections to the Community
- Logistics – Scale, Campus & Construction

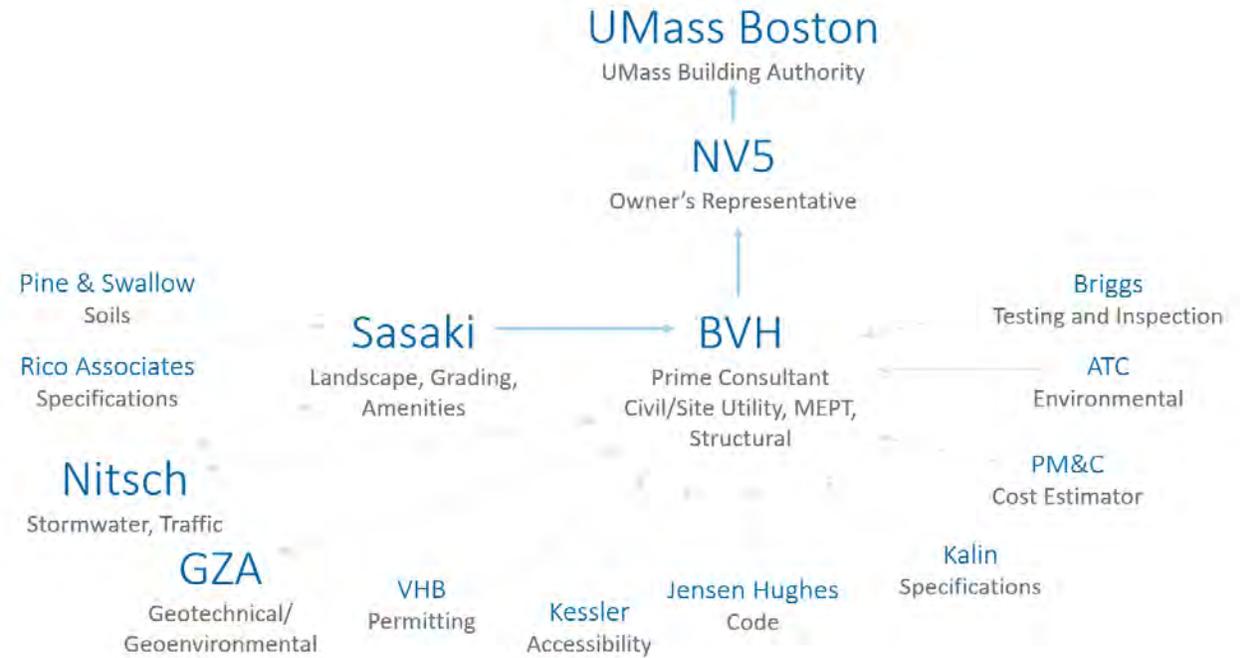


# ENGINEERING/DESIGN CHALLENGE

## Working with Existing Structure & Temporary Support



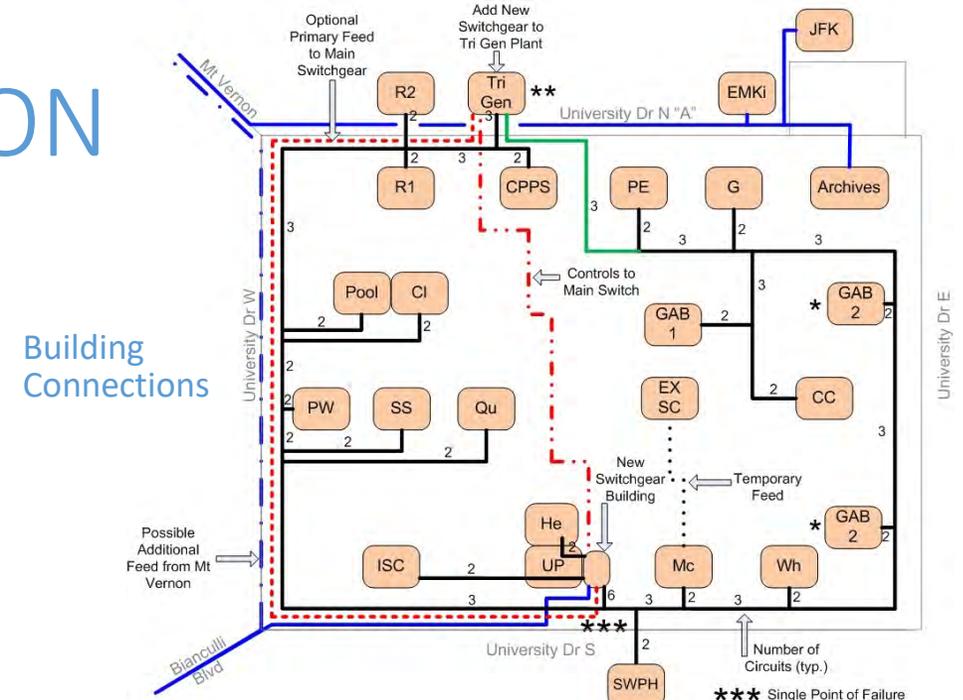
## Working with a Plethora of Specialized Firms



# ENGINEERING/DESIGN SOLUTION

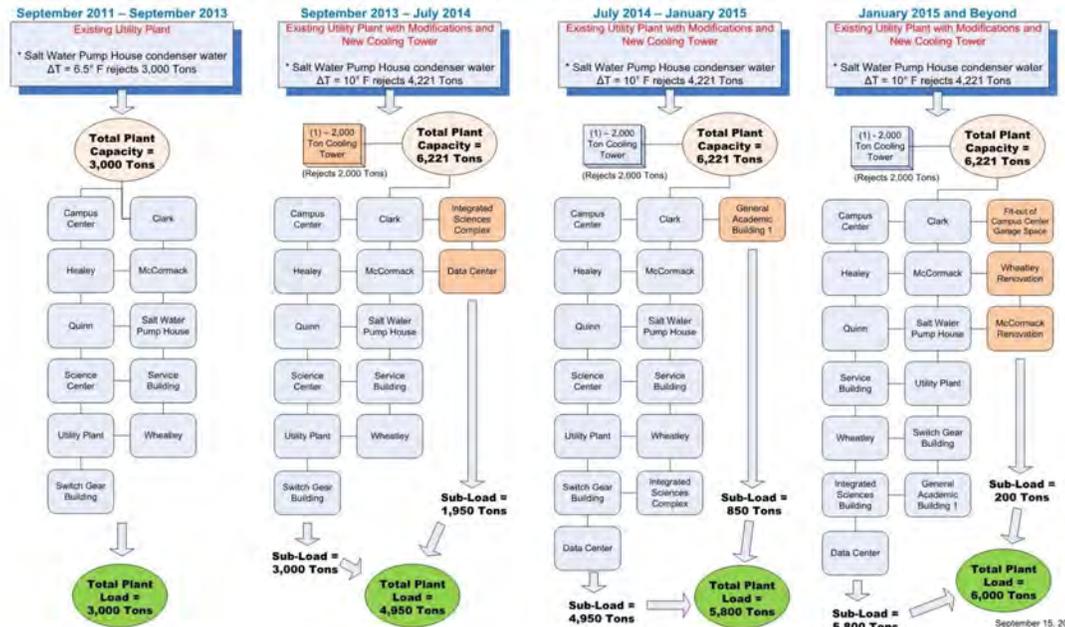
## Planning for the Future

- Capacity Analysis of Utility Plant
- Load Projection of the Master Plan
- Planning Utility Plant Upgrades & Sizing of Distribution System
- Continue Use of Seawater for Cooling Via the Saltwater Pump House
- Building Connections



## Chilled Water Requirements

Existing Utility Plant – 25 Year Master Plan



# ENGINEERING/DESIGN SOLUTION

## Design Approach

- Environmental Issues: Soil Borings & Soil Disposal/Reuse
- Utility Distribution & Resiliency
- Maintaining Heritage Landscapes
- Utility Support
- Stormwater Quality



# ENGINEERING/DESIGN SOLUTION

## Connections to Buildings & Planning for Future

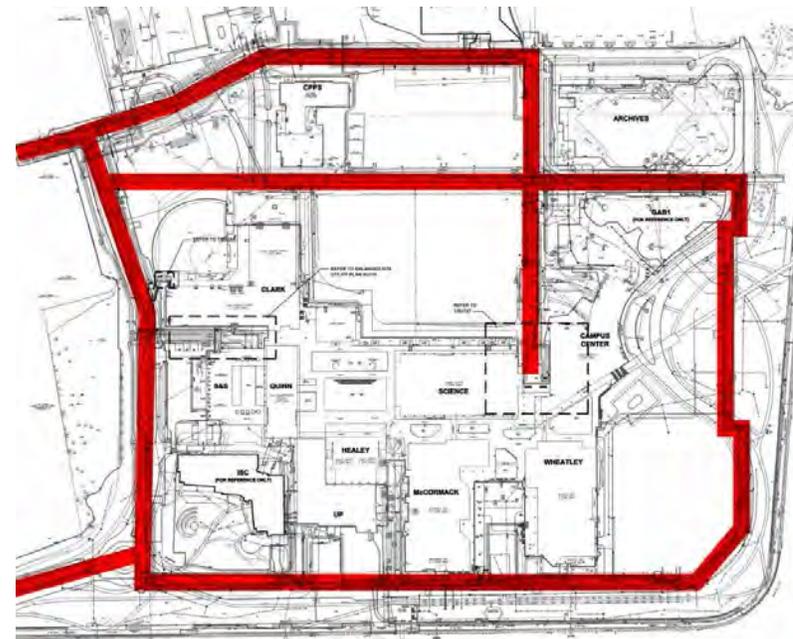
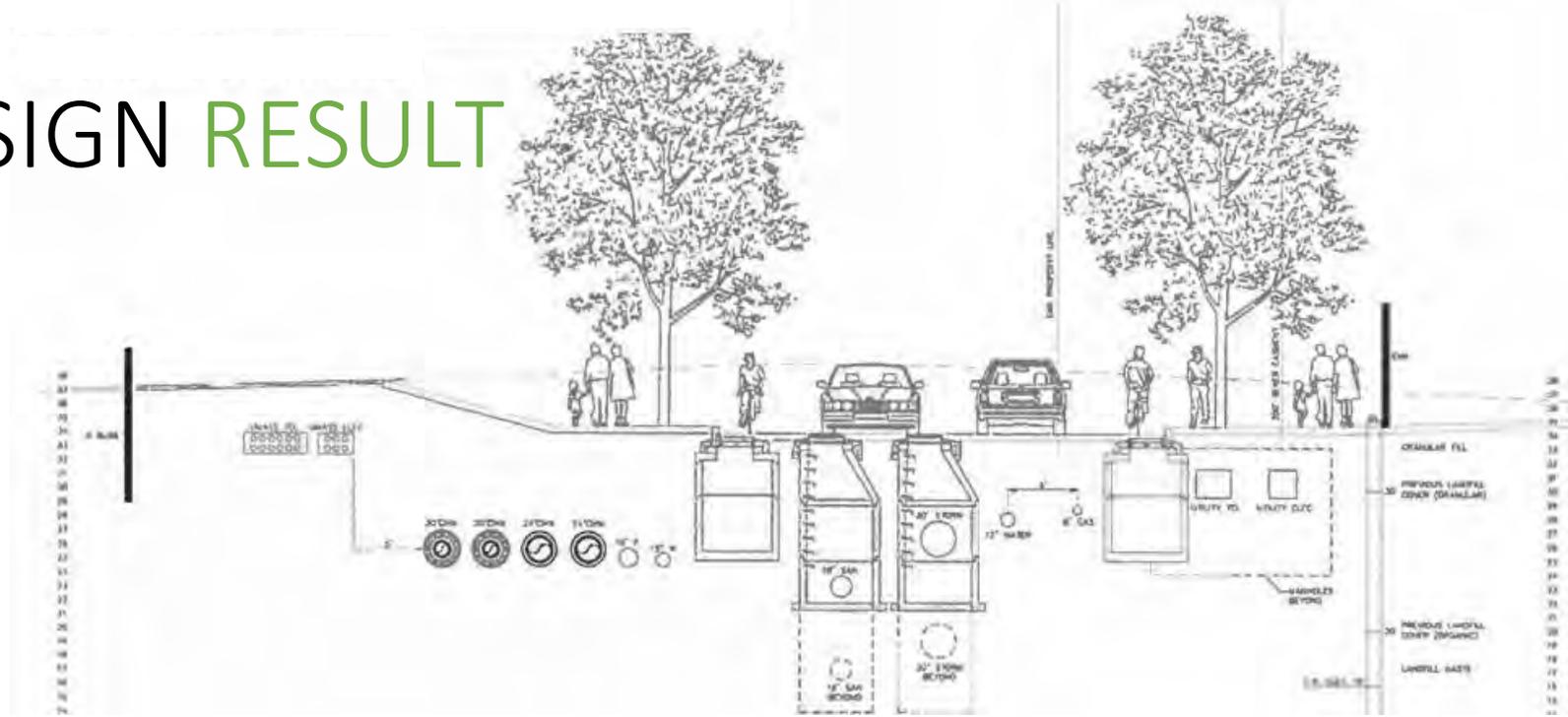
- Understanding existing building foundation systems
- Transitioning utilities between exterior & interior
- Intricacies of the Critical Points in the Distribution Network
- Vault Access for Personnel & Equipment



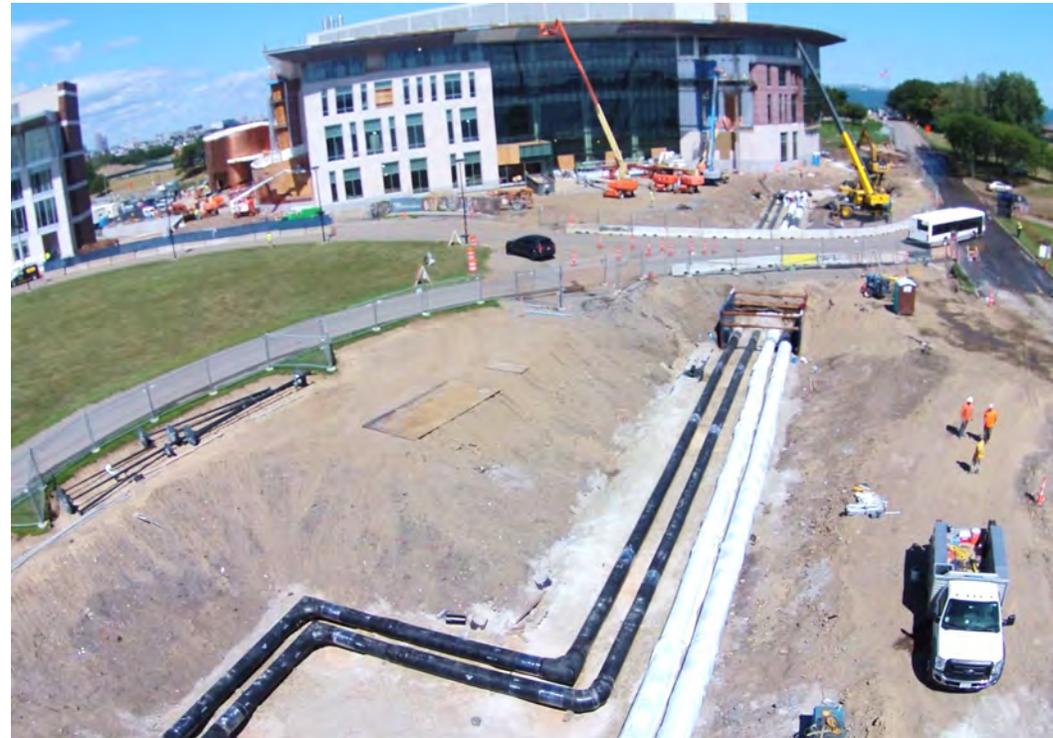
# ENGINEERING/DESIGN RESULT

## Project Outcomes

- 24+ Miles of Utilities
- Looped Hot Water, Chilled Water, Domestic Water, Fire Protection, Electric & Communications Systems
- Redundancy to Buildings
- Uniform Utility Corridor with Strategic Future Building Connection Points



# ENGINEERING/DESIGN RESULT



# ENGINEERING/DESIGN RESULT



# CONSTRUCTION CHALLENGES / SOLUTIONS



# PLANNING / CHALLENGES

Replacement of every utility on an operating campus including a complete reconfiguration of roadway system...without interruption

- Work Performed on a 24x7 – 365 Day a Year Operational Commuter Campus, With 3 Active Public Buildings
- Ensure Continuous Phasing, Sequencing, and Tie-In of Multiple Utility Installations With 10 Existing Campus Buildings
- Existing Conditions Exploration & Challenges
- Coordination With Multiple Simultaneous Campus Construction Projects
- Public Procurement



# SCOPE / CHALLENGES

Soil Management – 300,000 CY

Spoils Disposal – 85,000 CY (136,000 tons)

New Utility Plant Thermal Distribution Pumping

New Ring Electrical and Telcom Distribution

New Domestic and Fire Protection Services

15+ New Building Mechanical/Electrical Rooms



System	Quantity
HW S&R	16,500 LF
CW S&R	16,500 LF
Ductbank Conduit	209,300 LF
Site electric	24,800 LF
Water/FP	33,900 LF, 23 hydrants
Sanitary	4,100 LF, 24 manholes
Storm	15,100 LF, 62 catch basins
Thermal Vaults	8
Concrete paving	169,000 SF
Bituminous paving	63,000 SF
Rebar	249,000 lbs
Curb	34,000 LF
Trees	908
Lawn	1,170,000 SF

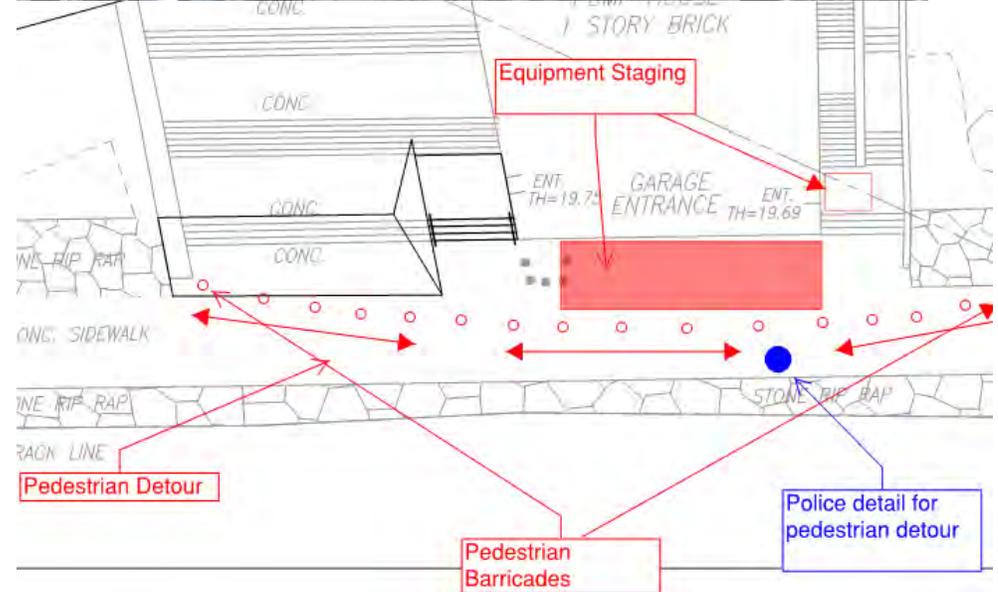
# PHASING / CHALLENGES

## Coordination with University

- New Campus Buildings Require Utilities
- 16,000 Students – Public Transit & Parking

## Campus Safety

- Impairments for Fire Protection Service and Emergency Response
- Roadway and Pedestrian Access changes – Isolate Construction
- Mitigation – Air Quality, Noise, Traffic Studies, Signage and Wayfinding



# PHASING / CHALLENGES

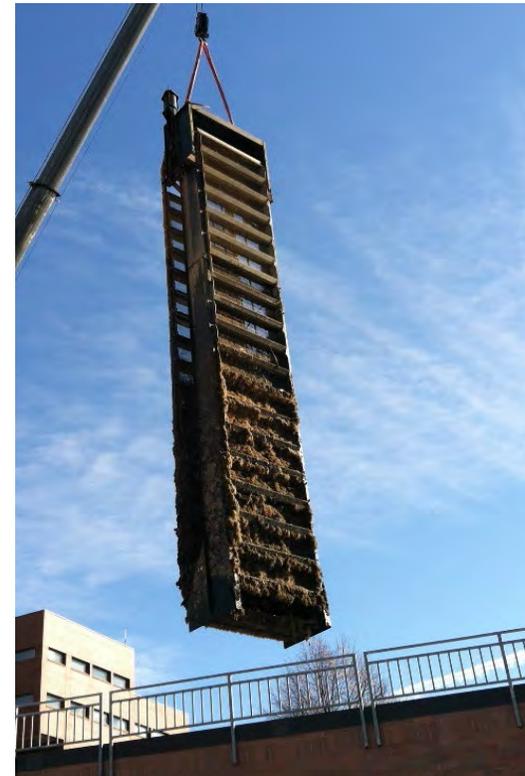
## Campus Impacts

- Maintain Existing Building Services
- 100+ System Cutovers Impacting all Utilities and Building Services
- Roadway Closures



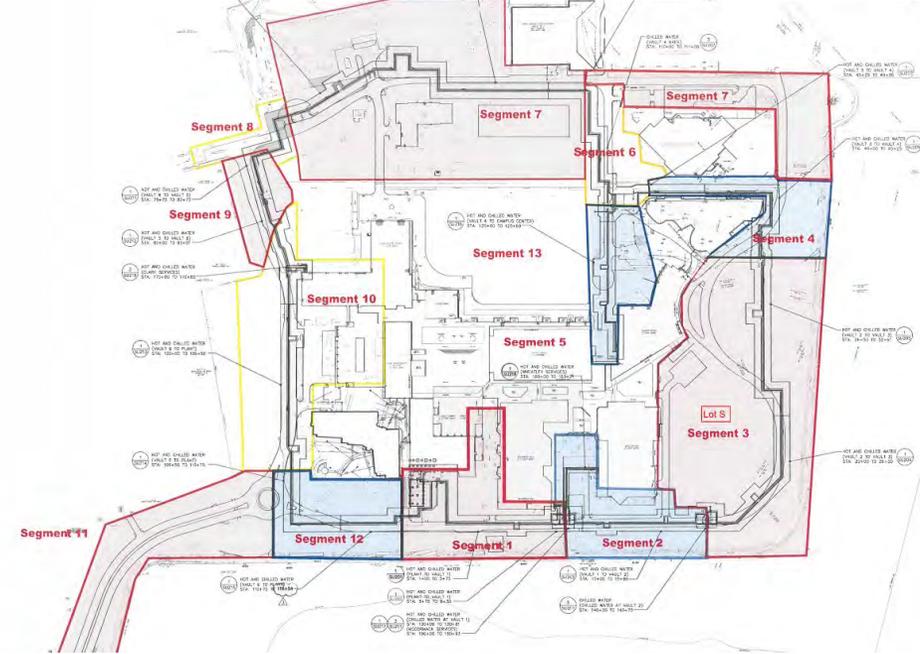
# CUP UPGRADE / CHALLENGES

- Replacement of Thermal Distribution Systems
- Seawater Pump House Renewal
- Additional Boiler/Chiller/Condenser Capacity Added By Parallel Project
- Interface With Plant Operations Staff Throughout Duration
- System Tie In Shutdowns - Line Stops
- New Construction Around Existing Operating Plant



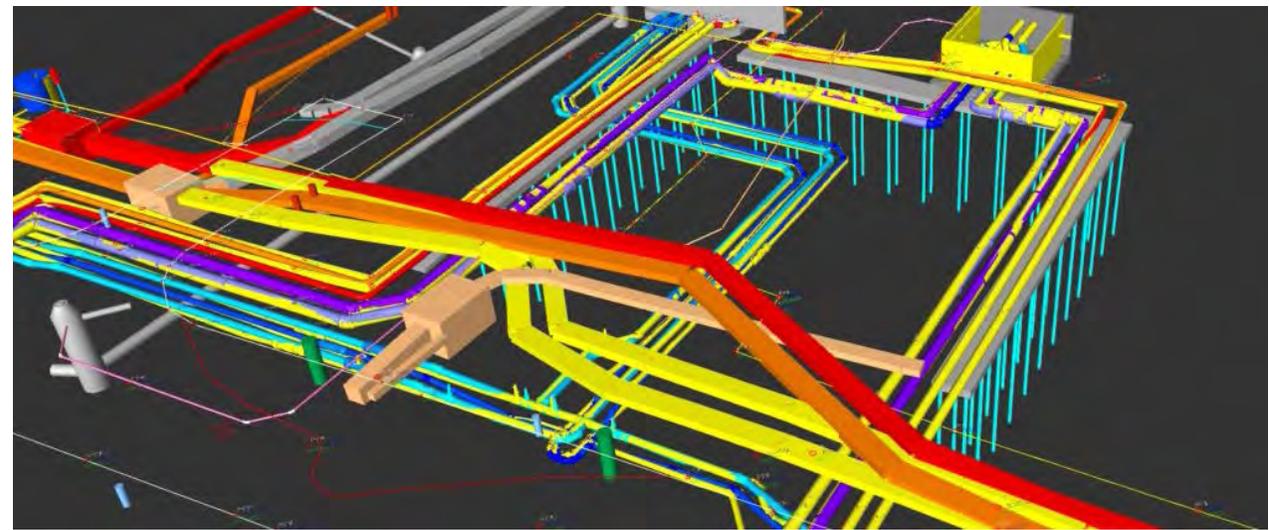
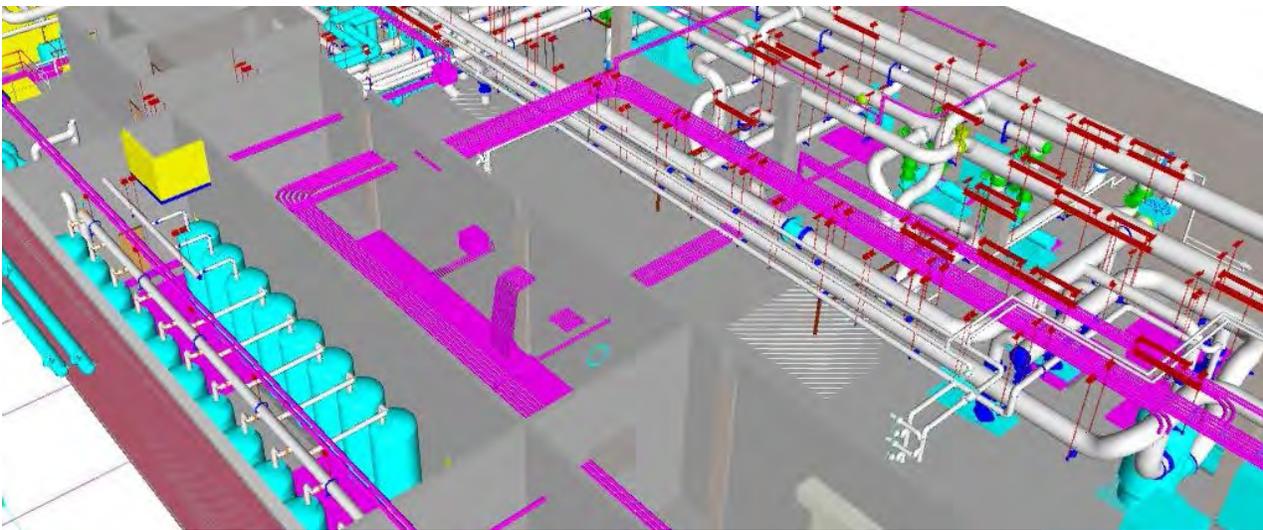
# PLANNING / SOLUTIONS

- Development of Detailed Phased Execution Plans
- Collaborative Review With University Stakeholders
- Traffic and Pedestrian Routing – Signage and Wayfinding
- Schedule & Contractor Scope Development
- Existing Conditions Investigations
- Underground Utilities Modeling
- Delivery Logistics
- Early and Often Public Utilities Engagement



# LASER SCANNING & MODELING / SOLUTIONS

- Enhanced Project Phasing
- Offsite/Onsite Prefabrication of Piping Sections
- Rig Path Analysis to Avoid Conflicts
- Utilization of In-House 3D BIM and Laser Scanning Services
- Document and Model Underground Piping
- Accurate As-Built Conditions



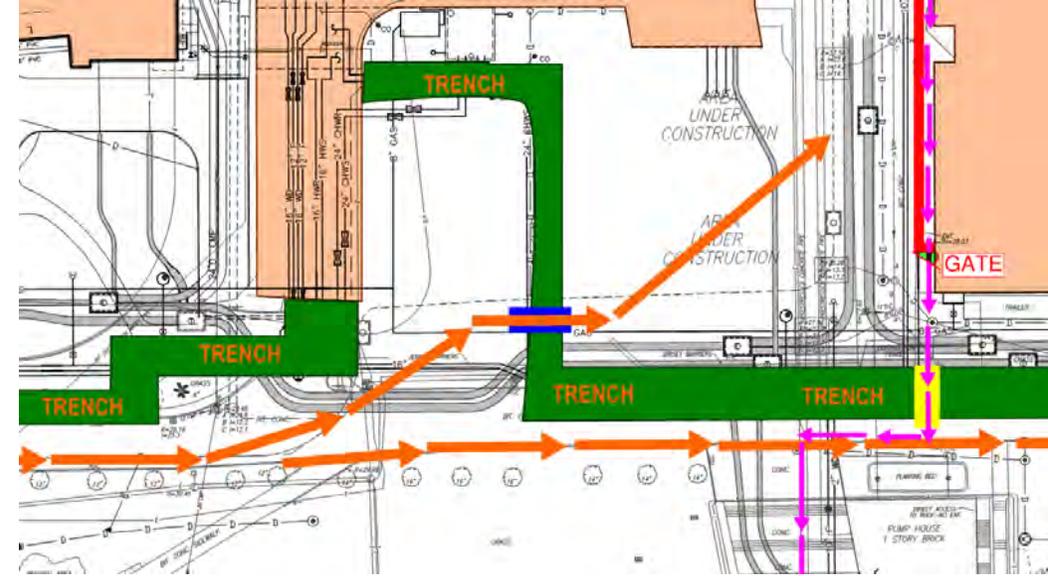
# PHASING/ SOLUTIONS

## QA/QC Requirements

- Full Project Team has 24/7 Access to Live Project Data
- Correct Issues Before the Formal Report Can Be Sent

## Safety Management

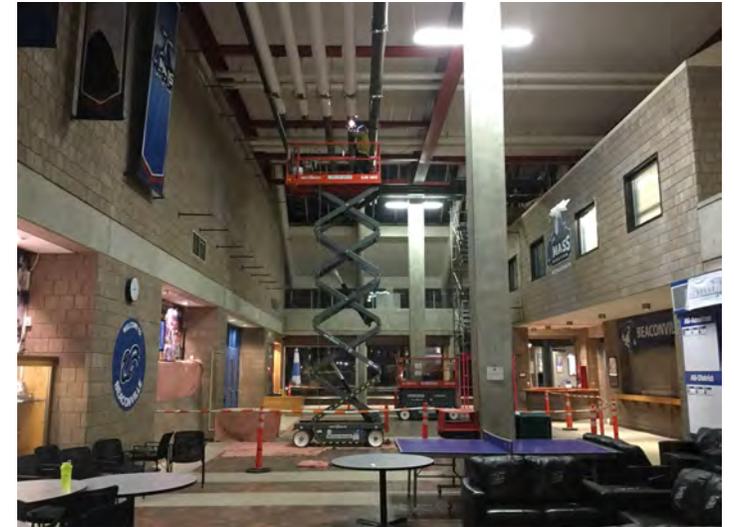
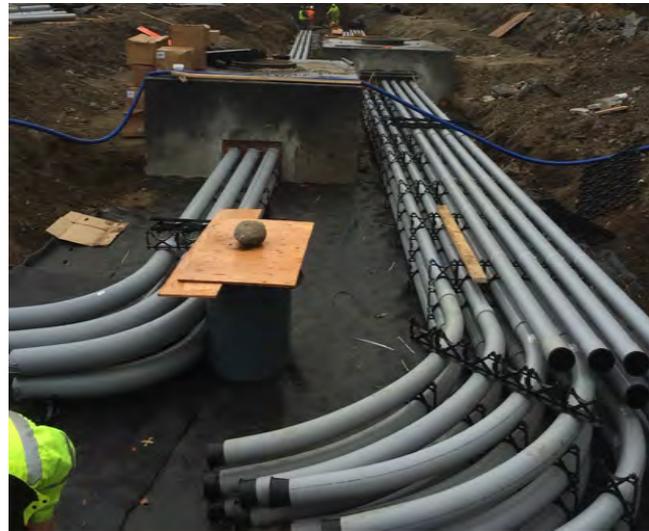
- Construction Updates to University Community
- Continuous Site Visits With Emergency Services
- Posted Wayfinding, Impairments
- Lock Out Tag Out



# PHASING/ SOLUTIONS

## Outage Mitigation

- Shutdowns Planned with University and User Groups
- Temporary Cold Storage, Spot Cooling
- Switching and Temporary Cross Connects Utilized



# CONSTRUCTION/ UNIQUE SOLUTIONS



- “Froth Flushing” – Flushing Water and Discharge Savings
- Soil Management
- SOE Solutions



- Full Closure UDdrive South
- Landforms For Excess Soils, Minimize Export and Import
- Temporary Chillers (3 x 500 ton)

# ENGINEERING/DESIGN RESULT

## Design Lessons Learned

- Dig Before You Design
- Geotechnical & Geoenvironmental Engineering are Vital
- Campus Logistics
- Consider How Underground Utilities are Supported
- Incorporating Utility Phasing is Crucial
- Stay Flexible



# Campus Wide Utility Replacement at UMass Boston

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