# Planning for the Future in a Changing Environment

**June 27, 2013**

**STATE OF NEW YORK PUBLIC HEALTH AND HEALTH PLANNING COUNCIL**
**Ad Hoc Advisory Committee on Environmental and Construction Standards**


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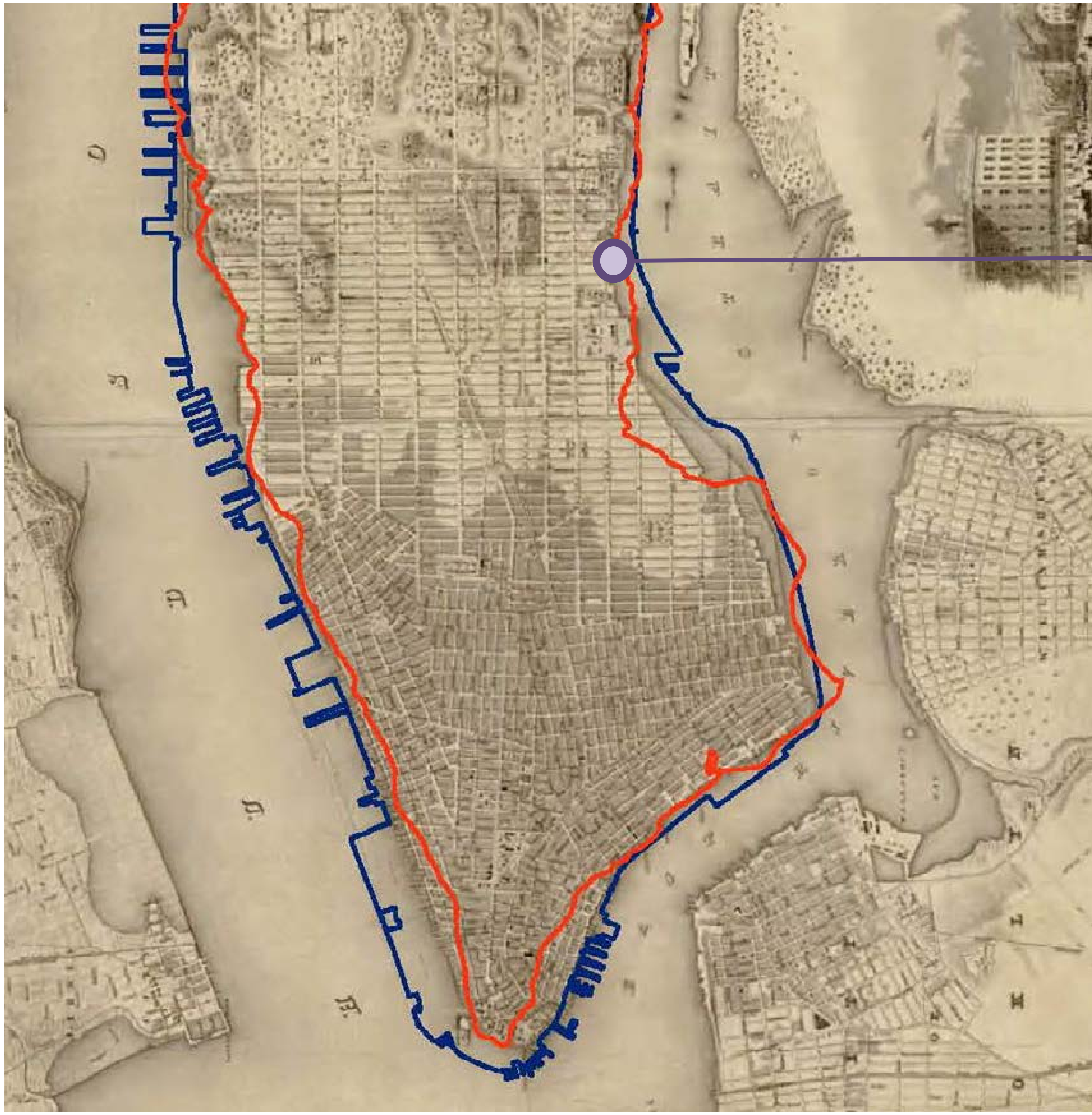
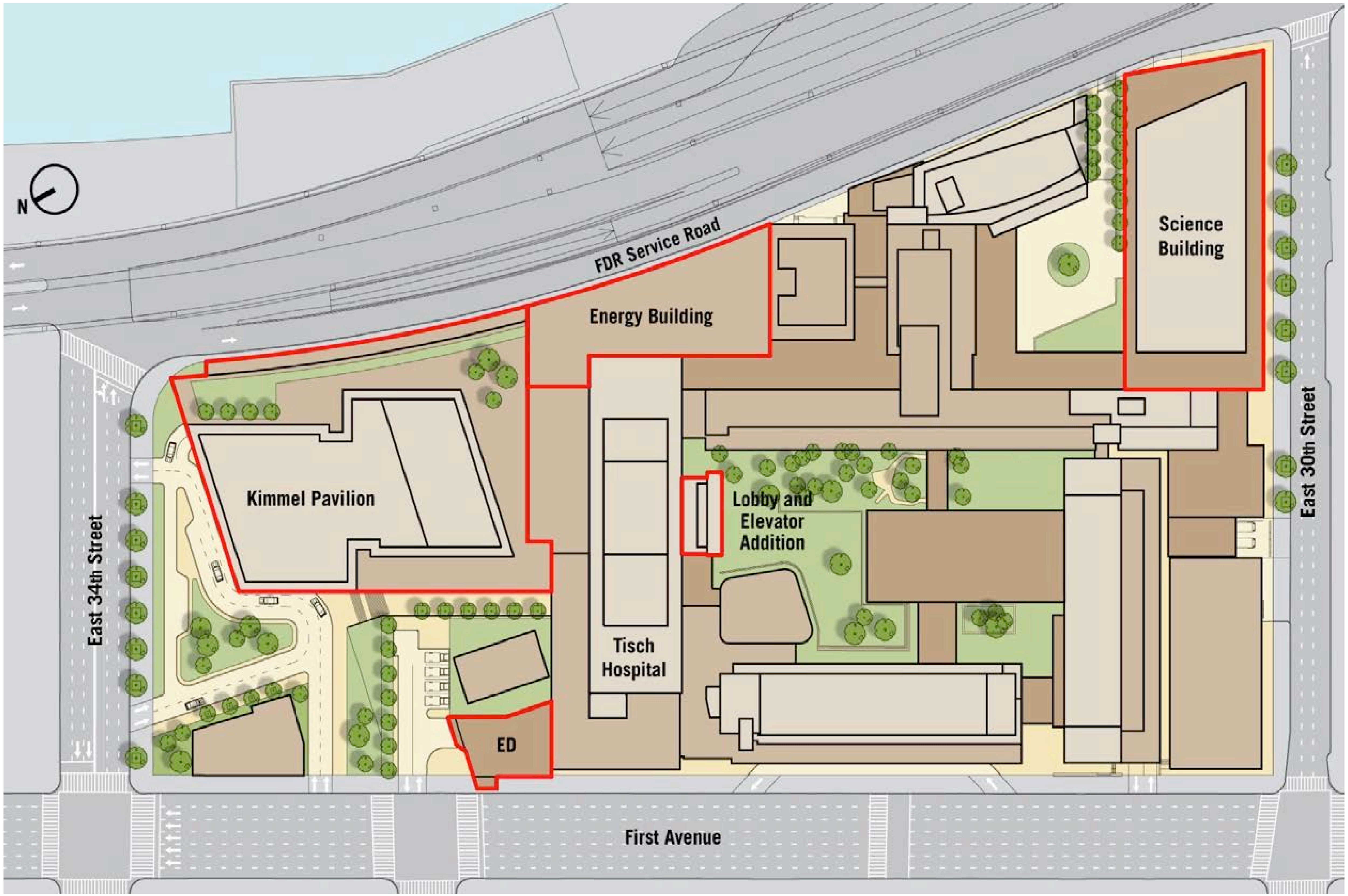
# Planning for the Future in a Changing Environments




NYU Langone MEDICAL CENTER

# CAMPUS TRANSFORMATION
## Site Plan

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# CAMPUS TRANSFORMATION
## Tisch Elevators and Lobby Expansion

Four new passenger elevators

Expanded and renovated lobby

Family space, conference and consult rooms on the inpatient floors

Electrical and IT risers

**STATUS: Complete**

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# CAMPUS TRANSFORMATION
## Emergency Department


20,000 sf renovation, 3,400 sf new construction

Separate ambulatory and ambulance entries

Dedicated pediatric experience

28 exam/treatment positions

Trauma/resuscitation room & 3 advanced triage rooms

Disposition Lounge w X-ray, ultrasound, and CT Scanner

**STATUS: In Construction**

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# CAMPUS TRANSFORMATION
# Energy Building


71,000 SF facility on FDR Drive, east of Tisch Hospital

8 MW Cogeneration Plant with standby boilers

7.5 MW Emergency Power Plant for Tisch Hospital and Energy Building

Campus High Tension Electric Service

Radiation Oncology

Loading dock facility

**STATUS: In Construction**

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# CAMPUS TRANSFORMATION
# Kimmel

800,000 SF clinical facility on 34th Street and 1st Avenue

32 ORs and procedure rooms, serving a mix of in- and outpatients

11 inpatient floors (374 beds) split about equally between acute and ICU

Single-bedded, same-handed rooms

Children's Hospital within a Hospital

Clean docks, materials management, and central sterile processing dept.

Public Spaces:

- Plaza & Lobby
- Roof Terrace and Café
- Conference Center

STATUS: Design Complete

# CAMPUS TRANSFORMATION
# Science Building

365,000 SF research facility on 30th Street and FDR Drive

12,000-14,000 cage central vivarium
3000 cage satellite vivarium

10 research floors

1 shared research core floor

Loading docks serving all campus vivaria.

Public Spaces:
- Lobby and access to Alumni Courtyard
- Roof Terrace and Cafeteria
- Conference Center

STATUS: In Design

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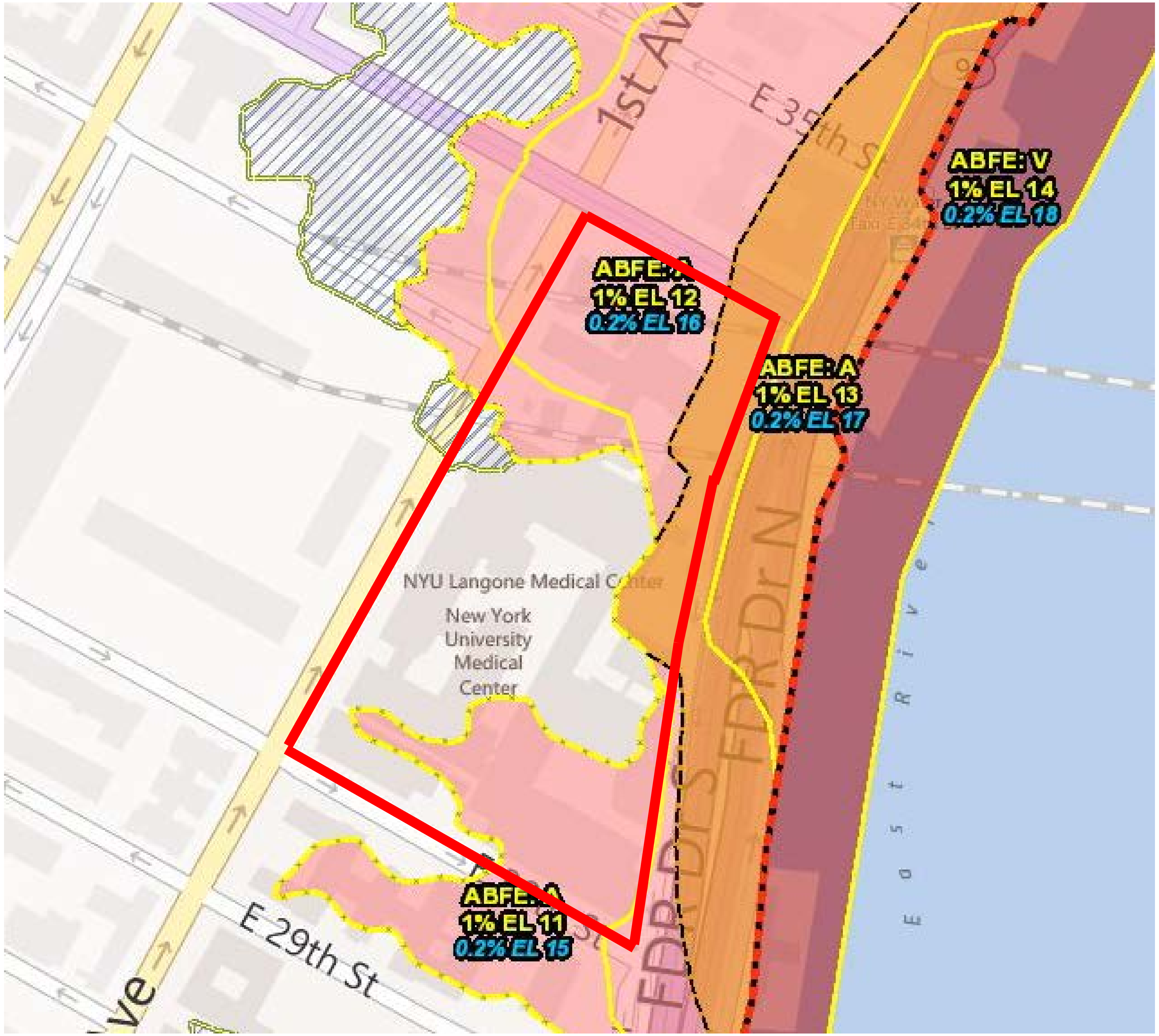
# SITE CONDITIONS

## FEMA Advisory Map




| FIRM ELEVATION (NAVD 88) | | PROJECT DATUM (BPMD) |
|---|---|---|
| 1% EL: | 8.9 | 7.25 |
| 0.2% EL: | 10.9 | 9.25 |

| ADVISORY BASE FLOOD ELEVATION (NAVD 88) | | PROJECT DATUM (BPMD) |
|---|---|---|
| 1% EL: | 12.0 | 10.35 |
| 0.2% EL: | 16.0 | 14.35 |

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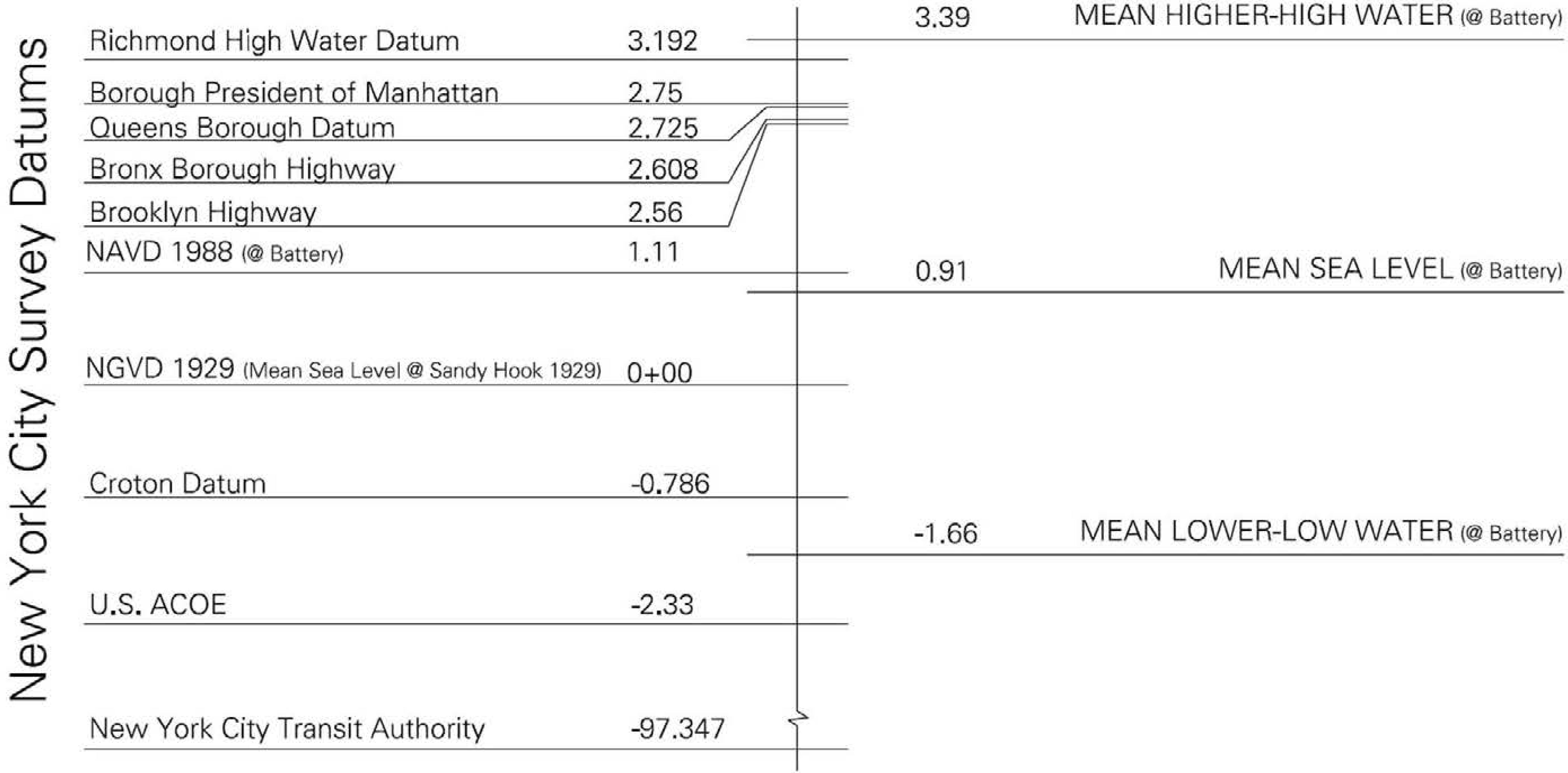
# SITE CONDITIONS
## Datum Conversion




***Approx. 14-foot Storm Surge at the Battery (MLLW) = 9.6' Manhattan Datum***

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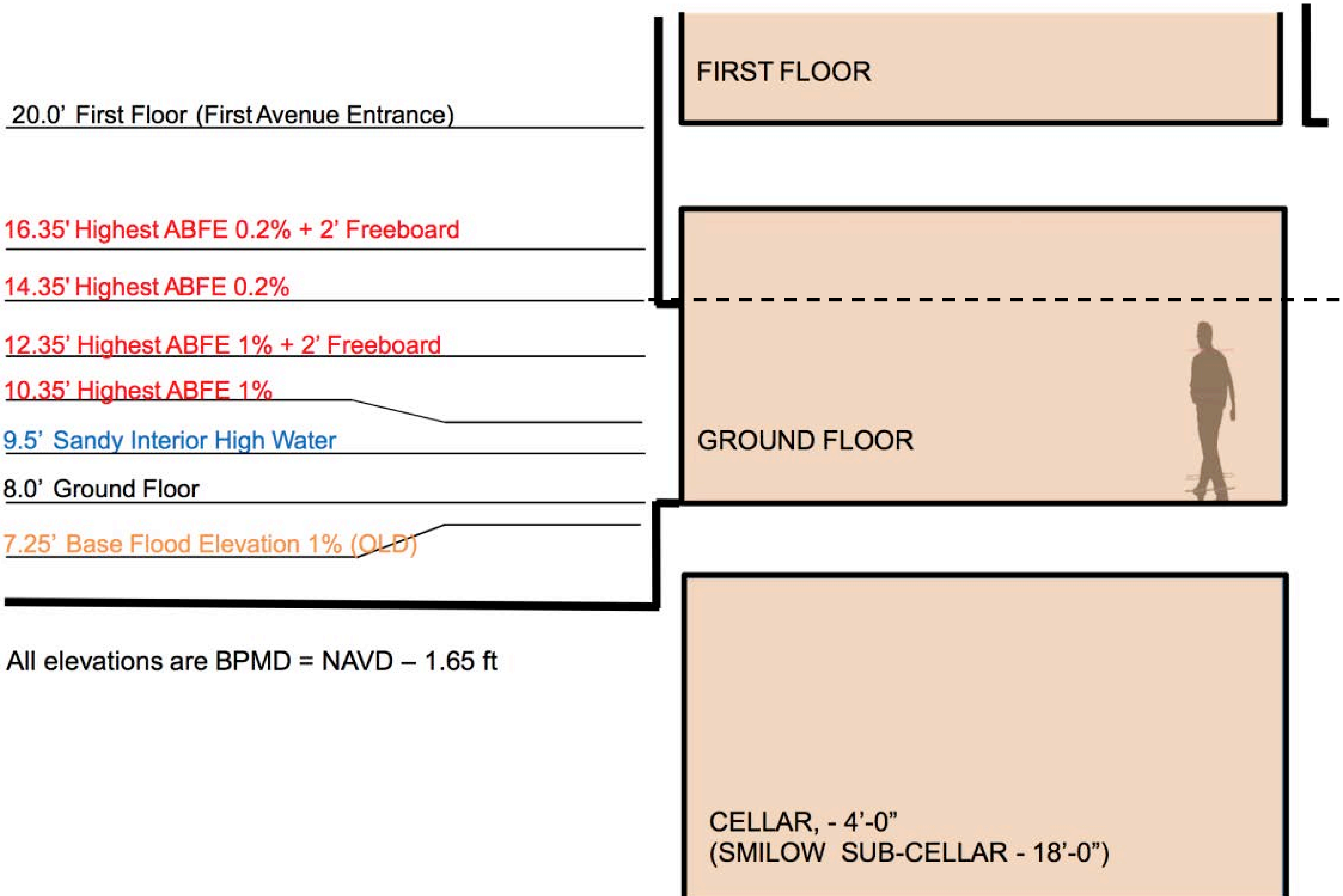
# SITE CONDITIONS

## Floor Elevations

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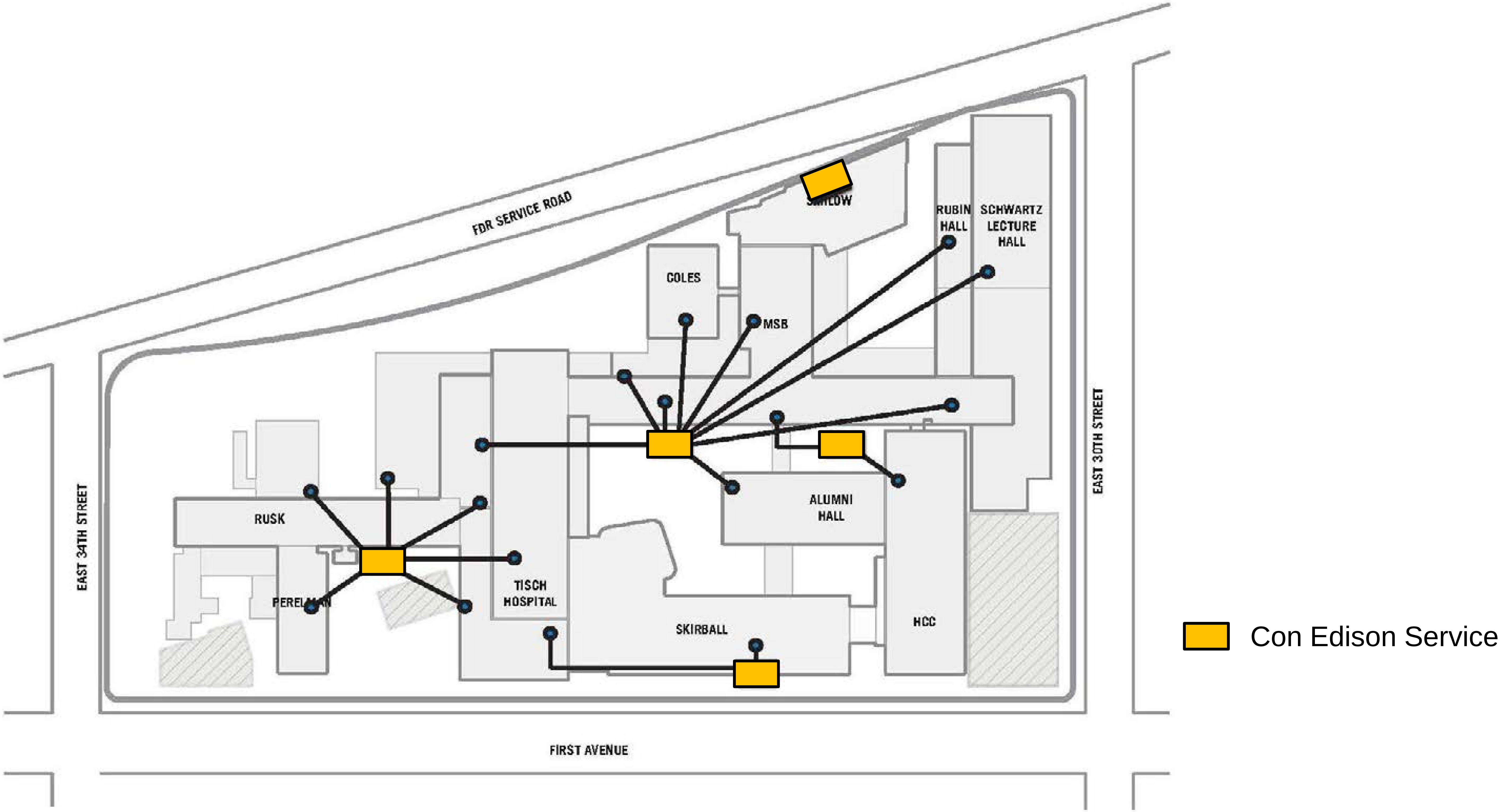
# CAMPUS RESILIENCY STRATEGIES

1. Cogeneration: On-site Heat and Power Generation
2. Enhance System Redundancy
3. Protect the Campus Perimeter
4. Elevate Critical Infrastructure
5. Relocate Critical Patient Care and Support Functions

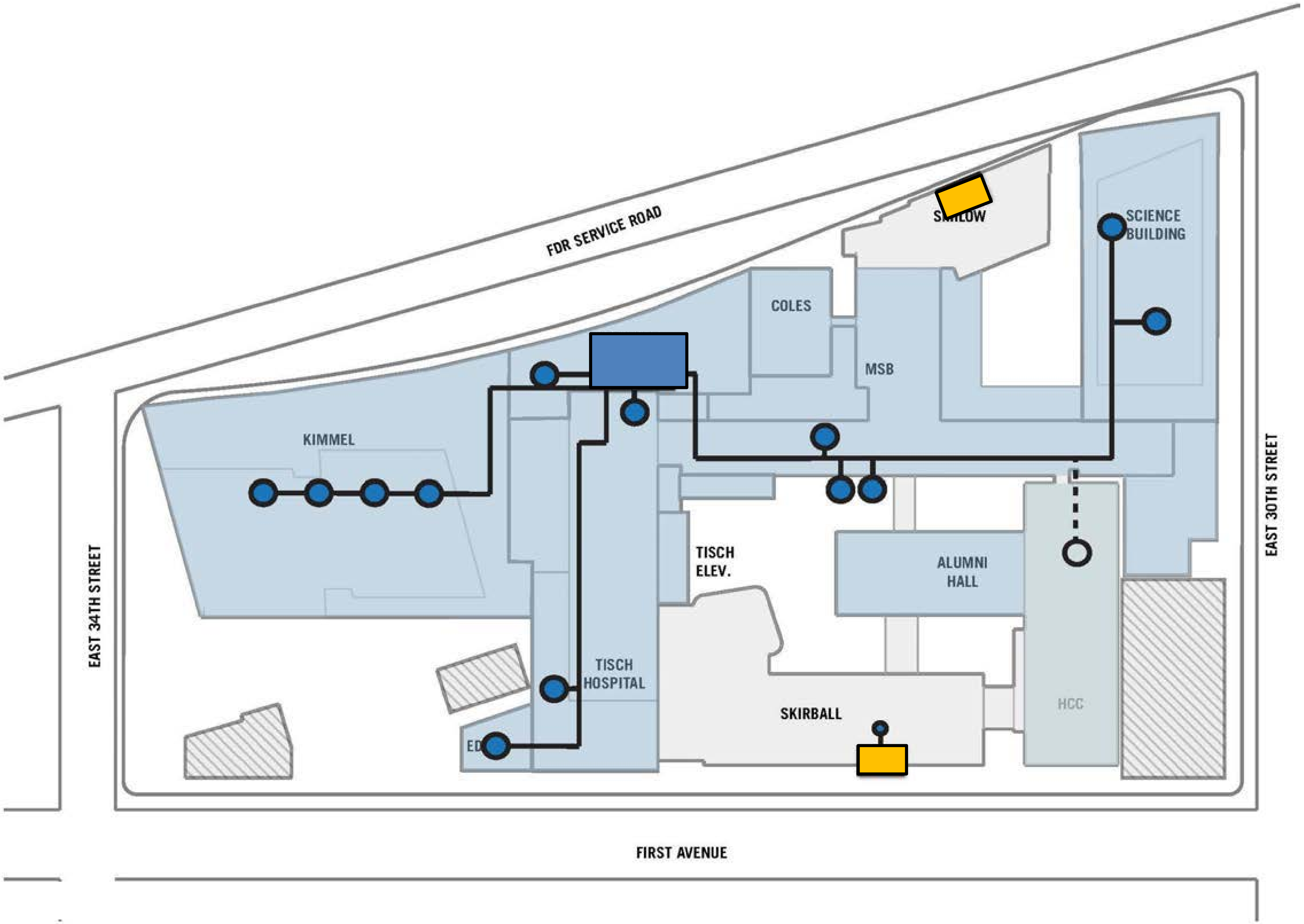
# 1. COGENERATION

## Existing Power Systems



# 1. COGENERATION

## Proposed Power Systems




- Natural gas is burned to generate 8 megawatts of power
- Can be run in "island mode" to serve all essential loads, including air-conditioning in patient areas
- Medium tension distribution across campus; transformers provided at each building
- Steam is generated as a bi-product to satisfy entire campus load
- Back-up boilers run on both gas and oil
- All components to be located above the DFE

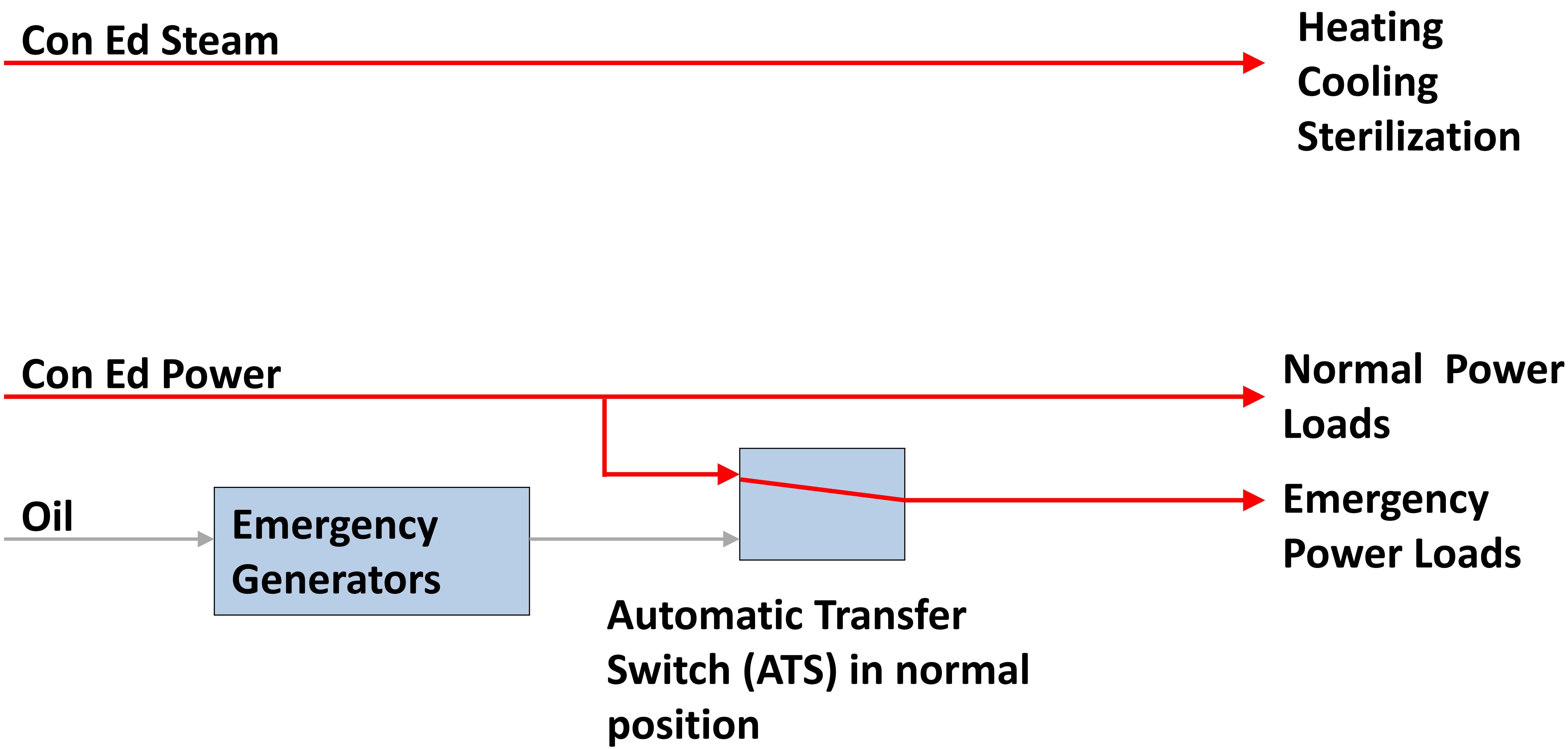
Cogeneration Plant

Sub-station

Con Edison Service

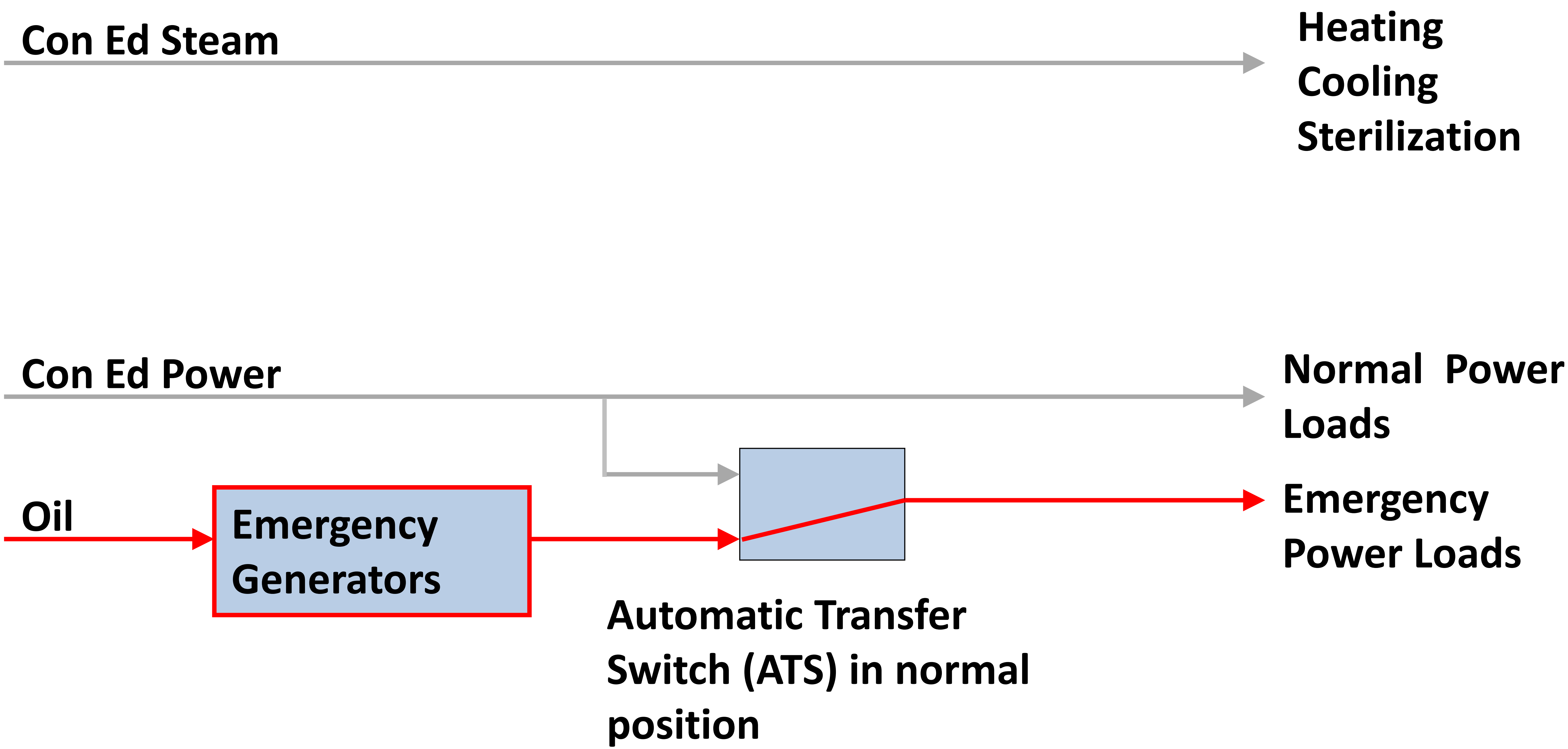
# 1. COGENERATION

## Existing Normal Mode



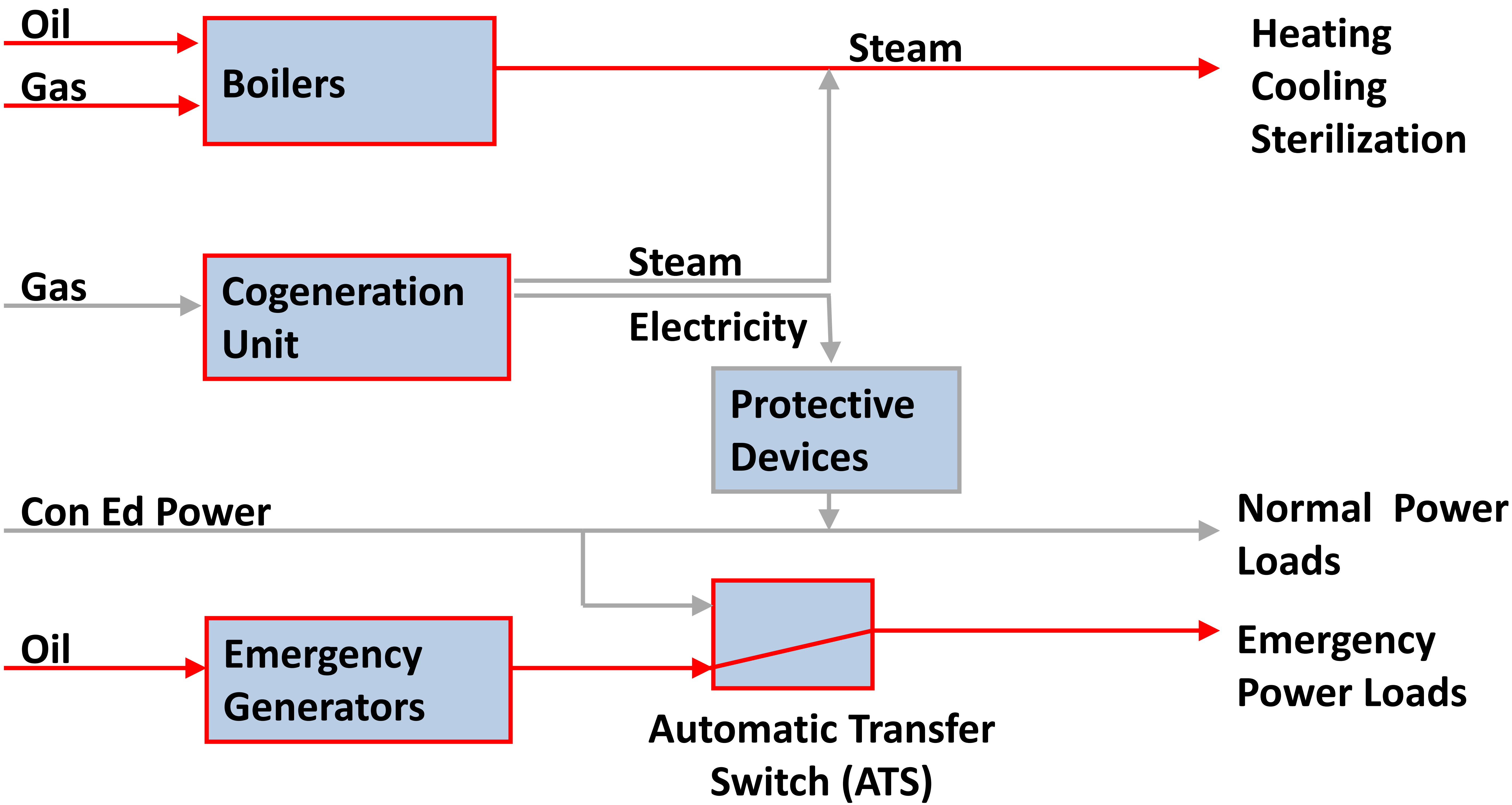
# 1. COGENERATION

## Existing Emergency Mode



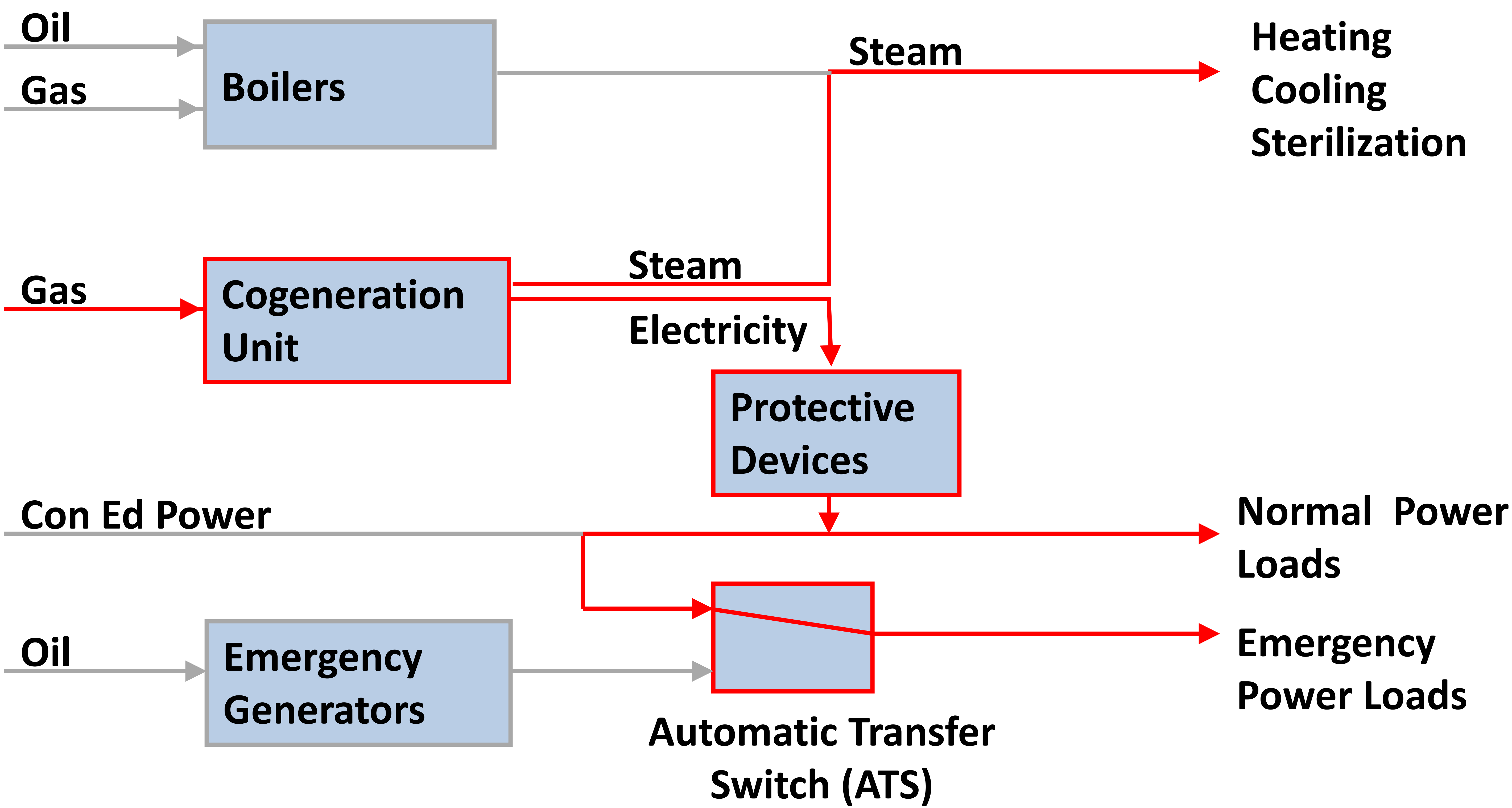
# 1. COGENERATION

## Planned Emergency Mode (Initial 1-3 hours)



# 1. COGENERATION

## Planned “Island Mode” (after 1-3 hours)



# CAMPUS RESILIENCY STRATEGIES

1. Cogeneration: On-site Heat and Power Generation
2. Enhance System Redundancy
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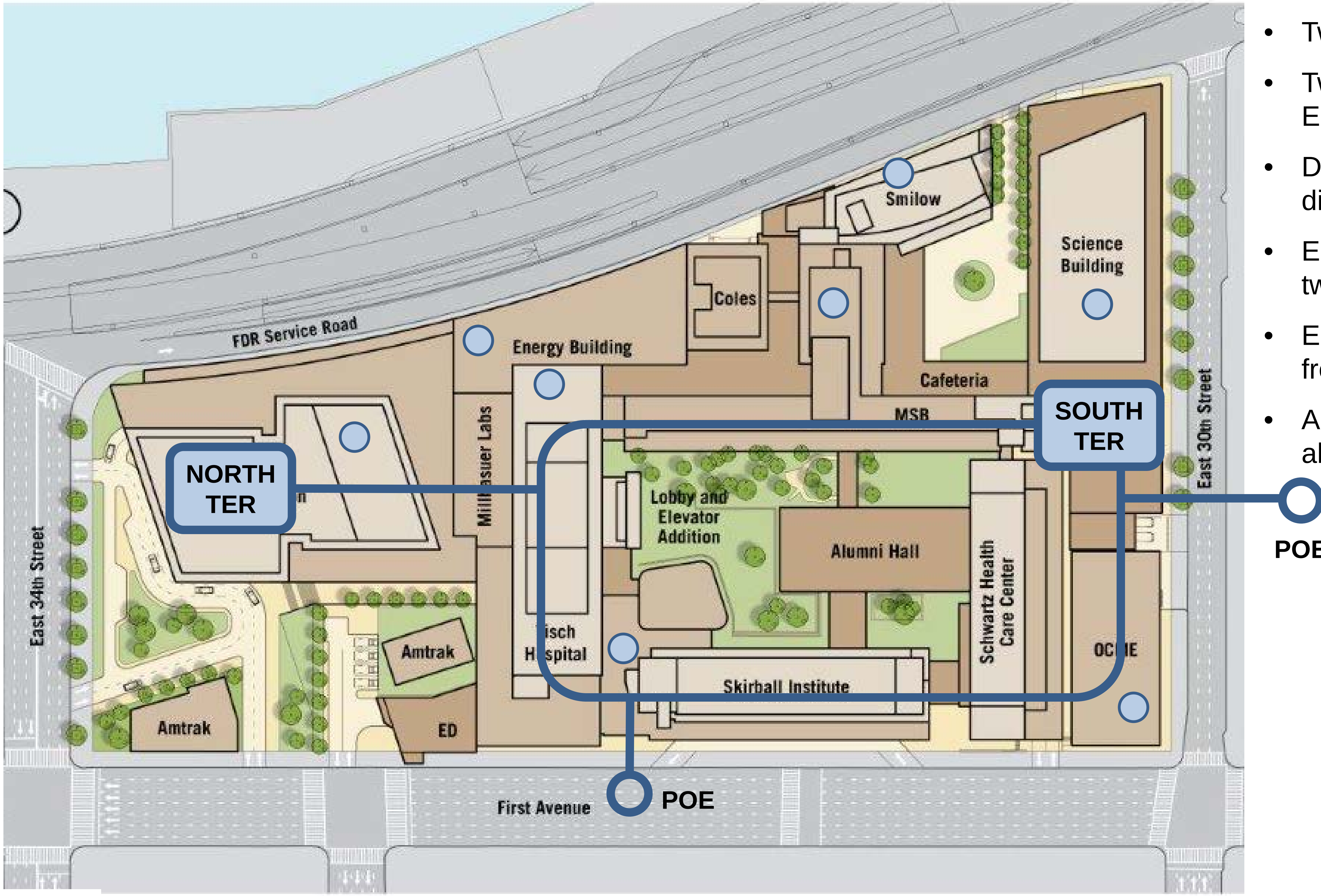
# 2. ENHANCED CAMPUS REDUNDANCY

## IT Systems




- Two points of entrance
- Two Telecommunications Equipment Rooms (TER)
- Diverse and redundant distribution pathways
- Each TER served from two POE
- Each building served from both TERs
- All critical equipment above the DFE

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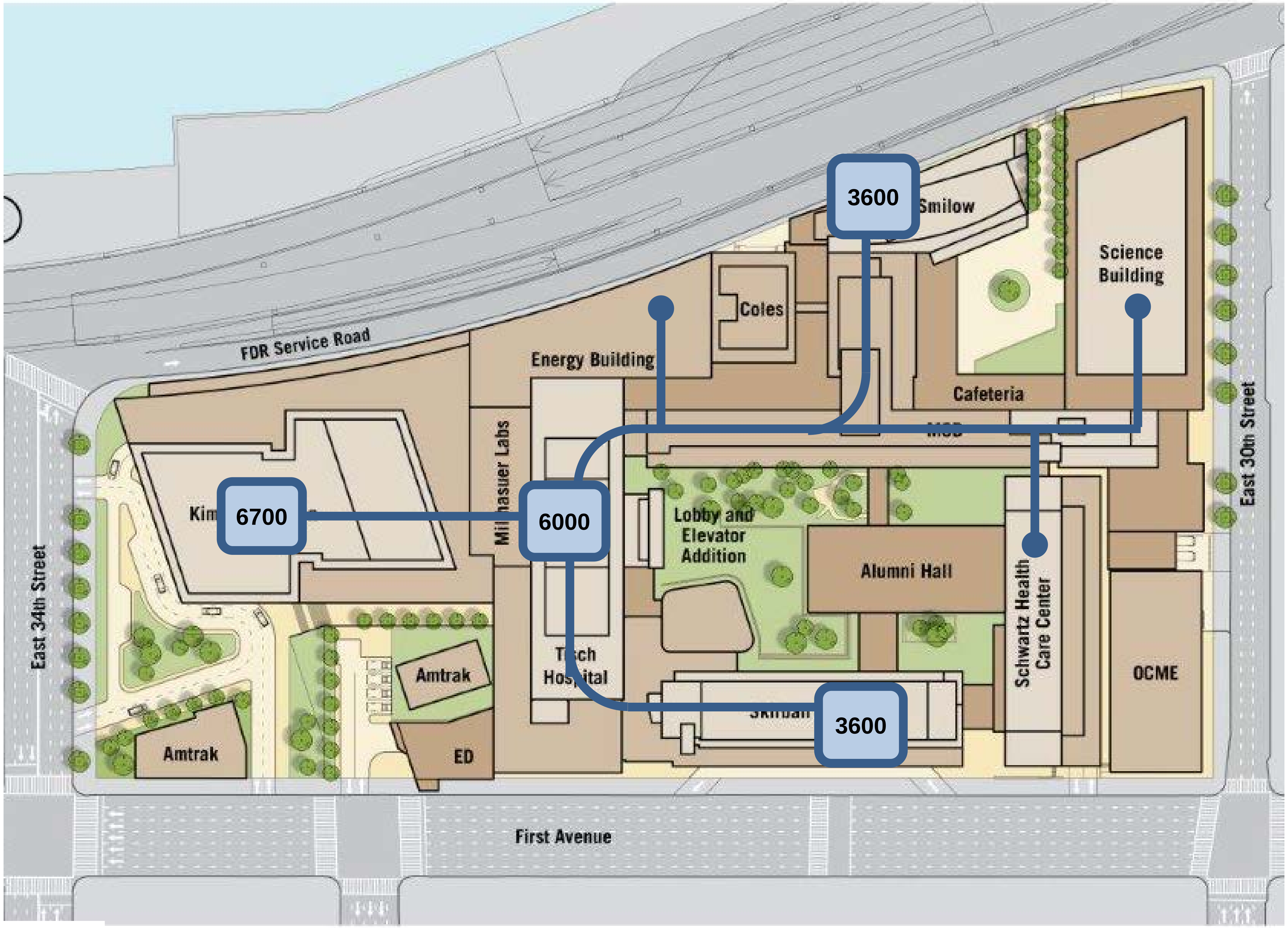
# 2. ENHANCED CAMPUS REDUNDANCY

## Chilled Water




### Chilled Water

- All plants feed a central campus loop at the rooftop level
- Chiller plants on emergency power
- Chiller plants can be powered indefinitely from cogen in "island mode"
- Steam chillers provide additional diversity

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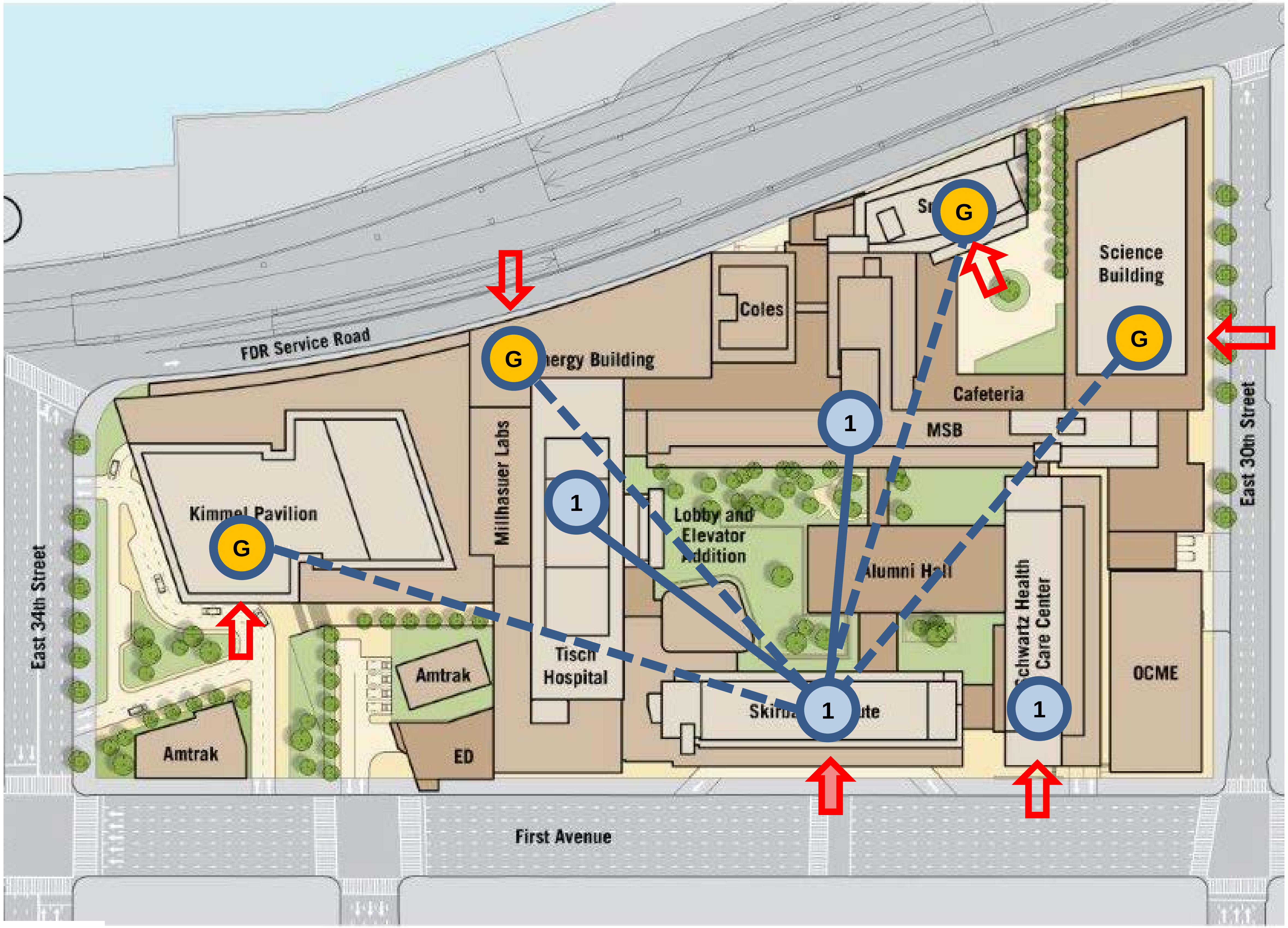
# 2. ENHANCED CAMPUS REDUNDANCY

## Fire Communications




Fire command centers below the Design Flood Elevation to report back to the Skirball station accessible from First Avenue

Fire Command Center Above the DFE (First Floor)

Fire Command Center Below the DFE (Ground Floor)

Normal FD Access

FD Access Point in Flood Conditions

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# CAMPUS RESILIENCY STRATEGIES

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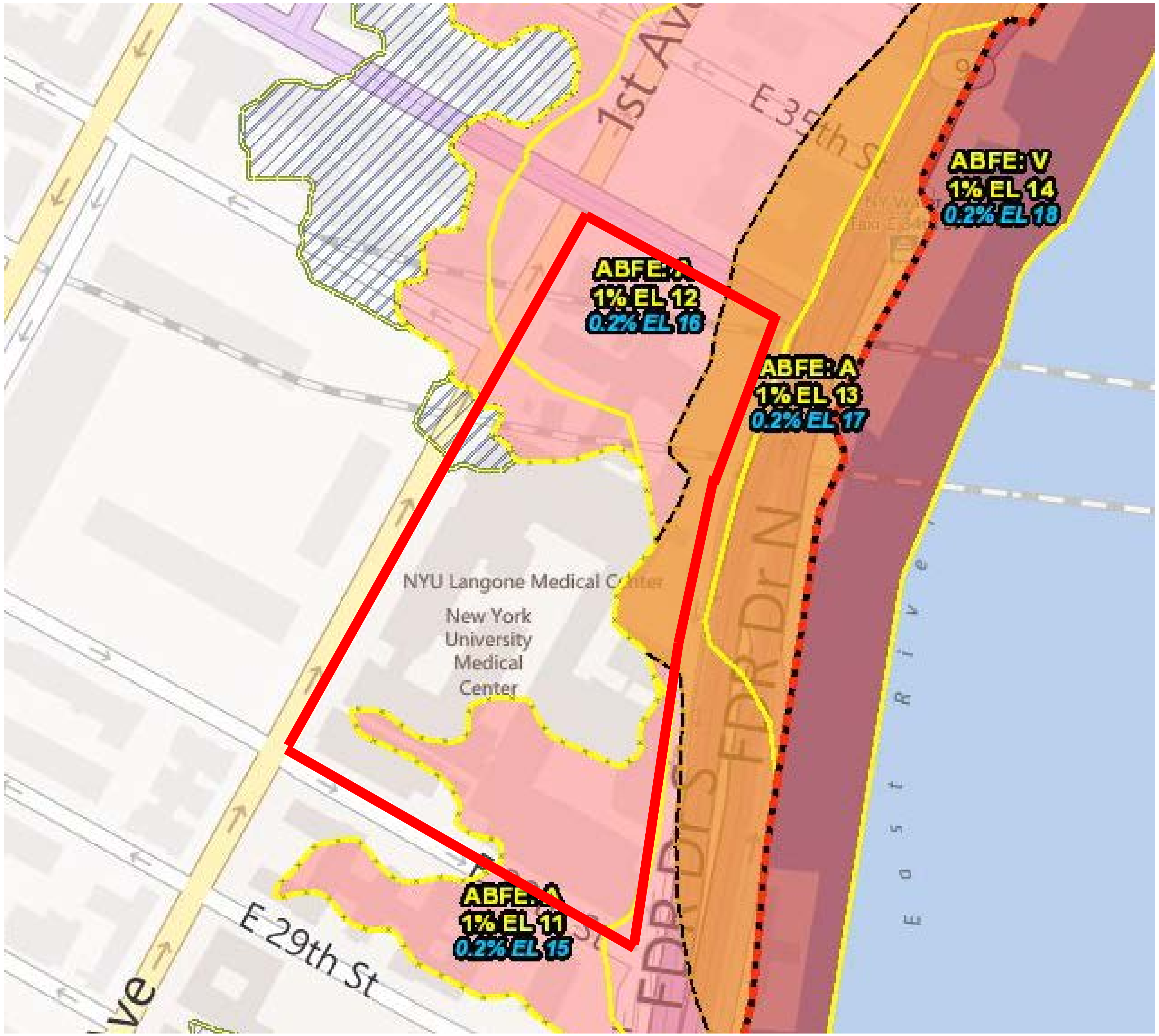
# SITE CONDITIONS
## FEMA Advisory Map



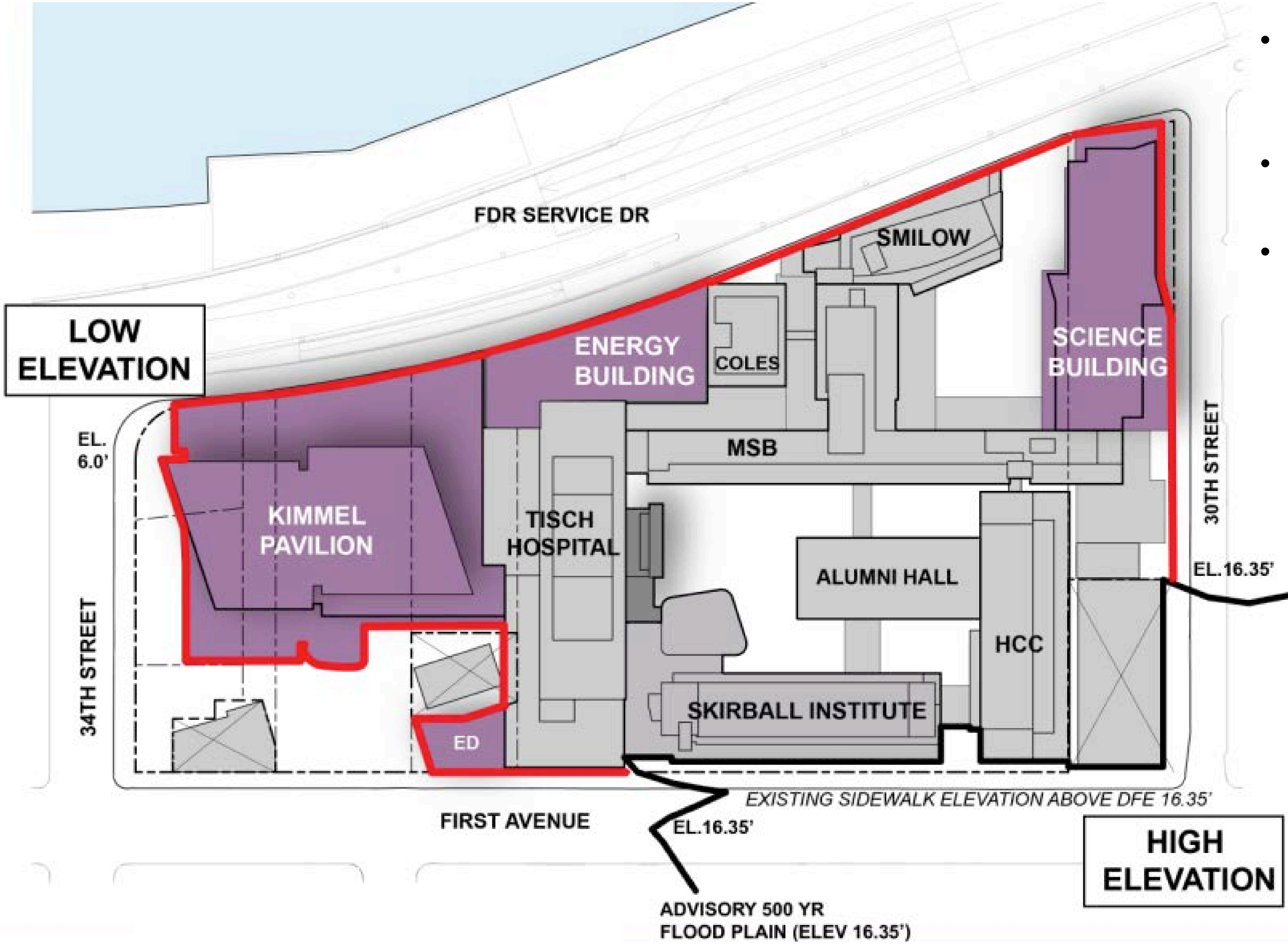

| ADVISORY BASE FLOOD ELEVATION (NAVD) | | PROJECT DATUM (BPMD) |
|---|---|---|
| 1% EL: | 12.0 | 10.35 |
| 0.2% EL: | 16.0 | 14.35 |

**DESIGN FLOOD ELEVATION:** **0.2% EL + Freeboard**

**15.35’ – 16.35’**

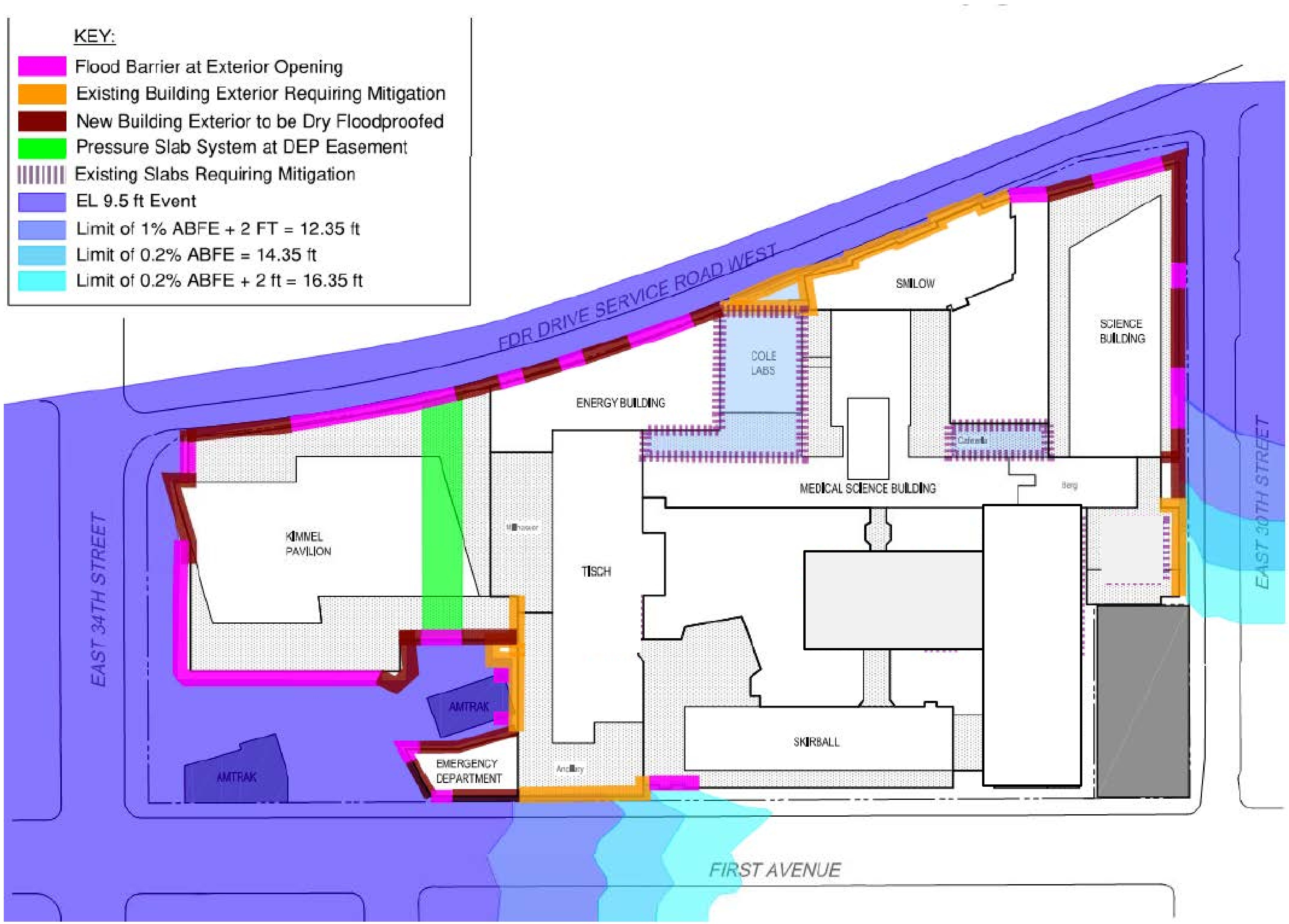
# 3. PROTECT CAMPUS PERIMETER

## Flood Wall




- Develop a campus flood wall system up to 500-yr advisory elevation
- Build in up to two feet of freeboard as feasible
- Upgrade walls and slabs for increased hydrostatic pressure

# 3. PROTECT CAMPUS PERIMETER
## Flood Wall




- Upgrade walls and slabs as required to resist increased hydrostatic pressure

# 3. PROTECT CAMPUS PERIMETER

## Flood Wall


Pre-storm Design


Post-storm Design

1. Raise sills where possible
2. Provide flood gates as entrances
3. Reinforce existing walls

# 3. PROTECT CAMPUS PERIMETER
## Flood Gates

### A. Demountable

- Storage and training required
- Labor intensive to erect and demount
- Requires more time in advance of storm
- Poor installation can result in failure
- Staging and erection of material may conflict with other storm preparations, especially at loading docks

### B. In-place

- No storage required—can' t be lost
- Can be regularly tested with less disruption to normal operations
- Can be implemented later in the storm and demounted more quickly
- More reliable if maintained properly
- More expensive
- *Can be active or passive*

# 3. PROTECT CAMPUS PERIMETER
## Flood Gates

For large areas of storefront glazing, consider vertically-rising flood walls


WALL IN USE


NORMAL CONDITION

# 3. PROTECT CAMPUS PERIMETER
## Other Considerations

- Back-flow prevention on storm and sanitary connections
- Consider pressure-rated piping below the Design Flood Elevation
- Assume some level of infiltration in any dry-flood-proofed condition
- Develop a pumping plan and provide emergency power

# CAMPUS RESILIENCY STRATEGIES

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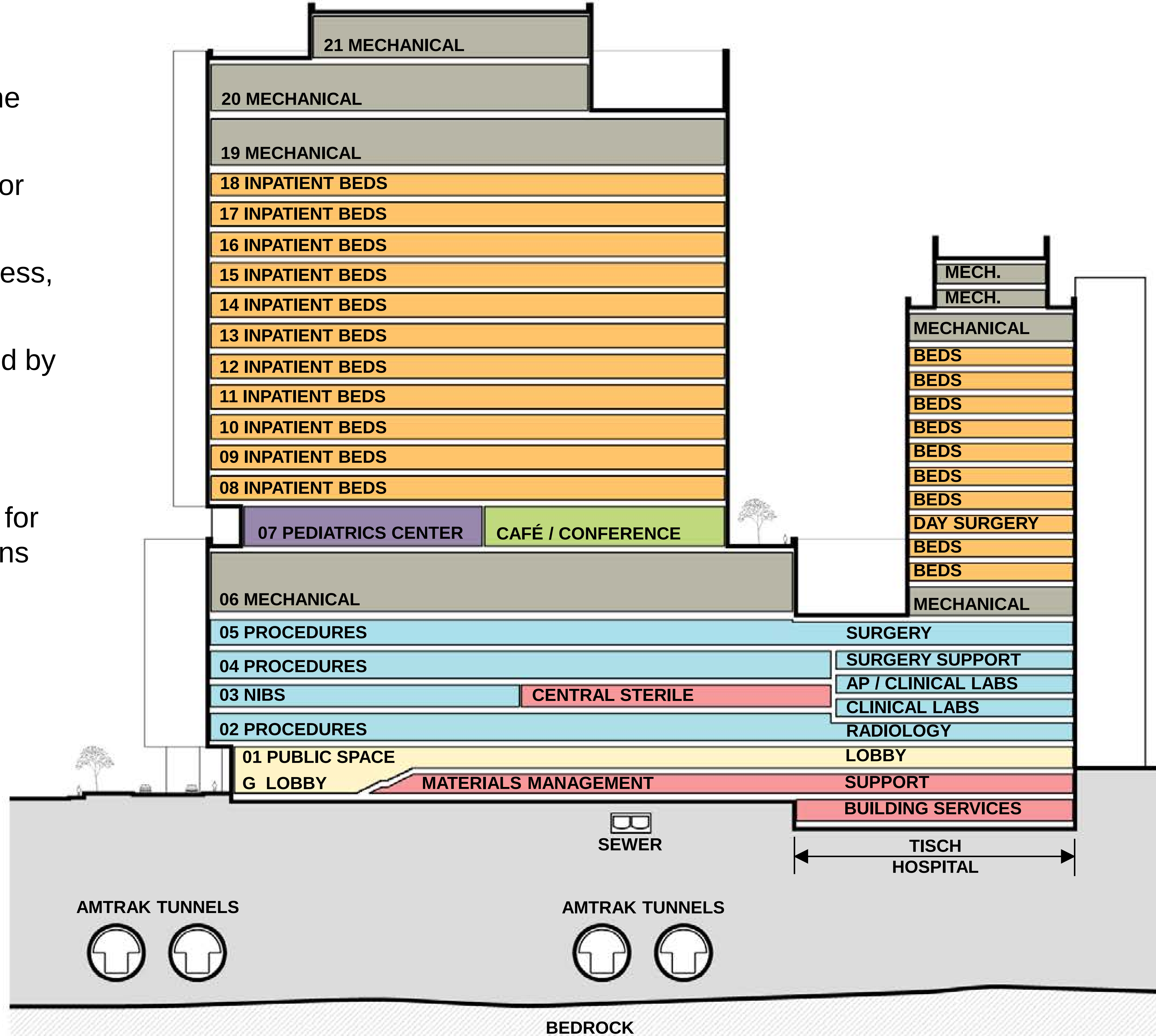
# 4. ELEVATE CRITICAL INFRASTRUCTURE

## New Buildings

- All systems to be located above the DFE unless prohibited by code
- No below-grade space in Kimmel or Energy Building
- Ground floor used for building access, storage, and parking
- Where systems cannot be elevated by code (fuel oil) provide secondary protection (vault within a vault)
- Fuel pumps and generators to be inside the building and accessible for maintenance during flood conditions

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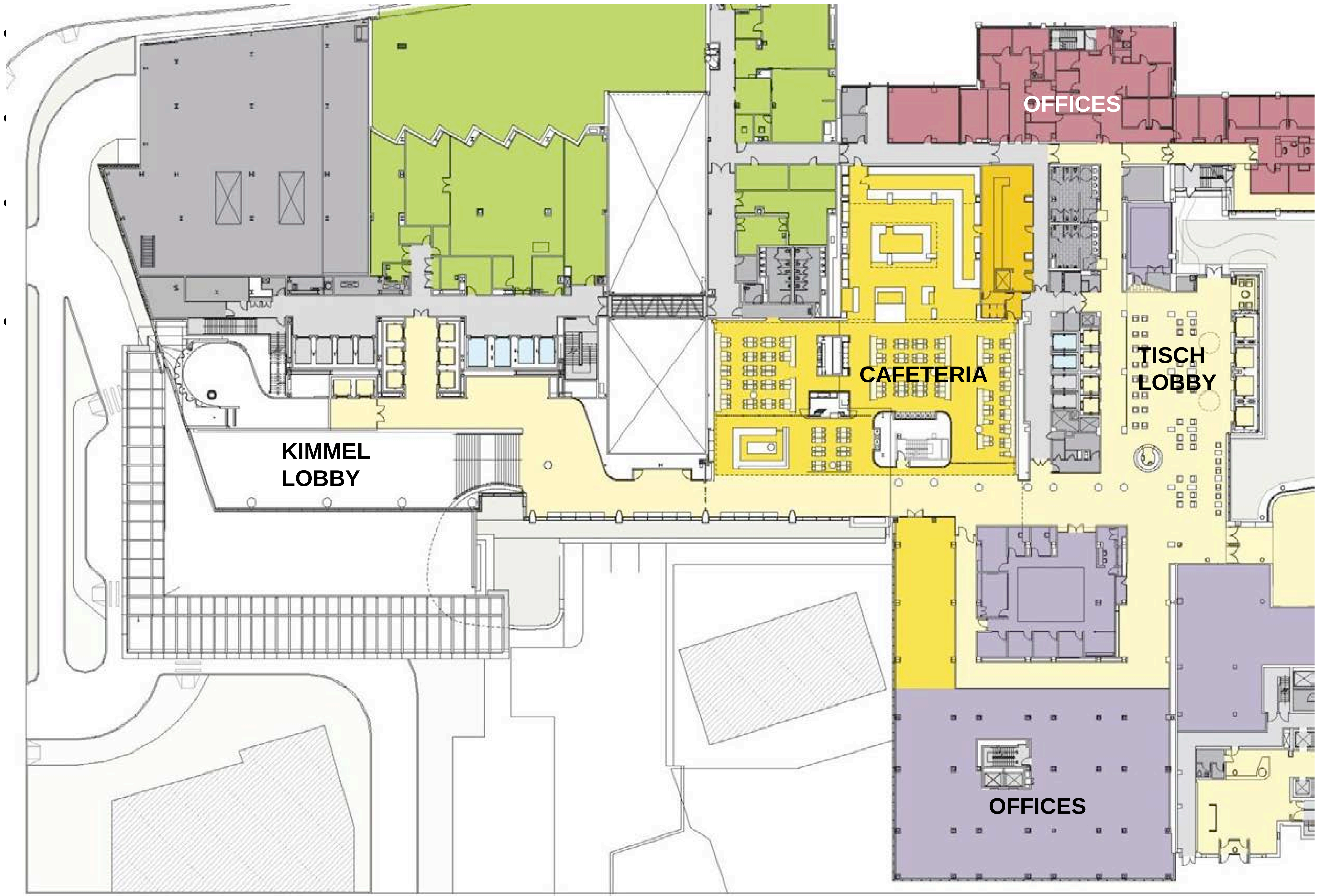
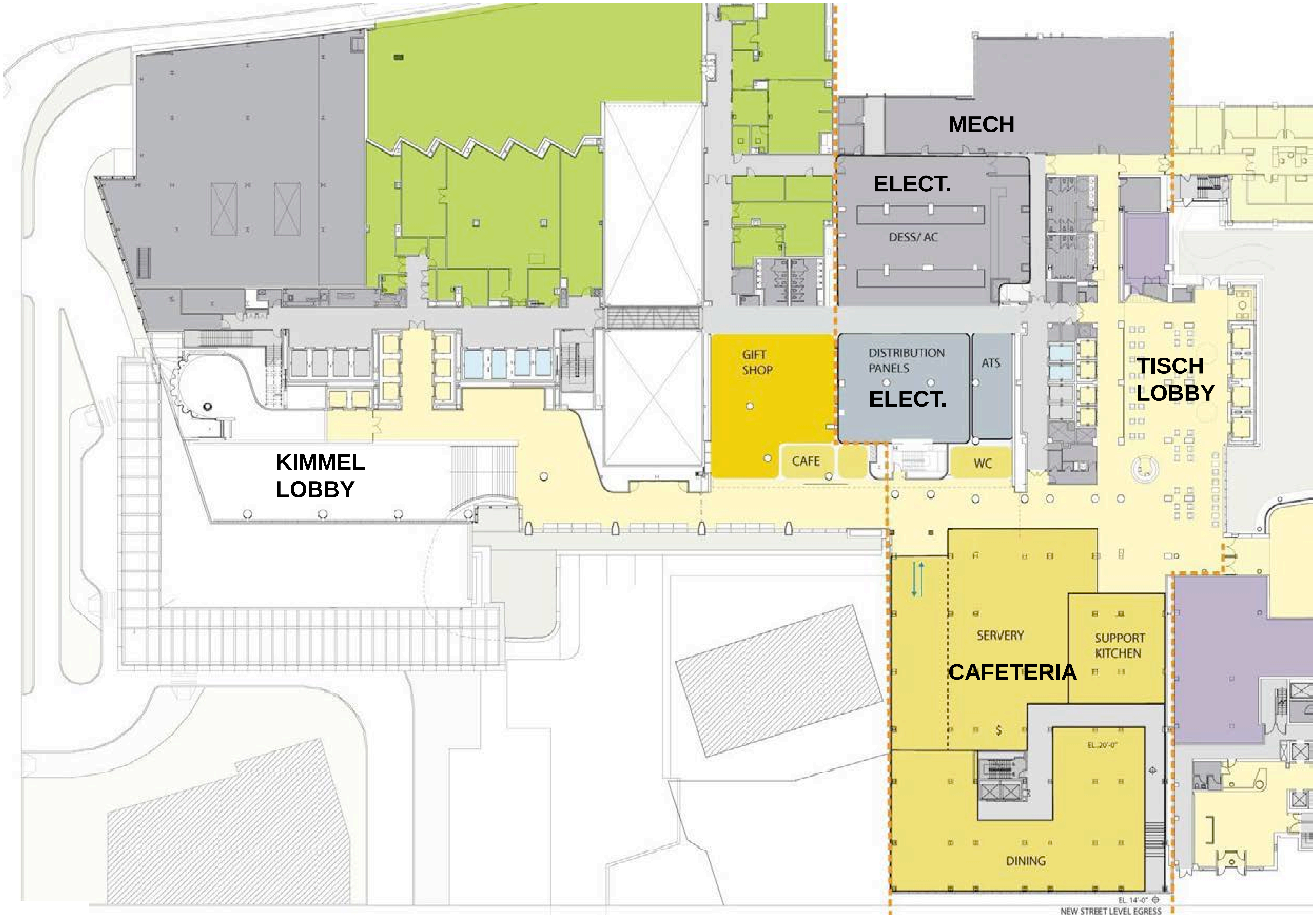
# 4. ELEVATE CRITICAL INFRASTRUCTURE

## Tisch Hospital—Pre-Storm Plan



# 4. ELEVATE CRITICAL INFRASTRUCTURE

## Tisch Hospital—Post-Storm Plan




**Tisch Systems to be Elevated:**

- **Normal Power**
- **Steam**
- **Domestic Water Pumps & Heaters**
- **IT**

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# CAMPUS RESILIENCY STRATEGIES

1. Cogeneration: On-site Heat and Power Generation
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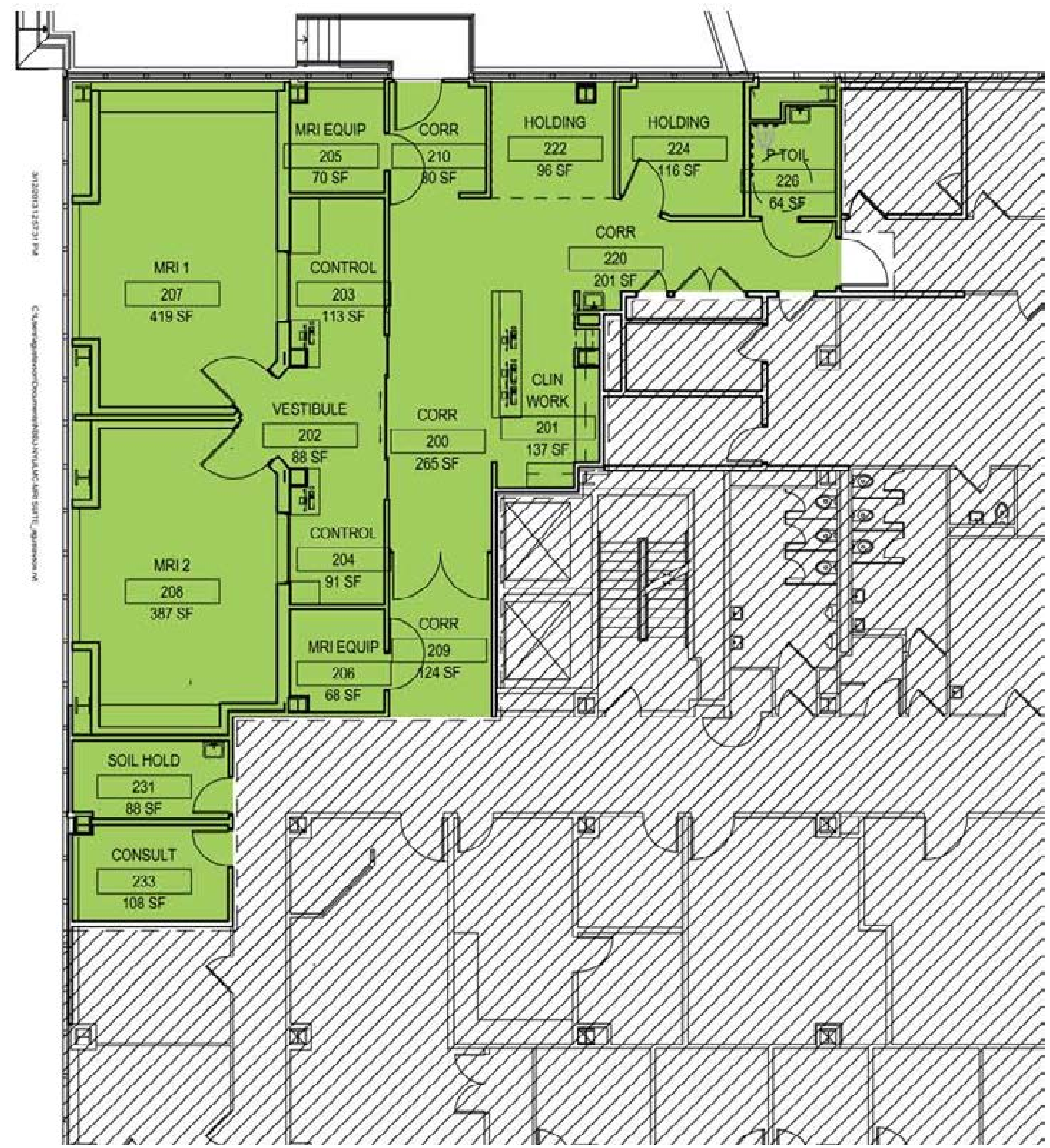
# 5. RELOCATE CRITICAL PROGRAMS

## Existing Buildings

a. Radiation Oncology (to 2nd Floor of Energy Building)

b. Inpatient MRI (to 2nd Floor of Tisch)

c. Outpatient MRI (to offsite facility, 38th Stree

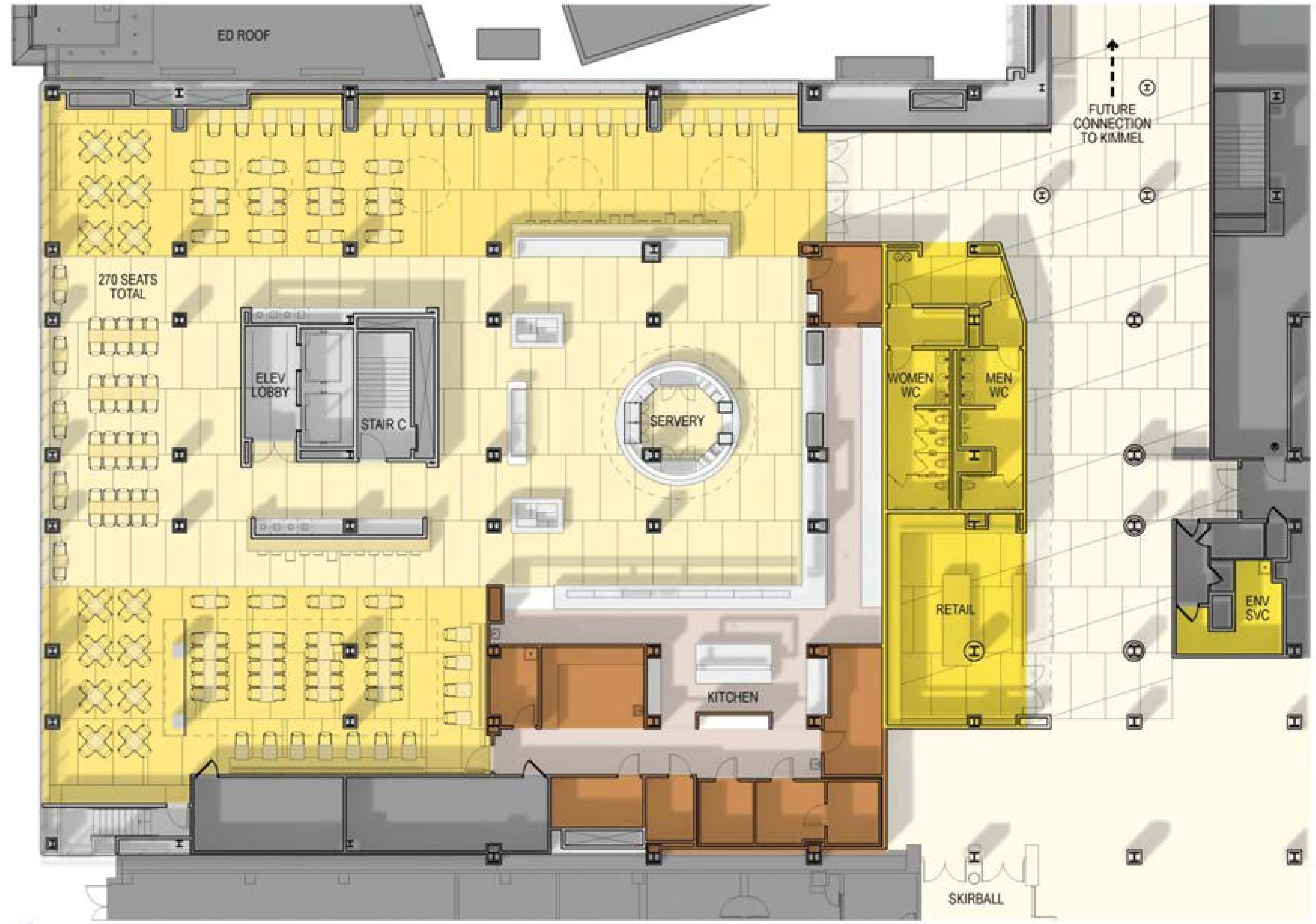



Tisch 2 MRI Suite

# 5. RELOCATE CRITICAL PROGRAMS
## Existing Buildings

Where a program cannot be elevated:

- Rely on campus flood wall
- Provide additional localized protection
- Plan for pumping
- Develop an emergency operation plan to continue essential services in the event of a failure




Cafeteria (Back-up Patient Meal Kitchen)

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