This mixed-use example is a two-story wood frame structure with a party-wall and rubble foundation. The structure has one shared bearing wall and is not suitable for elevation. Retrofit strategies that will result in full NFIP reduction in premiums require filling the basement to the lowest adjacent grade and reconfiguring the commercial space to a new elevated floor above the DFE. This strategy results in the relocation of the critical systems, partial loss of storage space for the commercial tenants and relocation of the active commercial space further away from the street frontage, which can be a major impediment to the viable operation of retail space. The residential space is relocated to a third story addition and the critical systems are placed in a rear addition or can be placed on the roof. All of these strategies require significant structural reinforcement.

Another approach, which would also lower premiums, would be to dry floodproof the commercial space through the use of flood shields integral to the building structure, fill the cellar, add reinforcement, and relocate critical systems to the roof.

Alternative adaptation strategies, currently not recognized by FEMA and NFIP, include leaving existing commercial uses in place, wet flooding below the DFE, and relocating the critical systems within a rear-yard addition above the DFE. This would maintain the usability of the retail space but would allow the flooding of the basement and storage space in the event of a storm. Another alternative solution would be to leave all uses in place and dry floodproof the cellar.

**SITE & BUILDING CONDITIONS**

**SITE CONDITIONS**
Situations with standard lot size and one side yard. Wide public streets and sidewalks are typical of this commercial corridor typology. On-street parking with no on-site parking is most common.

**BUILDING TYPOLOGY**
Commercial use and residential lobby is located at the ground floor with residential use above. Buildings are two to three-story with masonry or wood frame party-wall and wood joists on a rubble foundation. Critical systems are located in the cellar with the commercial space storage. Entrances are provided at or above sidewalk grade.

**FLOOD RISK**
- Flood Zone/BFE: AE +10'
- Grade Elevation: +4' at sidewalk and property
- Design Flood Elevation (DFE): +11' (+7' above sidewalk grade)
- Lowest Occupiable Floor: +5' (+1' above sidewalk grade)
- Cellar Elevation: -2' (-6' below sidewalk grade)
- Critical Systems Location: Cellar

**TYPOLGY**
- Lot Size: 40' x 100'
- Building Size: 37' x 65'
- Yards: 2' front; 35' rear; 2' at each side
- Construction Type: Wood Frame
- Foundation Type: Rubble
- Year Built: 1900
- Stories: 2 + cellar
- Residential Floor Area: 2,400 s.f. total
- Residential Units: 2
- Commercial Floor Area: 2,400 s.f. total
- Commercial Units: 2

**SITE CONDITIONS**
- Sidewalk Width: 8'
- Roadbed Width: 70'
- Zoning District: R3A + C1-2 Overlay, Mixed-Use
The allowable building height is measured from the DFE. The building has a non-compliant rear yard. The building is built to the maximum allowable floor area. In compliance with zoning, the floor area below the DFE can be relocated within the adjusted bulk envelope.

All systems are located in a mechanical room in the cellar. Two-story combustible construction with wood frame party-wall and wood joists on a rubble foundation. Building access is provided at three front entry locations - two commercial uses and one residential lobby - at 1’ above the sidewalk grade. The building access at the rear yard is provided at two locations, both 1’ above the rear yard grade.

Relocate systems to rear addition within fireproof and vented mechanical room. Tie all systems back into building systems following re-location. Relocate existing joists from the existing second story to the new lowest floor level and add support as required.

Relocate the two commercial spaces to elevated floor with one entrance lobby and showpit area for both commercial spaces. Elevate critical systems above the DFE at rear addition. Relocate residential unit to new addition at third story. Wet floodproof area below the DFE by installing flood vents located at all exterior and interior walls and replacing all windows, doors, structure and finishes with flood damage resistant materials.

Fill cellar to grade. Reinforce foundation walls and modify floor slab, as required. If adjacent properties are not infilling their sub-grade spaces, reinforce foundation walls to account for new load. Reinforce foundation for new addition on roof. Add new foundation system for addition at rear. Relocate existing joists from the existing second story to the new lowest floor level and add support as required.

There is a total loss of 400 s.f. of commercial use plus 2,400 s.f. of storage and systems use in the cellar. Gain of 1,000 s.f. for systems and storage at the new rear addition.

Residential lobby to remain. Reconfigure if necessary for wet floodproofing requirements. New access for commercial uses in new interior lobby accessible via ramp at streetwall entry. Commercial spaces accessible by stair or lift at commercial lobby.

Add ramp to commercial and residential entries. Convert one commercial entry to showpit area and replace all windows, doors and finishes with flood damage resistant materials.

Elevate the commercial floor to the DFE by relocating a portion of the floorplate, creating a double height space and mezzanine level for both commercial spaces. Fill cellar to lowest adjacent grade. Elevate critical systems above the DFE at rear addition. Relocate residential unit to new addition at third story. Wet floodproof area below the DFE by installing flood vents located at all exterior and interior walls and replacing all windows, doors, structure and finishes with flood damage resistant materials.

Fill cellar to grade. Reinforce foundation walls and modify floor slab, as required. If adjacent properties are not infilling their sub-grade spaces, reinforce foundation walls to account for new load. Reinforce foundation for new addition on roof. Add new foundation system for addition at rear. Relocate existing joists from the existing second story to the new lowest floor level and add support as required.

There is a total loss of 400 s.f. of commercial use plus 2,400 s.f. of storage and systems use in the cellar. Gain of 1,000 s.f. for systems and storage at the new rear addition.

Residential lobby to remain. Reconfigure if necessary for wet floodproofing requirements. New access for commercial uses in new interior lobby accessible via ramp at streetwall entry. Commercial spaces accessible by stair or lift at commercial lobby.

Add ramp to commercial and residential entries. Convert one commercial entry to showpit area and replace all windows, doors and finishes with flood damage resistant materials.
ADAPTATION CONSIDERATIONS
ACCESS & STREETSCAPE
An active streetscape along a retail corridor is a key aspect to its economic strength. While the challenges of adhering to new flood regulations can be counter to this, there are a number of ways property owners can meet the requirements while still providing transparency and activity at the ground level.

Here, the illustrated alternative strategy applies wet floodproofing to the space below the DFE, in the application of flood damage-resistant materials yet the use of this area as a seating area is non-compliant.

ACCESS & STREETSCAPE

NON-SUBSTANTIAL DAMAGE/IMPROVEMENT STRATEGIES

Non-substantially improved buildings within the floodplain are not required to comply with Appendix G of the NYC Building Code. This allows for greater flexibility in adapting buildings for flood resiliency. The alternatives illustrated below lower the risk for buildings and provide practical pathways for adaptation. Under current NFIP regulations, these measures may not lower insurance premiums. The blue icons below illustrate adaptive measures that receive full reduction of NFIP premiums. Icons in gray indicate strategies that improve building resiliency, but receive no or partial reduction of NFIP premiums.

If the lowest occupiable floor is left below the DFE, life safety must be considered. Residents should always follow evacuation procedures.

- **Dry floodproofing**
  - Install deployable flood shields at front and rear openings below the DFE. Provide alternate means of egress through residential lobby.
  - Wet floodproof residential lobby. Install flood vents and replace all windows, doors, and finishes with flood damage-resistant materials.

- **Wet floodproofing**
  - Fill the cellar to lowest adjacent grade. Elevate the critical systems above the DFE.
  - Loss of use at the cellar. Existing commercial space and residential lobby uses below the DFE are to remain.

- **Critical systems**
  - Relocate critical systems within fire-rated and vented enclosure at rear-yard addition above the DFE.
  - Commercial entrances and residential lobby to remain, reconfigure residential lobby as required per wet floodproofing engineering requirements.

- **Restoration**
  - Dry floodproof below the DFE by strengthening the foundation, floors and walls and sealing all penetrations. Install deployable flood shields, front and rear windrows, and doors.
  - Existing commercial, residential lobby and cellar uses below the DFE are to remain. Provide egress route up and over flood shields at commercial and residential uses.

- **Restoration & Enhancement**
  - Add reinforcement to party-walls, exterior walkways and foundation slab at dry floodproof enclosure, and ensure changes do not impact neighboring property’s structural integrity.
  - Critical systems to remain in place within dry floodproofed enclosure. Provide emergency shut off above the DFE.

- **Enhancement**
  - Wet floodproof below the DFE. Install flood vents and replace all windows, doors and finishes with flood damage-resistant materials.

- **Enhancement & Restoration**
  - Fill cellar to lowest adjacent grade, remove cellar slab and add reinforcement. Ensure changes to party-walls do not impact neighboring property’s structural integrity. Add support at roof for relocated systems.

- **Critical systems**
  - Relocate critical systems to the roof within a fire-rated and vented enclosure. Raise electrical utilities above DFE within an electrical closet on the ground level.

- **Enhancement & Restoration & Enhancement**
  - New addition at rear used as mechanical room and dry storage.

- **Enhancement & Restoration & Enhancement & Restoration**
  - New addition at rear used as mechanical room and dry storage. Existing commercial, storage and residential lobby uses below the DFE are to remain. Enhance critical systems within fire-rated and vented enclosure at rear-yard addition above the DFE.