

The detached building type closely resembles the typology for which federal floodproofing regulations are designed. It is a lightweight wood-frame structure with a masonry foundation, but its tight site conditions in the urban context can make retrofitting and staging construction difficult.

Retrofit strategies that will result in full NFIP reduction in flood insurance premiums include elevating the structure on a new foundation and filling the basement/cellar to the lowest adjacent grade. The area below the elevated structure can be left open or

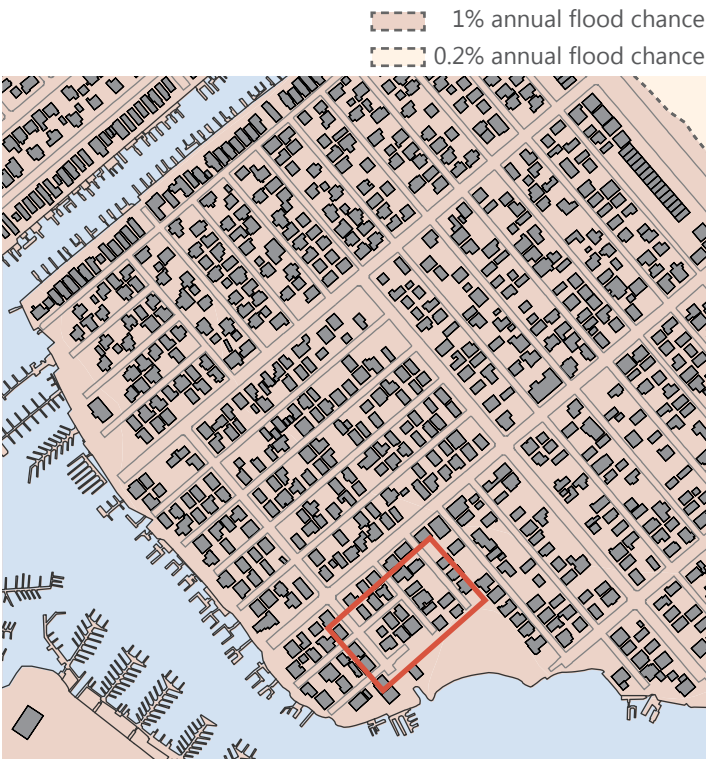
enclosed and wet floodproofed for use as parking, crawl space, access, and storage. Critical systems can be elevated within the building in a fire-rated mechanical room or in the yard, though in shallow lots clearance is rarely provided.

Here, like the bungalow case study, the vulnerability of the wood frame structure limits alternative adaptation strategies, which include elevating critical systems to minimize damage and disruption.

Elevation requires assessment of the building's structural integrity and any implications of site excavation for the neighboring buildings.

KEY CHARACTERISTICS

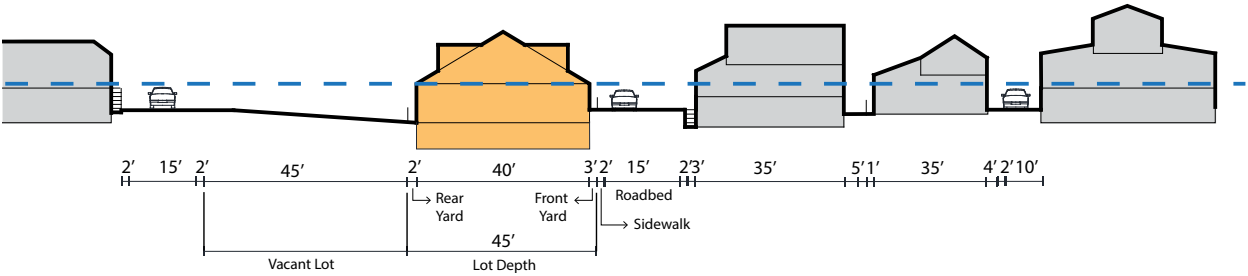
FLOOD RISK	
Flood Zone/BFE	AE +11'
Grade Elevation	+5' at sidewalk; +3' at property
Design Flood Elevation (DFE)	+13' (10' above sidewalk grade)
Lowest Occupiable Floor	+5' (level with sidewalk grade)
Cellar Elevation	-3' (8' below sidewalk grade)
Critical Systems Location	Cellar
TYPOLOGY	
Lot Size	40' x 45'
Building Size	30' x 40'
Yards	3' front; 2' rear; 3' side; 7' side
Construction Type	Wood Frame
Foundation Type	Masonry
Year Built	1920
Stories	1.5 + cellar
Residential Floor Area	1800 s.f.
Residential Units	1
Elevator	N/A
SITE CONDITIONS	
Sidewalk Width	3'
Roadbed Width	17'
Zoning District	R4, Residential



SITE & BUILDING CONDITIONS

SITE CONDITIONS
Sites with a shallow lot size with high building coverage, and limited side, front and rear yards that lead to tight building adjacencies. Property grade is often a few feet below the sidewalk grade. Streets are typically of sub-standard width with narrow or no sidewalks.

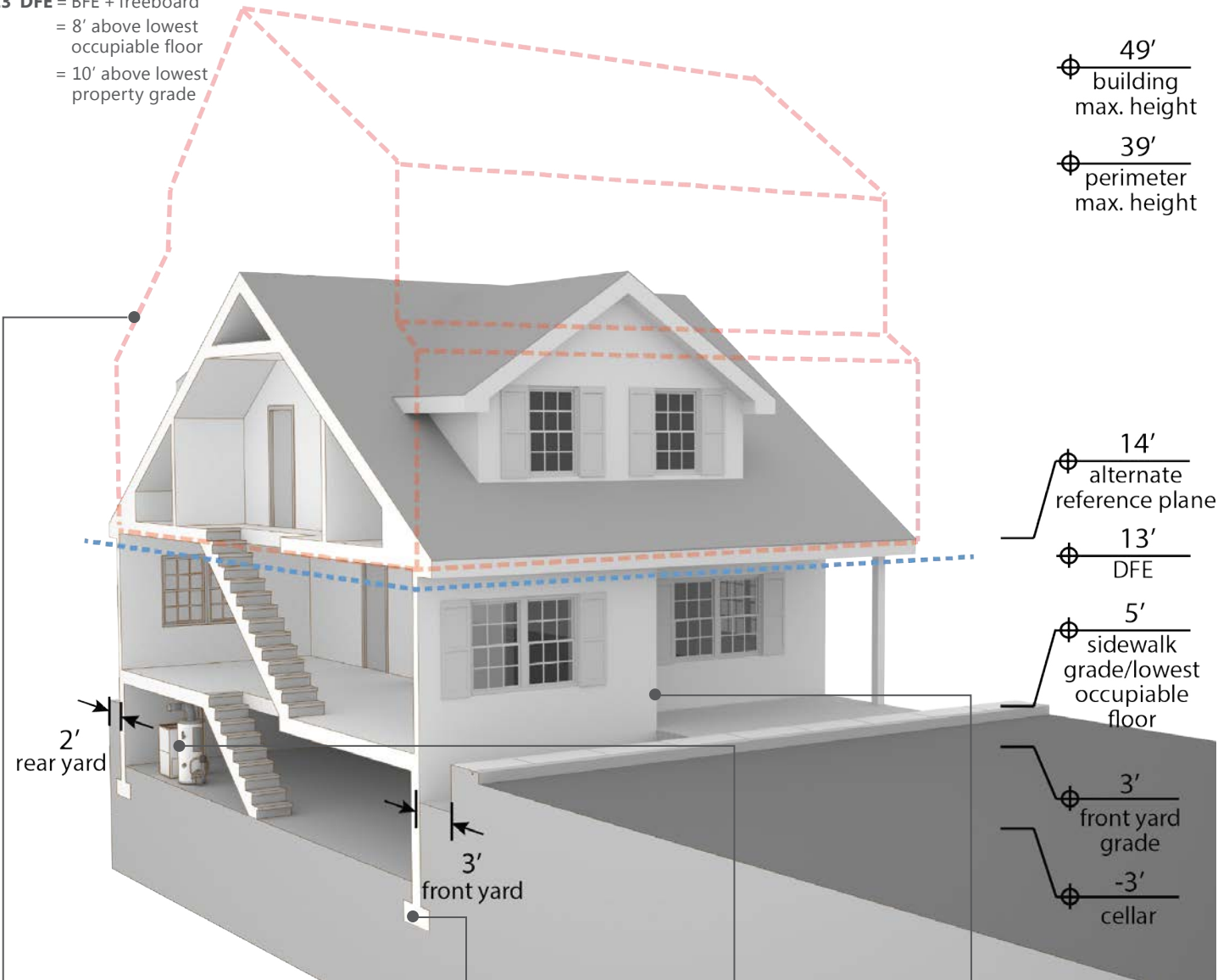
BUILDING TYPOLOGY
Buildings are one- to two-story wood frame structure with a masonry foundation. The structure is not sufficiently tied to the foundation. Critical systems are located in the cellar/basement.



EXISTING CONDITIONS

FLOOD ELEVATION

13' DFE = BFE + freeboard
= 8' above lowest occupiable floor
= 10' above lowest property grade



ZONING ENVELOPE

The building has non-compliant front, rear, and one side yard, and does not provide the required parking. Existing non-compliances must be considered when retrofitting buildings.

Per zoning, the allowable building height is measured from 9' above the sidewalk grade by application of the Alternate Reference Plane rule, which permits the building envelope base height to be shifted above the DFE in order to accommodate usable parking, access, or storage. This rule is available where the DFE is between 6'-9' above sidewalk grade.

The floor area is overbuilt which is an existing non-compliance. Zoning allows the relocation of existing non-compliant floor area above the DFE within the adjusted bulk envelope.

STRUCTURAL SYSTEMS

One-and-a-half story wood frame combustible construction type on unreinforced masonry foundation. The wood structure is not sufficiently tied to the foundation.

CRITICAL SYSTEMS

The electrical panels and the hot water heater are located in the cellar.

The fuel tank is located in the rear yard at grade.

ACCESS

Building access is provided at the front and rear entrances, both at sidewalk grade, which is 2' above property grade.

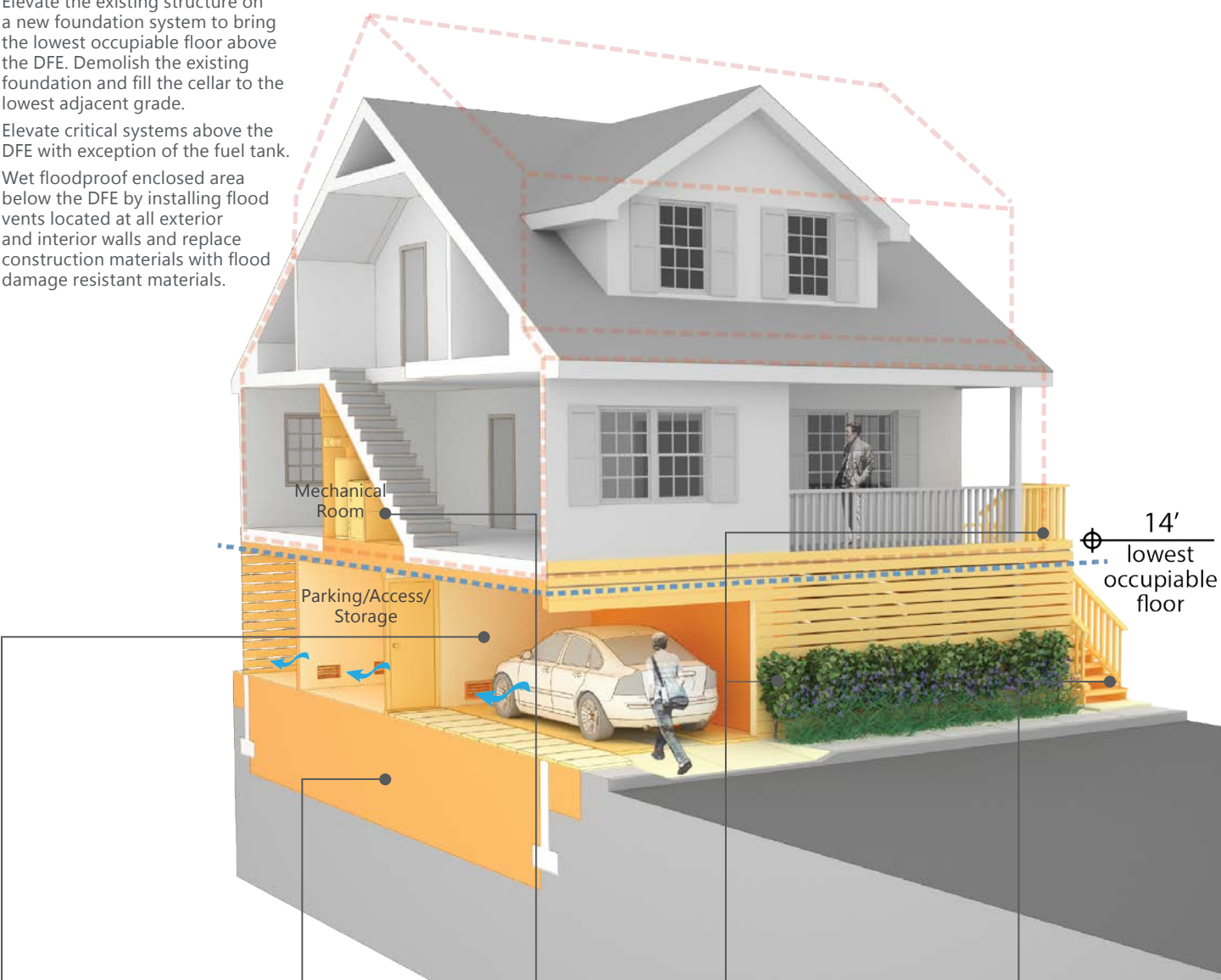
ILLUSTRATIVE RETROFIT STRATEGY

ELEVATE & WET FLOODPROOF

Elevate the existing structure on a new foundation system to bring the lowest occupiable floor above the DFE. Demolish the existing foundation and fill the cellar to the lowest adjacent grade.

Elevate critical systems above the DFE with exception of the fuel tank.

Wet floodproof enclosed area below the DFE by installing flood vents located at all exterior and interior walls and replace construction materials with flood damage resistant materials.



USE

The existing non-compliant yards and overbuilt square footage remain.

Relocation of the critical systems to above the DFE within the building envelope results in a 90 s.f. area loss. Zoning allows for the square footage to be relocated to a new addition within the bulk envelope.

Use below the DFE is for vehicular parking and storage.

The application of the Alternate Reference Plane rule provides necessary height for parking clearance.

STRUCTURAL SYSTEMS

Elevate the structure on new reinforced concrete or masonry unit foundation and columns. Fill the site to the lowest adjacent grade.

The relocation of the critical systems may require additional structural support.

Insulate and fireproof the underside of lowest level to enclose building envelope.

CRITICAL SYSTEMS

Elevate systems above the DFE to an interior fireproofed and vented enclosure; Install isolation and/or vibrations pads as needed.

Fuel tank may remain at grade; fasten as required to resist buoyancy and load pressure from water and debris.

STREETSCAPE

The application of the Alternate Reference Plane Rule requires two zoning streetscape mitigations. Note, these requirements may be waived if the front setback is less than 3 feet.

The planting along 60% of the width of the lot frontage fulfills one zoning mitigation requirement.

The stair turn at the front entry provides the second mitigation measure.

Lattice located below the DFE provides visual transition at the streetwall.

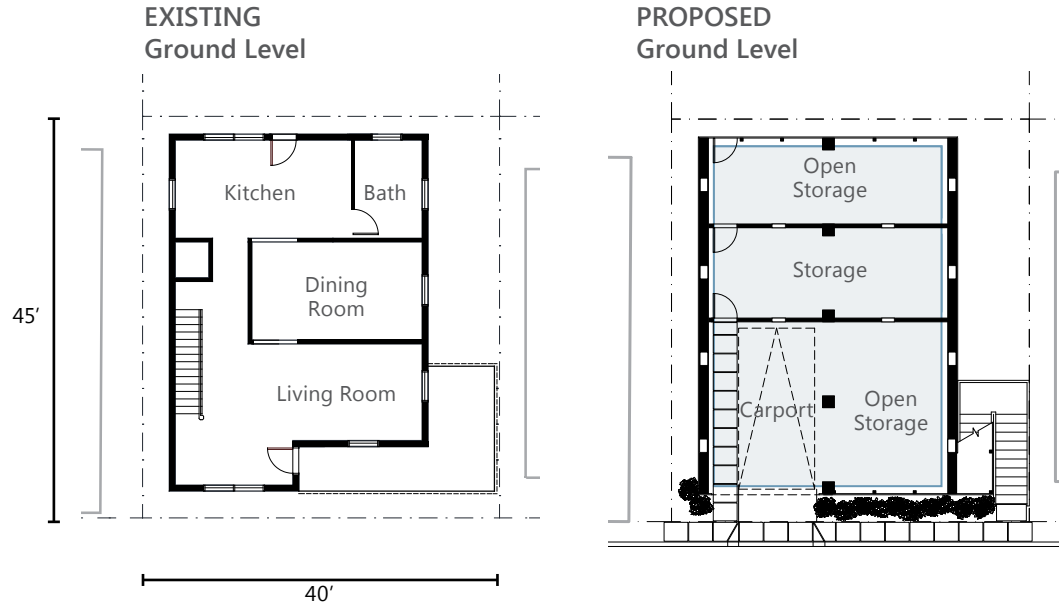
ACCESS

The building entrance is relocated to 9' above sidewalk grade. The stairs may be located underneath or adjacent to the structure depending on available yard space and clearance underneath the structure. Here the access may be located at the side yard.

Install a curb cut for parking at the new garage.



CHANGE OF USE



Cellar
Fill to lowest adjacent grade. Loss of storage and mechanical room.

Ground Level
New parking, access, and storage.
Two required streetscape mitigations: plantings and stair turn.

Level One
This becomes the lowest occupiable floor.
The critical systems relocate to a new mechanical room within the existing structure.
In order to drive wood piles or rebuild a foundation, typically the building must be moved out of the way and then back onto the new foundation. Where site conditions make elevation difficult due to restricted access to the building, consider elevating several buildings at once in order to accommodate the project equipment requirements.

ADAPTATION CONSIDERATIONS



ACCESS

When elevating buildings, add elements that enhance visual connectivity to the street. The Zoning Resolution requires homes to provide specific streetscape mitigations such as planting along the streetwall, open or covered porches, stair turns, porch or raised yards.



FIREPROOFING

When elevating buildings, consideration must be given to fire-rated walls and floors within the mechanical rooms and parking areas, as well as at exterior walls where neighboring buildings are in close proximity and the underside of exposed floor plates.
Materials within non-conforming side yards must be of fire rated construction type.



STREETSCAPE



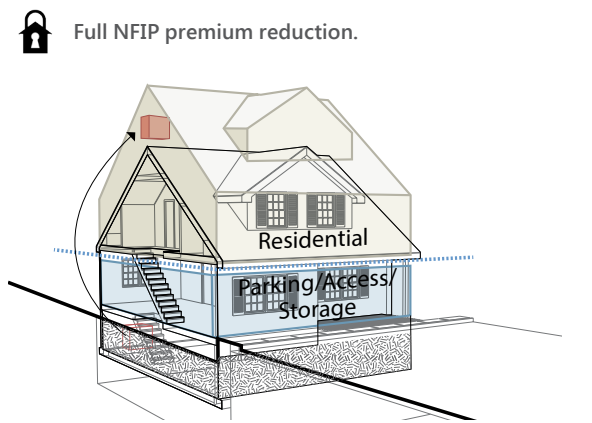
NON-SUBSTANTIAL DAMAGE/IMPROVEMENT STRATEGIES

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.

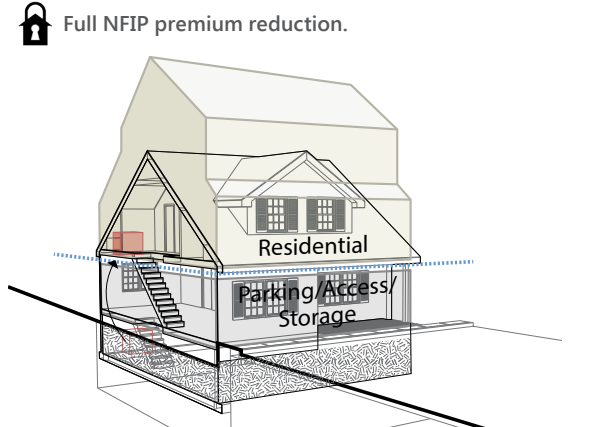
The blue icons below illustrate adaptive measures that receive full reduction of NFIP premiums. Icons in gray indicate strategies that improve building resilience, but receive no or partial reduction of NFIP premiums.

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

- Elevate the lowest floor above the DFE. Wet floodproof enclosed area below DFE by installing flood vents and flood-damage-resistant materials.
- Restrict all uses below the DFE to parking, crawl space, access, or storage.
- Elevate the entire structure on a new foundation system. Fill the cellar to the lowest adjacent grade.
- Elevate critical systems above the DFE. Relocate to new mechanical room within the existing structure.
- Entry stair access locations are limited due to the small size of the existing yards. Provide stair entry from below with the wet floodproof enclosure.
- Due to the elevated height of the lowest occupiable floor 9 feet above the sidewalk grade, two streetscape mitigations are required.



- Elevate the lowest floor above the DFE. Open area below the DFE may be used as parking, access, crawl space, or storage.
- Restrict all uses below the DFE to parking, crawl space, access or storage. Relocate floor area used for new mechanical room to a new addition within adjusted bulk envelope.
- Elevate the entire structure on a new foundation system. Fill cellar to lowest adjacent grade.
- Elevate critical systems above the DFE. Relocate to new mechanical room within existing structure.
- Entry stair access locations are limited due to the small size of the existing yards. Provide stair entry from below.
- Due to the elevated height of the lowest occupiable floor 9 feet above the sidewalk grade, two streetscape mitigations are required.



- Protect systems by dry floodproofing in place.
- If the DFE is within a few feet of the lowest occupiable floor consider keeping the structure in place and using flood damage-resistant materials below the DFE.
- Due to the wood frame construction type, extensive structural damage may occur. Create a continuous load path by connection of the frame to the roof and foundation.

No or partial reduction in NFIP premiums. Residential use and critical systems remain located below the DFE and the structure is not filled to lowest adjacent grade. Lowest occupiable floor is below the DFE.

