

STREETSCAPE ENHANCEMENT AND ECOLOGICAL PARKING LOT DESIGN

GREENFIELD, MASSACHUSETTS

NOT FOR CONSTRUCTION. THIS DRAWING IS PART OF A STUDENT PROJECT AND IS NOT BASED ON A LEGAL SURVEY.



PROJECT

Greenfield's residents and city officials are working to create a vibrant and welcoming downtown that is enjoyable for residents, attracts visitors, supports local businesses, and is environmentally sustainable.

In fall 2012, Greenfield will begin creating a sustainable master plan, a process that will bring together residents, officials and experts to craft a vision for Greenfield's future.

Leading up to that process, the Town has asked the Conway School to examine the downtown streetscape and two of its municipal parking lots, and develop designs that enhance both the aesthetics and ecological functioning of Main Street, Bank Row, and the parking lots.

GOALS

- Envision an inviting and beautiful streetscape that enhances pedestrian experience and promotes healthy ecological functions.

- Design two "green" parking lots that improve the ecological health of downtown Greenfield and can serve as a template for other downtown parking lots.

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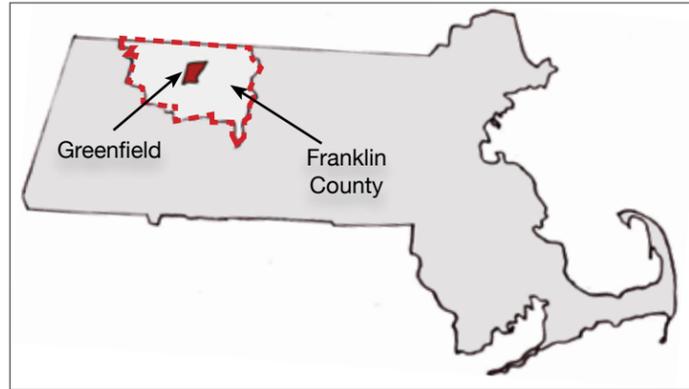
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STREETSCAPE ENHANCEMENT & ECOLOGICAL PARKING LOT DESIGN
TOWN OF GREENFIELD
DEPARTMENT OF PLANNING & DEVELOPMENT
114 MAIN STREET, GREENFIELD, MA 01301

RACHEL JACKSON & CHRISTINA PUERTO
THE CONWAY SCHOOL
GRADUATE PROGRAM IN SUSTAINABLE LANDSCAPE PLANNING & DESIGN
332 S DEERFIELD ROAD | PO BOX 179 | CONWAY, MA 01341
413-369-4044, WWW.CSID.EDU SPRING 2012

GREENFIELD, MASSACHUSETTS



State of Massachusetts



Restaurants and storefronts line the first floors of many Main Street buildings, with offices or apartments located above.



John W. Olver Transit Center

As the largest town in Franklin County, with a population of 18,000, and as the county seat, Greenfield plays an important regional role. The area has a long history of human habitation. Originally home to the Pocumtuck Indians, Greenfield was settled by the English colonialists in 1686 and incorporated as a town in 1753.

Located just north of the confluence of the Green, Deerfield and Connecticut Rivers, the downtown area is bounded to the south and the west by the Green and Deerfield Rivers and by Poet's Seat Ridge to the east. These physical constraints restricted sprawling development and helped Greenfield develop a compact, walkable downtown.

Historically, the rivers were a means of transportation as well as a power source for manufacturing in the nineteenth and twentieth centuries. Presently, rail lines and highways cross in Greenfield, solidifying the town's importance as a trade and transportation center.

Much of Greenfield's historic commercial core exists today as a walkable, central downtown with a mix of storefronts, offices and a few residences. Many of the structural changes that have occurred since the town's early development are tied to the rise of the automobile and include both street parking and multiple parking lots located behind Main Street's building fronts.

Just as transportation shaped the town's formation, it continues to play a major role in defining its future. The opening of the John W. Olver Transit Center will make downtown Greenfield a hub for regional bus travel and future passenger rail service. The new net-zero building demonstrates a commitment to sustainability that is reflective of broader green initiatives happening throughout the town. Greenfield has been designated a "Green Community" by the Commonwealth of Massachusetts because of its commitment to increasing energy efficiency, reducing greenhouse gas emissions, and increasing the supply of renewable energy.



Natural features of the Greenfield region



Transportation routes of the Greenfield region

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CONTEXT

ENVIRONMENTAL CHALLENGES

There are two major environmental challenges facing the small urban center of Greenfield, and streetscape and parking lot design have the potential to address these issues by increasing the healthy ecological functioning of the downtown area. These two challenges are the degradation of water quality through stormwater runoff and the urban heat island effect.

STORMWATER RUNOFF

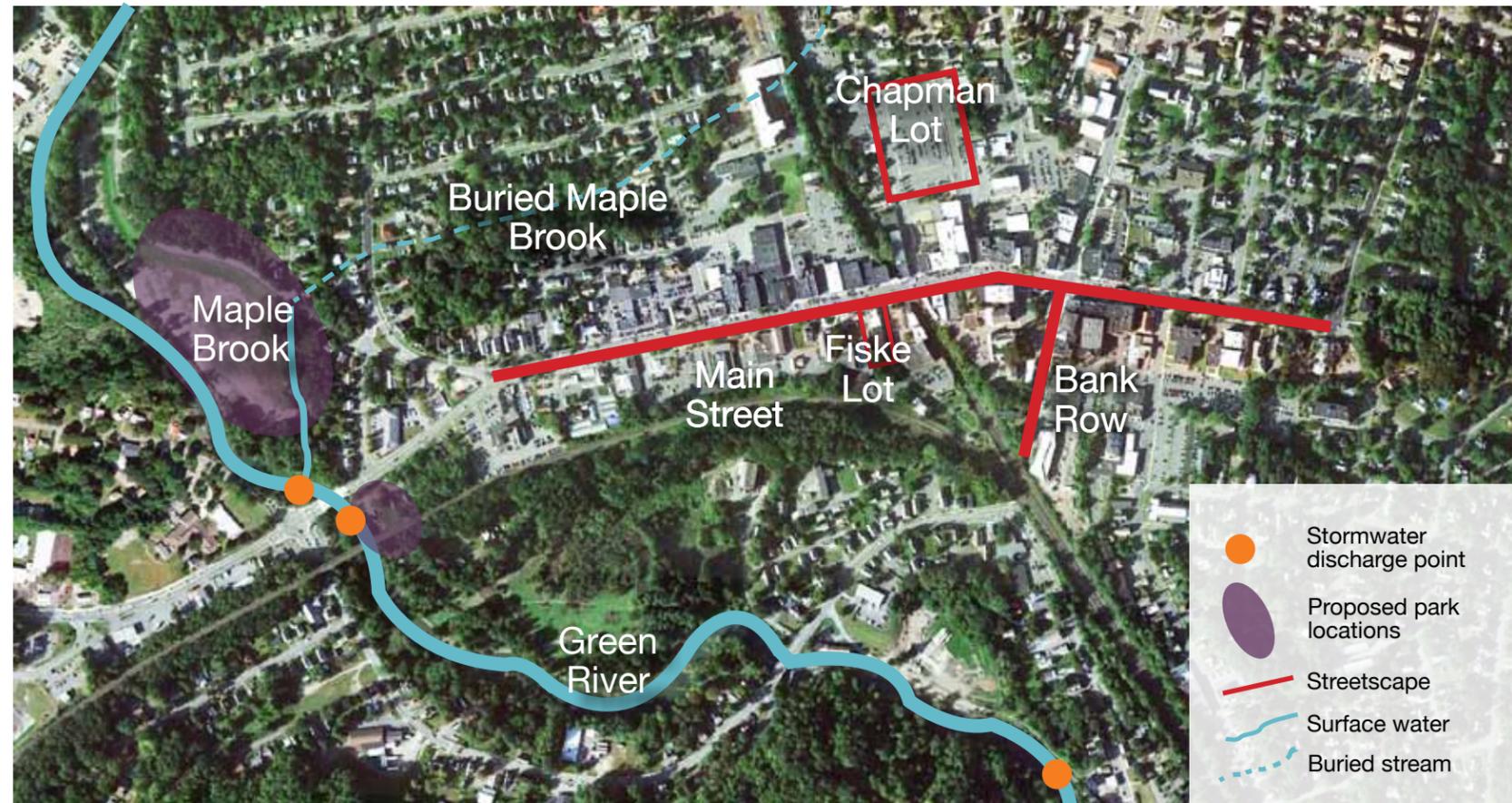
Over the last four decades, Greenfield has almost entirely separated its stormwater and sewage systems. This has greatly diminished the risk of combined sewage overflow, which historically resulted in the release of raw sewage into the river systems during large storms. However, because the systems are separated, stormwater is not directed to the treatment plant, but discharged directly into the Green River or one of its tributaries, potentially washing pollutants such as salt, oil, hydrocarbons and heavy metals from the road into the river.

Stormwater from downtown Greenfield flows out of three discharge points into the Green River (shown in orange). Two of these areas are close to the site of a former trailer park, which was closed after a flood in 2005, and the Town is in the process of repurposing the land in this area to create a riverfront park. If this proposal goes through, improving water quality in the Green River will become increasingly important because people will have direct access to the river.

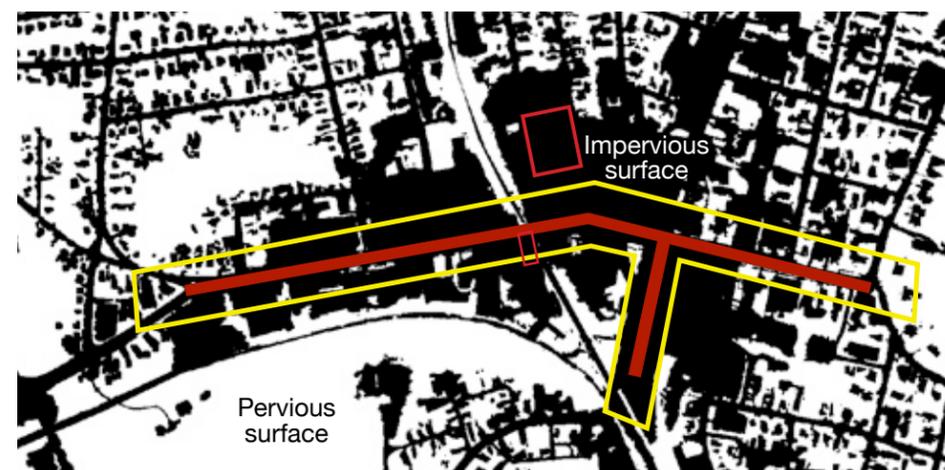
URBAN HEAT ISLAND EFFECT

The urban heat island (UHI) effect occurs when heat-storing materials, such as concrete and asphalt, retain and reflect heat within an urban center. In some cases, this phenomenon can lead to increases in air temperatures of seven to nine degrees compared to surrounding rural areas (Gartland 2010).

The urban heat island effect not only increases air temperatures, but also increases the temperature of stormwater runoff entering the river systems, and negatively impacts fish and other wildlife.



Stormwater washed from downtown Greenfield flows to three discharge points into the Green River. Most of the downtown area north of Main Street drains into the buried Maple Brook, which surfaces northwest of Main Street, and is then discharged north of Mohawk Trail, close to the proposed location of a riverfront park.



Twenty five acres of the twenty nine-acre focus area (outlined in yellow) have an impermeable surface cover.

About 87 percent of the project site has an impervious surface. This covers approximately 25 acres of the 29-acre downtown area. In a one-inch, one-hour storm, about 680,000 gallons of water run off the site and into the Green River. A streetscape plan and parking lot design that incorporates slowing, filtering, cooling, and infiltrating stormwater could greatly increase the water quality of the runoff entering the Green River.

DESIGN DIRECTIVES

Designs that incorporate increased vegetation and decreased asphalt and concrete cover could help mitigate UHI in downtown Greenfield. This could improve the water quality of the Green River, which would benefit both the river's aquatic ecosystems and Greenfield residents and visitors.

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ENVIRONMENTAL CHALLENGES

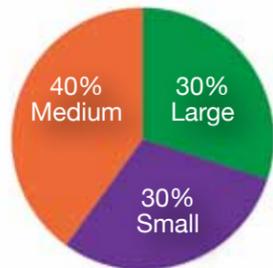
STREET TREES

Street trees provide many benefits to the urban landscape including:

- Shade for increased pedestrian comfort.
- Mitigation of urban heat island effect by shading streets and buildings, and providing the cooling benefits of evapotranspiration.
- Reduction of stormwater runoff. Trees can catch and evaporate up to 1/3 of the precipitation that falls on their foliage before it ever touches the ground. Additionally, permeable surfaces surrounding trees can enhance tree health, and filter polluted stormwater.
- Beautification.

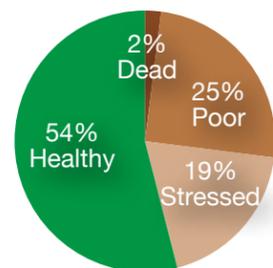


STREET TREE SIZE



- 30 percent of the street trees in Greenfield are “large”, with trunk diameters greater than one foot. 40 percent have trunk diameters between six and twelve inches (“medium”), and 30 percent have trunks less than six inches in diameter (“small”).
- Many street trees do not reach maturity, creating the need for frequent replacement.
- The benefits of street trees grow exponentially as the trees grow in size. A lack of large trees and a failure to mature means that many of Greenfield’s trees are not providing their full benefits.

STREET TREE HEALTH



- 54 percent of trees in downtown Greenfield are healthy, and 46 percent are stressed, in poor condition, or dead.
- The trees in stressed and poor condition will likely not reach maturity to maximize street tree benefits.
- Replacing trees that die while young is less cost effective than ensuring the health and longevity of existing trees.



A struggling tree in the central section of Main Street is missing foliage, showing signs of stress.



Trees in the central district are mainly planted in three-by-three foot tree wells with metal grates on top. Surrounded by impervious surface, it can be difficult for roots to access the air and water they need to thrive.

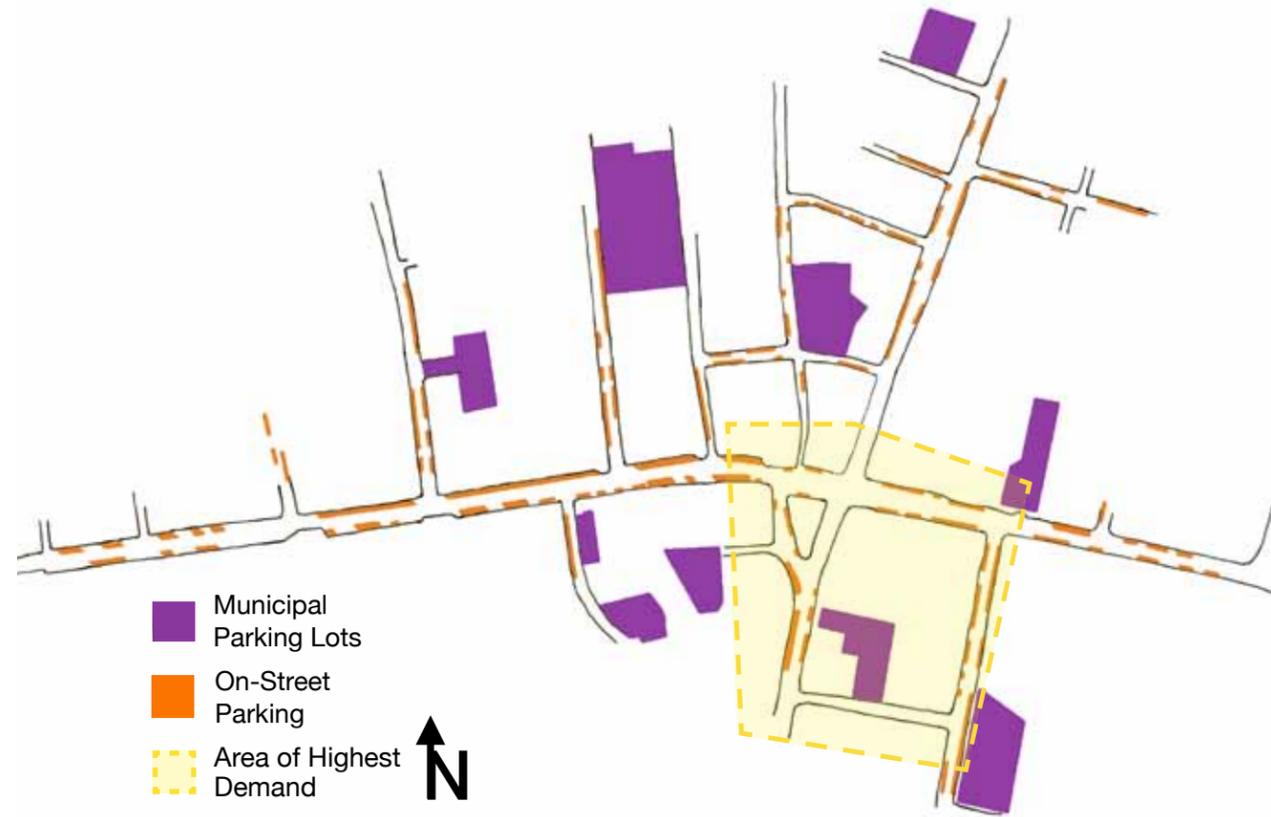
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DOWNTOWN PARKING

GOALS FOR DOWNTOWN GREENFIELD



As the automobile gained prominence during the twentieth century, many towns prioritized wide streets and abundant parking over keeping an intimate, village feel. In designing Greenfield's future it is important to find a balance between parking needs, ecological health, and creating an inviting pedestrian environment that works for the town and its residents.



- Municipal Parking Lots
- On-Street Parking
- Area of Highest Demand

EXISTING PARKING PATTERNS

- Downtown Greenfield contains 2,404 parking spots with 486 on the street, 700 in municipal lots, and 1,218 in private parking areas.
- A 2008 parking analysis of downtown Greenfield by Concord Square Planning & Development showed that while there is adequate parking in the downtown area to meet current needs, parking is not always available in the areas of highest demand.

IMPLICATIONS

- Abundant, cheap parking makes trips downtown convenient.
- Car-centered streetscapes may be less walkable and less conducive to a vibrant, ecologically healthy downtown.

FUTURE CHANGES IN PARKING PATTERNS

Renovation of the County Court House, a planned expansion of City Hall, and increased use of the new Olver Transit Center may affect future parking needs and should be considered when planning parking changes. These changes, and with a continuation of the trend of new businesses and restaurants opening in Greenfield, mean it is likely that residents and visitors will make more trips downtown in the future. Increased traffic could be managed by increasing the use of off-street lots, encouraging bicycling, walking, and bus ridership, or constructing of a parking garage in the central section of downtown.



Diagonal on-street parking along Bank Row.



Solar powered pay kiosk at the Chapman Street Lot.



Parallel parking in front of the Public Library.

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PARKING ANALYSIS

DOWNTOWN STREETScape

STREETSCAPE SECTIONS

Based on building density, type, and use, downtown Greenfield can be classified into four sections: Western, Central, Eastern, and Bank Row. Each of these sections exhibits different characteristics, but combine to create Greenfield's downtown. Analysis of existing conditions, needs, and uses will together inform the final designs and recommendations.

SOILS AND DRAINAGE

The Franklin County Soil Survey describes the soils beneath Main Street and Bank Row as a sandy well-drained loam. According to local geologist Richard Little, a layer of clay pan lies beneath much of that area, occurring anywhere from two to twelve feet beneath the sandy soils. The non-porous bedrock and clay tend to be closer to the surface at the eastern end of Main Street.

These varying conditions throughout the downtown area indicate that infiltration capacity is not consistent throughout. Further testing is needed to understand the drainage profile of specific areas, and to design for successful stormwater filtration in each section.



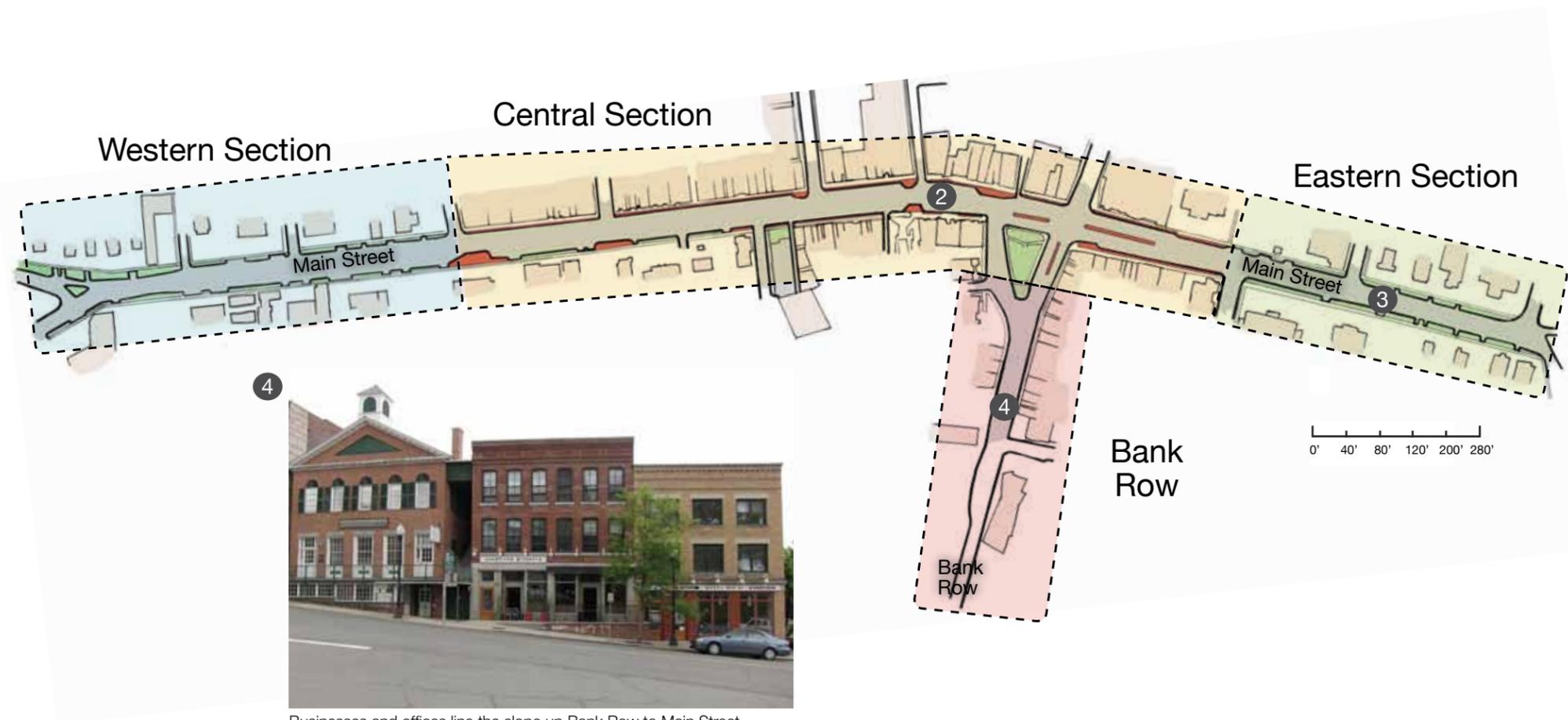
1 Athens Pizza and adjacent parking lot in the Western Section of Main Street.



2 Brick-lined streets and mixed-use buildings in the Central Section.

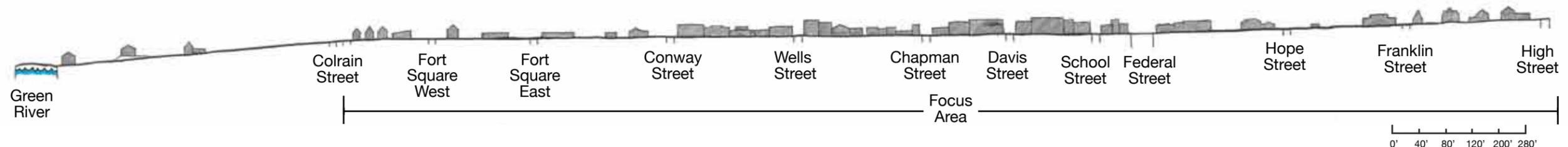


3 Historic home and garden used as an office in the Eastern Section.



4 Businesses and offices line the slope up Bank Row to Main Street.

MAIN STREET ELEVATION LOOKING NORTH



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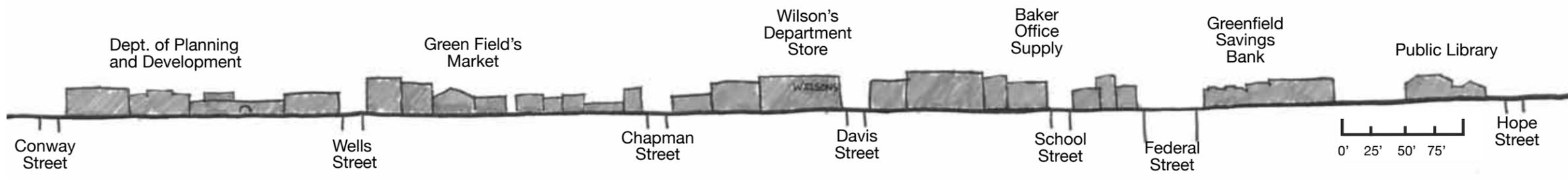
DOWNTOWN
STREETSCAPE

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CENTRAL SECTION
ANALYSIS



Section Elevation Looking North

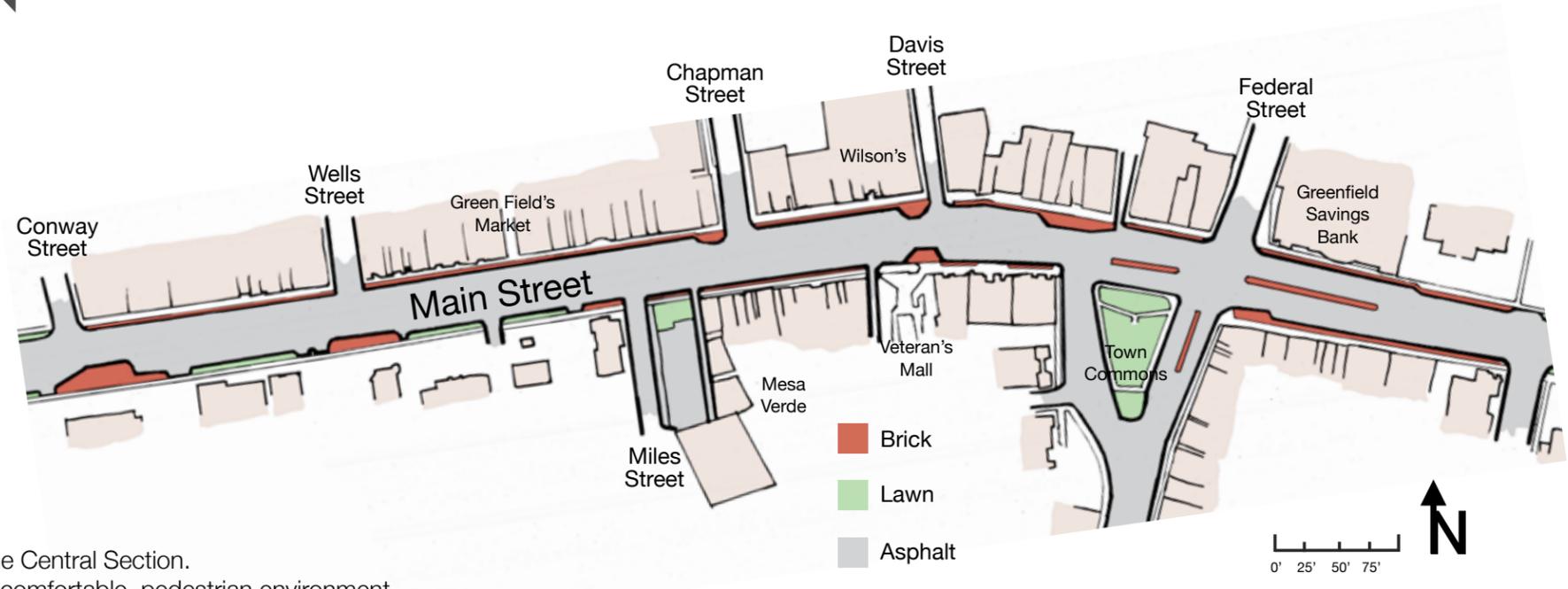
CENTRAL SECTION

EXISTING CONDITIONS

- Historic buildings line Main Street with street-level storefronts and restaurants, and offices and residences above.
- Buildings are densely situated with zero-lot-lines and shared building walls, creating a downtown feel.
- Street trees, while numerous, are small and provide limited shade. Most surfaces are concrete or asphalt leaving few vegetated or pervious areas.

DESIGN GUIDELINES

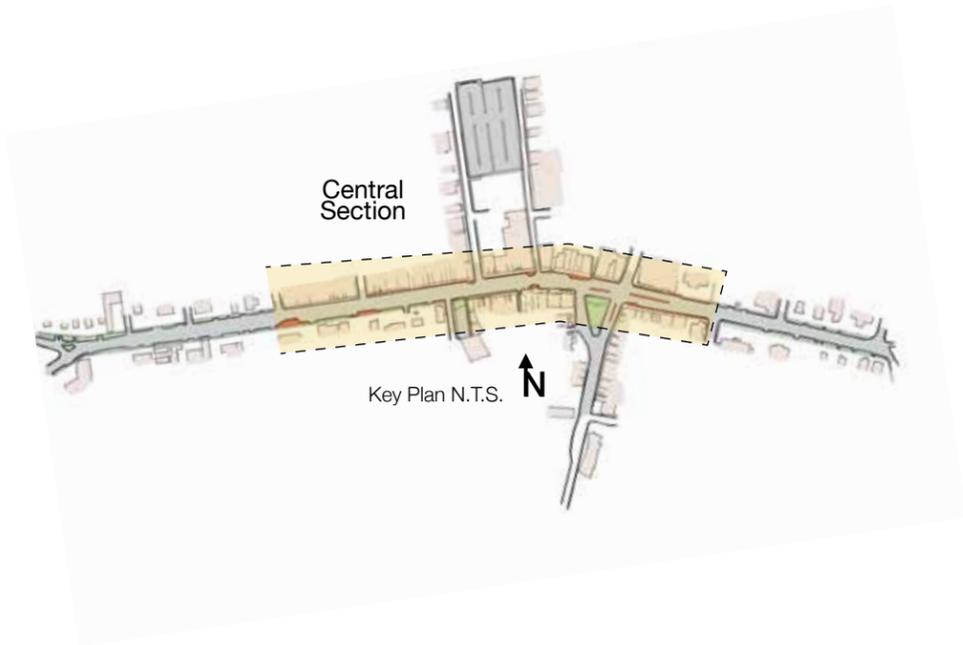
- Maintain and enhance the existing downtown feel of the Central Section.
- Improve street tree health to create a more vegetated, comfortable, pedestrian environment.
- Install bump-outs no less than ten feet wide to break up continuous parking strips and create a narrower, tree-lined street.
- Direct stormwater into tree wells to increase filtration and infiltration of water.
- Maintain left-turn lanes during any street-narrowing alterations.



The fronts of the historic, mixed use buildings in the Central Section of Main Street are built out to the sidewalk.



The Central Section is home to Wilson's Department Store, an iconic symbol of downtown Greenfield for 140 years.

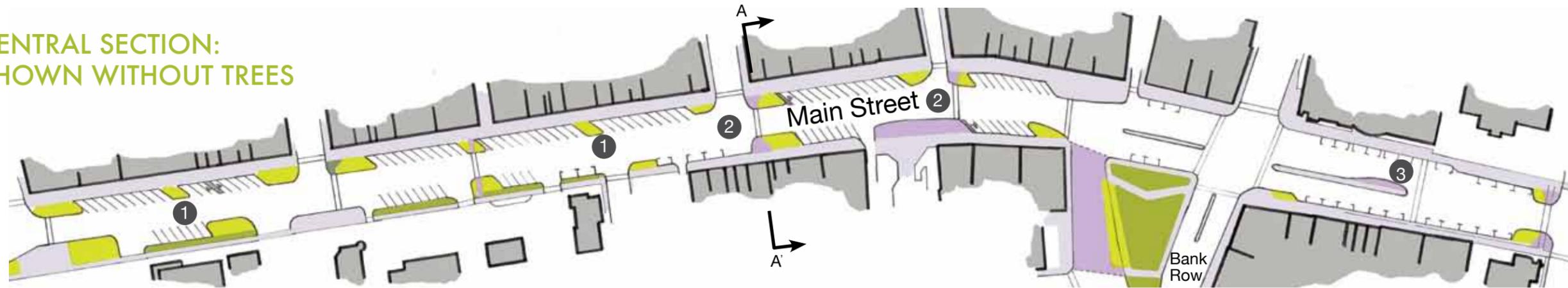


CENTRAL SECTION DESIGN

CENTRAL SECTION

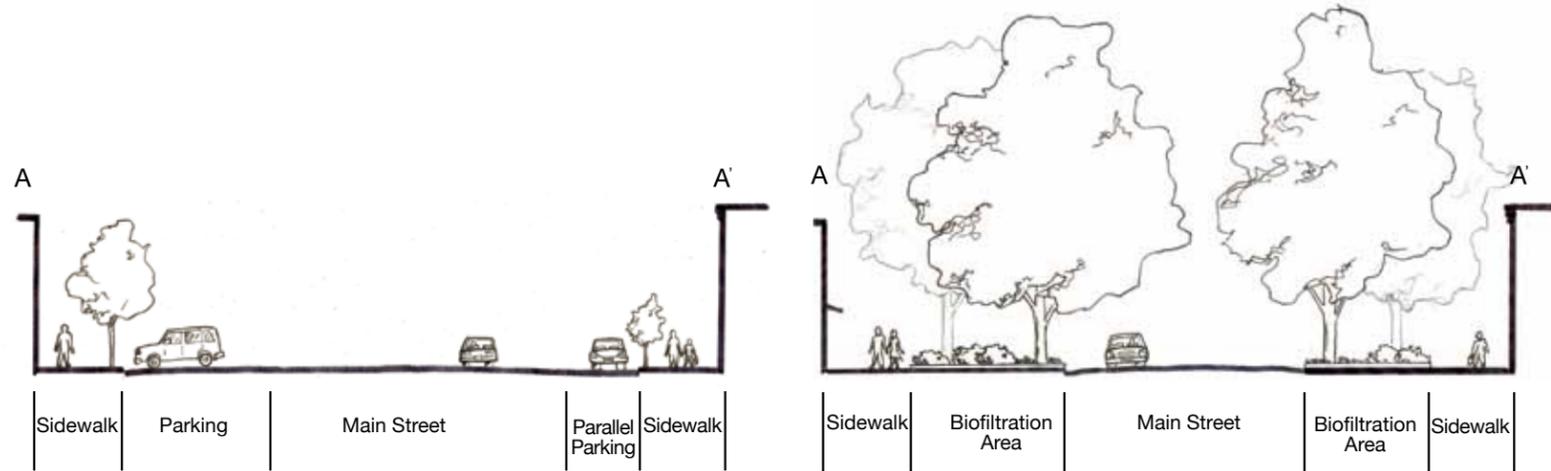


CENTRAL SECTION: SHOWN WITHOUT TREES



- 1 Large spans of parking are broken up by planted bump-outs, giving the feeling of a narrowed street while still retaining most of the parking. These bump-outs have a range of uses including seating space, stormwater filtration, and combinations of the two.
- 2 The crosswalks at both Chapman and Davis Streets are moved to the eastern sides of their intersections, eliminating potential conflict between pedestrians and cars making right turns onto Main Street.

- 3 The median east of the intersection of Main Street and Bank Row is expanded to slow traffic and allow space for a single street tree.
 - o Additional trees, planted in long trenches (see sheet 22) increase canopy cover and reduce urban heat island effect.
 - o On-street parking is reduced by 17 percent, with 23 of 133 parking spots removed.



Existing Street Section

Proposed Street Section

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CENTRAL SECTION
DESIGN

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BANK ROW

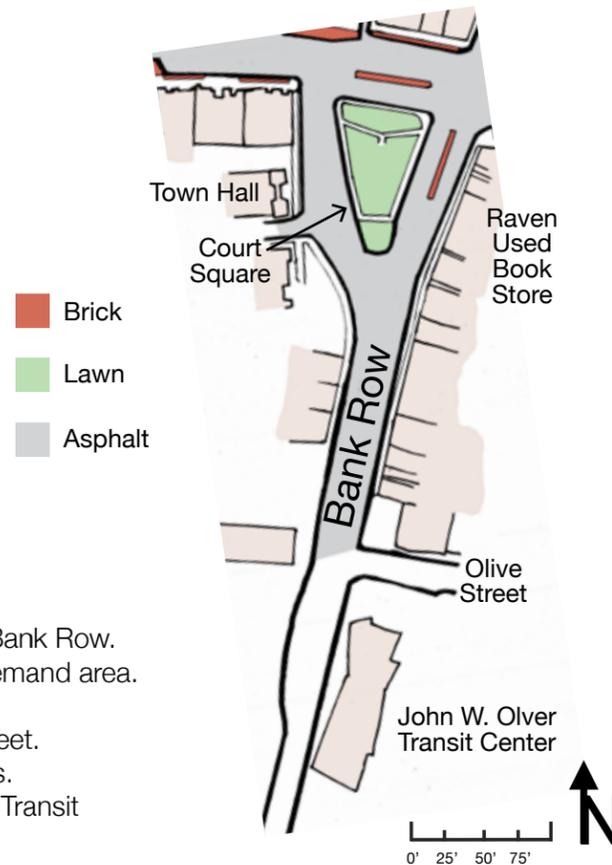
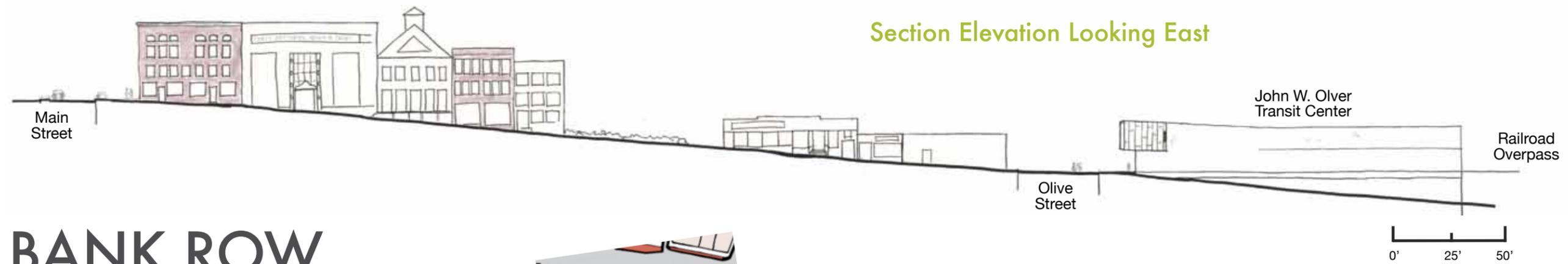
EXISTING CONDITIONS

- Historic buildings and high building density continue the walkable, downtown feel of the central section.
- Bank Row descends steeply from Main Street at about an 8 percent slope.
- The John W. Olver Transit Center, completed in 2012, sits at the bottom of the slope in the focus area.

DESIGN GUIDELINES

- Maintain and enhance the existing downtown feel of Bank Row.
- Maintain high number of parking spaces in this high demand area.
- Maintain or improve pedestrian crossing safety.
- Increase the filtration and infiltration of water on the street.
- Increase the presence, health and vitality of street trees.
- Enhance the connection between Main Street and the Transit Center.

Section Elevation Looking East



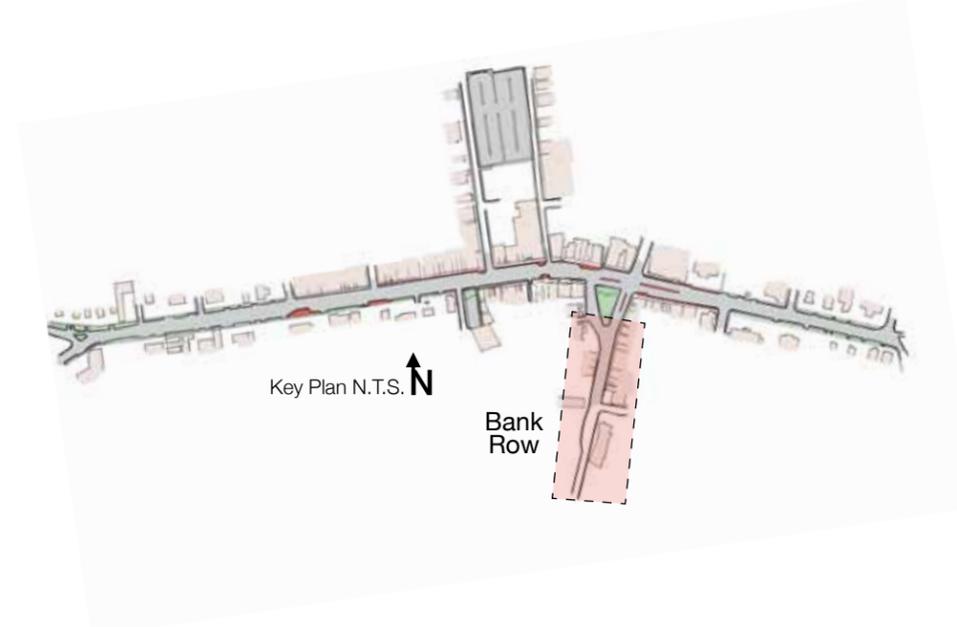
Newly renovated historic buildings along Bank Row attract patrons with outdoor seating, movable displays and hanging signs.



Mag Pie and other restaurants have opened in recently renovated buildings along Bank Row.



Village Pizza sits on the steeply sloped Bank Row.

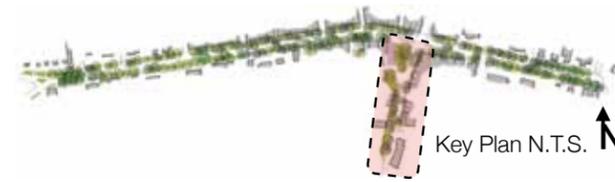


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BANK ROW ANALYSIS

BANK ROW DESIGN



BANK ROW



BANK ROW: SHOWN WITHOUT TREES

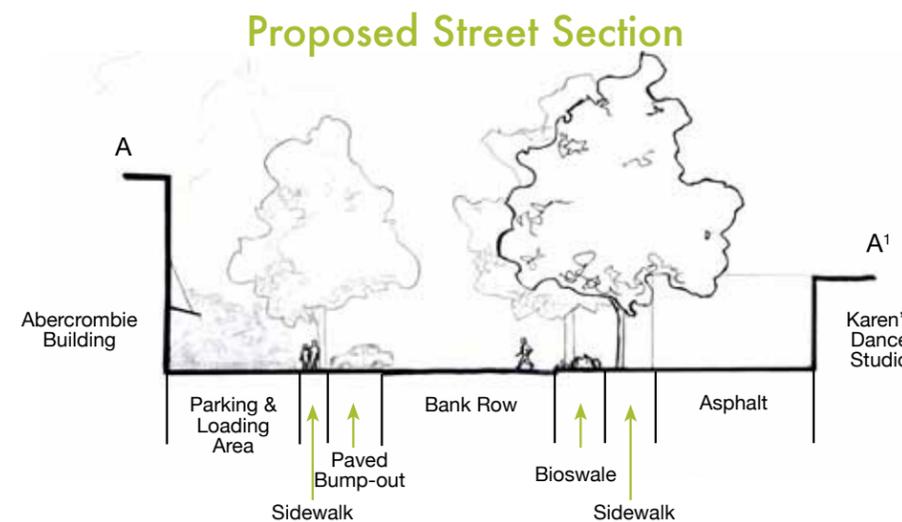
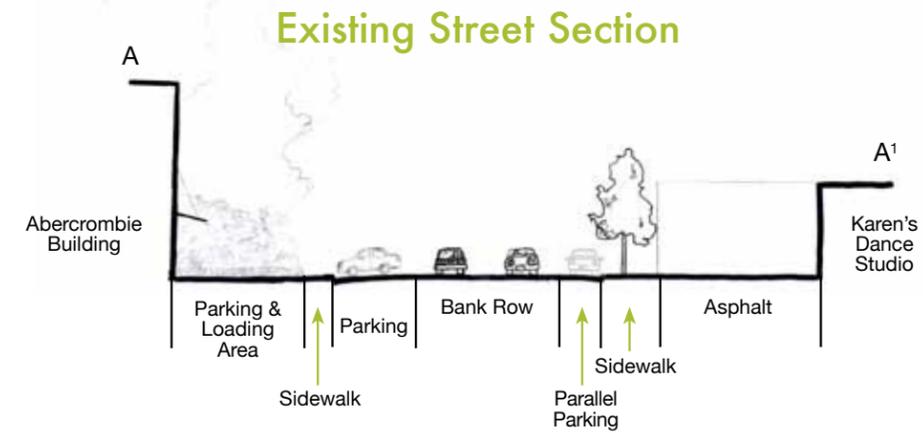


Many of the Bank Row changes are the same as proposed by Dodson & Associates in the 2008 Bank Row Streetscape Improvements study. Differences include:

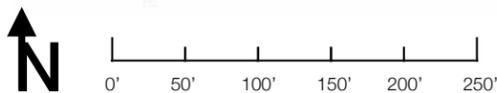
- A bump-out on the western edge of Bank Row increases pedestrian visibility and safety.
- A more intensive method of tree planting ensures better survival of urban trees (see sheet 22).
- Bank Row is narrowed at the southern end, allowing more space for trees and vegetation.
- One out of thirty spots is removed reducing on-street parking by 3 percent.

FUTURE CONSIDERATIONS

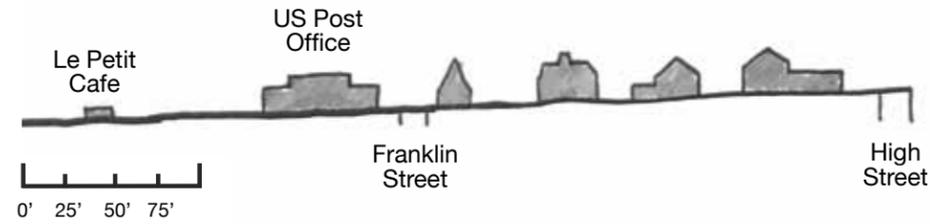
- A parking garage built in the lot off Olive Street would reduce the need for on-street parking and allow the removal of all the parallel parking spots on the eastern side of Bank Row. This would give space for the sidewalk to be widened and more street trees planted, making the journey from the Olver Transit Center to Main Street an easier, more inviting experience.
- Closing off Court Square to through traffic would create a larger, more accessible Town Common. Permeable pavers in a narrowed road could infiltrate water while still allowing access to the Arts Block alley and for farmers market vehicles.



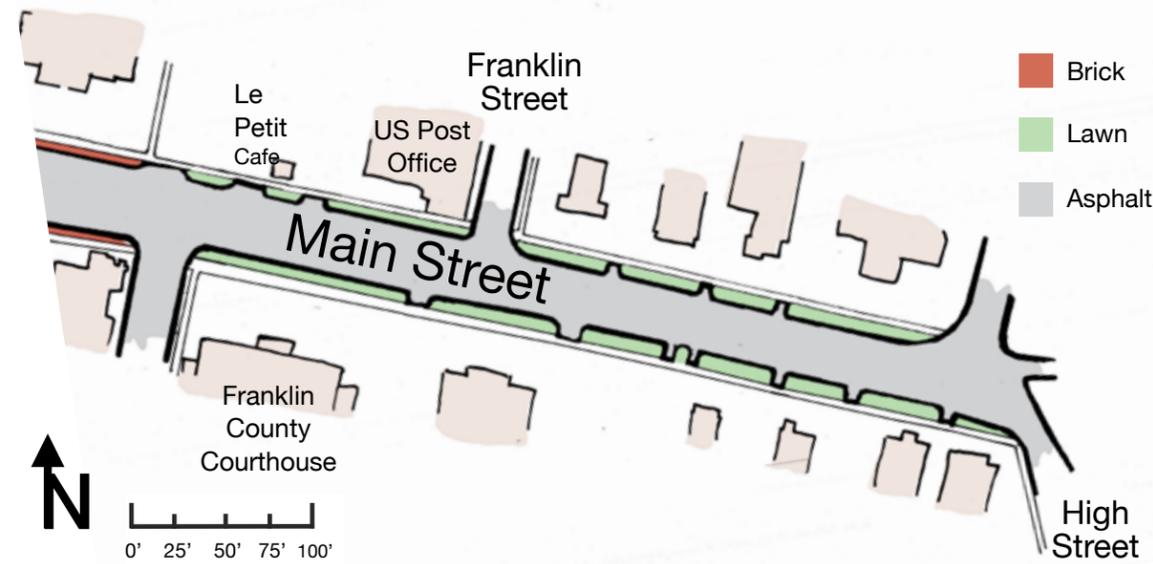
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Section Elevation Looking North



EASTERN SECTION



A historic home is used as a hair salon, and is separated from the street by a lawn and garden.



Greenfield's U.S. post office is located in the Eastern Section of Main Street.

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EXISTING CONDITIONS

- The section has a rich historic character, with institutional buildings such as the county court house and post office and historic homes and offices.
- Buildings are set back from the street with large street trees, lawns and gardens in between, creating a shady, comfortable environment.

DESIGN GUIDELINES

- Maintain and enhance the transition between the historic town center and the historic residential Greenfield.
- Maintain lush vegetation and comfortable pedestrian environment.
- Maintain and improve tree health.
- Maintain existing parking spaces, which are already limited.
- Increase pedestrian crossing safety.

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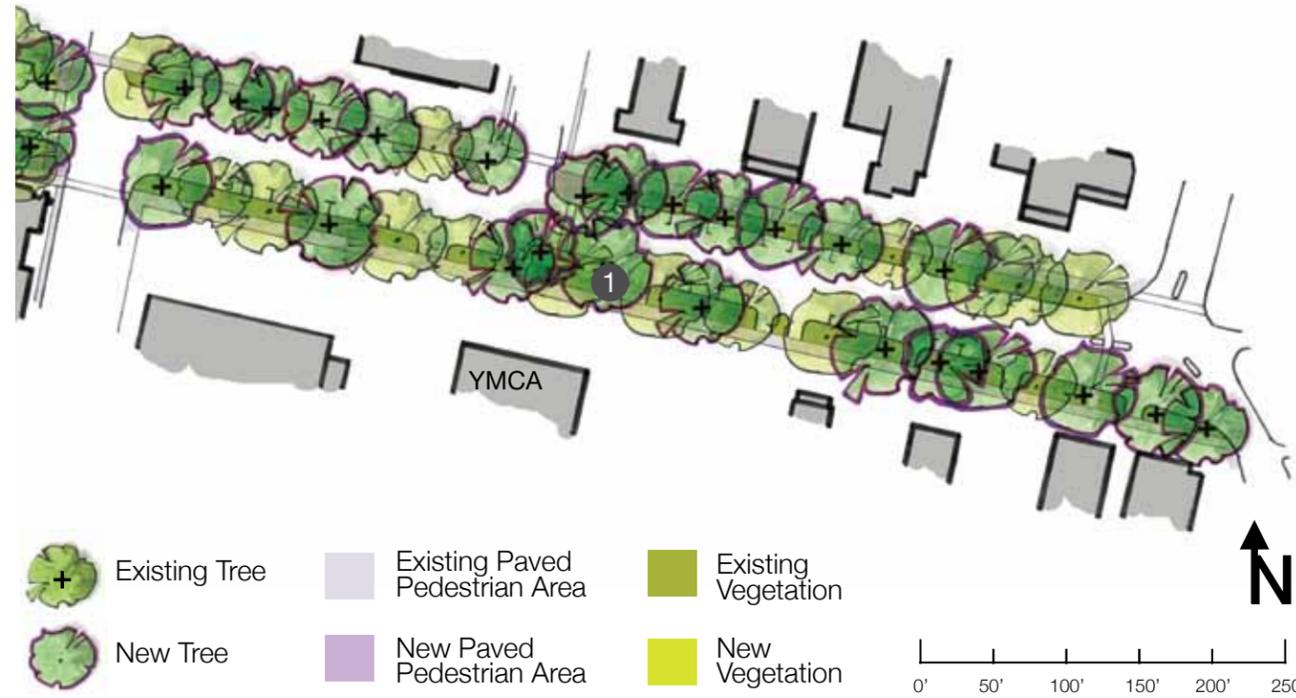
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EASTERN SECTION ANALYSIS

EASTERN SECTION DESIGN

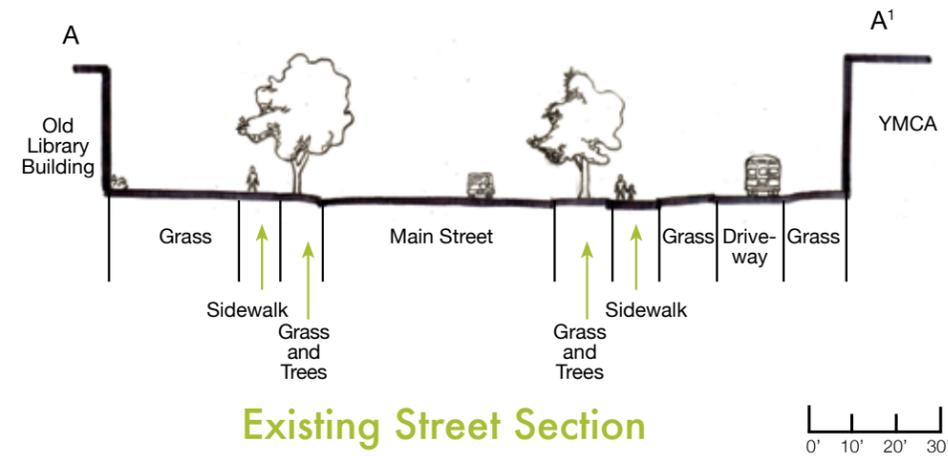


EASTERN SECTION

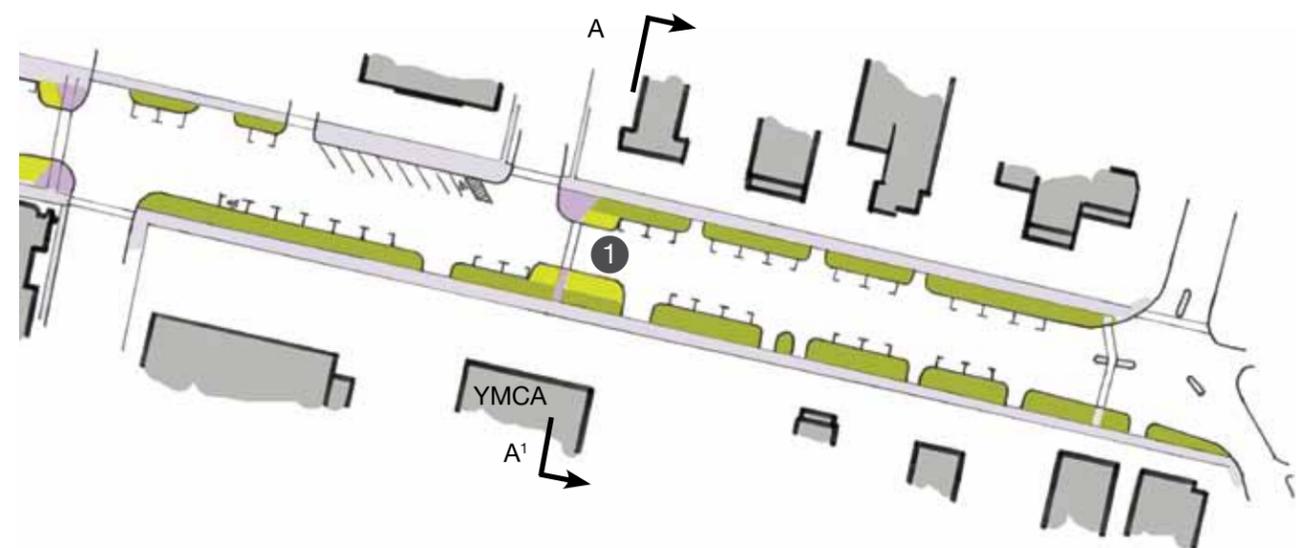


- Additional trees increase canopy cover.
- Most of the curb lines remain unchanged, reflecting the already green and inviting nature of this street section and the high demand for existing parking.
- The bump-out enhances safety by making pedestrians more visible when crossing the street, particularly important at this crossing which is used by many children accessing the YMCA.

1 New bump-outs with trees and a bench enhance an existing crosswalk in front of the YMCA without requiring the loss of any parking spots.



EASTERN SECTION: SHOWN WITHOUT TREES

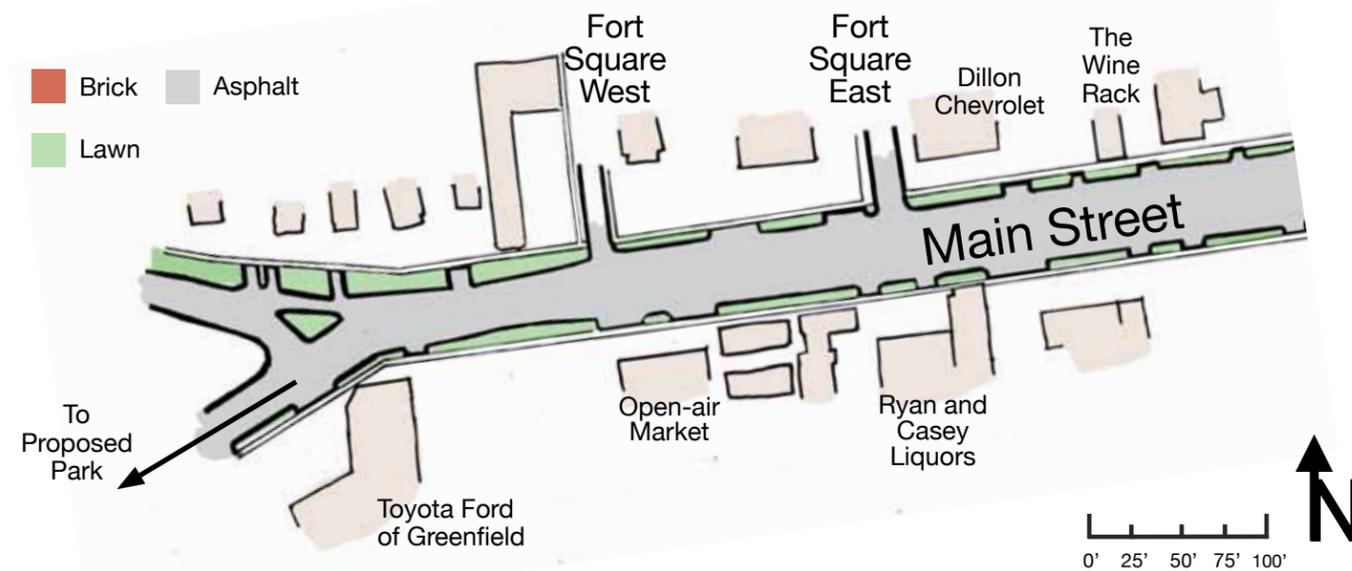


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Section Elevation Looking North



WESTERN SECTION



EXISTING CONDITIONS

- Modern 20th-century buildings house multiple auto dealerships, auto-repair shops, a gas station, other businesses and a few residences.
- Private parking lots separate many of the buildings from the sidewalk and street, making automobiles a dominant feature of the Western Section, as compared to the other three sections.
- This portion of Main Street is the main entrance into town from Interstate 91 and the primary corridor between Greenfield's core commercial center and a proposed river-access park to the west.
- Power lines, buried in all other sections of Main Street, are above ground west of Fort Square West.

DESIGN DIRECTIVES

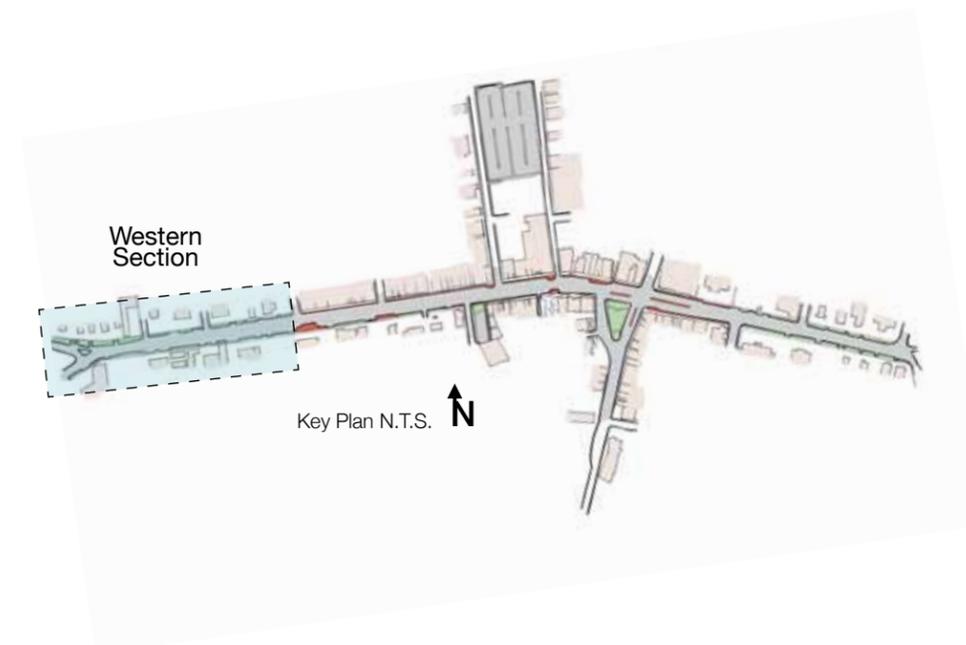
- Create a welcoming entrance to the downtown area that distinguishes Main Street from Mohawk Trail.
- Enhance aesthetic and physical connection to the Green River.
- Increase stormwater filtration and infiltration by directing water to new vegetated areas along the street.
- Maintain or improve tree health, and maximize green space and vegetation to create a comfortable, pedestrian environment.
- Narrow the street to slow traffic and increase pedestrian crossing safety
- Reduce under-utilized parking by removing all diagonal parking.



Auto dealership occupies a one-story, 20th century building in the Western Section.



Athens Pizza's private parking lot sets the building back from the street creating an open, uncomfortable pedestrian environment.

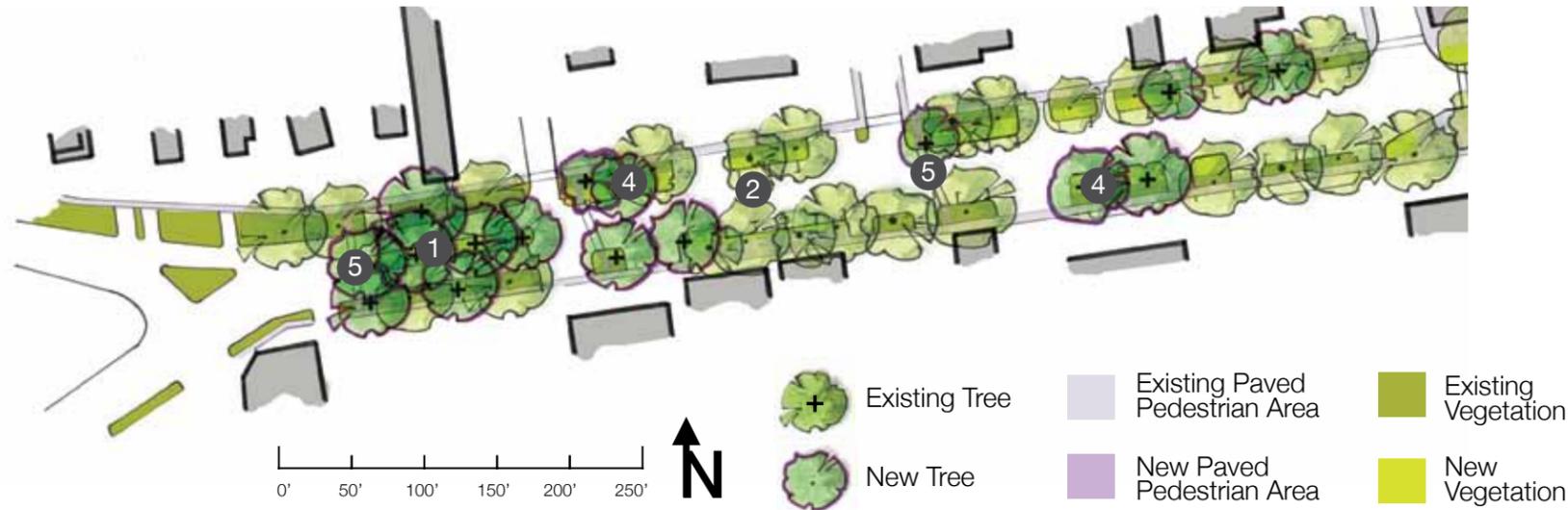


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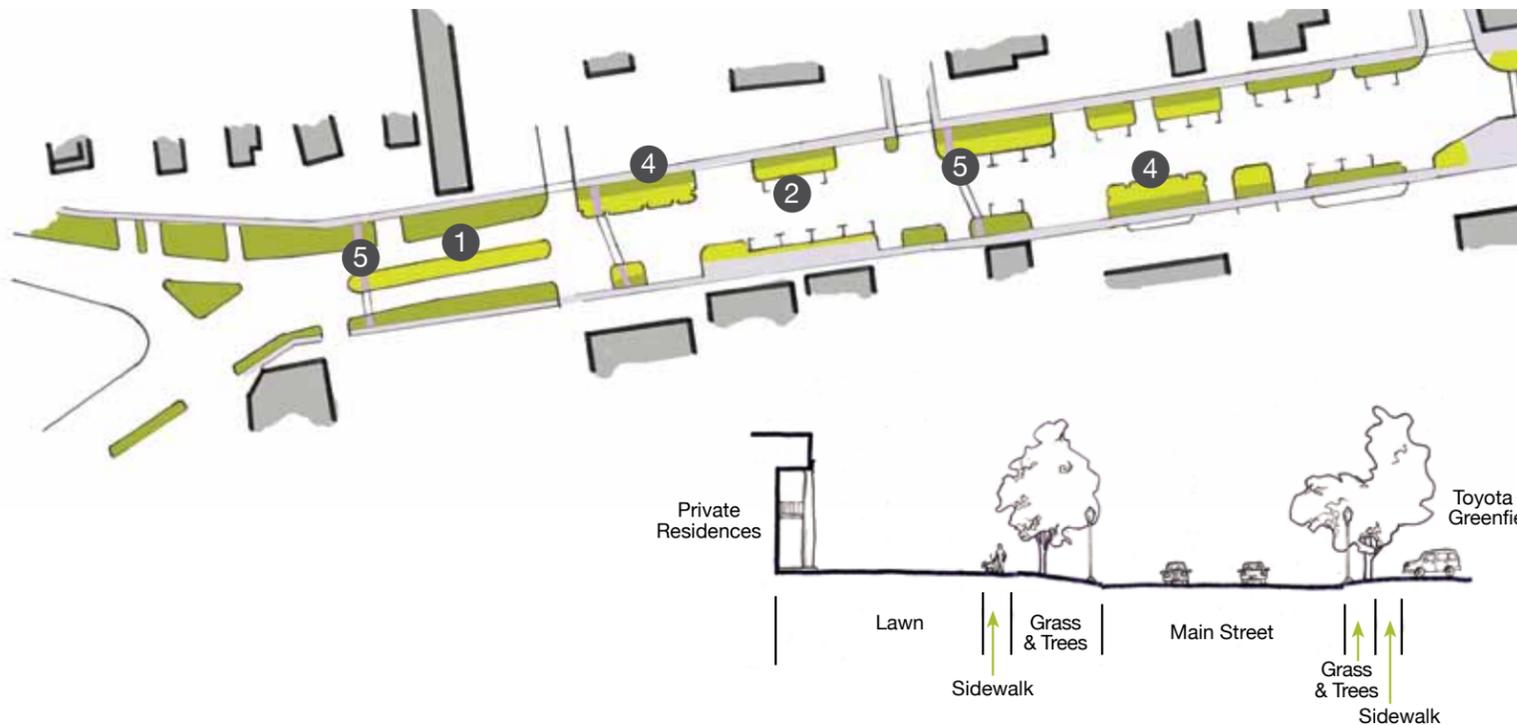
WESTERN SECTION DESIGN



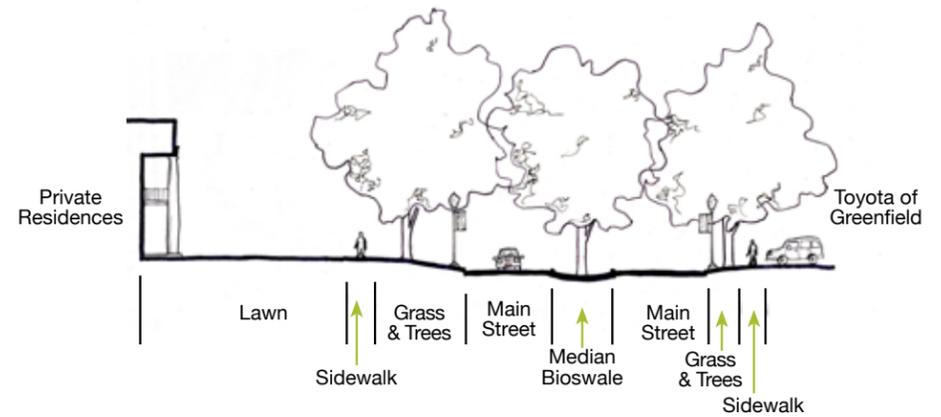
WESTERN SECTION



WESTERN SECTION: SHOWN WITHOUT TREES



Existing Street Section



Proposed Street Section

- The street is narrowed throughout the section, potentially slowing traffic and creating a safer pedestrian environment.
- Added vegetation and biofiltration areas in the bump-outs catch, filter or infiltrate stormwater potentially improving water-quality in the Green River and reducing downstream flooding.
- Large, healthy trees provide an inviting, shaded, pedestrian environment and reduce urban heat island effect.
- On-street parking is reduced by 46%, removing 18 of 39 spots in an area of underused parking.

- 1 A 14'-foot-wide median creates a distinct tree-lined entrance to the downtown area.
- 2 All diagonal parking is removed and replaced with parallel parking to increase area for stormwater filtration along the street.
- 3 Additional trees (outlined in purple), planted to optimize health (see sheet 22), line the street and the median. Power lines, now buried, no longer interfere with tree canopies.
- 4 Curb cuts along the street direct runoff into biofiltration basins. Overflow is directed into the storm sewer.
- 5 New crosswalks allow pedestrians to safely cross Main Street and give people the option to stop and wait in the median during heavy traffic. A third additional crosswalk in front of Ryan and Casey's liquor store divides what was a seven-hundred foot stretch of street without a marked crossing.

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WESTERN SECTION DESIGN

CREATING A DISTINCT DOWNTOWN IDENTITY

Streetscape elements can help to aesthetically unify downtown Greenfield, increasing its appeal for residents and visitors alike. There are a number of options for features such as signs, plants, waste bins and sitting areas that can beautify downtown and enhance Greenfield's identity. Visual elements extending throughout downtown can potentially unify the four distinct parts of the streetscape with a consistent visual theme.

EXISTING ELEMENTS



- Greenfield has begun to use design details to create visual unity. Distinctive light posts and American flags are found throughout the focus area. Brick detailing on the sidewalk edge and around the street trees, and planted barrels maintained by the Greenfield Garden Club are seen in the Central Section. However these elements are not consistent throughout the entire downtown area.

WASTE COLLECTION AND RECYCLING

- Trash receptacles consist of small green bins attached to street signs and larger bins on the sidewalk. Dumping of household garbage in town trash bins has been a problem. Recycling is found at three solar compactors and a large recycling container set back from the street. A consistent style and spacing for trash and recycling could reduce littering and increase recycling.



Trash cans and recycling bins in downtown Greenfield

- Trash cans like this one found in Keene, New Hampshire, prevent people from placing large bags of trash into the can.



Trash receptacle, Keene, NH.

SIGNS

- Current signs for parking can be hard to spot and may contribute to a perception that Greenfield lacks convenient parking.
- The green parking signs may blend into surrounding foliage. More brightly colored signs may be more effective. A map of parking locations placed at existing pay kiosks could help patrons plan future trips.



Parking sign on Main Street near the Veterans Mall.



Brighter colors may better catch the attention of motorists.

- Small signs can be placed on Main Street, Bank Row and Federal Street, welcoming visitors to the downtown district.
- Street lamp banners can help visually unite the downtown area while celebrating local culture and events.
- Hanging signs extending out from the face of a building, may be more visible to pedestrians and can add to the historic town feel of Greenfield.



Downtown entrance sign, Keene, NH.



Downtown banners in Newberry, South Carolina.



The hanging sign at Raven Books on Bank Row grabs the attention of passersby.

SEATING



Seating in Keene, New Hampshire.

- Keene, New Hampshire, uses corner bump-outs to provide both greenery and seating. By repeating this pattern throughout downtown, the town strengthens its identity as a green, pedestrian-friendly destination.
- Colored benches could add a visual cohesiveness downtown.
- Commissioning artists to design or paint benches could strengthen the creative character of Greenfield.



Benches can add interest and color to the streetscape.



A painted bench in Gdańsk, Poland.

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STREETSCAPE
ELEMENTS

FISKE AVENUE PARKING LOT

- Located directly off of Main Street
- Contains 11 spots, frequently full
- The highly visible lot has potential to be a showcase for green initiatives.



Fiske Lot Looking East

The Fiske Lot directly borders the privately owned Fiske Avenue. This small pedestrian-oriented street contains popular businesses and hosts outdoor dining in the warmer months.



DRAINAGE & SLOPES

- Lot slopes from the northeast to southwest at 4-5%
- 80% impervious surface
- Stormwater from paved areas enters one of three storm drains and flows to the Green River.

IMPLICATIONS

- Most of the stormwater has no opportunity to be filtered or infiltrated and may have a negative effect on the water quality of the river.

VEGETATION & SHADE

- 11 trees surround the parking lot. Arborvitae shrubs and perennials are planted along the retaining wall and southern edge of the lot.
- The trees and building cast partial shade across the lot during summer months.
- 7 of the trees are struggling or dying.

IMPLICATIONS

- Lack of porosity and tough urban conditions make tree survival difficult.
- Semi-shady lot will lose morning summer shade if stressed trees are removed, increasing UHI effect and making parking lot and Fiske Avenue less comfortable.

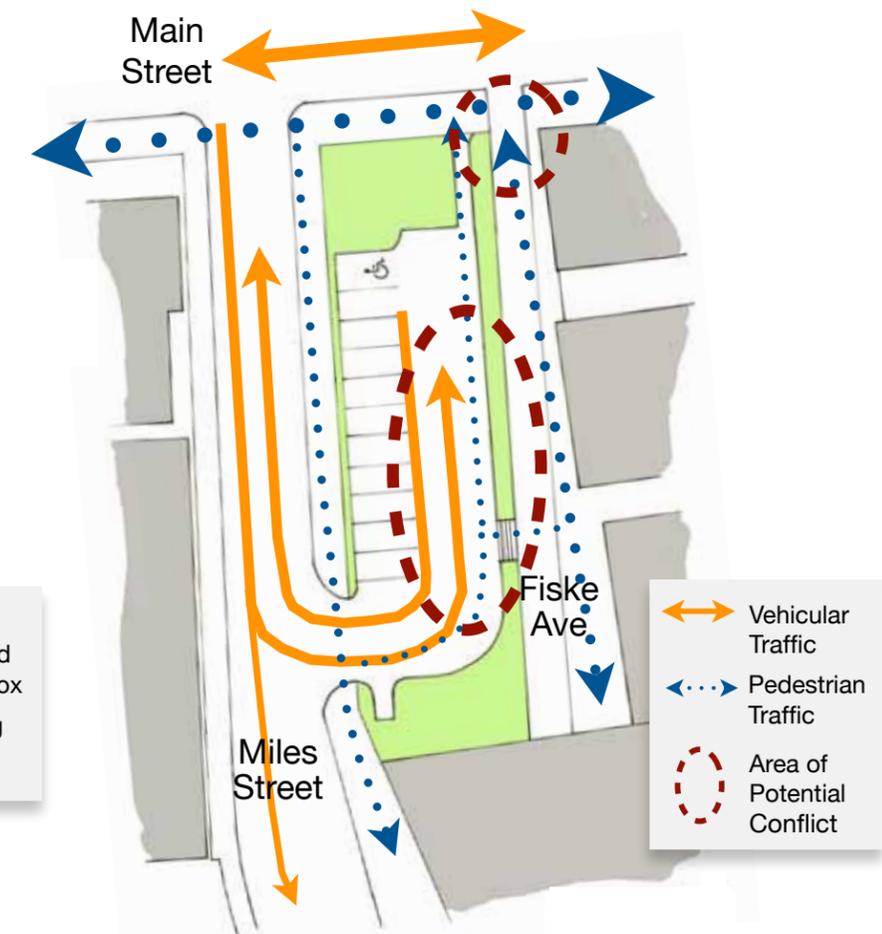
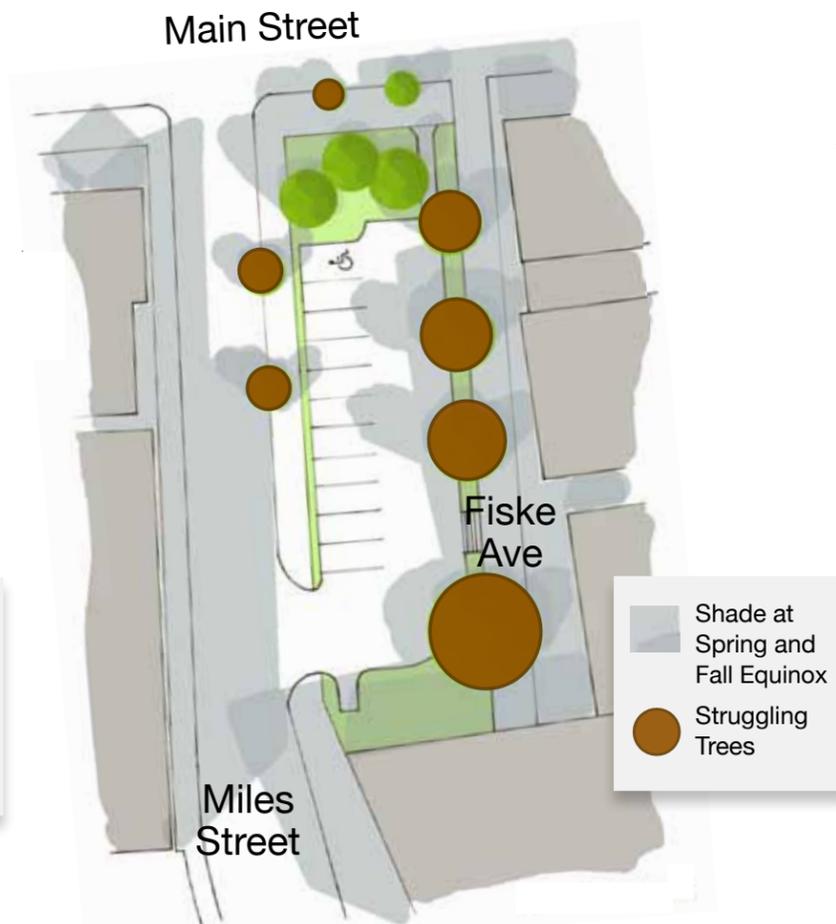
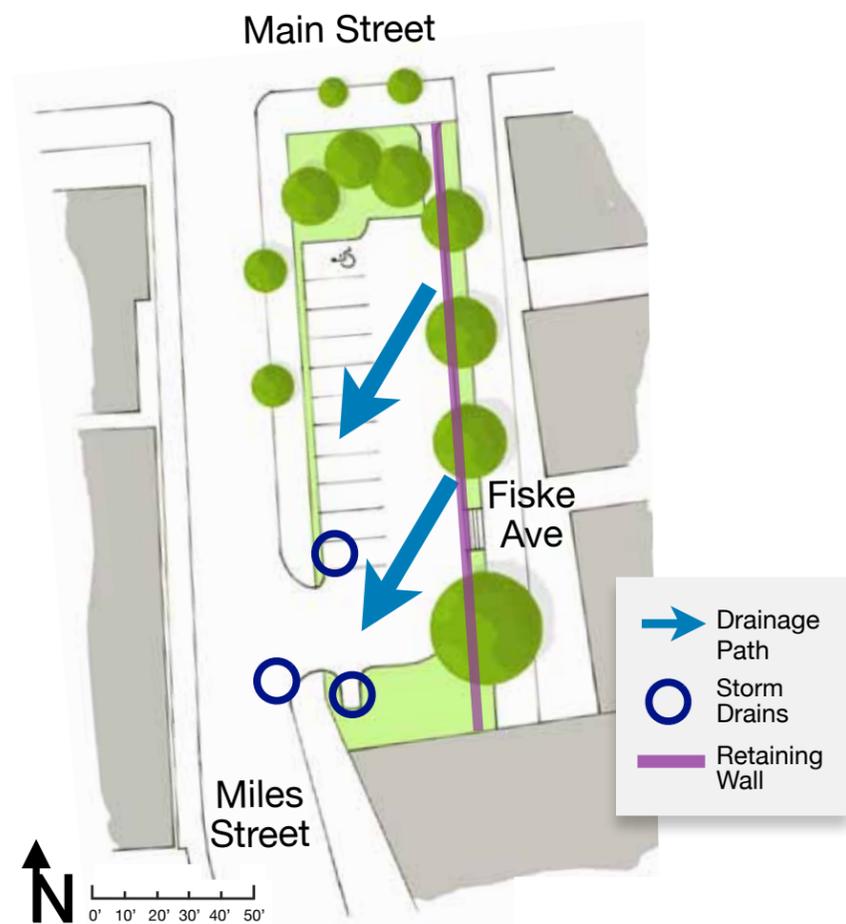
ACCESS & CIRCULATION

- Vehicular and pedestrian traffic share space with no clear walking path within the lot.

IMPLICATIONS

- Potential conflict between vehicles and the most popular pedestrian path.
- Loitering along fence and retaining wall can block sidewalk and make other pedestrians feel uncomfortable.

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FISKE LOT DESIGN ALTERNATIVES

ALTERNATIVE #1: ENHANCING EXISTING CONDITIONS

This design works within the existing curb lines to increase pedestrian safety and add more vegetation.



- 1 Parking and sidewalk are moved to face the retaining wall, increasing pedestrian safety by eliminating vehicle/pedestrian conflict.
- 2 Strips of grass and trees along Miles Street and wider planting beds along Fiske Avenue better support large trees.

- 3 Permeable paving in the form of dry-laid brick or interlocking concrete pavers enhances the beauty of Fiske Avenue and increases infiltration.
 - Parking lot runoff is left untreated.



Dry-laid brick in an alley in Keene, New Hampshire

ALTERNATIVE #2: STORMWATER TREATMENT

This design focuses on improving water quality by increasing pervious surface and maximizing tree health.



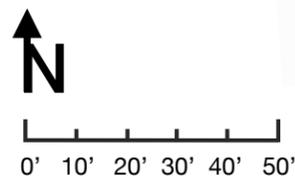
- 1 Entrance moved to the north, creating space for stormwater infiltration at the low southern end of the lot.
- 2 A tiered vegetated swale and basin infiltrates and filters runoff.
- 3 Permeable pavers increase porosity beneath the parking stalls and in Fiske Avenue.

- 4 New benches add seating options and an expanded entryway to Fiske Avenue allows space to gather with room for
 - Removes two parking spots.
 - Requires permission of adjacent property owners.
- 5 A new ramp connects the Miles Street sidewalk to Fiske Avenue.



A bioswale at UMASS Amherst treats and infiltrates water from a parking lot.

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FISKE LOT PREFERRED DESIGN: POCKET PARK

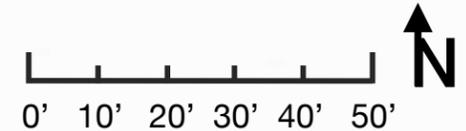
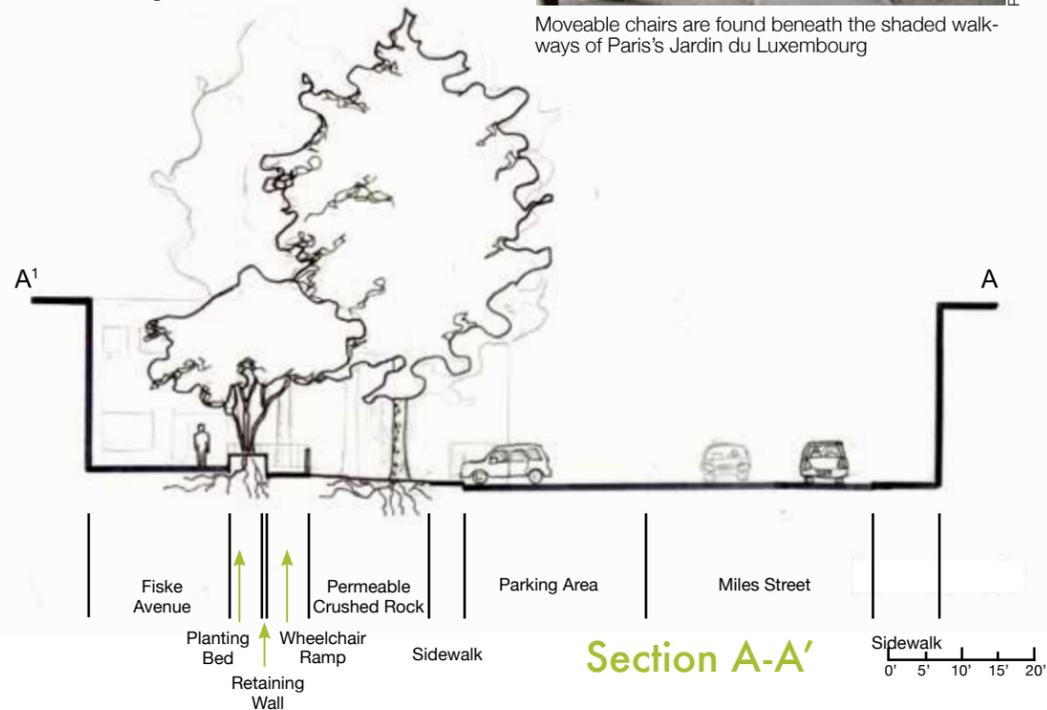
This design creates a shaded, green parking lot with expanded gathering spaces, while reducing impervious surface and related negative environmental effects. The expanded gathering spaces require cooperation of adjacent property owners on Fiske Avenue.

- 1 Parking is directly adjacent to Miles Street, reducing the total amount of asphalt.
- 2 The sidewalk is routed around the parking lot, eliminating potential pedestrian/vehicle conflicts.
- 3 An expanded Fiske Avenue, now surfaced with attractive permeable pavers, provides more room for sitting and outdoor dining. The wider entry area draws the eyes of passersby and connects Main Street to the popular businesses along the avenue.
- 4 Fine crushed rock creates a durable and permeable walking surface while supporting tree health and stormwater infiltration. London plane trees tower over the area, creating a classic shaded allée reminiscent of New York City's Bryant Park and Paris's Jardin du Luxembourg.
- 5 A vegetated rain garden treats and infiltrates stormwater from the parking lot and part of the street. A small sign explains the process of biofiltration and Greenfield's commitment to sustainability.
- 6 Smaller shade-tolerant redbud trees thrive in the planting bed along Fiske Avenue.
- 7 A gently sloped ramp provides easy access for wheelchairs between the parking lot and Fiske Avenue.



Moveable chairs are found beneath the shaded walkways of Paris's Jardin du Luxembourg

Philip Fuchs



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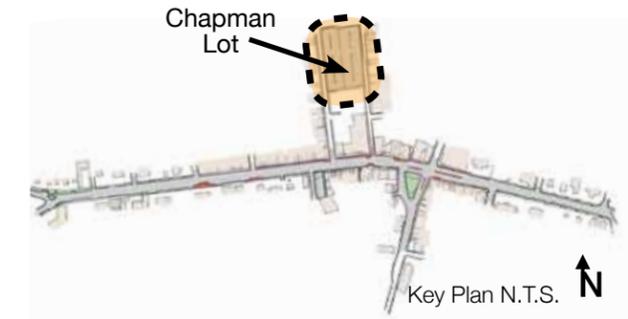
FISKE LOT
PREFERRED DESIGN

CHAPMAN STREET PARKING LOT

Located one block north of Main Street, this sloping, two-acre expanse of exposed asphalt is slated for upcoming renovation. Rarely more than half-full, a re-design has the potential to greatly improve the lot's attractiveness, usability, and contributions to environmental health.



Water sheets down the sloped asphalt during a light rain.

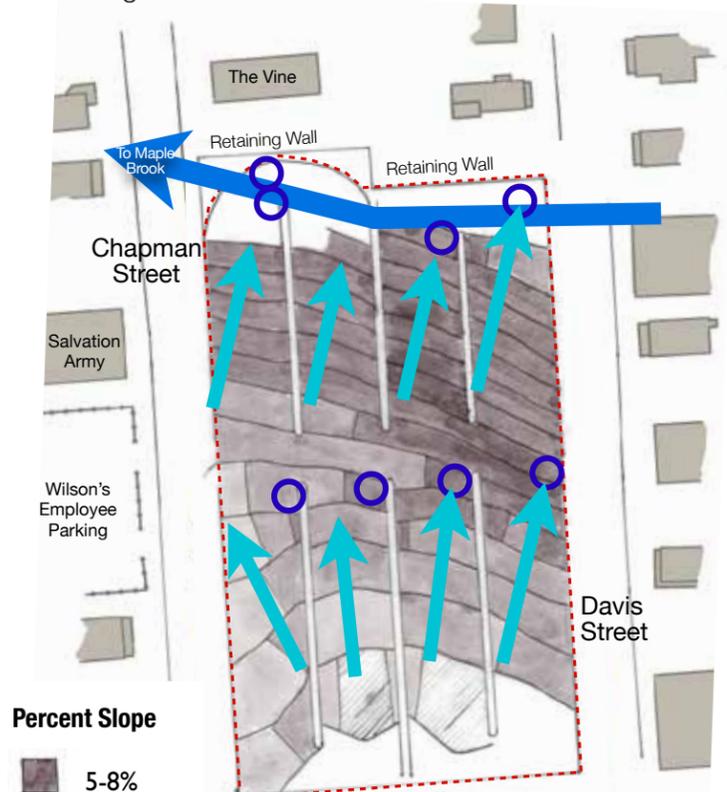


DRAINAGE & SLOPES

- Slopes range from 2% to 7%.
- All stormwater drains to the buried Maple Brook and then the Green River with no filtration.
- A retaining wall marks the northern border of the property.

IMPLICATIONS

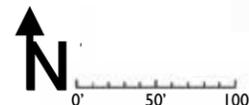
- Steep slopes in the northern half of the lot present a challenge to accessibility and a potential hazard in winter.
- Polluted runoff may affect water quality in the river.
- The high retaining wall could constrain potential grading changes and infiltration.



Percent Slope

- 5-8%
- 3-5%
- 2-3%
- 0-2%

- Direction of Surface Flow
- Underground Culvert
- Existing Storm Drain

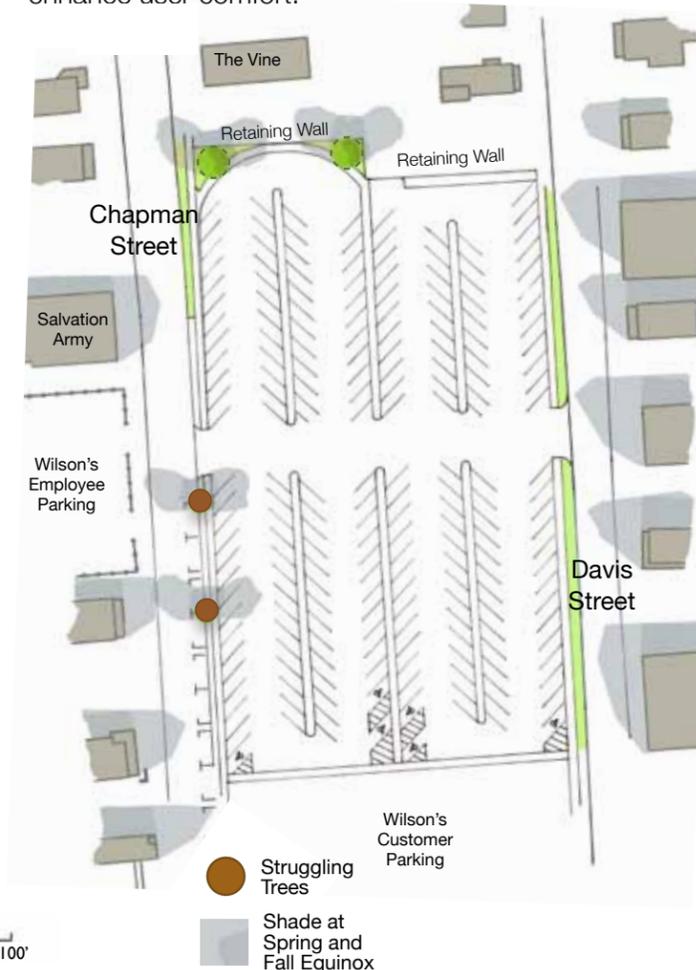


VEGETATION & SHADE

- Two trees at the northern end cast no shade on the property.
- Two street trees cast a small amount of shade on the lot but are in poor health.
- The lot does not meet current town requirements of one tree per ten parking spaces.

IMPLICATIONS

- Parking lot offers little protection from the sun and contributes to urban heat island effect.
- If the amount of parking stays the same, seventeen more trees are required to comply with town regulations.
- Increasing shade could improve ecological health and enhance user comfort.



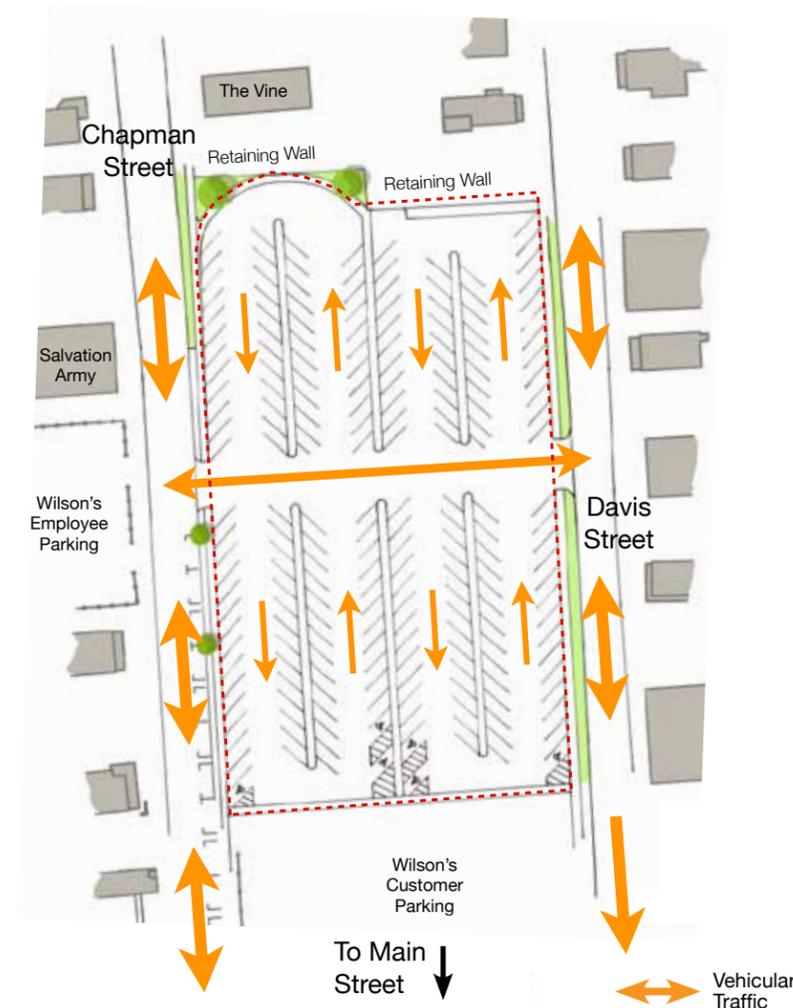
- Struggling Trees
- Shade at Spring and Fall Equinox

ACCESS & CIRCULATION

- Two entrances off Chapman and Davis Streets.
- Parking lot is used as a cut-through between the two streets.
- No clear pedestrian path within parking lot.

IMPLICATIONS

- Cars cutting through lot at speed potentially dangerous to pedestrians.



To Main Street ↓

Vehicular Traffic

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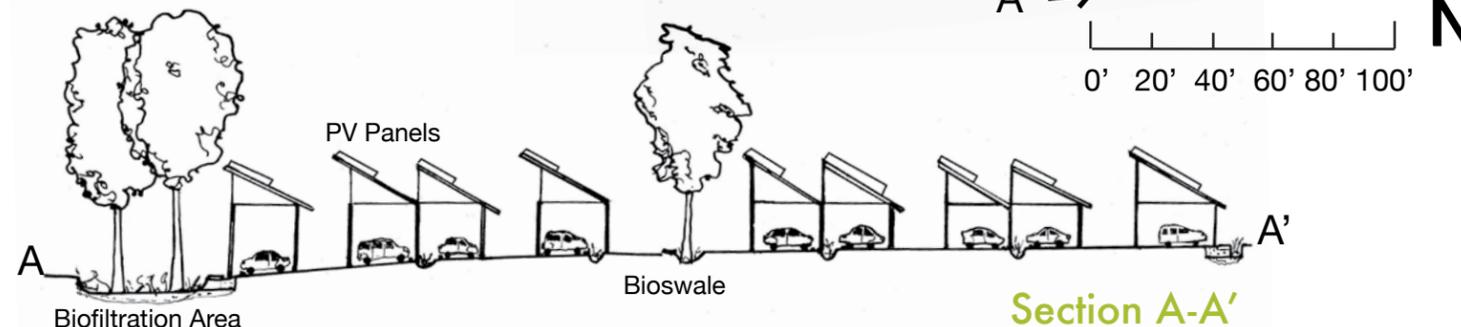
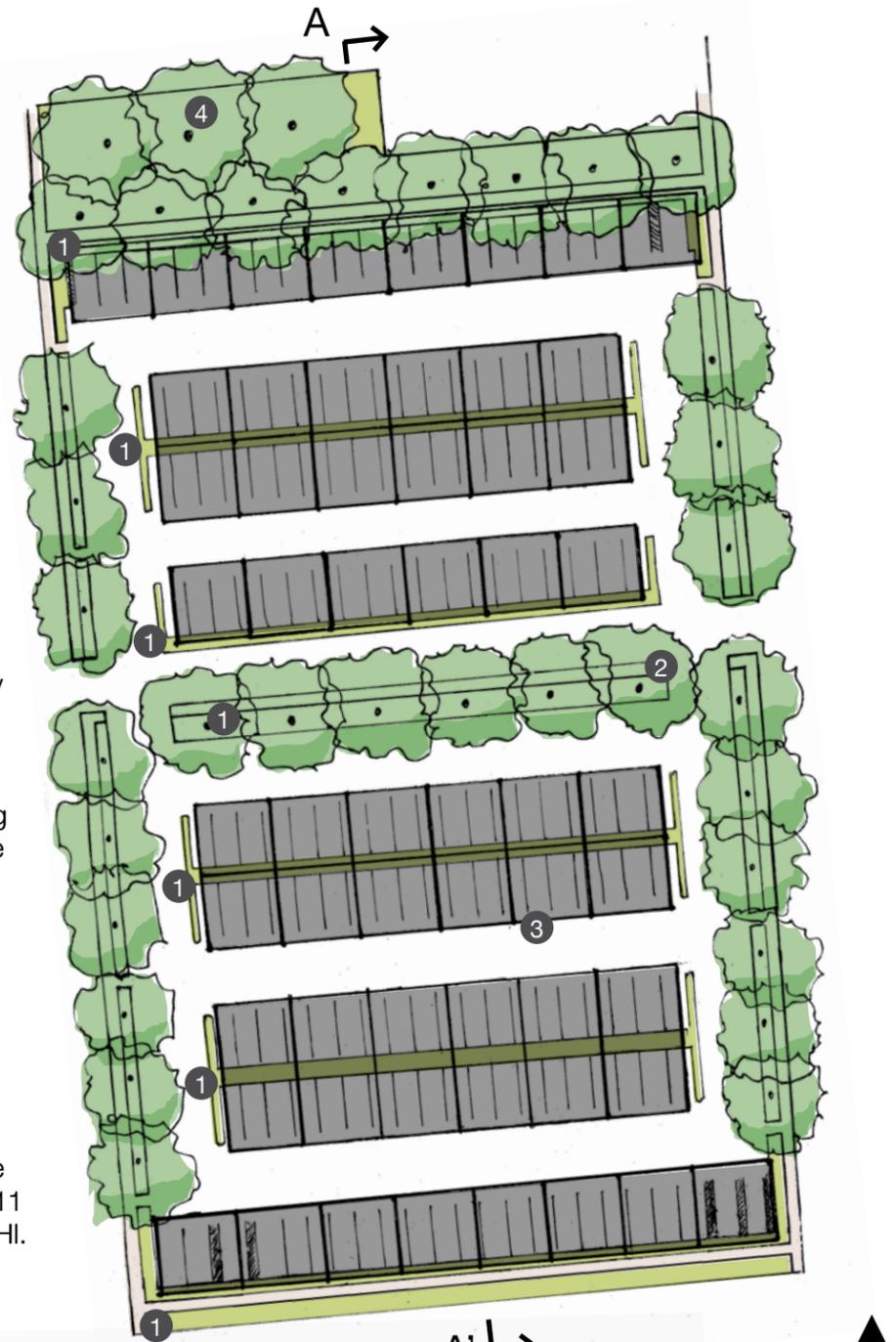
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CHAPMAN LOT
ANALYSIS

CHAPMAN LOT PREFERRED DESIGN

This design takes full advantage of the lot's solar access and creates a shady, comfortable parking area, while reducing impervious surface and slowing, cooling and filtering stormwater.

- 1 Six-foot-wide bioswales cross the slope in seven locations, slowing and filtering stormwater with salt-tolerant grasses and herbaceous plants.
- 2 A sidewalk lines the new street crossing the middle of the lot, allowing for safe pedestrian access along this throughway. The narrow street, lined with low-growing salt- and moisture-tolerant trees encourages vehicles to slow as they cross through the lot.
- 3 Photovoltaic panels cover approximately 50 percent of the surface area in the lot. A solar array of this scale has the potential to provide 475 kw of power, in addition to fully shading all of the parking areas in the lot. Not only does the shade provide comfort to parking patrons, it helps to mitigate the urban heat island effect (UHI).
- 4 A large biofiltration area planted with trees, shrubs, and herbaceous vegetation provides an area to further filter stormwater runoff from the parking lot before it enters the Green River. This porous vegetated area is also conducive to healthy tree growth. Additionally, the 11 new trees in this area help to mitigate UHI.



PHASING PLAN: TREE SHADE TO SOLAR ARRAY

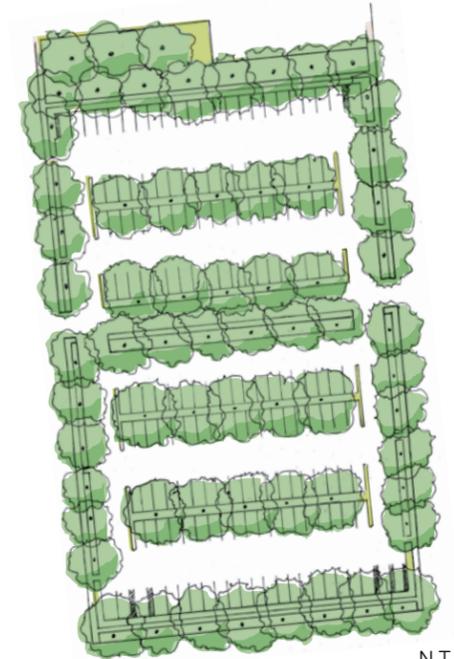
The design, installed in phases, first by planting a lush urban treescape, which is then replaced by an extensive solar array.

Phase One:

During the paving of the lot and the forming of the bioswales, trees are planted in the bioswales. Concrete footings for the future solar array are also installed on the edges of the bioswales at this time (see sheet 21 for construction details). The bioswales are planted after these installations.

Phase Two (optional):

If funds for a solar array installation become available, the trees in all but two of the bioswales should be removed, and the solar arrays installed on the existing concrete footings.



Chapman Lot Alternative:
If the originally planted trees were not removed for the installation of a solar array, the planted trees would reach maturity, cast ample shade and provide beneficial cooling effects in the lot.



Arizona State's solar parking structure

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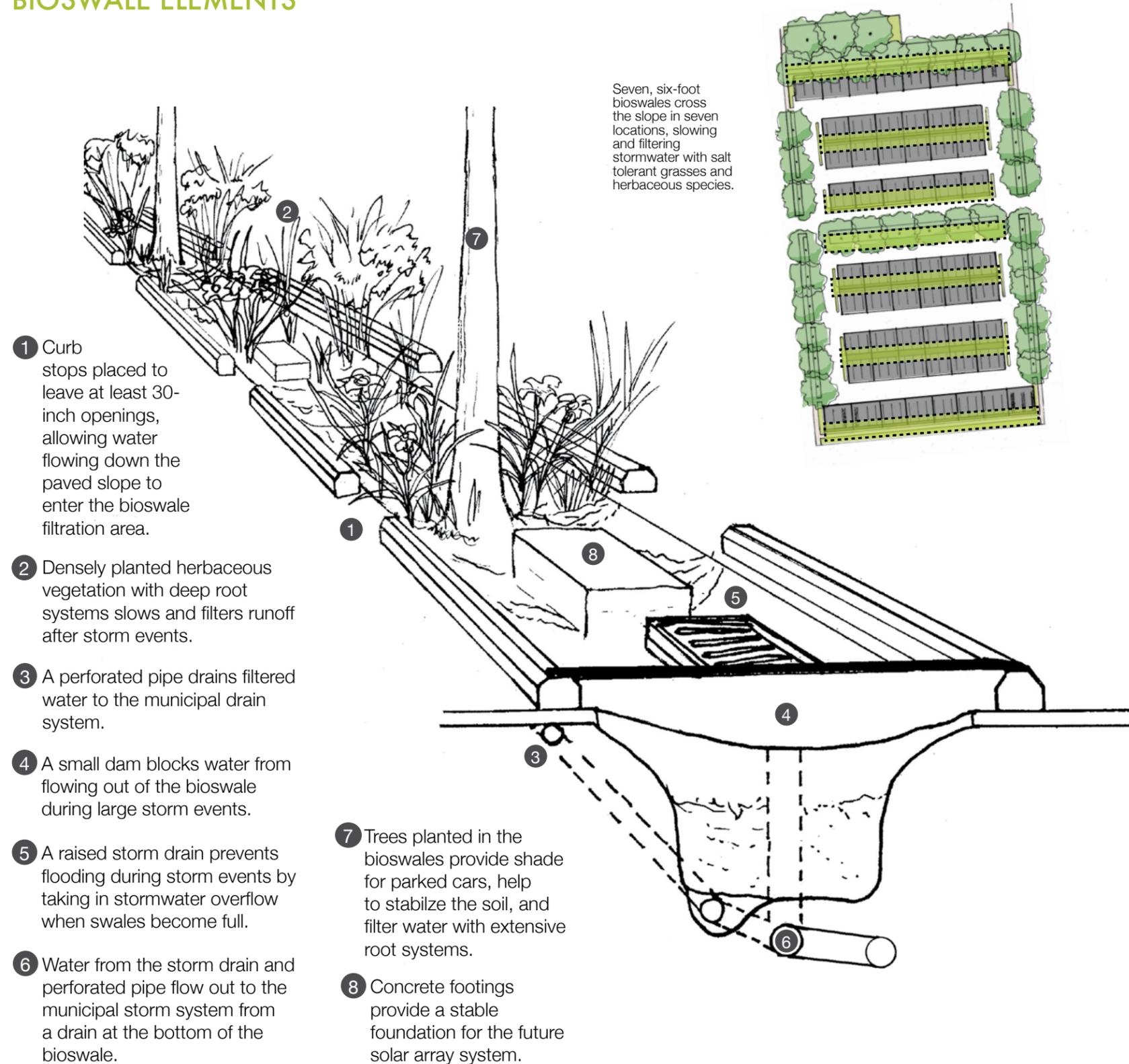
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CHAPMAN LOT
PREFERRED DESIGN

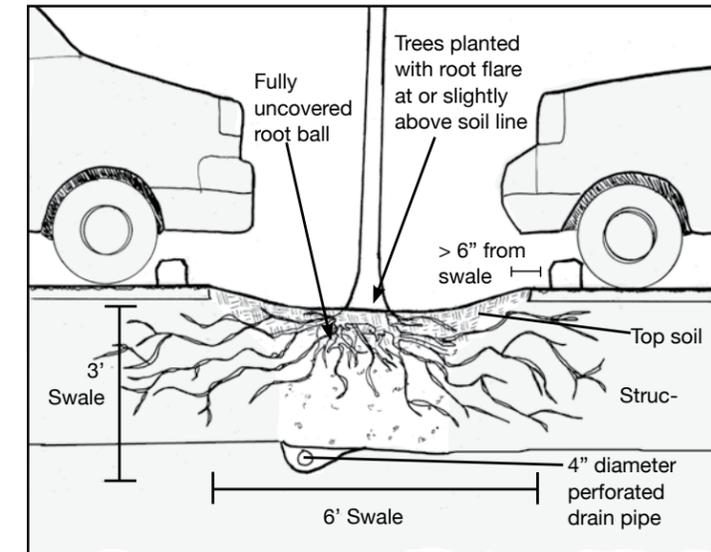
CHAPMAN LOT BIOSWALE CONSTRUCTION DETAILS

BIOSWALE ELEMENTS



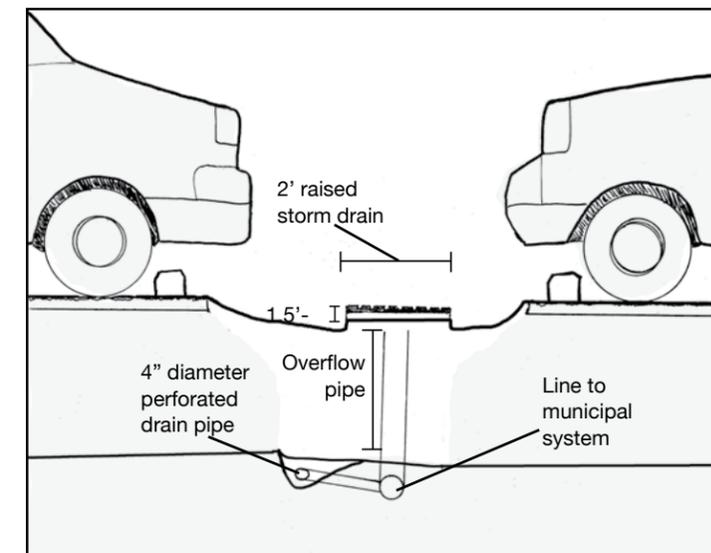
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TREE PLANTING DETAIL



Trees are planted in 6' bioswales as part of the first phase of the Chapman Lot installation.

STORM DRAIN DETAIL



Raised drains carry excess water away from the bioswale during large storm events. A perforated pipe running throughout the length of the bioswale carries filtered water to the municipal drain line, and Green River.

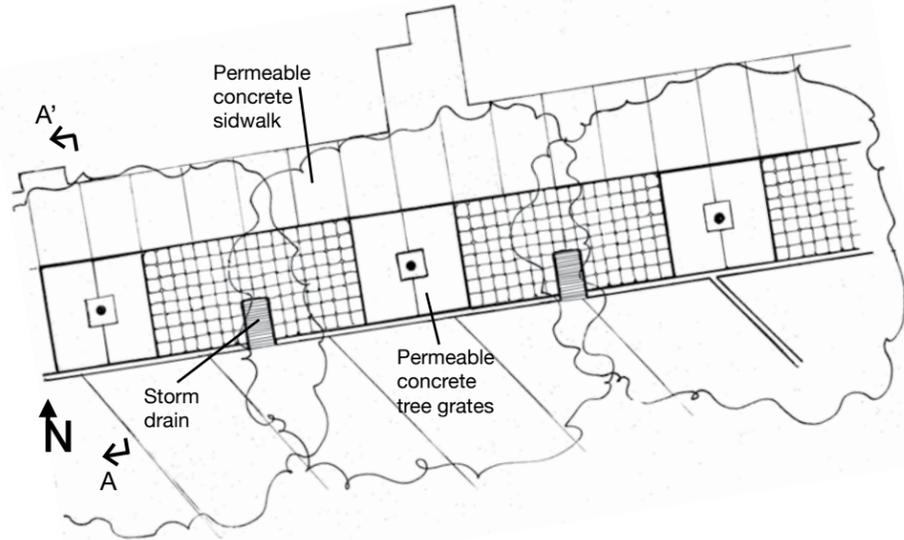
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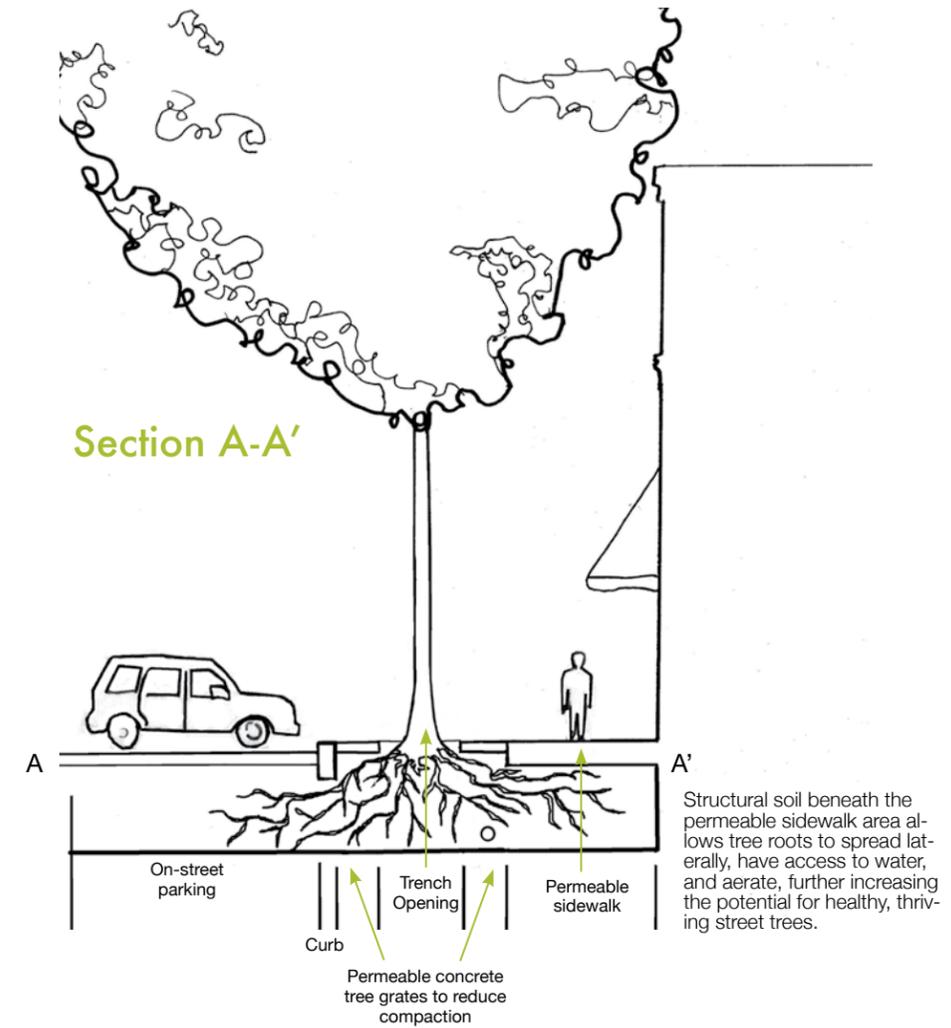
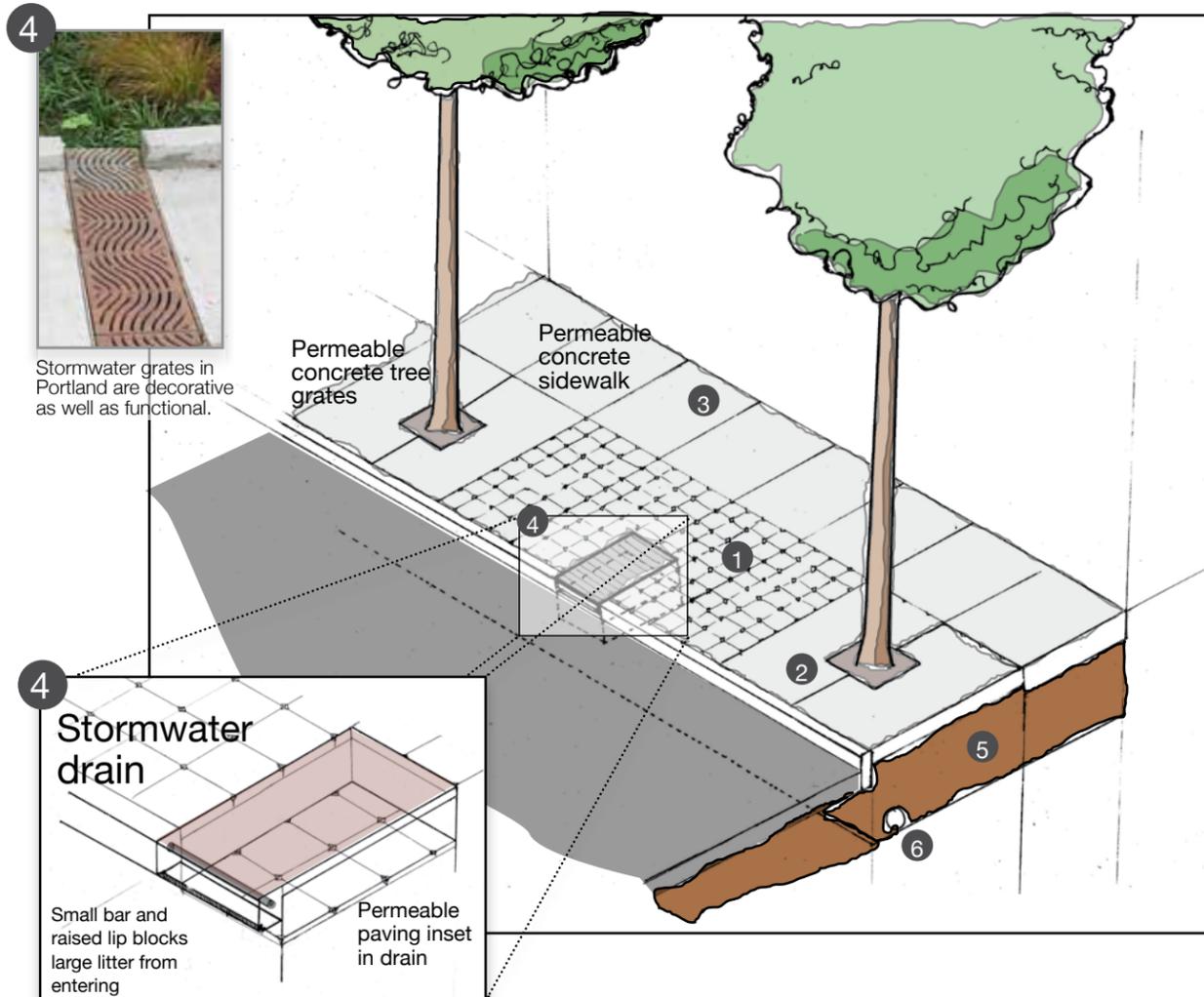
CHAPMAN LOT
DESIGN

STREET TREE TRENCH CONSTRUCTION DETAILS

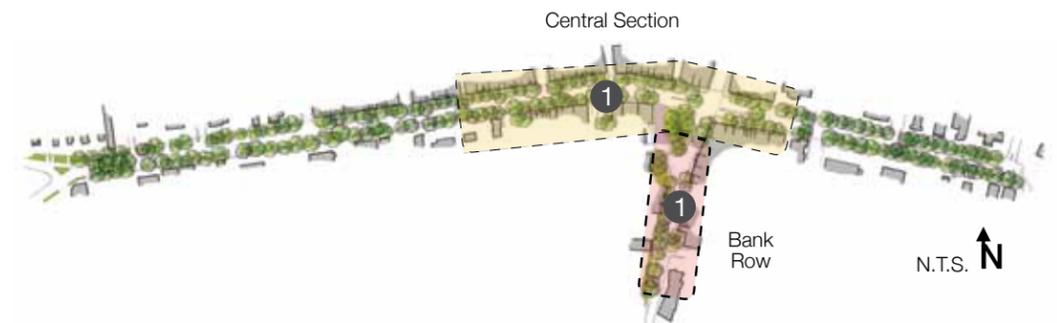
Small, individual tree pits in the Central Section and Bank Row are replaced with continuous tree trenches that allow tree roots to expand and provide structural support for large, healthy street trees.



CONTINUOUS TREE TRENCH ELEMENTS



- 1 Interlocking concrete pavers detail the sidewalks in the Central Section and Bank Row, aesthetically enhancing downtown and improving tree health.
- 2 Permeable concrete tree grates protect the soil from compaction and allow the tree roots access to water.
- 3 Permeable concrete sidewalks improve tree root aeration and access to water.
- 4 A curb cut and stormwater drain creates a flush walking surface, and allows stormwater to drain into the trenches from the road and sidewalk.
- 5 Continuous trenches are filled with structural soil, a medium which meets pavement design and installation requirements while remaining root penetrable and supportive of tree growth.
- 6 Perforated drain pipe carries filtered water to the main stormwater line.



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STREET TREE
TRENCH DETAILS

STORMWATER FILTRATION RAIN GARDENS & BIOSWALES

EXPANDED CURB BUMP-OUT AND SEATING



The Detroit Science Center's bioswale beautifies its parking lot while filtering out sediments and reducing polluted runoff.

Ryan Wilson



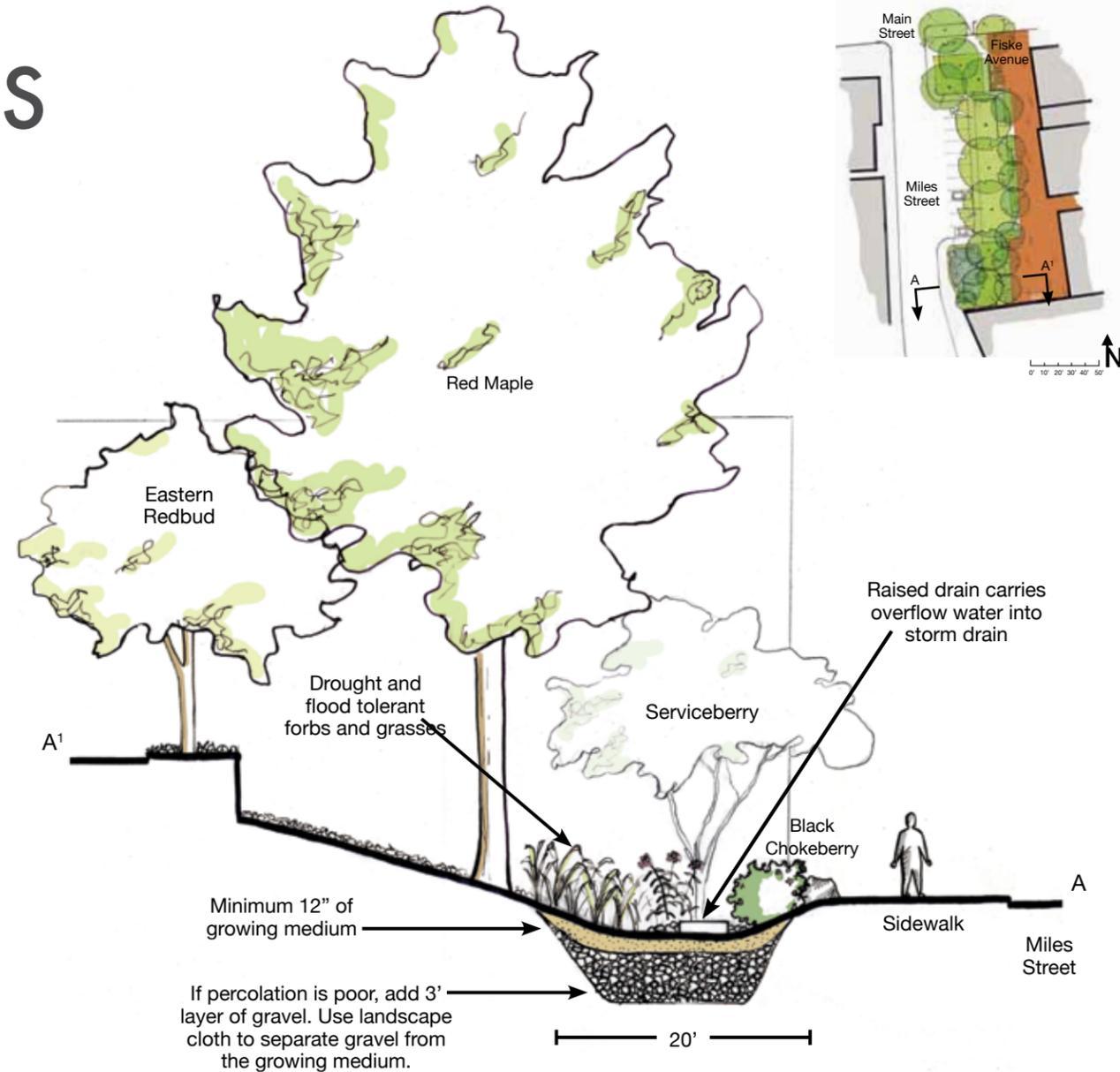
Curb bump-outs can provide space for seating, bike racks, or vegetation as shown here in Davis, California.

Thahn Ha Dang

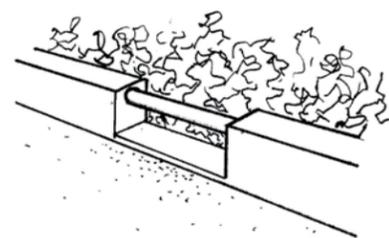


A vegetated bioswale takes in street and sidewalk runoff in Portland, Oregon.

Greg Ralsman



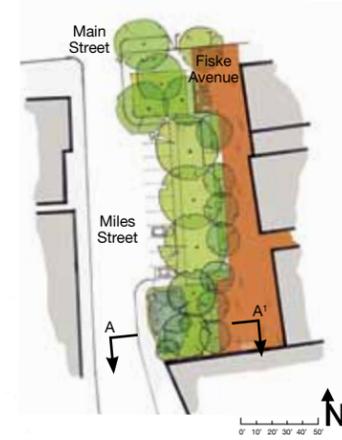
FISKE LOT RAIN GARDEN



- Curb cuts allow water from paved areas to enter rain gardens or bioswales while providing a clear distinction between vegetated and non-vegetated areas.



Attractive bioswales are combined with seating at Seattle's Olympic Sculpture Park.



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STORMWATER FILTRATION

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PLANT PALETTE

STORMWATER FILTRATION AREAS: RECOMMENDED PLANT SPECIES

Scientific Name	Common Name	Height	Spacing	Light Requirements
TREES				
<i>Acer rubrum</i>	Red Maple	40'-60'	>30'	Sun
<i>Amerlanchier arbora</i>	Serviceberry	15'-25'	>20'	Sun to partial shade
<i>Gleditsia triacanthos</i>	Thornless Honey Locust	30'-70'	>30'	Sun
<i>Celtis occidentalis</i>	Common Hackberry	30'-50'	>25'	Sun to full shade
SHRUBS*				
<i>Aronia melanocarpa x Iriquois Beauty</i>	Black Chokeberry	2'-3'	4'	Sun to full shade
<i>Cornus sericea</i>	Redosier Dogwood	7'-9'	6-8'	Partial shade
HERBACEOUS				
<i>Echinacea purpurea</i>	Eastern Purple Coneflower	26"-36"	24"-36"	Sun to partial shade
<i>Eupatorium perfoliatum</i>	Boneset	24"-36"	18"-24"	Sun to partial shade
<i>Eupatorium purpureum</i>	Joe-pye Weed	36"-96"	36"-48"	Sun to full shade
<i>Helenium autumnale</i>	Sneezeweed	36"-60"	36"-48"	Sun to partial shade
<i>Heemerocallis spp.</i>	Daylily spp.	18"-24"	15"-18"	Sun to full shade
<i>Lobelia siphilitica</i>	Great Blue Lobelia	24"-36"	18"-24"	Sun to partial shade
GRASSES & SEDGES				
<i>Carex flacca</i>	Blue Sedge	9"-12"	9"-12"	Sun to full shade
<i>Panicum virgatum</i>	Switchgrass	18"-24"	36"-48"	Sun to partial shade
<i>Schizachyrium scoparium</i>	Little Bluestem	18"-24"	24"-36"	Sun

* Shrubs should not be planted in areas that will see snow-piling during the winter months.

RECOMMENDED URBAN STREET TREES*

Scientific Name	Common Name	Height	Spread	Light requirements
<i>Acer rubrum</i>	Red Maple	40'-60'	30'-40'	Sun to partial shade
<i>Gleditsia triacanthos</i>	Thornless Honey Locust	40'-60'	40'-60'	Full sun
<i>Liquidambar styraciflua</i>	American Sweet Gum	40'-60'	40'-60'	Sun to partial shade
<i>Platanus x acerifolia</i>	London Planetree	40'-60'	20'-30'	Sun to partial shade
<i>Quercus Rubra</i>	Northern Red Oak	40'-60'	40'-60'	Full sun

*Adapted from City of New York "Trees for New York City" All trees are pollutant tolerant and can thrive in fluctuating moisture conditions.



Great Blue Lobelia (*Lobelia siphilitica*)



Daylily (*Hemerocallis spp.*)



Little Bluestem (*Schizachyrium scoparium*)



Switchgrass (*Panicum virgatum*)



Red Maple (*Acer rubrum*)



Thornless Honey Locust (*Gleditsia triacanthos*)



Red Oak (*Quercus rubra*)



Sweet Gum (*Liquidambar styraciflua*)



London Planetree (*Platanus x acerifolia*)

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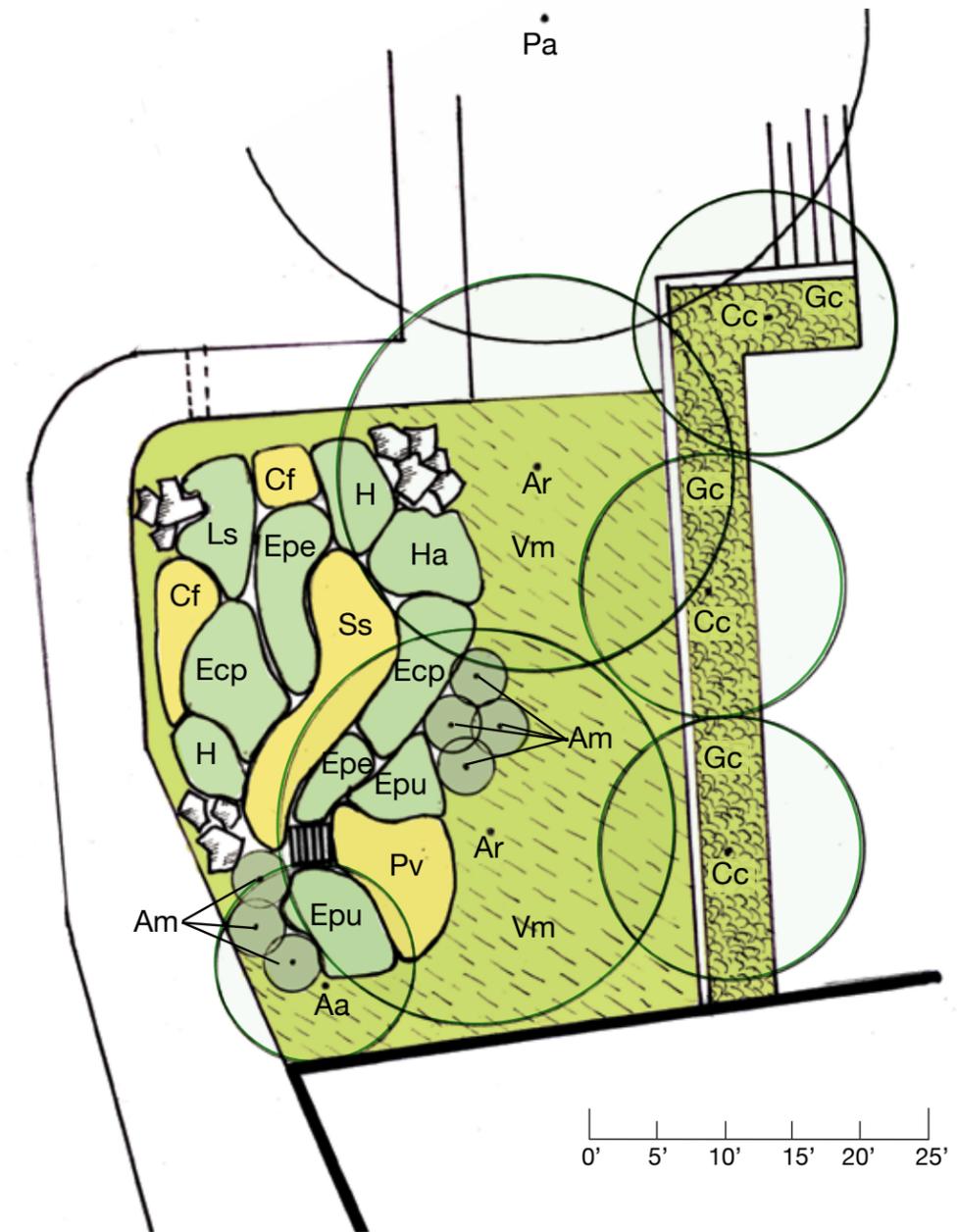
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PLANT PALETTE

PLANT PALETTE

FISKE RAIN GARDEN: PLANT SPECIES

Scientific Name	Common Name	Height	Spacing	Light Requirements
TREES				
<i>Acer rubrum</i>	Red Maple	40'-60'	>30'	Sun
<i>Amerlanchier arbora</i>	Serviceberry	15'-25'	>20'	Sun to partial shade
<i>Cercis canadensis</i>	Eastern Redbud	20'-30'	25'-35'	Sun to partial shade
<i>Platanus x acerifolia</i>	London Planetree	40'-60'	20'-30'	Grows in sun to partial shade
SHRUBS				
<i>Aronia melanocarpa x Iriquois Beauty</i>	Black Chokeberry	2'-3'	4'	Sun to full shade
HERBACEOUS				
<i>Eupatorium perfoliatum</i>	Boneset	24"-36"	18"-24"	Sun to partial shade
<i>Eupatorium purpureum</i>	Joe-pye Weed	36"-96"	36"-48"	Sun to full shade
<i>Helenium autumnale</i>	Sneezeweed	36"-60"	36"-48"	Sun to partial shade
<i>Hemerocallis spp.</i>	Daylily spp.	18"-24"	15"-18"	Sun to full shade
<i>Lobelia siphilitica</i>	Great Blue Lobelia	24"-36"	18"-24"	Sun to partial shade
SEDGES & GRASSES				
<i>Carex flacca</i>	Blue Sedge	9"-12"	9"-12"	Sun to full shade
<i>Panicum virgatum</i>	Switchgrass	18"-24"	36"-48"	Sun to partial shade
<i>Schizachyrium scoparium</i>	Little Bluestem	18"-24"	24"-36"	Sun
GROUNDCOVERS				
<i>Geranium canabrigiense</i>	Geranium	4"-6"	10"-12"	Sun to partial shade
<i>Vinca minor</i>	Vinca	6"	2'-4'	Sun to partial shade



FISKE RAIN GARDEN: PLANTING PLAN

TREES

- Ar — *Acer rubrum*
- Aa — *Amerlanchier arbora*
- Cc — *Cercis canadensis*
- Pa — *Platanus x acerifolia*

HERBACEOUS SPECIES

- Epe — *Eupatorium perfoliatum*
- Epu — *Eupatorium purpureum*
- Ha — *Eupatorium perfoliatum*
- H — *Hemerocallis spp.*
- Ls — *Lobelia siphilitica*

SHRUBS

- Am — *Aronia melanocarpa*

SEDGES & GRASSES

- Cf — *Carex flacca*
- Pv — *Panicum virgatum*
- Ss — *Schizachyrium scoparium*

GROUNDCOVERS

- Gc — *Geranium canabrigiense* 'biokovo'
- Vm — *Vinca minor*



Eupatorium perfoliatum

Peter Gorman



Eupatorium perfoliatum

Ed Gaillard



Cercis canadensis

Flickr User: Princess Stand in the Rain

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PLANT
PALETTE

ENVISIONING GREENFIELD

With its rich history, strong community, growing base of small businesses and expanding cultural events, Greenfield has the potential to be the thriving heart of Franklin County. In strengthening its commitment to ecological health, Greenfield demonstrates its desire to be not only a vibrant and welcoming community but a sustainable community as well. This streetscape enhancement and ecological parking lot plan set presents designs and opportunities that can help Greenfield move forward on its path to a sustainable and beautiful future.

STREETSCAPE

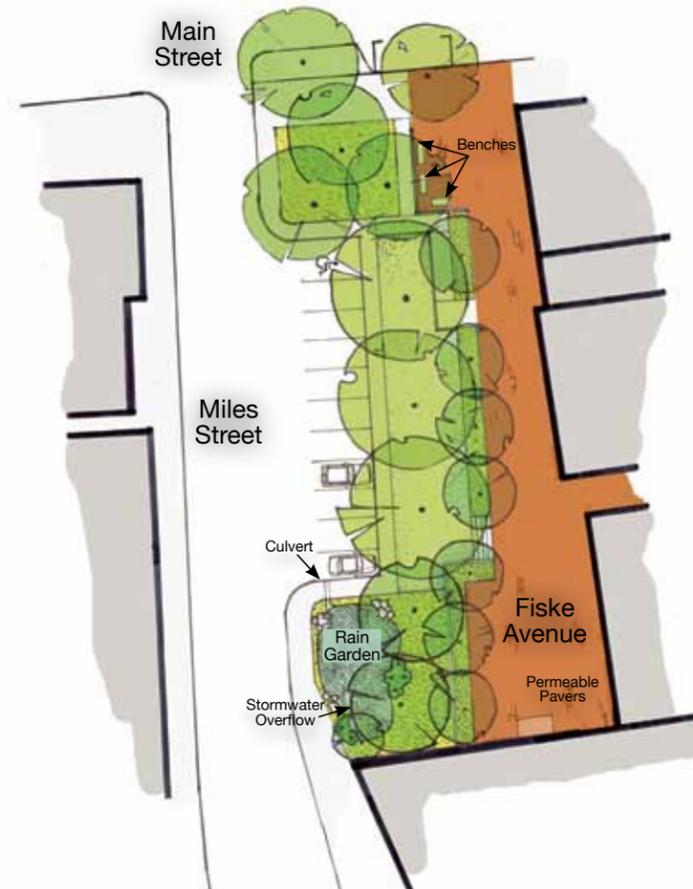
The streetscape plan will unify the different sections of the downtown area, creating a safe, welcoming pedestrian experience while addressing many of the ecological issues that the town faces as a small urban center.

STREETSCAPE DESIGN



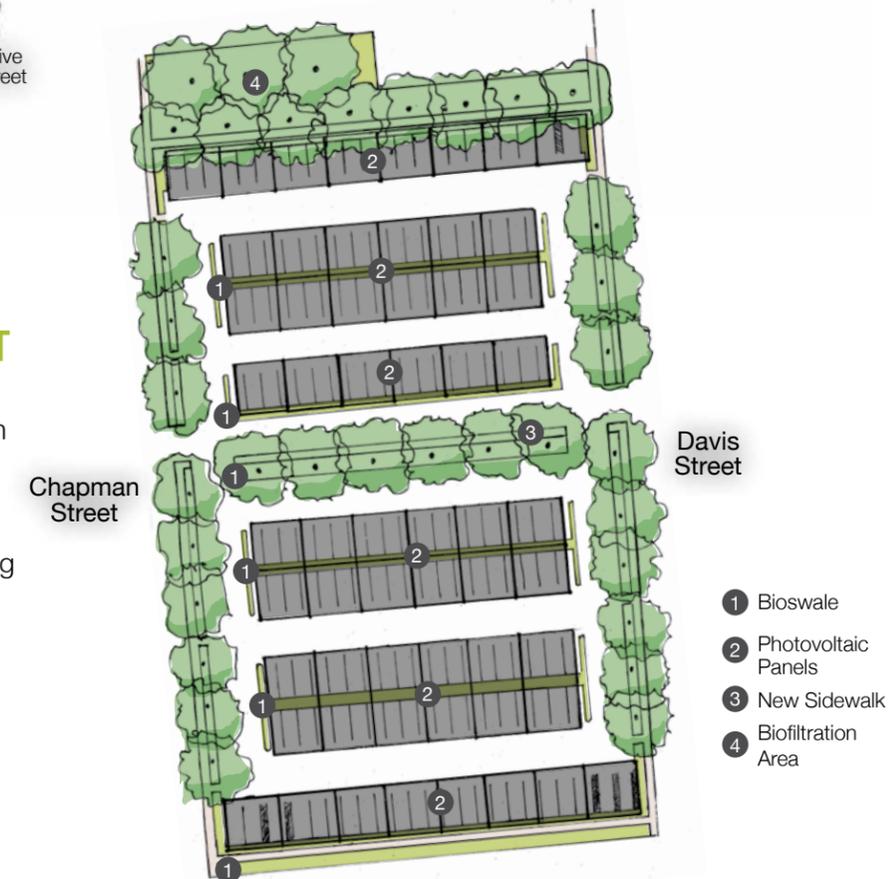
FISKE LOT

The Fiske lot design minimizes impervious surfaces, increasing tree health and filtering stormwater while enhancing and expanding on downtown gathering spaces.



CHAPMAN LOT

The Chapman lot design gives the opportunity to produce its own energy, while creating a shaded, pleasant parking experience.



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