

Rondout Riverport Shoreline Stabilization and Public Access – Phase II



City of
Kingston
New York



Project Advisory Committee – Meeting 3
May 22, 2019

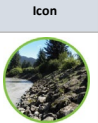






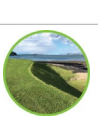




Norman Ward, RLA
PROJECT MANAGER

Steven Roy, LEED-AP
SR. TECHNICAL LEADER



agenda

1. Sign in/ Introductions
2. W&S Presentation (10 – 10:30)
 - Recap of last meeting 5/1
 - Sub-project areas
 - Rondout Waterfront
 - Breakwater to Lighthouse
 - Trolley Trail & Causeway
 - East Strand St & North St
3. Discussion (10:30 – 11:30)
4. Next Steps
 - Consultant/ Grantors Meeting
 - Public Meeting (TBD)
 - Next PAC Meeting (TBD)

Icon	Type	Where it works	Where it doesn't work	Width of Shoreline Required for Construction	Erosion Protection	Environmental Impact	Aesthetics	Public Access	Maintenance/ Longevity	Cost	Regulatory Requirements
	Vegetated Riprap	embankments with stable soils	densely shaded areas; loose soils/steep banks	6' to 20': width dependent on wave action and fill required at the toe of the slope to stabilize grade	immediate protection, less over-topping and wave run-up than smooth structures	shelters microhabitats; native vegetation provides forage and shelter; may be a barrier to some species of fish and wildlife	vegetation softens the appearance of the riprap	Can be dangerous if/when people climb on the riprap. Elevated walkways may be constructed on top of the riprap	riprap easily maintained; vegetation may need to be pruned to create views; must be weeded to prohibit spread of invasive species	moderate to high	may result in land encroachment to obtain proper slope; permit required to construct; accepted by the NYSEEC and USACE
	Vegetated Gabion Wall	moderate slopes	densely shaded areas; steep slopes with unstable/loose soils	2-4' of wall; 6' of stabilized slope with vegetation behind the wall (varies per design criteria and site conditions)	increases stability	vegetation may provide habitat	natural appearance; may impact views when vegetation matures	prohibits access close to the water's edge	high failure rate of vegetation in first two years; heavy monitoring and maintenance	high	moderate
	Vegetated Gabion Mattress	ice; surface erosion; moderate slopes	densely shaded areas; steep slopes with unstable/loose soils	3' to 12', depending on severity of erosion potential and height of mattress	increases stability	vegetation may provide habitat	fairly natural appearance; may impact views when vegetation matures	limits access close to the water's edge	high failure rate of vegetation in first two years; installation is labor intensive	high; installation very complex	moderate; may replace hardened shorelines in some instances
	Vegetated Cribbing	unvegetated slopes; adequate backfill; low wave inputs	densely shaded areas; steep slopes; high wave inputs	4' to 12', depending on severity of erosion potential	not good for wave energy dissipation; holds eroding soils in place	vegetation may provide habitat	timber has natural appearance; may impact views when vegetation matures	prohibits access close to the water's edge	periodic maintenance to ensure success of plantings; Pruning and plant replacement may be necessary; high failure rates of vegetation	moderate to high; requires heavy equipment and pre-cast concrete structures	natural stabilization may be favorably reviewed
	Bulkhead (Timber)	high banks with adequate backfill; sites with low wave inputs	steep slopes; high wave inputs	2' width of bulkhead; potential for 10' promenade behind bulkhead; anchorage widths are site dependent and may affect placement of structures	scour occurs at the base of the river side wall; erosion is controlled behind the wall	hydro acoustic effects may harm fish; no associated habitat value	generally favorable; may impact views when vegetation matures	walkway and boardwalk access can be constructed at the top of the bulkhead; prohibits access close to the water's edge	replacement of timber boards or steel; longer initial design life	pile driving equipment; materials; \$265 per linear foot (Hudson River Sustainable Shorelines)	not preferred by regulatory agencies
	Floating Wetland	areas with high urban runoff/pollutants	where open water surface is required; water depths shallower than 3'	3' to 10' width; may be designed to fit existing shoreline conditions and access considerations	reduces undercutting; attenuates wave action	vegetation may provide habitat; filters pollutants; filters suspended solids; must be anchored	enhances visual appearance of hardened shorelines	not appropriate for placement near boat launches	may require annual harvest and weeding	\$1 to \$24 per square foot; substantially lower costs than constructed wetlands (Biomatrix Solutions)	unknown
	Vegetated Geogrid	slopes less than 70 degrees; sites with limited space; elevations where the invert of the structure will be kept wet during the growing season	densely shaded areas; soils not suited to plant growth; must analyze structural capabilities of soils	can be built into the side of existing slopes	resists shear stress	creates vegetative habitat; provides non-point pollution control	natural looking; may impact views when vegetation matures	mature plantings restrict access	periodic maintenance to ensure success of plantings; Pruning and plant replacement may be necessary	\$130 - \$300 per linear foot; soil conditioning and excavation necessary (Massachusetts Clean Water Toolkit)	natural stabilization may be favorably reviewed; may replace hardened shorelines in some instances
	Living Shoreline	areas with low wave energy, parks, and areas not immediately adjacent to urban development	areas with high wave energy; areas vulnerable to storm surge; areas vulnerable to high water	6' to 20'; site dependent	slows inland water encroachment; reduces wave energy	creates vegetative habitat and opportunities for fish and wildlife; provides corridor for species to move and breed	natural appearance; may impact views when vegetation matures	mature plantings restrict access; public access may impact wildlife and success of vegetation and stabilized soils	periodic maintenance to ensure success of plantings; pruning and plant replacement may be necessary; removal of invasives required	\$1,000 to \$5,000 per linear foot (NOAA Fisheries)	guidelines, regulations, and incentives encourage adoption of living shorelines
	Low Impact Development	areas slated for redevelopment; areas with extensive impervious surfaces; existing parks and lawns	historic structures that must maintain original visual elements; areas where maintenance will not be possible	site dependent/green infrastructure design element dictates width of installation	captures stormwater inland, reducing runoff and CSO outfall volumes	vegetation may provide habitat	vegetation adds color, texture, and visual variation to the urban landscape; some communities resist LID installations due to unkempt appearance	does not restrict public access in majority of instances; tree pits reduce the width of sidewalks	periodic maintenance to ensure success of plantings; pruning and plant replacement may be necessary	\$10 to \$40 per square foot (LID Stormwater)	permitting generally favorable due to reductions in stormwater
	Vegetated Berm	undeveloped areas; natural areas with ample inland depth; parks	areas with development close to the shore; structures at risk of damage from flooding	16' - 20' width (varies with existing elevation site)	captures stormwater and reduces runoff volumes, especially when designed with an upland retention basin; vegetated slopes reduce shoreline erosion	vegetation may provide habitat	undulating topography enhances the visual quality of landscapes	limits access close to the water's edge, unless designed with access points at selected locations	periodic maintenance to ensure success of plantings; pruning and plant replacement may be necessary	moderate	unknown
	Steel Bulkhead	high wave energy areas; sites with existing hardened shorelines; sites with active water fronts	sensitive environmental resources; areas with limited development; areas adjacent to sensitive downstream shore conditions	2' width of bulkhead; potential for 10' promenade behind bulkhead; anchorage widths are site dependent and may affect placement of structures	wave action moderated at the site; wave energy deflected downward contributing to foundational and downstream erosion	unreinforced shorelines bear the brunt of erosion; inhibits sediment replenishment; does not provide habitat value; damages intertidal habitats	limited aesthetic potential; urban/industrial visual elements rather than natural	public access easily facilitated with the addition of ramps, stairs, docks, and boat launches	long lifespan; relatively easy to repair (limited components)	\$1,200 per linear foot (Hudson River Sustainable Shorelines)	regulatory approval very difficult for new bulkhead construction; restoration in place may be less burdensome
	Gravity Concrete Retaining Wall	high wave energy areas; sites with existing hardened shorelines; sites with active water fronts	sensitive environmental resources; areas with limited development; areas adjacent to sensitive downstream shore conditions	2' width of wall; potential for promenade and or stairs/seating; anchorage widths are site dependent and may affect placement of structures	wave action moderated at the site; wave energy deflected downward contributing to foundational and downstream erosion	unreinforced shorelines bear the brunt of erosion; inhibits sediment replenishment; does not provide habitat value; damages intertidal habitats	limited aesthetic potential; urban/industrial visual elements rather than natural	public access easily facilitated with the addition of ramps, stairs, docks, and boat launches	long lifespan; toppling a concern as foundation is eroded and pressure increases behind the wall	\$500 to \$1,000 per linear foot (Hudson River Sustainable Shorelines)	regulatory approval very difficult for new bulkhead construction; restoration in place may be less burdensome
	Boardwalk over Jetty	low-lying areas at risk of flooding that require an access route	boardwalks along coastlines should be designed to withstand high wave inputs	5' to 12' width (potential for maintenance vehicle access)	boardwalk design can incorporate erosion management strategies, such as adding riprap and cribbing to edges	no associated habitat value	timber has a natural appearance. The design of an elevated boardwalk can incorporate a canopy with PV panels	elevated boardwalks are typically intended for pedestrian use, but may be used to facilitate maintenance vehicle access. An elevated boardwalk can include improved viewsapes, year-round access, and stairs to kayak launches	replacement of timber boards as required	pile driving equipment and materials; moderate to high cost	unknown

schematic design

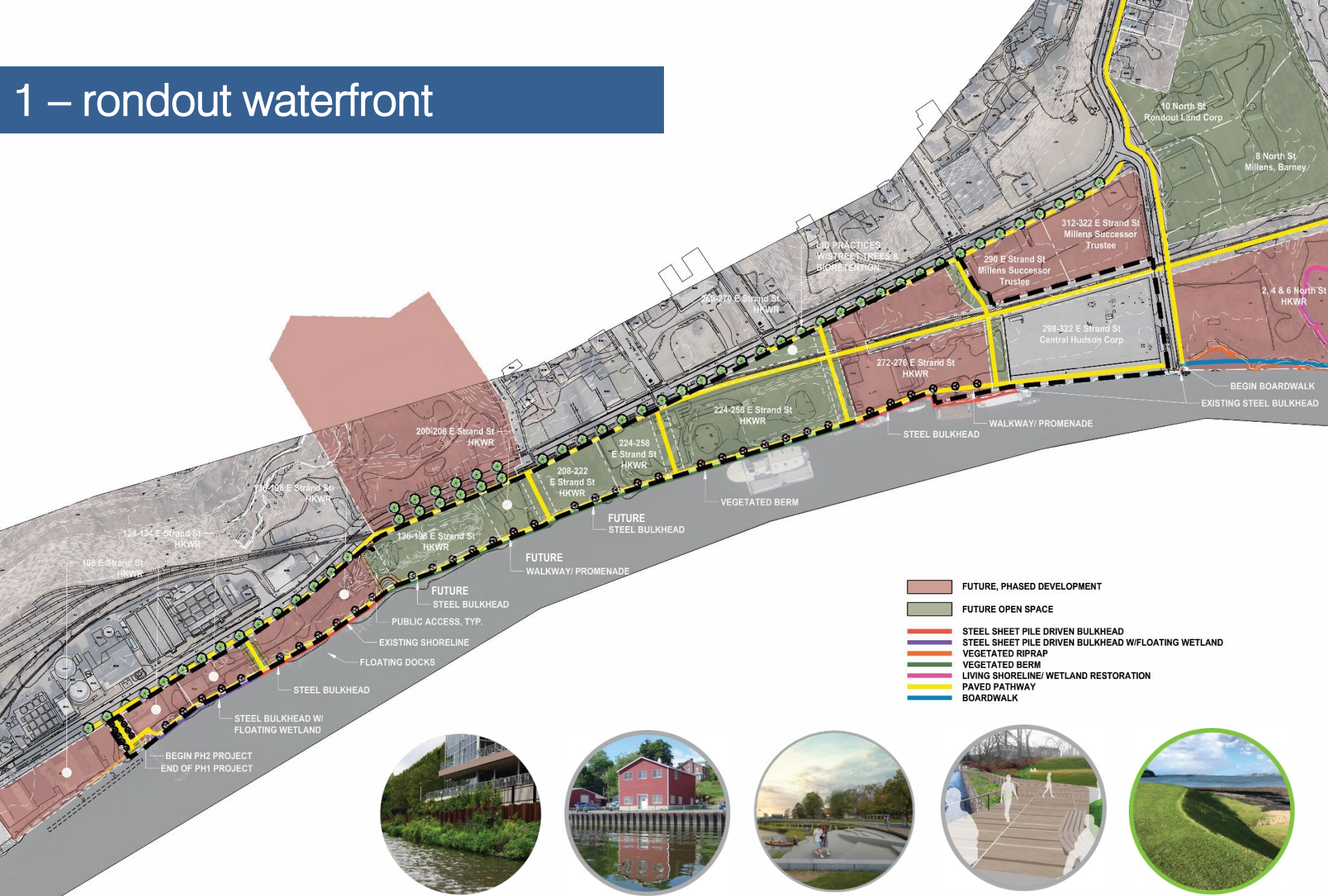


sub project areas

- 1 Rondout Waterfront
- 2 Breakwater to Rondout II Lighthouse
- 3 Trolley Trail Causeway
- 4 East Strand St & North St



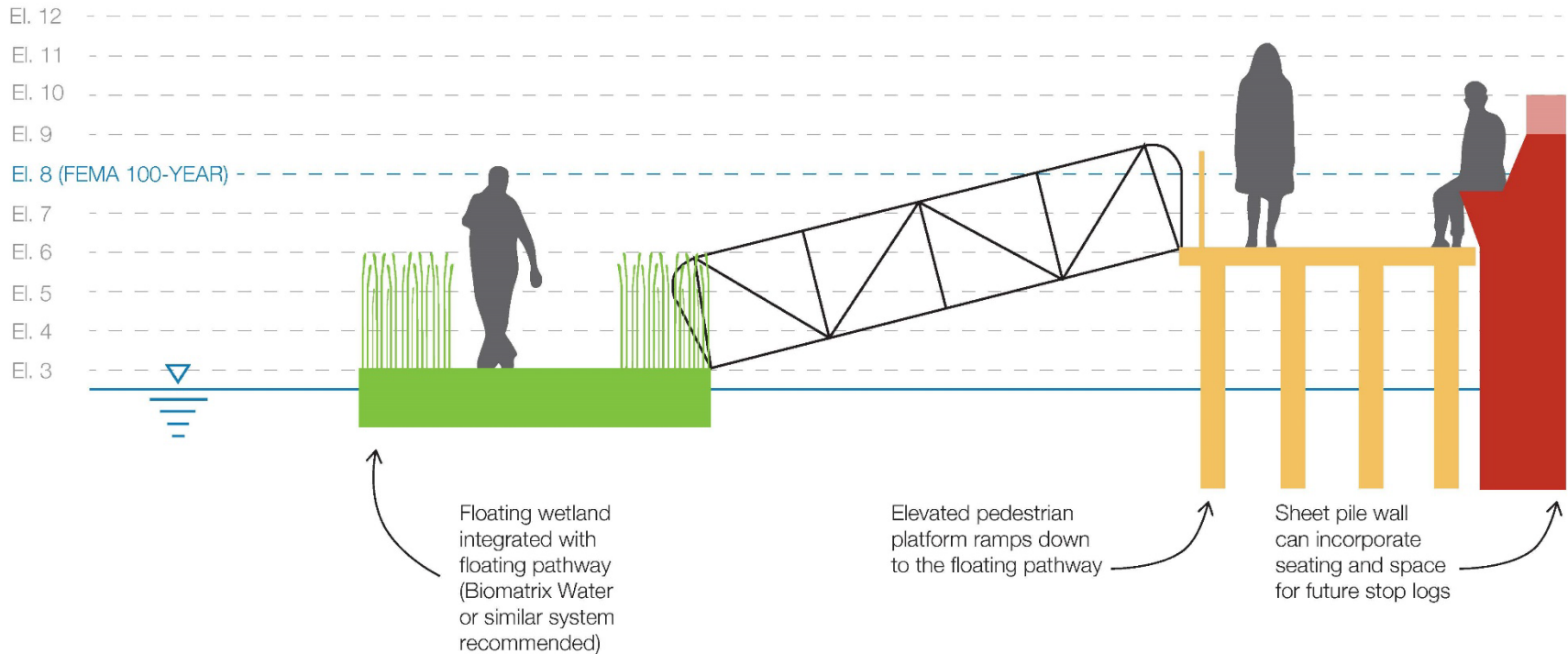
1 – rondout waterfront



1 – sheet pile wall and floating ecosystem



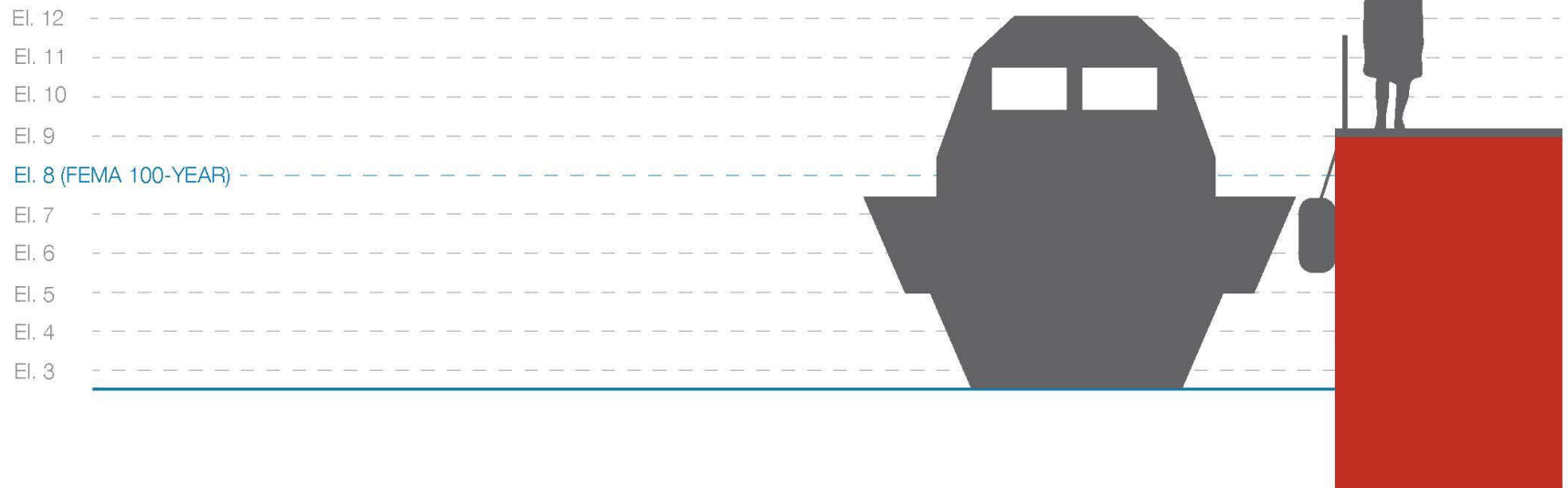
Sheet piles walls can incorporate elevated walkways, kayak tie-up areas, floating wetlands, and incremental attachment points to accommodate sea level rise.



1 – sheet pile wall with boat access



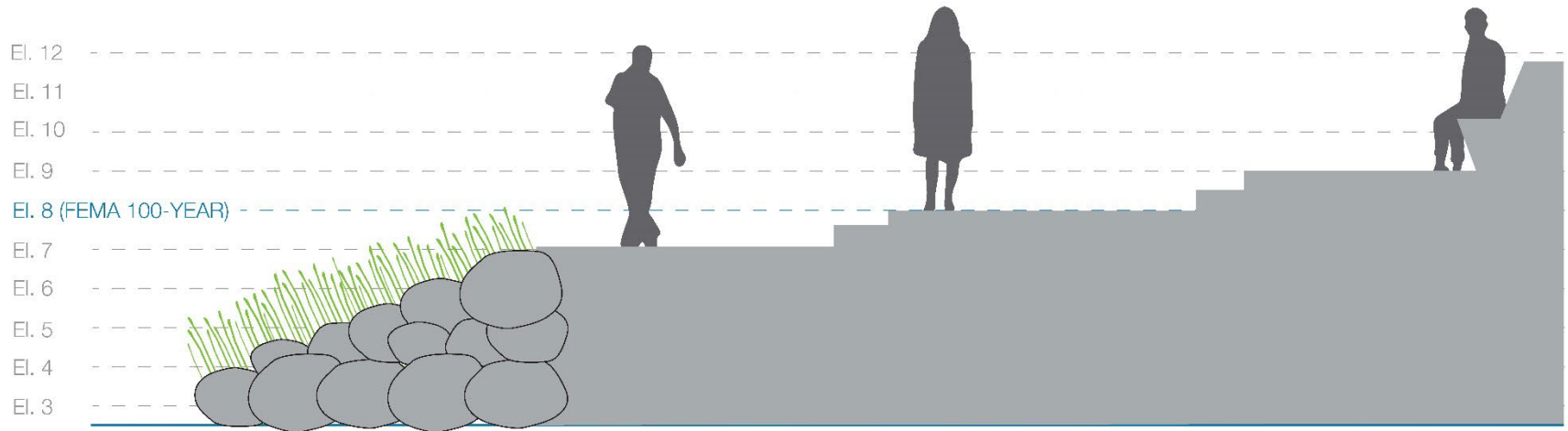
Sheet piles walls can incorporate a cap for a pedestrian walkway and mooring for boat access.



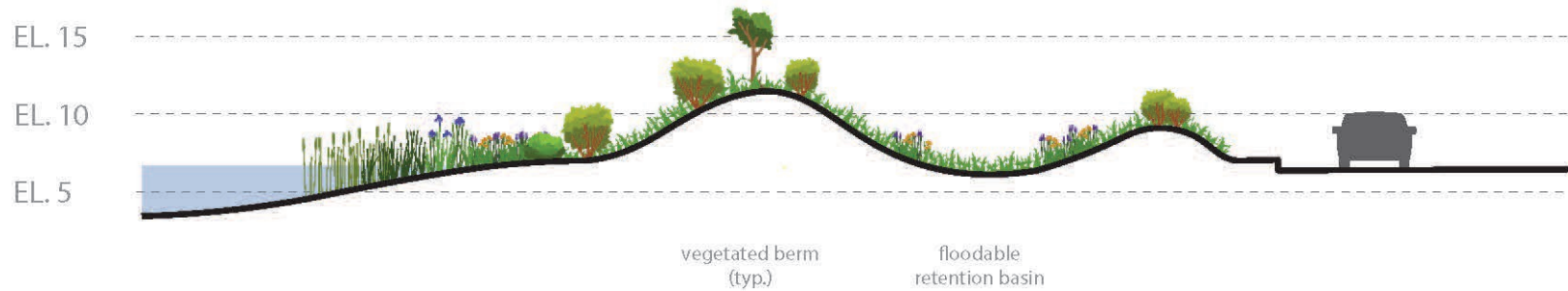
1 – pedestrian plaza/ tiered access



Pedestrian spaces can incorporate tiered plazas, joint planting, seating, and access to the waterfront.



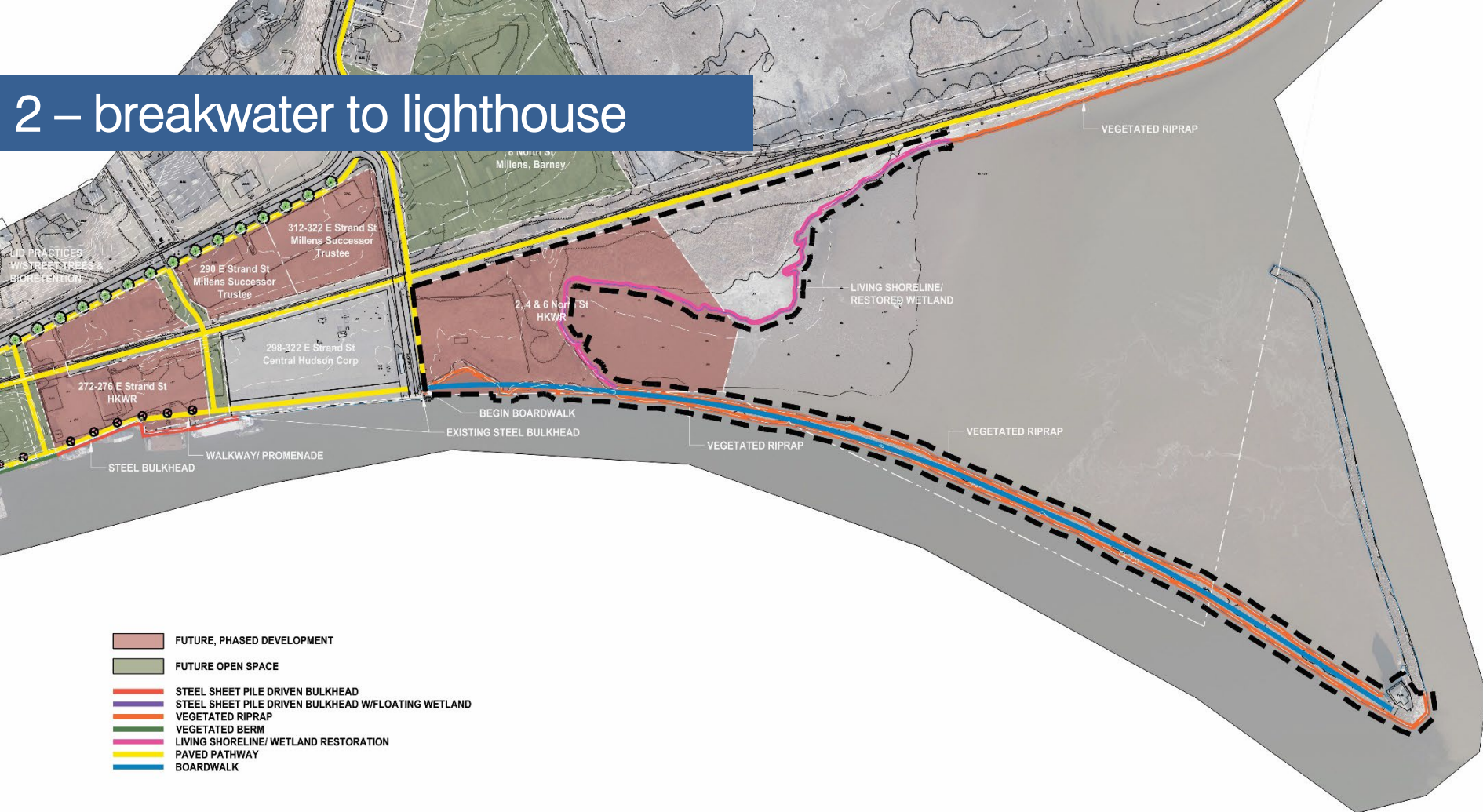
1 – vegetated berm/park/flood storage



1 – rondout waterfront

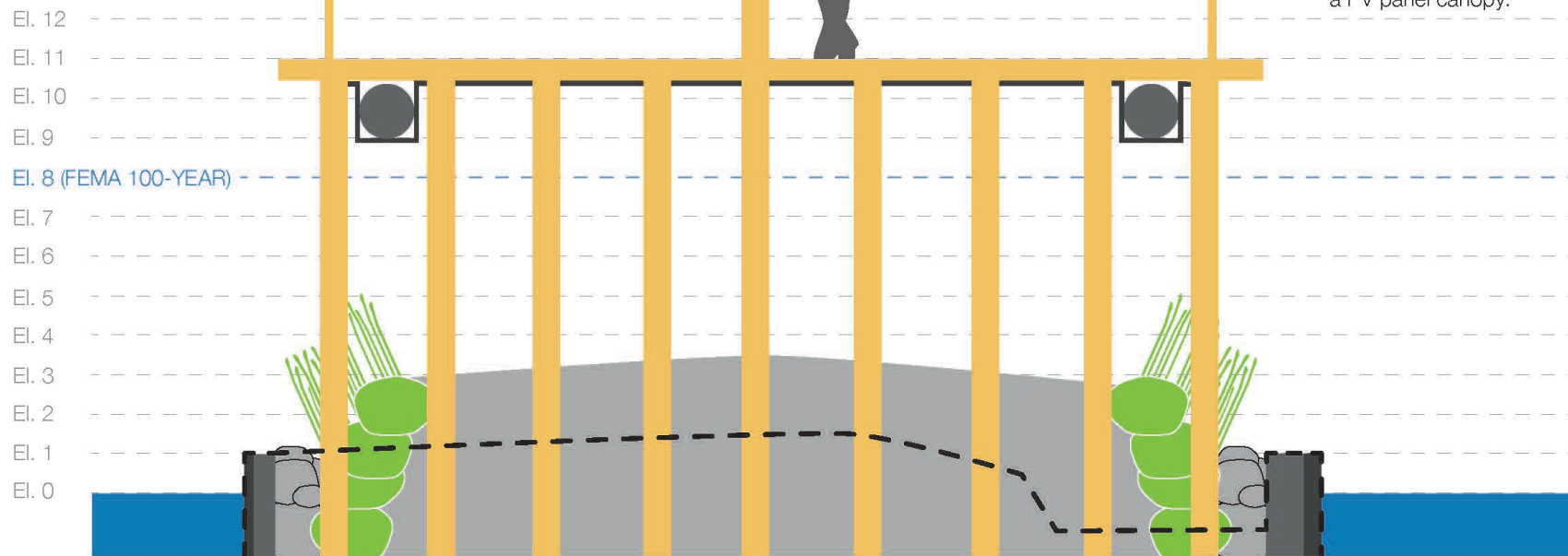


2 – breakwater to lighthouse



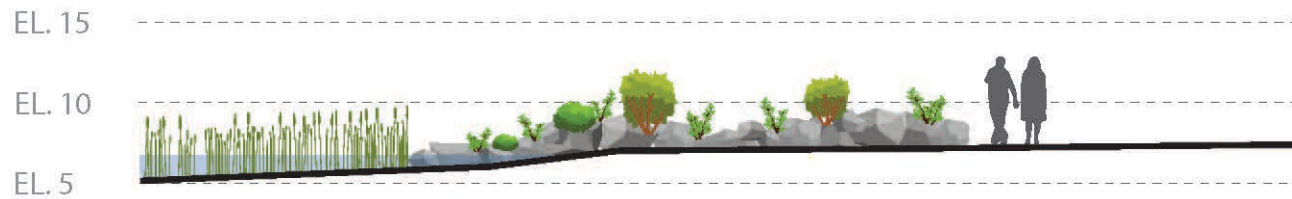
2 – boardwalk to lighthouse

Elevated boardwalk at approx.
El. 11 with suspended conduit
for water and sewer



Benefits of an elevated boardwalk can include improved views, year-round access, stairs to kayak launches, and a PV panel canopy.

2 – vegetation in riprap



2 – restored wetland



2 – breakwater to lighthouse



2 – breakwater to lighthouse



3 – trolley trail & causeway



4 – east strand st & north St

The map shows the East Strand area, bounded by East Strand St to the north and North St to the east. The shoreline is marked with various infrastructure elements. A legend in the bottom right corner defines the color-coded areas and features:

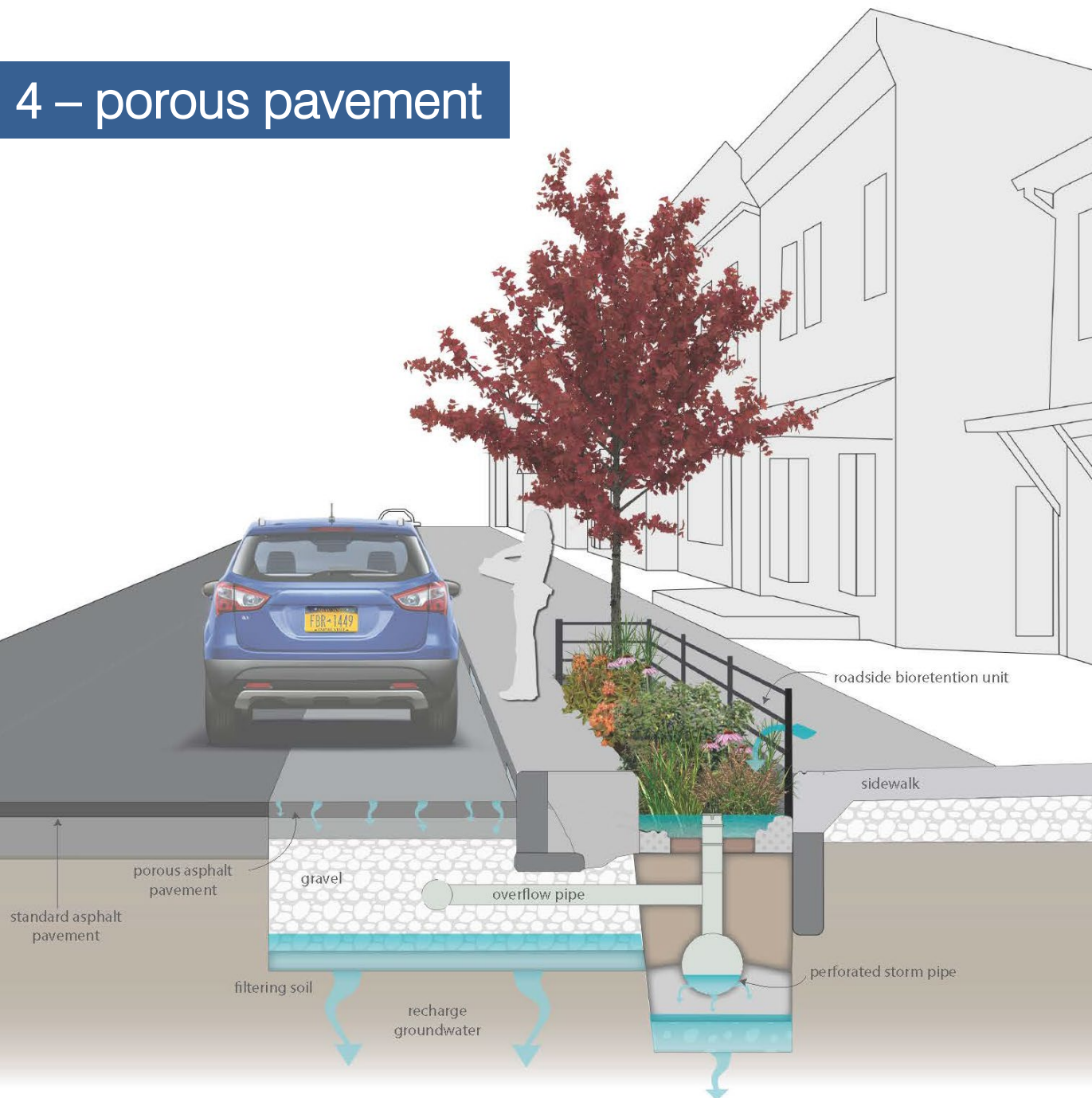
- FUTURE, PHASED DEVELOPMENT** (Red)
- FUTURE OPEN SPACE** (Green)
- STEEL SHEET PILE DRIVEN BULKHEAD** (Orange)
- STEEL SHEET PILE DRIVEN BULKHEAD W/ FLOATING WETLAND** (Dark Orange)
- VEGETATED RIPRAP** (Yellow)
- VEGETATED BERM** (Light Green)
- LIVING SHORELINE/ WETLAND RESTORATION** (Dark Green)
- PAVED PATHWAY** (Blue)
- BOARDWALK** (Light Blue)

Key features and labels on the map include:

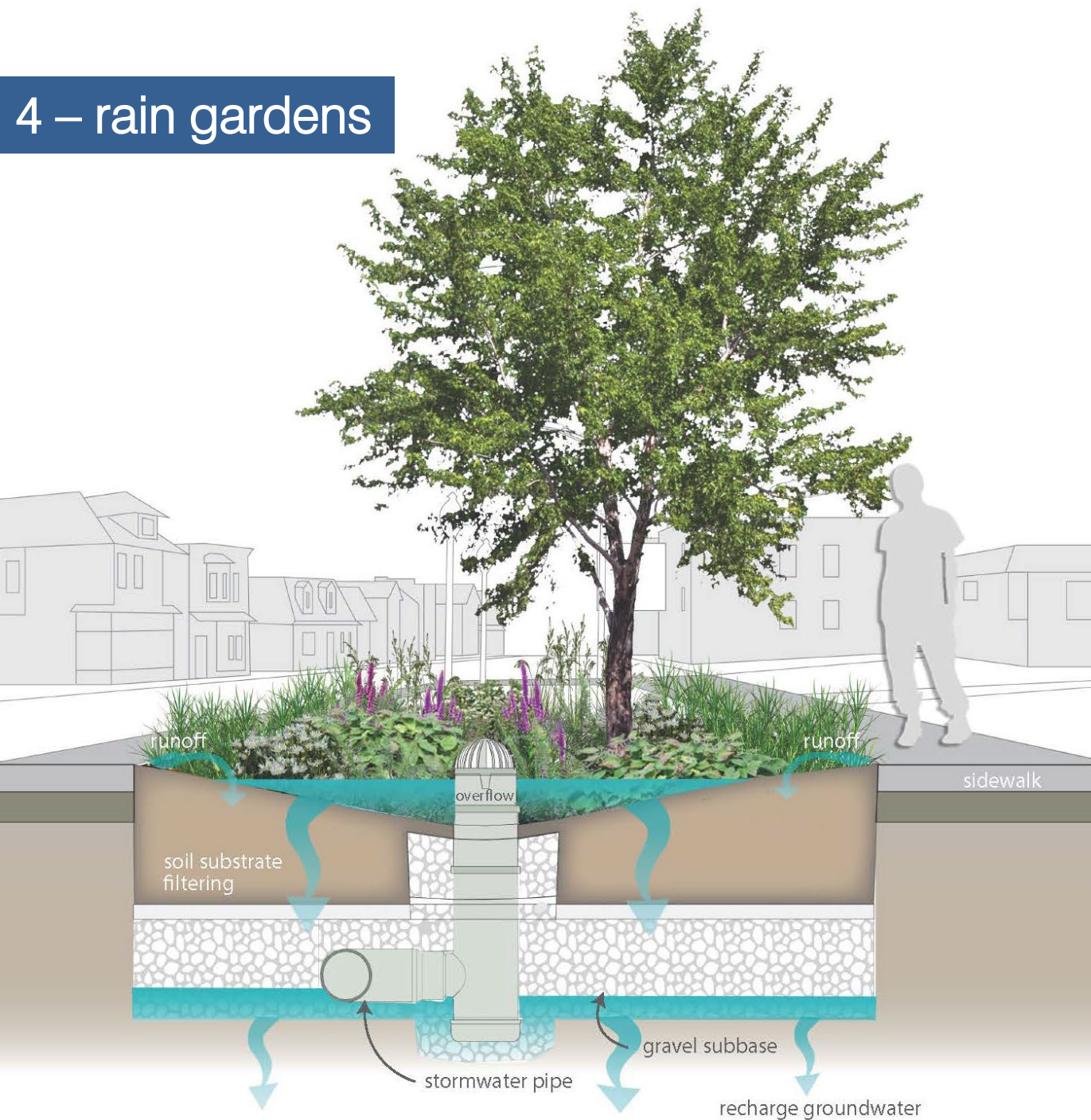
- Streets:** 100 E Strand St, 200 E Strand St, 224 E Strand St, 224-254 E Strand St, 250 E Strand St, 272-276 E Strand St, 312-322 E Strand St, 10 North St, 8 North St, 2, 4 & 6 North St.
- Infrastructure:** STEEL BULKHEAD, WALKWAY/ PROMENADE, VEGETATED BERM, PUBLIC ACCESS TYP., EXISTING SHORELINE, FLOATING DOCKS, BEGIN PH2 PROJECT, BEGIN BOARDWALK, EXISTING STEEL BULKHEAD.
- Landmarks/ Owners:** 10 North St Rowdout Land Corp, 8 North St Millers, Barney, 312-322 E Strand St Millers Successor Trustee, 250 E Strand St Millers Successor Trustee, 272-276 E Strand St HKWR, 224-254 E Strand St HKWR, 200 E Strand St HKWR, 200-220 E Strand St HKWR, 200-220 E Strand St HKWR.



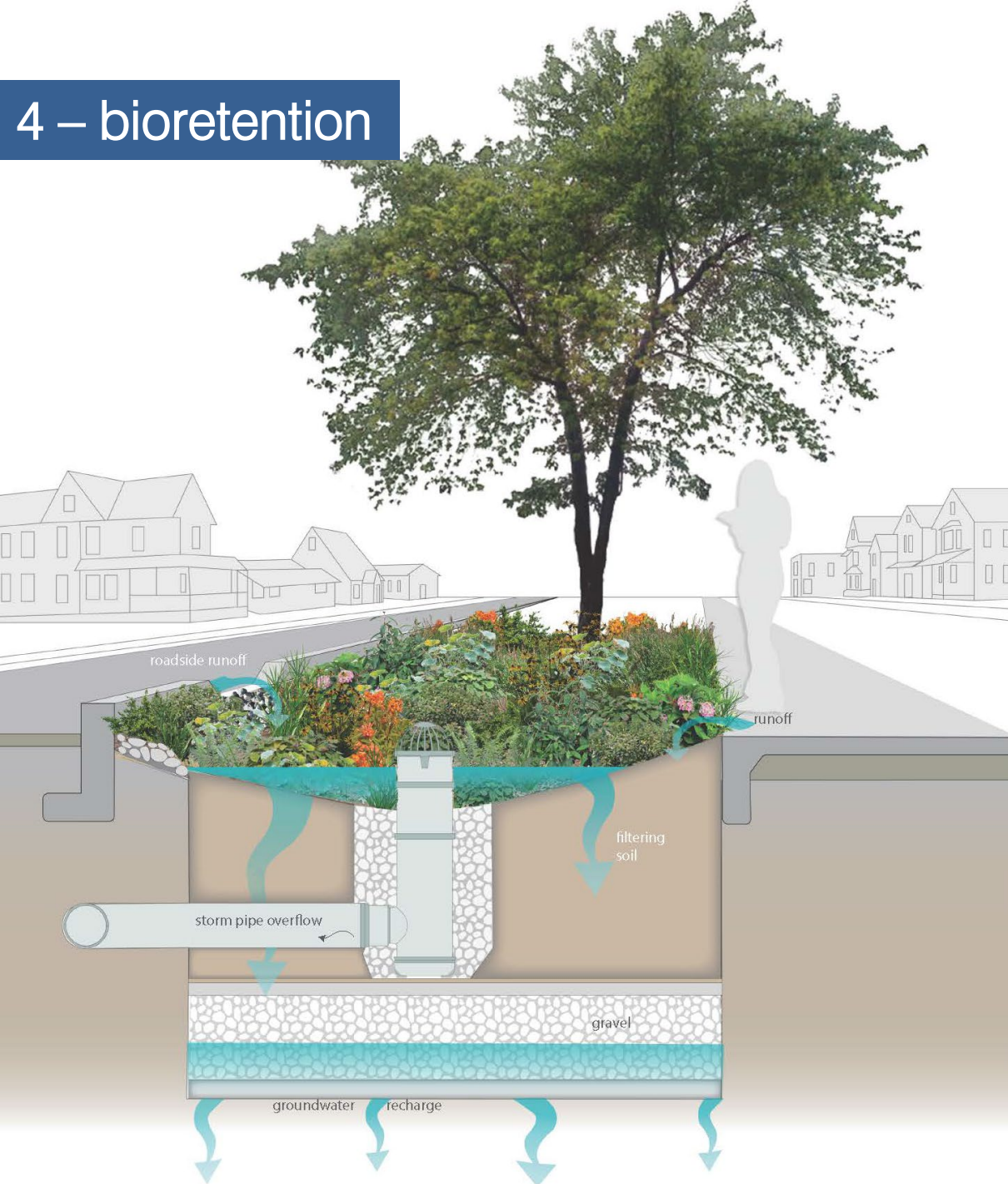
4 – porous pavement



4 – rain gardens



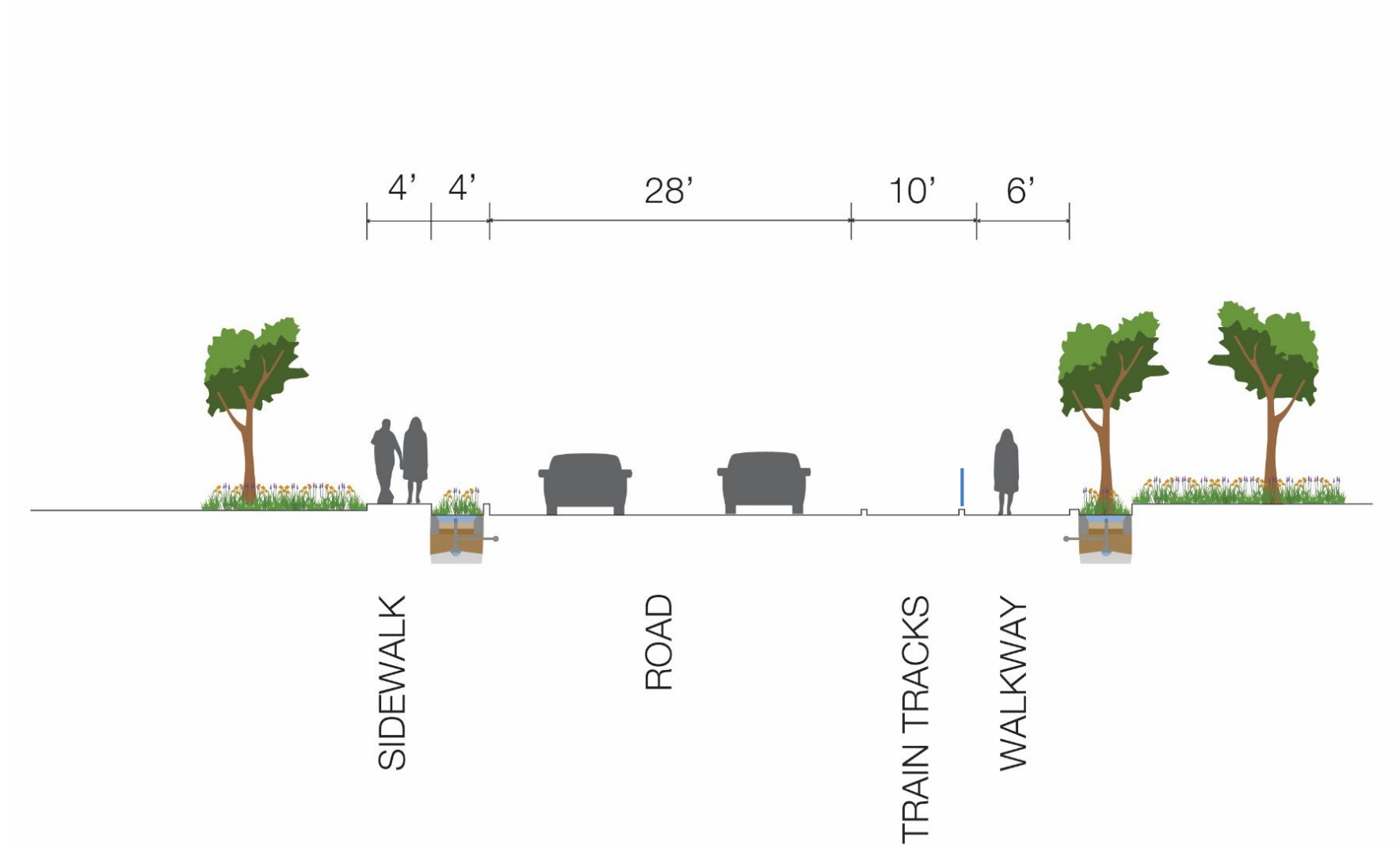
4 – bioretention



4 – bioretention



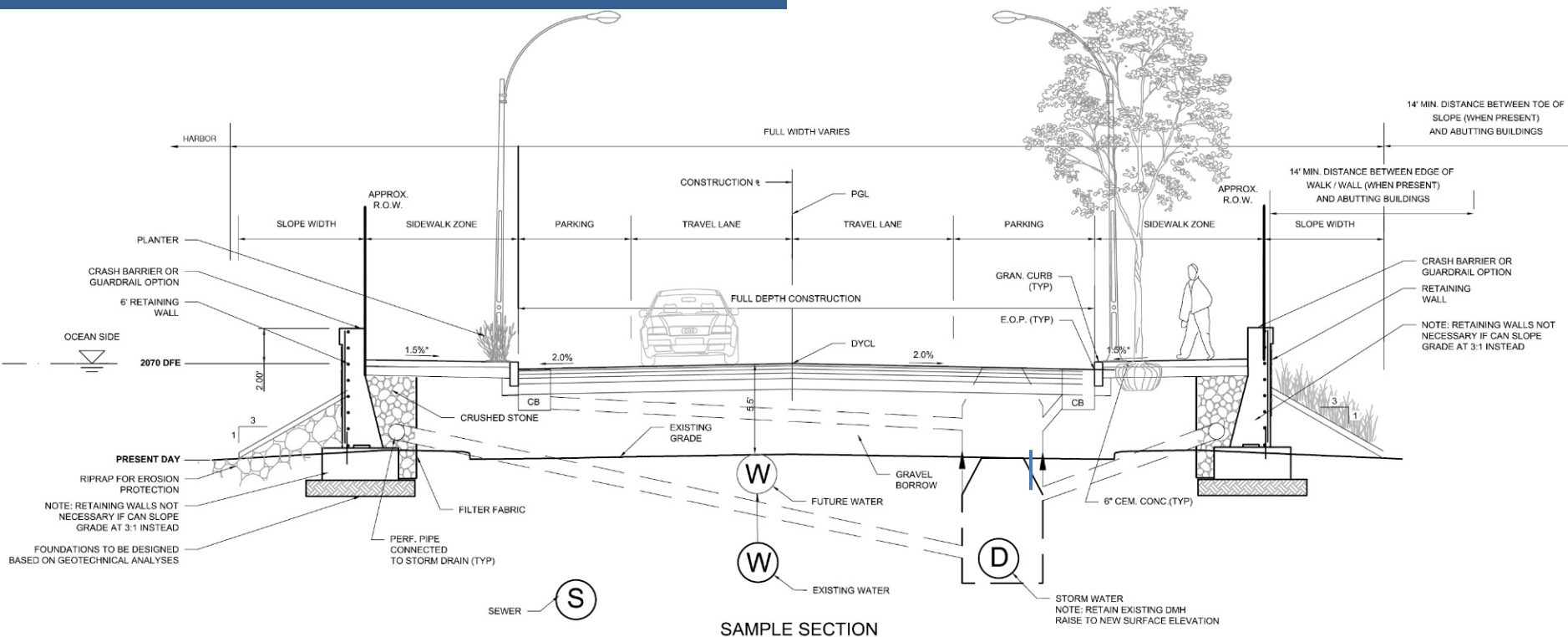
4 – east strand st & north st



4 – east strand st & north st



4 – east strand st & north st



CLIMATE RESILIENT DESIGN STANDARDS AND GUIDELINES FOR PROTECTION OF PUBLIC RIGHTS-OF-WAY

B.3 RAISED ROADWAY - OPTION 1 NO BUILT PROPERTY WITHIN AT LEAST 14 FEET OF EXISTING RIGHT OF WAY

Rondout Riverport Shoreline Stabilization and Public Access – Phase II

Thank You
Questions?

Weston & SampsonSM