

Introduction

- **Project Background**

- MassDEP is considering revisions to the Stormwater Management Handbook.

- **Project Objective:**

- Perform analysis of three (3) potential development Scenarios to demonstrate changes that may result from proposed revisions.



Overview of Proposed Revisions

- **Standard 2, Peak Discharge:**

- Change Design Storms from TP40 to NOAA Atlas 14 PLUS.

- **Standard 3, Recharge Volume**

- Increase for New Development and Redevelopment to meet current regulation.

- **Standard 4, Pollutant Removal**

- Increase for New Development and Redevelopment to align with MS4.



Scenario Identification

Scenarios represent a range of typical development and redevelopment situations:

- **Scenario 1:** New Residential Development
- **Scenario 2:** Roadway Redevelopment
- **Scenario 3:** Tight Urban Lot Redevelopment



Summary of Findings



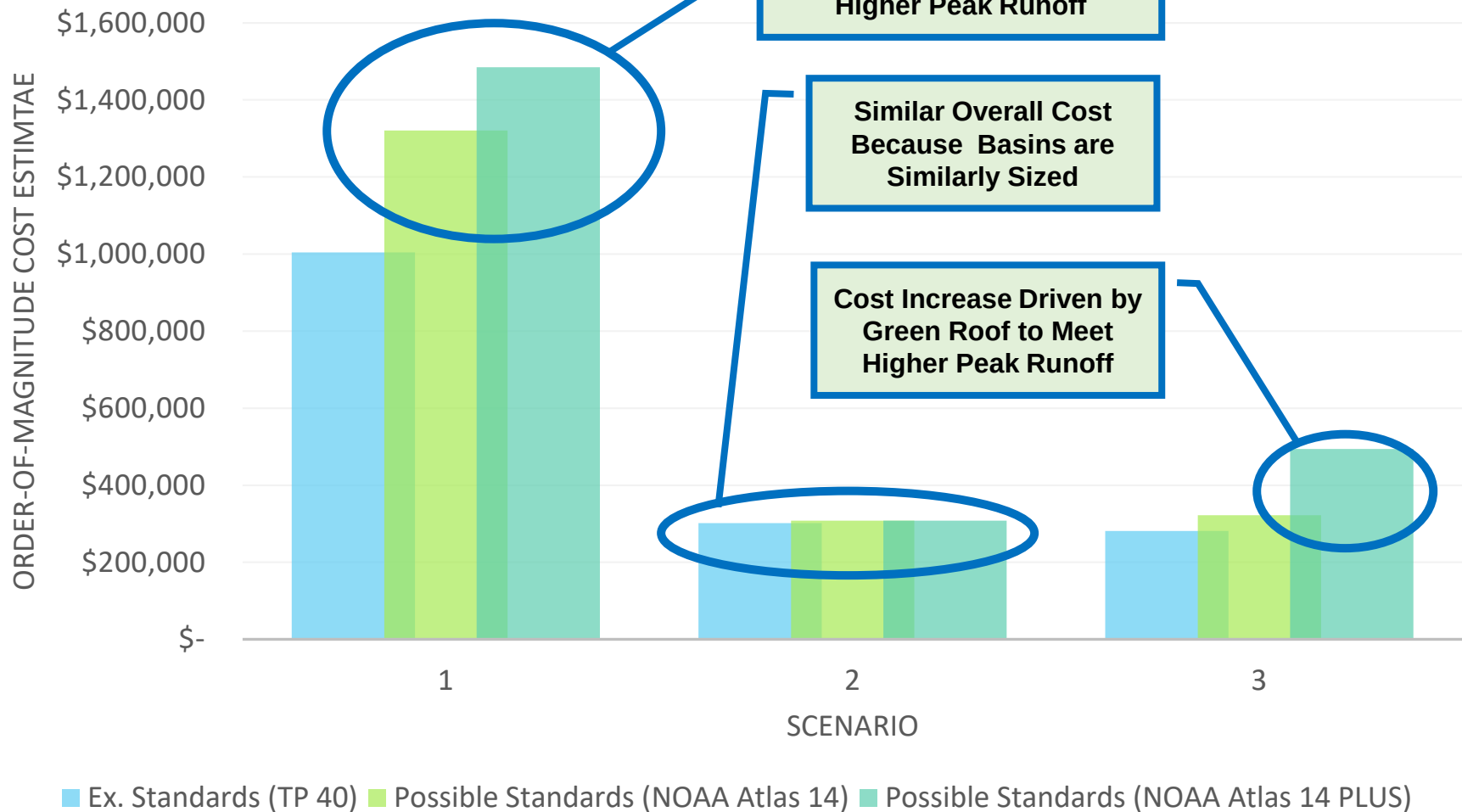
Overall Conclusions for All Three Scenarios

Overall

- Proposed revisions appear to be generally feasible.
 - R_v and peak discharge were the most challenging standards to meet.
- Creative ESSD / LID / off-site mitigation may be required for space constrained sites.
- BMP sizing and associated costs are expected to increase.
- Different standards drive increases in sizing and cost
 - Standard 4 (Water Quality) did not drive sizing in any scenario



Cost Estimate Summary



Scenario 1

New Development

26-Lot Residential Subdivision



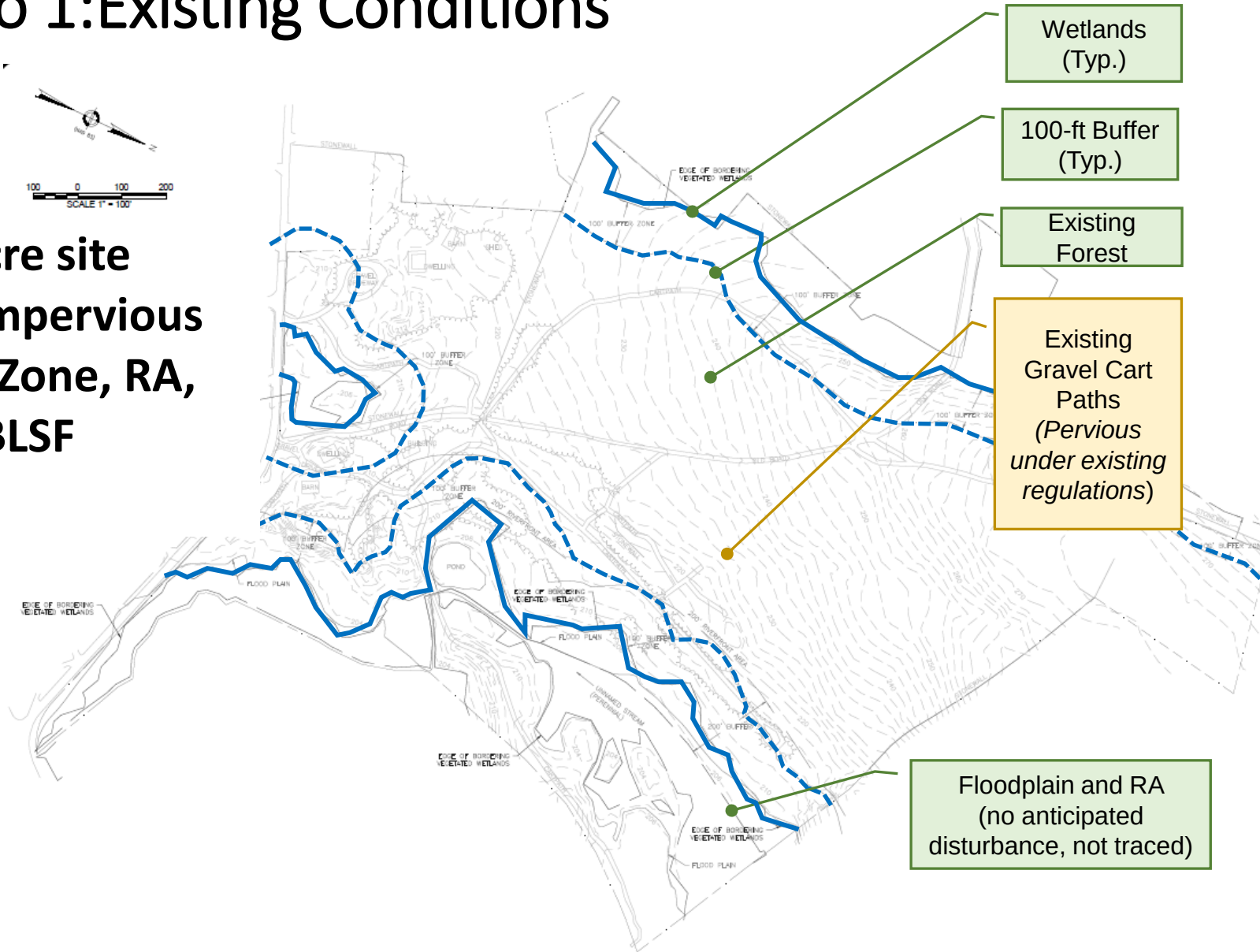
Scenario 1: Narrative

- **Existing Conditions:** 40.1 acre parcel primarily comprised of open space and forest.
 - Freshwater wetlands, two unnamed streams present on site. Site is crisscrossed by old gravel cart paths.
- **Proposed Conditions:** Subdivide the site into 26 half-acre single family lots.
 - Proposed ESSD: leave surrounding wetlands undisturbed, keep development out of 100-ft buffer as feasible, leave forested areas intact as feasible, and limit driveway sizing to 24-ft wide by 30-ft long.
- **Proposed Stormwater Treatment:** See forthcoming slides.



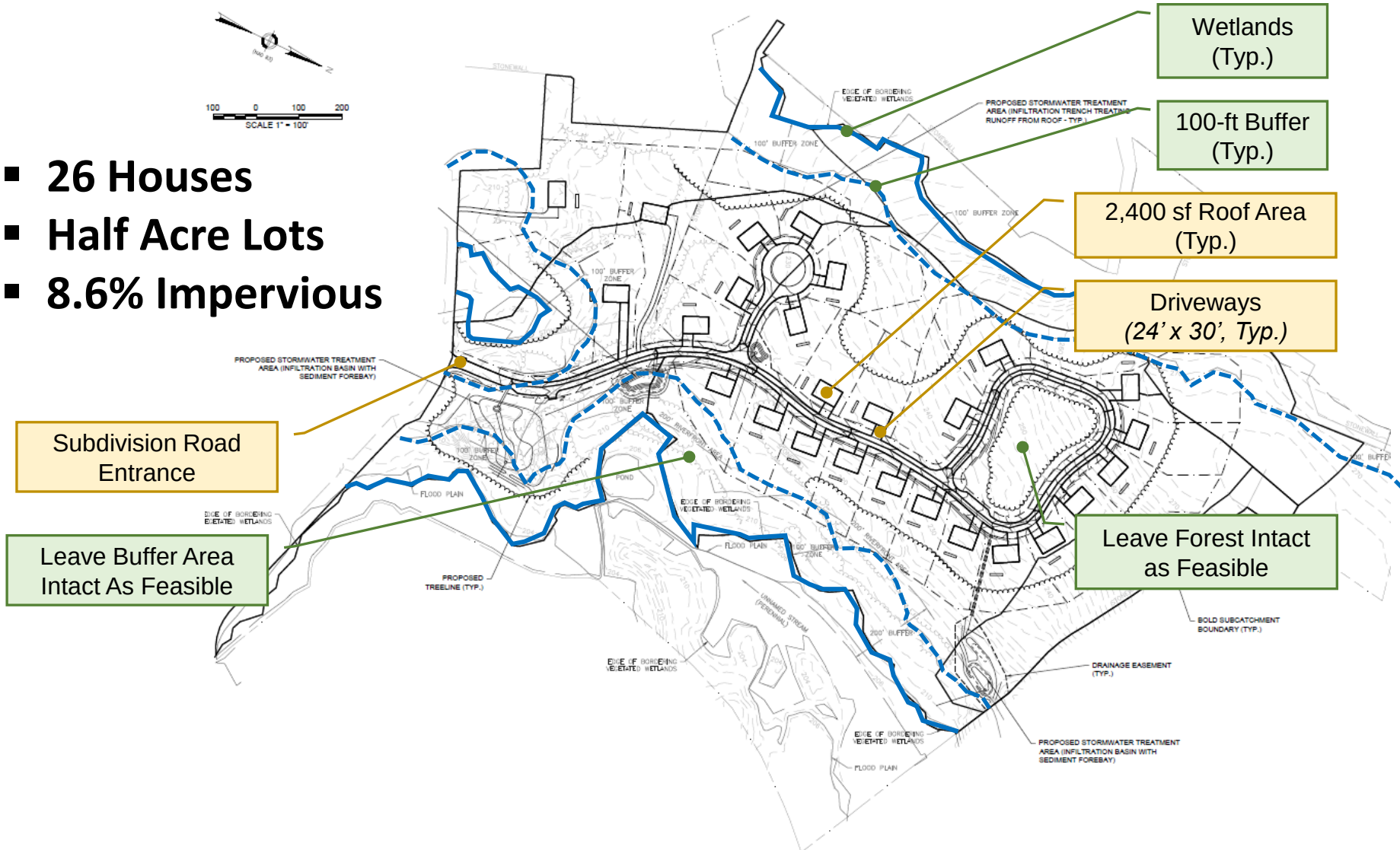
Scenario 1: Existing Conditions

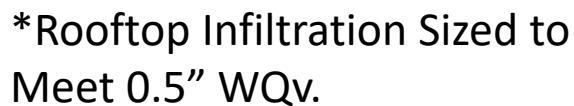
- 40.1 acre site
- 1.3% Impervious
- Buffer Zone, RA, BVW, BLSF
- MS4



Scenario 1: Proposed Project Conditions without Stormwater Treatment

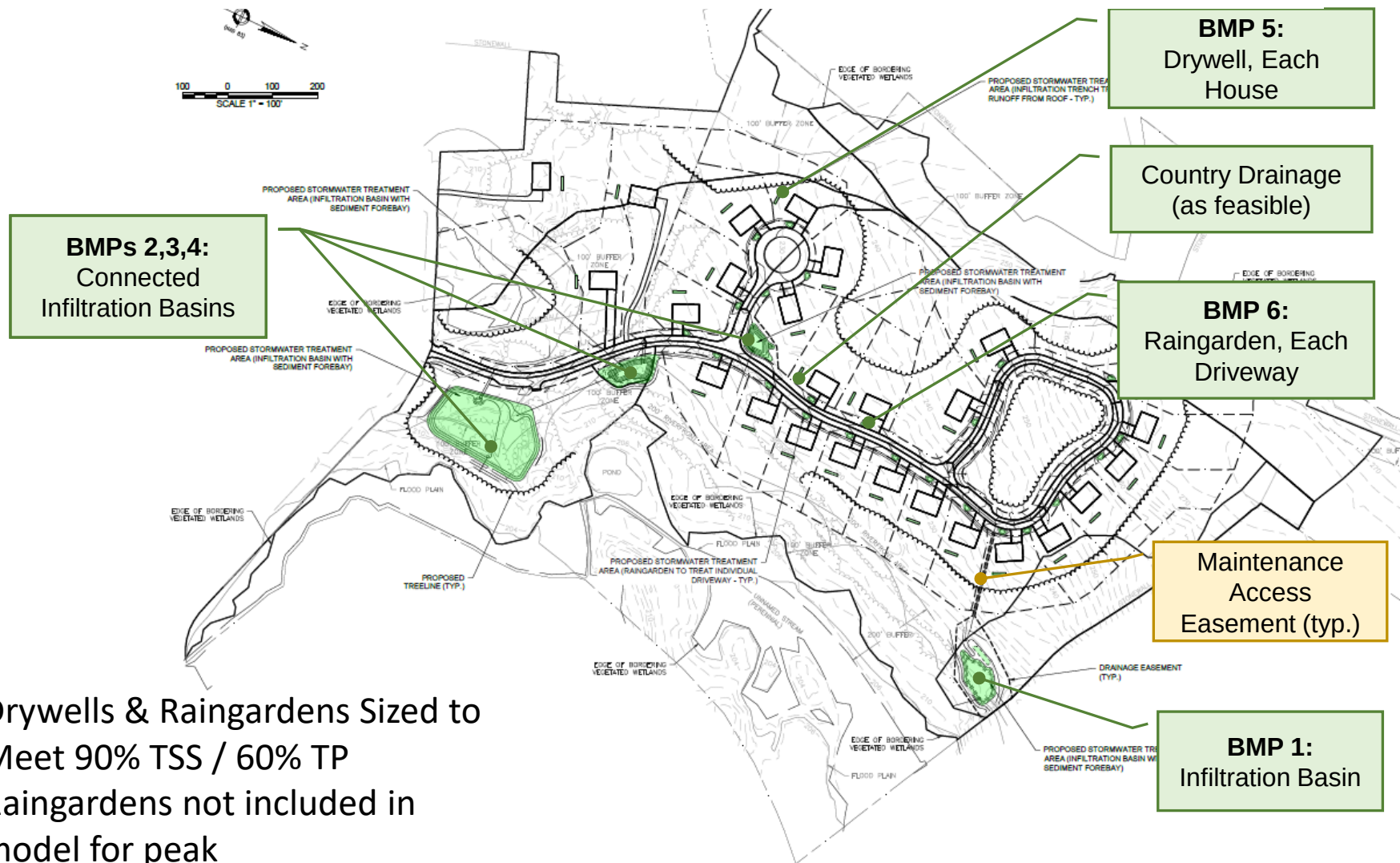
- 26 Houses
- Half Acre Lots
- 8.6% Impervious





Scenario 1B:

Treatment Option Under Proposed Regulation



Scenario 1A/1B Results

Treatment Goal:	Meet Existing Handbook Criteria	Meet Proposed Handbook Update Criteria
Rainfall Type	TP40	NOAA Atlas 14 PLUS
BMP Design Volumes	- Total: 17,000 cf - Rv: 17,000 cf - WQv: 17,000 cf	- Total: 66,400 cf - Rv: 26,900 cf - WQv: 26,900 cf
Standard 2: Peak Discharge (2-yr)	- Criteria: Post < Pre - Result: 20% Reduction	- Criteria: Post < Pre - Result: 43.8% Reduction
Standard 2: Peak Discharge (100-yr)	- Criteria: Post < Pre - Result: 7.4% Reduction (Criteria Drives Sizing)	- Criteria: Post < Pre - Result: 2.3% Reduction (Criteria Drives Sizing)
Standard 3: Recharge Volume	- Criteria: 0.25" (Type C Soil) - Result: 1.35"	- Criteria: 1" (Type C Soil) - Result: 2.13"
Standard 4: Pollutant Removal	- Criteria: 0.5" WQv, 80% TSS - Result: 1.35" WQv, 81% TSS	- Criteria: EPA Curves, 90% TSS / 60% TP (Appx. Min. WQv Depth = 0.58") - Result: 2.13" WQv, 94% TSS / 79% TP
Cost Estimate for Stormwater System	Total: \$1,004,000 (Per Unit: \$38,615.38)	Total: \$1,485,000 (Per Unit: \$57,115.38)

Cost Diff./Unit

- TP40 to NOAA 14 = \$12,192.31
- TP40 to NOAA 14 PLUS = \$18,500.00



Scenario 2
1,500-foot Existing Roadway
Widening Less Than Single Lane
To Add Sidewalk and Bicycle Path/Shoulder



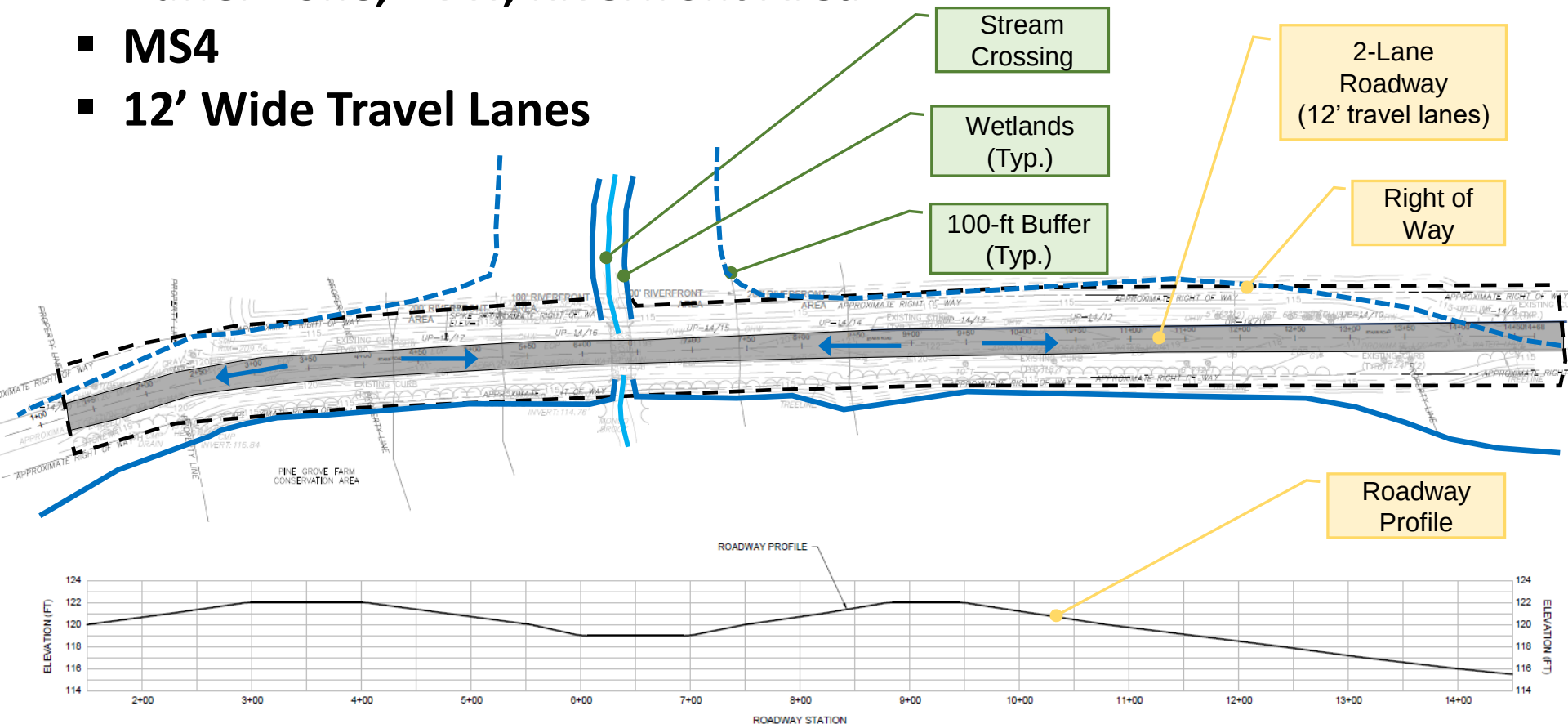
Scenario 2: Narrative

- **Existing Conditions:** Two lane ~1,500 ft long by 23-ft wide roadway with no shoulders (center line markings only). Roadway is constructed on earthen embankment and includes wetlands on both sides and crosses a stream in a culvert. Curbing and a stormwater collection system conveys roadway runoff directly into the stream.
- **Proposed Conditions:** Roadway reconstruction to improve pedestrian and bike access by adding a 5-ft wide bike lane on the northern side and a 5-ft wide pedestrian sidewalk on the southern side of the road with a 1-ft wide shoulder.
 - ESSD site practices: reduce each travel lane to 10-ft. Reconstructed road will not include shoulder parking – i.e., shoulder will be shared with the bike lane to reduce width. Overall road width will be 26-ft (10-10-5).
- **Proposed Stormwater Treatment:** See forthcoming slides.



Scenario 2: Existing Conditions

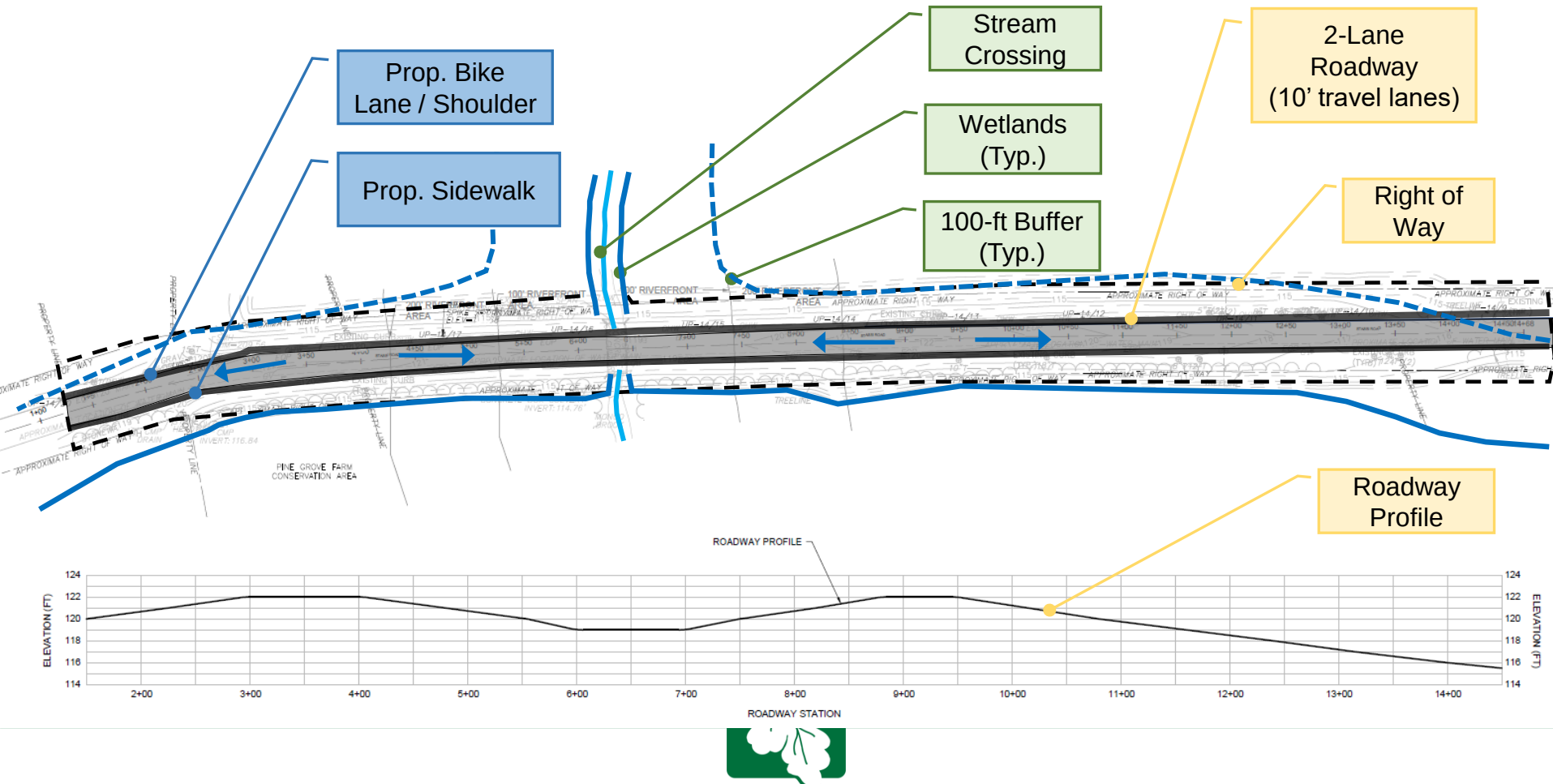
- 2.23 acre Right of Way
- 34.1% Impervious
- Buffer Zone, BVW, Riverfront Area
- MS4
- 12' Wide Travel Lanes



Scenario 2: Proposed Project Conditions without Stormwater Treatment



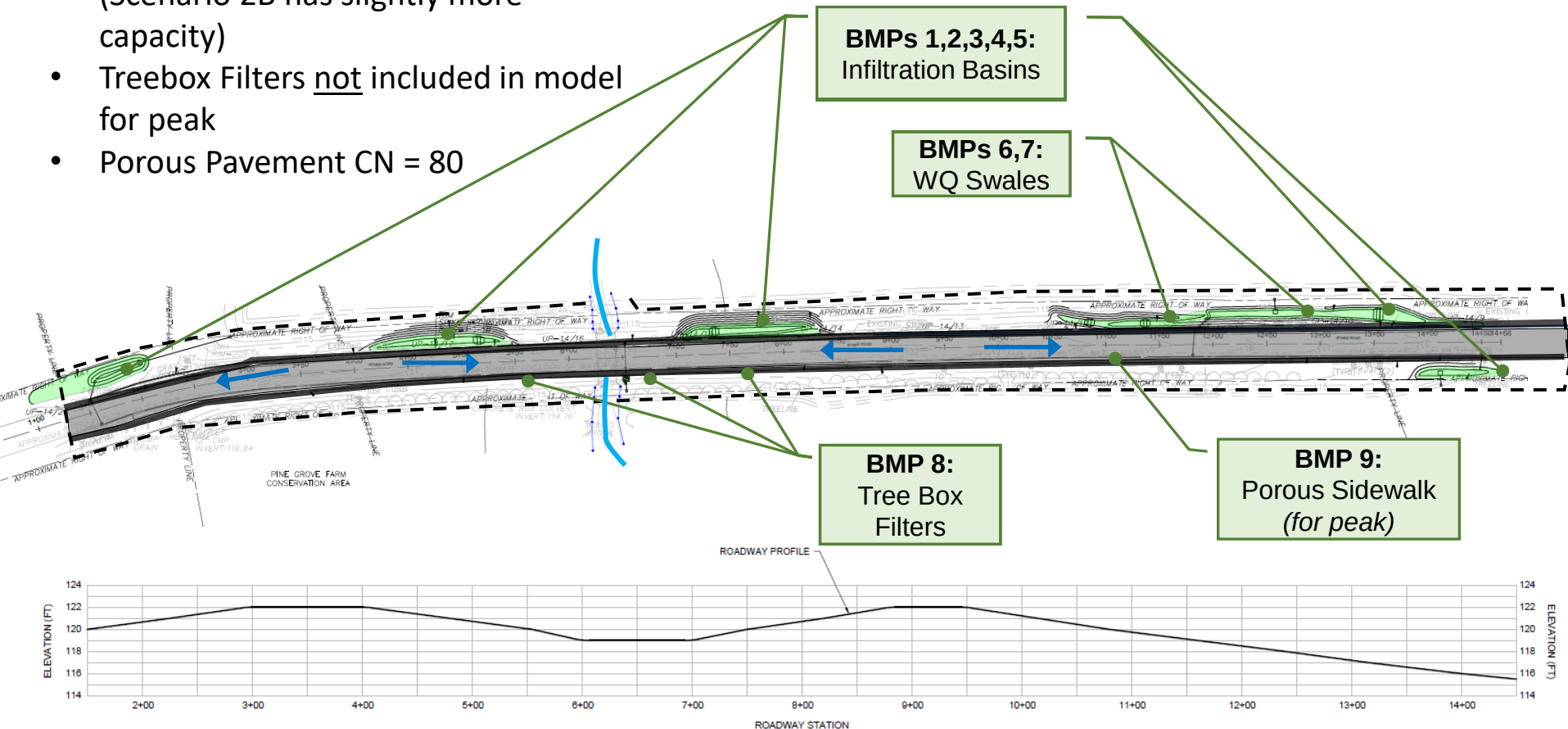
- 2.23 acre Right of Way
- 35.4% Impervious
- 10' Wide Travel Lanes



Scenario 2A / 2B:

Treatment Options Under Existing & Proposed Regulation

- Same treatment for Scenario 2A / 2B (Scenario 2B has slightly more capacity)
- Treebox Filters not included in model for peak
- Porous Pavement CN = 80



Scenario 2A/2B Results

Treatment Goal:	Meet Existing Handbook Criteria	Meet Proposed Handbook Update Criteria
Rainfall Type	TP40	NOAA Atlas 14 PLUS
BMP Design Volumes	- Total: 1,810 cf - Rv: 1,690 cf - WQv: 1,810 cf	- Total: 2,411 cf - Rv: 2,211 cf - WQv: 2,411 cf
Standard 2: Peak Discharge (2-yr)	- Criteria: Post < Pre (MEP) - Result: 4.6% Reduction	- Criteria: Post < Pre (MEP) - Result: 10.1% Reduction
Standard 2: Peak Discharge (100-yr)	- Criteria: Post < Pre (MEP) - Result: 0.2% Reduction	- Criteria: Post < Pre (MEP) - Result: 4.8% Reduction
Standard 3: Recharge Volume	- Criteria: 0.25" (MEP) - Result: 0.49"	- Criteria: 1" (MEP) - Result: 0.65" (Criteria Drives Sizing)
Standard 4: Pollutant Removal	- Criteria: 0.5" WQv, 80% TSS (MEP) - Result: 0.53" WQv, 82% TSS (Criteria Drives Sizing)	- Criteria: EPA Curves, 80% TSS / 50% TP (Appx. Min. WQv Depth = 0.40") - Result: 0.70" WQv, 89% TSS / 66% TP
Cost Estimate for Stormwater System	Total: \$302,000 (Per Linear Foot: \$201.33)	Total: \$308,000 (Per Linear Foot: \$205.33)

Cost Diff./Linear Foot

- TP40 to NOAA 14 = \$4.00
- TP40 to NOAA 14 PLUS = \$4.00



Scenario 3
Redevelopment
Manufacturing to 300 Unit Residential Building
On Small Urban Lot

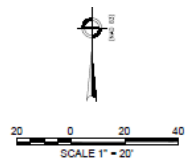


Scenario 3: Narrative

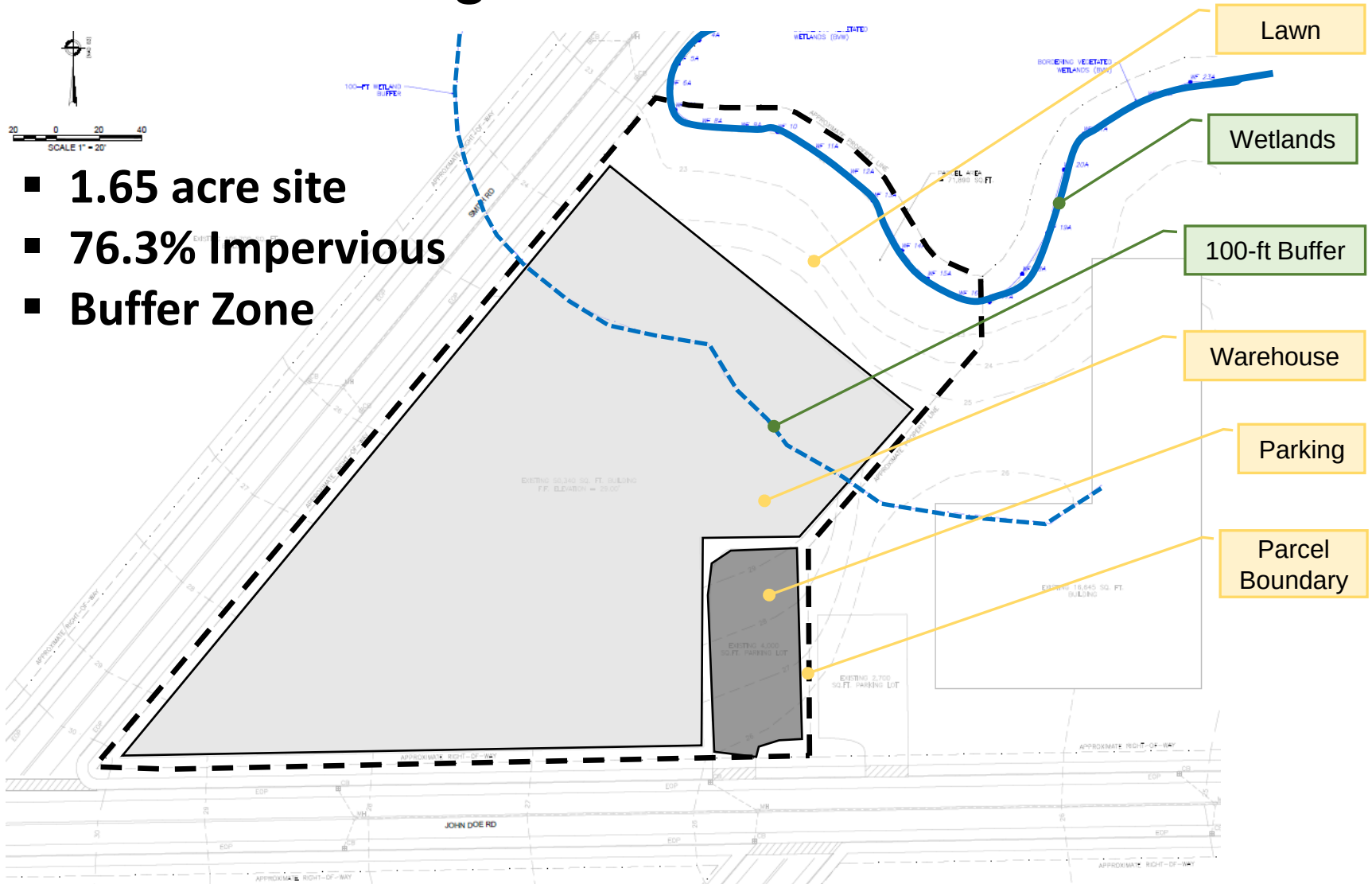
- **Existing Conditions:** 1.65 acre lot in a highly urbanized with an existing warehouse and parking area. Warehouse takes up most of the lot. Site is bordered by two roadways, a freshwater wetland, and an existing building and parking lot. Drainage from the building and parking lot discharges to the existing MS4. A grassed area to the northwest discharges to the freshwater wetland.
- **Proposed Conditions:** Demolish existing building and construct a 300-unit multi-family housing structure with a slightly larger footprint.
 - ESSD site practices will include: 1) decrease the existing building and parking lot footprint and 2) convert existing grassed area to brush (i.e., shrubs and wildflowers). The building will have 7 floors and parking for ~ 720 vehicles (i.e., 2.4 vehicles per unit) in an underground parking garage.
- **Proposed Stormwater Treatment:** See forthcoming slides.



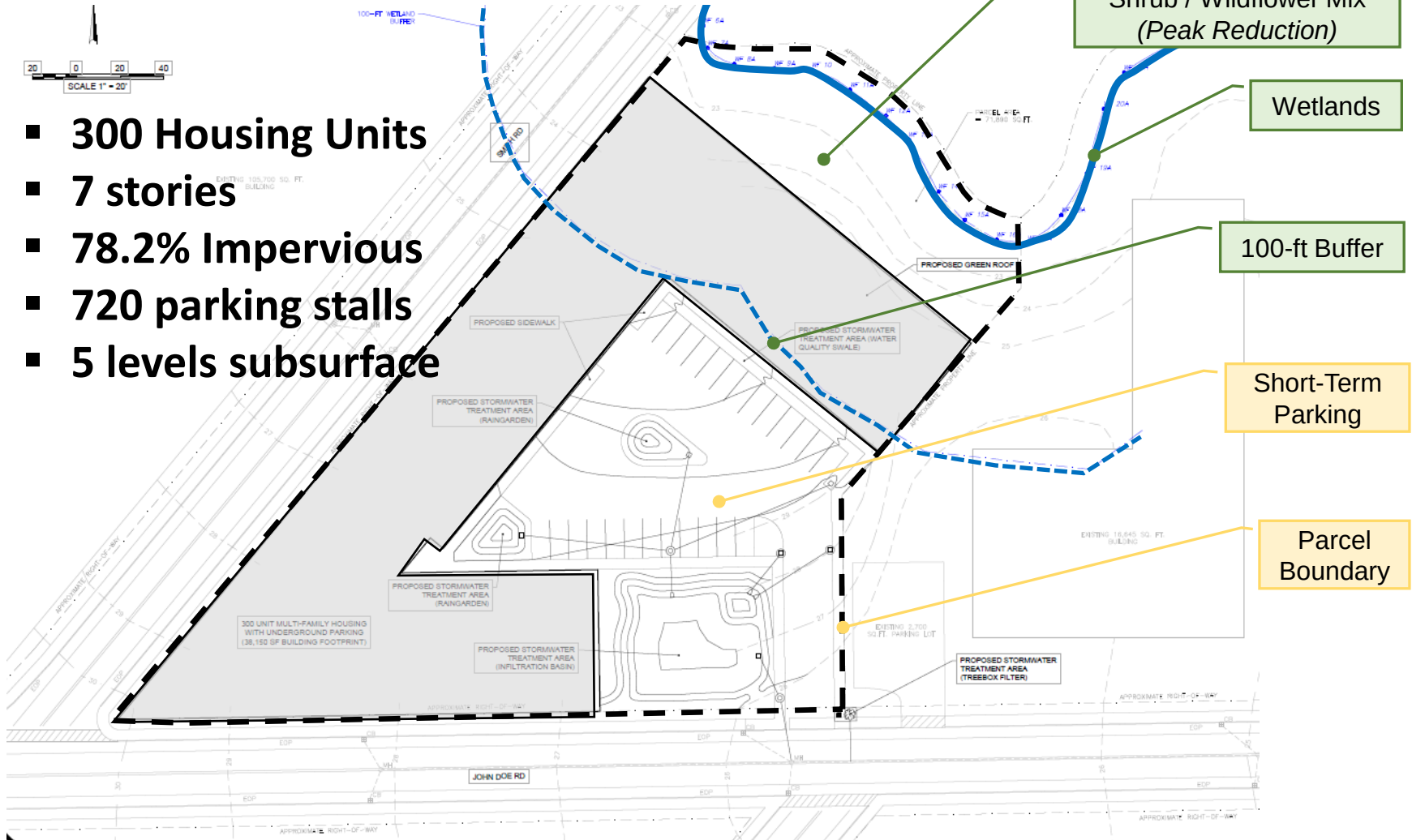
Scenario 3: Existing Conditions



- 1.65 acre site
- 76.3% Impervious
- Buffer Zone



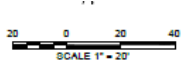
Scenario 3: Proposed Project Conditions without Stormwater Treatment



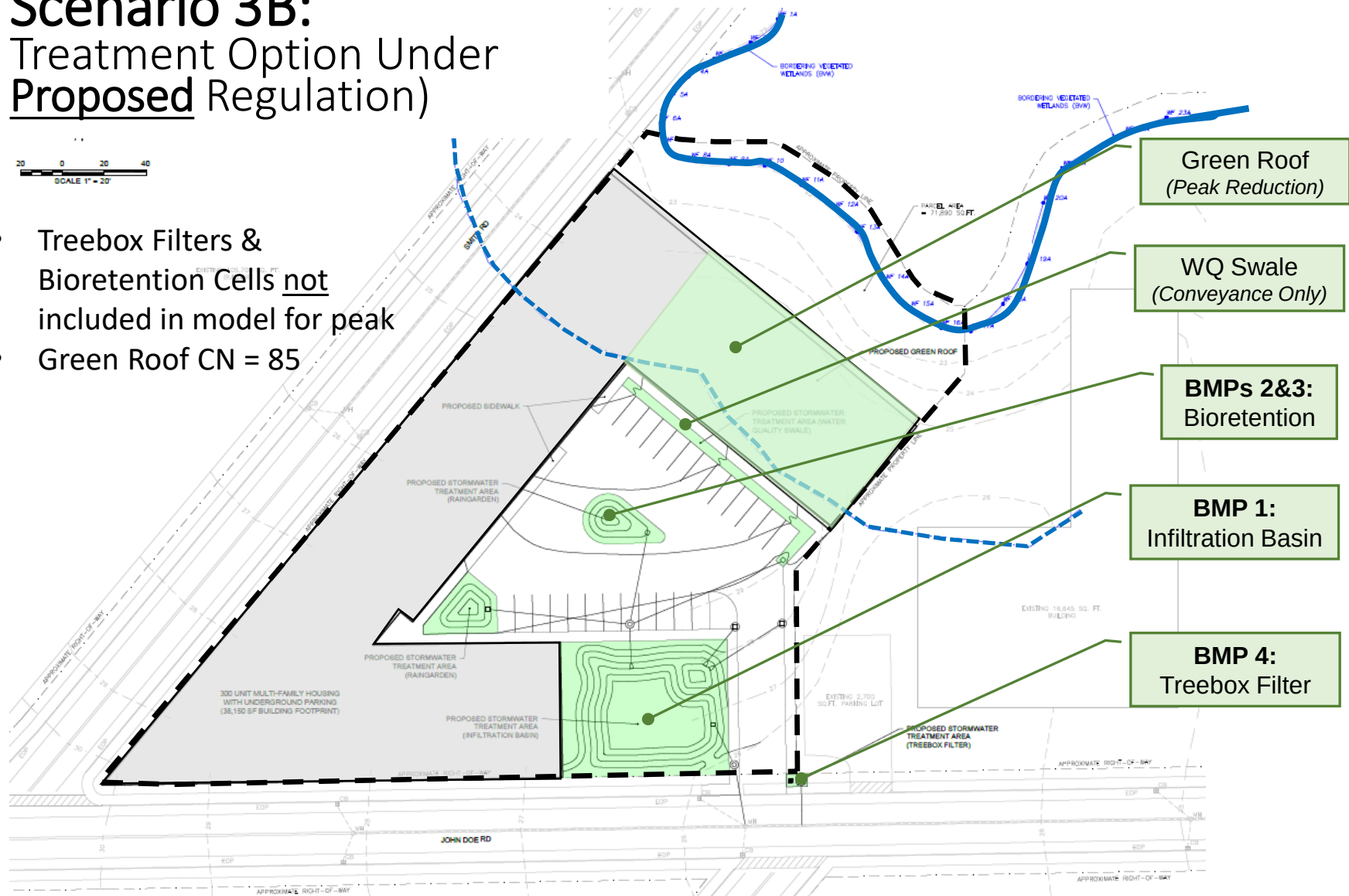
- ## Scenario 3A:
- ### Treatment Option Under Existing Regulation
- 20 0 20 40
SCALE 1" = 20'
- Treebox Filter & Bioretention Cells not included in model for peak
-
- The site plan illustrates a 300-unit multi-family housing development with underground parking (38,150 SF building footprint) situated on a sloped lot. The plan includes a proposed sidewalk, a proposed green roof, and a proposed stormwater treatment area (water quality swale). Four proposed stormwater treatment areas are identified: two rain gardens, one infiltration basin, and one treebox filter. The plan also shows existing features such as a 16,645 sq. ft. building, a 2,700 sq. ft. parking lot, and a 71,000 sq. ft. parcel area. The site is bordered by John Doe Rd to the south and an approximate right-of-way to the east. The plan includes a scale bar (1 inch = 20 feet) and a north arrow.
- WQ S
(Conveyan
- BMPs
Bioret
- BMP
Infiltration
- BMP
Treebox



Scenario 3B: Treatment Option Under Proposed Regulation)



- Treebox Filters & Bioretention Cells not included in model for peak
- Green Roof CN = 85



Scenario 3A/B Results

Treatment Goal:	Meet Existing Handbook Criteria	Meet Proposed Handbook Update Criteria
Rainfall Type	TP40	NOAA Atlas 14 PLUS
BMP Design Volumes	- Total: 2,620 cf - Rv. 1,345 cf - WQv. 2,620 cf	- Total: 5,320 cf - Rv. 2,045 cf - WQv. 3,320 cf
Standard 2: Peak Discharge (2-yr)	- Criteria: Post < Pre (MEP) - Result: 10.3% Reduction	- Criteria: Post < Pre (MEP) - Result: 23.2% Reduction
Standard 2: Peak Discharge (100-yr)	- Criteria: Post < Pre (MEP) - Result: 8.0% Reduction	- Criteria: Post < Pre (MEP) - Result: No Change (Criteria Drives Sizing)
Standard 3: Recharge Volume	- Criteria: 0.25" (MEP) - Result: 0.29"	- Criteria: 1" (MEP) - Result: 0.44" (Criteria Drives Sizing)
Standard 4: Pollutant Removal	- Criteria: 0.5" WQv, 80% TSS (MEP) - Result: 0.56" WQv, 89% TSS (Criteria Drives Sizing)	- Criteria: EPA Curves, 80% TSS / 50% TP (Appx. Min. WQv Depth = 0.45") - Result: 0.71" WQv, 94% TSS / 63% TP
Cost Estimate for Stormwater System	Total: \$281,000 (Per Unit: \$936.67)	Total: \$494,000 (Per Unit: \$1,646.67)

*1" R_v not met, can't drawdown in 72 hours within available space



Cost Diff./Unit

- TP40 to NOAA 14 = \$136.67
- TP40 to NOAA 14 PLUS = \$710.00