

Project Narrative

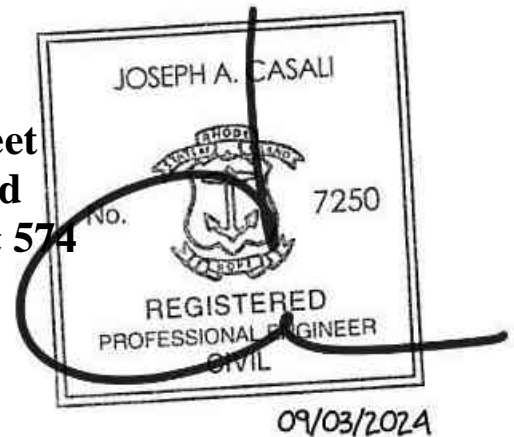
For a Proposed

54-Unit Residential Building Lundgren Equity Partners LLC

Located at

**135, 141 & 149 Gano Street
Providence, Rhode Island
AP 14, Lots 324, 325, 357 & 574**

Prepared for:
Lundgren Equity Partners LLC
163 Washington Street
Auburn, MA 01501



Elevation View along Gano Street; Courtesy of WRA Designs Inc. (NTS)

Submission Date:

May 2024; Revised September 2024

Submitted by:

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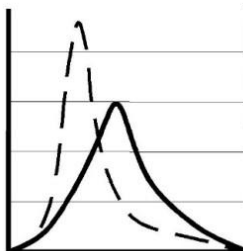


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1 INTRODUCTION

On behalf of Lundgren Equity Partners LLC, Joe Casali Engineering, Inc. (JCE) has prepared the following Project Narrative to identify existing and proposed site conditions associated with a 54-Unit Residential Complex proposed at the intersection of Gano Street and Power Street in Providence, Rhode Island. The subject properties can be identified as Providence's Tax Assessor's Plat Map (AP) 14, Lots 324, 325, 357 & 574, with frontage on Gano Street and Power Street (Figure 1 – Locus Map).

The project scope includes construction of a four-story apartment building with a total of 54 units (18 units on second, third floor, and fourth floors). The proposed building will be constructed with an associated parking area on the lower level (54 spaces), utility connections, and green roof (for stormwater management). Other site improvements include merging the four (4) existing lots on Gano Street and providing new access on Power Street to access the proposed development.

2 SITE LOCATION AND PHYSICAL DESCRIPTION

2.1 Existing Conditions

According to a May 2023, Class I Limited Content Boundary Survey performed by Ocean State Planners, Inc., the total area of the four (4) subject parcels is approximately 22,500 square feet (0.517 acres). The first lot, AP 14, Lot 325 contains an existing one-story commercial building (formerly “Gano Mart”) within 3,600 square feet. AP 14, Lot 324 is an 11,400 square foot parcel containing an existing commercial building (“Site Specific” - general contractor) and associated parking area. AP 14, Lots 357 and 574 contain an existing commercial building (formerly “Wild Card Tattoo” shop) and associated parking area within 7,500 square feet. All these existing structures are to be razed. The subject parcels are bound Power Street to the north, AP 14, Lot 316 containing “Fox Point Community Garden” to the east, AP 14, Lot 585 containing “Dunkin Donuts” to the south, and Gano Street to the west, as shown in Figure 1 – Locus Map. The subject parcels are within the City of Providence’s C-2, General Commercial District.

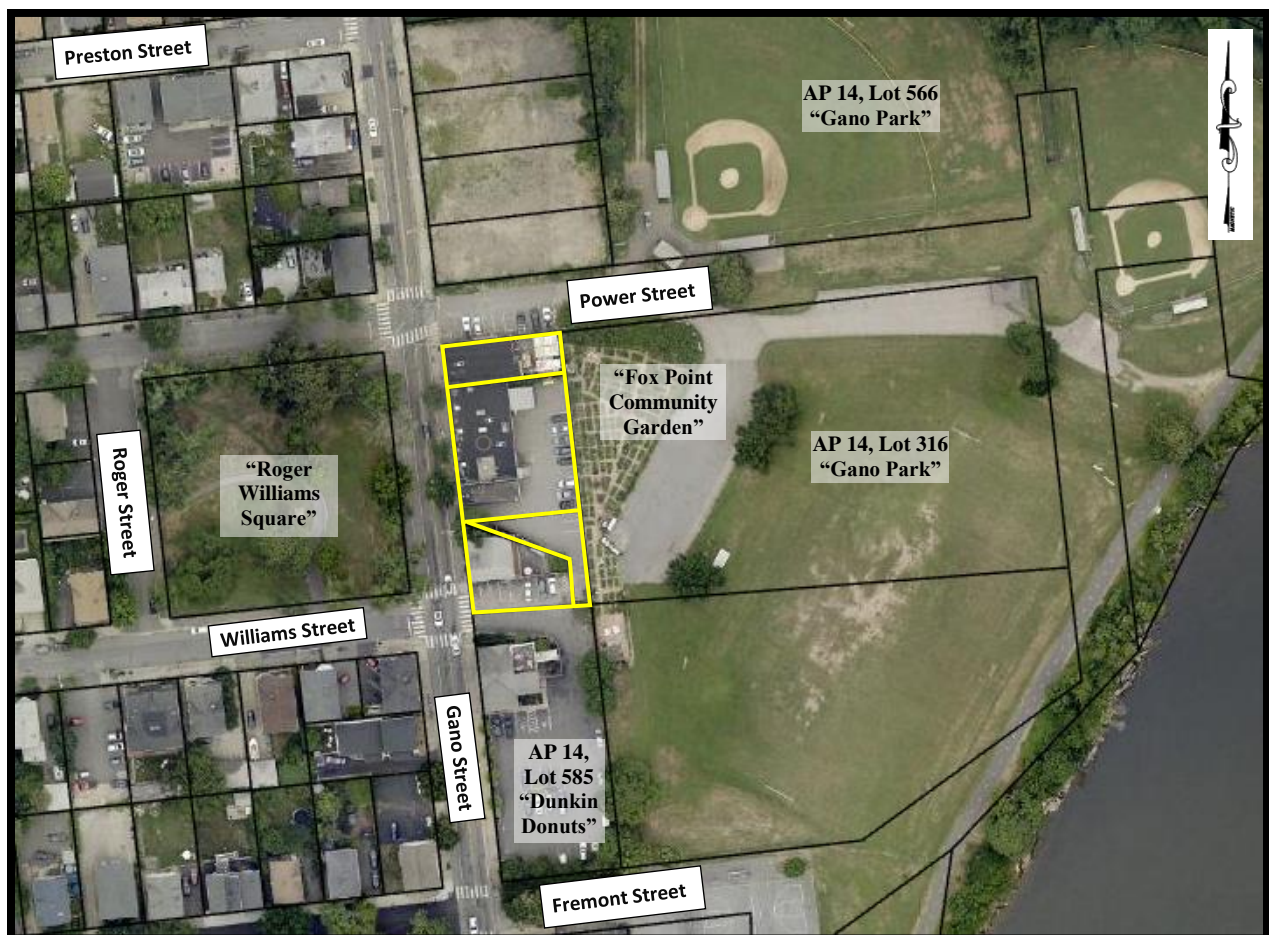


Figure 1 - Locus Map
NOT TO SCALE

2.2 Soil Classification

According to the *Web Soil Survey (WSS)* operated by the US Department of Agriculture Natural Resources Conservation Service (NRCS), produced by the National Cooperative Soil Survey, the soils on site consist entirely of Udorthents-Urban land complex (UD). UD soils consist of human transported material.



Figure 2 - Soils Map
NOT TO SCALE

2.3 Natural Resource Inventory

According to the Rhode Island Department of Environmental Management (RIDEM) Environmental Resource Mapping, there are no known wetlands, wetland buffers or natural watercourses on, or adjacent to, the subject parcel. In addition, the parcel is not located within a historic planning district, land conservation area or natural heritage area.

The project site lies within the Seekonk-River - Providence River Watershed (RI DEM Inventory #010900040901). Stormwater runoff from the site drains to the Seekonk River (RI0007019E-01) which has impairments for fecal coliform, total nitrogen, and dissolved oxygen. There are no Total Maximum Daily Loads (TMDLs) established at this time.

2.4 Recreational Resource Inventory

There are no known existing public, recreational or cultural resources within the subject site. The parcel is not located in a historic planning district, land conservation area or natural heritage area. The project site lies adjacent to Fox Point Community Garden, a local conservation land used for

public recreation. There are no boat launches, lake, and/or stream access points, beaches, or water trails.

2.5 FEMA Flood Hazard

The site is located on the Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map for the City of Providence, Rhode Island, Map Number 44007C0309K, effective date October 2, 2015. The majority of the project site is located within Flood Zone X, which is defined as areas determined to be outside the 0.2% annual chance flood plain. A small portion of the southeastern corner of the project site is within Flood Zone X, area with reduced flood risk due to levee.

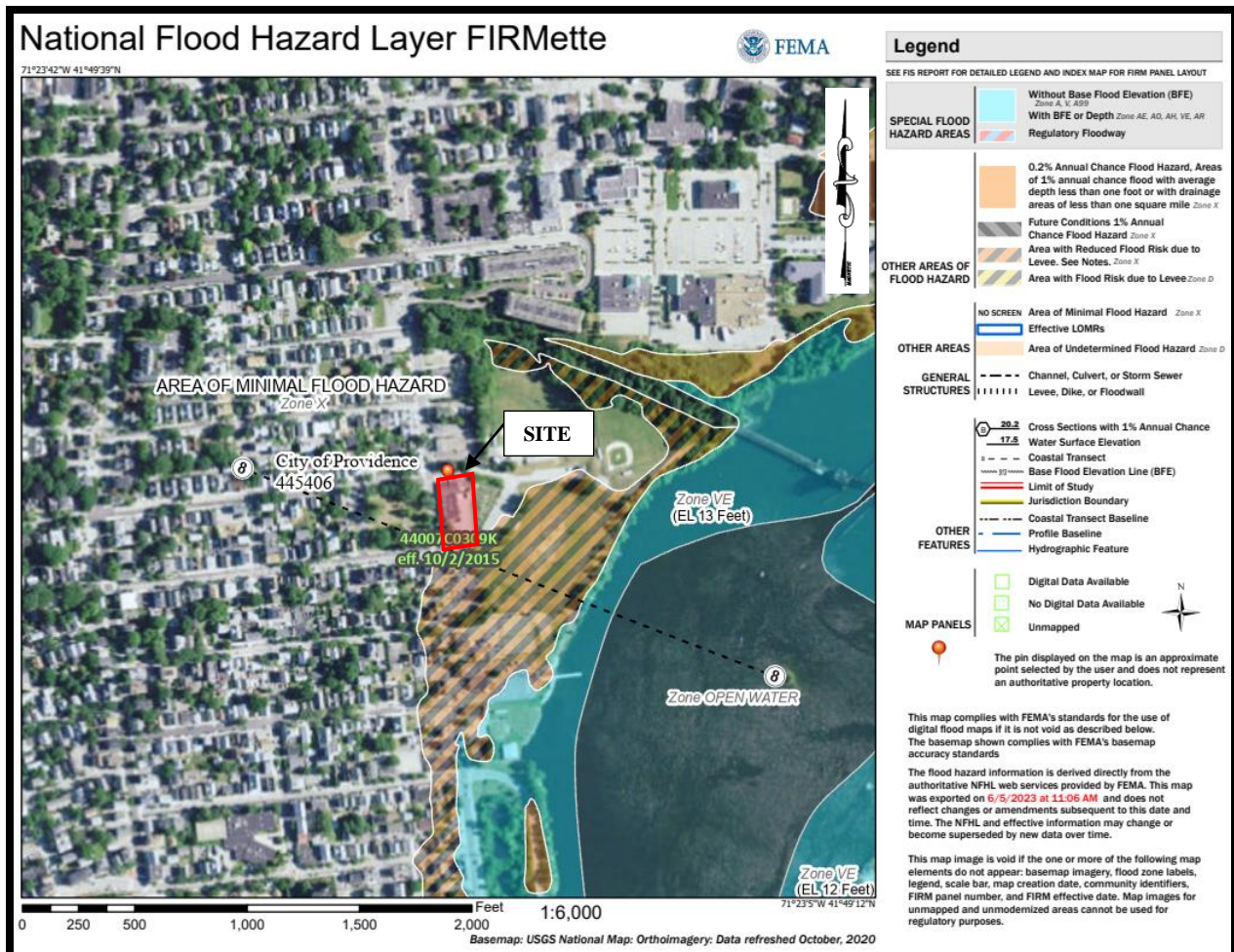


Figure 3 – FEMA Flood Insurance Rate Map (44007C0309K)

NOT TO SCALE

2.6 Zoning

According to the City of Providence Zoning Ordinance and Zoning Map, the subject parcels are currently zoned C-2, General Commercial Zoning District. This district is intended for intensive commercial uses and key commercial nodes, including larger retail establishments. The following are the current dimensional requirements for a residential use in the C-2 Zoning District:

Requirement	C-2 Zone
Minimum Lot Area	None
Minimum Building Height	16'
Minimum First Story Height	9' Residential Use 11' Non-Residential Use
Maximum Building Height	50', Not to Exceed 4 Stories
Maximum Building Coverage	None
Total Maximum Impervious Surface Coverage	None
Minimum Front Setback	Build to zone of 0' to 5'
Minimum Interior Side Setback	None, unless abutting residential district, then 10'
Minimum Corner Side Setback	Build to zone of 0' to 5'
Minimum Rear Setback	None, unless abutting residential district, then 20'

2.7 Easements

According to the May 2023 Class I Limited Content Boundary Survey performed by Ocean State Planners, Inc., there is an easement seven (7) inches wide more or less along the southerly portion of AP 14, Lot 325 for maintaining the building on Lot 325 (Deed Book 1155, Page 571). The abandoned Williams Street is subject to Narragansett Electric Co., and rights of owners of lots on record to use the abandoned portion of Williams Street (Deed Book 10237, Page 63).

2.8 Utilities

Water: There is a 12-inch ductile iron water main within Gano Street. A 6-inch AC water main exists within Power Street. Water utilities in this area are owned and maintained by the Providence Water Supply Board.

Sewer: There is an existing 18-inch sanitary sewer main available within Gano Street, owned and maintained by City of Providence. A 42-inch brick combined sewer overflow (CSO) main exists within Power Street, which is owned and maintained by Narragansett Bay Commission (NBC).

Drainage: A dedicated 12-inch public drainage main existing within Gano Street. This drainage main continues in a southerly direction within Gano St., ultimately discharging to the Seekonk River via an outfall located at the end of East Transit St (Gano Park Boat Launch).

Gas: A 4-inch cast iron gas main lies within Gano Street. Gas services are owned and maintained by RI Energy.

Electric/Communications/Gas: Electric and communication services are available to the subject site via overhead lines along Gano Street. Utility poles and electrical lines are owned and maintained by RI Energy. Gas is also available within Gano Street.

3 PROPOSED SCOPE OF WORK

3.1 General

The proposed project includes the construction of a four-story apartment building with 54 units (18 units on second, third, and fourth floors). The proposed building will be constructed with an associated parking area (54 spaces) on the lower level. The lower level will also contain the building lobby and community room. Other site improvements include closing the existing driveway on Gano Street, eliminating the on-street parking along Power Street, and providing a new driveway on Power Street. Parking is accessed from Power Street to the parking lot area within the lower level of the building. Pedestrian access is available on both Gano Street and Power Street. The building will contain an elevator and egress stairs, parking access and bicycle parking, and a trash chute serving each floor. Architectural plans are provided under separate cover; colored renderings of the proposed development are included in Appendix A. In addition, given the proximity of the proposed development to the adjacent Fox Point Community Garden, a detailed Shade Study has been performed; the results are included in Appendix B.

The interior lot lines will be abandoned, and the four (4) parcels will be merged. The total square footage of the parcel will be approximately 22,500 square feet (0.517 acres).

3.2 Utility Improvements

Fire Protection and Domestic Water: The proposed building will be serviced by a 2-inch domestic and 6-inch fire protection service tapped off the existing 12-inch ductile iron main within Gano Street. A fire hydrant exists at the intersection of Gano Street and Power Street, adjacent to Roger Williams Square. The proposed water design will require review and approval by the Providence Water Supply Board.

Sewer: The proposed building will be serviced by new 6-inch PVC sewer service which will connect into the existing stubs associated with the 18-inch sewer main within Gano Street. The sewer design will require review and approval by the Narragansett Bay Commission (via an indirect connect permit) and by the City of Providence Engineering Division.

Drainage: The overall size of the proposed development requires the project to comply with the City's Stormwater Ordinance. An Extensive GreenRoof system is proposed on the rooftop to achieve the required water quality volume prescribed by the City's Stormwater Ordinance. Excess rooftop runoff from the proposed building will be conveyed via roof drains to a series of underground drainage pipes that will connect directly to the existing 12-inch drainage main within Gano Street. The stormwater design and connection will require review and approval by the City of Providence Engineering Division. Given the size of the development, a permit is not required from the RI Department of Environmental Management.

Gas: Gas service will be provided to the proposed building via connection to the existing main within Gano Street. The proposed gas connection will be coordinated with RI Energy.

Electric/Communications: Proposed site improvements include coordination with RI Energy to provide primary electric service to the proposed building. An electric transformer is proposed to service the proposed building.

3.3 Permit Requirements

3.3.1 Providence Planning Department

The proposed development is considered a Minor Land Development project and since it is purely residential, will require administrative review by the City Planning Department.

3.3.2 City of Providence Engineering Division & Traffic Division; City Forester

The proposed development will require review and approval from the City of Providence Engineering Division for the proposed sewer and stormwater connections. In addition, the development will require review and approval from the City of Providence Traffic Division. Coordination with the City Forester will be required regarding existing street trees.

3.3.3 Fire Department

The site will require review and approval from the City of Providence Fire Department.

3.3.4 Providence Water Supply Board

The proposed development will require approval from the Providence Water Supply Board for the proposed fire protection and domestic water service design.

3.3.5 Narragansett Bay Commission (NBC)

All effluent from the subject parcel is ultimately treated at the Fields Point Wastewater Facility, operated by the Narragansett Bay Commission (NBC). Accordingly, the proposed sewer service will require a Sewer Connection Permit from the Narragansett Bay Commission.

4 STORMWATER MANAGEMENT

The proposed development is subject to the requirements of the City's Post-Construction Stormwater Control Ordinance, which references the Rhode Island Stormwater Design and Installation Standards Manual (RISDISM), implemented in December 2010, amended March 2015, by both the Rhode Island Department of Environmental Management (RIDEM) and the Rhode Island Coastal Resources Management Council (CRMC). As the site currently lies, there is no stormwater management system servicing the site. In general, stormwater runoff from the site sheet flows in a southerly direction to the southeastern corner of the property towards Gano Park.

Under typical conditions, the site's proposed stormwater management system would be designed to generally mimic existing conditions – discharging stormwater to the same design point as existing conditions, the adjacent Gano Park. However, based on conversations with City staff, we understand that this scenario is not desirable due to existing high groundwater tables and flooding within the park. Accordingly, the City recommended that the Applicant provide water quality appurtenances within the project site, and excess stormwater may be discharged directly to the dedicated storm main within Gano Street.

The stormwater management design adheres to all City of Providence standards and provides attenuation of peak stormwater runoff rates and total stormwater runoff volumes for the 1-, 2-, 10, 25- and 100-year storm events while improving the quality of stormwater leaving the site. The proposed Stormwater Management Plan improves the overall quality of stormwater leaving the site by using Best Management Practices (BMPs) including an extensive green roof system.

4.1 Green Roof

The pre-existing condition of the site included 96% impervious surface coverage via a combination of buildings and paved parking areas. The proposed condition improves this by providing a green roof system for water quality. The building will be provided with a partial green roof system, designed to provide ¼ of the total water quality volume required by the proposed development. Once the initial water quality volume is captured within the green roof system, excess stormwater runoff will be captured via traditional roof scuppers and downspouts, and hard piped into the stormwater main within Gano Street.

The green roof system is proposed to consist of LiveRoof Deep Modules, which includes a soil depth of approximately 6-inches. The LiveRoof Deep Module system is primarily used for biodiversity, prairies and garden-like perennial plantings. It also allows for food growing and shade planting, on roofs that are too shady for succulent plants. The Deep System is excellent for saving energy and is a good option for storm water management. Because it can support a broad array of plants, it can provide habitat and food for pollinators such as butterflies and honeybees and various bird species. Plantings can be random and naturalistic as well as patterned.

The type of plants used in the Deep System include a full array of low to tall growing *Sedums*, hundreds of different fibrous rooted herbaceous perennials, including native forbs, sedges, grasses, and edible plants. Foliage colors can vary widely; green, yellow, red, purple, and blue are possible, and flowers of any color and shape are found within the broad palette of plants capable of growing in its 6-inch soil profile.

Based on the RISDM, the site is considered a redevelopment, therefore all impervious areas must be treated for 50% of the required water quality volume. Calculations were completed in accordance with Section 3.3.3 of the RISDM using the following formula:

$$WQ_v = (1'') (I) / 12 \text{ in/ft}$$

Therefore, the required water quality volume for the site is as follows:

$$WQ_v \text{ Req.} = (1'') (29,570 \text{ SF}) / 12 \text{ in/ft} * 50\% = 932 \text{ CF}$$

As noted above, the LiveRoof Deep Module consists of a 6-inch-thick soil layer spanning an area of 9,786 sq. ft. The resulting total water quality volume is calculated as follows:

$$WQ_v \text{ Prov.} = (9,786 \text{ sq. ft.})(6'')(33\% \text{ void space}) = 1,615 \text{ CF}$$

4.2 Drainage Analysis

The comparative pre- versus post-development hydrologic analysis was performed using the Soil Conservation Service, Technical Release 20 and 55 (TR-20 and TR-55) methodology. The 1-, 2-, 10-, 25-, and 100-year storm events were modeled for a 24-hour, Type III storm utilizing HydroCAD version 10.00. HydroCAD modeling reports for the existing and proposed conditions can be found in Appendices D and F, respectively.

As shown in the following sections, the proposed stormwater management system has been designed to attenuate peak stormwater runoff rates and reduce stormwater volumes leaving the site for the 1-, 2-, 10-, 25- and 100-year design storm events.

4.2.1 Existing Conditions

The existing site consists of one (1) watershed discharging to one (1) off-site design point further described as the Seekonk River (DP1). The site was previously comprised of four (4) lots containing commercial buildings with associated parking areas. Under existing conditions, stormwater runoff from the site sheet flows towards the south to Gano Park and ultimately the Seekonk River. An Existing Conditions Watershed Map is included in Appendix C.

Design Point 1 – Seekonk River

Watershed 1: Consists of 22,500 sq. ft. of area consisting of a combination of impervious building and parking areas, and minimal landscaped areas. Accordingly, this watershed area has been assigned a minimum time of concentration (T_C) of 6.0 minutes and a composite Runoff Number (CN) of 96. Runoff from this area sheet flows to Gano Park and ultimately the Seekonk River (Design Point 1).

4.2.2 Proposed Conditions

As described elsewhere in this report, typically proposed conditions will be designed to mimic existing conditions. However, based on conversations with City staff, we understand that this scenario is not desirable due to existing high groundwater tables and flooding within the park. Accordingly, the City recommended that the Applicant provide water quality appurtenances within the project site, and excess stormwater may be discharged directly to the dedicated storm main within Gano Street. The dedicated storm main discharges to the Seekonk River (Design Point 1). These conditions are shown in detail on the Proposed Conditions Watershed Map included in Appendix E.

Design Point 1 – Seekonk River

Subwatershed 1A: This Subwatershed consists of 13,800 sq. ft. of rooftop area and therefore has been assigned a minimum T_C of 6.0 minutes and a CN of 98. The proposed rooftop area is conveyed via roof drains directly to the existing public drainage system within Gano Street which ultimately discharges to the Seekonk River (Design Point 1).

Subwatershed 1B: This Subwatershed area consists of the LiveRoof (green roof) Module area, consisting of approximately 8,393 sq. ft. of rooftop area. Based on the RISDISM, this Subwatershed area has been assigned a minimum T_C of 6.0 minutes and a composite CN Runoff Number of 85 (per Table 5-6 of the RISDISM for a 6-inch growing media thickness). The proposed rooftop area is conveyed via roof drains directly to the existing public drainage system within Gano Street which ultimately discharges to the Seekonk River (Design Point 1).

Subwatershed 1C: Consists of 307 sq. ft. area containing all surfaces outside of the building footprint, including a grassed area and a transformer pad. Accordingly, this Subwatershed area has been assigned a minimum T_C of 6.0 minutes and a CN of 73. Stormwater runoff from this Subwatershed area sheet flows to Gano Park and ultimately the Seekonk River (Design Point 1).

4.2.3 Results

A runoff analysis of the pre- and post-construction conditions was completed using the TR-20 methodology and is summarized in Table 1 below. Supporting calculations for the pre- and post-construction conditions are included in Appendices D and F respectively.

Table 1: Watershed Data

	Area (SF)	CN	Tc (min.)
Existing Conditions			
Watershed 1	22,500	96	6.0
Existing Total	22,500	96	--
Proposed Conditions			
Subwatershed 1A	12,407	98	6.0
Subwatershed 1B	9,786	85	6.0
Subwatershed 1C	307	73	6.0
Proposed Total	22,500	92	--
Delta (Δ)	0	-4	--

Note: Minimum Tc = 6 minutes.

As shown in Table 1 above, the overall watershed area remains unchanged when comparing existing to proposed conditions. However, due to the implementation of the green roof water quality system within the proposed site, the CN value has decreased.

Table 2: Stormwater Runoff Discharge

	Peak Discharge (cfs) to Design Point				
	1-Year	2-Year	10-Year	25-Year	100-Year
Existing DP #1	1.26	1.57	2.38	2.98	4.28
Proposed DP #1	0.73	0.90	1.35	1.68	4.08
ΔQ	-0.53	-0.67	-1.03	-1.30	-0.20

As shown in Table 2, the peak stormwater runoff rates realized at Design Point 1 (Seekonk River) have been reduced for all design storm events.

Table 3: Stormwater Total Runoff Volume

	Total Runoff Volume (cf) to Design Point				
	1-yr	2-yr	10-yr	25-yr	100-yr
Existing DP #1	4,232	5,340	8,312	10,551	15,411
Proposed DP #1	2,571	3,198	6,030	8,191	12,993
ΔV	-1,661	-2,142	-2,282	-2,360	-2,418

As shown in Tables 2 and 3, the peak stormwater runoff rates and total volume of stormwater being conveyed through Design Point 1 have been reduced for all design storm events via the

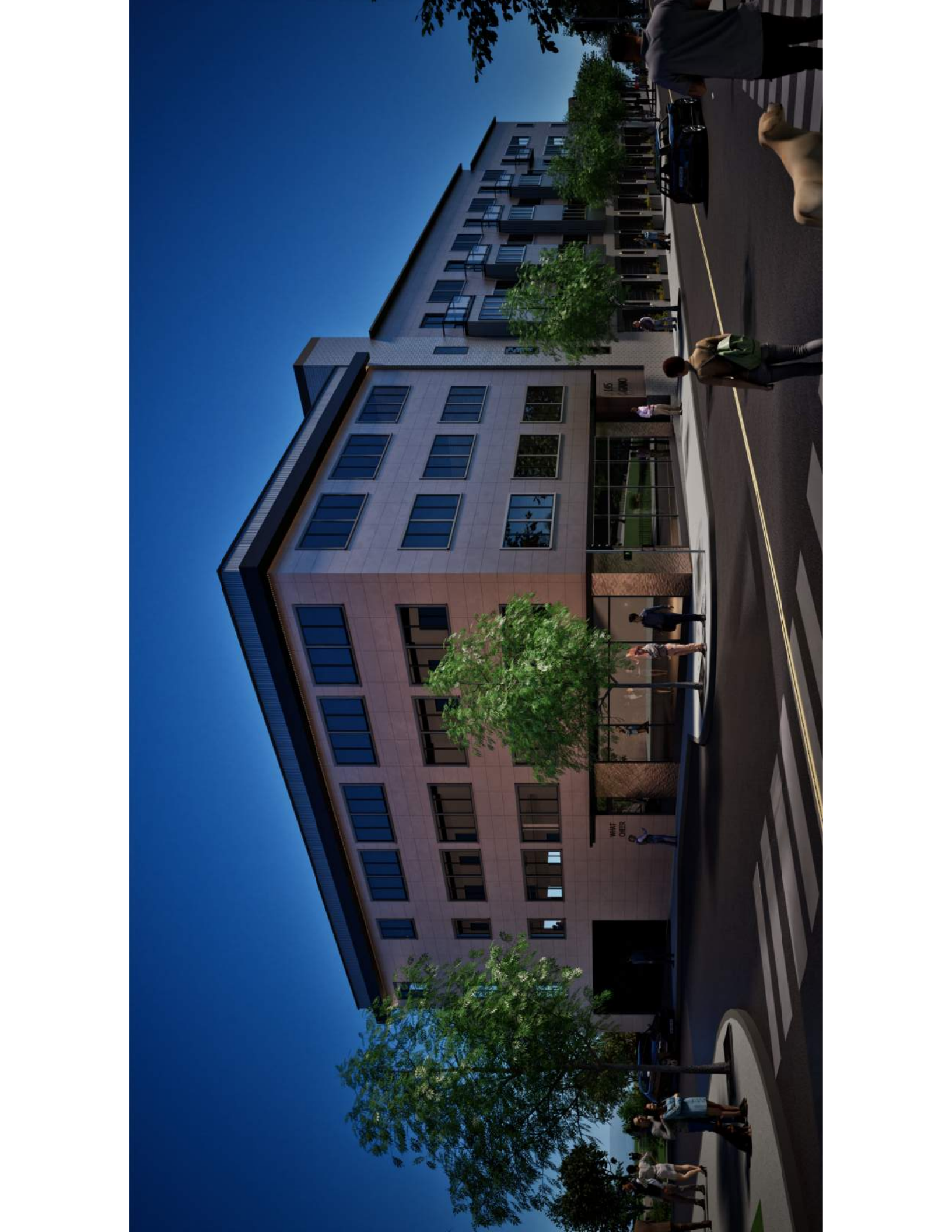
implementation of the LiveRoof Modules. This will reduce the overall impact on the Gano Park and ultimately improve the quality of stormwater runoff being routed to the Seekonk River.

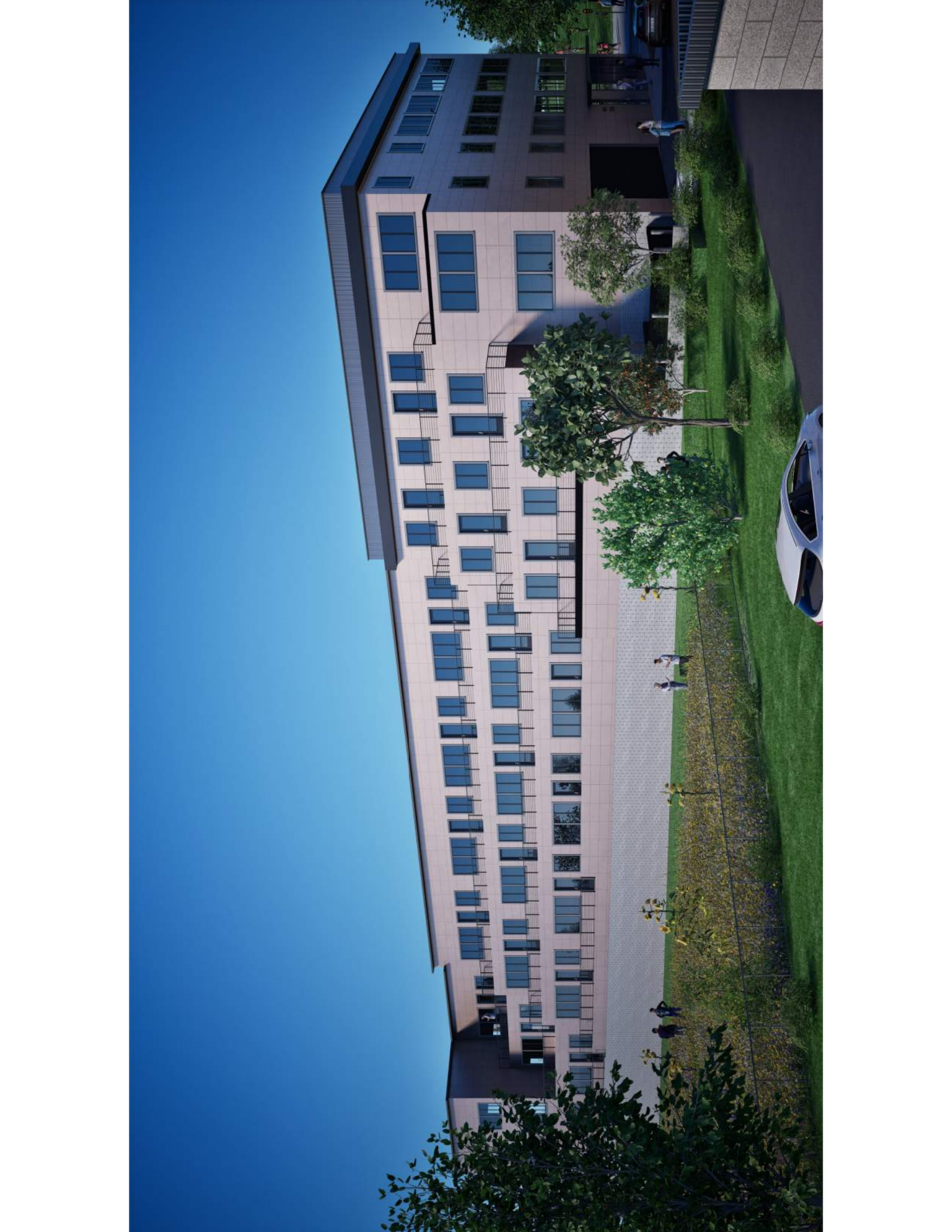
5 CONCLUSIONS

As shown above, the proposed improvements have been designed to minimize impacts of the proposed site development by attenuating peak stormwater runoff rates and volumes for the 1-, 2-, 10-, 25-, and 100-year design storm events. The stormwater management system design results in decreases in peak stormwater flows and total runoff volumes to Gano Park and ultimately the Seekonk River. The proposed site's stormwater BMP (LiveRoof Modules) has been designed to provide the required water quality in accordance with the City's Post-Construction Stormwater Management Ordinance. The result is a significant improvement in the quality of stormwater leaving the site and a reduction in stormwater runoff rates and volumes to Gano Park and the Seekonk River.

Appendix A

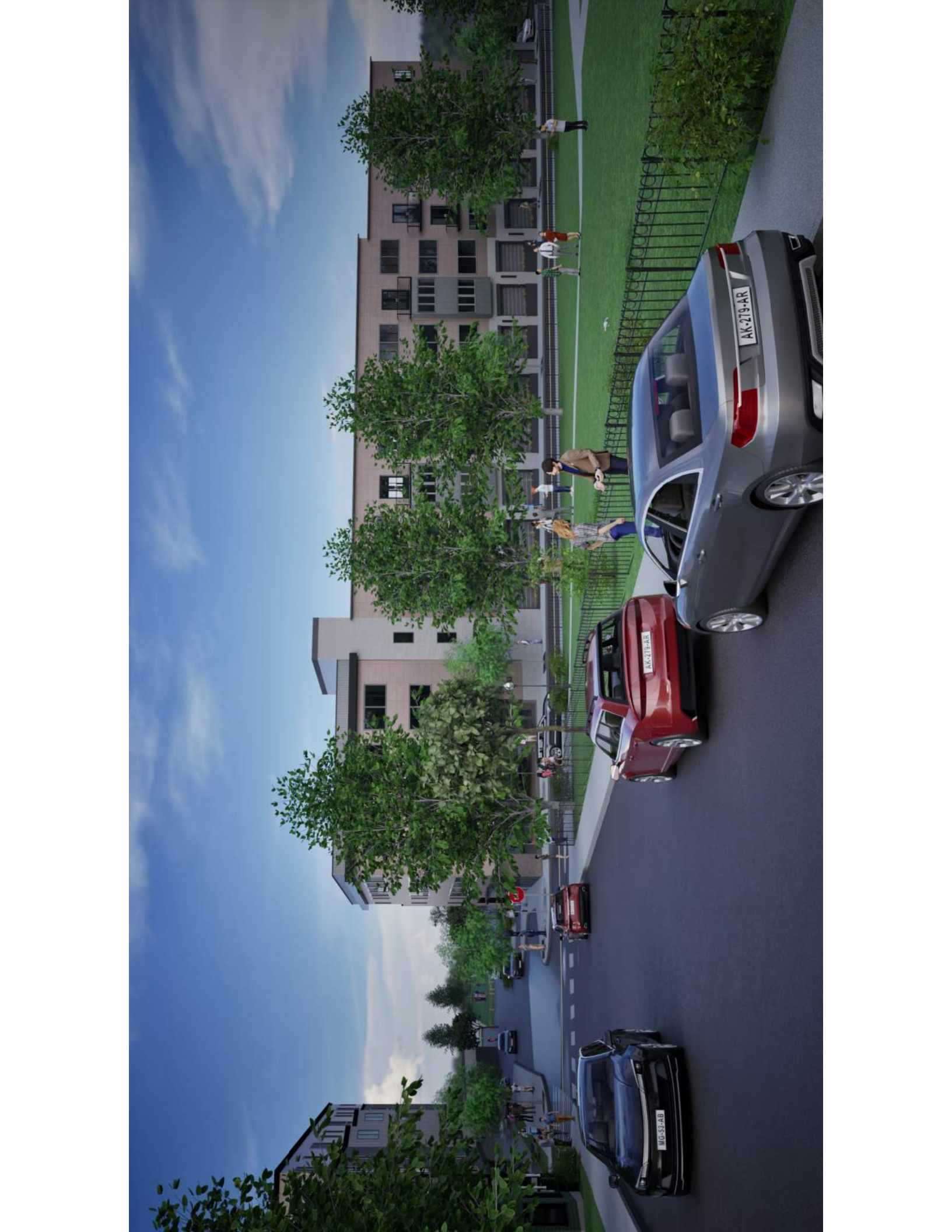
Colored Renderings prepared by WRA Designs, Inc.

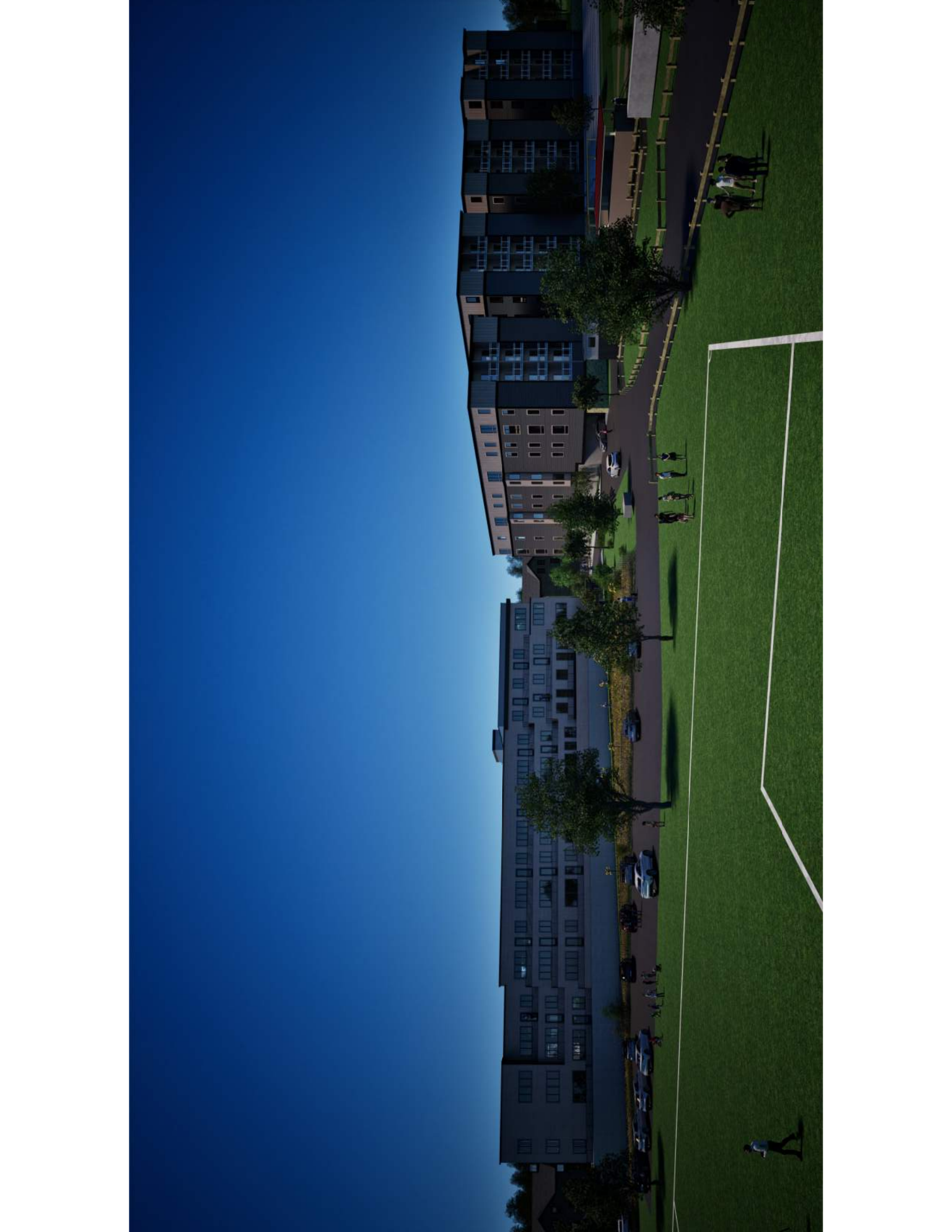


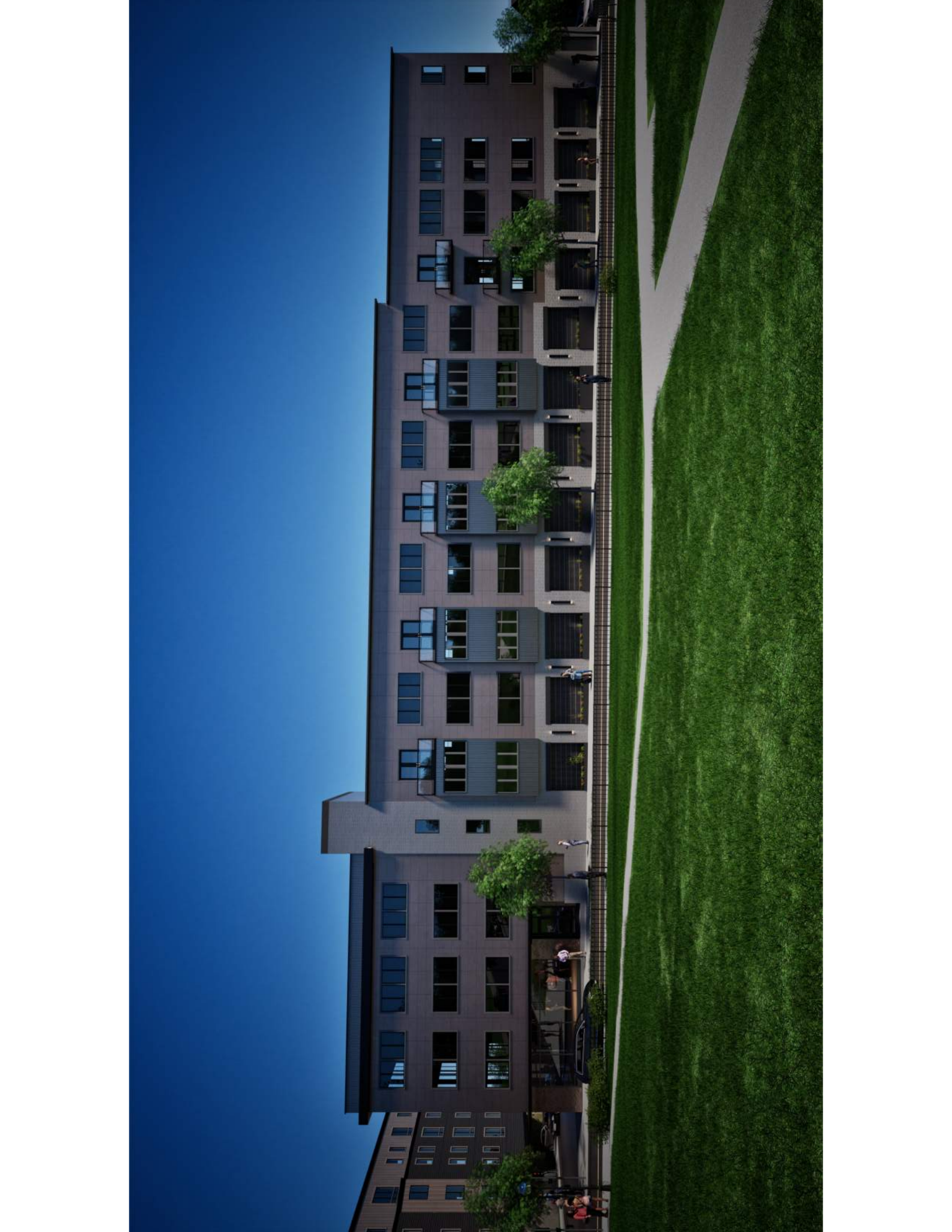




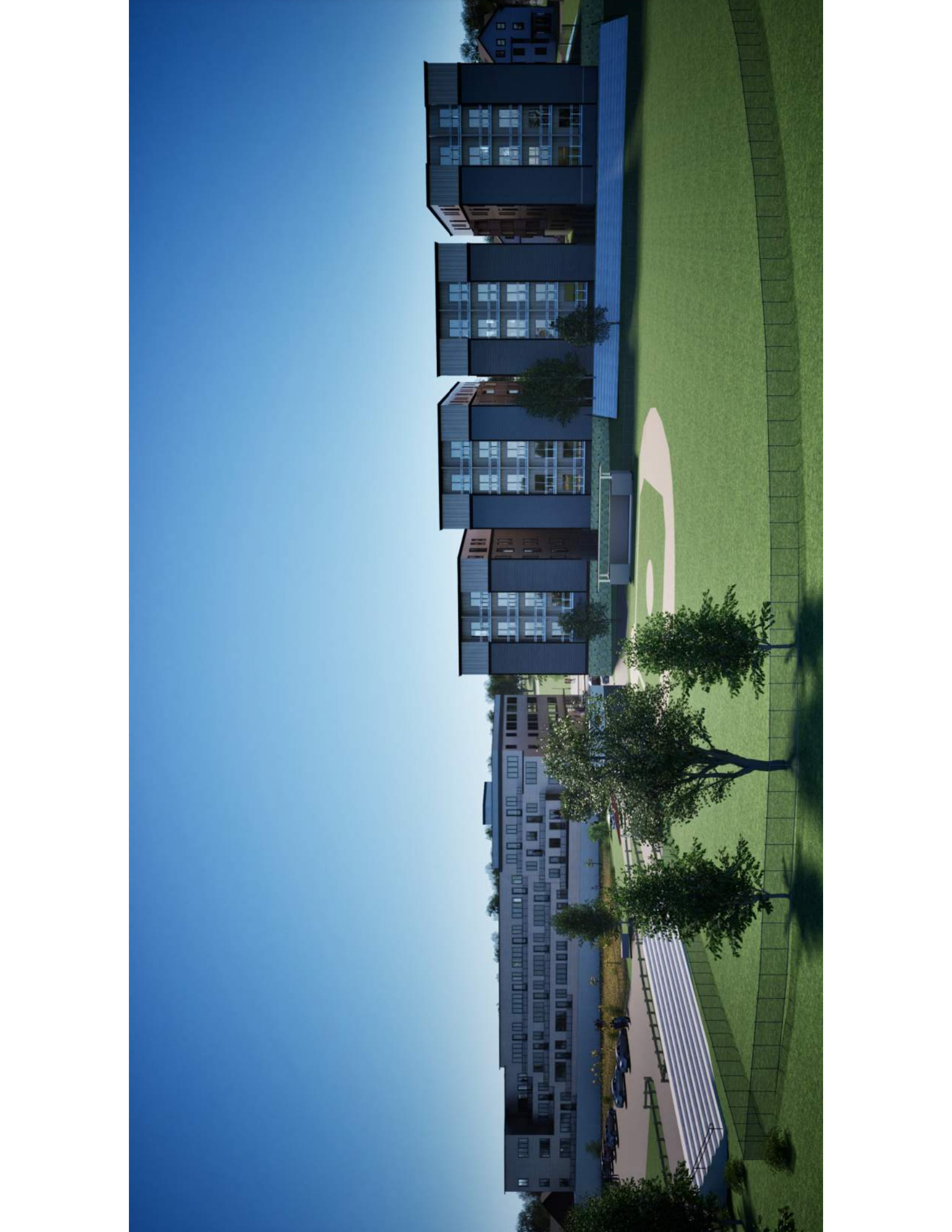










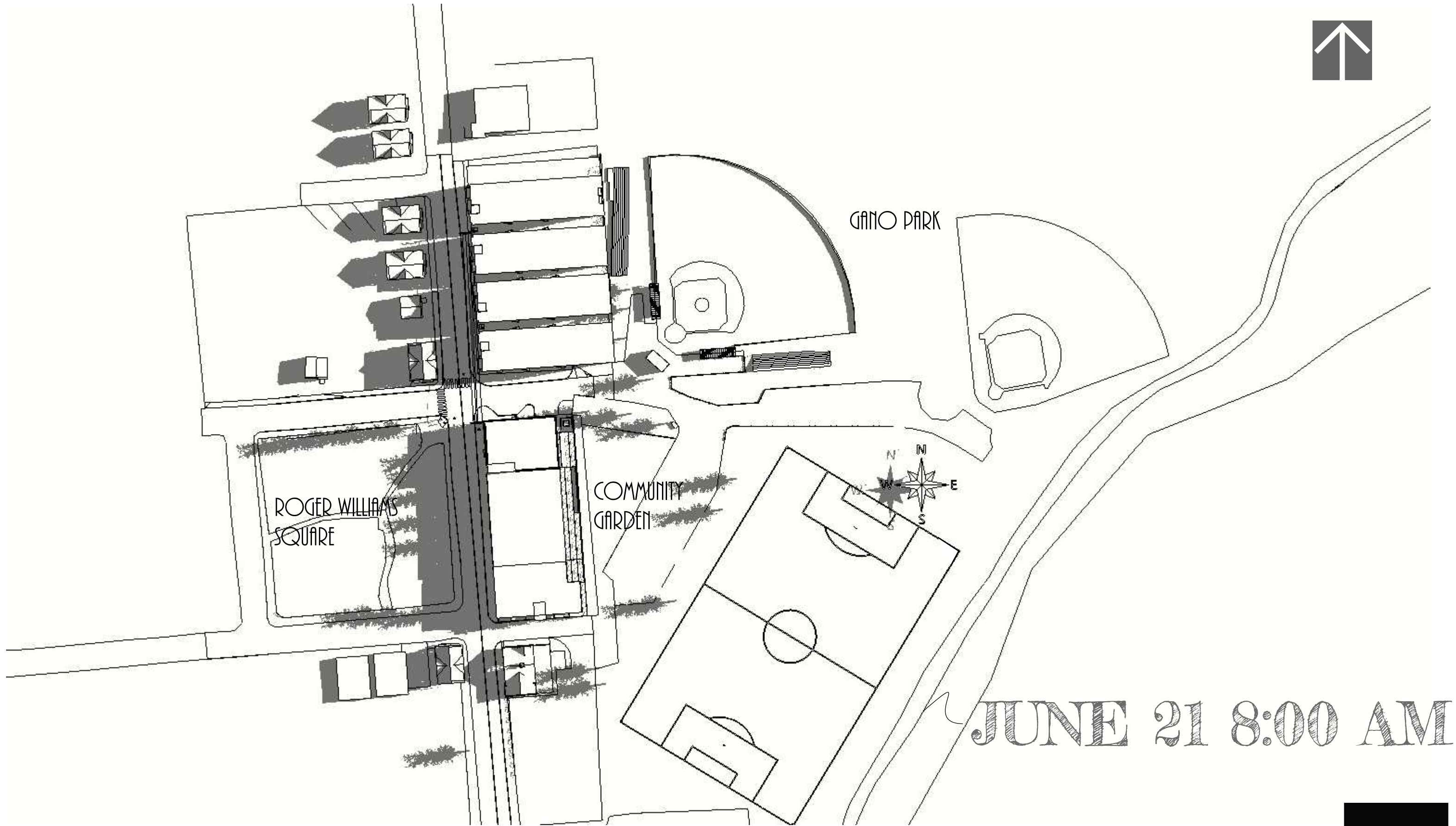






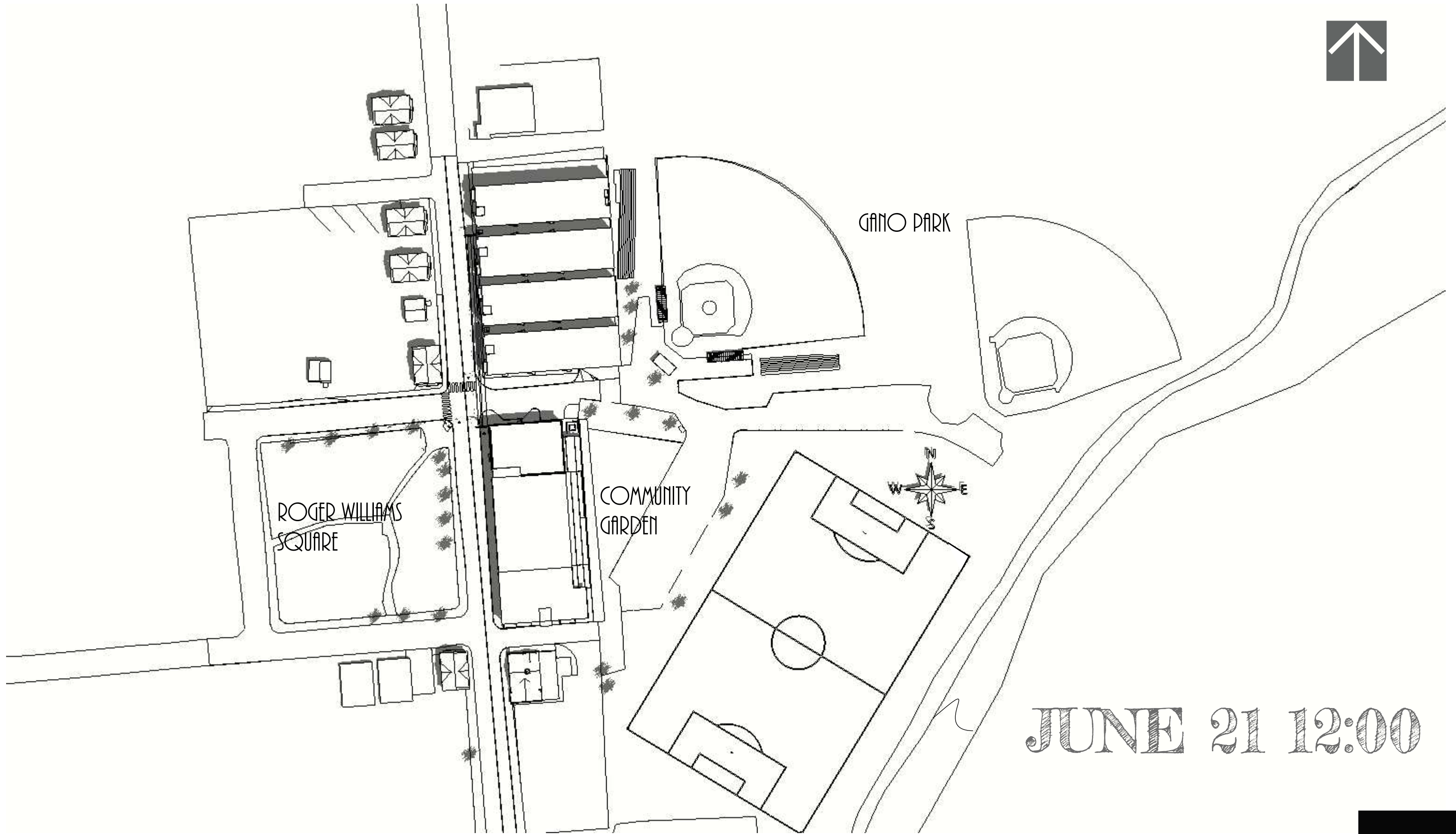
Appendix B

Shade Study prepared by WRA Designs, Inc.



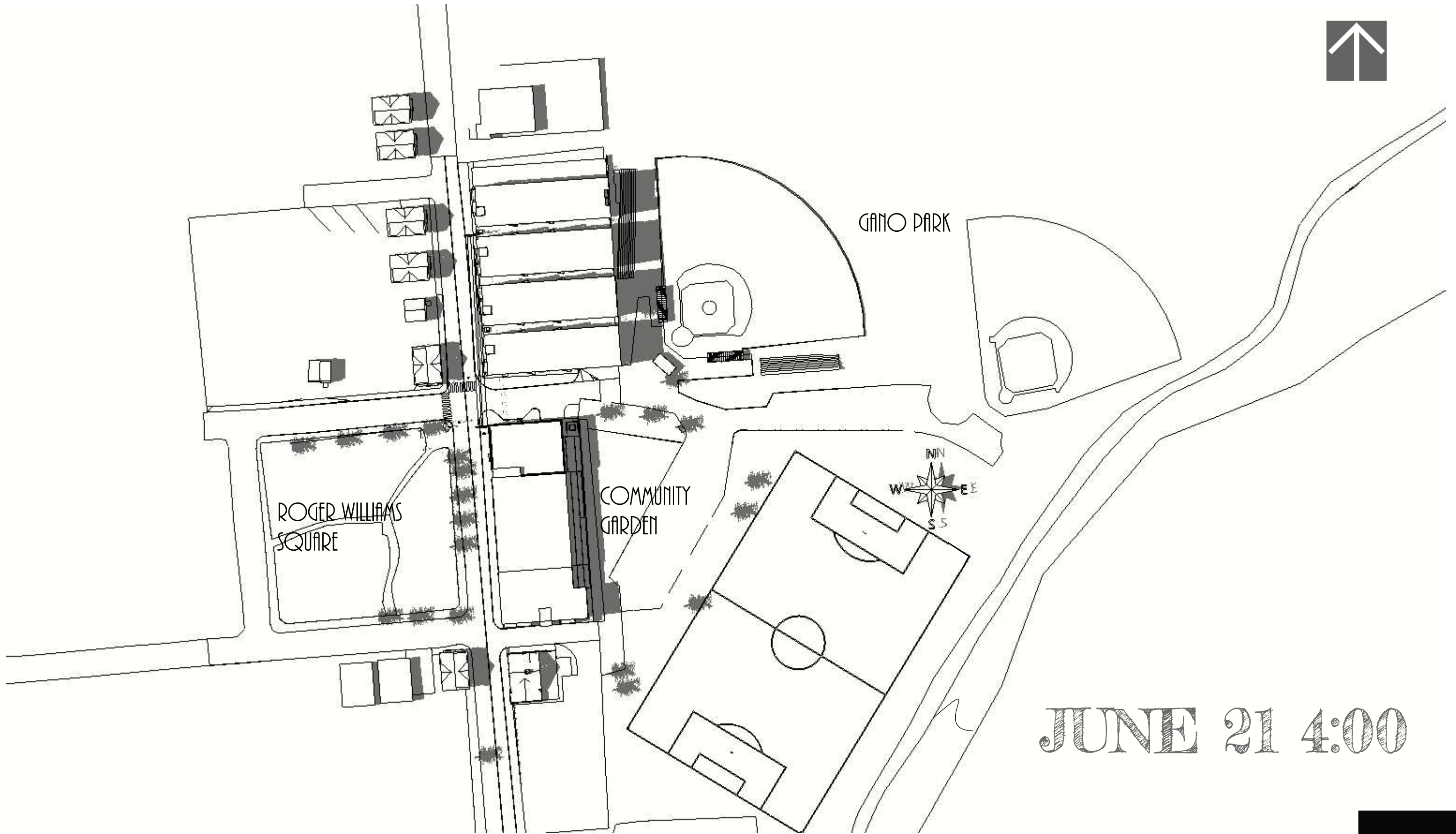
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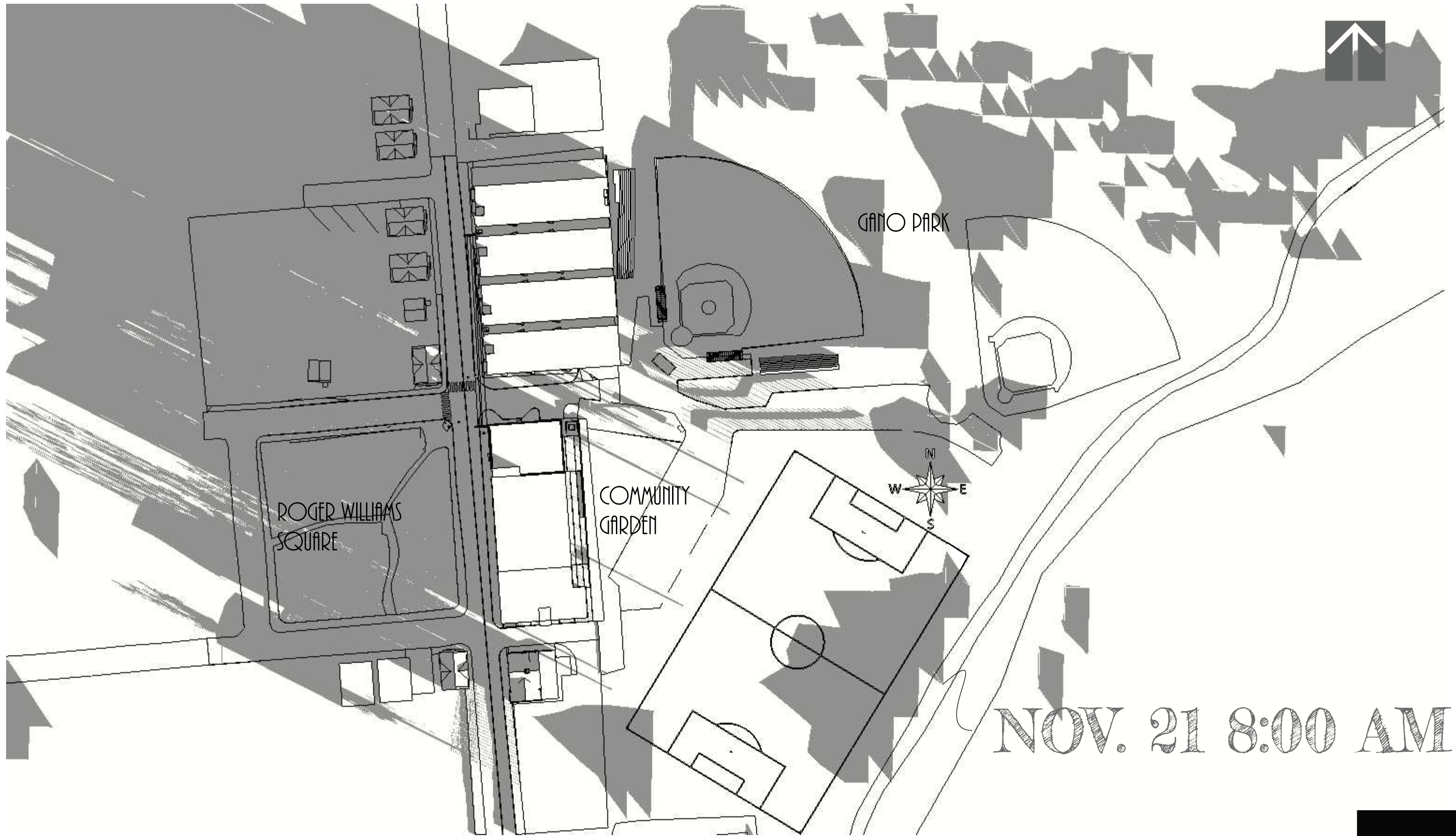
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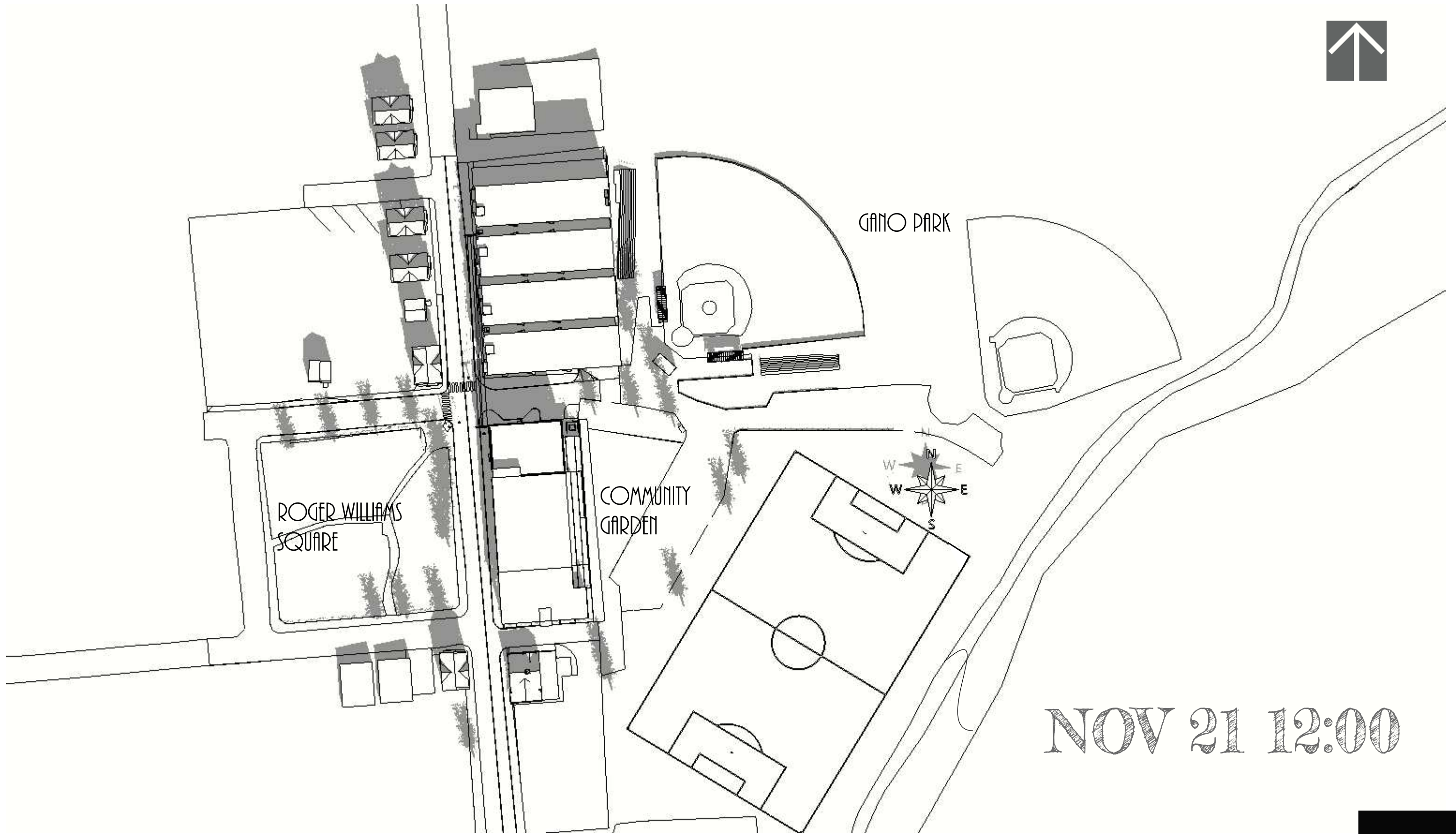
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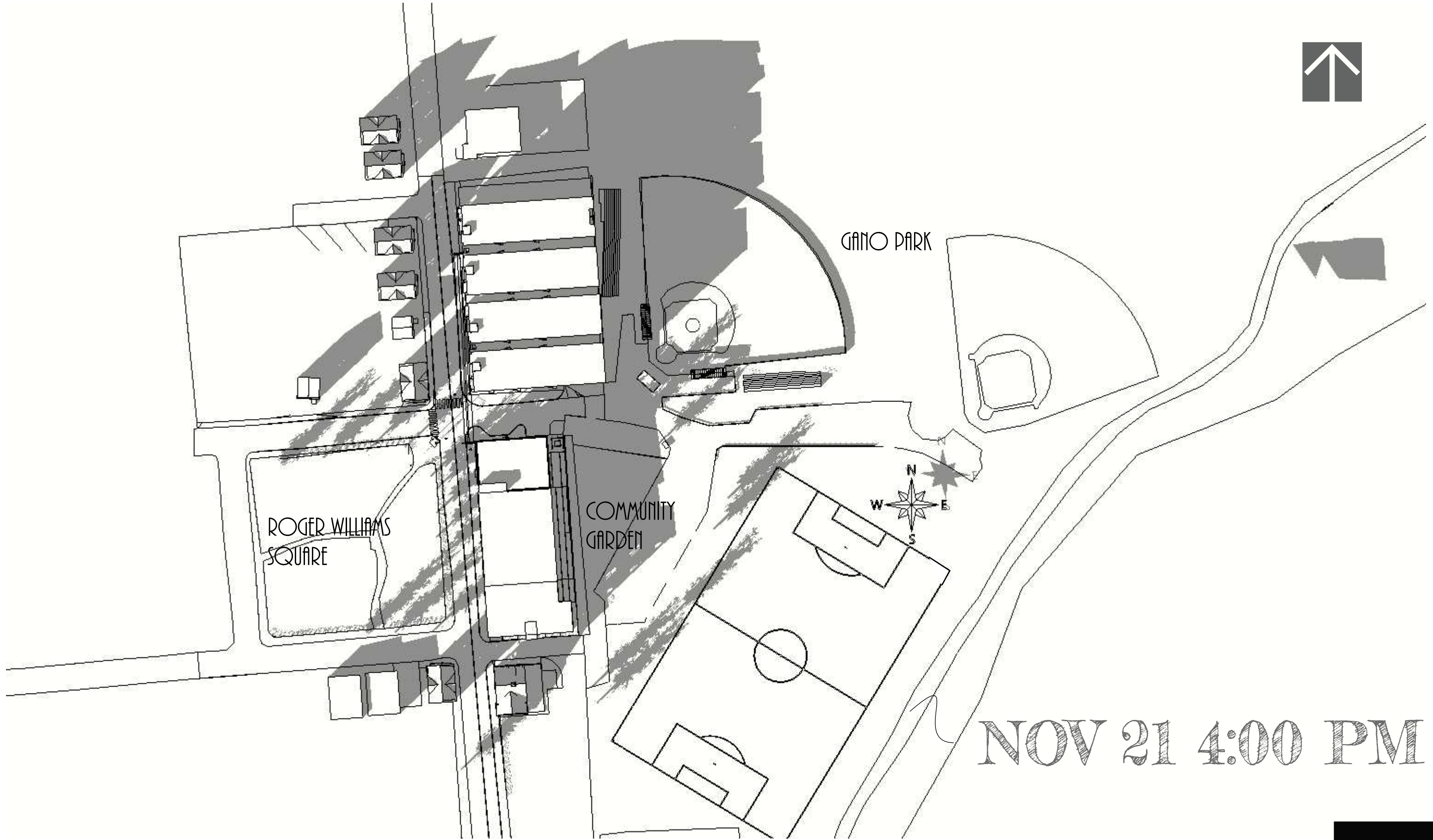
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NOV 21 12:00





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Appendix C

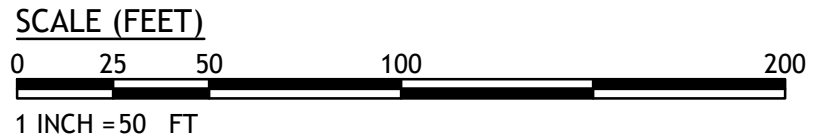
Existing Condition Watershed Map

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LEGEND

- WATERSHED BOUNDARY LINE
- TIME OF CONCENTRATION LINE
- UNDERGROUND TIME OF CONCENTRATION LINE



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54-UNIT RESIDENTIAL DEVELOPMENT
 135, 141 & 149 GANO STREET
 PROVIDENCE, RHODE ISLAND
 AP 14, LOTS 324, 325, 357 & 574

REVISIONS:

NO.	DATE	DESCRIPTION

DESIGNED BY: SD
 DRAWN BY: SD
 CHECKED BY: JAC
 DATE: MAY 2024
 PROJECT NO: 22-68

STORMWATER REPORT

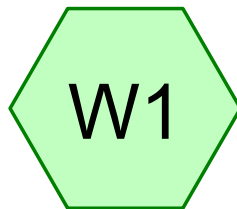
EXISTING CONDITIONS WATERSHED MAP

SHEET 1 OF 1

DP1

Appendix D

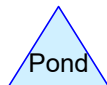
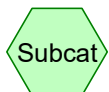
Existing Condition HydroCAD Calculations



Watershed 1



Lower Gradient -
Seekonk River



Gano Street Apartments - Existing

Prepared by Joe Casali Engineering, Inc

HydroCAD® 10.20-4a s/n 02468 © 2023 HydroCAD Software Solutions LLC

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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
820	39	>75% Grass cover, Good, HSG A (W1)
21,680	98	Roofs & Parking Lot, HSG A (W1)
22,500	96	TOTAL AREA

Gano Street Apartments - Existing

Type III 24-hr 1-Year Rainfall=2.70"

Prepared by Joe Casali Engineering, Inc

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Page 3

Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentW1: Watershed 1

Runoff Area=22,500 sf 96.36% Impervious Runoff Depth=2.26"
Flow Length=222' Tc=6.0 min CN=96 Runoff=1.26 cfs 4,232 cf

Link DP-1: Lower Gradient - Seekonk River

Inflow=1.26 cfs 4,232 cf
Primary=1.26 cfs 4,232 cf

Total Runoff Area = 22,500 sf Runoff Volume = 4,232 cf Average Runoff Depth = 2.26"
3.64% Pervious = 820 sf 96.36% Impervious = 21,680 sf

Gano Street Apartments - Existing

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Subcatchment W1: Watershed 1

Runoff = 1.26 cfs @ 12.09 hrs, Volume= 4,232 cf, Depth= 2.26"
 Routed to Link DP-1 : Lower Gradient - Seekonk River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
 Type III 24-hr 1-Year Rainfall=2.70"

	Area (sf)	CN	Description
*	21,680	98	Roofs & Parking Lot, HSG A
	820	39	>75% Grass cover, Good, HSG A
	22,500	96	Weighted Average
	820	39	3.64% Pervious Area
	21,680	98	96.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0350	1.75		Sheet Flow, SEG A Smooth surfaces n= 0.011 P2= 3.30"
0.6	122	0.0300	3.52		Shallow Concentrated Flow, SEG B Paved Kv= 20.3 fps
1.6	222	Total, Increased to minimum Tc = 6.0 min			

Gano Street Apartments - Existing

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Link DP-1: Lower Gradient - Seekonk River

Inflow Area = 22,500 sf, 96.36% Impervious, Inflow Depth = 2.26" for 1-Year event
Inflow = 1.26 cfs @ 12.09 hrs, Volume= 4,232 cf
Primary = 1.26 cfs @ 12.09 hrs, Volume= 4,232 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Gano Street Apartments - Existing

Type III 24-hr 10-Year Rainfall=4.90"

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Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentW1: Watershed 1

Runoff Area=22,500 sf 96.36% Impervious Runoff Depth=4.43"
Flow Length=222' Tc=6.0 min CN=96 Runoff=2.38 cfs 8,312 cf

Link DP-1: Lower Gradient - Seekonk River

Inflow=2.38 cfs 8,312 cf
Primary=2.38 cfs 8,312 cf

Total Runoff Area = 22,500 sf Runoff Volume = 8,312 cf Average Runoff Depth = 4.43"
3.64% Pervious = 820 sf 96.36% Impervious = 21,680 sf

Gano Street Apartments - Existing

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Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Subcatchment W1: Watershed 1

Runoff = 2.38 cfs @ 12.09 hrs, Volume= 8,312 cf, Depth= 4.43"

Routed to Link DP-1 : Lower Gradient - Seekonk River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.90"

	Area (sf)	CN	Description
*	21,680	98	Roofs & Parking Lot, HSG A
	820	39	>75% Grass cover, Good, HSG A
	22,500	96	Weighted Average
	820	39	3.64% Pervious Area
	21,680	98	96.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0350	1.75		Sheet Flow, SEG A Smooth surfaces n= 0.011 P2= 3.30"
0.6	122	0.0300	3.52		Shallow Concentrated Flow, SEG B Paved Kv= 20.3 fps
1.6	222	Total, Increased to minimum Tc = 6.0 min			

Gano Street Apartments - Existing

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Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Link DP-1: Lower Gradient - Seekonk River

Inflow Area = 22,500 sf, 96.36% Impervious, Inflow Depth = 4.43" for 10-Year event
Inflow = 2.38 cfs @ 12.09 hrs, Volume= 8,312 cf
Primary = 2.38 cfs @ 12.09 hrs, Volume= 8,312 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Gano Street Apartments - Existing

Type III 24-hr 25-Year Rainfall=6.10"

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Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentW1: Watershed 1

Runoff Area=22,500 sf 96.36% Impervious Runoff Depth=5.63"
Flow Length=222' Tc=6.0 min CN=96 Runoff=2.98 cfs 10,551 cf

Link DP-1: Lower Gradient - Seekonk River

Inflow=2.98 cfs 10,551 cf
Primary=2.98 cfs 10,551 cf

Total Runoff Area = 22,500 sf Runoff Volume = 10,551 cf Average Runoff Depth = 5.63"
3.64% Pervious = 820 sf 96.36% Impervious = 21,680 sf

Gano Street Apartments - Existing

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Type III 24-hr 25-Year Rainfall=6.10"

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Summary for Subcatchment W1: Watershed 1

Runoff = 2.98 cfs @ 12.09 hrs, Volume= 10,551 cf, Depth= 5.63"

Routed to Link DP-1 : Lower Gradient - Seekonk River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.10"

	Area (sf)	CN	Description
*	21,680	98	Roofs & Parking Lot, HSG A
	820	39	>75% Grass cover, Good, HSG A
	22,500	96	Weighted Average
	820	39	3.64% Pervious Area
	21,680	98	96.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0350	1.75		Sheet Flow, SEG A Smooth surfaces n= 0.011 P2= 3.30"
0.6	122	0.0300	3.52		Shallow Concentrated Flow, SEG B Paved Kv= 20.3 fps
1.6	222	Total, Increased to minimum Tc = 6.0 min			

Gano Street Apartments - Existing

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Type III 24-hr 25-Year Rainfall=6.10"

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Summary for Link DP-1: Lower Gradient - Seekonk River

Inflow Area = 22,500 sf, 96.36% Impervious, Inflow Depth = 5.63" for 25-Year event
Inflow = 2.98 cfs @ 12.09 hrs, Volume= 10,551 cf
Primary = 2.98 cfs @ 12.09 hrs, Volume= 10,551 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Gano Street Apartments - Existing

Type III 24-hr 100-Year Rainfall=8.70"

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Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentW1: Watershed 1

Runoff Area=22,500 sf 96.36% Impervious Runoff Depth=8.22"
Flow Length=222' Tc=6.0 min CN=96 Runoff=4.28 cfs 15,411 cf

Link DP-1: Lower Gradient - Seekonk River

Inflow=4.28 cfs 15,411 cf
Primary=4.28 cfs 15,411 cf

Total Runoff Area = 22,500 sf Runoff Volume = 15,411 cf Average Runoff Depth = 8.22"
3.64% Pervious = 820 sf 96.36% Impervious = 21,680 sf

Gano Street Apartments - Existing

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Subcatchment W1: Watershed 1

Runoff = 4.28 cfs @ 12.09 hrs, Volume= 15,411 cf, Depth= 8.22"

Routed to Link DP-1 : Lower Gradient - Seekonk River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.70"

	Area (sf)	CN	Description
*	21,680	98	Roofs & Parking Lot, HSG A
	820	39	>75% Grass cover, Good, HSG A
	22,500	96	Weighted Average
	820	39	3.64% Pervious Area
	21,680	98	96.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0350	1.75		Sheet Flow, SEG A Smooth surfaces n= 0.011 P2= 3.30"
0.6	122	0.0300	3.52		Shallow Concentrated Flow, SEG B Paved Kv= 20.3 fps
1.6	222	Total, Increased to minimum Tc = 6.0 min			

Gano Street Apartments - Existing

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Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Link DP-1: Lower Gradient - Seekonk River

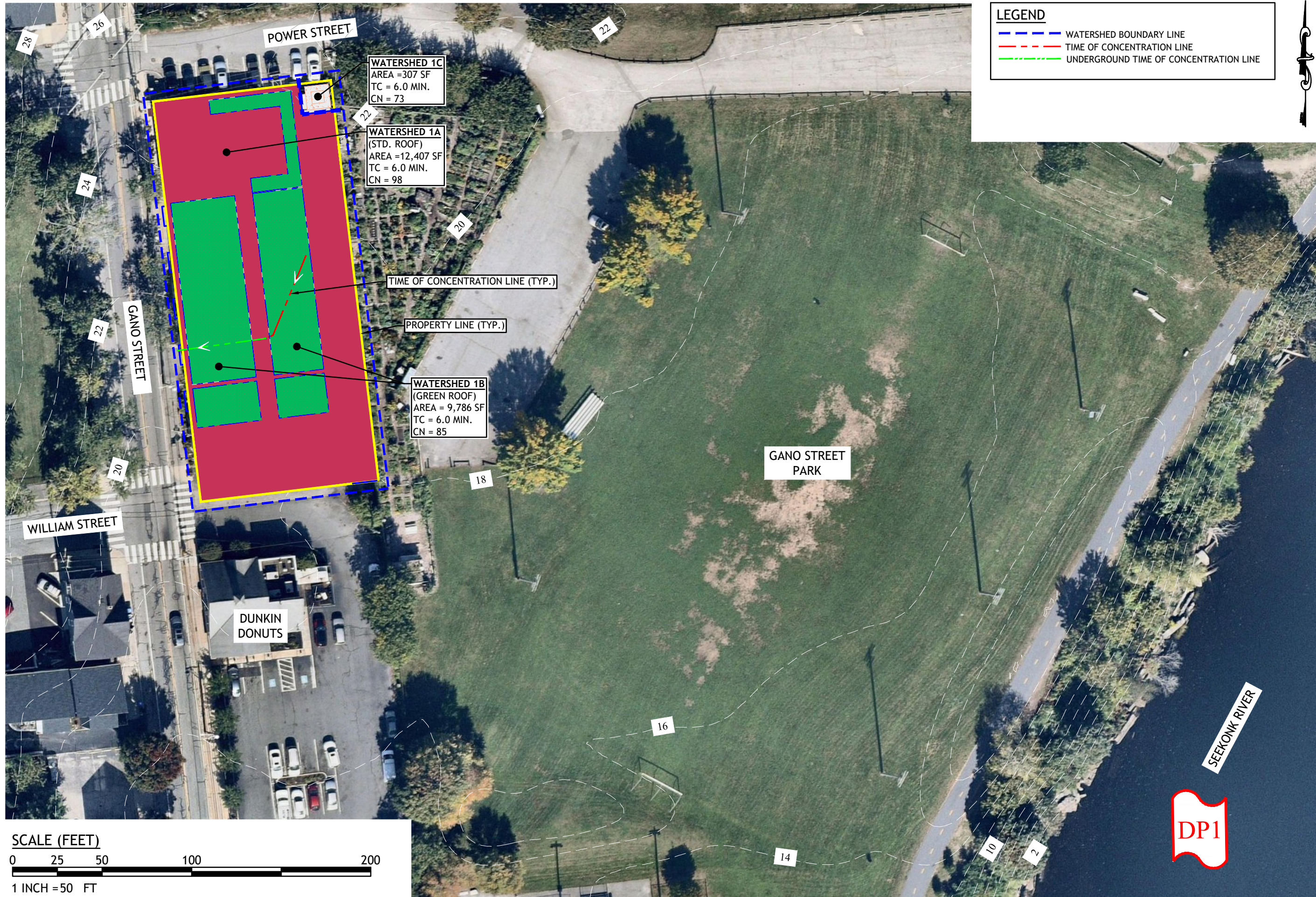
Inflow Area = 22,500 sf, 96.36% Impervious, Inflow Depth = 8.22" for 100-Year event
Inflow = 4.28 cfs @ 12.09 hrs, Volume= 15,411 cf
Primary = 4.28 cfs @ 12.09 hrs, Volume= 15,411 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Appendix E

Proposed Condition Watershed Map

Q:\22-68 Lundgren Equity Partners\Drainage\Watershed Map\Gano Street Apartments Watershed Maps.dwg May, 28, 2024 3:04pm



LEGEND

- WATERSHED BOUNDARY LINE
- TIME OF CONCENTRATION LINE
- UNDERGROUND TIME OF CONCENTRATION LINE

WATERSHED 1C
 AREA = 307 SF
 TC = 6.0 MIN.
 CN = 73

WATERSHED 1A
 (STD. ROOF)
 AREA = 12,407 SF
 TC = 6.0 MIN.
 CN = 98

WATERSHED 1B
 (GREEN ROOF)
 AREA = 9,786 SF
 TC = 6.0 MIN.
 CN = 85

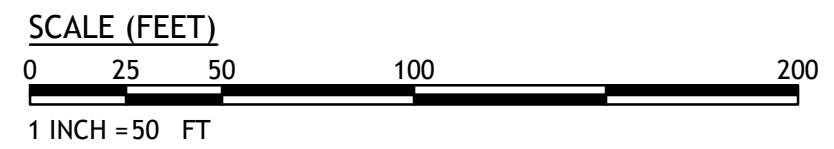
TIME OF CONCENTRATION LINE (TYP.)

PROPERTY LINE (TYP.)

GANO STREET PARK

SEEKONK RIVER

DP1



JCE
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54-UNIT RESIDENTIAL DEVELOPMENT
 135, 141 & 149 GANO STREET
 PROVIDENCE, RHODE ISLAND
 AP 14, LOTS 324, 325, 357 & 574

REVISIONS:

NO.	DATE	DESCRIPTION

DESIGNED BY: SD
 DRAWN BY: SD
 CHECKED BY: JAC
 DATE: MAY 2024
 PROJECT NO: 22-68

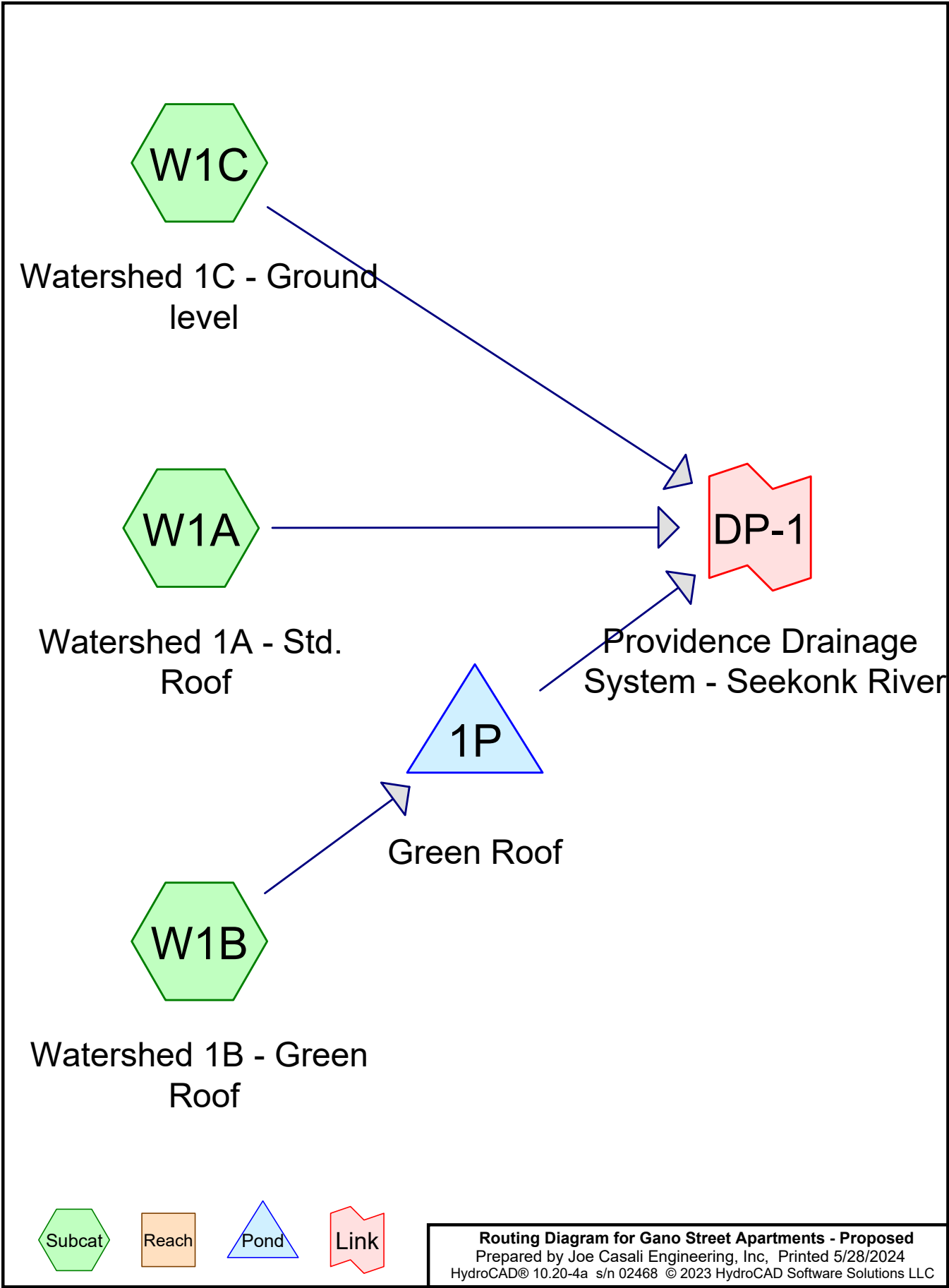
STORMWATER REPORT

PROPOSED CONDITIONS WATERSHED MAP

SHEET 1 OF 1

Appendix F

Proposed Condition HydroCAD Calculations



Routing Diagram for Gano Street Apartments - Proposed
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Gano Street Apartments - Proposed

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
132	39	>75% Grass cover, Good, HSG A (W1C)
175	98	Concrete Pad, HSG A (W1C)
9,786	85	Green Roofs (W1B)
12,407	98	Roofs, HSG A (W1A)

Gano Street Apartments - Proposed

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Subcatchment W1A: Watershed 1A - Std. Roof

Runoff = 0.73 cfs @ 12.09 hrs, Volume= 2,553 cf, Depth= 2.47"

Routed to Link DP-1 : Providence Drainage System - Seekonk River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
12,407	98	Roofs, HSG A
12,407	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Gano Street Apartments - Proposed

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Subcatchment W1B: Watershed 1B - Green Roof

Runoff = 0.35 cfs @ 12.09 hrs, Volume= 1,093 cf, Depth= 1.34"

Routed to Pond 1P : Green Roof

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
* 9,786	85	Green Roofs
9,786	85	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, SEG A
					Grass: Short n= 0.150 P2= 3.30"
5.5	50	Total, Increased to minimum Tc = 6.0 min			

Gano Street Apartments - Proposed

Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Subcatchment W1C: Watershed 1C - Ground level

Runoff = 0.00 cfs @ 12.10 hrs, Volume= 17 cf, Depth= 0.68"

Routed to Link DP-1 : Providence Drainage System - Seekonk River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
132	39	>75% Grass cover, Good, HSG A
* 175	98	Concrete Pad, HSG A
307	73	Weighted Average
132	39	43.00% Pervious Area
175	98	57.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Gano Street Apartments - Proposed

Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Pond 1P: Green Roof

Inflow Area = 9,786 sf, 0.00% Impervious, Inflow Depth = 1.34" for 1-Year event
 Inflow = 0.35 cfs @ 12.09 hrs, Volume= 1,093 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link DP-1 : Providence Drainage System - Seekonk River

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 141.34' @ 24.40 hrs Surf.Area= 9,786 sf Storage= 1,093 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	141.00'	1,615 cf	Green Roof (Prismatic) Listed below (Recalc) 4,893 cf Overall x 33.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
141.00	9,786	0	0
141.50	9,786	4,893	4,893

Device	Routing	Invert	Outlet Devices
#1	Primary	141.47'	124.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=141.00' (Free Discharge)
 ↑1=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

Gano Street Apartments - Proposed

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Link DP-1: Providence Drainage System - Seekonk River

Inflow Area = 22,500 sf, 55.92% Impervious, Inflow Depth = 1.37" for 1-Year event
Inflow = 0.73 cfs @ 12.09 hrs, Volume= 2,571 cf
Primary = 0.73 cfs @ 12.09 hrs, Volume= 2,571 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Gano Street Apartments - Proposed

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Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Subcatchment W1A: Watershed 1A - Std. Roof

Runoff = 1.33 cfs @ 12.09 hrs, Volume= 4,821 cf, Depth= 4.66"

Routed to Link DP-1 : Providence Drainage System - Seekonk River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
12,407	98	Roofs, HSG A
12,407	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment W1B: Watershed 1B - Green Roof

Runoff = 0.84 cfs @ 12.09 hrs, Volume= 2,671 cf, Depth= 3.28"

Routed to Pond 1P : Green Roof

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
* 9,786	85	Green Roofs
9,786	85	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, SEG A
					Grass: Short n= 0.150 P2= 3.30"
5.5	50	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment W1C: Watershed 1C - Ground level

Runoff = 0.02 cfs @ 12.10 hrs, Volume= 56 cf, Depth= 2.20"

Routed to Link DP-1 : Providence Drainage System - Seekonk River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
132	39	>75% Grass cover, Good, HSG A
* 175	98	Concrete Pad, HSG A
307	73	Weighted Average
132	39	43.00% Pervious Area
175	98	57.00% Impervious Area

Gano Street Apartments - Proposed

Type III 24-hr 10-Year Rainfall=4.90"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Pond 1P: Green Roof

Inflow Area = 9,786 sf, 0.00% Impervious, Inflow Depth = 3.28" for 10-Year event
 Inflow = 0.84 cfs @ 12.09 hrs, Volume= 2,671 cf
 Outflow = 0.16 cfs @ 12.55 hrs, Volume= 1,153 cf, Atten= 80%, Lag= 27.3 min
 Primary = 0.16 cfs @ 12.55 hrs, Volume= 1,153 cf
 Routed to Link DP-1 : Providence Drainage System - Seekonk River

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 141.48' @ 12.54 hrs Surf.Area= 9,786 sf Storage= 1,535 cf

Plug-Flow detention time= 261.9 min calculated for 1,153 cf (43% of inflow)
 Center-of-Mass det. time= 143.2 min (951.5 - 808.3)

Volume	Invert	Avail.Storage	Storage Description
#1	141.00'	1,615 cf	Green Roof (Prismatic) Listed below (Recalc) 4,893 cf Overall x 33.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
141.00	9,786	0	0
141.50	9,786	4,893	4,893

Device	Routing	Invert	Outlet Devices
#1	Primary	141.47'	124.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=0.16 cfs @ 12.55 hrs HW=141.48' (Free Discharge)
 ↳1=Sharp-Crested Rectangular Weir(Weir Controls 0.16 cfs @ 0.24 fps)

Summary for Link DP-1: Providence Drainage System - Seekonk River

Inflow Area = 22,500 sf, 55.92% Impervious, Inflow Depth = 3.22" for 10-Year event
 Inflow = 1.35 cfs @ 12.09 hrs, Volume= 6,030 cf
 Primary = 1.35 cfs @ 12.09 hrs, Volume= 6,030 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Gano Street Apartments - Proposed

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Subcatchment W1A: Watershed 1A - Std. Roof

Runoff = 2.38 cfs @ 12.09 hrs, Volume= 8,747 cf, Depth= 8.46"

Routed to Link DP-1 : Providence Drainage System - Seekonk River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
12,407	98	Roofs, HSG A
12,407	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment W1B: Watershed 1B - Green Roof

Runoff = 1.70 cfs @ 12.09 hrs, Volume= 5,619 cf, Depth= 6.89"

Routed to Pond 1P : Green Roof

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
* 9,786	85	Green Roofs
9,786	85	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, SEG A Grass: Short n= 0.150 P2= 3.30"
5.5	50	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment W1C: Watershed 1C - Ground level

Runoff = 0.04 cfs @ 12.09 hrs, Volume= 139 cf, Depth= 5.43"

Routed to Link DP-1 : Providence Drainage System - Seekonk River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
132	39	>75% Grass cover, Good, HSG A
* 175	98	Concrete Pad, HSG A
307	73	Weighted Average
132	39	43.00% Pervious Area
175	98	57.00% Impervious Area

Gano Street Apartments - Proposed

Type III 24-hr 100-Year Rainfall=8.70"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Pond 1P: Green Roof

Inflow Area = 9,786 sf, 0.00% Impervious, Inflow Depth = 6.89" for 100-Year event
 Inflow = 1.70 cfs @ 12.09 hrs, Volume= 5,619 cf
 Outflow = 1.67 cfs @ 12.10 hrs, Volume= 4,107 cf, Atten= 2%, Lag= 0.5 min
 Primary = 1.67 cfs @ 12.10 hrs, Volume= 4,107 cf
 Routed to Link DP-1 : Providence Drainage System - Seekonk River

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 141.50' @ 12.10 hrs Surf.Area= 9,786 sf Storage= 1,601 cf

Plug-Flow detention time= 145.7 min calculated for 4,100 cf (73% of inflow)
 Center-of-Mass det. time= 59.3 min (847.0 - 787.7)

Volume	Invert	Avail.Storage	Storage Description
#1	141.00'	1,615 cf	Green Roof (Prismatic) Listed below (Recalc) 4,893 cf Overall x 33.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
141.00	9,786	0	0
141.50	9,786	4,893	4,893

Device	Routing	Invert	Outlet Devices
#1	Primary	141.47'	124.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=1.65 cfs @ 12.10 hrs HW=141.50' (Free Discharge)
 ↳1=Sharp-Crested Rectangular Weir(Weir Controls 1.65 cfs @ 0.52 fps)

Summary for Link DP-1: Providence Drainage System - Seekonk River

Inflow Area = 22,500 sf, 55.92% Impervious, Inflow Depth = 6.93" for 100-Year event
 Inflow = 4.08 cfs @ 12.09 hrs, Volume= 12,993 cf
 Primary = 4.08 cfs @ 12.09 hrs, Volume= 12,993 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs