Memorandum

To: John Daghlian
Associate City Engineer
City of Newton

Date: June 19, 2020
Revised March 1, 2021

Project #: 10865.03

From: Richard S. Hollworth, P.E.
VHB, Inc.

Re: Riverside Station Redevelopment
Water/Sewer/Stormwater Summary

The following memorandum has been prepared to summarize the water, wastewater and stormwater design approach and the Petitioner's commitment to best practices associated with the Riverside Station Redevelopment project (the "Project"). Quantitative analyses and calculations demonstrating compliance with MassDEP and local stormwater regulations have been provided in the Stormwater Management Report dated December 2019 and subsequent peer review response letters/supplemental documentation which will be refined as necessary concurrent with any applications for building permits.

1.1 Water Supply

This section discusses the proposed water supply services for the Project including a description of the Petitioner's commitment to water conservation. In all cases, the City's water distribution system is believed to have sufficient capacityv to meet the normal daily peak demands of the Project.

The City of Newton is served by the MWRA water supply system and water is distributed through the City of Newton municipal water system. The existing water distribution infrastructure near the Site includes two municipal lines, an 8-inch line, and a 12-inch line both located in Grove Street. A 48-inch MWRA transmission main also bisects the Site. Existing MBTA facilities are served from two connections to the municipal system: an 8-inch connection to the 12-inch main and a 6-inch connection to the 8-inch main. From record plans it does not appear that the existing water distribution system through the site is looped.

As applicable, the projected water demand was established based on prior precedent and standard water use rates based upon wastewater flows calculated in accordance with the DEP Wastewater Design Flow Guidelines at 314 CMR 7.15. DEP wastewater design flow volume which are considered to be dated and very conservative in relation to actual flow volumes. Therefore, water conservation factors were applied to acknowledge the appropriate reduction due to water conservation measures and/or more recently accepted standards.

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Based on feedback from the City of Newton, water service to the Project will be supplied via two separate connections to provide system redundancy. A new 12" water loop through the site along Main Street to serve as the main water distribution and fire protection feeds.

Sufficient Infrastructure

Indications from the City Engineer and reported updates from the City's water modeling using project-specific inputs into the City's model modeling conducted by their consultant supplemented by historic and recently completed hydrant flow tests demonstrate that there is sufficient water supply and infrastructure to serve the Project without adversely impacting the surrounding neighborhoods. At the time of the recent hydrant flow tests, specific hydrants along the project frontage were also identified for replacement which will be completed as part of the Project. The additional hydrant flow tests completed in the immediate project vicinity and the data obtained from the flow tests will be used to check and calibrate the predictive capabilities of the model.

MWRA Water Main Relocation

The 48-inch MWRA main running through the site, referenced by the MWRA as Section 80, is a welded steel pipe constructed in the late 1950s. This water main is located within a 30-foot wide easement that runs from Grove Street at the southern corner of the Site to the western edge of the site adjacent to the Charles River and Route 128/I-95. This main serves as a supplemental water supply to the Towns of Wellesley and Needham, which each have their own water supply wells but often need to draw water from the MWRA system during high demand periods normally associated with the summer irrigation season.

In order to construct the Project and maintain the integrity of the MWRA water main, a portion of the 48" MWRA water main will be rerouted. The Petitioner will work with MWRA to secure an MWRA 8M Permit necessary to complete construction.

Water Conservation

The Petitioner has taken an "integrated planning" approach to water conservation for the Project with a goal of minimizing the impact on the local water distribution system and the MWRA water supply system. Maximizing water efficiency within buildings will reduce the burden on the municipal water supply and wastewater systems. Due to significant differences in the design, construction and on-going operation of each of the various land uses, it is imperative to evaluate the appropriateness and effectiveness of the water conservation measures per land use. For example, each rental unit will be

equipped with sub-metering of utilities to promote conservation. Like homeowners, when renters know that their dry and wet utilities are individually metered it improves greatly upon their conservation efforts. Likewise, the commercial space will have low flow, high-efficiency faucets, as well as low-flow water closets and urinals. The Proponent is also committing to harvest rainwater for irrigation to further reduce the demand.

Overall, water conservation measures are expected to reduce water consumption significantly.

1.2 Wastewater

The City's sewer system is divided into three primary sewershed areas. Each of those primary sewershed areas are further subdivided into smaller subsets defined by logical flow boundaries for system analysis and location reference.

Sanitary sewers on the Site convey wastewater from the existing MBTA buildings through a series of laterals that generally flow south to north under the storage yard tracks. The laterals combine on-site and discharge to a 12-inch City of Newton sewer trunk line located in the northwest corner of the Site. The municipal sewer resides in a 40-foot wide City of Newton Main Drain and Common Sewer easement that runs along the MBTA train tracks parallel to the northeast property boundary. Additionally, an existing 10" sewer service connects north of the Project Site, the municipal sewer connects to the Concord Albemarle 24-inch by 36-inch brick egg arch trunk line sewer main that runs along the Charles River and eventually connects to MWRA infrastructure at Albemarle Road where it is conveyed to the Deer Island Sewage Treatment Plant in Boston Harbor. Additionally, an existing 10" sewer service connects directly to the Concord Albemarle sewer pipe from the existing Hotel Indigo. This service pipe is located along the southern edge of the site within the State Highway Layout. Per discussion with Newton Public Works Department Water and Sewer Division, there is 3 million gallons per day of available capacity within the recently refurbished Concord Albermarle sewer main.

Table 1 – Estimated Net New Wastewater Generation

Proposed Use	Size	Design Flow Basis [1]	GPD
Residential	805 bedrooms	65 GPD per bedroom	53,325
Retail	21,981 SF	50 GPD per 1,000 SF	1,099
Lab/R&D	362,235 SF	75 GPD per 1,000 SF	27,168
MBTA Office	7,500 SF	50 GPD per 1,000 SF	375
		∑ Design Flow	80,967
		Less existing hotel average daily flows[2]	15,000
		Net New Wastewater Average Daily Flow	**65,967**

1. Design Flow Basis determined in conjunction with The City of Newton Public Works Department Engineering Division and include factors to account for the aforementioned water conservation measures.
2. Determined for existing hotel by The City of Newton Public Works Department Engineering Division based on average water meter readings

Average daily wastewater generation for the uses proposed is closely correlated to water demand, and the water conservation measures that will be incorporated into the Project through the Proponent's commitment to sustainability which will significantly reduce wastewater flows to the system comparatively.

The Project involves the construction of a new sewer collection system of gravity service laterals and mains to convey wastewater generated by the new buildings with eventually discharging to the Concord Albemarle 24"x 36" sewer main. Building services will connect to a new sewer to be located generally within the access road through the site. The sewer will drain southerly and connect to a manhole in an existing 10-inch sewer service main located in the reconfigured Route 95/128 northbound on-ramp, which drains to the Concord Albemarle sewer main. Preliminary sizing of the building laterals indicates that flows can be accommodated in 6-inch service connections and sewer mains can be accommodated in 10-inch pipe. All new sewer system components will be Polyvinyl Chloride (PVC) pipe.

Inflow and Infiltration

MassDEP Policy (BRP 09-01) effective on April 2, 2009 and revised on September 24, 2010 requires wastewater mitigation for projects within MWRA sewer service areas that (1) exceed one or more

MEPA thresholds that trigger preparation of an Environmental Impact Report; and (2) generate new wastewater flow exceeding 15,000 gpd. Mitigation is required in the form of I/I removal of "clean" sources of water from the wastewater sewer system; this being ground water or surface water runoff from rain or snow melt. Inflow sources typically include sewer connections from catch basins, roof leaders, sump pumps and foundation drains. Infiltration is groundwater flow entering the sewer system through pipe or manhole defects in the collection system itself. The effects of I/I on a sewer system are dramatic during wet weather events, when sources of I/I can consume all available excess capacity within the pipe network and cause system back-up and surcharges of untreated sewage.

The Petitioner is committed to fulfilling the City Department of Public Works request for I/I removal. Accordingly, the Project will result in no net increase to the regional wastewater system by virtue of providing wastewater inflow and infiltration (I/I) removal (mitigation) in accordance with MassDEP Policy and City of Newton requirements.

1.3 Stormwater Management

The Project presents a unique opportunity to implement significant improvements to the quality and additional control of the quantity of stormwater runoff tributary to the Charles River, thereby allowing the restoration of a more natural hydrologic cycle. Beyond the immediate benefit of removing large expanses of pavement with little existing treatment of stormwater runoff, the Project incorporates a progressive stormwater management system utilizing a combination of Low Impact Development (LID) techniques and stormwater Best Management Practices (BMPs) integrated into the site design which focus on groundwater recharge and water quality. The stormwater infrastructure will collect, treat, recharge and/or filter stormwater prior to discharging to the on-site culvert and eventually the Charles River. The specific combination of BMP techniques utilized have an exceptional capability to address phosphorous removal, specifically to provide a 65% reduction from stormwater runoff, as required by the Total Maximum Daily Load (TMDL) criteria established by the Environmental Protection Agency (EPA) for the Upper/Middle Charles River.

The Project proposes to showcase best practices and principles of green infrastructure: restoring the ecological and hydrologic functions of a former parking lot and Hotel Indigo. With sustainability, livability, and resilience as guiding principles, the design team has developed a green infrastructure concept design that will exceed stormwater management regulatory requirements while creating public amenities and reducing urban heat island effect.

The Project's green infrastructure approach will integrate small-scale, decentralized stormwater practices throughout the site, in locations where those practices best fit site conditions and can generate the highest benefits. The proposed green infrastructure practices include water-receiving landscapes, permeable hardscapes, and water conservation practices. These practices, proven effective in installations in Cambridge, Boston, and throughout the Northeast, will be designed with maintenance in mind to ensure that they provide environmental and community benefits well into the future.

1.3.1 Watershed Overview

Situated within the Charles River Watershed and Runaway sub-watershed, the Project has an opportunity to mitigate the impacts that past development and urban stormwater runoff have had on these waterbodies. To improve upon existing conditions, the Project aims to restore the natural water cycle and function of the landscape, which has been lost through prior development. The Project will reduce impervious cover, increase tree canopy, store and reuse roof runoff for irrigation and integrate green infrastructure throughout the site to slow, filter, collect, and infiltrate rainwater where it falls.

Under existing conditions, the Project Site is developed and predominately impervious; containing a parking lot supporting the MBTA Riverside Station, the Hotel Indigo with associated parking, and a bus terminal facility. As such, limited pervious surfaces are present and are located primarily at project boundaries; these include landscaped and grass areas and wooded cover along a steeply sloping area along Grove Street and the State Highway Layout (SHLO). The regional topography is generally characterized as hilly while the majority of the existing Project Site is flat, ranging from 1% to 2.5% slopes.

Stormwater runoff within the hotel and MBTA parking areas is collected by a series of catch basins and is conveyed through a closed pipe network, with a portion of the parking lot stormwater runoff treated by an oil water separator located in the western parking lot of the MBTA site. This stormwater enters the existing 60-inch culvert contained within a City of Newton drainage easement, which conveys Runaway Brook, located east of the Project Site on the Woodland Golf Course, and discharges to the Charles River. Stormwater runoff at the southern and western Project boundaries is collected by catch basins in Recreation Road. This runoff is eventually discharged to the Charles River as well but bypasses the existing 60-inch culvert. Figure 2 – *Existing Drainage Conditions* depicts the existing drainage patterns of the Project Site.

Similar to the established drainage pattern for the site and surrounding areas, stormwater runoff from the Project Site is discharged to a regulated wetland resource to the west; a deep marsh system associated with the Charles River.

The Charles River Watershed is impaired in part due to phosphorus carried by urban stormwater runoff to the river. The Final TMDL for Nutrients in the Upper/Middle Charles River establishes a pollution diet and stormwater management strategies to reduce phosphorus loading to the Charles River. Per Table ES-3 of the TMDL Technical Report (CN 272.0), Commercial/Industrial and High Density/Multi-Family Residential uses require a 65% reduction in annual average phosphorus loading. The Project commits to meeting this phosphorus reduction target, as detailed in Section 1.2.3 below.

1.3.2 Site Considerations

The Project site has been previously mined for gravel and developed as part of the MBTA parking facility and Hotel Indigo, resulting in variable soil conditions of fill and natural material. Certain areas may be unsuitable for infiltration; particularly, a small area located near the existing MBTA Station that has shallow bedrock.

According to the National Resources Conservation Service (NRCS), surface soils on the Project site are identified as urban land, which does not have a Hydrologic Soil Group (HSG) rating. Soils adjacent to the Project site in the NRCS soil map are classified with a HSG A rating. Soil evaluations in the geotechnical report completed by Sanborn Head Associates show predominately well-draining soils that would be characterized as a HSG A soil. Sanborn Head also reported that Groundwater at the site is generally anticipated to flow to the north/northwest toward the Charles River and is generally deep (greater than 15' below the ground surface).

Under existing conditions, the Site is developed and is predominately impervious, except for small isolated landscaped areas dispersed throughout the Site and the Grove Street frontage including the steeply sloping area along the southerly portion of Grove Street between the existing MBTA access drive and Hotel Indigo.

The Project proposes new buildings, roadways, sidewalks, streetscape, parking areas, and green space, as generally illustrated on the project landscape plans.

In selecting the conceptual stormwater practices, the design team aimed to maximize benefits by matching stormwater practices to the best setting and site conditions. The design prioritizes infiltration practices where subsurface conditions allow, and fits those practices under hardscapes (parking lane, bike lane, and plazas) and landscapes (streetscape and open space).

Green Infrastructure Plan

The overall principles of the conceptual green infrastructure plan are:

1. Make room for stormwater: grading and utility layout to allow green infrastructure to be distributed throughout the site.

2. Divert runoff from sidewalks, bike path, and streets into permeable pavement and bioretention facilities, integrated into the streetscape and transportation design.
3. Capture portions of roof runoff in rainwater cisterns, to be used for landscape irrigation.
4. Prioritize infiltration facilities where conditions are most amenable; particularly, under the proposed parking garage. Infiltration facilities (including rainwater reuse for irrigation) maximize groundwater recharge and phosphorus reduction.
5. Where site conditions are not amenable to infiltration, design facilities to direct filtered runoff to the closed drainage system.
6. Maximize tree canopy, and support tree health by extending sand-based structural soil under the sidewalk adjacent to tree wells.
7. Design with maintenance and longevity in mind.
8. Reduce runoff volume and peak discharge rates to the municipal drainage system.

The following describes the Green Infrastructure practices:

- Main Street will be crowned, which will direct roadway and sidewalk stormwater to permeable pavement parking on both sides of the street.
- Main Street adjacent to the new plaza area framed by Buildings 2, 3 and 4 will transition to a raised intersection constructed with permeable pavers.
- The majority of roof runoff and paved areas will be routed to a large subsurface infiltration system below the parking garage and a smaller system along the Transit Green.
- On Main Street, roadway and sidewalk runoff will be treated in bioretention bump-outs along the side of the street.
- Sand-Based Structural Soil systems to promote groundwater recharge and a thriving landscape will be used along the new roadway corridors on-site as well as the north side of Grove Street.

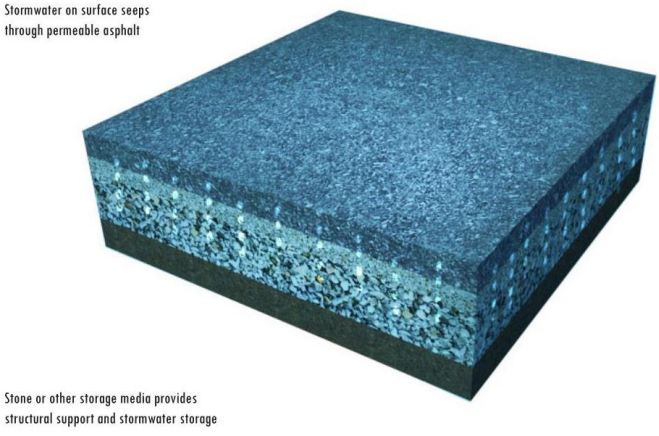
Specific green infrastructure practices are further described below.

Bioswales, planters and curb bump-outs

Gutter flow, sidewalk runoff, and parking lot runoff will be diverted into a bioswale, curb bump-outs, and planters distributed throughout the Site. While facility designs will be refined for each location, each facility will feature runoff infiltration through layers of mulch, bioretention media, and peastone into a reservoir layer of open-graded crushed stone. Once ponding reaches the desired ponding depth, an outlet will drain each facility to the next downstream catch basin or manhole. Where conditions preclude infiltration, these facilities will be designed with a waterproof liner and perforated underdrain to fully drain the facility within 72 hours.

Permeable Pavement

Several on-street parking lanes, and the Building 2, 3, 4 plaza will feature permeable pavement. Rain falling on the pavement or running onto it from adjacent surfaces will infiltrate through the pavement and choker stone into a reservoir layer of open-graded crushed stone. Where conditions preclude infiltration, these facilities will be designed with a sand filter layer (for phosphorus reduction), a waterproof liner, and a perforated underdrain to fully drain the facility within 72 hours.



Street Trees with Sand-Based Structural Soil

Sand-Based Structural Soil (SBSS) is a non-propriety mix of stone and soil that supports the sidewalk while allowing tree roots to grow normally. A SBSS system, located adjacent to a tree wells, will include sidewalk set on a minimum of six inches of open graded crushed stone over a minimum of 30 inches of SBSS. Where appropriate for each site, the tree wells and SBSS will be paired with permeable pavement or diversion of gutter flow into a depressed tree well.

Rainwater Harvesting and Infiltration Chambers.

Roof runoff from Buildings 3 and 4 will be routed to a prefabricated stormwater chambers. This system will serve two functions: 1) storage for rainwater harvesting, and 2) infiltration for groundwater recharge, water quality treatment, and peak rate reduction.

1.3.3 Regulatory Compliance

Through the integrated green infrastructure approach described above, the Project will meet stormwater management regulatory requirements while providing broad environmental and community benefits. Regulatory requirements applicable to the Project stormwater management plan include:

- Final TMDL for Nutrients in the Upper/Middle Charles River, CN 272.0 (May 2011);
- Massachusetts Stormwater Management Standards; and
- City of Newton Requirements for On-Site Drainage.

In addition, a very small portion of the buffer zone associated with the Runaway Brook on the opposite side of Grove Street extends on to the site and is regulated by the Massachusetts Wetlands Protection Act and under the jurisdiction of the Newton Conservation Commission. Proposed work within jurisdictional resource area buffers will be documented in a Notice of Intent that will be prepared and filed in due course.

At the schematic design level, the Project is focused on designing for four primary regulatory objectives:

- Protecting receiving waterbodies;

- Providing a Comprehensive Soil Erosion and Sediment Control System;
- Peak Rate Attenuation;
- Groundwater Recharge; and
- Water Quality: total suspended solids and phosphorus reduction.
- Implement a Comprehensive Stormwater Operations and Maintenance Plan

The Operations and Maintenance Plan will continue to be refined to further define specific treatment system locations and project phasing which will be submitted in conjunction with the Building Permit applications. In addition to the recently completed TV inspection of the municipal 60" diameter culvert that traverses the site that demonstrated the integrity of the pipe, the line will also be field traced to verify the pipe location prior to any construction.

The Project proposes to reduce impervious cover which does not account for converting paved areas to permeable pavers. In addition, converting the large expanses of surface parking to a parking structure and the new development consisting of new trees, functional open spaces will dramatically decrease the exposed paved surfaces and corresponding potential pollutant load. Under proposed conditions, new pervious spaces will infiltrate rainwater on-site, thereby increasing groundwater recharge and reducing peak discharge rates compared to existing conditions. In addition, all runoff from the site will be collected in or passed through one or more BMPs, as described above, designed specifically to remove total suspended solids and recharge groundwater and limit phosphorus to levels prescribed by DEP, prior to connecting into the municipal culvert on-site.