The growth factor used to project traffic volumes from 2019 to 2026 was 1%. It is not clear where the data came from to arrive at that conclusion except for a footnote in the old traffic count data from the appendix which states that traffic growth between 2005 and 2009 decreased and between 2105 and 2018 traffic increased at station 550, on Route 1 in Peabody by 2%. A 1% per year growth factor was selected to be the to adjust the 2019 traffic volumes to 2026 levels. We accept this growth factor assumption.

Trip Distribution and Assignment

Traffic volumes associated with the project were assigned to the study area roadways based on a review of existing travel patterns. The existing travel patterns on Farm Avenue do not reflect potential travel patterns for residential developments that would likely be destined for Boston and other jobs south of Peabody. Rather than develop a revised trip distribution pattern based on Journey to Work data from the US Census to verify the trip distribution pattern, a sensitivity analysis should be performed at the study area intersections with a different set of distribution patterns. A second set of analyses should be performed with a large percentage of the traffic turning left out of the site toward the Intercontinental Way/Dearborn Road intersection.

Traffic Operations Analysis

Capacity analyses were performed for the two study area intersections under existing 2019 and 2026 No-Build conditions. The Build analyses included the two study intersections as well as the Farm Avenue/ Site Drive intersection. The capacity analysis was performed using software from the University of Florida for unsignalized intersections. Several inputs to the capacity analysis should be reviewed for consistency with MassDOT's guidelines. The first is the value of the peak hour factor (PHF)s used. Since the traffic counts were performed manually, no PHFs were provided with the traffic counts. It is customary to used actual PHFs for existing traffic analyses and modify the PHFs to reflect future conditions. MassDOT recommends using a PHF of .92 for future capacity analyses. Since the number of trucks were not classified during counting, assumptions about the truck percentages used should be referenced. Also, the truck percentages used at the site drive should be explained since truck values for the site drive traffic was double that assumed for Farm Avenue.

Overall, the traffic operations analyses performed at the two study area intersections shows a good Level of Service (LOS) can be expected under future build conditions. If after providing justification for use of PHF and truck % and adopting revised trip distribution pattern based on preceding comments, a new analysis should be provided at the Farm Avenue/Site Drive intersection to confirm the conclusion of the study.

Site Access and Parking

World Tech reviewed the site plan for overall site circulation issues. Below are our findings.

There are 152 parking spaces proposed. It is not clear why the number of parking spaces was reduced from 1.7 per unit to 1.3 per unit. Again, the math is incorrect on the site plans where

116 units were used to calculate the required number of spaces. Please provide justification for the number of parking spaces provided.

Transportation Demand Management

There were several Transportation Demand Management (TDM) measures identified but no firm commitment provided to implement these measures. Elements of TDM measures should be proposed, including secure bike parking and information posted regarding public transportation schedules and maps. The investigation of rideshare options with MassRIDES is listed among the TDM measures to be encouraged but no game plan is provided to accomplish these measures.

In order to promote the use of public transportation a statement is made that a sidewalk will be provided from Farm Road to Forest Street to access public transportation services. The existing site plans do not show a sidewalk connection from the proposed site to Forest Avenue. Forest Avenue is the wrong destination for pedestrian traffic due to a lack of existing sidewalks on Forest Avenue and a lack of public transportation services provided on this roadway. A new pedestrian connection should be provided from the site to the existing neighborhood on Farm Road. A sidewalk should be provided from the proposed residences, down the site drive to Farm Avenue and continue down Farm Avenue to the nearest sidewalk at 25 Farm Avenue. This pedestrian connection will serve as a general walking path and means to connect with public transportation services in the industrial park. In order to provide this important pedestrian amenity, a firm commitment should be made to provide these sidewalk improvements and the site plans modified to show the location and construction details for the installation of these sidewalks.

Summary

Based on the calculated volumes, the project is expected to generate approximately 642 new trips (321 in/321 out) per day, 41 trips in the morning (13 in/31 out) during the morning peak hour and 52 trips in the evening (32 in/20 out) during the evening peak hour.

The project team should provide the following analysis/documentation

- Please rerun the analysis at the intersection of Farm Avenue at Site Drive with the new trip distribution pattern, truck % and peak hour factor.
- Existing sight distance should also be reviewed at the intersection of Farm Avenue/Site Drive intersection and modifications along the Right-of-Way developed to enhance the sight distance requirements.
- Address Site Access and Circulation concerns especially the new sidewalk connections along Farm Avenue. A construction plan should be provided showing the modifications to the site roadway and new sidewalk along Farm Avenue in accordance with the City's Complete streets Policy.
- The reduction is the number of parking spaces should be justified.

- There were no Transportation Demand Management measures identified that were specifically committed to. Proposed bike rack locations should be provided. Other elements of TDM should be committed to including installing vehicle charging stations.
- The traffic control measures proposed at the site drive, e.g. stop signs and pavement markings as a minimum, should be added to the sign plans.

If you have any questions or require additional information, please feel free to contact me directly at any time.

Sincerely,

WORLDTECH ENGINEERING, LLC

Rodney C. Emery

Rodney C. Emery, P.E. PTOE

The Residences at Farm Avenue, 27R Farm Avenue – Downstream Sewer Capacity Peer Review

TO: William Paulitz, PE, City Engineer

FROM: Janet Moonan, PE, Heidi Baird, Tighe & Bond

THROUGH: David Murphy, PE, Tighe & Bond

DATE: August 13, 2020

Introduction

Tighe & Bond was hired by the City of Peabody to perform an evaluation of:

1. The proposed wastewater generation estimates for The Residences at Farm Avenue development, to be located at 27R Farm Avenue ("Proposed Development"); and
2. Whether there is adequate available capacity in the City's sewer system to accommodate anticipated flows from the Proposed Development and other development/redevelopment projects recently evaluated by Tighe & Bond that contribute to the City's sewer system "downstream" of the Proposed Development.

Figure 1 in Attachment A shows the location of the Proposed Development and the downstream collection system evaluated in this memorandum.

This technical memorandum summarizes the results of this evaluation.

Information Gathering and Data Review

To complete the evaluation, Tighe & Bond reviewed the following information:

- The Residences at Farm Avenue, Peabody, MA 01960, Comprehensive Permit Application Under M.G.L. Chapter 40B, Sections 20-23, February 4, 2020;
- The Residences at Farm Avenue Preliminary Architectural Plans, for The Residences at Farm Avenue, 27R Farm Ave in Peabody, Massachusetts, prepared by Boston + Brockton, Sheets 1 through 8;
- Preliminary Site Development Plan in Peabody, Mass, prepared by Hayes Engineering Inc., January 30, 2020, Sheets C-1 through C-8;
- The City's Sewer System Map as of 10/29/1996 and the City's GIS mapping;
- As-built drawings of the collection system:
    - West Peabody I/I Reduction Program drawings prepared for South Essex Sewerage District by Tighe & Bond and dated June 2007, Sheets 1 through 12;
    - Additions to the Sewerage System, Plan and Profile, Forest Street (Sta. 0 + 00 to Sta. 15 – 07.8), prepared by Green Engineering Affiliates Inc. 12-14-72;
    - Stormwater Control System "C" and Dearborn Road Pump Station Improvements (Part B), prepared by Tighe & Bond dated June 1997, Sheets 1 through 12.

In addition, pump runtime data from January 1, 2013 through December 31, 2019 collected at the Newbury Street Pump Station and pump runtime data from January 1, 2015 through September 30, 2017 collected at the Dearborn Pump Station, collected by Weston and Sampson, and quarterly billed water use from the existing facilities along Newbury Street, Lakeland Park Drive, Forest Street, and Pine Street from 2017 through 2019, provided by the City, were used during this assessment.

Understanding of Project

Based on our review of the documents provided for the Proposed Development, we understand the following:

- The Residences at Farm Avenue LLC, ("Applicant") is planning to construct a six-story, 116-unit residential apartment building. The proposed development consists of 116 rental housing apartments with 57 one-bedroom, 47 two-bedroom, and 12 three-bedroom apartments with 157 interior and exterior parking spaces in a single, pedestal-style, building with 5 floors of residences above a ground-level parking garage.

- The total estimated average daily wastewater flow, as documented in The Residences at Farm Avenue, Peabody, MA 01960, Comprehensive Permit Application, to be generated from the proposed project and discharged to the City's collection system is 20,570 gallons per day (gpd).

- The project site is not served by gravity sewer. Per the Comprehensive Permit Application, the Applicant is proposing to serve the new building with a wastewater lift station that will be designed to pump waste via a force main into the existing municipal sewer force main within Farm Avenue.

An evaluation is required to assess the proposed project's wastewater generation and to determine if there is sufficient capacity within the downstream collection system to accommodate the wastewater flows from the proposed project. Based on the information provided by the Applicant and subsequent discussions with City staff, Tighe & Bond identified the downstream sanitary sewers that would convey sewage from the Proposed Development. The map in Attachment A shows the downstream sewer route evaluated (highlighted in yellow). An evaluation of the Proposed Development's pump station is not included in Tighe & Bond's scope of work.

Estimated Wastewater Flows from the 27R Farm Avenue Development

In the documentation and correspondence provided, The Residences at Farm Ave LLC stated the Title 5 [310 CMR 15.00] wastewater flow for the proposed occupancy is approximately 20,570 gpd. The Proposed Development will consist of 116 rental housing apartments with 57 one-bedroom, 47 two-bedroom, and 12 three-bedroom apartments, as noted earlier in this memorandum. The flows were calculated based on the residential unit flow rate recommended by Title 5 of 110 gpd per bedroom.

110 gpd/bedroom x 187 bedrooms = 20,570 gpd

Note that, as stated in Title 5, the value of 110 gpd per bedroom is "equivalent to estimated generated flow for the proposed use plus a factor representing flow variations."

As another way to review the project proponent's estimated average daily wastewater flow, we also calculated an average daily flow based on the number of occupants and a typical

average daily flow per occupant of 70 gpd. This unit flow rate is suggested as a minimum value if actual flow data cannot be obtained in the guidance manual titled *TR-16 Guides for the Design of Wastewater Treatment Works* (TR-16 Guidelines), published by the New England Interstate Water Pollution Control Commission (NEIWPCC), 2011 edition, as revised in 2016. A total number of 303 occupants was estimated assuming 2 individuals in one bedroom of each apartment and 1 individual added for each additional room of each apartment.

303 occupants x 70 gpd/occupant = 21,210 gpd

The estimated flow using the number of occupants is within 3% of the average daily flow estimated using Title 5. Based on this comparison, we conclude that the average daily flow estimate presented by the Applicant is reasonably conservative.

An additional 1,000 gpd was added to the proposed flow for the Proposed Development to account for infiltration and inflow (I/I). As a result, the total average daily flow used in our analysis is 21,570 gpd. Note that an infiltration allowance between 250 and 500 gallons per day per inch of sewer diameter per mile of sewer length is typically used in hydraulic calculations, and therefore, based on the short length of sewer piping anticipated within the Proposed Development, this value is sufficiently conservative for this site.

Connection to the City's Collection System

Tighe & Bond strongly recommends against allowing the Proposed Development to connect a new force main to the existing sewer force main along Farm Avenue. An additional connection to the force main would require analysis and potential upsizing of the pumps at, or other modifications to, the Farm Avenue and Dearborn Road Pump Stations. In addition, an analysis of the existing force main to understand condition and to confirm whether there is sufficient capacity would be necessary.

In addition, the City indicated that the existing manhole at the intersection of Forest Street and Lakeland Park Drive (MH 58-23) has had Sanitary Sewer Overflow (SSO) events in the past. The addition of any flow upstream of or to this manhole would increase the potential for future SSO events, which is prohibited by State and Federal regulatory requirements.

Therefore, we recommend that the Applicant construct a pump station and force main to pump the sewage from the Proposed Development and discharge to the gravity sewer manhole located on Forest Street (MH58-4), which is located downstream of the intersection of Forest Street and Lakeland Park Drive. Our analysis starts at this location.

Evaluation of City's Downstream Collection System

Tighe & Bond utilized the above information to evaluate the Proposed Development's wastewater discharge impact on capacity of the City's downstream wastewater collection system (from the Proposed Development to the City's connection with the interceptor at the City of Salem line, that ultimately travels to South Essex Sewerage District's treatment works). Manhole numbering used in this evaluation is consistent with the 1996 Sewer Maps and the City's GIS. Pipe segments are identified based on manhole numbering.

A pipe-by-pipe approach was used to evaluate the capacity of the downstream sewer system to accommodate existing and proposed flows from the Proposed Development. We utilized the as-built drawings cited previously in this memorandum to prepare the pipe-by-pipe evaluation included in Attachment B. Assumptions made regarding sewer attributes are also cited in Attachment B (e.g., pipe slope assumptions where data was not available). Manning's

equation was used to calculate the full-pipe capacity of the sewers evaluated downstream of the Proposed Development. Because the existing gravity sewers downstream of the Proposed Development are AC and RC pipe, we used a roughness coefficient of 0.011 and 0.014, respectively.[1]

In our evaluation of the downstream sewer system, Tighe & Bond considered the combined impacts on City's sewer system capacity from the Farm Avenue Pump Station, Dearborn Road Pump Station, the Proposed Development, the Newbury Street Pump Station, and the 7 Dearborn Road Redevelopment. Figure 1 in Attachment A shows the locations of these items.

- Farm Avenue Pump Station discharge equal to 14,500 gpd (based on 2015 through 2017 Spring average flows). Dearborn Road Pump Station discharge equal to 60,000 gpd (based on 2015 through 2017 Spring average flows). The flow from these Stations discharge into the most upstream manhole on Forest Street.
- Estimated average daily wastewater flow based on water use data from City (2017, 2018, 2019) from parcels contributing to the sewer system on Forest Street, Lakeland Drive, and Newbury Street north of the pump station discharge.
- Newbury Street Pump Station discharge equal to 122,000 gpd (based on three-year average of run times). The Newbury Street Pump Station enters the City's system on Route 1 as shown in Figure 1 on Attachment A.
- Estimated average daily wastewater flow from the 7 Dearborn Development equal to 30,700 gpd. Supporting calculations are documented in the memorandum prepared by Tighe & Bond titled *Seven Dearborn Proposed Development – Downstream Sewer Capacity Peer Review,* dated July 26, 2019.
- Estimated average daily wastewater flow of 10,000 gpd from the Newbury Point development to be located 1 Hotel Road on the rear portion of an existing lot at 55R Newburyport Turnpike. The proposed development will consist of two floors of parking and five floors of living (38 one bedroom units, 16 two bedroom units, 6 three bedroom units, and a club room). Flows account for some infiltration.
- For the Proposed Development, which has an average daily flow of 21,570 gpd, a peak flow of 171,920 gpd would be calculated using peaking factors per TR-16 Guidelines. However, TR-16 Guidelines recommend that all force main piping have a minimum flow of 3 fps. Because this discharge must be pumped, for a 4" force main, this flow is equivalent to 120 gallons per minute (gpm) and therefore the calculated peak flow rate for the Proposed Development used in the analysis was 173,000 gpd.

Other than for the Proposed Development as noted above, peak wastewater flows were estimated using TR-16 using the average wastewater flow estimates. Per Figure 2-1 in TR-16, we applied a peaking factor to the estimated average daily wastewater flows in order to calculate the estimated peak wastewater flows. As noted above, the infiltration was estimated based on the 1998 Single Season, Two Phase Infiltration/Inflow Study West Peabody Area at a rate 800 gpd/in-diameter mile.

Note that we concluded our pipe-by-pipe evaluation of the available sewer system capacity downstream of the Proposed Development at the manhole where the sewer enters the 30"

[1] https://www.ejprescott.com/media/reference/ManningEqua&TableofNR-15.pdf

diameter Interceptor, since the proposed wastewater flows are less than 1% interceptor capacity. Sewer segments downstream are the same or larger diameter.

Our spreadsheet model indicates that the existing sewers downstream can accommodate the estimated average daily flow from the Proposed Development. Our model also indicates that the existing sewers downstream can accommodate the estimated peak hourly flows. The results for the sewer segments reviewed are detailed in Attachment B. Several of the existing sewer segments had calculated full-pipe velocities exceeding 10 feet per second (fps), which is a design criterion for new pipes recommended by TR-16. However, because these pipes have sufficient remaining capacity, we do not anticipate actual velocities to reach the estimated full-pipe velocities under peak flow conditions. A summary of the results for the sewer segments reviewed is presented below in Table 1 and is detailed in Attachment B. The applicable rows are highlighted in Attachment B.

TABLE 1
Hydraulic Analysis Summary

Segment	Hydraulic Capacity (mgd)[1]	Avg Daily Flow (mgd) [2]	Peak Hourly Flow (mgd)	Surplus Capacity Available (Y/N)
Forest Street	2.99	0.103	0.621	Y
Newbury Street-East Pipe[3]	3.02	0.307	1.798	Y
Newbury Street Combined[4]	10.4	0.330	1.926	Y
Pine Street[3]	3.25	0.341	1.969	Y

[1] Based on the sewer with the lowest hydraulic capacity along the segment, correlates to "Full-Pipe Flow Capacity" in Attachment B.

[2] Correlates to Attachment B, including the existing, proposed, and infiltration flows, for the lowest capacity sewer along the segment.

[3] Includes additional flow from 7 Dearborn Road redevelopment and the Newbury Point development to be located 1 Hotel Road on the rear portion of an existing lot at 55R Newburyport Turnpike.

[4]Includes the combined flow from the east and west sewer mains along Newbury Street.

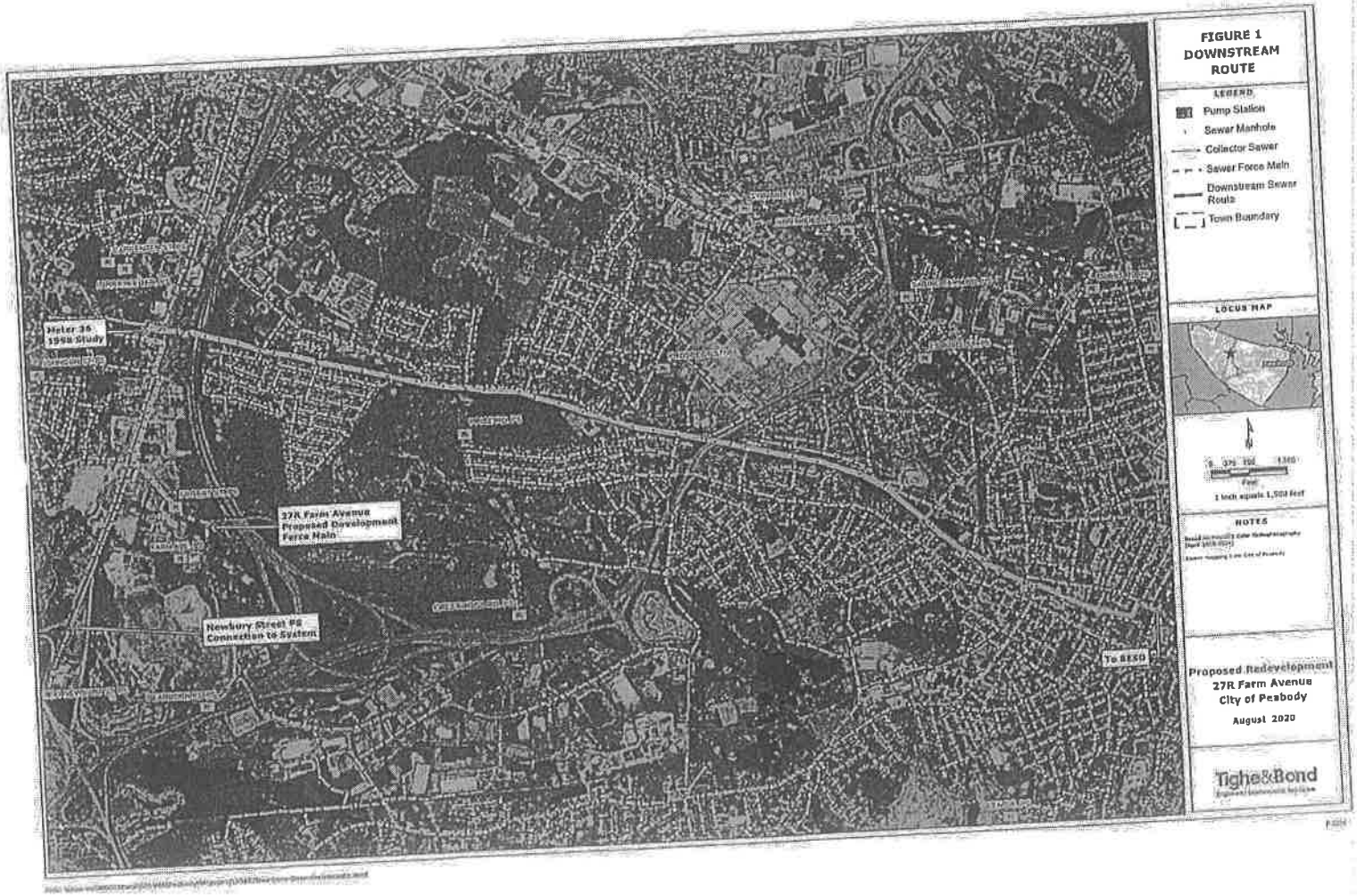
Conclusions

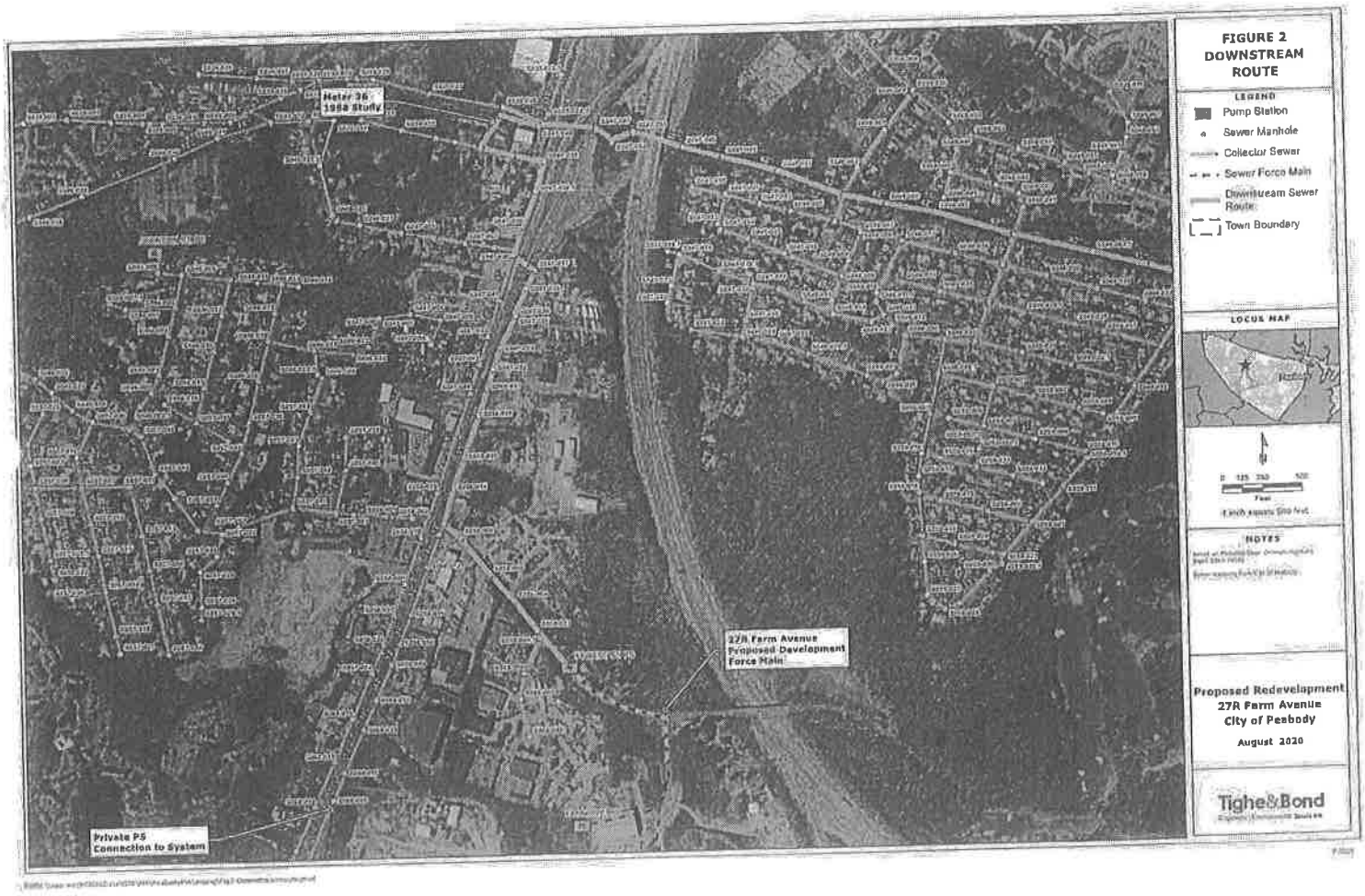
Based on the evaluation completed as described above, our analysis suggests that the additional sewer flows that would be generated by the Proposed Development will not result in sewer capacities being exceeded downstream assuming connection to the City's system is made downstream of the intersection of Forest Street and Lakeland Park Drive.

Attachments

A – Figures: 27R Farm Avenue Development Downstream Piping

B – Sewer Capacity Analysis Review – Existing Conditions & Available Capacity


Meter 36
1998 Study
27R Farm Avenue
Proposed Development
Force Main
Newbury Street PS
Connection to System
To BESD
FIGURE 1
DOWNSTREAM
ROUTE
LEGEND
Pump Station
Sewer Manhole
Collector Sewer
Sewer Force Main
Downstream Sewer
Route
Town Boundary
LOCUS MAP
1 inch equals 1,500 feet
NOTES
Proposed Redevelopment
27R Farm Avenue
City of Peabody
August 2020
Tighe&Bond


Meter 36
1988 Study
27R Farm Avenue
Proposed Development
Force Main
Private PS
Connection to System
FIGURE 2
DOWNSTREAM
ROUTE
LEGEND
Pump Station
Sewer Manhole
Collector Sewer
Sewer Force Main
Downstream Sewer
Route
Town Boundary
LOCUS MAP
NOTES
Proposed Redevelopment
27R Farm Avenue
City of Peabody
August 2020
Tighe&Bond

Attachment B: Sewer Capacity Analysis Review
Existing Conditions and Available Capacity

Sewer Pipeline	Description/ Location	Pipe Dia. (in)	Pipe Material	Pipe Area (sf)	Pipe Length (ft)	Invert Elevation (ft)[1]	Calculated Pipe Slope (ft/ft)	Hydr. Radius (ft)	Full-Pipe Velocity (fps)	Full-Pipe Flow Capacity (mgd)	Existing Average Day Flow (gpd)[2]	Proposed Average Day Flow (gpd)[3]	Infiltration (gpd)[4]	Existing + Proposed + Infiltration Average Day Flow (MGD)	Peak Flow with Development (MGD)[4]	Available Capacity Following Development (Estimated) (+/-) (MGD)	Location Notes
Downstream Sewer Capacity																	
MH 58-4 MH 58-5	Forest Street	12	AC	0.785	218	158.60 154.35	0.0195	0.25	5.90	2,993	79,740	21,570	919	0.099	0.604	2.389	Manhole downstream of the intersection of Lakeland Park Drive and Forest Street.
MH 58-5 MH 58-6	Forest Street	12	AC	0.785	293	154.35 149.07	0.0180	0.25	7.21	2,993	79,466	21,570	1,351	0.102	0.612	2.331	
MH 58-6 MH 58-7	Forest Street	12	[illegible]	[illegible]	152	149.07 146.21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
MH 58-7 MH 58-14	Newbury Street	15	AC	1.227	216	146.12 144.67	0.0067	0.31	5.11	4,951	273,145	21,570	2,120	0.297	1.782	2.347	Intersection of Forest Street and Newbury Street. Flow from upstream on Newbury Street enters the sewer at MH 58-7
MH 58-14 MH 58-15	Newbury Street	15	AC	1.227	201	144.53 143.43	0.0055	0.31	4.61	3,659	273,145	21,570	2,517	0.297	1.706	1.953	
MH 58-15 MH 58-16	Newbury Street	15	AC	1.227	327	143.28 141.55	0.0053	0.31	4.93	3,908	273,200	21,570	3,203	0.319	1.708	2.202	
MH 58-16 MH 58-17	Newbury Street	15	AC	1.227	180	141.47 137.22	0.0236	0.31	9.59	7,508	274,207	21,570	3,616	0.299	1.712	5.895	
MH 58-17 MH 47-33	Newbury Street	15	AC	1.227	266	132.12 122.15	0.0377	0.31	12.11	9,592	274,207	21,570	4,230	0.300	1.713	7.884	
MH 47-33 MH 47-34	Newbury Street	15	AC	1.227	219	127.01 122.55	0.0204	0.31	8.90	7,057	278,460	21,578	4,718	0.300	1.743	5.914	
MH 43-34 MH 47-35	Newbury Street	15	RCP	1.227	18	122.6 120.00	0.1394	0.31	16.30	14,569	278,460	21,570	4,757	0.306	1.743	12.765	
MH 47-35 MH 47-36	Newbury Street	15	RCP	1.227	177	119.79 108.08	0.0605	0.31	12.06	9,557	278,460	21,570	5,161	0.306	1.742	7.814	
MH 47-36 MH 47-37	Newbury Street	15	RCP	[illegible]	[illegible]	102.99 100.34	[illegible]	0.31	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

Attachment B: Sewer Capacity Analysis Review
Existing Conditions and Available Capacity

Sewer Pipeline	Description/ Location	Pipe Dia. (in)	Pipe Material	Pipe Area (sf)	Pipe Length (ft)	Invert Elevation (ft)[5]	Calculated Pipe Slope (ft/ft)	Hydr. Radius (ft)	Full-Pipe Velocity (fps)	Full-Pipe Flow Capacity (mgd)	Existing Average Day Flow (gpd)[2]	Proposed Average Day Flow (gpd)[3]	Infiltration (gpd)[6]	Existing + Proposed + Infiltration Average Day Flow (MGD)	Peak Flow with Development (MGD)[4]	Available Capacity Following Development (Estimated) (+/-) (MGD)	Location Notes
MH 47-37 MH 47-37.1	Newbury Street	15	RCP	1.227	81	109.55 107.33	0.0274	0.31	4.75	3.763	279,870	21,570	5,637	0.307	1.746	2.018	
MH 47-37.1 MH 47-40	Newbury Street	15	AC	1.227	84	106.53 105.91	0.0074	0.31	3.36	4.246	279,870	21,570	5,918	0.307	1.746	2.502	
MH 47-40 MH 47-39	Newbury Street	15	AC	1.227	194	105.61 97.72	0.0402	0.31	12.12	10.931	302,486	21,570	6,335	0.331	1.822	9.322	Flow from second main on West side of Newbury Street combines with sewer main.
MH 47-39 MH 47-38	Newbury Street	15	AC	1.227	422	91.21 71.89	0.0457	0.31	13.48	10.888	302,477	21,570	7,195	0.335	1.695	8.792	
MH 47-38 MH 47-33	Pine Street	15	AC	1.227	421	68.70 65.16	0.0084	0.31	5.28	4.592	307,354	21,570	8,153	0.337	1.982	2.597	Intersection of Newbury Street and Pine Street
MH 47-33 MH 47-29	Pine Street	15	AC	1.227	211	64.96 61.25	0.0176	0.31	7.27	6.557	308,079	21,570	8,637	0.338	1.897	4.658	
MH 47-29 MH 35-22	Pine Street	15	AC	1.227	211	61.35 59.63	0.0077	0.31	3.47	4.333	309,599	21,570	9,111	0.340	1.916	2.417	
MH 35-29 MH 47-48	Pine Street	15	RCP	1.227	218	58.54 57.37	0.0050	0.31	4.10	3.231	309,599	21,570	9,216	[illegible]	1.917	1.321	
MH 47-48 MH 47-44	Cross Country to 30" Interceptor	15	RCP	1.227	25	57.37 57.03	0.0113	0.31	5.31	4.202	309,599	21,570	9,802	0.341	1.917	2.2[illegible]	Inlet into 30" Interceptor

[1]Manhole label from the drawings labeled "Sewer System Map as of 10/29/96" and "West Peabody I/I Reduction Program" prepared by Tighe & Bond in June 2007.

[2]Existing flow accounts for discharge from Farm Avenue Pump Station and Dearborn Road Pump Station (spring averages), and Newbury Street Pump Station (three year average), and water use data from all parcels along the existing upstream and downstream piping. Sewer rates developed from water use data assumed 90% of the water metered from a facility enters the sewer system.

[3]Projected flow data was developed by the Residences at Farm Ave LLC LLC and documented in the Applicant Information, Development Team, Development Description, Permitting, and Proposed Schedule dated February 4, 2020; Per the 2011 TR-16 Guides for the Design of Wastewater Treatment Works Revised in 2016, Tighe & Bond added 1,000 gpd for I/I estimation.

[4]Peak flows were calculated based on the average day flow and peaking factors of 4.4 for flows around 0.3 MGD, 4.8 for flows around 0.25 MGD, and 5.6 for flows around 0.18 MGD. The peaking factors were obtained from the TR-16 Guides for the Design of Wastewater Treatment Works, 2011 Edition, as Revised in 2016.

[5]Invert elevations are based on the Record Drawings entitled "West Peabody I/I Reduction Program" Prepared by Tighe & Bond and dated June 2007.

[6]Infiltration was estimated at 500 gpd/inch diameter mile per Section 2.2.3.3. of TR-16 Guidelines for the Design of Wastewater Treatment Works, 2011 Edition, as Revised in 2016.