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Technical Memorandum

То:	Village of Croton-on-Hudson
From:	AKRF, Inc.
Date:	May 27, 2022
Re:	Traffic Screening Analysis – Proposed HSRG Overlay and LI District Zoning Amendments

This memorandum presents the results of the preliminary screening analysis that was conducted in advance of the preparation of the Traffic Impact Study (TIS) related to the theoretical maximum buildout projected under the proposed Harmon/South Riverside Gateway (HSRG) Overlay and Light Industrial (LI) District zoning amendments.

As indicated in the scope of work dated March 21, 2022, the following six intersections were proposed for analysis in the TIS:

- 1. Croton Point Ave. and Veterans Plaza
- 2. Croton Point Ave. and Rt. 9/9A Southbound Ramps
- 3. Croton Point Ave. and Rt. 9/9A Northbound Ramps
- 4. Croton Point Ave. and S. Riverside Ave.
- 5. S. Riverside Ave. and Benedict Blvd.
- 6. S. Riverside Ave. and Clinton St.

The preliminary screening analysis was conducted to estimate the likelihood of traffic impacts occurring at any of the intersections listed above. Any intersections determined to "screen-out" based on the criteria outlined below would be removed from the TIS study area list of intersections for quantified analysis.

A. SCREENING PROCEDURES

ASSESSMENT OF PROJECT GENERATED TRIPS

The first step of the screening process involved estimating the increase in traffic through each of the six intersections as a result of the proposed zoning amendments. The trip generation (as presented in AKRF's February 25, 2022 memorandum to the Village, see **Attachment A**) was based on data presented in the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition.* Assumptions regarding potential driveway locations were utilized to develop trip assignments for the theoretical maximum buildout for the weekday AM and PM peak periods. Individual trip assignments were developed for groups of parcels

assumed to share common driveways/access points. The cumulative trip assignments were then utilized to estimate the increase in traffic that would pass through each intersection as a result of the proposed zoning amendments (see **Attachment A** for the cumulative parcel trip assignments for the HSRG Overlay and LI District).

Table 1 summarizes the anticipated increase in traffic as a result of the proposed zoning amendments for the six intersections examined. The increases are shown for individual vehicle movements (left, through, right) as well as for the overall intersection.

As shown in Table 1 each of the six intersections are anticipated to experience an overall increase in traffic in excess of 100 vehicles during both the weekday AM and PM peak periods. A threshold of a 100 vehicle increase through a given intersection during a peak hour is not uncommon for consideration of a quantified analysis. However, the increases in traffic for individual vehicle movements were also reviewed.

In examining the increase in traffic for individual vehicle movements, the following four intersections contain at least one movement which would experience an increase of greater than 50 vehicles:

- Croton Point Ave. and Rt. 9/9A Southbound Ramps
- Croton Point Ave. and Rt. 9/9A Northbound Ramps
- Croton Point Ave. and S. Riverside Ave.
- S. Riverside Ave. and Benedict Blvd.

As the common threshold increases for both overall intersection (100 vehicles) and intersection movements (50 vehicles) would be met at these locations, it is recommended that a quantified analysis is conducted as part of the TIS for the four intersections listed above.

Since only the increase in traffic for individual vehicle movements would be less than 50 vehicles for the other two intersections (Croton Point Avenue/Veterans Plaza and S. Riverside Avenue/Clinton Street), further examination was conducted to determine if a quantified analysis would be warranted.

CROTON POINT AVENUE AND VETERANS PLAZA

As Veterans Plaza provides a direct link to the parking facilities for the Croton-Harmon station of the Metro-North Railroad and is a major trip origin/destination location in the area, the intersection of Croton Point Avenue and Veterans Plaza is recommended for quantified analysis.

S. RIVERSIDE AVENUE AND CLINTON STREET

At the intersection of S. Riverside Avenue and Clinton Street, the highest increases in traffic are anticipated to occur on the Riverside Avenue through movements (all less than 50 vehicles). In order to estimate the potential effects of these increases, a preliminary capacity analysis was performed for this intersection.

Table 2 presents the preliminary capacity analysis results for the S. Riverside Avenue and Clinton Street intersection. The Existing Conditions traffic volumes were derived from traffic counts collected in April 2022. A comparison of future No Build (i.e., without the proposed zoning) with future Build (i.e., with the proposed zoning) was made. For the purposes of this analysis, it was conservatively assumed that the future design year (i.e., the future year by which the full theoretical buildout from the rezoning would occur) would be 2042 (2022 + 20 years).

Future No Build traffic volumes were developed by increasing the Existing 2022 traffic volumes in the study by a 1 percent per year compounded growth rate. This reflected increases in background traffic growth that would be expected to occur with or without the rezoning. Future Build traffic volumes were developed by adding the trips that were generated by the rezoning to the No Build network. The weekday AM and PM peak-hour models of the S. Riverside Avenue and Clinton Street intersection were then evaluated with the 2042 No Build and Build volumes.

				AM PFA		PM PEAK HOUR					
				Movement	Intersection	Movement	Intersection				
Traffi	c Intersections										
		EB	L	1		2					
			Т	3		9					
			R	0		0					
		WB	L	39		24					
			Т	11		6					
1	Croton Point Avenue & Veterans Plaza		R	15	108	34	150				
		NB	L	0		0					
			T			6 22					
		SB	L	14		29					
		55	T	3		5					
			R	1		2					
		EB	Т	25		56					
			R	9		14					
	Croton Point Avenue & Route	WB	L	76		39					
2	9/9A SB Ramps		T	61	184	56	200				
		SB	L	10		28					
			I R	0		8					
		FB	L	1		4					
			Т	33		72					
			R	7		7					
	Croton Point Av & Route 9/9A NB Ramps/Restaurant Drvwy.	WB	L	27		14					
			Т	109		72					
3			R	1	228	4	265				
-		NB	L	11		23					
			T D	1 20		4 57					
		SB	L	5		2					
		52	T	3		1					
			R	9		4					
	South Riverside Avenue & Croton Point Avenue	EB	L	50		102					
			R	10		21					
4		NB	L	21	203	15	230				
		C D	T	9	-	10					
		30	I R	105		10 72					
		EB	L	0		0					
			Т	0		0					
			R	0		0					
		WB	L	18		20					
			T	1		1					
5	South Riverside Avenue & Renedict Blvd	ND	R	5	156	8	185				
		IND	L T	4 38		11 66					
			R	17		20					
		SB	L	8		6					
			Т	64		51					
			R	1		2					
		EB	L	3		2					
	Couth Disconside Assessor	N 175	R	19		9					
6	South Riverside Avenue &	NB		6 27	102	17	116				
	Ginton St.	SP	1 T	36		42					
		30	R	1		3					
Notes											
EB = Ea	Notes: EB = Eastbound, WB = Westbound, NB = Northbound, SB = Southbound, I = Left, T = Through, R = Right										

Table 1 Croton Zoning Generated Trips - By Movement & Intersection

E Eastbound, w nrougn, R Rigi π,

					S.	River	side Av	venue	e & Cli	nton St	treet
		Lana	202	22 Existir	ng	204	2 No Bu	ild	2042 Build		
Peak Hour	Approach	Group	v/c Ratio	Delay (sec)	Delay (sec) LOS		Delay (sec)	LOS	v/c Ratio	Delay (sec)	LOS
Weekday AM	EB (Clinton)	LR	0.05	16.0	С	0.08	19.5	C	0.18	20.2	С
Peak Hour	NB (S. Riverside)	L	0.01	8.9	А	0.01	9.3	А	0.02	9.5	А
Weekday PM	EB (Clinton)	LR	0.05	17.3	С	0.09	21.8	С	0.15	21.8	С
Peak Hour	NB (S. Riverside)	L	0.01	8.3	А	0.01	8.5	А	0.03	8.8	А
Notes: v/c = Volume to Capacity; LOS = Level of Service EB = Eastbound, NB = Northbound; L = Left, R=Right											

	Table 2
Preliminary Level of Service	Analysis
S Riverside Avenue & Clinto	on Street

The capacity analysis was performed using methodologies based on the Highway Capacity Manual, 6th Edition (HCM 6) methodology (Synchro 11 software) to calculate existing and future traffic operating conditions (Level of Service ("LOS") and total delay) at each of the Study Area intersections. LOS is based on a grading scale of "A" through "F" with "A" representing optimum traffic conditions and "F" representing poor traffic conditions (LOS D or better is typically considered acceptable operating conditions).

A comparison of the No Build and Build analysis results indicates that all intersection movements would continue to operate at acceptable Level of Service (LOS) 'C' or better during the peak hours analyzed and there would be no degradation to unacceptable LOS E or F under 2042 Build conditions with the proposed rezoning. Therefore, due to the unlikely potential for this intersection to experience impacts with the proposed rezoning, it is proposed that the intersection of S. Riverside Avenue and Clinton Street not be included as part of the TIS study area for a quantified analysis.

B. CONCLUSION

Based on the screening outlined above, one intersection has been screened-out of quantified analysis, and the following five intersections are proposed for quantified analysis in the TIS:

- 1. Croton Point Ave. and Veterans Plaza
- 2. Croton Point Ave. and Rt. 9/9A Southbound Ramps
- 3. Croton Point Ave. and Rt. 9/9A Northbound Ramps
- 4. Croton Point Ave. and S. Riverside Ave.
- 5. S. Riverside Ave. and Benedict Blvd.

ATTACHMENT A

-Trip Generation Table from AKRF's February 25, 2022 memorandum to the Village

- Cumulative trip assignment volumes for the HSRG Overlay and LI District

Building	Zoning	Land Use		ITE Land Use	Sizo	Weeko	ay AM Pea	k Hour	Weekd	ay PM Pea	ak Hour	Saturday Midday Peak Hour			
Component	Component	Description	Code # Land Use		5120	In	Out	Total	In	Out	Total	In	Out	Total	
	HSRG	Multifamily Housing (3 story max.)	220	Multifamily Housing (Low-Rise) - Not Close to Rail Transit ⁽¹⁾	383 Units	34	108	142	117	68	185	79	78	157	
	LI TOD	Multifamily Housing (5 story max.)	221	Multifamily Housing (Mid-Rise) - Not Close to Rail Transit ⁽²⁾	87 Units	6	21	27	21	13	34	18	17	35	
Residential			470 Units	40	129	169	138	81	219	97	95	192			
					Internal Trips ⁽⁶⁾	-4	-13	-17	-14	-8	-22	-10	-9	-19	
					Mass Transit Credit (7)	-4	-11	-15	-12	-8	-20	-9	-8	-17	
_		470 Units	32	105	137	112	65	177	78	78	156				
					7.423 kSF ⁽⁸⁾	10	2	12	5	11	16	2	2	4	
		Office	712 / 710	Small Office Building (AM, PM) / General Office Building (Sat.) ⁽³⁾	Internal Trips ⁽⁶⁾	-1	0	-1	-1	-1	-2	0	0	0	
		Onice	112/110		Mass Transit Credit (7)	-1	0	-1	0	-1	-1	0	0	0	
					Total Office	8	2	10	4	9	13	2	2	4	
		Retail			7.859 kSF ⁽⁸⁾	11	8	19	26	26	52	27	25	52	
			822	Strip Retail Plaza (<40k) ⁽⁴⁾ Fine Dining Restaurant ⁽⁵⁾	Internal Trips ⁽⁶⁾	-1	-1	-2	-3	-2	-5	-3	-2	-5	
					Mass Transit Credit (7)	-1	-1	-2	-2	-3	-5	-2	-3	-5	
Commercial					Pass-by Trips ⁽⁹⁾	-2	-1	0	-7	-7	-14	-6	-5	-11	
00					Total Retail	7	5	15	14	14	28	16	15	31	
		Restaurant			6.549 kSF ⁽⁶⁾	3	2	5	34	17	51	41	29	70	
					Internal Trips (6)	0	-1	-1	-3	-2	-5	-4	-3	-7	
			931		Mass Transit Credit (/)	0	0	0	-3	-2	-5	-4	-2	-6	
					Pass-by Trips ⁽¹⁰⁾	-1	0	-1	-12	-6	-18	-19	-14	-32	
					Total Restaurant	2	1	3	16	7	23	14	10	25	
		21.831 kSF	17	8	28	34	30	64	32	27	60				
		TOTAL	TRIP GE	ENERATION		49	113	165	146	95	241	110	105	216	
Notes: [1] ITE equation T ITE equation T	Γ = 0.31(X) + 22.8 Γ = 0.43(X) + 20.5	5 (24% entering, 7 5 (63% entering, 3	6% exiting 7% exiting	:) was used for the Weekday AM Pe; ;) was used for the Weekday PM Pe;	ak Hour ak Hour				L	L	I	11	L		

ITE rate of 0.41 trips/dwelling unit (50% entering, 50% exiting) was used for the Saturday Midday Peak Hour.

(2) ITE equation T = 0.44(X) - 11.61 (23% entering, 77% exiting) was used for the Weekday AM Peak Hour

ITE equation T = 0.39(X) + 0.34 (61% entering, 39% exiting) was used for the Weekday PM Peak Hour

ITE Equation Ln(T) = 1.00 Ln(x) - 0.91 (51% entering, 49% exiting) was used for the Saturday Midday Peak Hour.

(3) ITE rate of 1.67 trips/1,000 SF (82% entering, 18% exiting) was used for the Weekday AM Peak Hour

ITE rate of 2.16 trips/1,000 SF (34% entering, 66% exiting) was used for the Weekday PM Peak Hour

ITE rate of 0.53 trips/1,000 SF (54% entering, 46% exiting) was used for the Saturday Midday Peak Hour. ITE Rates unavailable for the "Small Office Building" land use for the Saturday Midday Peak Hour, therefore, "General Office Building" land use rates were utilized instead.

(4) ITE rate of 2.36 trips/1,000 SF (60% entering, 40% exiting) was used for the Weekday AM Peak Hour

ITE rate of 6.59 trips/1,000 SF (50% entering, 50% exiting) was used for the Weekday PM Peak Hour

ITE rate of 6.57 trips/1,000 SF (51% entering, 49% exiting) was used for the Saturday Midday Peak Hour

(5) ITE rate of 0.73 trips/1,000 SF (50% entering, 50% exiting) was used for the Weekday AM Peak Hour

ITE rate of 7.80 trips/1,000 SF (67% entering, 33% exiting) was used for the Weekday PM Peak Hour

ITE rate of 10.68 trips/1,000 SF (59% entering, 41% exiting) was used for the Saturday Midday Peak Hour

(6) Internal trips calculated utilizing an internal trip credit of 10%.

(7) Mass Transit credit calculated utilizing a 10% mass transit credit.

(8) The commercial square footage was assumed to be 34% office, 36% retail, and 30% restaurant.

(9) Pass-by trip percentage of 34% utilized for the Weekday PM peak hour and 26% utilized for the Saturday Midday peak hour, based on average of pass-by trip percentages presented in the Institute of Transportation Engineers (ITE) Trip Generation Handbook, 3rd Edition for ITE Land Use Code 820 "Shopping Center". ITE Pass-by trip percentage unavailable for Land Use 820 for the Weekday AM peak hour and was developed from the ratio of Weekday AM to Weekday PM peak hour trips yielding a pass-by trip percentage of 20%.

(10) Pass-by trip percentage of 44% utilized for the Weekday PM peak hour, based on average of pass-by trip percentages presented in the Institute of

Transportation Engineers (ITE) Trip Generation Handbook, 3rd Edition for ITE Land Use Code 931 "Quality Restaurant". ITE Pass-by trip percentages unavailable for Land Use 931 for the Weekday AM and Saturday Midday peak hours and were developed from the ratio of Weekday AM and Saturday Midday to Weekday PM peak hour trips yielding pass-by trip percentages of 24% and 57% for the Weekday AM and Saturday Midday peak hours, respectively.

Source: ITE Trip Generation Manual, 11th Edition

Table 1 **Trip Generation*** Croton Zoning Study

Table A-1

Croton Zoning Cumulative Trip Assignment Summary

		HSRG	TRIPS						
INTERSECTIONS		DECIDENTIAL DE	TRES	DECIDENTIAL DE	DI IOL	COMMEDIAL DROJECT TRAFFIC			
INTERSECTIONS			AM	DM	A M	DM	A M	DM	
			Alvi	F IVI	AM	F IVI	Alvi	F IVI	
1 Croton Point Avenue & Veterans Plaza	FR	T	0	0	0	1	1	1	
1. Ciolon Foint Avenue & Velerans Flaza	ED	т	3	0	0	0	0	0	
		R	0	0	0	0	0	0	
	WR	T	32	17	2	2	4	5	
	** D	T	11	6	2	2	4	0	
		1 D	11	0	0	0	12	0	
	ND	ĸ	0	0	3	11	12	25	
	NB	L	0	0	0	0	0	0	
		Т	0	0	1	2	2	4	
		ĸ	10	28	4	1	1	2	
	SB	L	0	0	10	7	6	22	
		Т	0	0	2	1	1	4	
		R	0	0	1	0	0	1	
2. Croton Point Avenue & Route 9/9A SB Ramps	EB	Т	13	38	8	5	4	14	
		R	0	0	6	4	3	11	
	WB	L	76	39	0	0	0	0	
		Т	43	22	5	11	13	23	
	SB	L	10	28	0	0	0	0	
		Т	0	0	0	0	0	0	
		R	0	0	1	3	3	5	
3. Croton Point Av & Route 9/9A NB Ramps/Restaurant Drvwy.	EB	L	1	4	0	0	0	0	
		Т	25	60	5	3	3	9	
		R	3	1	3	2	1	5	
	WB	L	27	14	0	0	0	0	
		Т	101	56	2	5	6	11	
		R	1	4	0	0	0	0	
	NB	L	1	5	2	6	7	12	
		т	1	4	0	0	0	0	
		R	20	57	0	0	0	0	
	SB	L	5	2	0	0	0	0	
		т	3	1	0	0	0	0	
		R	9	4	0	0	0	0	
4. South Riverside Avenue/Croton Point Avenue	EB	L	43	92	5	3	2	8	
		R	9	19	1	1	0	2	
	NB	L	20	13	0	1	1	2	
		т	9	10	0	0	0	0	
	SB	т	9	10	0	0	0	0	
	~-	R	98	59	2	4	5	9	
5. South Riverside Avenue/Benedict Blvd.	EB	L	0	0	0	0	0	0	
		т	0	0	0	0	0	0	
		R	0	Ő	0	0	Ő	Ő	
	WB	Ţ	16	15	1	2	2	4	
		T	1	1	0	0	0	, O	
		R	5	8	0	0	0	0 0	
	NB	T.	4	11	0	0	0	ů 0	
	110	т	34	60	3	2	1	5	
		R	15	16	2	1	1	3	
	SR	T	8	6	0	0	0	0	
	50	т	60	43	1	3	3	5	
		P	1	2	0	0	0	0	
6 South Riverside Avenue/Clinton St	FR	T	3	2	0	0	0	0	
0. South Avenue/Ginton St.	ĽD		10	2	0	0	0	0	
	ND	к Т	19	9	0	0	0	0	
	TAD.	T	22	17	2	2	1	5	
	CP	1	33	30 25	5	2	1	5	
	515		52	35	1	3	3	5	
		к	1	3	0	0	0	0	
	The								