



Appendix F Vibration

This appendix contains additional information that supplements the vibration analysis results contained in Final Environmental Impact Statement, Section 3.7.2 Vibration. This appendix contains the following sections:

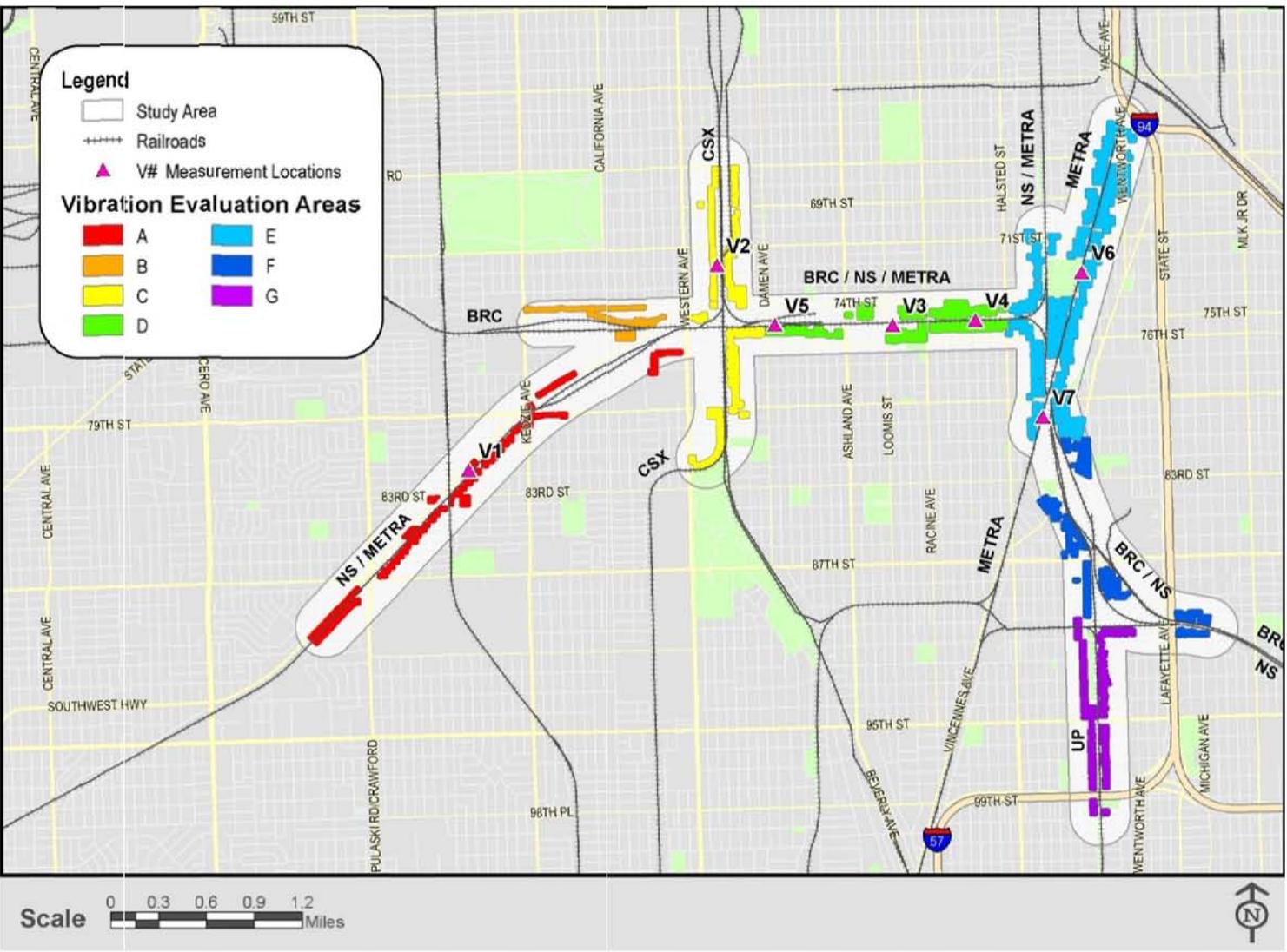
- Section 1.0 Vibration Evaluation Areas - contains a map showing the vibration evaluation areas and vibration measurement site locations in the study area
- Section 2.0 Measurement Site Photographs - contains existing vibration measurement site photographs or sketches.
- Section 3.0 Vibration Measurement Data - contains graphs summarizing the existing vibration measurement data
- Section 4.0 Detailed Vibration Impact Summary Tables - contains detailed vibration impact summary tables, including: a Summary of Locations Where No-Build Alternative Vibration Exceeds FTA Threshold table, a Build Alternative Ground-Borne Vibration Impact Summary table, a Build Alternative Ground-Borne Noise Impact Summary table, and a Summary of Locations Where Temporary Tracks Vibration Exceeds FTA Threshold table
- Section 5.0 Vibration Impact Location Maps - contains vibration impact location maps, including the Build Alternative Vibration Impact Locations, the Locations Where No-Build Alternative Vibration Exceeds FTA Threshold, and the Temporary Tracks Vibration Impact Locations

The following tables and figures are included in this appendix:

- Table 4-1 Summary of Locations Where No-Build Alternative Vibration Exceeds FTA Threshold
- Table 4-2 Build Alternative Ground-Borne Vibration Impact Summary
- Table 4-3 Build Alternative Ground-Borne Noise Impact Summary
- Table 4-4 Summary of Locations Where Temporary Tracks Vibration Exceeds FTA Threshold
- Figure 1-1 Vibration Evaluation Areas
- Figures 2-1 through 2-7 Vibration Measurement Site Photographs or Sketches
- Figure 3-1 Ground-Borne Vibration from Metra Trains at 20 mph
- Figure 3-2 Ground-Borne Vibration from Metra Trains on Viaduct at 20 mph
- Figure 3-3 Ground-Borne Vibration from Freight Trains at 20 mph
- Figures 5-1 through 5-36 Build Alternative Vibration Impact Locations
- Figures 5-37 through 5-48 Locations Where No-Build Alternative Vibration Exceeds FTA Threshold
- Figures 5-49 through 5-50 Temporary Tracks Vibration Impact Locations



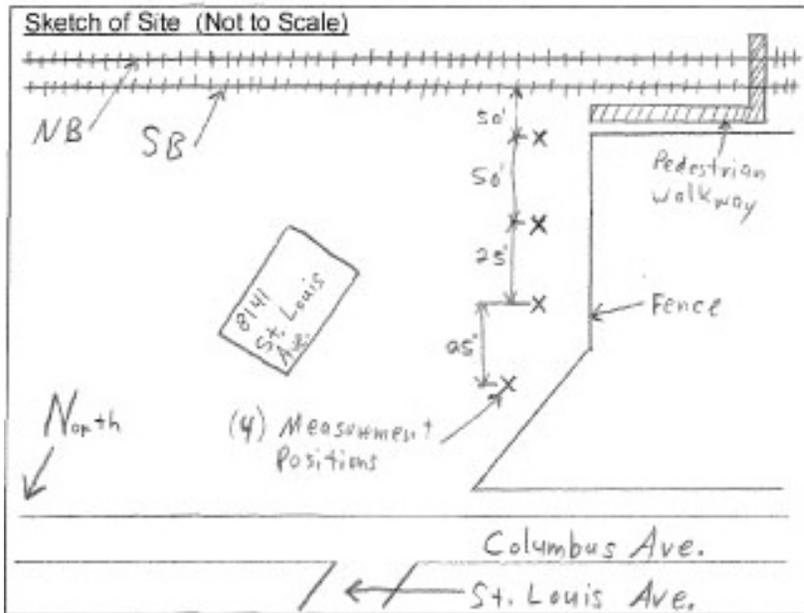
1.0 Vibration Evaluation Areas



Source: Harris Miller Miller & Hanson Inc., 2012

Figure 1-1: Vibration Evaluation Areas

2.0 Measurement Site Photographs



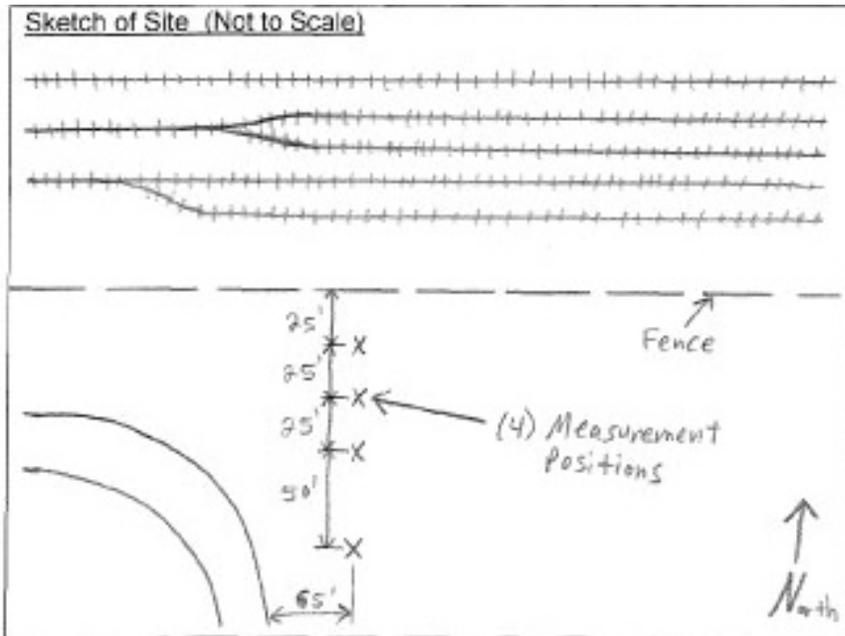
Source: Harris Miller Miller & Hanson Inc., 2012

Figure 2-1: Vibration Measurement Site V1 (No Photo Available)



Source: Harris Miller Miller & Hanson Inc., 2012

Figure 2-2: Vibration Measurement Site V2



Source: Harris Miller Miller & Hanson Inc., 2012

Figure 2-3: Vibration Measurement Site V3 (No Photo Available)



Source: Harris Miller Miller & Hanson Inc., 2012

Figure 2-4: Vibration Measurement Site V4



Source: Harris Miller Miller & Hanson Inc., 2012

Figure 2-5: Vibration Measurement Site V5



Source: Harris Miller Miller & Hanson Inc., 2012

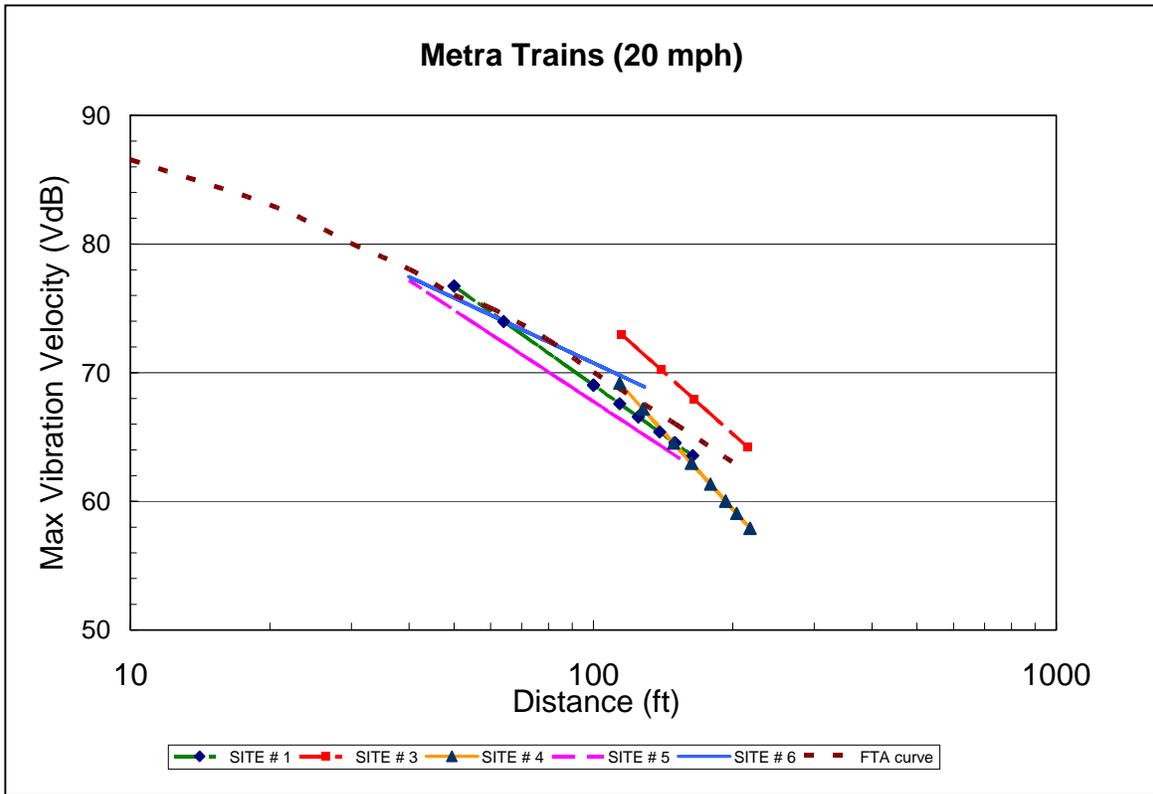
Figure 2-6: Vibration Measurement Site V6



Source: *Harris Miller Miller & Hanson Inc., 2012*

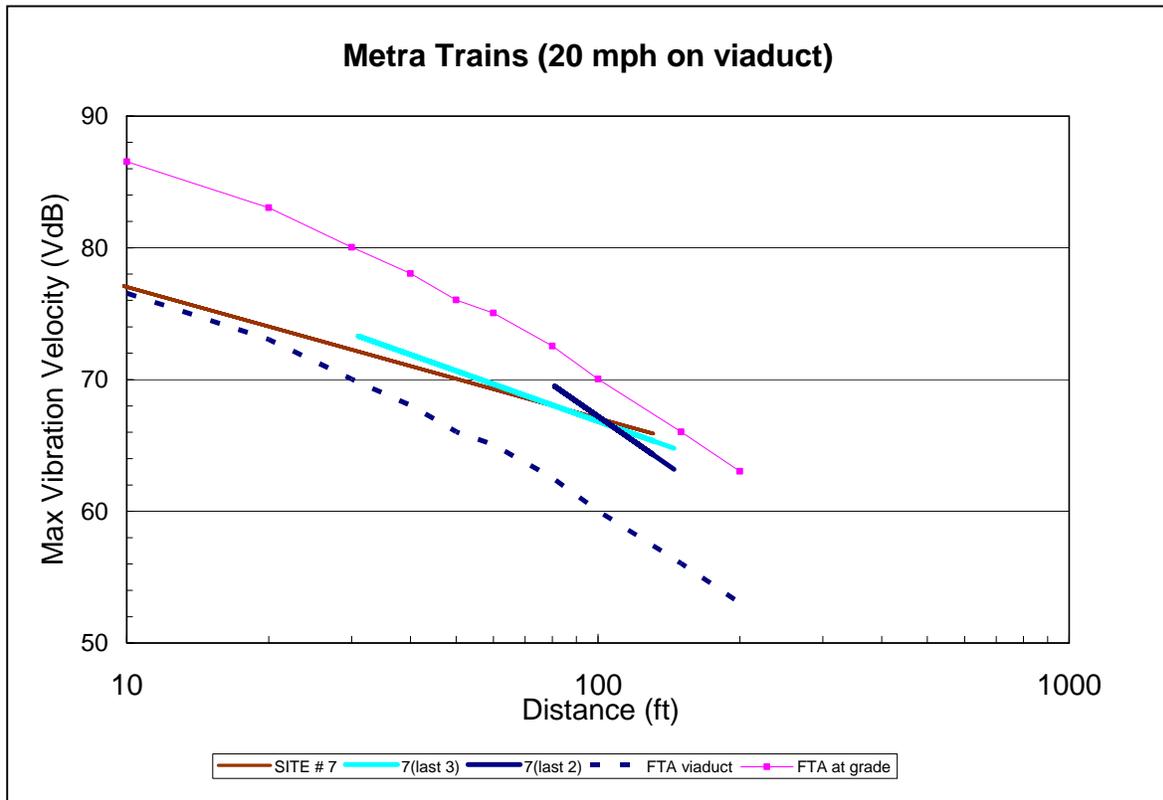
Figure 2-7: Vibration Measurement Site V7

3.0 Vibration Measurement Data



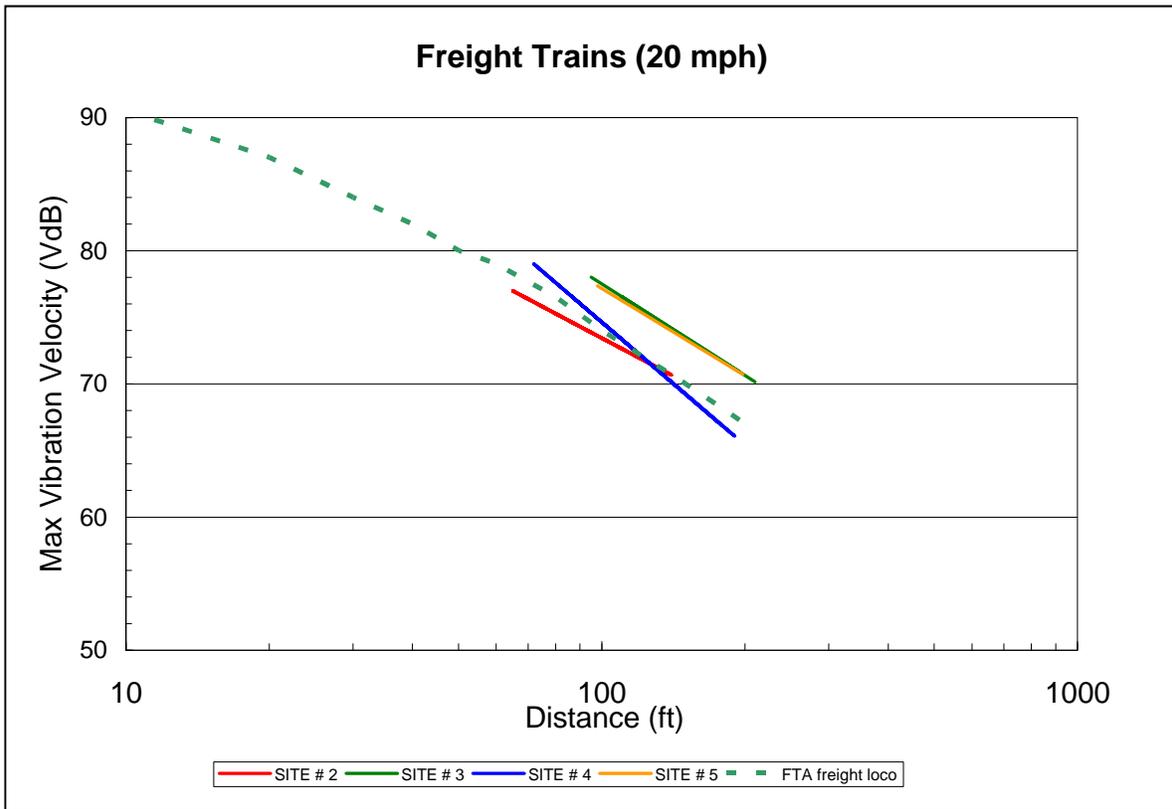
Source: Harris Miller Miller & Hanson Inc., 2012

Figure 3-1: Ground-Borne Vibration from Metra Trains at 20 mph



Source: Harris Miller Miller & Hanson Inc., 2012

Figure 3-2: Ground-Borne Vibration from Metra Trains on Viaduct at 20 mph



Source: Harris Miller Miller & Hanson Inc., 2012

Figure 3-3: Ground-Borne Vibration from Freight Trains at 20 mph



4.0 Detailed Vibration Impact Summary Tables

Table 4-1: Summary of Locations Where No-Build Alternative Vibration Exceeds FTA Threshold

Vibration Eval. Area	Location	Dist to Nearest Track (ft) ¹	GBV Threshold (VdB)	Max GBV Level (VdB) ¹	# Above GBV Threshold	GBN Threshold (dBA)	Max GBN Level (dBA)	# Above GBN Threshold
A	W 87th St to W 83rd St	26 to 43	72 to 75	N/A	0	35 to 40	36 to 42	2 res.
A	W 83rd St to S Kedzie Ave	59 to 79	72 to 75	N/A	0	35 to 40	36 to 42	1 res. 1 day care
C	S Western Ave to W 79th St	106 to 133	72 to 75	72 to 73	6 res.	35 to 40	N/A	0
C	W 71st St to W 67th St	64 to 113	72 to 75	74 to 80	22 res.	35 to 40	N/A	0
E	W 81st St to W 78th St	83 to 105	72 to 75	N/A	0	35 to 40	37 to 38	2 res.
E	W 78th St to W 76th St	45 to 70	72 to 75	N/A	0	35 to 40	36 to 40	7 res.
E	W 76th St to W 74th St	53 to 71	72 to 75	N/A	0	35 to 40	35 to 36	5 res.
E	W 74th St to W 70th St – Metra Tracks	22 to 64	72 to 75	N/A	0	35 to 40	35 to 43	17 res.
E	W 70th St to W 65th St	32 to 54	72 to 75	N/A	0	35 to 40	36 to 41	18 res.
F	W 90th St to W 86th St	36	72 to 75	N/A	0	35 to 40	35 to 35	5 res.
Total Above Ground-Borne Vibration (GBV) Threshold					28 res.			
Total Above Ground-Borne Noise (GBN) Threshold								57 res. 1 day care

¹ For each location, a range is provided.

Source: Harris Miller Miller & Hanson Inc., 2012.

Note : The locations of these sites are shown on Figures 5-37 through 5-48. In some instances, because of the scale of the figures, a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Table 4-2: Build Alternative Ground-Borne Vibration Impact Summary

Vibration Evaluation Area	Location	Dist to Nearest Track (ft) ¹	GBV Impact Criteria (VdB) ¹	Max Existing GBV Level (VdB) ¹	Max No-Build GBV Level (VdB) ¹	Max Build GBV Level (VdB) ¹	Increase Build over Existing GBV Level (VdB) ¹	GBV Impacts
A	W 90th Pl to W 87th St	0	72 to 75	77 to 80	77 to 80	76 to 80	-1 to 0	0
A	W 87th St to W 83rd St	0	72 to 75	72 to 93	72 to 92	72 to 93	0	0
A	W 83rd St to S Kedzie Ave	84 to 186	72 to 75	67 to 92	67 to 92	72 to 88	-4 to 8	22 res.
A	S Kedzie Ave to S Western Ave	175 to 185	72 to 75	71 to 77	71 to 77	72 to 78	1 to 2	6 res.
B	S Kedzie Ave to S Western Ave	31 to 133	72 to 75	71 to 84	71 to 84	72 to 84	-1 to 2	21 res.
C	S Western Ave to W 79th St	120	72 to 75	72 to 73	72 to 73	72 to 74	0	2 res.
C	W 79th St to Forest Hill Junction	101 to 194	72 to 75	71 to 79	71 to 79	72 to 82	0 to 6	32 res.
C	Forest Hill Junction to W 71st St	0	72 to 75	0	0	0	0	0
C	W 71st St to W 67th St	63 to 112	72 to 75	73 to 80	74 to 80	73 to 87	-1 to 7	10 res.
D	S Damen Ave to S Ashland Ave	72 to 175	72 to 75	71 to 82	71 to 82	73 to 83	1 to 2	29 res. 1 church
D	S Ashland Ave to S Racine Ave	87 to 197	72 to 75	70 to 72	70 to 73	72 to 81	1 to 9	12 res. 1 library
D	S Racine Ave to S Halsted St	81 to 197	72 to 75	66 to 79	66 to 79	72 to 78	-1 to 9	48 res.
E	W 81st St to W 78th St	93	72 to 75	68 to 88	68 to 88	72 to 85	-6 to 6	5 res.
E	W 78th St to W 76th St	104 to 135	72 to 75	68 to 90	69 to 90	72 to 90	-1 to 6	43 res.
E	W 76th St to W 74th St	66 to 235	72 to 75	72 to 88	71 to 86	72 to 86	-2 to 2	50 res.
E	Wye Connection - S Halsted St south to W 76th St	29 to 69	72 to 75	70 to 74	70 to 76	75 to 83	5 to 9	5 res.
E	Wye Connection -	0	72 to 75	0	0	0	0	1 res.



Vibration Evaluation Area	Location	Dist to Nearest Track (ft) ¹	GBV Impact Criteria (VdB) ¹	Max Existing GBV Level (VdB) ¹	Max No-Build GBV Level (VdB) ¹	Max Build GBV Level (VdB) ¹	Increase Build over Existing GBV Level (VdB) ¹	GBV Impacts
	S Halsted St north to W 74th St							
E	W 74th St to W 70th St – Metra tracks	23 to 236	72 to 75	72 to 95	70 to 93	72 to 93	-2 to 6	99 res. 1 church
E	W 74th St to W 70th St – NS tracks	153 to 183	72 to 75	69 to 84	69 to 84	72 to 85	1 to 3	12 res.
E	W 70th St to W 65th St	33 to 207	72 to 75	74 to 93	72 to 91	72 to 90	-3 to -1	204 res. 1 hospital 1 school
F	Dan Ryan Expressway to S Indiana Ave	0	72 to 75	0	0	0	0	0
F	W 90th St to W 86th St	74 to 136	72 to 75	67 to 79	67 to 79	72 to 77	-1 to 6	21 res.
F	W 86th St to W 81st St	77 to 136	72 to 75	72 to 81	72 to 81	72 to 84	-9 to 4	29 res.
G	W 100th St to W 95th St	65 to 134	72 to 75	72 to 80	72 to 80	72 to 80	0	14 res.
G	W 95th St to W 90th St	81 to 129	72 to 75	73 to 78	73 to 78	73 to 85	0 to 8	84 res. 1 church
Total Ground-Borne Vibration (GBV) Impacts								749 res. 1 library 3 churches 1 school 1 hospital

¹ For each location, a range is provided.

Source: Harris Miller Miller & Hanson Inc., 2012.

Note: The locations of these impacted sites are shown on Figures 5-1 through 5-36. In some instances, because of the scale of the figures, a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Table 4-3: Build Alternative Ground-Borne Noise Impact Summary

Vibration Evaluation Area	Location	Dist to Nearest Track (ft) ¹	GBN Impact Criteria (VdB) ¹	Max Existing GBN Level (VdB) ¹	Max No-Build GBN Level (VdB) ¹	Max Build GBN Level (VdB) ¹	Increase Build over Existing GBN Level (VdB) ¹	GBN Impacts
A	W 90th Pl to W 87th St	0	35 to 40	0	0	0	0	0
A	W 87th St to W 83rd St	25 to 87	35 to 40	35 to 43	36 to 42	36 to 43	0 to 1	3 res.
A	W 83rd St to S Kedzie Ave	70 to 84	35 to 40	36 to 42	36 to 42	38 to 38	2 to 5	2 res.
A	S Kedzie Ave to S Western Ave	0	35 to 40	0	0	0	0	0
B	S Kedzie Ave to S Western Ave	0	35 to 40	0	0	0	0	0
C	S Western Ave to W 79th St	0	35 to 40	0	0	0	0	0
C	W 79th St to Forest Hill Junction	0	35 to 40	0	0	0	0	0
C	Forest Hill Junction to W 71st St	0	35 to 40	0	0	0	0	0
C	W 71st St to W 67th St	63	35 to 40	0	0	37	7	2 res.
D	S Damen Ave to S Ashland Ave	0	35 to 40	0	0	0	0	0
D	S Ashland Ave to S Racine Ave	0	35 to 40	0	0	0	0	0
D	S Racine Ave to S Halsted St	0	35 to 40	0	0	0	0	0
E	W 81st St to W 78th St	0	35 to 40	37 to 38	37 to 38	0	0	0
E	W 78th St to W 76th St	45 to 70	35 to 40	36 to 40	36 to 40	35 to 40	0	7 res.
E	W 76th St to W 74th St	66 to 68	35 to 40	35 to 38	35 to 36	36	-2	3 res.
E	Wye Connection - S Halsted St south to W 76th St	0	35 to 40	0	0	0	0	0
E	Wye Connection - S Halsted St north to W 74th St	0	35 to 40	0	0	0	0	0
E	W 74th St to W 70th St – Metra tracks	23 to 87	35 to 40	36 to 45	35 to 43	35 to 43	-2 to 6	27 res.
E	W 74th St to W 70th St – NS tracks	63 to 63	35 to 40	0	0	35 to 35	1 to 1	6 res.
E	W 70th St to W 65th St	33 to 62	35 to 40	35 to 43	36 to 41	35 to 40	-3 to -1	19 res.
F	Dan Ryan Expressway to S Indiana Ave	0	35 to 40	0	0	0	0	0
F	W 90th St to W 86th St	0	35 to 40	35	35	0	0	0



Vibration Evaluation Area	Location	Dist to Nearest Track (ft) ¹	GBN Impact Criteria (VdB) ¹	Max Existing GBN Level (VdB) ¹	Max No-Build GBN Level (VdB) ¹	Max Build GBN Level (VdB) ¹	Increase Build over Existing GBN Level (VdB) ¹	GBN Impacts
F	W 86th St to W 81st St	0	35 to 40	0	0	0	0	0
G	W 100th St to W 95th St	0	35 to 40	0	0	0	0	0
G	W 95th St to W 90th St	83	35 to 40	0	0	35	8	8 res.
Total Ground-Borne Noise (GBN) Impacts								77 res.

¹ For each location, a range is provided.

Source: Harris Miller Miller & Hanson Inc., 2012.

Note: The locations of these impacted sites are shown on Figures 5-1 through 5-36. In some instances, because of the scale of the figures, a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Table 4-4: Summary of Locations Where Temporary Tracks Vibration Exceed FTA Threshold

Vibration Evaluation Area	Location	Dist to Nearest Track (ft) ¹	GBV Impact Criteria (VdB)	Max GBV Level (VdB) ¹	Increase GBV Level (VdB) ¹	Residences	GBN Impact Criteria (dBA)	Max GBN Level (dBA)	Increase GBN Level (dBA) ¹	Residences
C	W 79th St to Forest Hill Junction	87 to 136	72	72 to 77	4 to 8	28 res.	35	N/A	N/A	0
C	Forest Hill Junction to W 71st St	80 to 133	72	72 to 86	6 to 18	20 res.	35	36	17 to 18	2 res.
Total Above FTA Threshold for Ground-Borne Vibration (GBV)						48 res.				
Total Above FTA Threshold for Ground-Borne Noise (GBN)										2 res.

¹ For each location, a range is provided.

Source: Harris Miller Miller & Hanson Inc., 2012.

Note: The locations of these sites are shown on Figures 5-49 through 5-50. In some instances, because of the scale of the figures, a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

5.0 Vibration Impact Location Maps



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-1: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-2: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-3: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

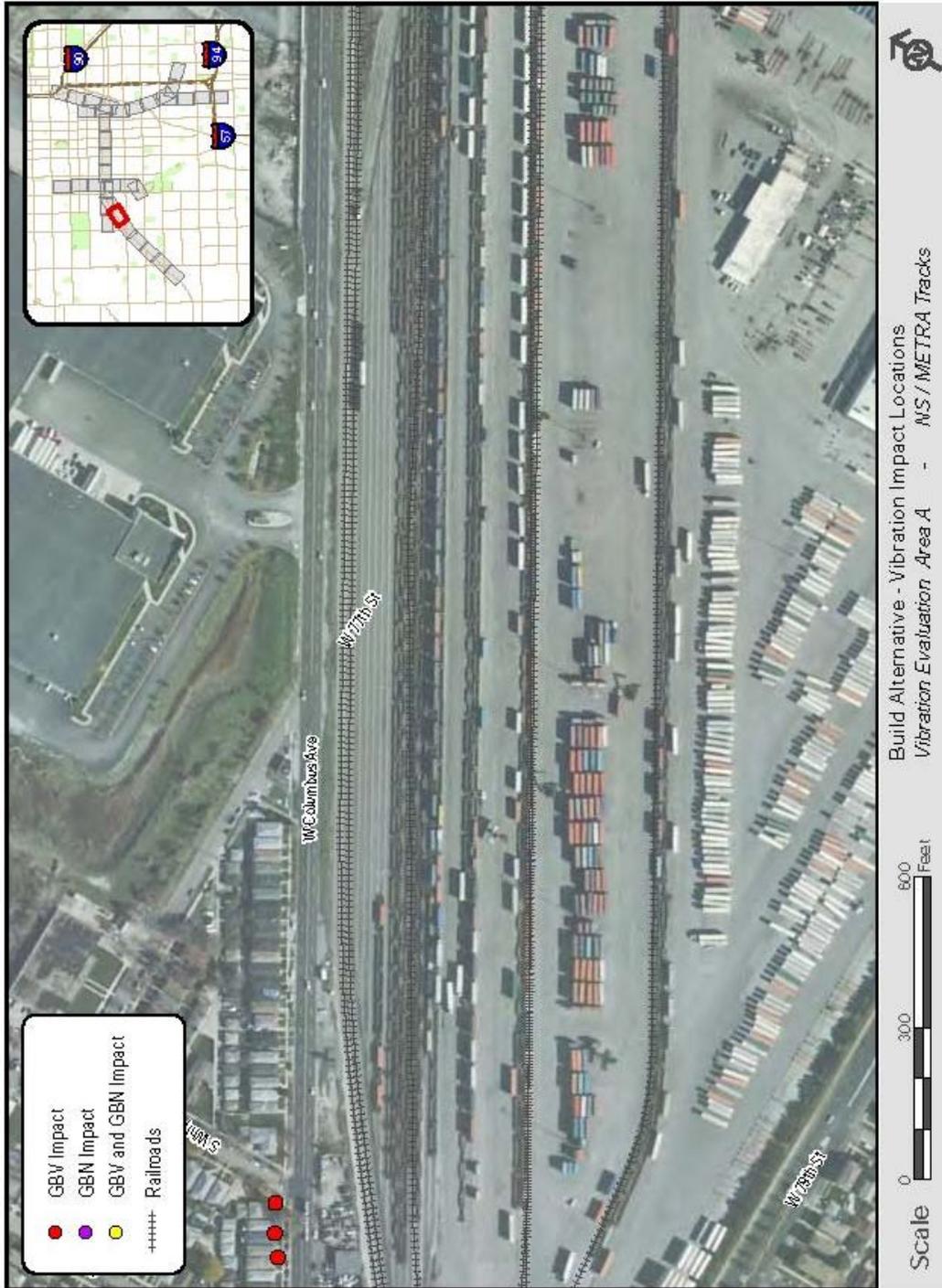
Figure 5-4: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-5: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

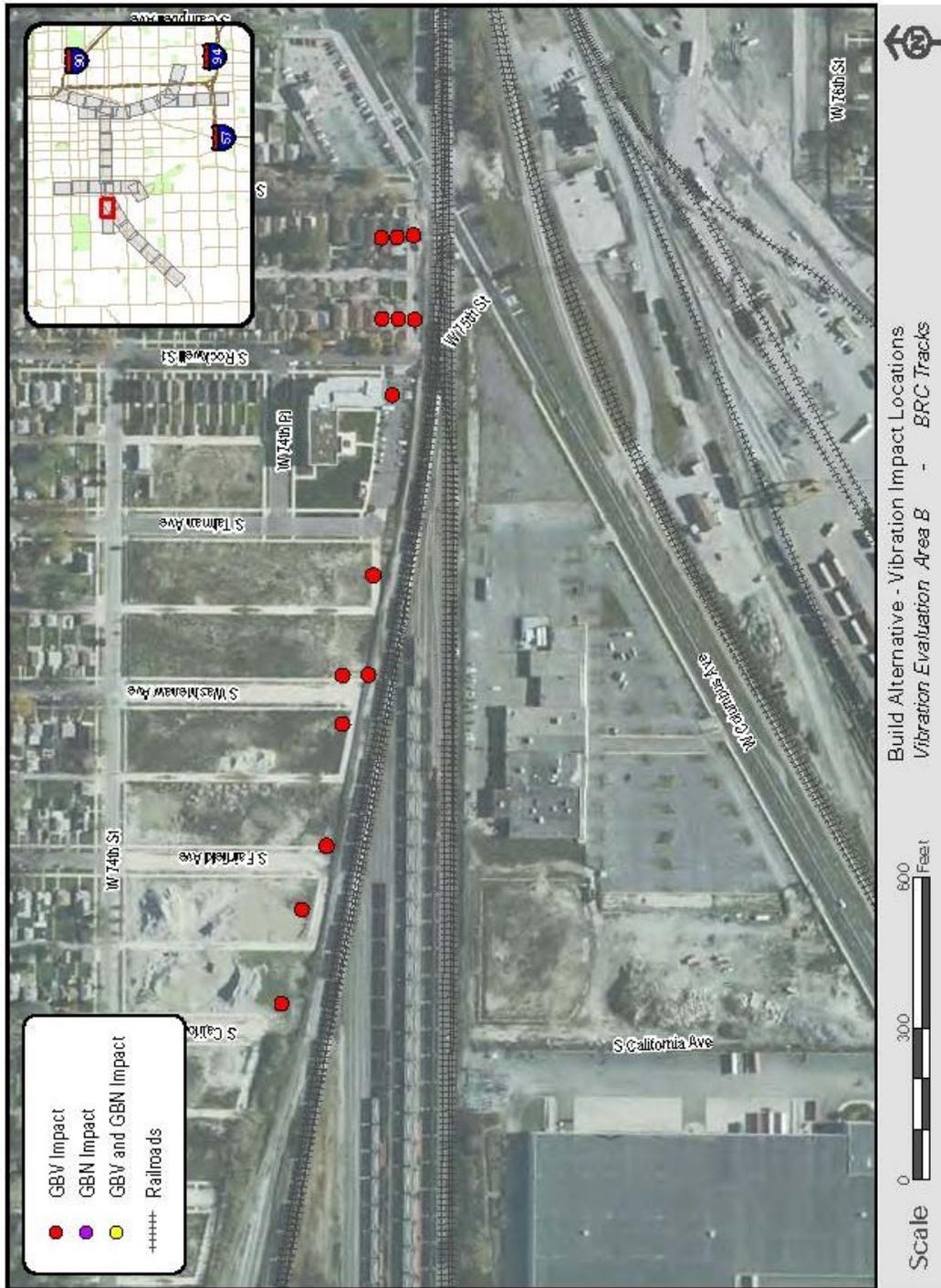
Figure 5-6: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

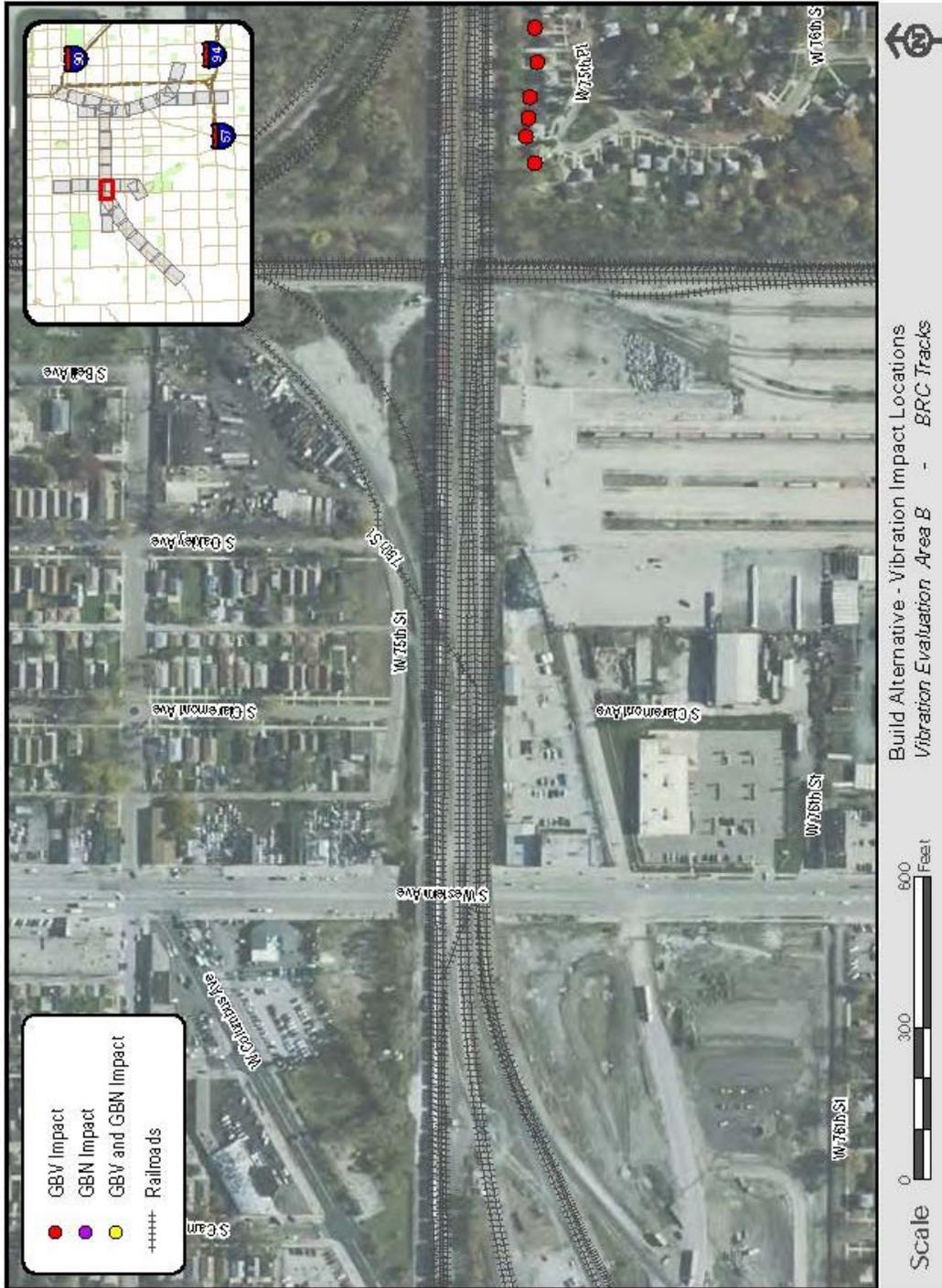
Figure 5-8: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-9: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

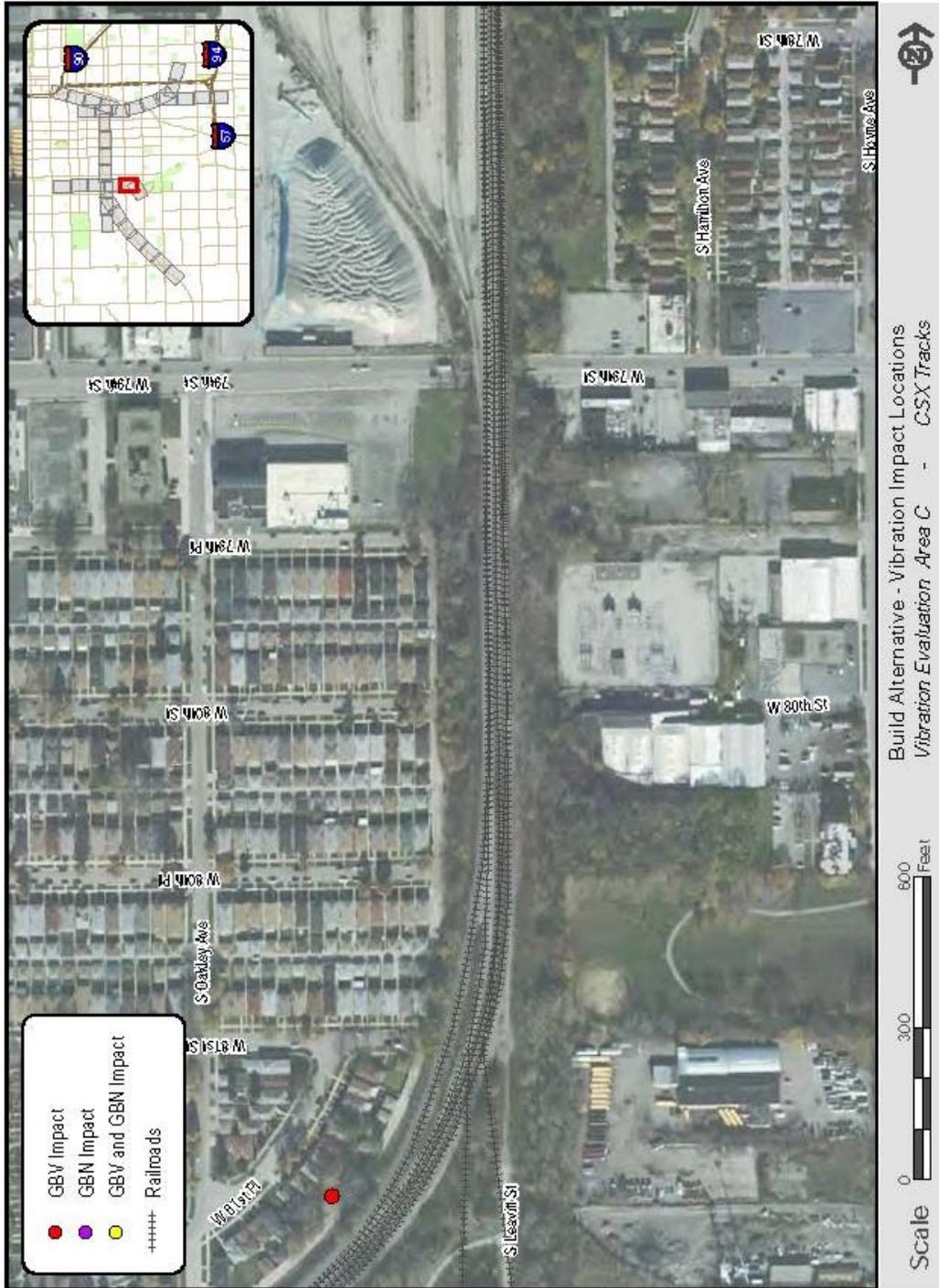
Figure 5-10: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-11: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-12: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

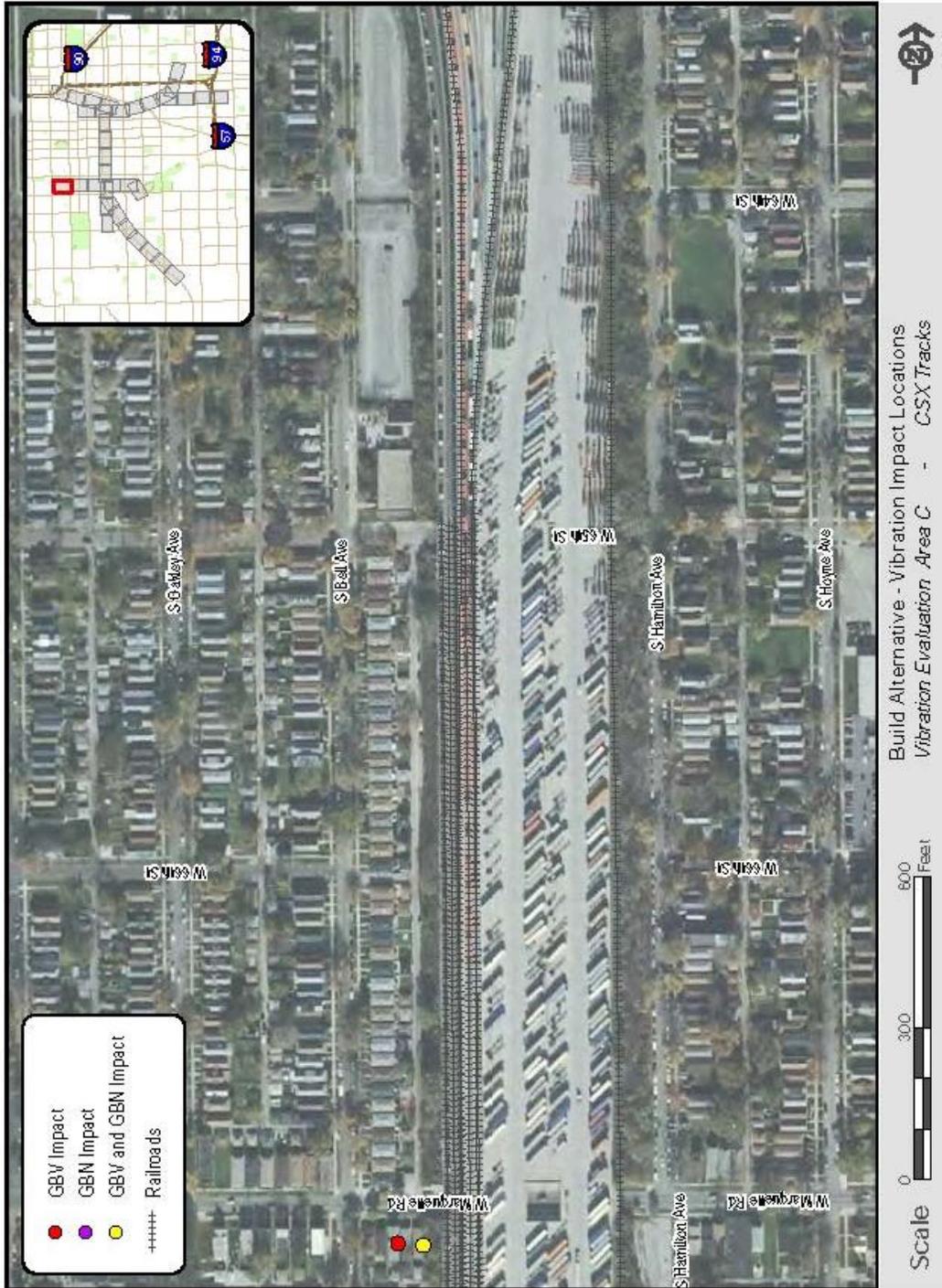
Figure 5-14: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-15: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

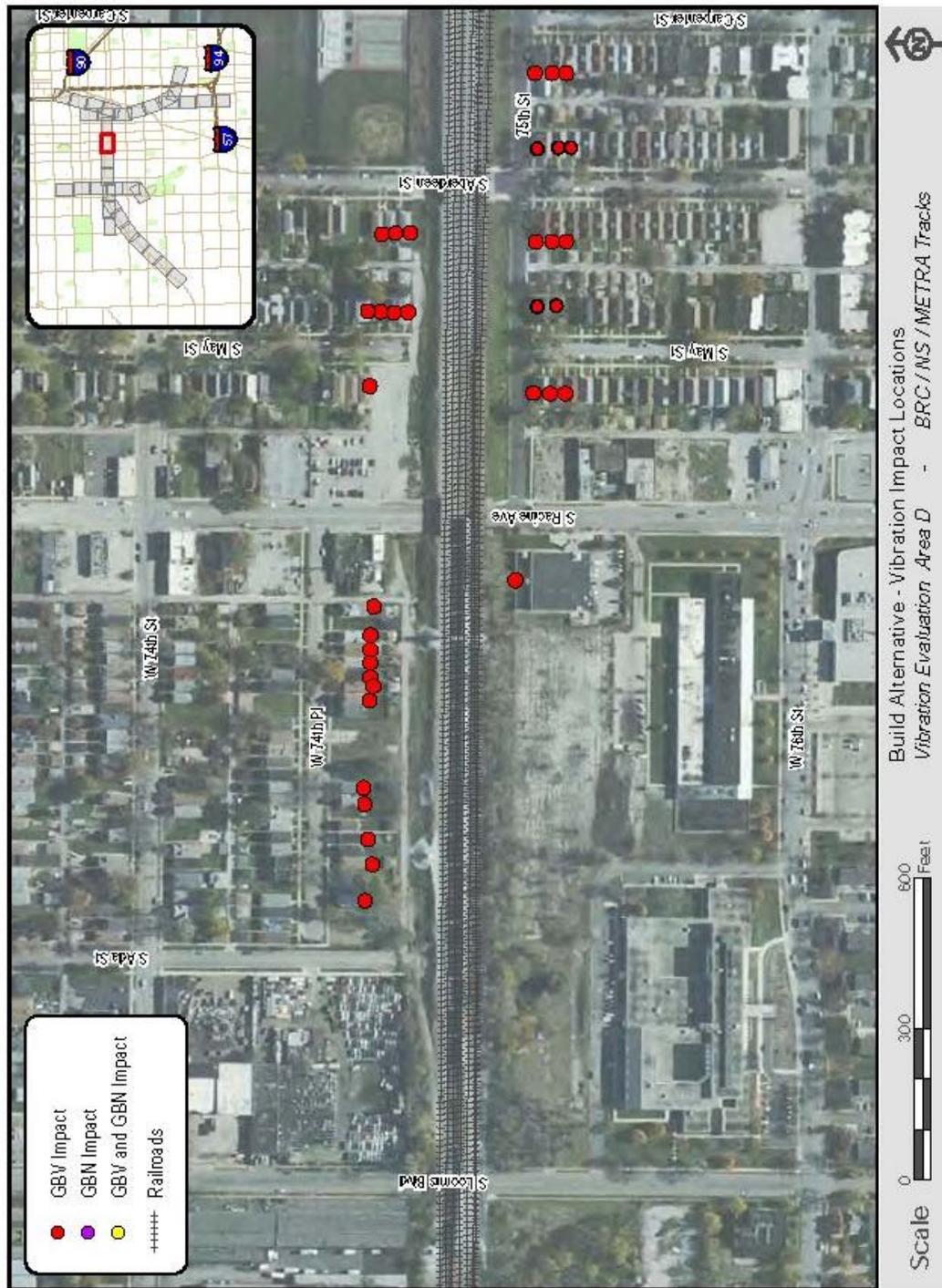
Figure 5-16: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

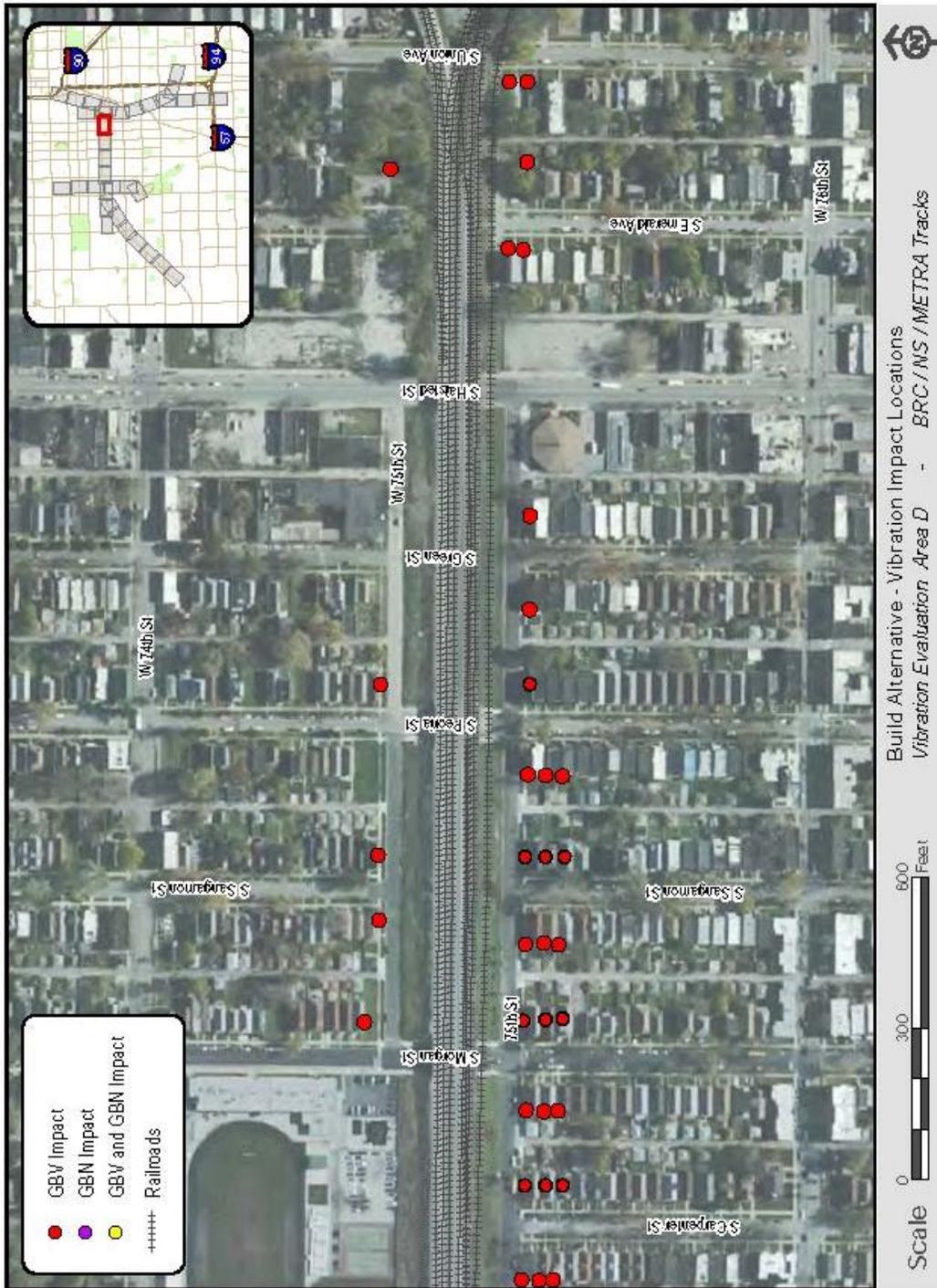
Figure 5-18: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

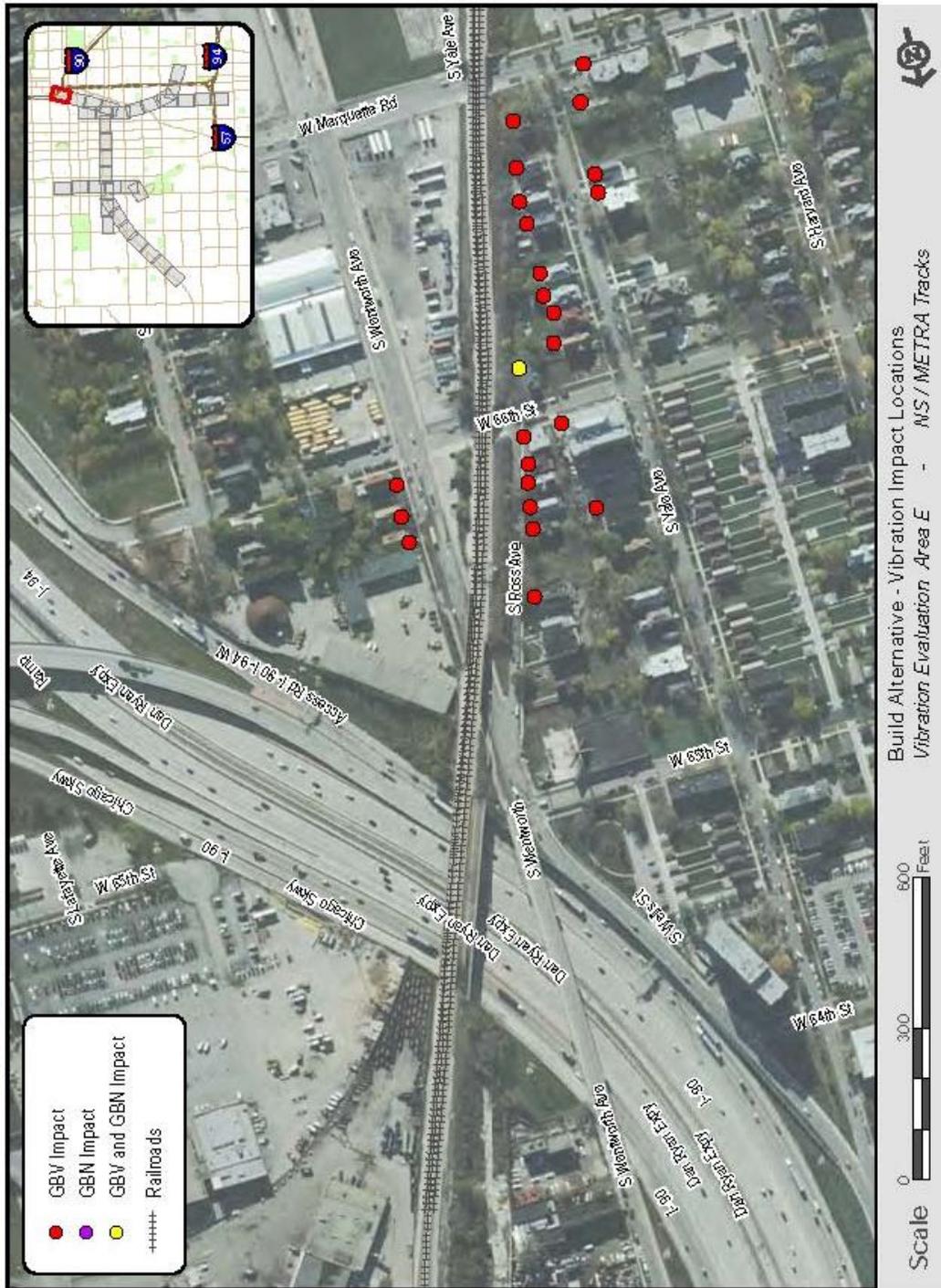
Figure 5-19: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

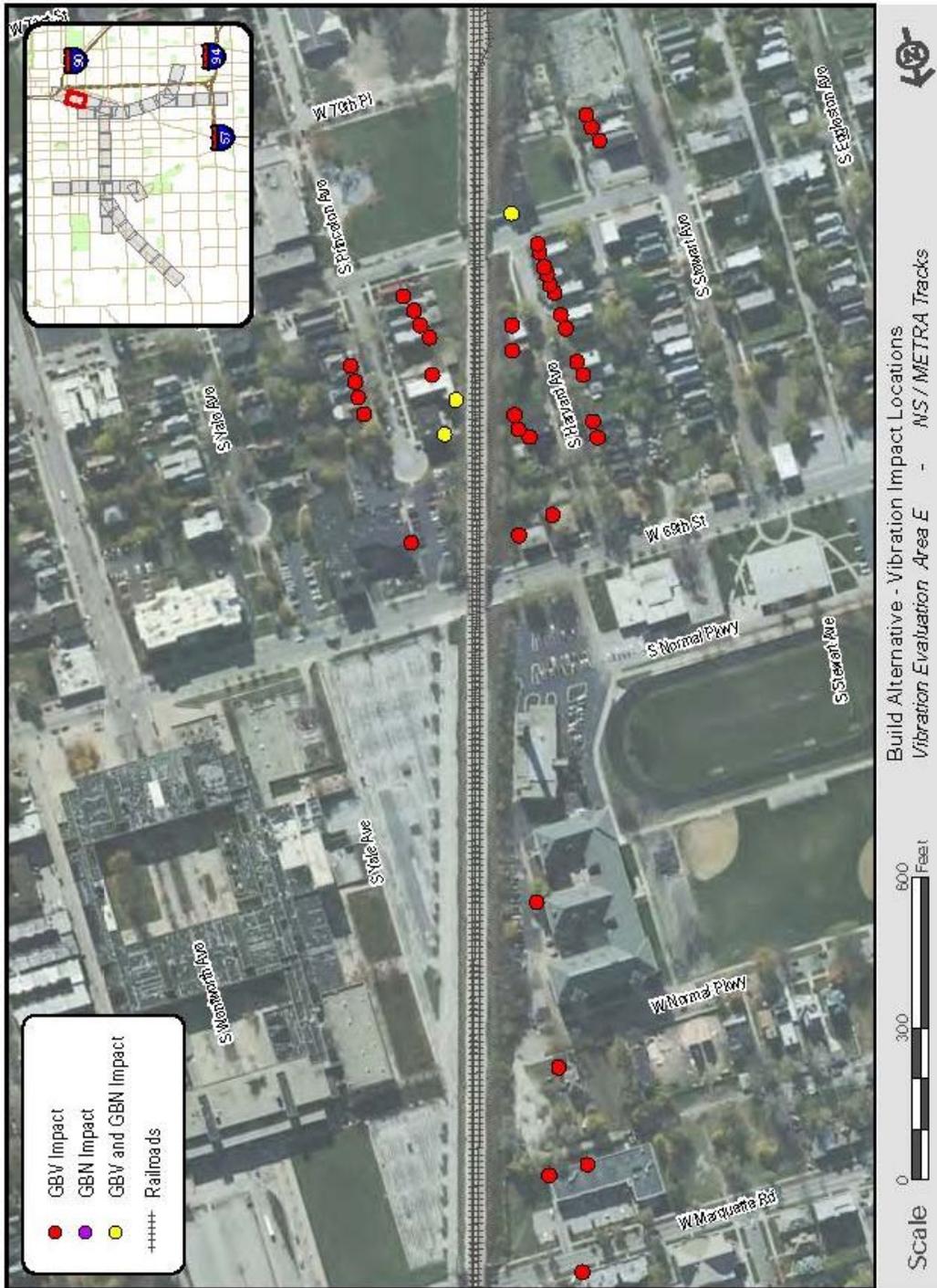
Figure 5-20: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-21: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-22: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-23: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

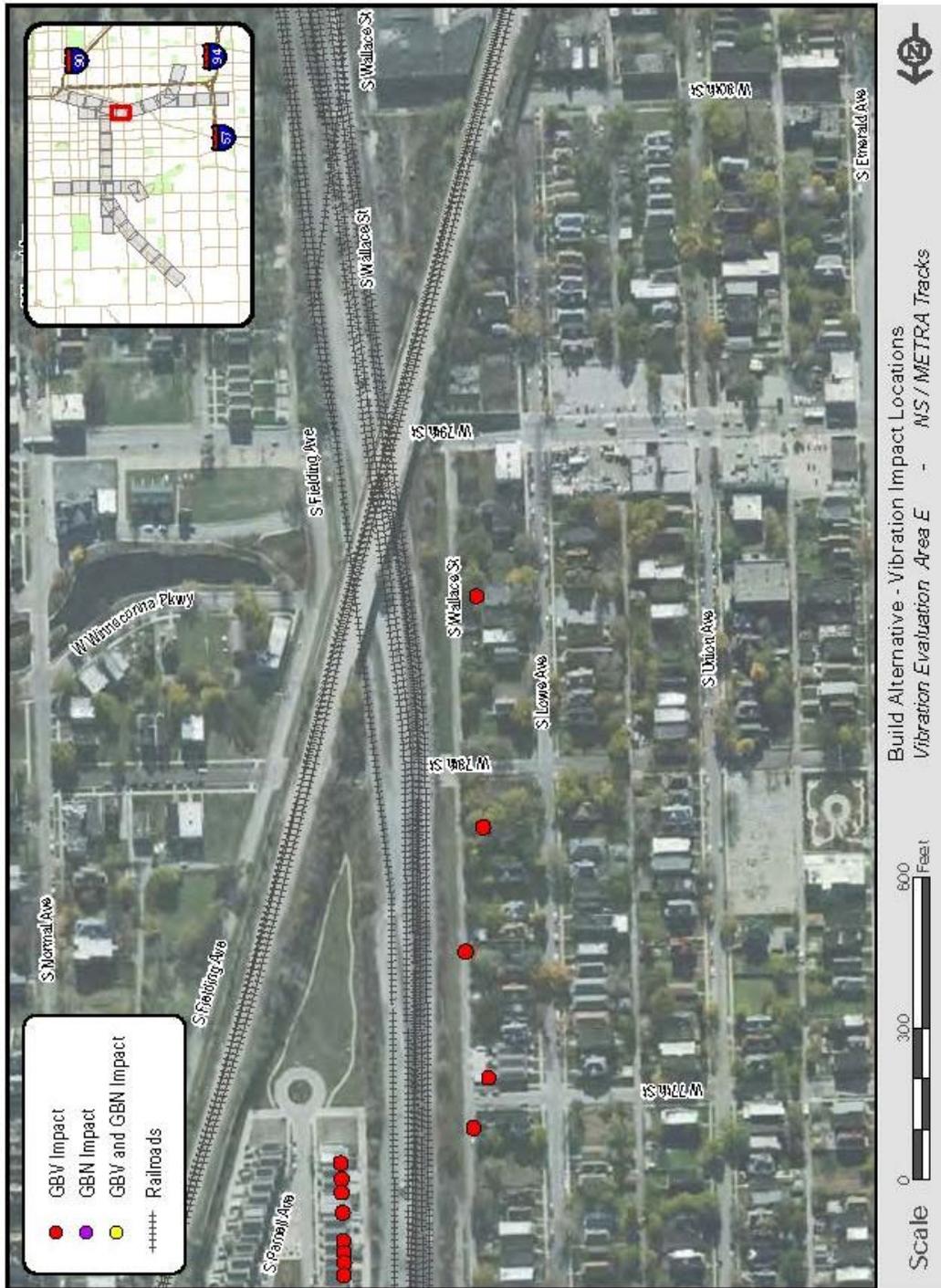
Figure 5-24: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

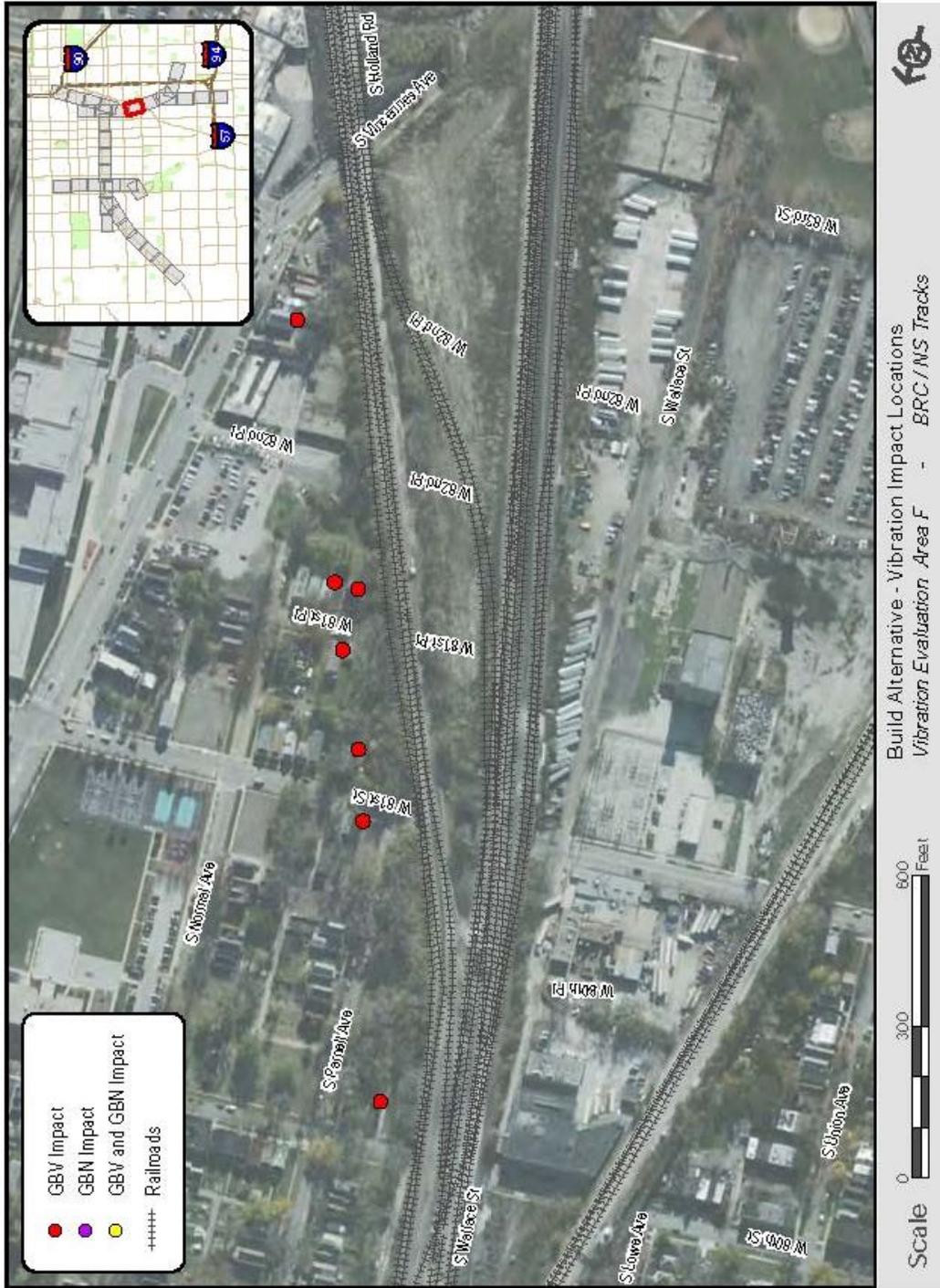
Figure 5-25: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-27: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

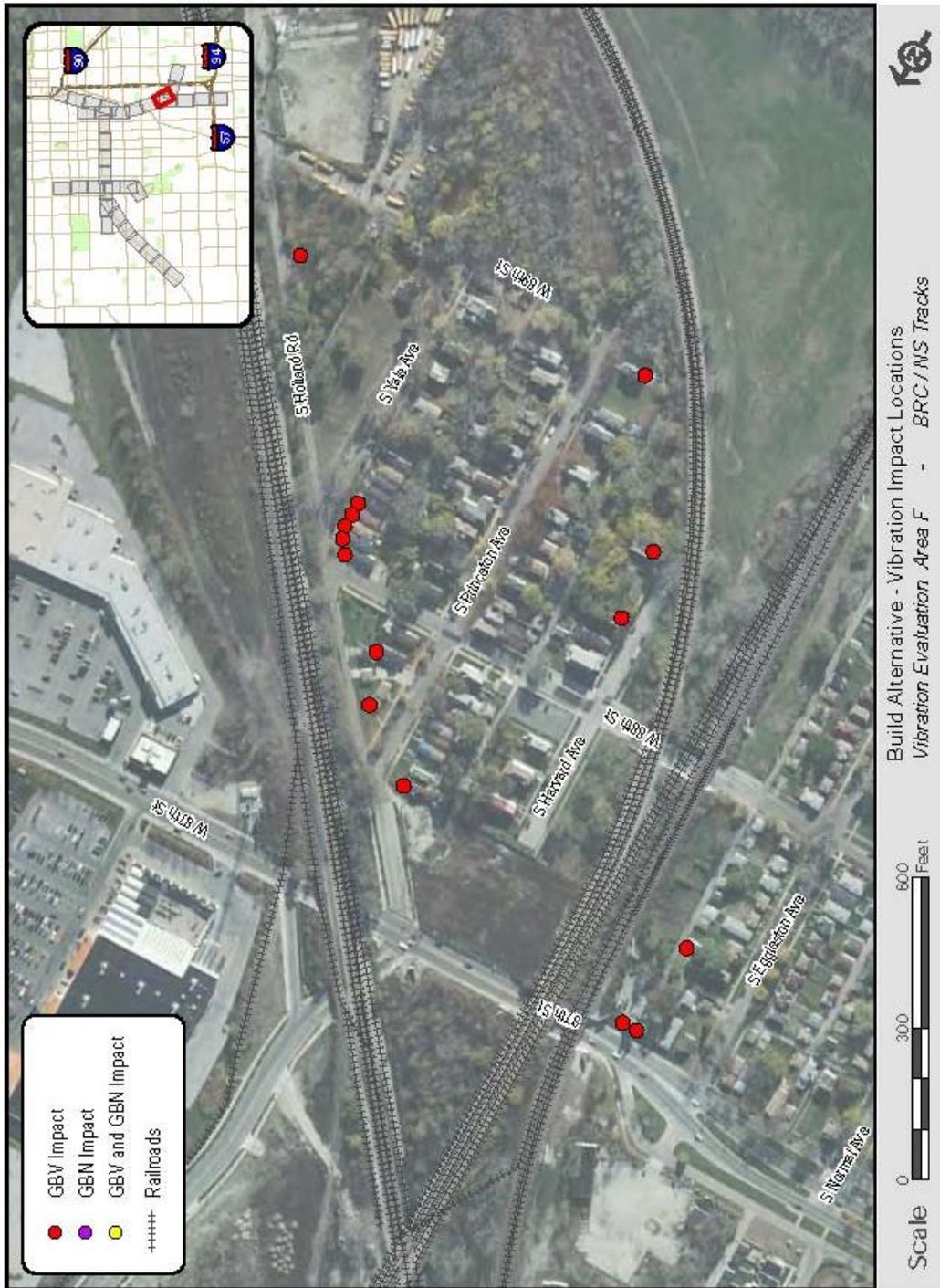
Figure 5-28: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

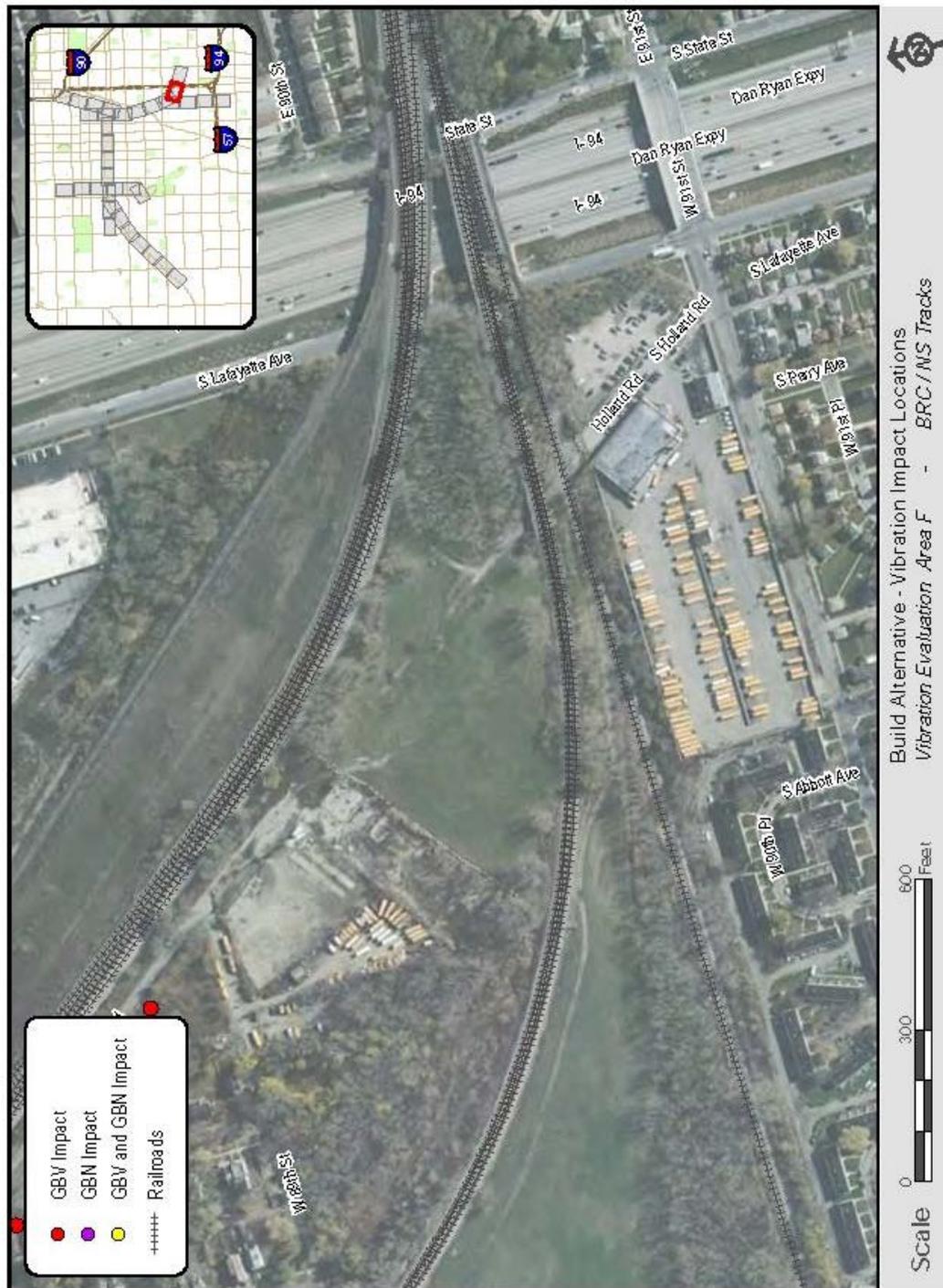
Figure 5-29: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-30: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-31: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

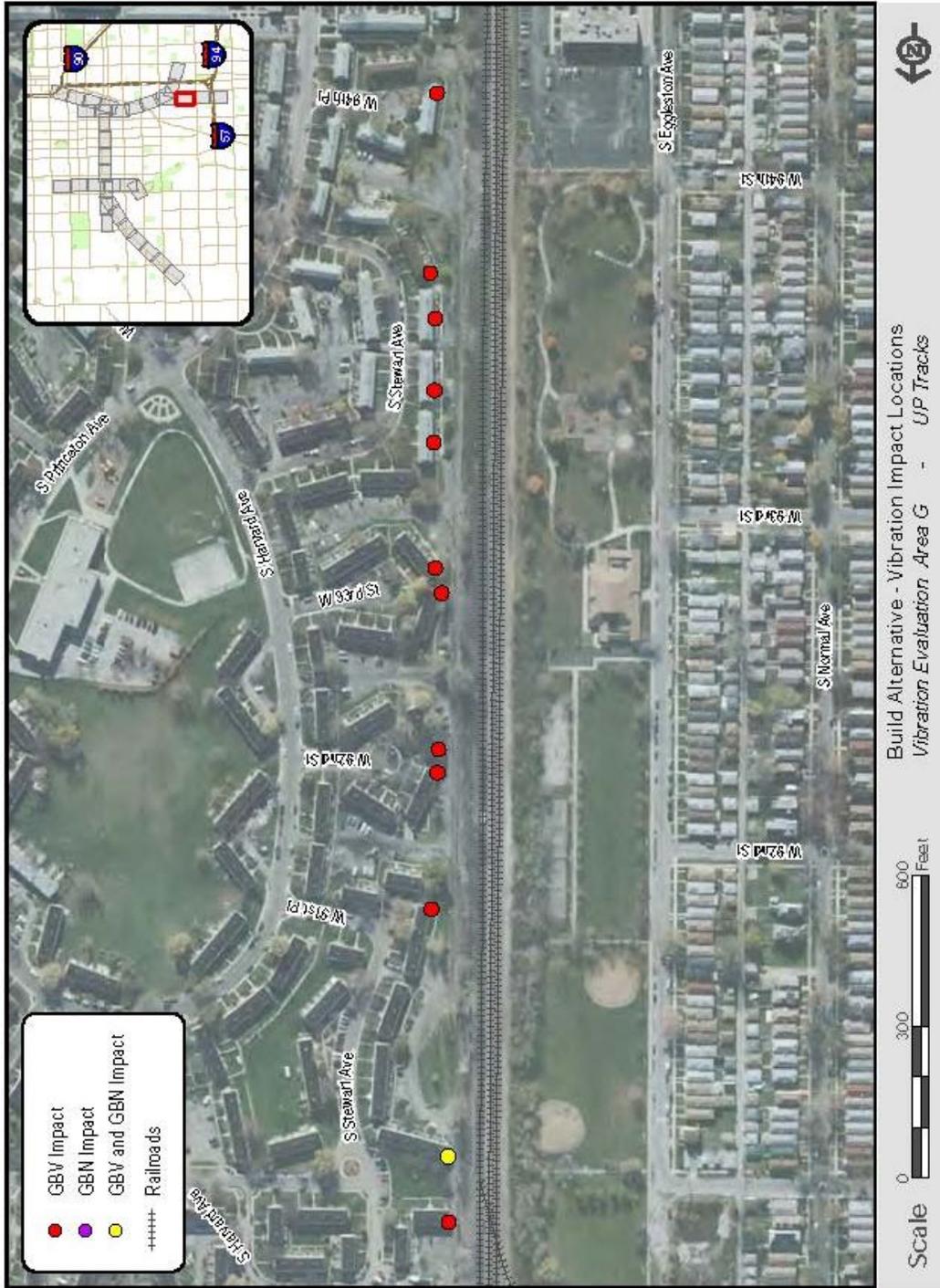
Figure 5-32: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

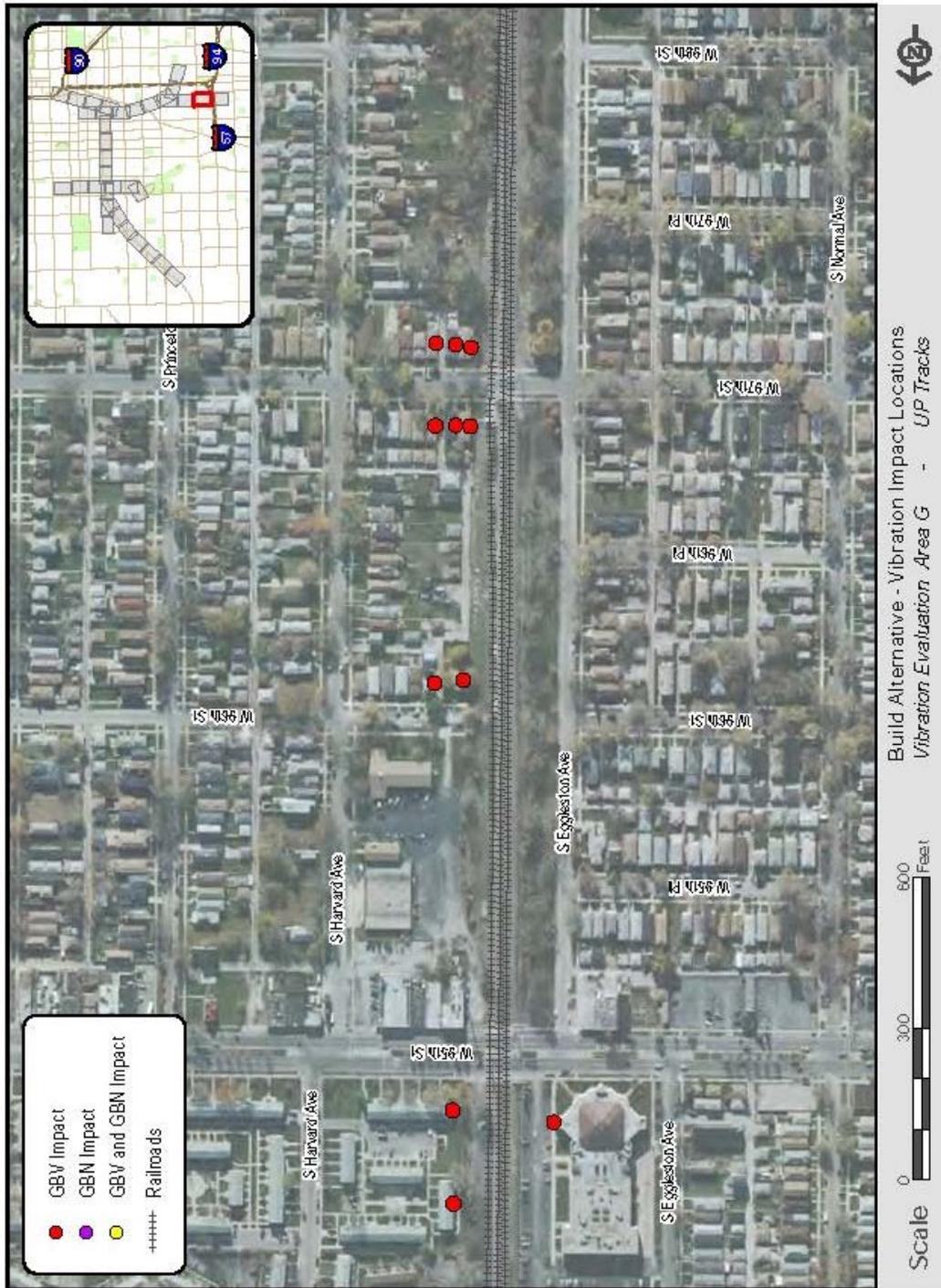
Figure 5-33: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

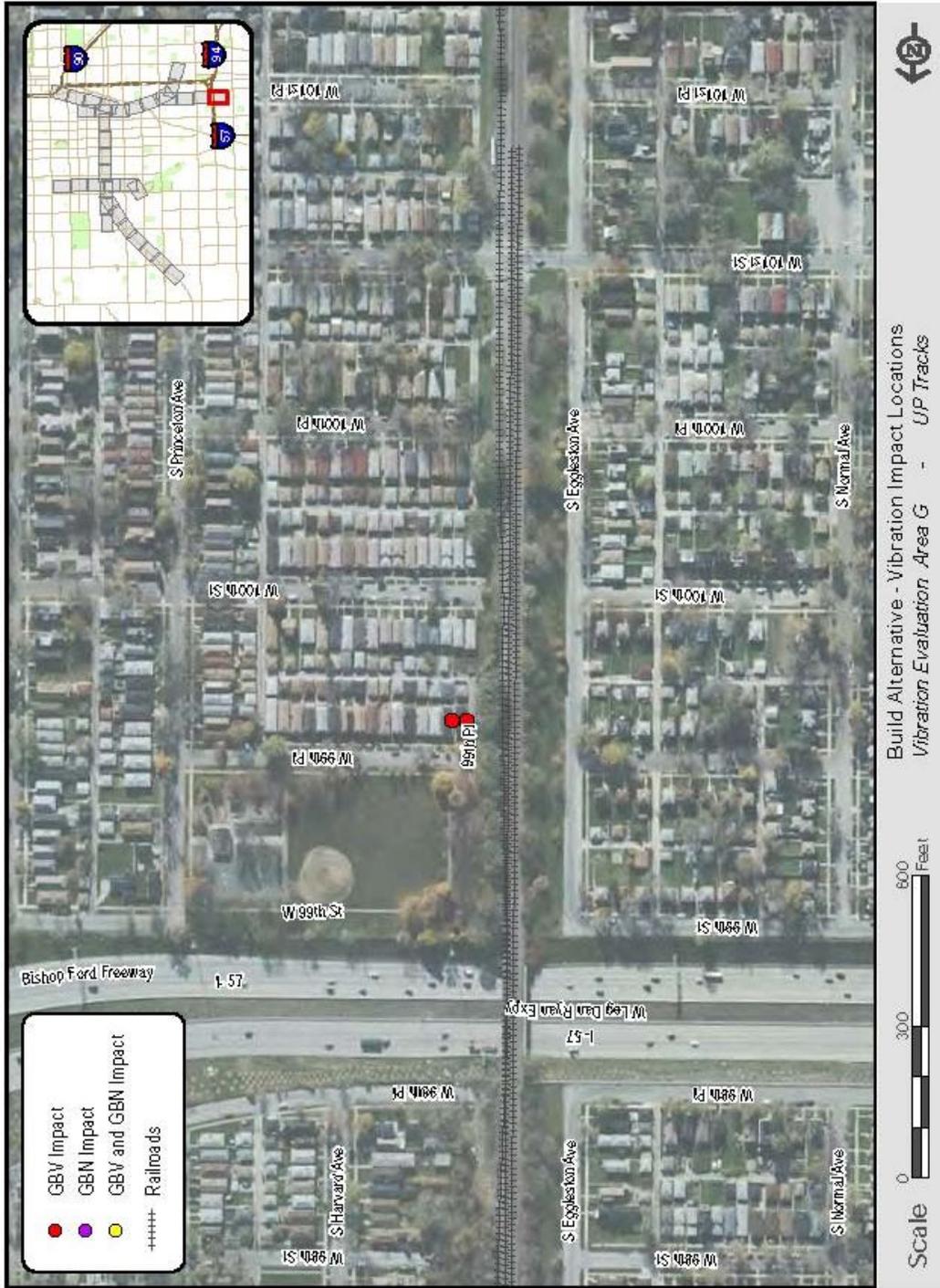
Figure 5-34: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-35: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-36: Build Alternative Vibration Impact Locations



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-37: Locations Where No-Build Alternative Vibration Exceeds FTA Threshold



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-38: Locations Where No-Build Alternative Vibration Exceeds FTA Threshold



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-40: Locations Where No-Build Alternative Vibration Exceeds FTA Threshold



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-41: Locations Where No-Build Alternative Vibration Exceeds FTA Threshold



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-42: Locations Where No-Build Alternative Vibration Exceeds FTA Threshold



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-43: Locations Where No-Build Alternative Vibration Exceeds FTA Threshold



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-44: Locations Where No-Build Alternative Vibration Exceeds FTA Threshold



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

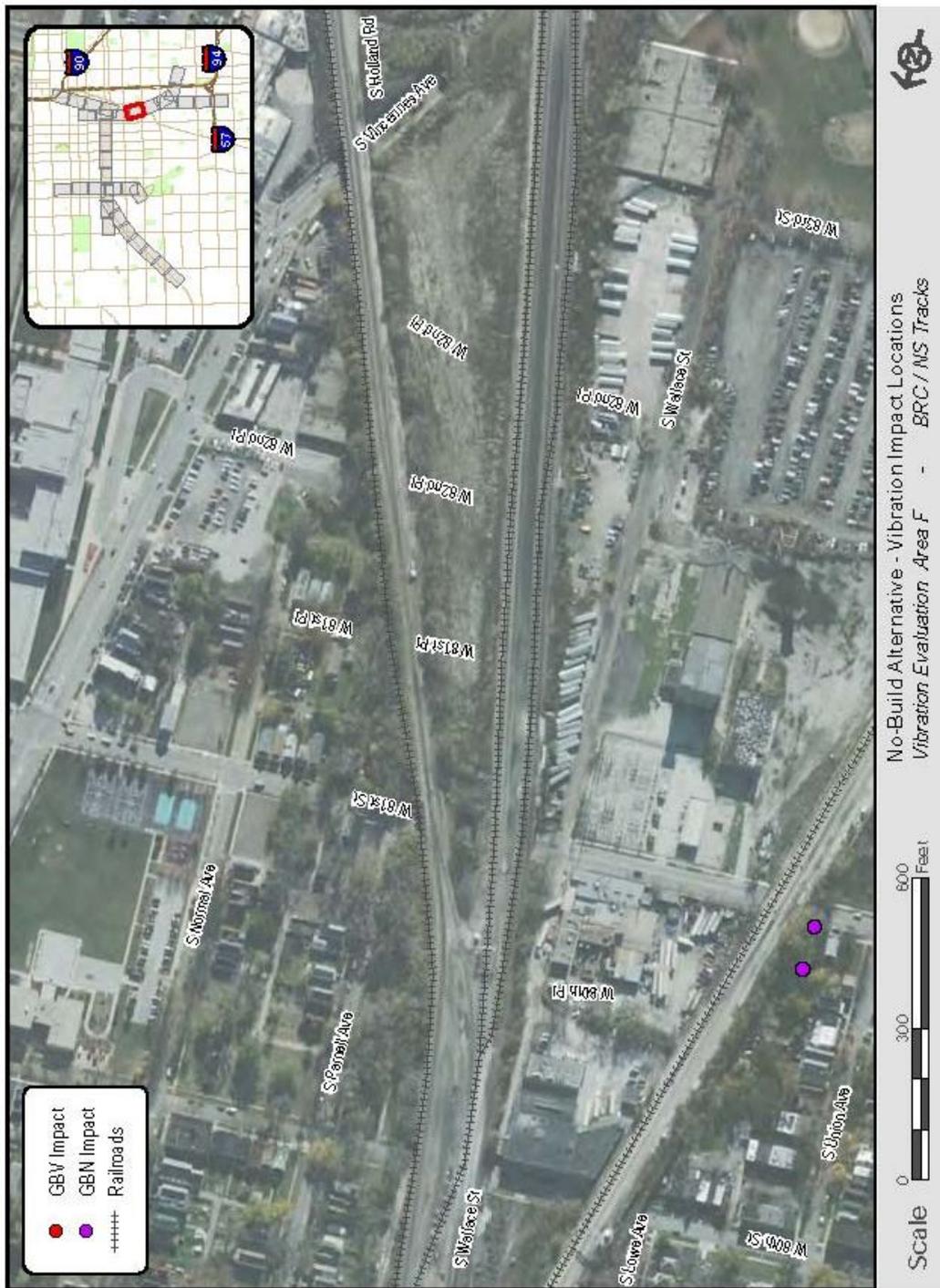
Figure 5-45: Locations Where No-Build Alternative Vibration Exceeds FTA Threshold



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-46: Locations Where No-Build Alternative Vibration Exceeds FTA Threshold



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

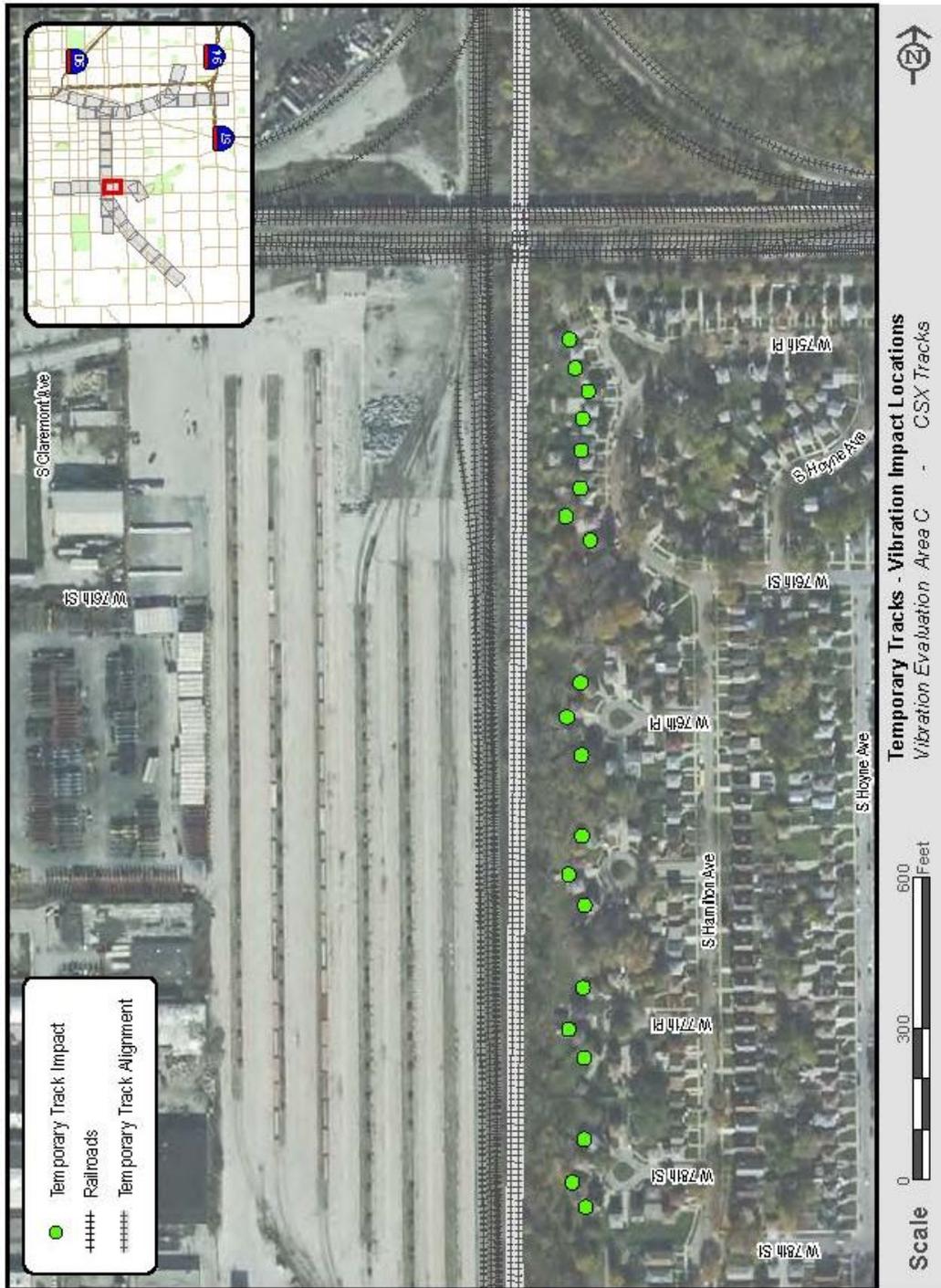
Figure 5-47: Locations Where No-Build Alternative Vibration Exceeds FTA Threshold



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-48: Locations Where No-Build Alternative Vibration Exceeds FTA Threshold



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-49: Locations Where Temporary Tracks Vibration Exceeds FTA Threshold



Source: Harris Miller Miller & Hanson Inc., 2012

Note: In some instances a single dot on the figure may indicate more than one residence as, for example, a multi-family building may include several residences.

Figure 5-50: Locations Where Temporary Tracks Vibration Exceeds FTA Threshold