

# **CONSTRUCTION VIBRATION MONITORING SUMMARY REPORT**

**SEPTEMBER 1 –30, 2017**

**VIRGINIA AVENUE TUNNEL RECONSTRUCTION PROJECT  
WASHINGTON, DC**

**Prepared for:  
CSX Transportation**

**Prepared by:  
Gannett Fleming Inc.**

**September 2017**

## **VIRGINIA AVENUE TUNNEL RECONSTRUCTION**

### **Construction Vibration Monitoring Summary**

Gannett Fleming Inc. (GFI) has prepared this vibration monitoring report as part of the ongoing efforts to comply with the commitments presented in the Virginia Avenue Tunnel Reconstruction Final Environmental Impact Statement (FEIS) and Section 4(f) Evaluation dated May, 2014 and further detailed in the Record of Decision (ROD), dated November, 2014. CSX Transportation, the project sponsor, has agreed to a number of environmental commitments as mitigation for environmental impacts that will result from the Virginia Avenue Tunnel Reconstruction Project. The commitments are divided between those related to construction of the Project and those related to the restoration of affected areas upon project completion of the Selected Alternative. These environmental commitment measures are mitigations which avoid the impact altogether by not taking a certain action or parts of an action; minimize impacts by limiting the degree or magnitude of the action and its implementation; rectify the impact by repairing, rehabilitating, or restoring the affected environment; reduce or eliminating the impact over time by preservation and maintenance operations during the life of the action; or compensate for the impact by replacing or providing substitute resources or environments. This construction vibration monitoring summary report is intended to fulfill aspects of the vibration monitoring commitments contained in the ROD for the Virginia Avenue Tunnel reconstruction.

**REPORTING NOTICE:** *Beginning with the February 2017 report on vibration monitoring results, data is being reported in new ways to help improve the clarity of communication about the vibrations being detected, and to correct a labeling error that was included in monthly reports since June 2015. The error identified summary data as “monthly average vibration levels.” The data should have been identified as “monthly maximum vibration levels.” To address that issue the labeling has been corrected and summaries of both measurements will be included in the current and future monthly monitoring reports. Results are also being provided in Velocity Decibels (VdB) and Peak Particle Velocity (PPV) for comparison to previous reports prepared as part of the Environmental Impact Statement (EIS). In addition, the maximum daily vibration levels are plotted on separate charts for each monitoring location.*

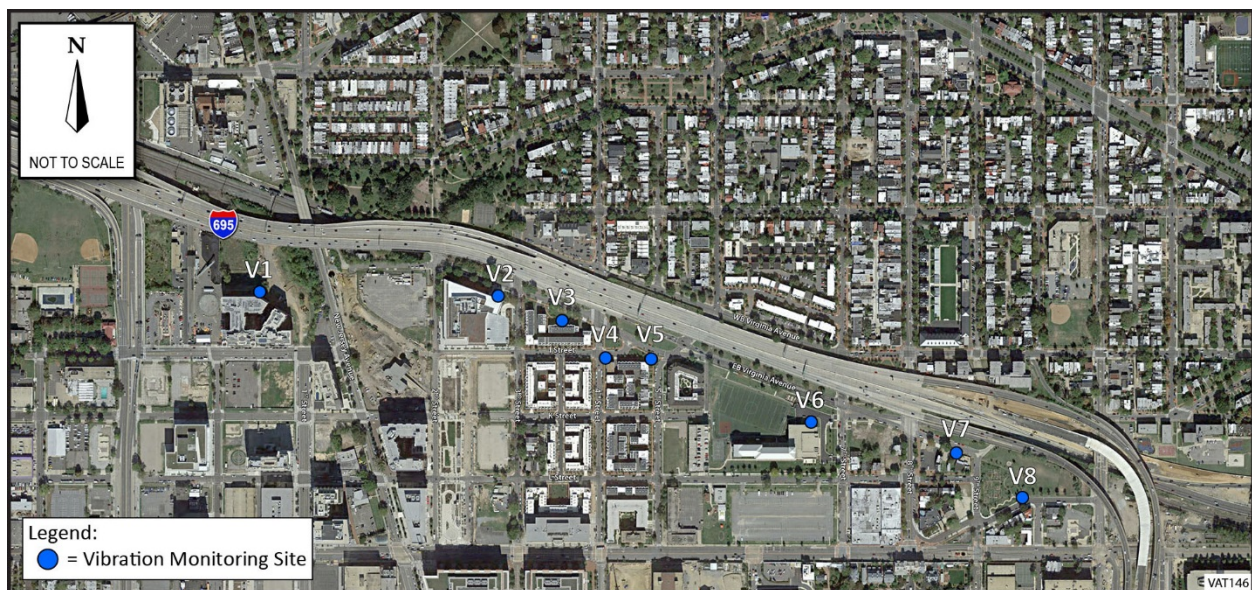
The Project Team has installed perimeter vibration monitoring stations adjacent to various buildings within the Project limits. These monitoring stations are intended to monitor construction vibration associated with the Project. Construction vibration will be monitored throughout the Project’s construction period. Sophisticated monitoring devices have been installed at eight locations to ensure the construction activities are performed in compliance with

the permitted vibration levels. The monitoring devices will record the vibration level and automatically report the data back to the Project Engineers.

### Methodology of Construction Vibration Monitoring

Construction vibration level data was collected for the reporting period starting September 1 through September 30, 2017. Eight fixed vibration monitoring locations have been measured continuously to monitor vibration levels since the beginning of major construction activities in May 2015. Vibration level data was collected every minute for the duration of the vibration monitoring period. The locations of the monitoring stations are depicted in Figure 1 and the addresses described in Table 1.

**Figure 1. Vibration Monitoring Locations**



**Table 1. Vibration Monitoring Locations Description**

Site ID	Vibration Monitoring Location
V1	West of New Jersey Avenue SE
V2	Corner of 3 <sup>rd</sup> Street and Virginia Avenue SE
V3	Between 3 <sup>rd</sup> Street and 4 <sup>th</sup> Street SE, in front of Townhomes
V4	Corner of 4 <sup>th</sup> Street SE and I Street SE
V5	Corner of 5 <sup>th</sup> Street and Virginia Avenue SE, in front of Capper Senior Apartments
V6	Adjacent to fence of Marine Corps Recreational Facility on 6 <sup>th</sup> Street SE
V7	Between 8 <sup>th</sup> and 9 <sup>th</sup> Streets SE, in front of Commercial Buildings
V8	Virginia Avenue Park

## Vibration Data Summary Charts

Table 2 presents the maximum and monthly average vibration levels measured during the month of September 2017 and shows how the measured levels compare to the established vibration criteria for structural damage. The maximum daily vibration level for each of the eight monitor locations is plotted in Figures 2 to 9.

**Table 2. Maximum and Average Construction Vibration Monitoring Results – September 2017**

Site ID	Vibration Monitoring Location	Maximum Level Recorded		Monthly Average Level		Structural Damage Criteria <sup>a,b</sup>		Number of Exceedances
		VdB	PPV (in/sec)	VdB	PPV (in/sec)	VdB	PPV (in/sec)	
V1	West of New Jersey Avenue SE	83	0.06	65	0.007	102 <sup>c</sup>	0.5 <sup>c</sup>	0
V2	Corner of 3 <sup>rd</sup> Street and Virginia Avenue SE	86	0.08	63	0.006	102 <sup>c</sup>	0.5 <sup>c</sup>	0
V3	Between 3 <sup>rd</sup> Street and 4 <sup>th</sup> Street SE, in front of Townhomes	87	0.09	66	0.008	94 <sup>f,g</sup>	0.2 <sup>f,g</sup>	0
V4	Corner of 4 <sup>th</sup> Street SE and I Street SE	83	0.06	70	0.013	90 <sup>e</sup>	0.12 <sup>e</sup>	0
V5	Corner of 5 <sup>th</sup> Street and Virginia Avenue SE, in front of Capper Senior Apartments	86	0.08	61	0.005	94 <sup>f</sup>	0.2 <sup>f</sup>	0
V6	Inside the fence of Marine Corps Recreation Facility on 6 <sup>th</sup> Street SE	90	0.12	61	0.004	94 <sup>f</sup>	0.2 <sup>f</sup>	0
V7	Between 8 <sup>th</sup> and 9 <sup>th</sup> Streets SE, in front of Commercial Buildings	88	0.10	64	0.007	94 <sup>f</sup>	0.2 <sup>f</sup>	0
V8	Virginia Avenue Park	81	0.04	60	0.004	94 <sup>f</sup>	0.2 <sup>f</sup>	0

a. Federal Railroad Administration (FRA). *CREATE Noise and Vibration Assessment Methodology*. December 2007.

b. Federal Transit Administration (FTA). *Transit Noise and Vibration Impact Assessment*. U.S. Department of Transportation Report No. FTA-VA-90-1003-06, May 2006.

c. Reinforced- concrete, steel or timber (no plaster)

d. Engineered Concrete and masonry (no plaster) buildings

e. Buildings extremely susceptible to vibration damage

f. Non-Engineered timber and masonry buildings

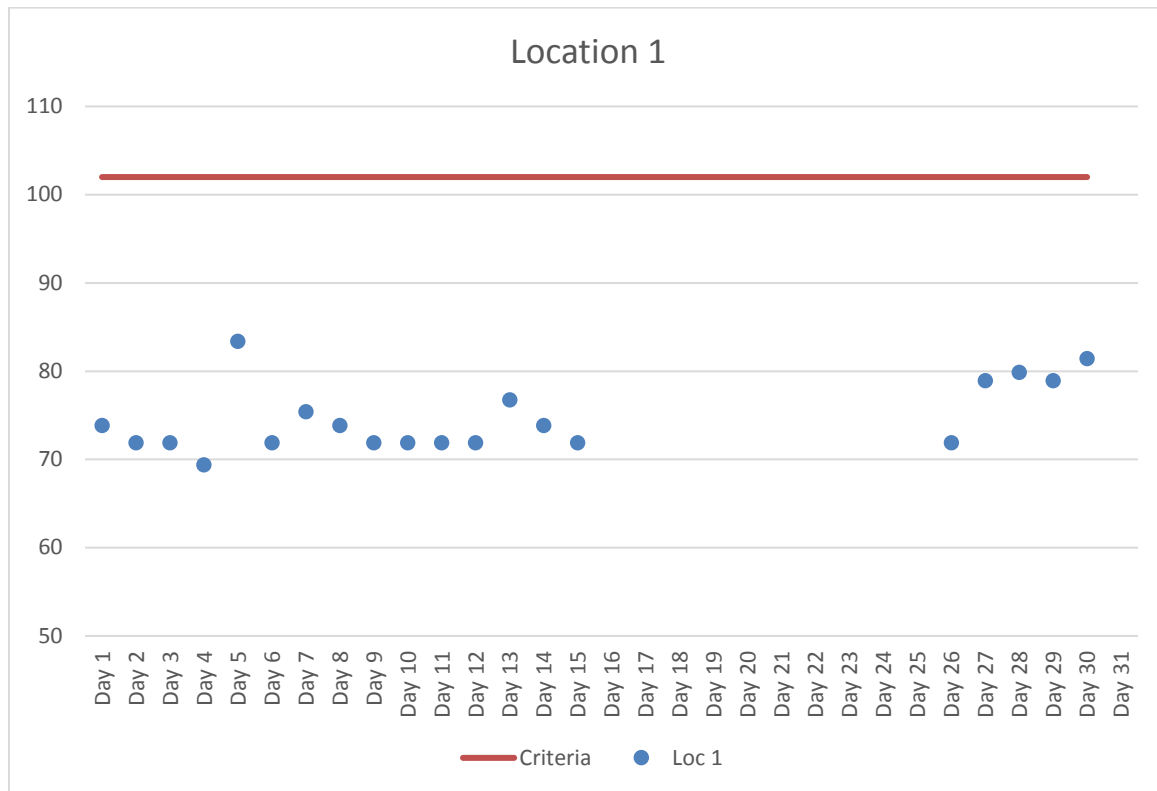
g. Note that the Structural Damage Criteria for Site V3 has been changed to a more conservative criterion based on recent assessment of the structural composition of the townhomes.

**Special notes for Figures 2 through 7:**

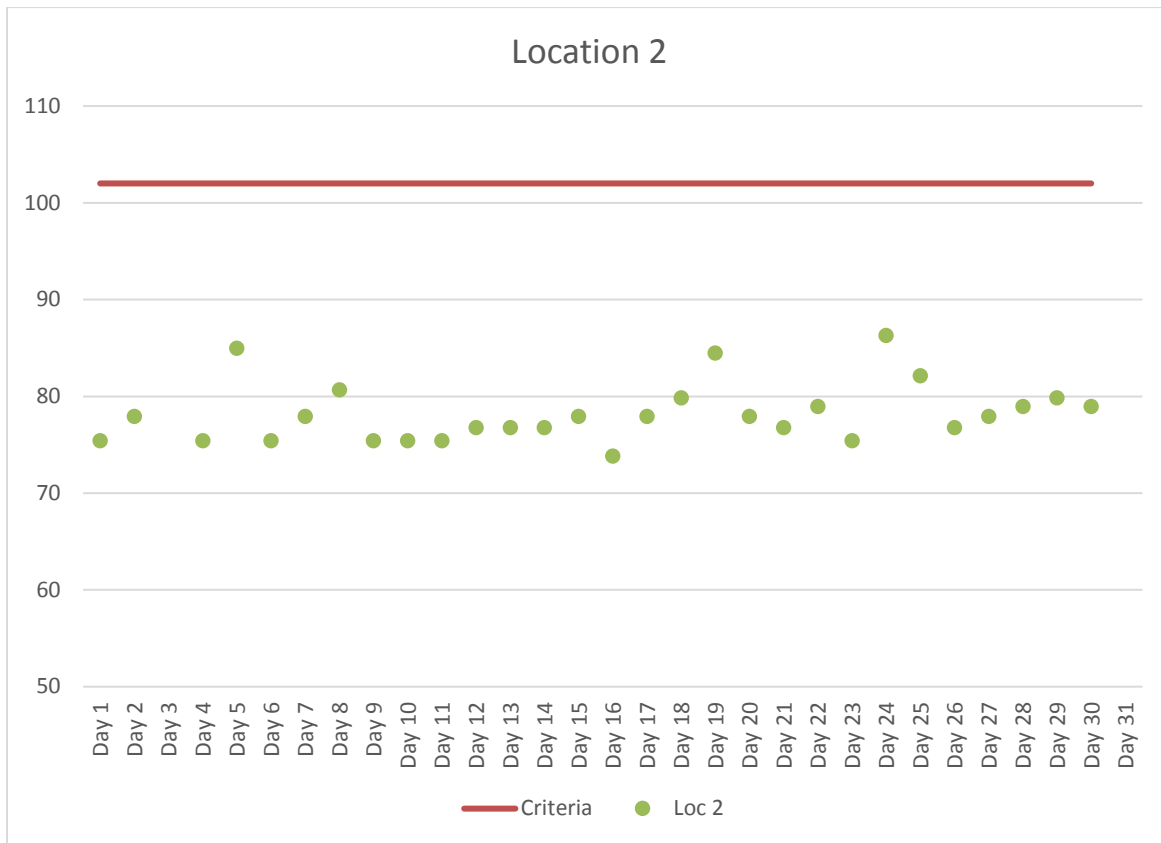
Breaks in data recording occurred at various monitors on the following dates due to power losses. CSX will continue to closely monitor and correct such issues and report accordingly in the monthly reports.

Monitoring Location 1 did not record data from September 16 to 25 due to power losses at the electric outlet in the construction staging yard. Monitoring Location 2 did not record data on September 3 due to a localized power loss. Monitoring Location 5 did not record data from September 22 to 24 due to power losses (faulty solar controller was replaced). Monitoring Location 6 did not record data on September 13, 14 and 16 to 18 due to power losses and delays in authorization needed to access the Marine Corps’ facility where the monitor is located. Monitoring Location 7 did not record data on September 2 and 4 due to power losses attributed to overgrown tree branches which interfered with solar panels. Monitoring Location 7 did not record data on September 23 and 24 due to power losses (fuse was replaced). Monitoring Location 8 did not record data on September 3, 4, 5, 20 and 28 due to interruptions caused by wireless malware.

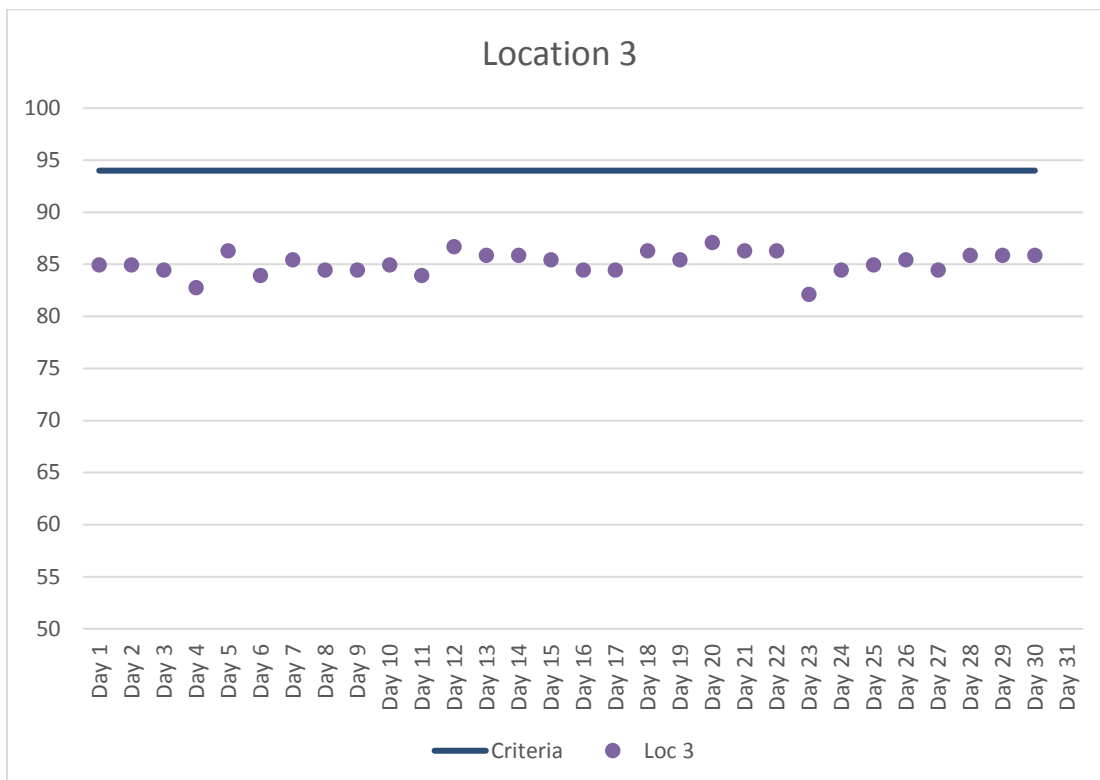
**Figure 2. Location 1 Maximum Daily Construction Vibration Monitoring Data (VdB) – September 2017**



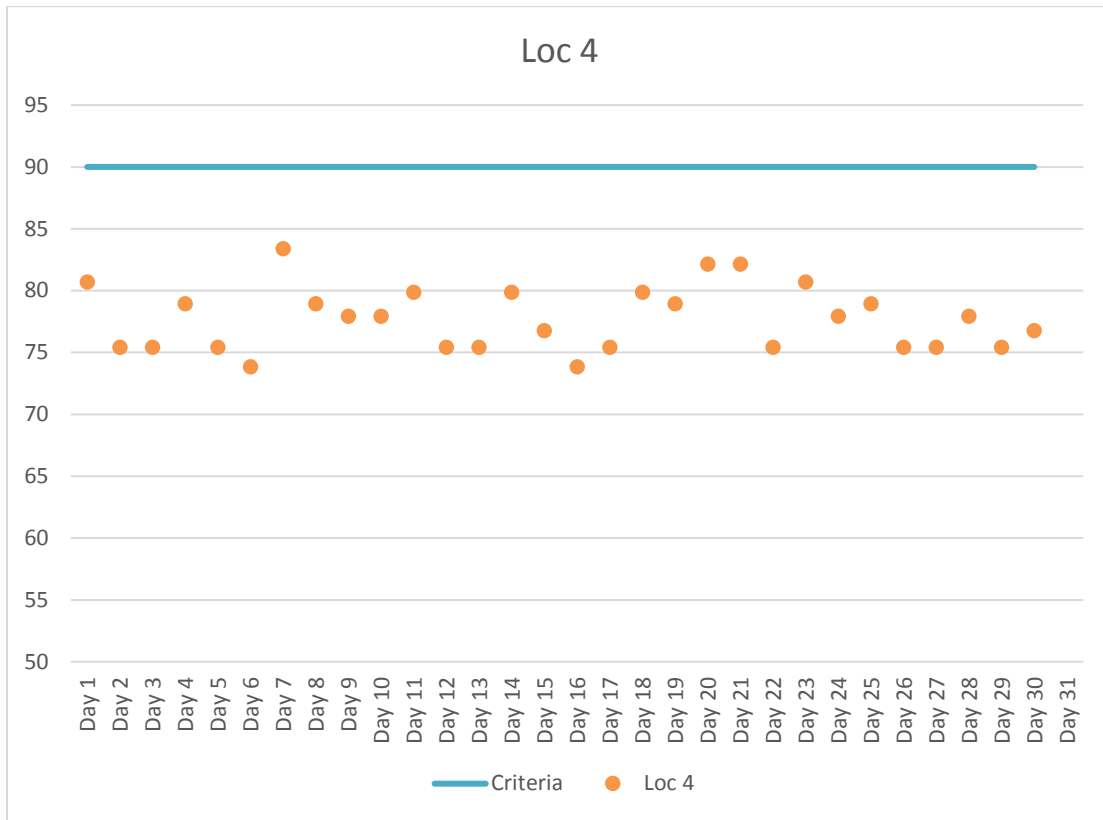
**Figure 3. Location 2 Maximum Daily Construction Vibration Monitoring Data (VdB) – September 2017**



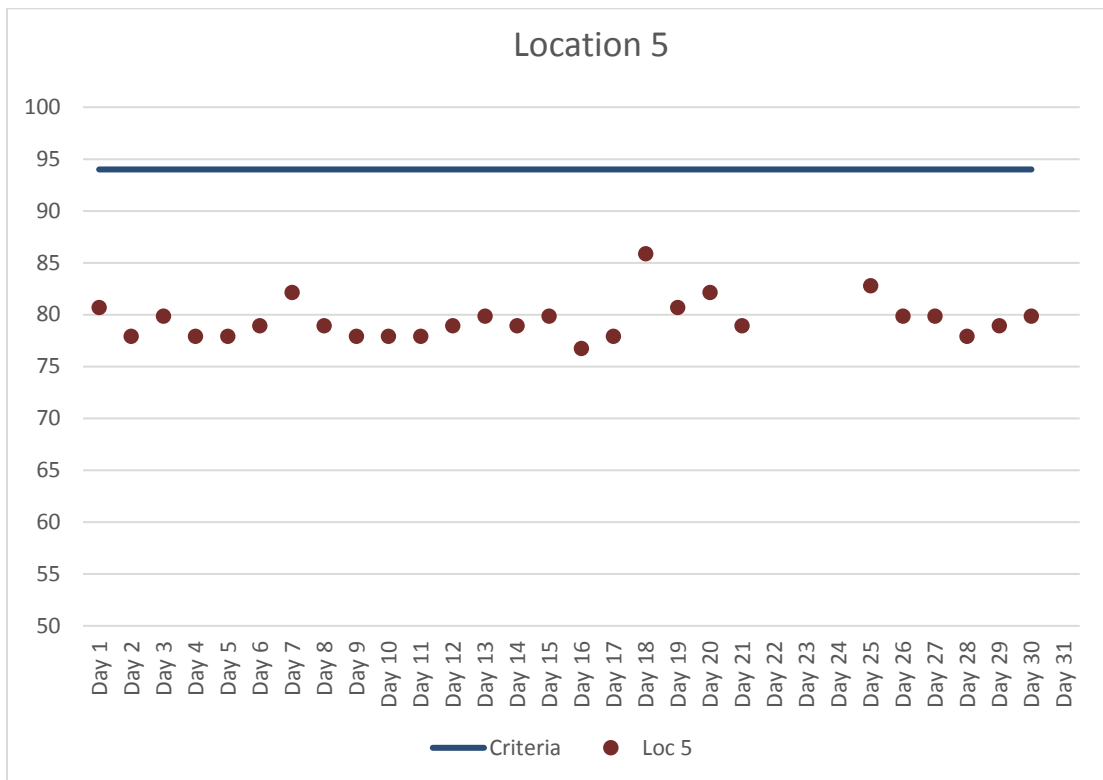
**Figure 4. Location 3 Maximum Daily Construction Vibration Monitoring Data (VdB) – September 2017**



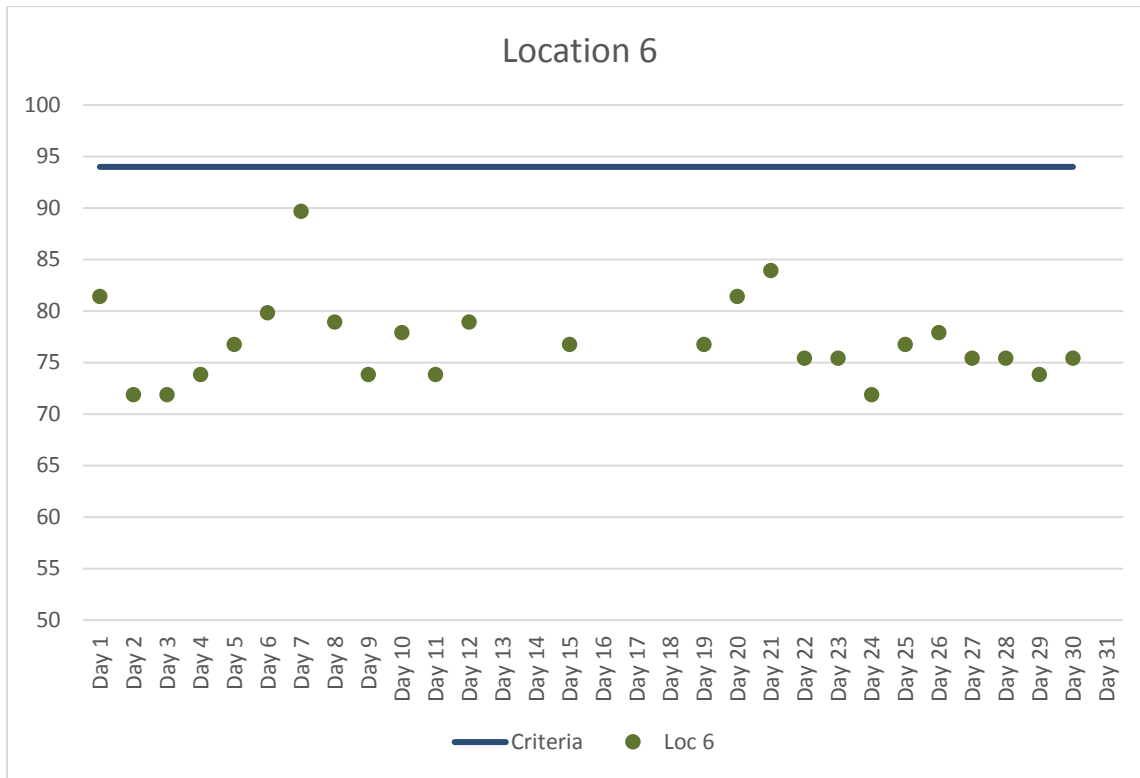
**Figure 5. Location 4 Maximum Daily Construction Vibration Monitoring Data (VdB) – September 2017**



**Figure 6. Location 5 Maximum Daily Construction Vibration Monitoring Data (VdB) – September 2017**



**Figure 7. Location 6 Maximum Daily Construction Vibration Monitoring Data (VdB) – September 2017**



**Figure 8. Location 7 Maximum Daily Construction Vibration Monitoring Data (VdB) – September 2017**

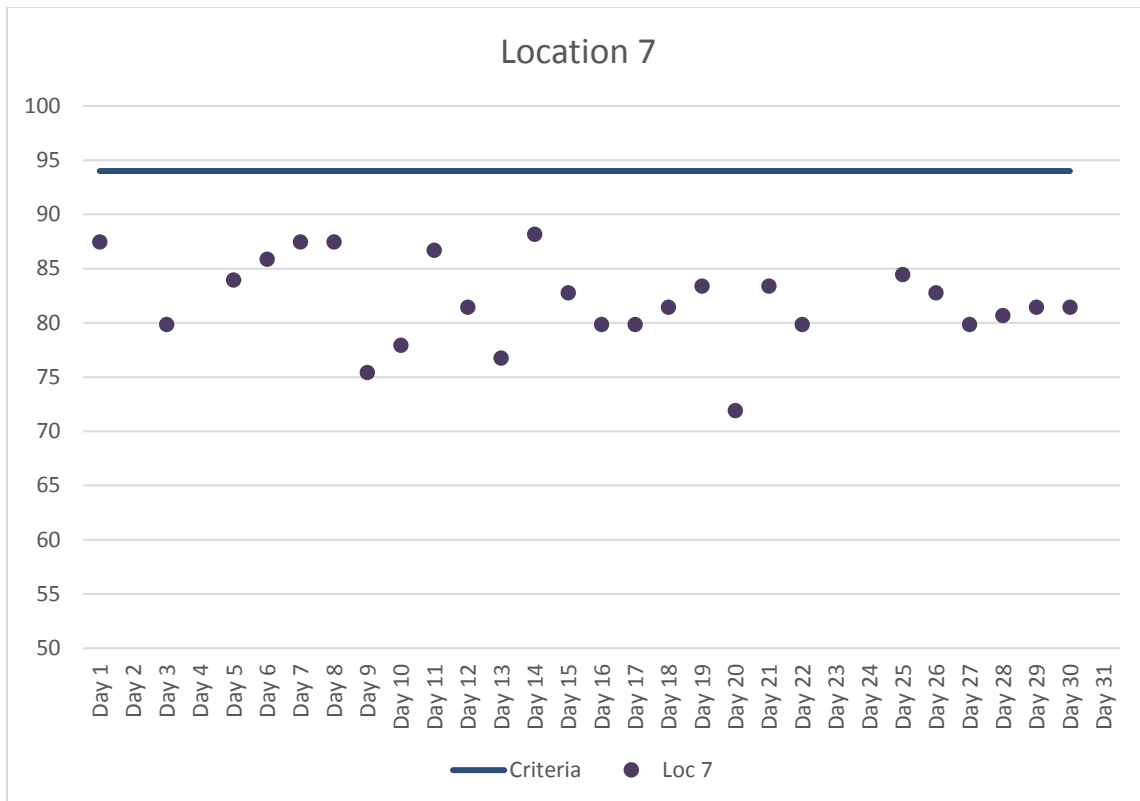




Figure 9. Location 8 Maximum Daily Construction Vibration Monitoring Data (VdB) – September 2017

