Technical Memorandum

TO:	Brad Windler, Skagit Transit
CC:	Mark Hurley, TCF Architecture PLCC
FROM:	Steve Quarterman and Amy Maule
DATE:	June 25, 2018
RE:	**Noise and Vibration Study** **Skagit Transit MOA-2 Facility** **Skagit County, Washington** **Project No. 0813011.010.012**

Introduction

Landau Associates, Inc. (LAI), under contract to TCF Architecture, is assisting Skagit Transit with evaluation of noise and vibration associated with the construction of a Maintenance, Operations, and Administration (MOA-2) facility. Skagit Transit is pursuing federal funds for the proposed project provided by the US Department of Transportation (USDOT) Federal Transit Authority (FTA). This technical memorandum presents a Noise Screening Procedure of the Skagit Transit MOA-2 facility including an evaluation of construction noise and vibration screening procedure. The Noise and Vibration Study follows FTA Noise and Vibration Impact Assessment guidelines (USDOT FTA 2006). Skagit Transit proposes to use federal funds administered by the FTA to design and construct the new MOA-2 facility, located in unincorporated Skagit County (Figure 1).

Skagit Transit previously purchased a former FedEx property (Skagit County parcel P121434 and P121435; 11784 Bay Ridge Drive), located in the Port of Skagit, and is proposing to convert the existing warehouse on the property, encompassing 69,000 square feet of enclosed space, into the MOA-2. Skagit Transit is in the process of purchasing an additional plot of land (the western portion of Skagit County parcel P127387; address unlisted), located adjacent to the currently-owned property, which will also be used to complete the MOA-2 facility. The total facility acreage of both properties will be approximately 10.37 acres. In addition to converting the existing warehouse, the project includes the construction of new structures to house ancillary functions of the MOA-2 facility including bus fueling stations and a bus wash station.

Noise/Vibration-Sensitive Sites

The inventory of noise- and vibration-sensitive sites was prepared using the Noise Screening Procedure presented in the FTA guidelines (USDOT FTA 2006), which includes inventory of resources within specified distances of the transit facility and access roads. Using FTA guidelines, noise- and vibration-sensitive land use categories generally include the following three categories:

1) Category 1: (Noise) Tracts of land where quiet is an essential element of their intended purpose. (Vibration) Buildings where vibration would interfere with interior operations.

2) Category 2: Residences and buildings where people normally sleep (Noise and Vibration).
3) Category 3: Institutional land uses with primarily daytime (Noise and Vibration) and nighttime use (Noise).

No Category 1, 2 or 3 land uses occur adjacent to the project site. The nearest sensitive land use to the project area is a residence (Category 2) located south of Peterson Road, approximately 1,500 feet (ft) southeast of the project area. Land uses adjacent to the project area include the following (shown on Figure 2):

- Vacant or agricultural land to the north and east of the project area.
- Sakata Seed America (industrial land use) to the southeast of the project area.
- Heavily vegetated or forested land to the northwest and southwest of the project area, and VT Volant Aerospace (industrial land use) to the west of the project area.
- Vacant or agricultural land to the south of the project area.

Access to the proposed MOA-2 is from Bay Ridge Drive, an existing road currently serving the project site and adjacent Port of Skagit industrial facilities. No new access roads are proposed as part of this project.

Facility Noise

Using FTA guidelines, possible noise-sensitive land use categories located within specified screening distances of Bus Facilities—Storage and Maintenance Facilities from the MOA-2 site were evaluated. The applicable screening distances specified in the FTA guidelines include 350 ft (with no intervening buildings) and 225 ft (with intervening buildings; USDOT FTA 2006). For purposes of this evaluation, the 350 ft screening distance was applied.

The planned MOA-2 facility includes parking for 72 buses, maintenance bays for 14 buses, and 186 employee or van-pool parking spaces. This volume of vehicles is less than the baseline assumptions for screening distances provided in the FTA guidelines, which is 100 buses accessing the facility and 30 buses serviced and cleaned during the peak activity hour. Therefore, the screening distances were not adjusted.

No noise sensitive land uses occur within the screening distance of 350 ft (Figure 2); therefore, facility noise is not evaluated further in this technical memorandum.

Vibration

FTA guidelines were used to identify vibration-sensitive land use categories located within specified screening distances of Bus Projects, which are 100 ft for Category 1 land uses and 50 ft for Category 2 land uses. No vibration-sensitive land uses are located within the specified screening distance from

the subject property (refer to Figure 2, which identifies land uses within 350 ft of the project area); therefore, vibration is not evaluated further in this technical memorandum.

Construction Noise

Construction creates temporary noise. Construction is usually carried out in reasonably discrete steps, each with its own mix of equipment and noise characteristics. The most constant noise source at construction sites is usually engine noise from construction-related vehicles and machinery. Mobile equipment generally operates intermittently or in cycles of operation, while stationary equipment, such as generators and compressors, generally operates at fairly constant sound levels. Trucks are present during most phases of construction and are not confined to the project site, so noise from trucks may affect more receivers than other construction noise. Other common noise sources include impact equipment, which could be pneumatic, hydraulic, or electric powered.

Noise levels during the construction period depend on the type, amount, and location of construction activities. Depending on the activity, peak noise levels from equipment associated with project construction would most likely range from 69 to 106 decibels adjusted (dBA) at 50 ft (assuming pile driving is anticipated as part of proposed project construction; EPA 1971). The noise levels estimated during construction are summarized below.

Construction Equipment Noise Ranges

Equipment	Examples	Noise Level (dBA) at 50 ft
Earth-moving	Compactors, loaders, backhoes, tractors, graders, pavers	73 to 96
Materials-handling	Concrete mixers and pumps, cranes, derricks	74 to 88
Stationary	Pumps, compressors, generators	69 to 87
Hauling	Trucks traveling on roadway	83 to 94
Impact Equipment	Pile drivers	95 to 106
Impact Tools	Jackhammers, rock drills, pneumatic wrenches	81 to 98

dBA = decibels adjusted
ft = feet

Construction noise at sensitive receivers farther away would decrease at a rate of approximately 6 dBA per doubled distance from the source. Because construction equipment would be at least 1,500 ft from the nearest residence, the average noise levels at the residence would be significantly less than the noise levels presented above.

Construction noise can be reduced by using enclosures or walls to surround equipment, installing mufflers on engines, substituting quieter equipment or construction methods, minimizing time of operation, and locating equipment farther away from noise-sensitive receivers (e.g., homes).

To reduce construction noise at nearby receivers, if needed, the following abatement measures can be incorporated into construction plans and contractor specifications:

- Limiting construction activities to the hours of 7:00 a.m. to 10:00 p.m. would avoid construction noise levels during sensitive nighttime hours.
- Using haul vehicles with rubber bed-liners would reduce noise from loading trucks.
- Equipping trucks with ambient backup alarms would reduce the noise for equipment backing.
- Equipping construction equipment engines with adequate mufflers, intake silencers, and engine enclosures.
- Constructing temporary noise barriers or curtains around stationary equipment that must be located close to residences would decrease noise levels at nearby sensitive receivers.
- Turning off construction equipment during prolonged periods of non-use to eliminate noise from construction equipment during those periods.
- Requiring contractors to maintain all equipment and train their equipment operators would reduce noise levels and increase efficiency of operation.
- Locating stationary equipment away from receiving properties would decrease noise from that equipment in relation to the increased distance.

Conclusion

Skagit Transit is proposing the development of the MOA-2 facility be located on the western half of Skagit County parcel P127387, and the entirety of parcels P121434 and P121435. Following FTA guidelines, there are no noise-sensitive land uses within the specified screening distance from the project (350 ft) and no vibration-sensitive land uses within the specified screening distance from the project (100 ft for Category 1 or 50 ft for Category 2). No new access roads are planned.

Construction activities associated with the project are expected to increase noise levels in the project area above ambient conditions. However, construction noise abatement measures can be incorporated into construction plans and specifications, as necessary. Based on the distance of the nearest residential receiver from the project area (1,500 ft), construction noise impacts are expected to be minimal.

Use of This Report

This Technical Memorandum has been prepared for the exclusive use of TCF Architecture and Skagit Transit for specific application to the Skagit Transit MOA-2 pre-design. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of Landau Associates. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau Associates, shall be at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided

in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

This document has been prepared under the supervision and direction of the following key staff.

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Attachments

Figure 1. Vicinity Map
Figure 2. Project Area and Noise Screening Assessment Map

References

EPA. 1971. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. NTID300.1. US Environmental Protection Agency. December 31.

USDOT FTA. 2006. Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06. US Department of Transportation Federal Transit Administration. May.

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Miles

Data Source: Esri 2012

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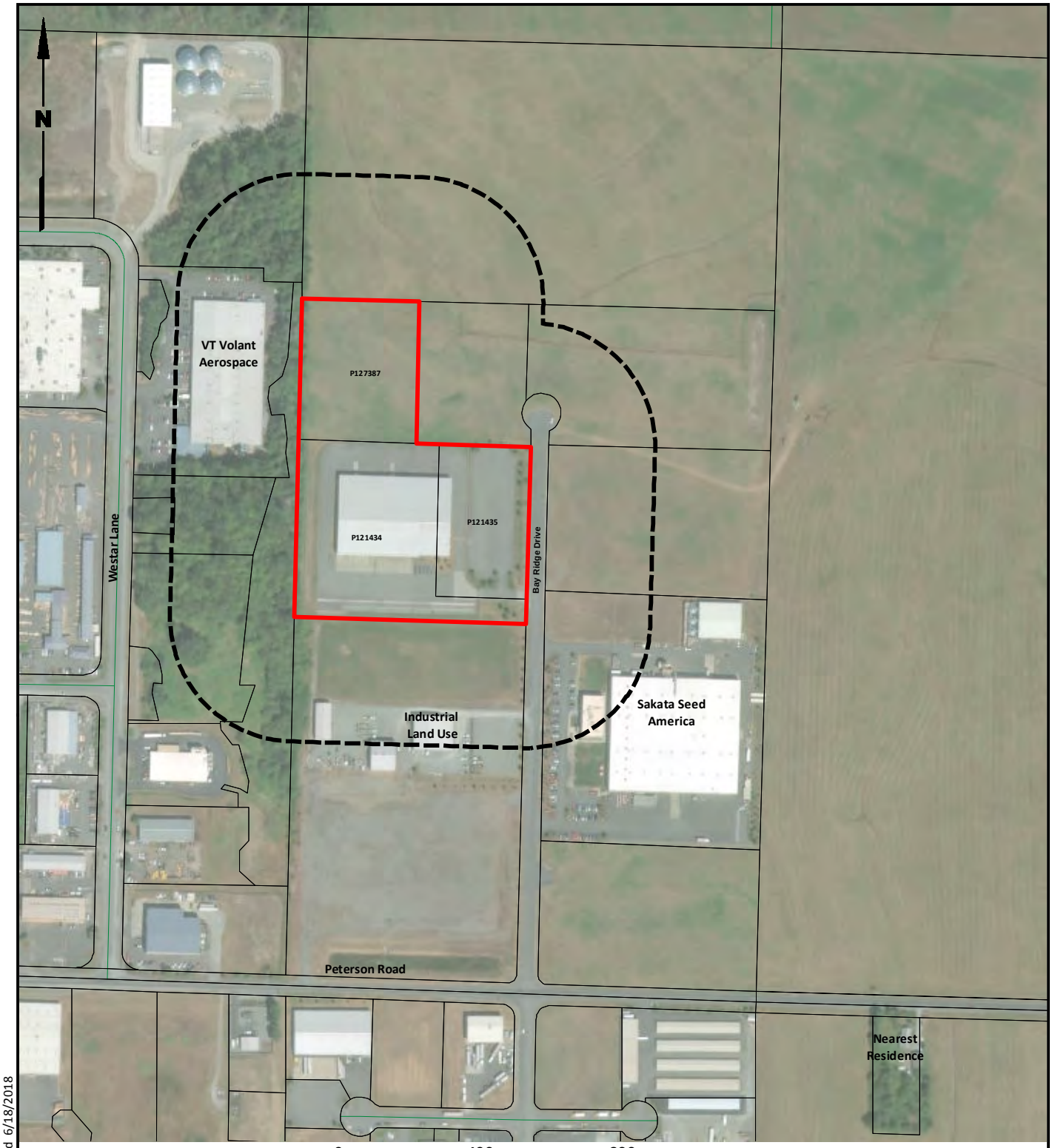
Skagit Transit MOA-2 Facility Skagit County, Washington	**Vicinity Map**	Figure 1



Legend

- Project Area
- Tax Parcels
- 350-foot Buffer (FTA Noise Screening Distance)

0 400 800

Scale in Feet

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.
2. FTA Noise Screening distance of 350-feet is designated for bus facilities.

Data Source: Skagit County GIS; Esri World Imagery.

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Skagit Transit MOA-2 Facility Skagit County, Washington	**Project Area and Noise Screening Assessment Map**	Figure 2